

# Phnom Bakheng Conservation Master Plan

## THE CONSERVATION AND PRESENTATION OF PHNOM BAKHENG



# 1

## Volume 1: Conservation Master Plan

Phnom Bakheng, the temple mountain at the center of Angkor World Heritage site, is a dramatic expression of the genius of the Khmer people and their king Yasovarman. Yasovarman named his new city Yasodharapura, which remained the official name of the capital until the end of the Angkor period.

Consecrated in 907 AD Bakheng is part of an unparalleled architectural and religious legacy of a group of monuments spanning five hundred years from the tenth to the fourteenth century. It represents a masterpiece of human creative genius for the high quality of its artistic work and the integration of its symbolic form with the natural landscape to create a physical manifestation of a Hindu cosmological template of the perfect universe.



**WORLD MONUMENTS FUND**

អាជ្ញាធរអប្សរា  
A P S A R A

World Monuments Fund / APSARA Authority Collaborative Project



# **Phnom Bakheng Conservation Master Plan: the conservation and presentation of Phnom Bakheng**

## **Volume 1: Conservation Master Plan**

Phnom Bakheng is a 10th century temple mountain centrally located in the World Heritage site of Angkor, Cambodia



Prepared by the World Monuments Fund  
under the auspice of the APSARA Authority

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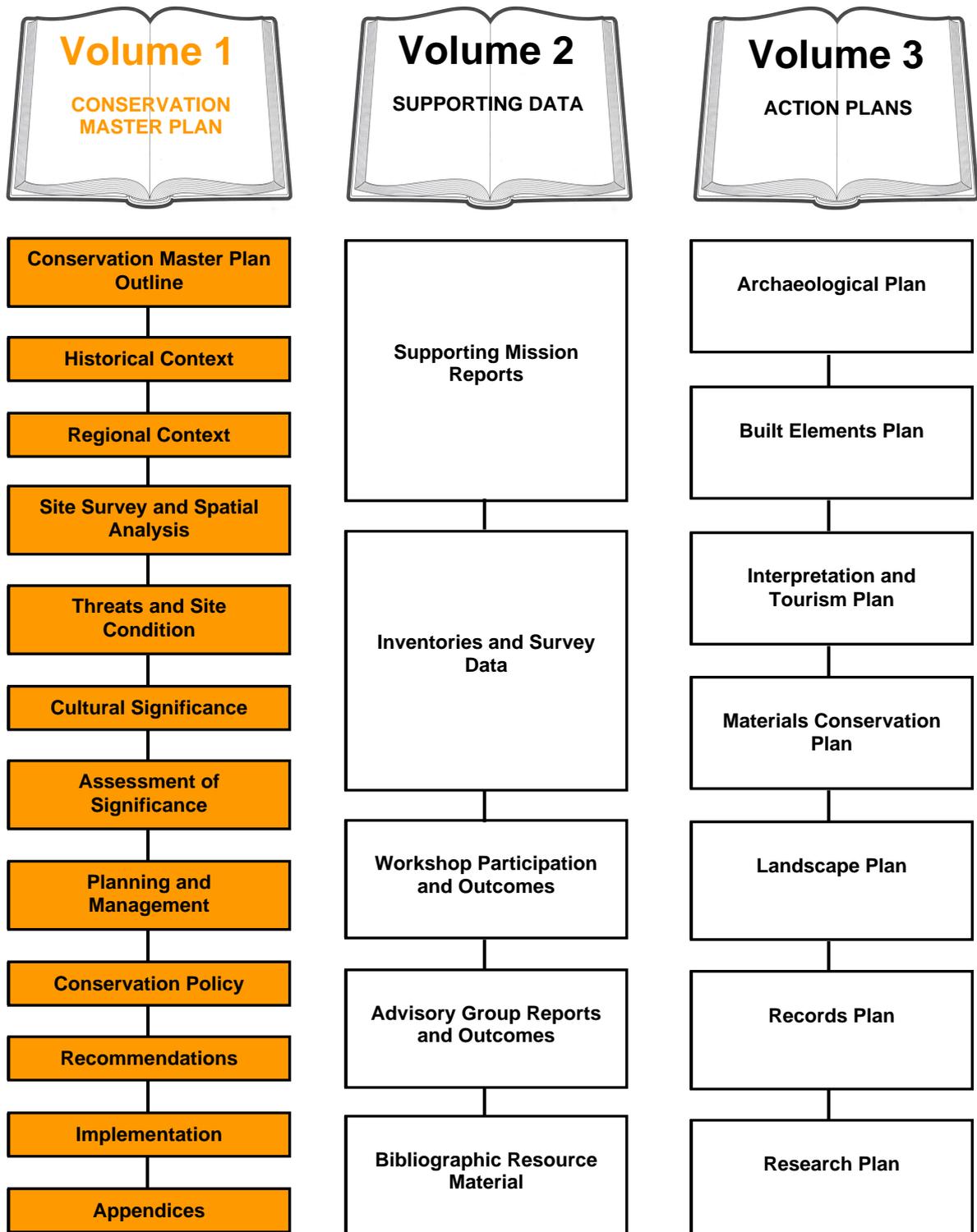
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# PHNOM BAKHENG CONSERVATION MASTER PLAN

## REPORT STRUCTURE



Report Structure (  denotes current Volume).



THE PHNOM BAKHENG CONSERVATION MASTER PLAN  
WAS ENDORSED BY THE INTERNATIONAL COORDINATING COMMITTEE FOR THE  
SAFEGUARDING AND DEVELOPMENT OF THE HISTORIC SITE OF ANGKOR  
ON [CURRENTLY NOT ENDORSED]

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## CONSERVATION MASTER PLAN OUTLINE

### 1.0 EXECUTIVE SUMMARY

This Conservation Master Plan (CMP) for Phnom Bakheng, a 10th century temple mountain centrally located in the World Heritage site of Angkor, is a document that states and illustrates why this place is significant and how that significance is to be retained in the long term. This CMP incorporates a logical development progressing from the understanding of the history and fabric of the site, into an explicit assessment of the significance, and from there, directly into the formulation of policies for retaining that significance.

The primary goal of the project is to develop a comprehensive conservation management strategy for Phnom Bakheng using an interdisciplinary approach. The CMP for Phnom Bakheng will ensure that future management and interpretation achieve a broad vision of the quality, significance, condition and potential of the site and its intrinsic and enduring value.

The CMP examines the historical, regional and physical context in a multifaceted way, taking into account Angkor Park and its geographical setting, climate, geology and topography, ecology, tourism and current uses and facilities at Phnom Bakheng.

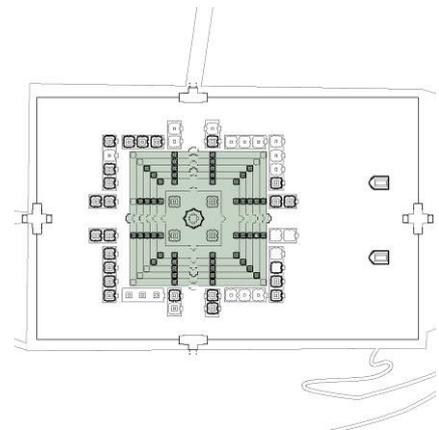
The management planning process is based on a holistic, value-based, interdisciplinary and participatory approach. It includes an assessment of site values, an assessment and documentation of its condition, study and analysis of the context issues, an establishment of guiding principles, an identification of objectives and definition of strategies required to fulfill them.

The site conservation planning is focused on conserving Phnom Bakheng's intrinsic values; including the values which contribute to Angkor's *outstanding universal values* and insuring authenticity and integrity is maintained. While enabling consensus-building with key stakeholders and realizing economic development in harmony with the site's aesthetic beauty and cultural and natural values.

Conservation in the context of this CMP includes not only ensuring the physical survival of the archaeological site and monument, but also enhancing the visual character of the landscape setting and improving the interpretation and understanding of the whole site as a cultural landscape.

The overall conservation approach is guided by sustainable development practices which seek to conserve the cultural resources in balance with the ecological resources of the site.

This CMP was prepared by the World Monuments Fund in partnership with the APSARA Authority (Authority for Protection and Management of Angkor and the Region of Siem Reap) for the APSARA Authority to effectively conserve and manage Phnom Bakheng.



**Plan of Bakheng; including the laterite wall enclosure. (DF 2006)**

**Bakheng symbolizes a celestial period. It represents Mount Meru, the center of the world according to Indian cosmology.**



**Aerial photography looking towards the southeast over Phnom Bakheng with Angkor Thom's moat visible in the right hand corner foreground. (APSARA)**

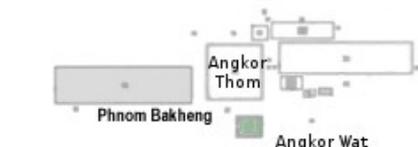
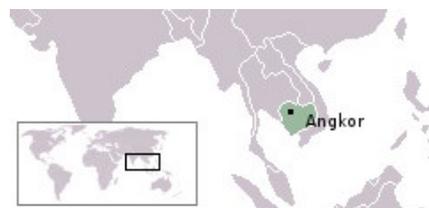
## 2.0 INTRODUCTION

### 2.1 Background

In December 2004 the World Monuments Fund (WMF) and the United States Department of State, announced a \$550,000 grant from the State Department to the World Monuments Fund for the conservation and presentation of Phnom Bakheng, a 10th century temple mountain in the Historic City of Angkor, Cambodia.

The WMF in partnership with the APSARA Authority collaborated with an interdisciplinary team to produce this CMP for Phnom Bakheng.

This three year program included detailed site assessment, conservation planning, emergency interventions, and site interpretation. The team conducted “risk mapping” and supplementary archaeological research, assessing environmental and architectural conservation needs, developing recommendations concerning the structural stability of the site, and creating an integrated plan for interpretation and tourism at Phnom Bakheng.



Angkor, CAMBODIA



Angkor, CAMBODIA

Date of Inscription: 1992

Criteria: C (i) (ii) (iii) (iv)

**Angkor is one of the most important archaeological sites in Southeast Asia. Stretching over some 400 sq. km, including forested area, Angkor Archaeological Park contains the magnificent remains of the different capitals of the Khmer Empire, from the 9th to the 15th century.**

### UNESCO

### 2.2 APSARA Authority and the Administration of Angkor

Owing to Angkor being inscribed simultaneously on the UNESCO World Heritage List and the World Heritage in Danger List in December 1992, it was necessary to establish working mechanisms to promote national and international collaboration.

At the first Intergovernmental Conference on the Safeguarding and Development of the Historic Site of Angkor, held in Tokyo in October 1993, an International Coordinating Committee for the Safeguarding and Development of the Historic Site of Angkor (ICC) was created. This Committee is co-chaired by France and Japan with UNESCO as acting Secretariat. Its inaugural meeting in December 1993, assembling representatives of more than twenty countries and organizations, marked the first high-level international discussions on Angkor ever to be held in Cambodia.

The subsequent creation of a sub-committee responsible for holding discussions and making decisions on technical issues regarding Angkor (the Technical Committee) reinforced structures for effective management of international efforts at the site.

The ICC holds plenary sessions in Phnom Penh or Siem Reap once a year. All national and international projects concerning Angkor must be submitted to the ICC, via its Technical Committee, for discussion. In 1997, the Technical Committee decided to create the Ad Hoc group of experts, responsible for advising the APSARA Authority on technical solutions to specific problems as well as on broad questions related to the safeguarding of Angkor. These mechanisms allow the APSARA Authority to collaborate directly with international governmental and non-governmental agencies, to coordinate actions undertaken in many domains, and to strengthen national technical capacities.

The APSARA Authority was created by Royal Decree in 1995. A second additional Royal Decree reinforced its authority in January 1999.

The APSARA Authority, in collaboration with other governmental agencies, is responsible for: protecting, maintaining, conserving and improving the value of the archaeological park, the culture, the environment and the history of the Angkor region as defined on the World Heritage List.

### 2.3 Overview of Context and Significance

The Bakheng temple-complex, constructed on the summit of a *phnom* (hill) in the center of the Angkor site, is one of the most important and symbolic 10th century monuments at Angkor. Consecrated in 907 AD Bakheng is part of an unparalleled architectural and religious legacy of a group of monuments spanning five hundred years from the 10th to the 14th century. It is a dramatic expression of the genius of the Khmer people and their king Yasovarman, with its integration of a symbolic form with the natural landscape to create a physical manifestation of a Hindu cosmological template of a perfect universe.

Yasovarman named his new city Yasodharapura, which remained the official name of the capital until the end of the Angkor period. Yasovarman built the Eastern Baray soon after establishing his capital Yasodharapura. The Eastern Baray (1.8 x 7 km) was part of the cosmic vision of the Khmer religion. The waters of the river coming down from the Phnom Kulen once gathered in this enormous reservoir, replenishing the city.

Although the water harvesting system has a functional aspect, not to be underestimated is the religious significance in the context of setting and ultimately spatial planning, which is balanced masterfully through building masses, landscape elements and open space.

### 2.4 Overview of Issues

Phnom Bakheng is one of the most threatened temple complexes in Angkor and the last of the key monuments to benefit from international aid. It is under many pressures, all interconnected and very challenging: water infiltration, hydraulic erosion, structural instability, stone degradation, tourist pressures and poor interpretation and visitor orientation.

The disappearance of many of Bakheng's towers was caused in part by 16th century efforts to use the towers' sandstone to build a large seated Buddha. The encroachment of the forest followed, significantly destabilizing the temple-complex structures before being cleared completely in the 1920s.

In the 1970s, during Cambodia's prolonged civil conflict, the site was commandeered by the military and used as a heavy-gun emplacement and a military encampment, and the surrounding area was extensively landmined.

The current infrastructure to welcome visitors compromises the overall historic setting of the *phnom*. The present parking and market facilities are located over the central axis of the historic eastern plaza. The temporary vehicular pull off and parking areas impinge on the historical and natural heritage landscape.

### 2.5 WMF Policy Approach

Restoration or reconstruction of ruins and archaeological sites are more problematic than those of buildings in use, because less evidence survives and the potential for speculative work is higher. Any intervention on the archaeological site has the potential to change character and substance. Excavation removes deposits which cannot be replaced, and even the repair of masonry or other structures inevitably introduces changes. In order to minimize such changes and preserve the fabric, evidential quality and character of the site as far as possible; WMF's approach to conserving the architectural remains of Phnom Bakheng will be to conserve it as a partial ruin. The general aim will be to slow or arrest the process of decay while also making the site safer and more intelligible to the visitor.



Phnom Bakheng provides an exceptional vantage point for sunset viewing, which has resulted in concentrated tourist pressures and significant loss of historic fabric. (ME Dec. 2004)



Tourists flock to Phnom Bakheng in their thousands for sunset viewing. (JPS June 2005)



East *phnom* axial stairs and uncontrolled monsoon runoff, resulting in hydraulic erosion and loss of significant fabric. (APSARA Aug. 2003)



View of the extent of tree encroachment at Phnom Bakheng, just prior to being removed by EFEO. (EFEO 1915)

WMF policy is to carry out minimum conservation work necessary for the long term survival and, where possible, display of the site. Any decisions on what should be done at Phnom Bakheng will be derived from a thorough understanding of the site and its significance and values.

The conservation priorities will follow the conclusions and recommendations of the Structural Risk Map dated March 2005, as supplemented by a similar risk map made of the surviving fine stone carving on the structure. Physical interventions will entail structural stabilization and may entail very limited *anastylosis* or the re-erection of fallen elements. Such work will be done mainly at the exterior walls for structural purposes and at the site's various watershedding surfaces.<sup>1</sup> In no place does WMF envisage restoring any element of Phnom Bakheng to an earlier appearance.

## 2.6 Acknowledgments

The CMP incorporates contributions from a wide range of people and organizations, including current and former APSARA Authority staff, heritage practitioners, engineers, hydrologists, architects, Association des Amis d'Angkor (AAA), École française d'Extrême-Orient (EFEO) and focus groups and workshop participants. Though written feedback on early drafts, the CMP document includes and reflects the views and work of many people to whom Phnom Bakheng and Angkor are important.

All of these contributions are gratefully acknowledged.

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\* The opinions, findings and conclusions or recommendations expressed herein are those of the author(s) and do not necessarily reflect those of United States Department of State.

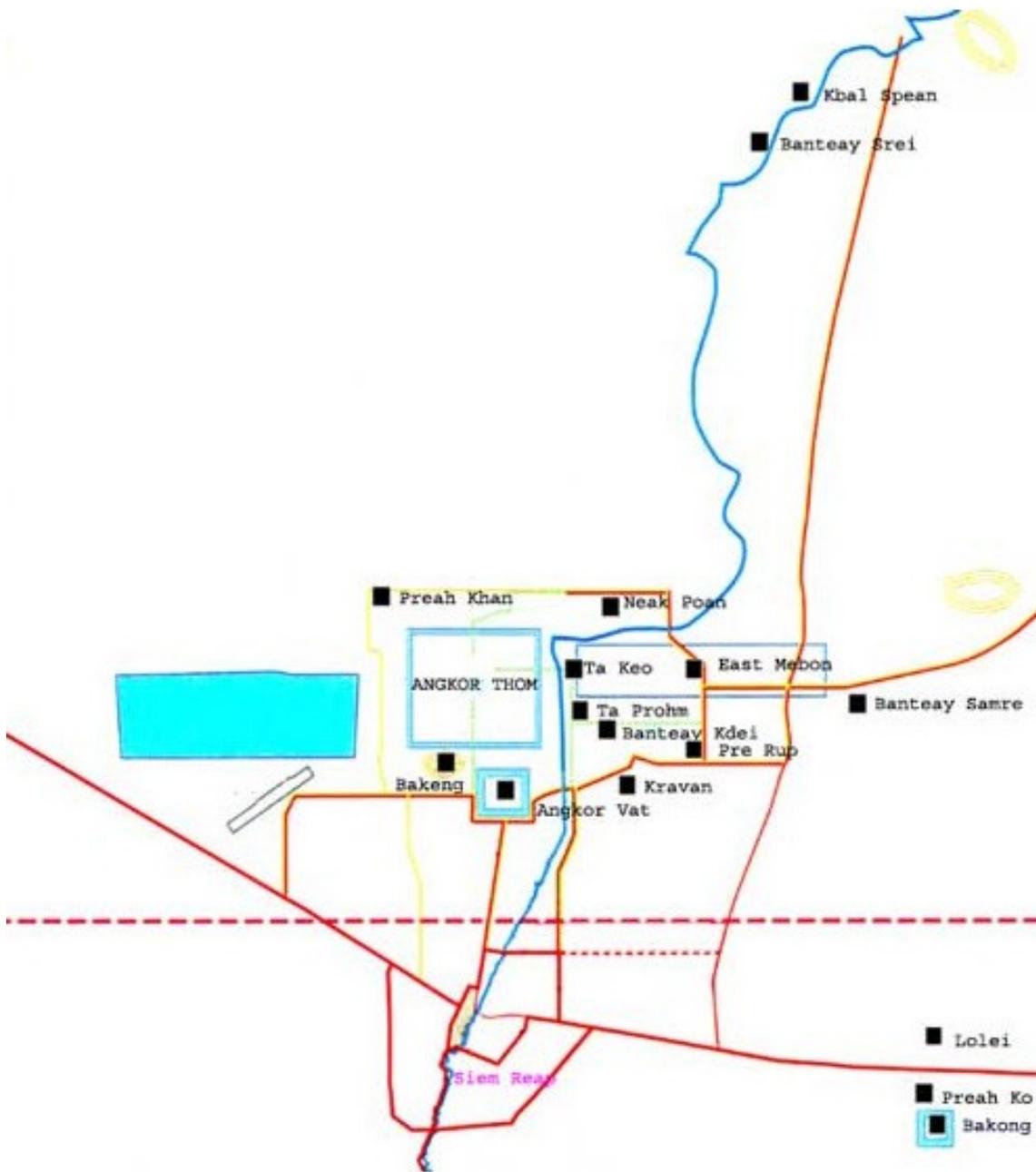


Figure 1 Key Temples and Access Road from Siem Reap to Angkor and Hariharalaya (APSARA)

### 3.0 THE STUDY PROCESS

#### 3.1 Aims

Conservation in the context of this plan refers to all measures carried out to preserve the physical remains of the site and its historic setting. The aim of conservation is to preserve the authenticity of all the elements of the site and to retain for the future its historic information and all its values.

The primary goal of the project is to develop a comprehensive conservation management strategy for Phnom Bakheng using an interdisciplinary approach. The Conservation Master Plan for Phnom Bakheng will ensure that future management and interpretation achieve a broad vision of the quality, significance, condition and potential of the site and its intrinsic and enduring value. The vision expresses the need to: *Conserve and interpret the cultural and natural resources of Phnom Bakheng within the context of the Historic City of Angkor.*

The primary objective of the CMP is to provide an integrated interdisciplinary framework for the future management of the heritage resources at Phnom Bakheng through:

- identifying the cultural and natural heritage resources of the site;
- assessing the value of significance of those resources;
- identifying opportunities and constraints that apply to their management;
- developing policies for conservation, ecological repair, interpretation, management and use of the site;
- developing priorities for conservation works and further investigation and planning;
- establishing the cultural significance of Phnom Bakheng, including its setting in Angkor;
- formulating appropriate policies for the conservation of the Phnom Bakheng cultural landscape, taking into account its historical and technical significance, its significance to the Cambodian people, the significant physical fabric, the natural setting, and the on-going usage and management of the place by the APSARA Authority;
- formulating appropriate policies for the long term conservation of the cultural significance of the place. These policies are to include future usage, on-going maintenance and management of the cultural landscape;
- providing a benchmark document; and
- fostering participation among stakeholders in the conservation planning process.

Conservation in the context of this plan refers to all measures carried out to preserve the physical remains of the site and its historic setting. The aim of conservation is to preserve the authenticity of all the elements of the site and to retain for the future its historic information and all its values. Conservation in practice involves treatment of damage caused by natural processes and human actions and prevention of further deterioration, using both technical and management measures.

#### 3.2 Project Identification

Procedurally this project was framed by producing a Project Identification Report which resulted from an on-site integrated and holistic planning analysis. WMF's signature *charrette method* for international heritage conservation project planning was used here due to the severe time constraints posed by a number of urgent site and public safety issues at the site.

The *charrette*, a workshop of multiple sessions of intense multi-day meetings ending with presentations or critique and improvement by stakeholders, known as *Mission I*, which took place between 8 and 17 December 2004 to coincide with the 11th Plenary Session of the International Coordinating Committee for the Safeguarding and Development of the Historic Site of Angkor (ICC) on 16-17 December 2004 in Siem Reap.

This workshop resulted in an initial determination of the optimum parameters for conservation and presenting Phnom Bakheng, which was arrived at through consensus with the project planning team and invited respondents and presenting of its findings at an on-site presentation to the APSARA Authority and the ICC Ad Hoc Group of Experts on 16 December 2004. WMF made a PowerPoint presentation on 17 December 2004 at the ICC meeting outlining its plans for the Phnom Bakheng Project.

The ICC Ad Hoc Committee endorsed the WMF and it was noted in the ICC minutes:

*“The Committee acknowledges the project being undertaken with the APSARA National Authority on Phnom Bakheng. Given the various emergency situations and visitor safety concerns, the Committee strongly recommends that the joint team (APSARA and WMF) working on the site move ahead as quickly as possible with the priority operations to ensure structural consolidation and visitor safety. The general direction and emergency intervention are outlined in the attached memorandum prepared by Prof. CROCI (ad hoc group of experts) and Prof. GAVRILOVIC (WMF).”*

It was from the findings of this Project Identification Phase that the structure and proposed contents of the CMP were derived.

### **3.3 Process and Workshop**

An extensive interactive program of consultation with the APSARA Authority staff, stakeholders, tourism industry and the wider local and international community has been undertaken to ensure that the views of interested people form part of the significance assessment and the conservation policy of the place.

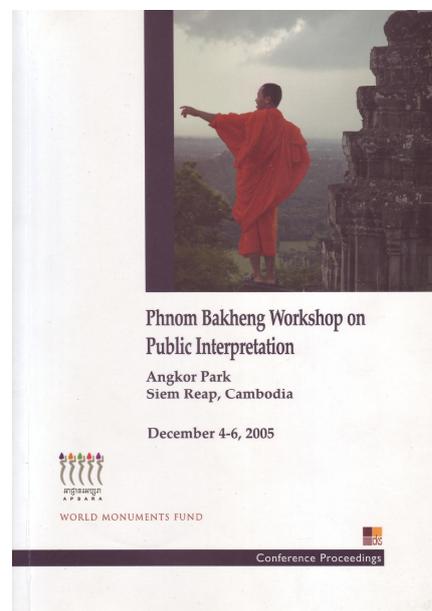
An event which helped shape this CMP was the *Phnom Bakheng Workshop on Public Interpretation*, convened by the World Monuments Fund under the auspices of the APSARA Authority, held at the Center for Khmer Studies in Siem Reap, Cambodia, December 4-6, 2005.

The Workshop provided an international multidisciplinary forum for presentations and discussions on the history and use of Phnom Bakheng. Scholars and experts from the fields of history, archaeology, conservation, architecture, tourism studies and anthropology together developed an integrated approach to presenting and conserving Phnom Bakheng's cultural and natural heritage and values. During the two and a half day Workshop, participants developed an unprecedented model for planning for Angkor's monuments by focusing on not only conservation requirements but also on the demands of tourism and the needs of local populations.

The publication of the *Phnom Bakheng Workshop on Public Interpretation Conference Proceedings* includes the most current research from specialists on the site's history, ecology, art and architecture, tourism, and heritage planning.



Photograph of attendees at the Phnom Bakheng on-site presentation to the APSARA Authority and the ICC on the 16 December 2004.



Front cover of the *Phnom Bakheng Workshop on Public Interpretation Conference Proceedings*, published in 2006



View looking north-northeast from an air balloon showing Phnom Bakheng and surrounding cultural landscape. (ME Dec. 2004)

### 3.4 Vision for the Future

The cultural significance of Phnom Bakheng as a whole is provided by not only the survival of the temple-complex, but also by the unique integration of its symbolic form with the natural landscape.

The vision for the future of Phnom Bakheng is based therefore on the fundamental need to conserve, enhance and interpret the cultural significance of the Yasodharapura landscape, in particular the *phnom* and its immediate environ, and its contribution towards Angkor's *outstanding universal values* while maintaining authenticity and integrity in the conservation and interpretation process.

Key vision objectives include:

- protect and conserve the cultural and natural resources of Phnom Bakheng within the context of the Historic City of Angkor;
- restore damaged landscape so that the natural system they support can regain viability;
- through an integrated approach to interpretation, tourism and visitor management transform the visitor experience and work to conserve the physical and intangible heritage of the site;
- develop and implement a comprehensive management strategy using an interdisciplinary approach; and
- strengthen partnerships for the conservation, management, interpretation and stewardship of the site.

### 3.5 Establishing Methodology

Phnom Bakheng has been assessed as a cultural landscape rather than just considering the temple-complex and immediate curtilage. In both the historical outline and in the physical survey the broader context has been considered. A cultural landscape approach forms the basis of the assessment of many cultural places listed on the World Heritage List.

Cultural landscape analysis is particularly useful in understanding the landscape of Angkor, which generally contains a range of built structures within a modified landscape.

The actual definition of a cultural landscape accepted by the World Heritage Committee stated that cultural landscapes 'are illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal.' They should be selected for World Heritage status on the basis both of their *outstanding universal value* and of their representativity in terms of a clearly defined geographical region, and also for their capacity to illustrate the essential and distinctive cultural elements of such regions. Such landscapes were also required to be 'distinctive.'

A cultural landscape perspective explicitly recognizes the history of a place and its cultural traditions in addition to its ecological value. They are characterized:

Geographically/topographically/functionally by:

- Mountains, water, farming and inhabited settlements including villages and towns;

Intellectually by:

- Historical and/or cultural significance, continuity and tradition, religiosity and aesthetics.<sup>2</sup>



View from the south-southwest towards Phnom Bakheng. Note the artificial plateau of Phnom Bakheng and the central tower of the quincunx is clearly visible within the farming landscape even though its superstructure is absent. (CP Dec. 2004)

Very few if any cultural landscapes possess every one of those characteristics but all of them possess some of them, in different combinations. Phnom Bakheng, the center of Yasodharapura – the first city at Angkor, provides an outstanding example of looking beyond the ensemble of built structures and seeing a whole landscape derived from religious observance, Hinduism in this case.

The ‘culturally-significant’ cultural landscape of Southeast Asia undoubtedly is the Angkor cultural landscape with Phnom Bakheng the ‘first Angkor city’ at its center, arising from, associated with and representing the Khmer culture.

By articulating and understanding the complex and interrelated values represented through cultural landscape, a richer and more effective process for identification and management will be conceived. This way of looking encourages the understanding of heritage as an integrated system of related parts where the relationship between the parts acquires greater importance than the parts themselves.

### 3.6 Report Structure<sup>3</sup>

This Conservation Master Plan (Volume 1) provides policies and illustrations that cover all aspects of the heritage significance at Phnom Bakheng. However, the CMP does not provide detailed guidelines and instructions for implementation – the detail is to be found in other subsidiary documents (Volume 3).

Volume 2 contains supporting data.

All Volumes will be public documents.

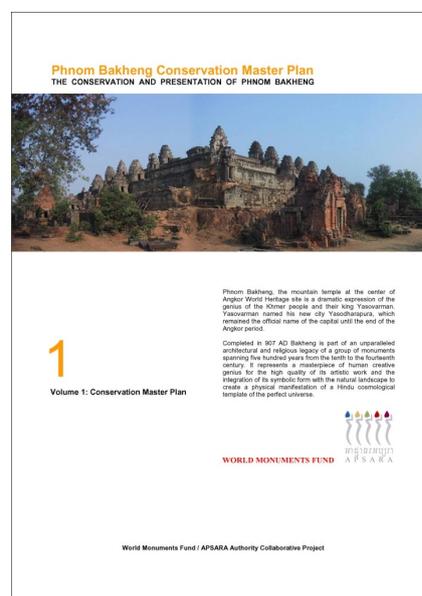
**3.6.1 Relationship between Volume 1 and Volume 3:** the relationship between this Plan (Volume 1) and other planning documents (Volume 3) is shown graphically in Figure 2. This relationship embodies the following principles:

Within the framework provided by the CMP are Action Plans (Volume 3):

- Archaeology;
- Built Elements;
- Interpretation and Tourism;
- Landscape;
- Materials Conservation;
- Records; and
- Research.

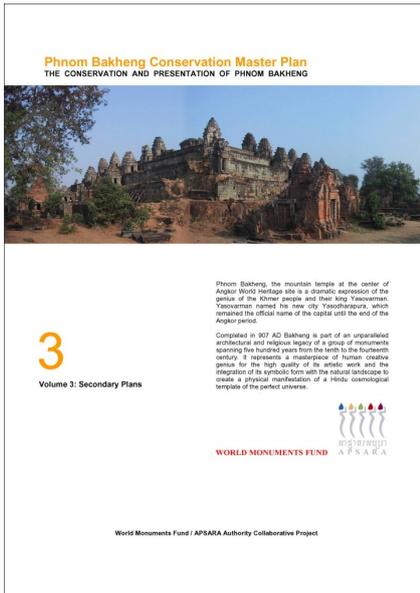
**3.6.2** These Action Plans will overlap with the CMP (Volume 1), in relation to policy, but will also include more specific policies and implementation strategies.

**3.6.3** The size and detail of the Action Plans and their coverage will vary in accordance with their scope. For example – Archaeology, Built Elements, Interpretation and Tourism, and Materials Conservation Action Plans will, of necessity, comprise substantial documents.



**Phnom Bakheng Conservation Master Plan, Volume 1: Conservation Master Plan**

**This Conservation Master Plan provides policies and illustrations that cover all aspects of the heritage significance at Phnom Bakheng**



Phnom Bakheng Conservation Master Plan, Volume 3: Action Plans

These Action Plans will overlap with the CMP (Volume 1), in relation to policy, but will also include more specific policies and implementation strategies.

3.6.4 Operating in conjunction with each of the Action Plans will be Work Procedures that set out the method. The Work Procedures form part of their corresponding Action Plan.

3.6.5 The diagram below provides an example of the relationship between the Landscape Action Plan and some of its Work Procedures.

3.6.6 Volume 2: is comprised of supporting data including: mission reports, inventories, survey data, workshop and advisory group reports and outcomes, and bibliography database.

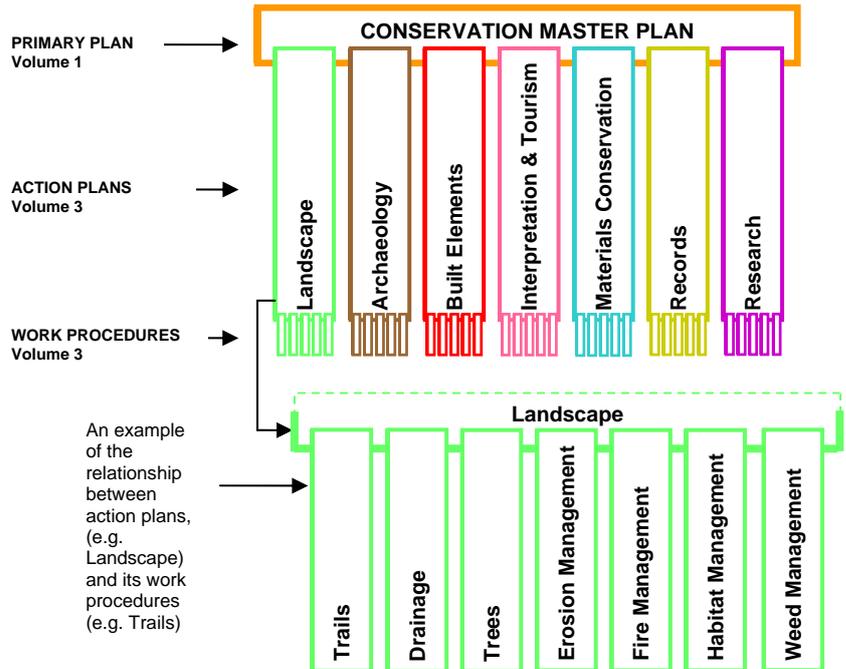


Figure 2 Relationship between Volume 1 and Volume 3 Planning Documents

3.7 Conclusion

With the input of stakeholders, who include partners, scholars, and relevant communities, this CMP serves as a working tool for the APSARA Authority and the WMF to communicate the significance of the site, and document and illustrate a vision for its conservation, interpretation and management.

The future for Phnom Bakheng is based on the fundamental need to conserve, enhance, and interpret the historic landscape of Yasodharapura evident in the morphological transformation of the cultural landscape of Angkor – in particular the *phnom* and its immediate environs, and its contribution to Angkor’s outstanding universal values – while maintaining its authenticity and integrity.

## **HISTORICAL CONTEXT**

### **4.0 THE KHMER EMPIRE<sup>4</sup>**

The Khmer empire was a powerful kingdom based in what is now Cambodia. The empire, which seceded from the kingdom of Chenla, at times ruled over and/or vassalised parts of modern-day Laos, Thailand and Vietnam. Its greatest legacy is Angkor, which was the capital during the empire's zenith. Angkor bears testimony to the Khmer empire's immense power and wealth, as well as the variety of belief systems that it patronized over time. The empire's official religions included Hinduism and Mahayana Buddhism, until Theravada Buddhism prevailed after its introduction from Sri Lanka in the 13<sup>th</sup> century.

The history of Angkor as the central area of settlement of the historical kingdom of Kambuja is also the history of the Khmer from the 9<sup>th</sup> – 15<sup>th</sup> centuries.

From Kambuja itself — and so also from the Angkor region — no written records have survived other than stone inscriptions. Therefore the current knowledge of the historical Khmer civilization is derived primarily from:

- archaeological excavation, reconstruction and investigation;
- inscriptions on stele and on stones in the temples, which report on the political and religious deeds of the kings;
- reliefs in a series of temple walls with depictions of military marches, life in the palace, market scenes and also the everyday lives of the population; and
- reports and chronicles of Chinese diplomats, traders and travelers.

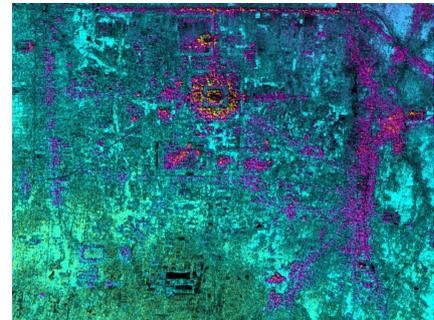
The beginning of the era of the Khmer kingdom of Angkor is conventionally dated to 802. In this year, king Jayavarman II had himself declared "Chakravartim" (king of the world).

#### **4.1 The Empire's Birth**

##### **Jayavarman II - founder of the Angkor Empire**

Jayavarman II lived as a prince at the court of Java, whether as a prisoner or for his education (or both) has not yet been established. After he eventually returned to his home, the former kingdom of Chenla, he quickly built up his influence, conquered a series of competing kings, and in 790 became king of a kingdom called "Kambuja" by the Khmer. In the following years he extended his territory and eventually established his new capital of Hariharalaya near the modern Cambodian town of Roluos. He thereby laid the foundation of Angkor, which was to arise some 15 km to the northwest. In 802 he declared himself Chakravartim, in a ritual taken from the Indian-Hindu tradition. Thereby he not only became the divinely appointed and therefore uncontested ruler, but also simultaneously declared the independence of his kingdom from Java. Jayavarman II died in the year 834.

Jayavarman II's successors continually extended the territory of Kambuja. Indravarman I (reigned 877 - 889) managed to expand the kingdom without wars, and he began extensive building projects, thanks to the wealth gained through trade and agriculture. Foremost were the temple of Preah Ko and irrigation works. He was followed by his son Yasovarman.



Hariharalaya, the ancient 9<sup>th</sup> Century AD capital of the Khmer in Cambodia, is shown in the upper center portion of this NASA Airborne Synthetic Aperture Radar (AIRSAR) image. The image was acquired during the 1996 PACRIM mission with AIRSAR operating in the TOPSAR mode.

At the center of the image is the terraced sandstone temple mountain of the King Indravarman, the Bakong. The smaller enclosed rectangular feature just to the north is Preah Ko. Further to the south are more rectangular features, temples and water reservoirs attributed to other kings in the earlier part of the 9<sup>th</sup> Century AD and maybe even earlier. Just visible at the top of the image is a long linear feature that forms the southern border of the immense water reservoir, at the center of which is the Lolei temple.

The city was the first capital of the Khmer after the 802 AD ceremony consecrating the king as 'Devaraja'. This is usually translated as 'god who was king' or 'king who was god'. In the next century, the center of power shifted to the northwest, to the area known today as Angkor. (NASA)

## 4.2 The Classical Age

### **Yasovarman – founder of Yasodharapura**

Yasovarman (reigned 889 - 915), established a new capital, Yasodharapura - the first city of Angkor.

The city's central temple was built on Phnom Bakheng, a hill which rises around 70 m above the plain on which Angkor sits. Under Yasovarman the Eastern Baray was also created, a massive water reservoir of 7.5 by 1.8 km.



A 12<sup>th</sup> or 13<sup>th</sup> century relief at the Bayon temple in Angkor depicts the Khmer army going to war against the Cham. (Manfred Werner Aug. 2001)

At the beginning of the 10th century the kingdom split. Jayavarman IV established a new capital at Koh Ker, some 100 km northeast of Angkor. Only with Rajendrarvarman II (reigned 944 - 968) was the royal palace returned to Yasodharapura. He took up again the extensive building schemes of the earlier kings and established a series of temples in the Angkor area; not the least being the East Mebon, on an island in the middle of the Eastern Baray, and several Buddhist temples and monasteries. In 950 the first war took place between Kambuja and the kingdom of Champa to the east (in the modern central Vietnam).

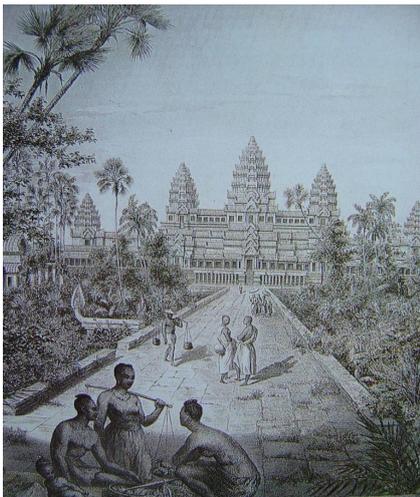
From 968 to 1001 reigned the son of Rajendrarvarman II, Jayavarman V. After he had established himself as the new king over the other princes, his rule was a largely peaceful period, marked by prosperity and a cultural flowering. He established a new capital near Yasodharapura, Jayenanagari. At the court of Jayavarman V lived philosophers, scholars and artists. New temples were also established: the most important of these are Banteay Srei, considered one of the most beautiful and artistic of Angkor, and Ta Keo, the first temple of Angkor built completely of sandstone.

After the death of Jayavarman V a decade of conflict followed. Kings reigned only for a few years, and were successively violently replaced by their successors until eventually Suryavarman I (reigned 1010 - 1050) gained the throne. His rule was marked by repeated attempts by his opponents to overthrow him and by military conquests. In the west he extended the kingdom to the modern Lopburi in Thailand, in the south to the Kra Isthmus. At Angkor, construction of the Western Baray began under Suryavarman I, the second and even larger (8 by 2.2 km) water reservoir after the Eastern Baray.

### **Suryavarman II - Angkor Wat (or Angkor Vat)**

The 11<sup>th</sup> century was a time of conflict and brutal power struggles. Only with Suryavarman II (reigned 1113 - 1150) was the kingdom united internally and extended externally. Under his rule, the largest temple of Angkor was built in a period of 37 years: Angkor Wat, dedicated to the god Vishnu. Suryavarman II conquered the Mon kingdom of Haripunjaya to the west (in today's central Thailand), and the area further west to the border with the kingdom of Bagan (modern Burma), in the south further parts of the Malay peninsula down to the kingdom of Grahi (corresponding roughly to the modern Thai province of Nakhon Si Thammarat), in the east several provinces of Champa and the countries in the north as far as the southern border of modern Laos. Suryavarman II's end is unclear. The last inscription, which mentions his name in connection with a planned invasion of Vietnam, is from the year 1145. He probably died during a military expedition between 1145 and 1150.

There followed another period in which kings reigned briefly and were violently overthrown by their successors. Finally in 1177 Kambuja was defeated in a naval battle on the Tonle Sap lake by the army of the Chams, and was incorporated as a province of Champa.



Historical view of Angkor Wat, c 1870s by French explorer Louis Delaporte.

## *historical context*

### **Jayavarman VII – Angkor Thom**

The future king Jayavarman VII (reigned 1181-1219) was already a military leader as prince under previous kings. After the Cham had conquered Angkor, he gathered an army and regained the capital, Yasodharapura. In 1181 he ascended the throne and continued the war against the neighboring eastern kingdom for a further 22 years, until the Khmer defeated Champa in 1203 and conquered large parts of its territory. Jayavarman VII stands as the last of the great kings of Angkor, not only because of the successful war against the Cham, but also because he was no tyrannical ruler in the manner of his immediate predecessors, because he unified the empire, and above all because of the building projects carried out under his rule. The new capital now called Angkor Thom (literally: "Great City") was built. In the center, the king (himself a follower of Mahayana Buddhism) had constructed as the state temple the Bayon, with its towers bearing faces of the bodhisattva Avalokiteshvara, each several metres high, carved out of stone. Further important temples built under Jayavarman VII were Ta Prohm, Banteay Kdei and Neak Pean, as well as the reservoir of Srah Srang. Alongside, an extensive network of streets was laid down, which connected every town of the empire. Beside these streets 121 rest-houses were built for traders, officials and travelers. Not least of all, he established 102 hospitals.



Jayavarman VII (Musée national des Arts asiatiques-Guimet – RMN)

## **5.0 CHRONOLOGY – ANGKORIAN PERIOD**

The following table is a brief overview of the periods that have been established to categorize historical events, art styles and other research objects at Angkor. The construction of Phnom Bakheng occurred in the reign of Yasovarman (r.889-910) at a time of transition, on the cusp, between the empire's birth and the classical age of the Khmer civilization.

The chronology table below is an official reformatted transcript from the APSARA Authority's website, where further information can be obtained, at <http://www.autoriteapsara.org/en/angkor/chronology.html>

		CHRONOLOGY	
ANGKORIAN PERIOD	THE EMPIRE'S BIRTH	802-834(?)	Jayavarman II <b>Temples:</b> Prasat Damrei Krap (Phnom Kulen) <b>Style:</b> Phnom Kulen <b>Comments:</b> Jayavarman II is the founder of the Khmer Empire, and the first king to be known as sacred cakravartin (universal monarch in the Indian tradition) instituting the God-King (devaraja) cult.
			Jayavarman III <b>Temples:</b> Prasat Kok Po, Prasat Prei Monti <b>Style:</b> Phnom Kulen
		877-after 886	Indravarman I <b>Temples:</b> First temples at Roluos, Development of Hariharalaya (hydraulic city), Bakong, Preah Ko, Lolei & Indratataka <b>Style:</b> Preah Ko (875-893) <b>Comments:</b> Hariharalaya is the first hydraulic city of classical Angkorian type. The <i>baray</i> of Lolei (Indratataka) is the first of its kind.
		889-after 910	Yasovarman I <b>Temples:</b> Eastern Baray, Phnom Bok, Phnom Krom, Phnom Bakheng <b>Style:</b> Bakheng (893-925) Harshavarman I <b>Temples:</b> Baksei Chamkrong, Prasat Kravan <b>Style:</b> Bakheng (893-925)
		928-944	Jayavarman IV <b>Temples:</b> Koh Ker temples <b>Style:</b> Koh Ker (921-945) <b>Comments:</b> The capital is transferred to Koh Ker.
		944-967	Rajendravarman I <b>Temples:</b> Eastern Mebon, Pre Rup, Prasat Bat Chum <b>Style:</b> Pre Rup (944-967) <b>Comments:</b> Angkor once more becomes the empire's capital after a victory against the Cham in 950.
		968-1000	Jayavarman V <b>Temples:</b> Surroundings of the Royal Palace, North & South Khleang, Phimeanakas, Ta Keo (begun), Banteay Srei (begun) <b>Style:</b> Banteay Srei (967-1000), Khleang (965-1010)
		?-1010	Jayaviravarman <b>Temples:</b> Completion of Ta Keo <b>Style:</b> Banteay Srei (967-1000), Khleang (965-1010) <b>Comments:</b> Period of trouble, rivalries for the throne.
	1010-?	Suryavarman I <b>Temples:</b> Phimeanakas, Phnom Chiso, Vat Ek, Vat Baset, Western Baray <b>Style:</b> Baphuon (1010-1080) <b>Comments:</b> Suryavarman I usurps the throne.	
	1050-1066	Udayadityavarman II <b>Temples:</b> Baphuon, Western Mebon <b>Style:</b> Baphuon (1010-1080)	
	1066-1080	Harshavarman II <b>Temples:</b> <b>Style:</b> Baphuon (1010-1080) <b>Comments:</b> War against Champa.	
	1080-1107	Jayavarman VI <b>Temples:</b> Pimai (present-day Thailand) <b>Style:</b> Angkor Wat (1100-1175)	
	1113-after 1145	Suryavarman II <b>Temples:</b> Angkor Wat, Banteay Samre, Thommanon, Chau Say Thevoda <b>Style:</b> Angkor Wat (1100-1175) <b>Comments:</b> War against Champa and the Dai Viet, many conquests, beginning of the so-called "classical" age.	
	1150-1165	Yasovarman II <b>Temples:</b> Preah Pithu, Beng Meala (XIIth C) <b>Style:</b> Angkor Wat (1100-1175) <b>Comments:</b> Period of trouble, Yasovarman II is assassinated.	
	1165-1177	Thibhuvanadityavarman <b>Temples:</b> Preah Pithu, Beng Meala (XIIth C) <b>Style:</b> Angkor Wat (1100-1175) <b>Comments:</b> Thibhuvanadityavarman takes the throne, 1177 is a black year, Angkor is destroyed and temporarily abandoned.	
	1181-1218	Jayavarman VII <b>Temples:</b> Angkor Thom (walls), Bayon, Preah Palilay, Banteay Kdei, Ta Prohm, Preah Khan, Ta Som, Neak Poan, Ta Nei, Royal Terraces, Prasat Suor Proat, Spean Thma, Banteay Chhmar, Krol Ko <b>Style:</b> Bayon (1177-1230) <b>Comments:</b> Jayavarman VII regained the lost territories and enlarged the borders of the empire (from Myanmar to the China Sea), Mahayana Buddhism is instituted as a state religion, some hundred hospitals are built, the communication network is improved, Angkor is at the height of its power and its influence.	

historical context

## REGIONAL CONTEXT

### 6.0 CURRENT SETTING AND SITUATION

#### 6.1 Geographical Setting

Cambodia covers an area of 181,035 sq km, forming part of the south-western portion of the Indochinese peninsula between latitudes 10 degrees and 15 degrees north of the equator and longitudes 102 degrees and 108 degrees east. The country's maximum extent is about 580 km from east to west and 450 km from north to south. Cambodia shares its 2,438 km border with Thailand (in the west and north), Laos (in the north) and Vietnam (in the east and southeast). In the southwest Cambodia is bordered by the Gulf of Thailand.

In the conservation of cultural landscapes it is important to understand the dynamics of the complex cultural values inherent in the natural system and complexities of the system itself for effective planning, management and intervention of the landscape.

The most distinctive geographical feature is the lacustrine plain formed by the inundations of the Tonle Sap (Great Lake), measuring about 2,590 square kilometers (1,000 sq. mi) during the dry season and expanding to about 24,605 square kilometers (9,500 sq. mi) during the rainy season.

កម្ពុជា

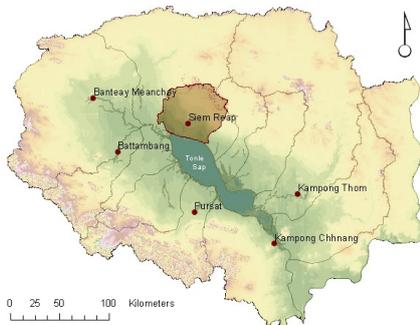
Cambodia in Khmer text.



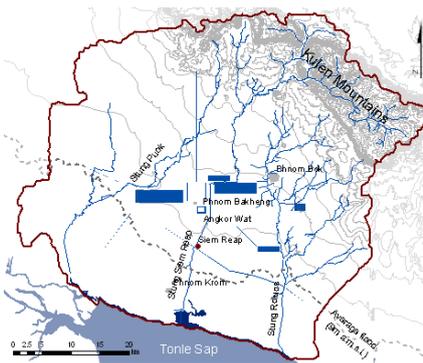
Figure 3 Part view of Southeast Asia. Southeast Asia is geographically divided into two regions, namely Indochina and Malay Archipelago. Indochina includes all of Myanmar (formerly Burma), Thailand, Cambodia, Laos and Vietnam

**"Cambodia is a county of water and rice fields. The alternating dry and wet seasons give rhythm to the Khmer people's way of life..."**

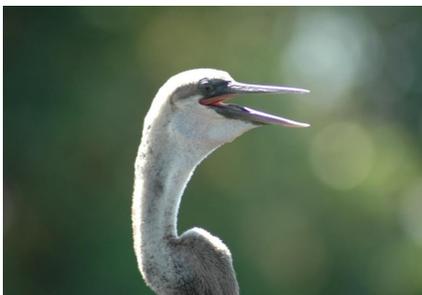
**AusHeritage, 2003**



**Cambodia and the situation of Angkor area related to the Tonle Sap catchment area. (Kummu 2003)**



**Detail of the situation of Angkor area related to the Tonle Sap catchment area, with the three topographic high points – Phnom Krom, Phnom Bok and Phnom Bakheng. (Kummu 2003)**



**Detail of a bird in its habitat on the Tonle Sap lake. (ME Dec. 2005)**

**6.2 Climate**

The climate is dominated by the tropical monsoon system, which is influenced by the local topography of west-central Cambodia, its major features the Tonle Sap lake basin and Phnom Kulen mountain plateau. The sub-humid environment has high seasonal rainfall that varies between 1,110 – 1,800 mm per year, with an average of 1,500, with a peak in August – September.

During the monsoon season from May to October when 80 percent of the annual rainfall occurs, typical storms release large volumes of water within relatively short periods of time, turning the lowlands into an extensive floodplain. The highest number of tropical storms per day is recorded in the month of September, when the relative humidity also reaches a peak.

The dry season lasts for 6 months, from November to April. The highest evaporation rates are observed in March and April, when the air temperature is high and relative humidity low.

**6.3 Geology and Topography**

Topographically, the country divides into two distinct parts: the central low-lying land, the central plains, with a large part being less than 10m in elevation, and the flat coastal areas; and the mountain ranges and high plateau surrounding the central plains.

The central plains form three quarters of the country, mainly consisting of alluvial plains of the Mekong River and Tonle Sap Basin which are Cambodia's two dominant topographical features.<sup>5</sup> The plains are flat with an elevation of 5 – 10 meters.

Phnom Bakheng is one of four isolated hills on the Siem Reap Plain that have survived as resistant erosional remnants following a long period of tropical deep weathering, and the fluvial (river) dissection of, a former, higher surface. The original surface is indicated by the similar heights (circa 85 meters above sea level) of the four phnom and the Khulen Plateau in the north. Prolonged erosion was succeeded by deposition of fluvial sediments, which are approximately 40 meters thick in the Angkor area. The oldest sediments are estimated to be up to 700,000 years old, confirming that the region has been relatively stable for at least this period of time. Importantly, the Angkor Temple Complex is located at least 700 kilometers to the east of the nearest earthquake zone.

The composition of the bedrock at Phnom Bakheng is a well indurated, fine grained, quartz-rich extrusive volcanic rock, likely a tuffaceous rhyolite. This fairly homogeneous bedrock displays a high degree of structural cohesion at all of the outcrops examined.

**6.4 Ecology**

Presently the ecology of the Angkor area can be divided into three groups. Firstly, the floodplain where rice fields and floor forest occurs. Secondly, the plain which consists of mostly shallow water rice cultivation and bush land and finally, the hills and forest area which starts north of the gentle plain area and extends up to Kulen Mountain's waterfalls and thick forest.<sup>6</sup>

*regional context*

## 6.5 Angkor Park and Tonle Sap

Cambodia was the first country in Southeast Asia to establish protected areas. The forests surrounding the temples of Angkor were declared a national park in 1925.

The *Conservation d'Angkor* (or Angkor Conservation Office) adopted a policy for forest protection and management in 1911, which dealt with maintenance, afforestation and the opening of access roads and the clearing of vegetation around each monument. In 1925 a central area was officially designated as the Angkor Historic Park, and it was managed as such until the war in the 1970s.

The Tonle Sap (meaning Large Fresh Water River but more commonly translated as Great Lake) is a combined lake and river system of immense importance to Cambodia. It is the largest freshwater lake in Southeast Asia and is an ecological and biodiversity hotspot that was designated as an UNESCO biosphere in 1997.

The Tonle Sap Biosphere Reserve is contiguous to the Angkor World Heritage site. Biosphere Reserves are areas of terrestrial and coastal ecosystems which are internationally recognized within the framework of UNESCO's *Man and the Biosphere Programme*.

Biosphere reserves are sites which innovate and demonstrate approaches to conservation and sustainable development. They are under national sovereign jurisdiction, yet share their experience and ideas nationally, regionally and internationally within the World Network of Biosphere Reserves.

The Tonle Sap Biosphere Reserve consists of a lake and its floodplain with three distinct zones: an open lake at its center, a freshwater swamp forest surrounding it and seasonally flooded grasslands at the margins, mainly in the eastern shore. The hydrological regime of the Mekong River which feeds the area is highly characteristic: the area underwater in the dry season is five times less than in the rainy season and the mass of flood water reverses direction between seasons.

The ancient capital Angkor is situated 10 km from the northeastern edge of the lake, providing easy access to the resource rich lake which is seasonally harvested.

For most of the year the lake is fairly small, around one meter deep and with an area of 2,700 square km. During the monsoon season, the Tonle Sap river which connects the lake with the Mekong river reverses its flow. Water is pushed up from the Mekong into the lake, increasing its area to 16,000 square km and its depth to up to nine meters, flooding nearby fields and forests. This provides a perfect breeding ground for fish and makes the Tonle Sap ecosystem one of the most productive inland fisheries in the world, supporting over 3 million people and providing over 75% of Cambodia's annual inland fish catch and 60% of the Cambodians' protein intake. At the end of the rainy season, the flow reverses and the fish are carried downriver.

The receding waters also leave nutrient rich deposits of sediment in the surrounding area and water table creating prime agricultural land.

The reversal of the Tonle Sap river's flow also acts as a safety valve to prevent flooding further downstream.

The lake occupies a depression created due to the geological stress induced by the collision of the Indian subcontinent with Asia.



Advanced Spaceborne Thermal Emission and Reflection Radiometer color image of the northern part of Tonle Sap lake and Angkor, data acquired February 2004.

The extent the Tonle Sap recedes is evident by the color green around the lake that represents the swamp forest. When the lake is full the green color near the lake will show as blue/green due to the different reflection properties of water and vegetation.

The green in the upper right hand corner represents the forests of Phnom Kulen. The dark blue square in the center is the moat surrounding Angkor Wat.



Khmer fisherman working on the Tonle Sap lake. (ME Dec. 2005)



Fish dried from the Tonle Sap lake provide a year round source of protein for the people of Cambodia including Angkor and Siem Reap. (ME March 2005)

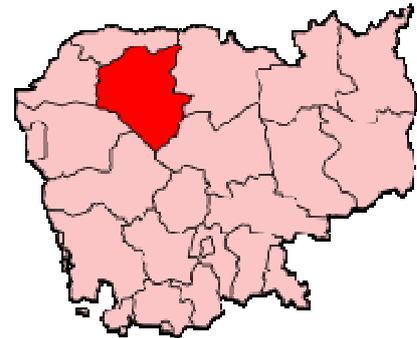


## SITE SURVEY AND SPATIAL ANALYSIS

### 7.0 LOCATION AND ANALYSIS OF THE SITE

#### 7.1 Details

<b>Country:</b>	Cambodia
<b>Province:</b>	Siem Reap
<b>WHS Name:</b>	Angkor
<b>Site:</b>	Phnom Bakheng
<b>Coordinates:</b>	13° 26' N 103° 50' E



Cambodia, Siem Reap province

**7.1.1 Siem Reap:** is a province located in north western Cambodia, on the shores of the Tonle Sap lake. The provincial capital is also called Siem Reap. The name literally means place of the defeat of Siam, referring to the victory of the Khmer empire over the army of the Thai kingdom of Ayutthaya in the 17th Century. Today it is most widely known for being the closest city to the ruins of the temples of Angkor.

**7.1.2 Angkor WHS:** lies north of the city of Siem Reap, Cambodia. The World Heritage site extends over an area of 400 sq km. It is recognized internationally both as a group of temples of outstanding architectural importance and as a symbol of spiritual ideas.

**7.1.3 Angkor International Airport:** Cambodia has two international airports, one in Phnom Penh the other in Siem Reap. The Siem Reap - Angkor International Airport is situated in the Angkor WHS within Zone 1: Monumental Sites (see *Figure 21 Protected Zones identified in the ZEMP report (APSARA)*).

The Siem Reap runway 2,550 meters in length can be seen from Phnom Bakheng towards the west-southwest. In 2005 1 million inbound passengers passed through, 77% international passengers and 23% domestic.<sup>7</sup>

**7.1.4 Phnom Bakheng:** an oval-shaped sandstone massif measuring approximately 650 m long, over 300 m wide and nearly 70 m high is situated near the center of Angkor within *Zone 1: Monumental Sites*.

**7.1.5 Bakheng:** the summit of Phnom Bakheng has been leveled and terraces formed in the bedrock so that a stepped pyramid could be constructed from large sandstone blocks quarried and hauled from Phnom Kulen<sup>8</sup> called Bakheng; on the last tier of the pyramid temple, Yasovarman established a central tower that became the center of his city, Yasodharapura, and his kingdom.



Aerial survey of Phnom Bakheng. (JICA, 1997)



Historical view of the south and west elevations of the Central Tower at Bakheng. (EFEO 1924)



East Mebon was dedicated in 953 AD, approximately 50 years after construction of the *baray*. The *baray* has since dried up, giving the temple an impression of greater height which has led some to confuse it with the temple mountains which were the kingdom's state temples.

*The Mebon has all the characteristics of a temple mountain symbolizing Mount Meru - here there is a three meter high central platform carrying the quincunx of towers.*

*Originally the Mebon temple stood on an island surrounded entirely by the waters of the Eastern Baray - accessible only by boat. The center of the baray was marked by this small island of 120 meters across on which the temple stands. The main entry pavilion of the Royal Palace and the Victory Gate of Angkor Thom were subsequently aligned along this axis.*

**7.1.6 Eastern Baray:** before founding Yasodharapura, Yasovarman had to ensure a sufficient supply of water to enable the cultivated areas to be exploited around Phnom Bakheng. Emulating his father who built Indratataka (pool of Indra) at Lolei, Yasovarman built on a grander scale another reservoir called Yashodharatataka, known as the Eastern Baray. It was constructed by elevating dykes rather than by excavation.<sup>9</sup> The dykes are 7.5 by 1.8 km, creating a capacity of 40 million cubic meters and was supplied by a river which was diverted from its normal course, know now as the Siem Reap river.

Supplied first by a river to the northeast that was blocked by embankments to the north and east to the NE corner of the *baray*. The next phase was the addition of supply through an offtake from the old-Puok river to the north. This offtake was a zigzag canal that came down to a major east-west bank north of the *baray* then turned east and south to enter the NE corner of the *baray*.<sup>10</sup>

The *baray* is now dry and the Seim Reap river incised below the historic inlet level.

In the middle of the *baray* is the East Mebon.

**7.1.7 Siem Reap river:** the name Siem Reap is now used for the entire channel from the Kulen (former Puok river), down the offtake, then passing west of the Eastern Baray before running south-west through the town of Siem Reap then into the Tonle Sap lake.

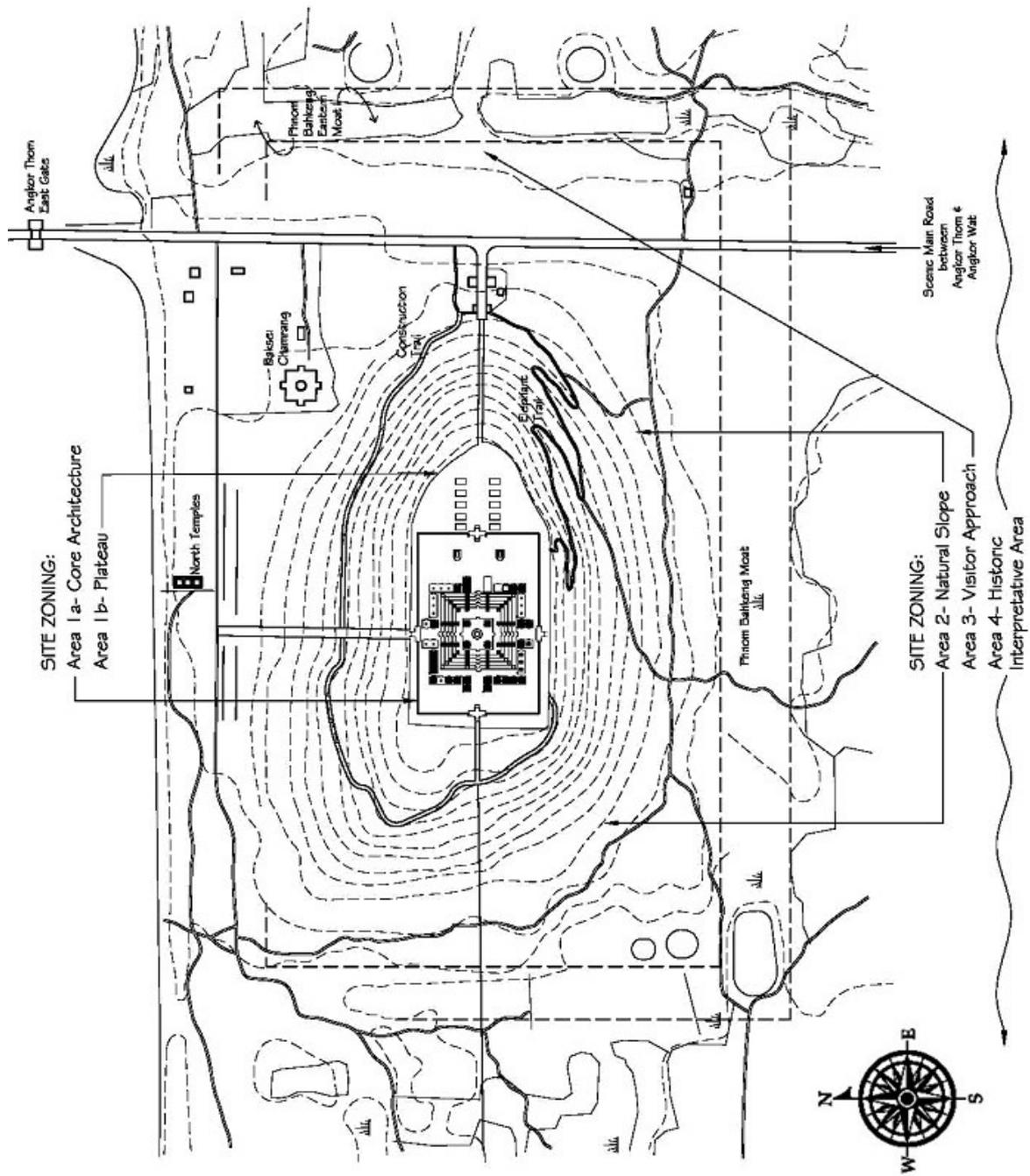
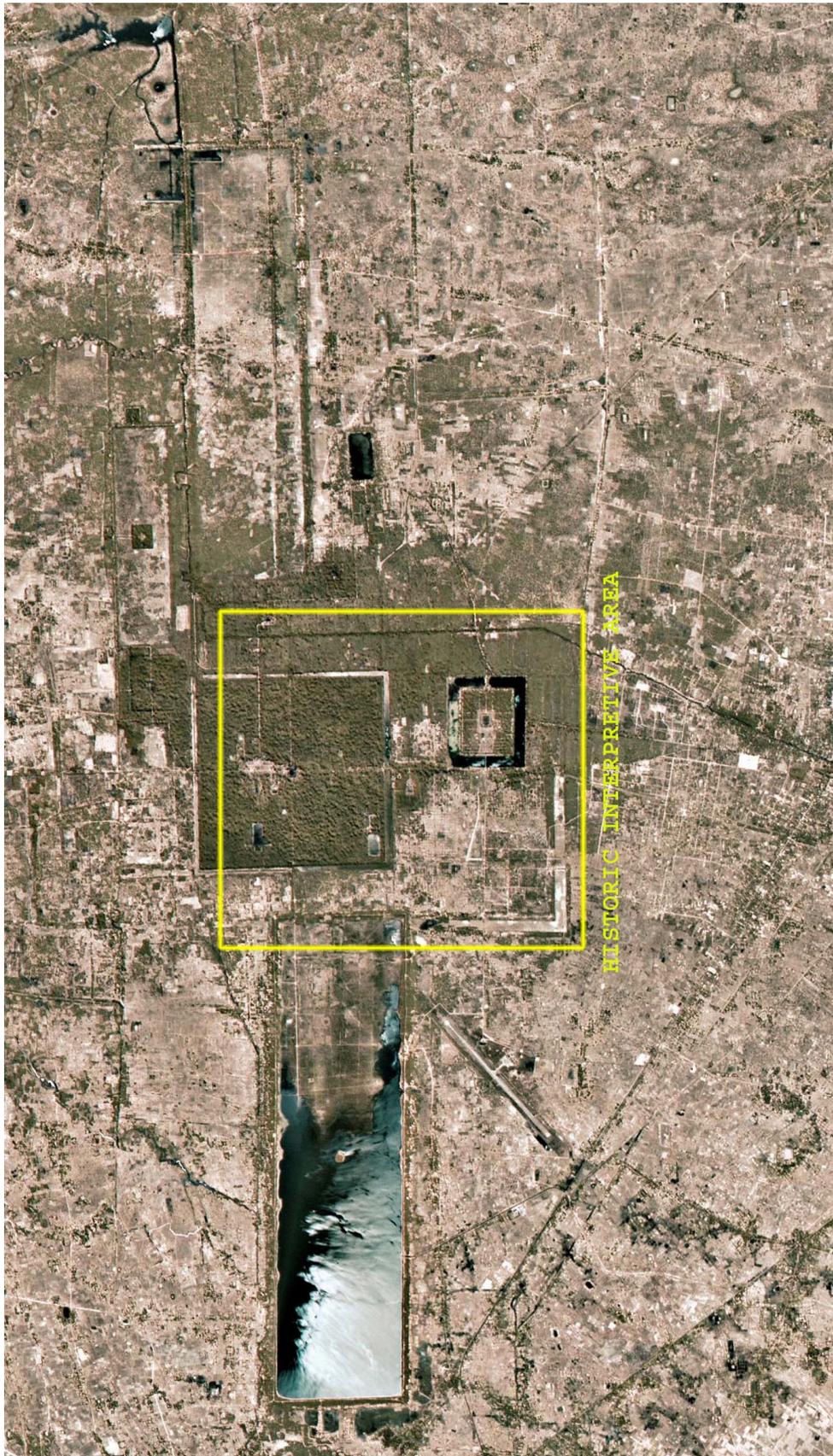
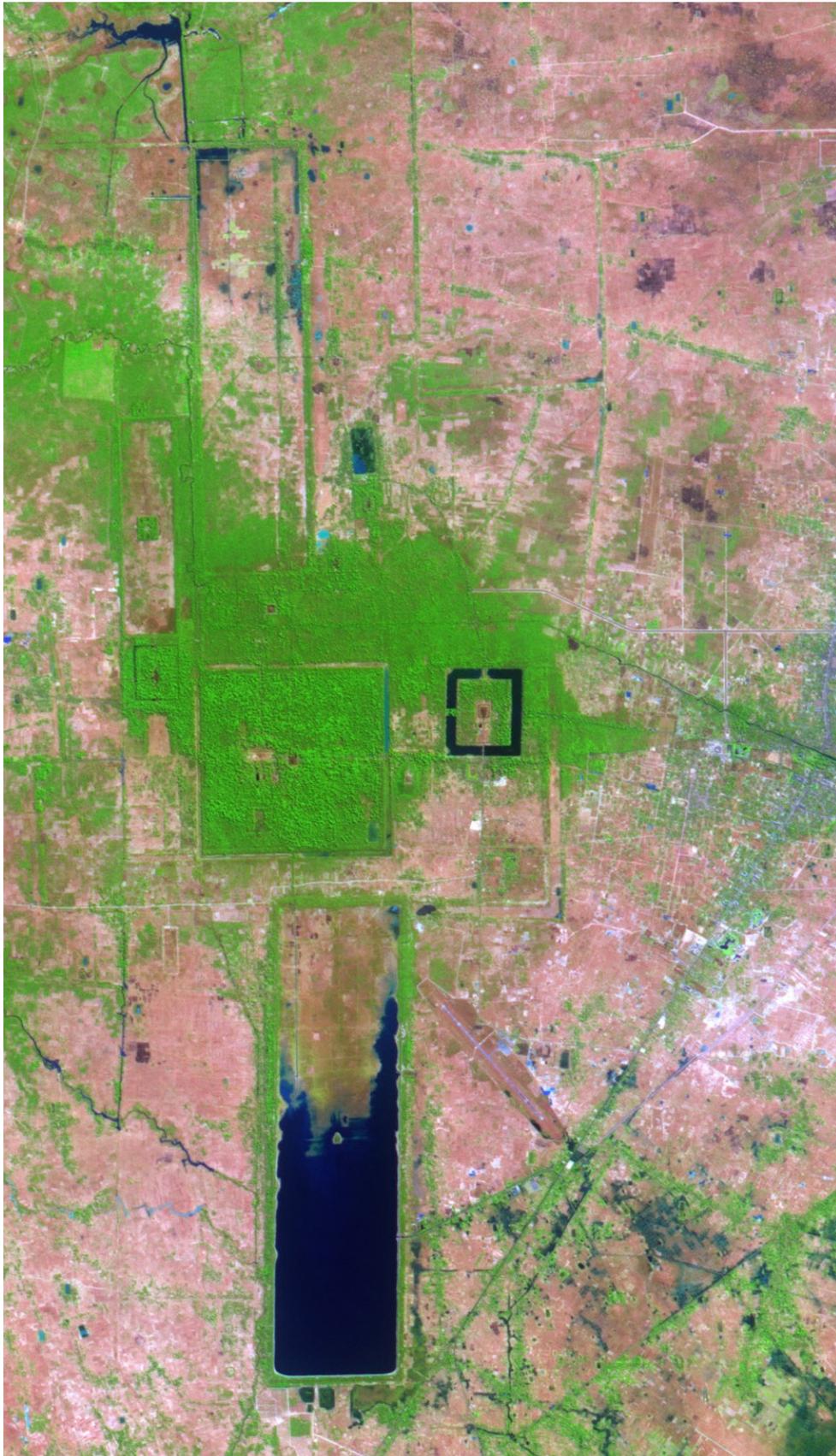


Figure 4 Site survey of existing features and Site Zoning Areas (Hudson and Pacific Design 2005)



The airport is visible to the west (left) of the Historic Interpretive Area. Note the distinctive 'L' shaped moat within the Historic Interpretive Area (bottom left) which was once believed to be part of a larger square shape moat system enclosing Yasovarman's city Yasodharapura with Phnom Bakheng at its center, known as Golouपुरa, which has subsequently been refuted. The Western Baray contains part water, while the former reservoir of the Eastern Baray now empty can be seen in the upper right-hand corner. The portion of the Siem Reap river which was modified to form a canal can be seen running parallel to the right-hand side of the Historic Interpretive Area.

**Figure 5** Aerial survey of Phnom Bakheng and Angkor

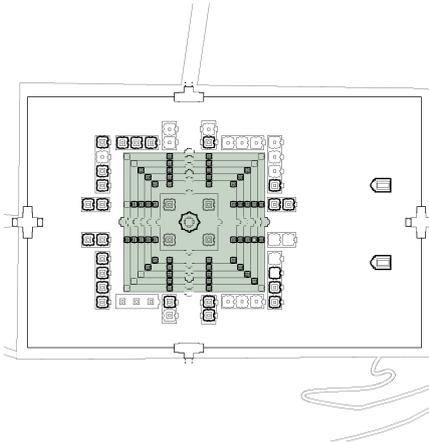


The simulated natural color image data was acquired on February 17, 2004, by the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) on NASA's Terra satellite. In this image, water is black and blue, vegetation is bright green, and bare earth is pink. Phnom Bakheng is located south of the Angkor Thom moat and can be identified by the distinctive brown/pink spot surrounded by trees growing on Phnom Bakheng. Further to the south at the base of the image Siem Reap is part visible as a light blue network of roads.

**Figure 6 Thermal Emission and Reflection Image of Angkor**

**SITE ZONING AND ANALYSIS**

The optimal physical parameters of Phnom Bakheng and its historic environs have been defined for reference purposes into four zones. The key areas identified are:



**Area 1:  
Phnom Bakheng Pyramid Temple (DF 2006)**



**View of the eastern elevation of Bakheng with visitors ascending the east stairs for sunset viewing; note the collective contribution the sandstone shrines make to Bakheng's form with their four upper tiers and one with a decorative sandstone crown silhouetted against the skyline. (ME March 2005)**



**View of western facade of the central prasat and remnants of the northeast prasat that formed the quincunx in the background, left side. (ME March 2005)**

**8.1 Area 1 Phnom Bakheng Pyramid Temple<sup>11</sup>**

Including: Pyramid Temple comprising; Sandstone Towers (12 per terrace and 5 in quincunx formation on the platform of the quincunx).

**8.1.1 Pyramid Temple:** the pyramid consists of five terraces of decreasing height excavated in the rock of the hill and veneered in sandstone blocks, with four stairs aligned with the cardinal directions flanked by tall buttresses with lions on top at each level. The impressive square structure measures 76 meters NS by 81.9 meters EW at the base and 47 meters NS by 50.6 meters EW at the summit and is 13 meters high. The geometry of the structure was refined to exaggerate the optical illusions of perspective by offsetting the north-south axis and towers in quincunx formation towards the west, which reinforced the east axis as the primary route and ceremonial approach, see paragraph 11.0 *KHMER ART AND ARCHITECTURE*.

**8.1.2 Stone Steps, Buttresses and Lion Statues:** the four axial stairways flanked by buttresses the height of each platform wall provide access to each platform level. The stair raisers and the stair widths decrease in height and width respectively exaggerating the optical illusions of perspective. Another subtle illusion is formed by the skillful way in which the lion statues decree in height with their respective buttresses.

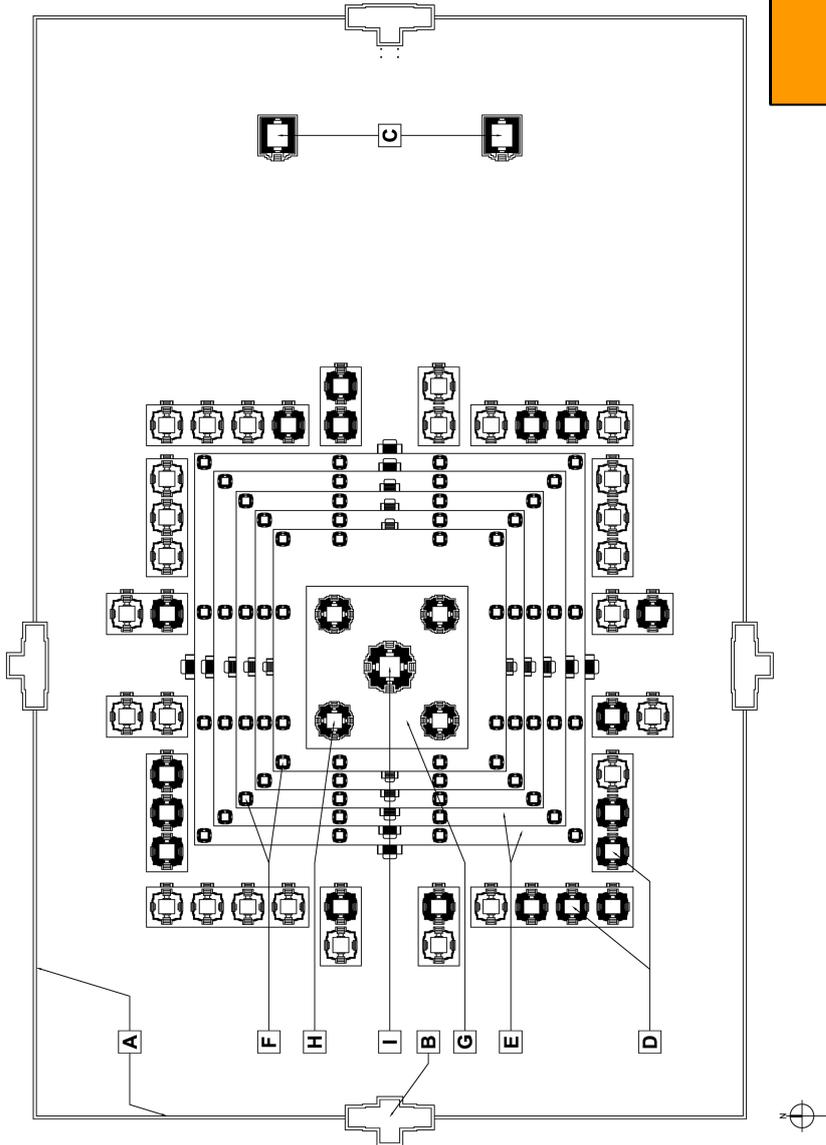
**8.1.3 Sandstone Shrines:** there are 12 sandstone shrines on each terrace, four at the corners, and one on either side of each stairway. Shrines frequently opened only towards one direction, all these are facing east. The other three sides feature blind doors to maintain symmetry.

**8.1.4 Towers of the Quincunx:** five towers, or sanctuary towers, made entirely of sandstone, with real doors openings to the four cardinal points, standing on a podium 30.4 meters NS by 29.6 meters EW which is 1.78 meter tall and offset to the west on the 5th terrace. Creating varying widths on the 5th terrace from 5 to 12 meters – enough room to accommodate royal ceremonies on the east side at the end of the ceremonial access route.

Arranged in a quincunx pattern (four at the corners and one in the center), the towers are now truncated or have disappeared altogether, the effect – loss of the impressive and imposing silhouette that once adorned the temple mountain enhancing the site's mystic, splendor and symbolism.

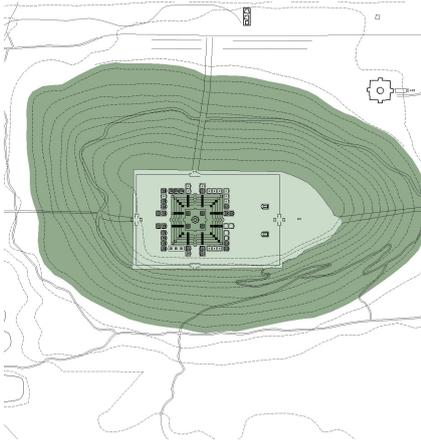
**8.1.5 Central Sanctuary:** the central tower, which is the largest, housed the *linga* Yashodhareshvara (the Lord who brings glory) and, like the other four, now lacks a superstructure. For details on the intricate relief sculpture reference paragraph number 11.2.1.

**8.1.6 Platform of the Quincunx:** with a function similar to a podium – it raises the towers of the quincunx even further above the surrounding and is quite separate in function and construction to the temple platforms. The podium consisting of a laterite core resting on the 5th platform, with sandstone plinth and paving over.



BAKHENG	
A	ENCLOSURE WALL
B	GOPURAS (Entrance Pavilions)
C	"LIBRARIES"
D	BRICK SHRINES, 44 Around Base
E	PYRAMID PLATFORMS
F	SANDSTONE SHRINES
G	12 Per Terrace
H	PLATFORM OF THE QUINCUNX
I	TOWERS OF THE QUINCUNX CENTRAL SANCTUARY

Figure 7 Built Elements forming Area 1 and part of Area 2 (DF 2006)



Area 2: Plateau (DF 2006)

## 8.2 Area 2 Plateau

This area includes the earthen plateau from the edge of the pyramid temple. Including: Brick Shrines (44 around temple base); Libraries; Enclosure Wall; Gopuras (two entrance pavilions); and everything beyond the enclosure wall to the edge of the plateau.

**8.2.1 Plateau:** the plateau is relatively flat. Sited in this area are a number of structures both contemporaneous with Bakheng and modern.

The plateau around the pyramid temple is of great importance to the interpretation of the place and the functionality of its future, policies need to ensure this is enhanced in the conservation process. The plateau also provides an opportunity to interpret the conservation and archaeological process undertaken at the site.

**8.2.2 Brick Shrines:** a total of 44 brick shrines are constructed around the lowermost platform wall of Bakheng; built in groups of two, three or four on the same base and stand in pairs on either side of the four entrances.

Shrines frequently opened only towards one direction, all these open and face to the east. The other three sides may feature blind doors to maintain symmetry. The blind doors, including lintels and door reveals are constructed in sandstone block at some and formed within the brickwork at others.

**8.2.3 Libraries:** free-standing buildings, they are placed in pairs on either side of the entrance to the enclosure with door opening to the east and west. They are ventilated by lines of diamond shaped holes in the north and south walls. Some researchers have suggested that the ventilation holes may have exhausted smoke; although it is not certain what the libraries' function was.

Initially opening to the west, they have later been pierced with an additional opening in their eastern side. The south library contains a makeshift shrine on the east side, see paragraph number 13.6 *Religious Site and Landscape*, p.72.

**8.2.4 Enclosure Wall and Gopuras:** the ceremonial access route along the east cardinal axis to the temple pyramid passes through the *gopura* of the innermost enclosure wall, which measures approximately 190 meters by 122 meters.

**8.2.5 Ceremonial Access Route:** follows the east cardinal axis through the historic Approach Platform at the base of the *phnom*, up the east axial stairs, along the plateau and through the east *gopura* of the laterite enclosure wall, and then between two libraries before arriving at the temple pyramid.

**8.2.6 Heritage Police station:** constructed in 2004 as a base for the Heritage Police officers to monitor activities and enforce heritage protection rules throughout Angkor Park.



View of the southwest corner of the library located on the north side of the entry. (ME March 2005)



View from the top of Bakheng temple along the ceremonial east axial route with the two libraries in the mid-ground, the north library is concealed by a tree. (ME March 2005)



View of the police station located in the northeast quadrant of the plateau. (ME March 2005)

## site survey and spatial analysis

**8.2.7 Remains of a stone structure:** to the right of the Ceremonial Access Route remain some sandstone pillars and the laterite base.

**8.2.8 Buddha Footprint:** or Buddhapada was dug out of the ceremonial access route and a Vietnamese pagoda constructed over of which monks were noted as the guardians in the 1860s.<sup>12</sup> It is a working shrine with offerings made daily.

**8.2.9 Elephant Station:** is located within the laterite enclosure wall where visitors dismount and mount elephant rides. More visitors ascend Phnom Bakheng on the elephants than descend.

Further analysis is required to determine whether the elephant station should be located on the plateau outside the laterite enclosure wall.

**8.2.10 Earth Mound:** located on the east side of the temple and raised around part of the south set of four brick shrines is an earth mound. This mound may also be acting as a retaining element for the 1st tier sandstone veneer wall; the earth mound has been heaped two-thirds up the sandstone veneer wall.

It appears the mound's soil may have been heaped in the early 20th century, possibly when the forest and associated soil was removed by EFEO. This mound may have also assisted in accessing the temple during early 20th century conservation works.

**8.2.11 Nandi Bull Statue:** located on the south cardinal axis, (see paragraph number 13.6 for a photograph of the bull) is an intact Nandi, or sacred bull. Remains of the other bulls that once stood on the other three cardinal directions—which assured the omnipresent power of the god—are dispersed on the plateau.

**8.2.12 Dispersed Stone Artifacts:** hundreds of fallen stones are dispersed over Areas 1, 2 and 3. It appears some are resting near the original location they fell from; however the position of others may be completely unrelated to their original structure. Many of these stones still show intricate decorative carving, and some show figural carvings. Several of the stone tower cap stones are lying on the ground. These stones are in danger of accelerated deterioration and potential looting due to their scattered locations.



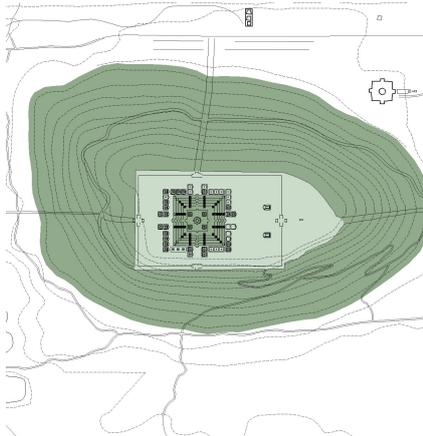
Part view of sandstone structures' remains adjacent to the Heritage Police station. (ME March 2005)



View of the ceremonial route along the plateau to the east axial stairs leading to the Central Tower; note the timber Vietnamese pagoda in the mid-ground which sits over the Buddha footprint and the stone bedrock remains raised above the surrounding plateau area. (ME March 2005)



View of earth mound heaped around brick shire G4, which is used by tourists to obtain access to the 1st tier of the pyramid. (MS March 2005)



Area 3: Natural Slope (DF 2006)

### 8.3 Area 3 Natural Slope

This area includes the natural slope of the outcropping tuffaceous rhyolite hill of Phnom Bakheng, including: the historic axial stairs, trails, vegetation and the dispersed stone artifacts.

**8.3.1 North Trail:** constructed in 1919 or 1920 by EFEO with upgrades in 2003. The North Trail has an average width of 2.3 meters providing access to the plateau for motorbikes and narrow vehicles. Where it crosses the north *phnom* stairs a timber bridge has been installed to span the historic stairs. The North Trail provides interpretive opportunities with views of the greater Angkor landscape and monuments including the Western Baray and glimpses of Baksei Chamkrong and Angkor Thom's moat.

**8.3.2 South Trail:** constructed in 1919 or 1920 by EFEO with recent upgrades, the South Trail is narrower than the North Trail with an average width of 1.7 meters which zigzags in parts. The South Trail is used by the elephant concessionaire who provides ascending and descending recreational rides on the elephants from the eastern base of the *phnom* to just within the laterite enclosure wall near the southeast corner.

**8.3.3 Dispersed Stone Artifacts:** hundreds of fallen stones are dispersed over Area 2. It appears some are resting near the original location they fell from; however the position of most others is completely unrelated to their original structures. Many of these stones still show intricate decorative carving, and some show figural carvings. These stones are in danger of accelerated deterioration and potential looting due to their scattered locations.

**8.3.4 Phnom Axial Stairs:** aligned on the cardinal axis of the east, west and north terrains of Phnom Bakheng are remains of laterite stairs which provide access in whole or part to Bakheng temple from the base of Phnom Bakheng. It is unclear why stairs were not constructed on the south axis, although it may be because the steeper terrain on the south side would have made it impractical to construct stairs.

The east stairs is the principle route selected by tourists and the North and South Trail secondary routes. The north and south stairs are rarely used as these routes are not clearly promoted for public use.

**8.3.5 East Stairs:** the east *phnom* axial stairs is the principal tourist access forming part of the historical ceremonial processional avenue from the historic Approach Platform to Bakheng temple, a precursor to the long level processional avenues seen in post temple planning, for example – Baphuon and Banteay Srei.

The east stairs is the preferred tourist route to ascend and descend Phnom Bakheng, contributing in combination with hydraulic erosion near complete loss of the east stairs fabric. Due to public safety and heritage concerns the APSARA Authority will close the east stairs to the public in 2006.



View from the North Trail towards the historic Approach Platform and the Vendor Stores beyond. (ME Dec. 2004)



View towards the east *phnom* axial stairs flanked by a pair of lions at its base. (KK Dec. 2004)

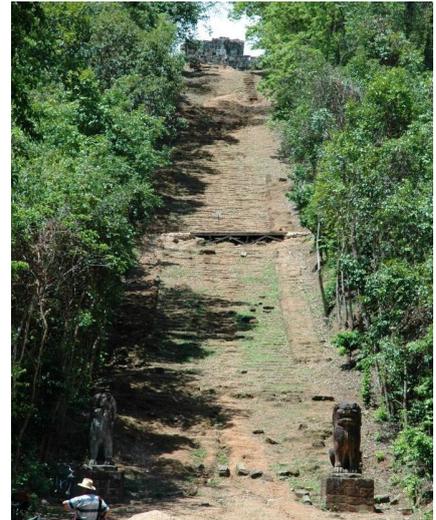
**8.3.6 North Stairs:** the north *phnom* axial stairs has access restrictions in place, in part, which are controlled by police. Access is available from the base of the stairs to the point where the North Trail crosses the north axial stairs. To continue the ascent of Phnom Bakheng from this point the North Trail is used.

The condition of the laterite used to construct the north *phnom* axial stairs is poor although sufficient fabric remains to analyze and interpret the form and construction technique. A complete detailed survey is required before further deterioration of historic fabric occurs.

**8.3.7 West Stairs:** the west *phnom* axial stairs is overgrown in parts with shrubs and trees. Access via the west stairs is rarely used by tourists although a small portion where the North Trail intersects is used by some tourists to shortcut the North Trail route while ascending and descending the *phnom*.

**8.3.8 Pair of Lions:** two lions, each on laterite plinths flank the *phnom* axial stairs at their base, which are amongst the finest proportional sculptured animals in the round in Khmer Art.

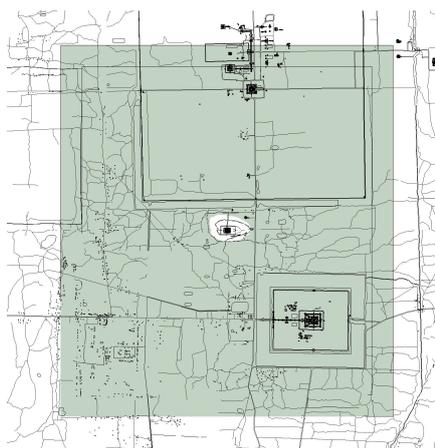
**8.3.9 Woodland Habitat:** the trail system affords an opportunity to experience a complete successional forest at each solar aspect: East, North, West and South. Within this forest are associated wildlife viewing opportunities, notably butterflies and birds. Additional scientific research may be required to interpret this natural resource.



View of the north *phnom* stairs; note the timber bridge spanning the laterite stairs at midpoint along the stairs. (ME March 2005)



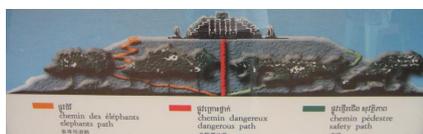
View at the base of the west *phnom* axial stairs, which are overgrown with vegetation, one of the Lions that flank the base of the axial stairs remains in its original position. (JPS March 2005)



Area 4:  
Historical Extent of Yasodharapura (DF 2006)



Approach Platform at the base of the east *phnom* axial stair has suffered from uncontrolled monsoon runoff and visitor access causing erosion and loss of significant historic fabric. (ME Dec. 2005)



Directional sign at the base of the east *phnom* stairs, sited within the historic Approach Platform area.

## 8.4 Area 4 Historical Extent of Yasodharapura

This area includes everything from the foot of Phnom Bakheng slope to the historical extent of Yasodharapura. Including: the Approach Platform; Signage; Elephant Station; Roads; Parvi; Vendor Stores; Parking Bay; Moat and the Historical Interpretive Area extending some distance from the *phnom*. The boundary shown is schematic and shouldn't necessarily be defined by a geometric form; one of the objectives of the *Interpretation and Tourism Plan* will be to define this boundary.

Archaeological investigation is recommended to be carried out around the eastern base of the *phnom* in partnership with EFEO, prior to stabilization work to mitigate further loss of significant fabric from erosion.

**8.4.1 Historic Interpretive Area:** is the extent of Yasodharapura, this areas includes attributes which are direct tangible expressions of the *outstanding universal value* of Phnom Bakheng within the context of Angkor, as well as those areas which in light of future research possibilities offer potential to contribute to and enhance such understanding.

**8.4.2 Approach Platform:** remnants of the historic Approach Platform contemporaneous with the construction of Bakheng are visible. Significant loss of historical fabric has occurred in this area due mainly to hydraulic erosion and tourist pressures. The historic built elements are compromised; interpretation will be required to enable visitors to understand the significance of this area.

**8.4.3 Signage:** located in the northwest portion of the Approach Platform are directional and information signs. The directional sign includes information in Khmer, French, English and Japanese language. Only a small portion of tourists are observed reading these signs and most tourists still ascend the east *phnom* axial stairs to Bakheng temple even though the signage recommends the North Trail as the 'safety path'. The signage fails in its objective.

**8.4.4 Elephant Station:** adjacent to the interpretive signs at the Approach Platform is the elephant station where visitors mount and dismount elephant rides. More visitors ascend Phnom Bakheng on the elephants than descend.

This area can accommodate up to eight elephants at any one time. There is a route conflict between tourists and elephants where the elephants track across the Approach Platform and the tourists intersect while tracking across to the east *phnom* axial stairs and the North Trail route.

There is a proposal to relocate the elephant station to the south side of the Approach Platform which would eliminate this route conflict, improve visitor safety and mitigate further damage to historic fabric.

**8.4.5 Scenic Royal Road:** running north-south the road cuts directly through the eastern side of the site between the Approach Platform and the *phnom* moat.

The Scenic Royal Road is a primary two-way road within the Angkor WHS, providing access between Angkor Wat and Angkor Thom. During the afternoons between 5:00 PM and 6:00 PM significant vehicular congestion occurs due to organized tour buses alighting customers for sunset viewing at Phnom Bakheng.

The current method of vehicles pulling off the road has eroded the soil and visual character of the Royal Road and surrounding landscape.

The APSARA Authority has a draft 'Parvi' proposal for each main temple in Angkor.

The study team has a proposal to reroute the Scenic Royal Road around and behind the Vehicle Parking Bay, in effect, removing the traffic from this historically important area. Further archaeological studies are required to determine optimal design and routing of the road.

This proposal when implemented will lead to significant improvements to the amenity of the area and greatly improve the setting and appreciation as a significant spiritually symbolic site.

**8.4.6 Vendor Stores:** the vendor stores are set back 7 meters on the eastern side of the Scenic Royal Road centered on the eastern axial stairs which lead up the *phnom*, while their service area including tables and chairs that extends toward the road by 4 meters.

The 18 stores extend over a length of 70 meters parallel with the Scenic Royal road and are 4 meters in depth selling locally made handcrafts, clothes, hats, tourist books and cold drinks. These vendor stores provide an important service to tourists within Angkor and contribute to the economy of Siem Reap. Locals within Angkor Park do not have as much of a market presence nor benefit from the markets financially. So they are compelled to travel for work each day.

Currently the vendor stores detract from the amenity of Phnom Bakheng due to their siting over the historical eastern axis.

**8.4.7 Vehicle Parking Bay:** The Vehicle Parking Bay sited behind the Vendor Stores was constructed as a temporary measure by the APSARA Authority in 2002 to alleviate vehicle congestion. The Vehicle Parking Bay is underutilized and fails in eliminating vehicle congestion at sunset viewing time in front of the vendor stores. A complete redesign of the Vehicle Parking Bay, in combination with the Vendor Stores and other control mechanism, are required to improve the amenity of the *Parvi* or Eastern Plaza while maintaining and improving a sense of arrival to this spiritually symbolic site.

**8.4.8 Eastern Plaza:** additional funds are necessary to improve vehicular and pedestrian circulation through the construction of the proposed Eastern Plaza. Included will be permeable pavement surfaces that will direct storm runoff and reduce erosion. Storm water filtration devices will reduce oil infiltration into the aquifer.

**8.4.9 Baksei Chamkrong:** is a small Hindu temple mountain in the Bakheng style to the north-east of Phnom Bakheng, it was commenced by Yasovarman's son, Harshavarman I.

Baksei Chamkrong consists of a small building on a square pyramid that has four laterite terraces measuring 27 meters at the base and 15 at the summit and is 13 meters tall. The single prasat, on a sandstone base, which adds another 11 meters to its height, is made of brick and stucco, with the doorframes and false openings made of sandstone. The roof consists of three tiers which are decreasing reproductions of the facade. Four axial stairways with stout buttresses lead to the summit of the temple, which was once surrounded by an enclosure wall and whose entrance was surmounted by a *gopura*.

Baksei Chamkrong contains a stele on the door reveal with reference to Yasovarman's reign (see paragraph 12.3 *Inscriptions* for photograph).

This landscaped parkland around Baksei Chamkrong running parallel with Angkor Thom's moat offers potential for recreational and interpretive activities within walking distance of Phnom Bakheng.



Tourists waiting to mount the elephants from the elephant station, it is proposed to relocate the station to the south side of the approach platform. (JHS Dec. 2005)



View of the Eastern where the Vendor Stores are sited and the Scenic Royal Road in the foreground. (JHS Dec. 2005)



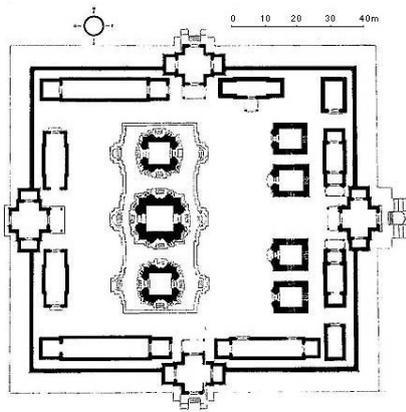
The temple mountain of Baksei Chamkrong was built in the 10th century by Harshavarman I to honor his parents and contained the statues of Shiva and the Devi. (ME Dec. 2004)



View of remains of Prasat Thma Bay Kaek. Note Prasat Bei is located further west in the background. (KK Dec. 2004)



View of the east elevation of Prasat Bei. Note how the land drops down into Angkor Thom's moat towards the north (right side). (KK Dec. 2004)



Plan of Phnom Krom (Maurice Glaize)

**8.4.10 Prasat Thma Bay Kaek:** located within the Baksei Chamkrong parkland remains of a single square brick tower preceded to the east by a laterite terrace, situated between Baksei Chamkrong and the moat of Angkor Thom, 125 meters west of Scenic Royal road. When cleared in 1945, five gold leaves arranged in a quincunx were found under the base step.<sup>13</sup>

**8.4.11 Prasat Bei:** located within the Baksei Chamkrong parkland running parallel with Angkor Thom's moat is Prasat Bei. Consisting of three small brick towers aligned north south on a common laterite podium.

**8.4.12 Bakheng Moat:** remnants of Bakheng's moat contemporaneous with the construction of Bakheng are visible. The moat included causeways on the axial crossings.

**8.4.13 Angkor Thom's Moat:** the southern section of Angkor Thom's moat is situated to the north of Baksei Chamkrong demarcating the northern edge of the Baksei Chamkrong parkland.

**8.4.14 Tep Pran:** located near the Eastern Baray a stele inscribed on its four sides, found in the vicinity but whose true origin is unknown describes the ancient Buddhist monastery or asrama founded by Yasovarman towards the end of the 9th century. The text gives regulations that are almost identical to those of the Shivaite founded by Yasovarman to the south of the Eastern Baray.

**8.4.15 Phnom Krom and Phnom Bok:** while not located within the Historic Interpretive Area, Phnom Krom is on the shores of the Tonle Sap, 15 km south-southwest of Phnom Bakheng and Phnom Bok 15 km northeast. Phnom Krom is one of four geographical high points in the Angkor plain, the others Phnom Bok, Phnom Dei and Phnom Bakheng (see *Figure 17 Archaeological Sites in the Angkor region*, page 70).

Each of the temples, whose main buildings comprise three sanctuary towers opening to the east and west arrayed along a single north-south axis, housed a Brahmanistic triad composed of the gods Siva, Visnu and Brahma respectively.

At Phnom Krom the upper portions of the towers have collapsed and the facades are degraded but otherwise they remain intact. The towers are enclosed by a laterite wall intersected on each side by an entry tower in the shape of a cross. Three long halls built of laterite (only the bases of which remain) parallel the wall around the courtyard. They probably served as rest houses. Four small buildings inside the courtyard preceded the sanctuaries. They are similar except that the two at either end are brick and the two in the middle are sandstone. All four have a series of holes in the walls, which suggests they may have been used as crematoriums, although it is not certain of their function.

The three central towers stand on a north south axis on a low rectangular podium with molding and paving constructed of sandstone over a laterite base. Two sides of the base are intercepted by three stairways with lions on the landings. The towers are square and originally had four recessed tiers on the upper portion; they open to the east and west with false doors on the north and south. Traces of decoration remain around the base of the podium near the stairs, on the pilasters, the panels of the false doors, the cornices and on niches in the corners. The upper terrace affords a panoramic view of the Tonle Sap lake and the surrounding plain.<sup>14</sup>

*site survey and spatial analysis*

**8.4.16 Phnom Dei:** is almost most twice as far away as Phnom Bok, further to the northeast. During the reign of Yasovarman , a temple was erected on Phnom Dei to Sankara-Narayana<sup>15</sup>

When standing on top of Phnom Krom and look northward at the very distant Phnom Bakheng, a curious feature appears. From this vantage point, the top of Phnom Bakheng is precisely even with the horizon line formed by the ridge of the Kulen mountains. From the vantage point of the East Mebon temple, the top of Phnom Bok is also exactly identical to the top of the far away Kulen ridge. The summits of these two mountains were flattened to better accommodate the construction of a temple complex. However, it is highly unusual that they were flattened so as to be perfectly even with the line of the Kulen mountains when seen from the East Mebon and Phnom Krom.

This sensitivity to the location and presence of the four Angkorian mountains and the large Kulen plateau extends to more than a visual concordance with the horizon line or an awareness of the position of Phnom Bakheng. When King Yasovarman moved the capital to Angkor from Hariharalaya in the southeast, he built temples on all four mountain peaks.

While the temple-complex on Phnom Bakheng was being surveyed in the 1960s, the remains of a wall were found underneath one of the eastern buildings. We cannot be certain whether King Yasovarman leveled these mountain peaks to build his temples, or whether the peaks were leveled earlier and already had temple ruins on them. Regardless of any possible antecedents, Yasovarman obviously considered the mountains to be highly sacred, powerful locations. He took advantage of their lofty pre-eminence to dedicate temples to the worship of Brahmanical gods on their peaks. In a way, he was asserting his authority over the region, as well as propitiating its gods, by building temples on these geographic markers.<sup>16</sup>

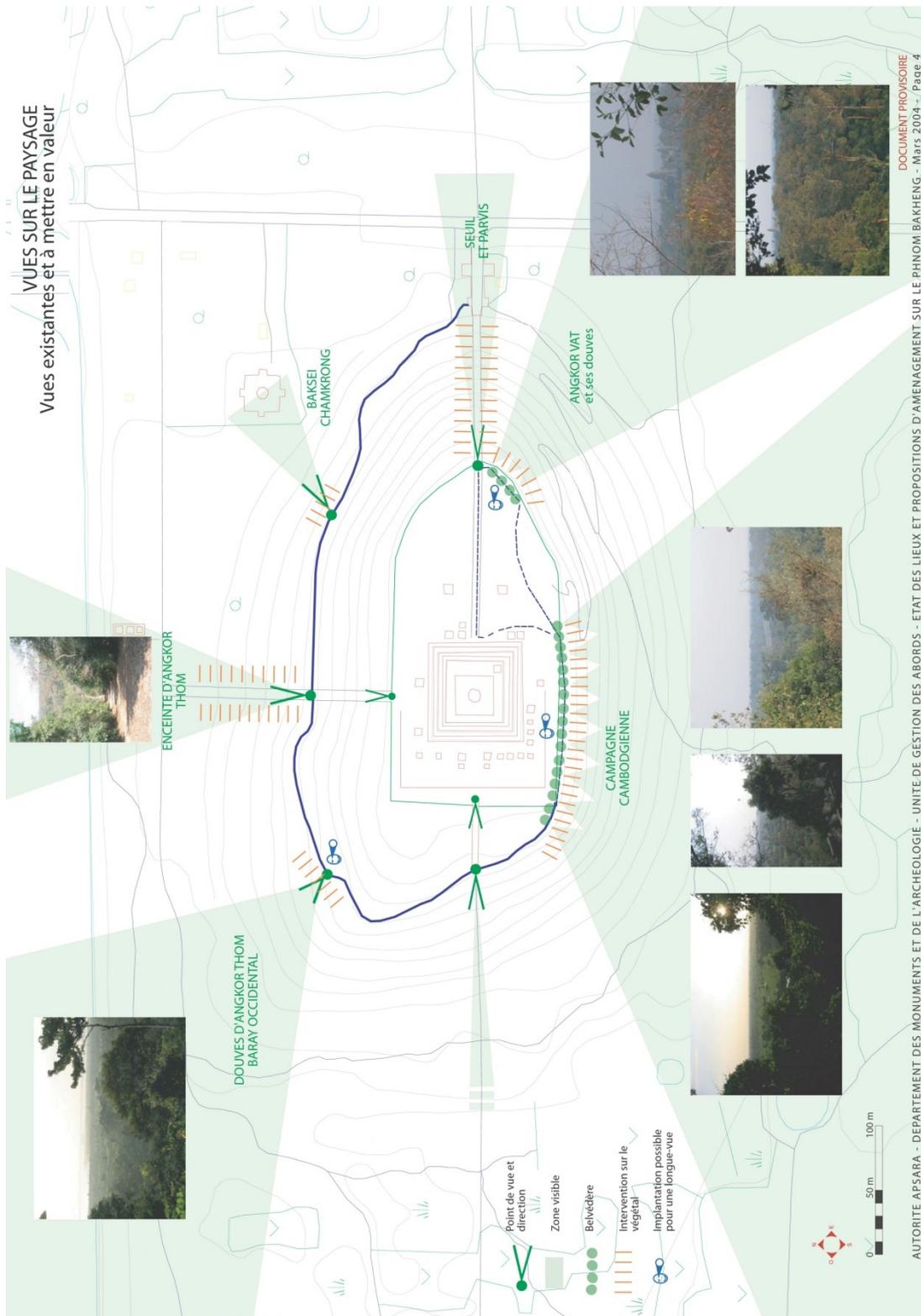


Figure 8 Analysis of viewing areas along the North Trail of Phnom Bakheng  
 Etat des lieux et propositions d'aménagement sur le phnom Bakheng (Surrounding Management Unit,  
 Department of Monuments and Archaeology, APSARA Authority, March 2004)

site survey and spatial analysis

## THREATS AND SITE CONDITION

### 9.0 THREATS AND CONDITION ASSESSMENT

#### 9.1 General

The information presented in this section constitutes a summary of the base-line data necessary to monitor the state of conservation. Information provided in this section includes physical condition of the property, any threats to the property and existing conservation measures at the property.

A complete detailed study containing base-line data of Bakheng and other built elements can be located in *Volume 2: Supporting Data*.

Refer to *Volume 3: Action Plans – Built Elements, Landscape etc* for details relating to technical solutions for identified threats.

#### 9.2 History and Development

The disappearance of many of the Bakheng towers was caused, in part, by 16th century efforts to use the towers' sandstone to build a large seated Buddha sited over the five *prasat*, or sanctuary towers.

Bakheng had been completely engulfed in trees prior to EFEO undertaking conservation work in the early 20th century. These trees caused significant damage to the temple structure. The tree roots dislodged the sandstone blocks and paving allowing monsoon rains to carry materials between the bedrock and sandstone platform walls which contributed over time to their collapse in parts.

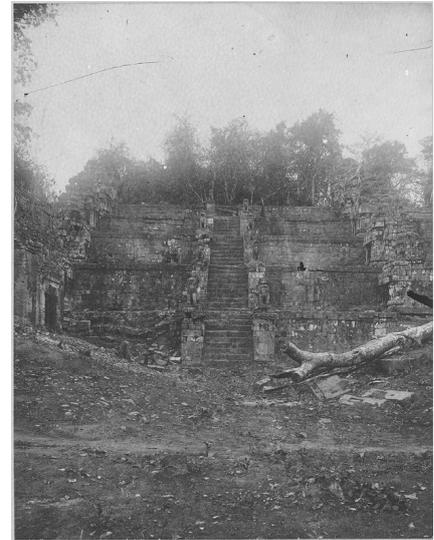
Remains of the seated Buddha were visible in the 1920s before EFEO undertook conservation works and in the process completely dismantled the Buddha (see paragraph 12.7 for photograph of incomplete Buddha).

In modern times, during Cambodia's prolonged civil conflict, the site was commandeered by the military and used as a heavy-gun emplacement and a military encampment, and the surrounding area was extensively land-mined. More recent threats include heavy and poorly managed tourism and monsoon rains. Due to the site's deforestation, conducted in order to provide access for de-mining and, later, visitors, the monsoon rains are especially damaging, causing erosion and creating dangerous areas of potential collapse of the manmade structures.

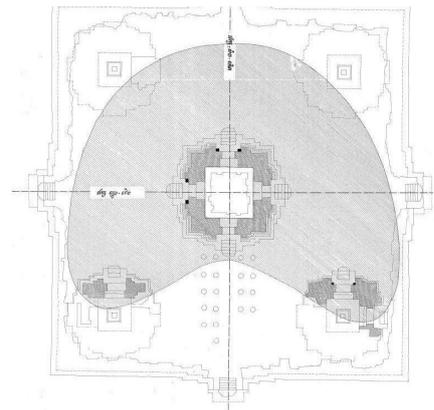
#### 9.3 Architectural Analysis

Other than for the remarkable fact that the tiered platforms foundations have been cut out of bedrock, the methods of construction for both stone and brick structures at Phnom Bakheng are typical of the Angkorian style found throughout of most of the historic city. Although the Khmer construction techniques present some technical deficiencies, including:

- dry joints that lead to weight concentration and root penetration;
- poor bonding causing joints to open and stone to crack;
- laterite blocks as an internal core typically on the corners of the stepped pyramid where there wasn't sufficient bedrock as foundation, has lead to structural collapse due to the friable nature of laterite when it is continually exposed to water; and
- vertical joints were allowed to run on top of one another making walls very unstable. Often a whole wall will collapse if one stone near the base becomes dislodged.



View of the eastern stairs at Bakheng during forest clearance by EFEO in 1915. (EFEO 1915)



Shaded area indicating the location of the incomplete 16th century seated Buddha sited over the towers of the quincunx.



Aerial photography of Bakheng post vegetation clearance in the 1920s. (EFEO)



View of western side of sandstone shrine G10; note the vertical separation between the joints which align above each other. This has occurred due the movement of the platform veneer wall and the subsequent movement of the sandstone shrine footing which aligns parallel on or near the platform wall's outer (northern) edge. (MS March 2005)



Dry joints have lead to weight concentration, point loading and shear cracks. (BW Dec. 2004)



The displacement of the northwest corner of the platform wall was caused in part by hydraulic pressure behind the platform wall.

Contributing to the wall displacement, the sandstone blocks are not systematically coursed and there was no effort at bonding the stones across joints – in some areas vertical joints are aligned. (BW March 2005)

**9.3.1 Sandstone as a Building Material:** the Khmers were not sophisticated stone masons. Their tradition, prior to the construction of the great Angkorian temples was to build in wood. The Khmers probably learnt their skills in engineering from the Indian subcontinent where structures at that time were of a relatively small scale and were also very simplistic.

**9.3.2 Structural techniques:** their method of architectural construction was based on the simple post and lintel method of construction and the most basic form of corbelled vaulting to create larger spans (see paragraph number 11.4). Apparently there was not the need for large covered spaces for worship in Angkorian temples which were primarily Hindu, individual worship was more common. In the case of the royal or 'state' temples worship was conducted by high priests representing the kings.

The structures survived on their dead weight and gravity. The stones were laid 'dry' with no mortar or bedding between the stones. The stones were not systematically coursed and there was no effort at bonding the stones across joints – in many cases vertical joints are common, especially in the towers.

**9.3.3 Sandstone Masonry Techniques:** it appears that the stones were partially dressed at the quarry and then transported to the building site where they would be immediately erected. Evidence on how the builders achieved the very precise and extremely tight joints between stones has been depicted in a bas relief in the Bayon. However in practice to produce the precision surfaces to achieve these joints is still not clearly understood. From research at Prasat Ta Keo, it is clear that the stones were laid as building blocks to create the structure and afterwards sculpted in situ.

In some of the early Angkor style structures there was an interesting tendency for construction techniques in sandstone to mimic some carpentry details. In several instances in Phnom Bakheng such details can be found.

**9.3.4 Construction Failures in Sandstone:** the main cause of failure is often the poor quality of the sandstone used and the fact that the stones are incorrectly bedded. If the stone beds are laid vertically there is a tendency for the stone to delaminate. This is either caused by the presence of clay between the sandstone laminates and the clay expanding due to take up of moisture or if there are salts present naturally in the sandstone. The use of cement in early repairs will also cause the migration of salts into the stone and produce the same result due to the crystallization of the salts in the strata.

**9.3.5 Lintels:** lintel failure often occur where spans are too great and other factors are present including, shifting of the structure leading to overloading of the lintels, or where stones are not correctly bonded causing point load stress at critical bearing points.

**9.3.6 Laterite as a Building Material:** laterite is a local stone probably quarried from the local moats. When exposed to air for extended periods, laterite soils harden, prior to hardening laterite can be cut into blocks for building purposes. Lateritic soils tend to be ancient soils with long exposure to water leaching, typical of tropical monsoon environments, during which process the softer kaolinite clay minerals are washed away, giving the soil a porous, vesicular appearance.

Laterite is used primarily as a backing material and for foundations. At Phnom Bakheng it has been used as a core material to construct the foundations for the Platform of the Quincunx and to make up the rectilinear

### threats and site condition

plan of the tiered platforms especially at the corners where there was insufficient bed rock.

**9.3.7 Laterite Structural Failures:** laterite will fail structurally as a result of the constant wetting and drying of the material and eventually the deadweight of the above structure will cause the laterite to disintegrate. If laterite is kept dry it will retain its structural integrity. The key therefore to protecting laterite is to provide proper drainage and protection from water.

**9.3.8 Brickwork as a Building Material:** the techniques of building in brick had been well established in the earlier monuments of Roluos. However the brick structures at Phnom Bakheng are greater in scale and there is a marked improvement in their construction technology. As in Roluos there was a scarcity of suitable clays for making fired bricks and of lime required to make the mortar.

**9.3.9 Brick Shrines:** clay brick is much smaller and its absorbency greater than the sandstone blocks used in the construction at Phnom Bakheng. Therefore brick structures tended to be more susceptible to rapid growth of shrubs and trees which very quickly took root in the brick shrines at Bakheng contributing to their obliteration, in part, from the top of the structure downwards. In most cases the brick shrines were set on a laterite foundation and plinth. The constant wetting and drying of the laterite caused structural failure and resultant settlement to the structure above, which further aggravated the situation by allowing vegetation to take root on the structures. Comparative examples of similar failures can be seen in the Roluos group and in some of the later brick structures in Preah Rup and in the East Mebon.



Detail view of the northwest corner of brick shrine G13; note the podium sandstone plinth is absent, the laterite foundation has completely disintegrated and the clay brick work is missing in parts. (MS March 2005)

## 9.4 Vegetation

Public perception and understanding of the site is inextricably linked to a complex relationship of the ancient Angkor cities within a highly forested and romanticized 'ruins' context. To that end, present management has been careful to preserve and protect the forest to ensure that the setting for the ruins is not negatively impacted by unnecessary clearing or deforestation. However, deferred vegetation management is resulting in overgrowth that is causing safety hazards, damaging resources and reducing visitor experience.

**9.4.1** Vegetation is probably the cause for most structural failures. In the case of Phnom Bakheng, there was an extraordinary overburden of soil, debris and undergrowth over the centuries. Eventually large bushes and trees took root in the overburden, which started prying the stones apart in search of water during the dry seasons.

**9.4.2** Once the joints are opened up the passage of storm water became an added hazard. In the case of the platform walls where sandstone has been used as a facing to the bedrock and although the builders provided a key, in parts, by cutting grooves into the bedrock; once water starts entering between the bedrock and the facing it carried with it soil. Shrubs and eventually trees took root, growing in the gaps and forcing the facing away from the bedrock. There was no attempt to tie the facing to the bedrock.

**9.4.3 Erosion and lack of biodiversity:** are interrelated problems at Phnom Bakheng. Drainage at the top and bottom of the site is inadequate, leading to loss of groundcover (biomass) and understory.



Northeast corner of Phnom Bakheng; note the overburden of soil and shrubs on the brick shrines which contributed to their obliteration in part. (EFEO 1930)

## 9.5 Hydrogeology and Hydrology Analysis at Bakheng



The façade wall of the lowest terrace during intense monsoonal rain. Note the water spouting from between the sandstone blocks, indicating the build-up of hydraulic pressure behind the façade. (APSARA Aug. 2003)

**9.5.1 Hydrologic Background:** when the structure was completed in the 10th century, the upper platforms and the surfaces of the four terraces were originally sealed with a relatively impermeable cover of sandstone paving slabs. However, due to the deterioration of this cover, most of the incident rainfall (of approximately 1500 mm per annum) now reaches the bedrock core of the temple structure, either through permeable joints between the pavers, through cracked pavers, or directly onto exposed bedrock in areas where the pavers are missing. Consequently, runoff now either flows over areas of massive bedrock to the platform edge, or enters widened discontinuities that act as hydraulic pathways, channeling water outwards to the side walls and corners of the structure.

Long-duration storms have the potential to surcharge the soil-filled cavity behind the sandstone facing walls, creating substantial hydraulic pressures, particularly on the lower tiers of the temple structure.

Detailed examinations of the structure have failed to reveal an engineered drainage system. Consequently, it is concluded that the runoff was not actively managed, but allowed to either flow over the temple surface, or to evaporate.

**9.5.2 Hydrologic Analysis of Bakheng:** the bedrock of the temple mountain is well-cemented and competent. Consequently, the mass is relatively impermeable. Also, many of the joints are unweathered and tight, so do not offer drainage pathways. However, several joints are extremely weathered and open, acting as conduits for groundwater. In addition, the disruption and removal of the pavers on the terraces allows rainwater to enter the bedrock core, and particularly to accumulate behind the sandstone façade. This deterioration has been assisted by the tropical vegetation that previously covered the structure.

The structural stability of the sandstone façade, and the decay and disintegration of the internal laterite block fill are exacerbated, if not completely caused by, the inflow of storm water. It is recommended that the optimum way to alleviate both of these problems is to severely restrict, or completely exclude, infiltration.



The bedrock cut-slope of the lowest terrace on the western face of the temple. Note the horizontal shelves cut in the bedrock to support the drystone façade, and the light-colored siltstone beds that dip at 300° to the north (upper right to lower left). (MM June 2005)

**9.5.3 Bedrock Analysis:** the edifice (temple mound) was hewn from the solid rock that lay at the core of the original hill (Phnom). The bedrock is a crudely bedded (layered) sequence of conglomerates (well-rounded pebbles and cobbles in a sandy matrix), coarse sandstones, and fine siltstones. The rocks dip at between 20° to 30° to the north. In general, discontinuities in the bedrock are tight, giving the rock a massive appearance. However, particularly at the corners, some discontinuities, including bedding planes and several sets of vertical and sub-vertical joints, have been widened by weathering and flushed by groundwater to produce major conduits for water and sediment movement. In addition, at certain locations, pipe-like features have developed along bedding planes and at joint intersections. Together, these pathways have resulted in sediment accumulating behind the façade.

Intersecting joints daylight (emerge) at several locations on the cut-slope faces, producing unstable wedge-shaped blocks, or localized slabs, that have been displaced to varying degrees by the prising action of roots, hydraulic pressures, and soil infills. These block movements, together with root action, hydraulic pressures, and the soil infills have imposed forces on the rear of the sandstone façade that originally clad the cut-slopes. Consequently, localised collapses have occurred on the lower two terraces.

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Rainwater entry has been facilitated by deterioration, or complete destruction, of the paved surface that originally protected the terraces.

Remedial measures should pay particular attention to the state of the discontinuities. Widened discontinuities emerging from the edifice should be filled with a drainage filter to reduce water flow and prevent them from acting as drainage conduits. Wedge-shaped blocks produced by adverse discontinuities daylighting on the cut-slopes should be trimmed, and all loose blocks scaled.

Reconnaissance levelling of the terraces has been carried out. The results indicate that no detectable tilting or warping of the structure has occurred, confirming the overall stability of the edifice. However, a comprehensive levelling survey may also be undertaken to monitor localised movements in the sections where wall collapses have occurred, to identify if any locations require critical treatment and remedial measures.

**9.5.4 Bedrock and Platform Walls:** originally, five platform levels were excavated in the bedrock. Vertical cut-slopes were all faced with sandstone walls, and the horizontal terraces were paved with sandstone pavers. Because there were natural irregularities in the bedrock underlying the hill, the bedrock did not everywhere conform to the desired final form. Consequently, three main types of platform wall have been identified, based upon the configuration of the underlying bedrock and the resulting proximity of the cut-slope to the final profile. However, in all cases, the sandstone walls were erected purely as façades, of drystone construction, and seated directly on platformed bedrock. Nowhere were they constructed as retaining or supporting walls.



The northeastern corner of the lowest terrace, illustrating how the disintegration of the laterite blocks used to form the final profile has contributed to the structural collapse of the sandstone façade. This method of construction was used, to a greater or lesser extent, on all four corners of the structure. Deterioration of the paved terrace surfaces allowed water to accumulate behind the façade, and alternate wetting (saturation) and drying of the laterite blocks caused them to disintegrate (BW March 2005)

In the ideal situation, the walls were constructed with little space between the facing stones and the underlying bedrock. Every second course comprised longer sandstone blocks that were keyed into the cut-slope along a shelf specially cut out for the purpose. Other sections where the cutslopes did not meet the final profile, have laterite, and in some cases stone rubble, placed in the gap between the sandstone façade and the cut-slope. In several sections where the bedrock was at some distance from the final profile, particularly at the corners, and especially at the southeast corner of the temple, large laterite blocks were used to construct the desired profile.

Accumulation of soil behind the façade, combined with the growth of tree roots and the ingress of rainwater, has created periodically saturated conditions. This has led to the deterioration, disaggregation, and collapse of the laterite blocks. Originally, the lateral loads behind the façades were low. However, the soil infill, seasonal saturation of the cavity, vegetation growth, and laterite decay has imposed lateral pressures, loading that the facing walls were not designed to resist. Consequently, the corners of the temple have particularly suffered from structural instability. In other sections, the localized displacement of wedge-shaped, joint-bounded bedrock blocks has imposed additional loads behind the wall.

Inspections have revealed that no significant lateral movement, or settlement, of the foundations has occurred. Also, the majority of the individual sandstone blocks that were used to construct the façade are in good condition. Minor surface exfoliation is apparent on many blocks, and some have suffered point-load deterioration on their leading edges, but overall the quarried blocks have survived extremely well.

### 9.6 Emergency Stabilization

Some structures throughout the site were identified as needing immediate 'emergency' stabilization to prevent imminent collapse on *Mission I*. Work at the 12 general locations ranging from stabilization of entire structures to simple propping at cracked lintels or leaning walls were addressed by December 2005.

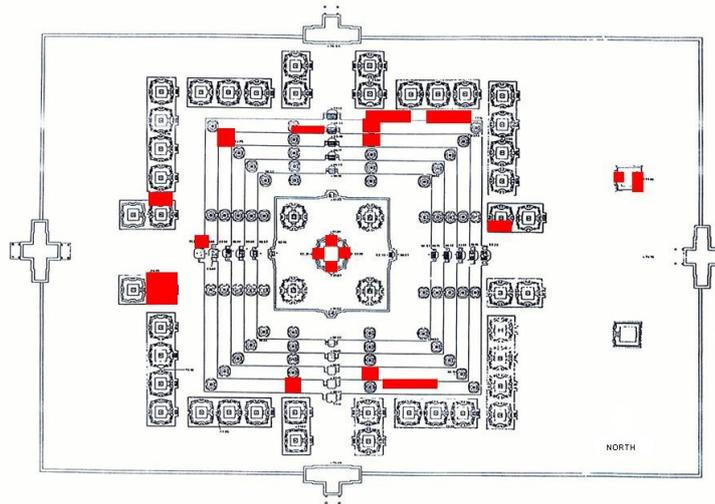
The emergency work is intended as only a short-term stabilization measure, and is expected to be in place for 18 months. Permanent repairs must be completed at each of these locations to ensure long term stability.



View of southeast corner of the north library with temporary emergency stabilizations works in situ. (JHS Dec. 2005)



View of the Central Tower of the Quincunx where temporary supports have been provided at the four axial doorways. (JHS Dec. 2005)



Map of the 12 locations where 'emergency' stabilization works have been implemented. (MS 2005)

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## 9.7 Structural Analysis

The objectives of the structural risk analysis include:

- record typical site conditions to characterize the type and extent of damage;
- conduct analyses to determine stability of individual elements such as stairs, walls and lintels;
- use this information to identify current risks and define a stabilization scheme;
- formulate a prioritized plan and methods to stabilize, repair, and strengthen site resources; and
- identify and address emergency conditions

The following structures or their components within the laterite enclosure wall were analyzed to identify areas requiring critical intervention:

**9.7.1 Platform Walls:** the sandstone block platform veneer walls are built to follow the outline of excavated bedrock. For the most part these walls operate not as retaining structures but simply as veneer over the underlying bedrock. In select locations, typically corners, they do retain some infill soil/stone. Sections of platform walls are failing where soil and water has washed in to fill the space between the bedrock and veneer walls.

**9.7.2 Stone Steps and Buttresses:** the four axial stairways flanked by tall buttresses are serving to support and reinforce the platform walls. Most buttresses are rotating outwards due to past vegetation growth and contributing to the central outward displacement of the steps themselves, which are built integral to the buttresses.

**9.7.3 Sandstone Shrines:** the 60 sandstone shrines, 12 per terrace at Bakheng often have an outer wall resting on either the top course of the sandstone block platform veneer wall or adjacent sandstone pavers. Stability of the stone shrines is tied directly to the stability of the platform walls on which they sit on or adjacent to pavers.

**9.7.4 Towers of the Quincunx (sanctuary towers):** the 4 sandstone towers on the Platform of the Quincunx have sustained considerable damage and/or loss and displacements of its carved sandstone block, which has compromised the quincunx's distinctive form. Three of the towers are essentially collapsed with little of the original stone remaining in situ; the fourth, in the northeast corner has lost its superstructure.

**9.7.5 Central Tower:** absent of a superstructure a significant portion of the main Central Tower of the quincunx remains, but has suffered damage. All lintels are in critical condition. Lintels are either: entirely collapsed, propped with a stack of stones, or propped with a concrete beam. Emergency stabilization was carried out to provide full support to the remaining structure in late 2005.

A list of prioritized repairs for the central tower is listed below:



View of eastern temple stairs and their integral buttresses with lions on top. Note the Central Tower at the top, which is absent of a superstructure. (ME Dec. 2005)



View of the west axial stair and buttress, that has been displaced outwards by past vegetation growth, which was removed in the early 20th century. (ME Dec. 2004)



View of the eastern side of the central tower with its superstructure missing and remains or one of the Prasats of the quincunx in the background to the left. The condition of the platform is poor in parts; note the missing sandstone paving in the foreground has exposed the laterite block fill. (BW Dec. 2004)

Location	Repair No.	Notes	Repair Type
Entry lintels, all elevations	1	All lintels are in critical condition. Lintels are either: entirely collapsed, propped with a stack of stones, or propped with a concrete beam. Stabilization is required to provide full support to the stone above.	Immediate
Corbels over entries, all elevations	2	Large portions of some corbels are collapsed; others are cracked. Support of stones above is questionable.	Immediate
Tower walls	3	Some displacement, cracks, and isolated mortar repairs exist.	No repairs

Table 1 Central Temple Tower: listing of prioritized repairs.



Detail of the Platform of the Quincunx's northeast corner; note the laterite block core has been exposed. (ME March 2005)

**9.7.6 Platform of the Quincunx and Tier 5 Platform:** in parts, the platforms are in good condition, notably where the towers of the quincunx and sandstone shrines stand or stood, the paving still exhibits the exquisite craftsmanship of the finely jointed and interlocking paving joints. In other areas probably where shrub and tree roots became established there has been considerable dislodgment of the sandstone paving allowing the monsoon rain to infiltrate the structure and laterite block core beneath.

**9.7.7 Platforms (tiers 1, 2, 3, & 4):** all platforms are in poor condition, either the sandstone paving is missing, often in large sections, or dislodged except where the sandstone shrines remain. The absences of paving allows water to infiltrate the temple structure depositing matter and effecting hydraulic pressure behind the platform wall and over time contributing to their structural instability.



View of a heavily deteriorated and completely obliterated brick shrine. (KK Dec. 2005)

**9.7.8 Brick Shrines:** the 44 brick shrines around the base of Bakheng are built on raised foundations consisting of laterite masonry fill with some soil infill. Most of the brick shrines are heavily deteriorated or completely collapsed. Much of the original brick material at the collapsed shrines has been damaged or obliterated.

**9.7.9 Libraries:** the two stone "library" structures east of the base of the temple. There are two main deficiencies at the libraries. Of particular concern is the current condition of stone lintels and door frames at the east and west entries. A second issue is that the walls of both libraries are "spreading" laterally.

**9.7.10 Enclosure wall:** the enclosure wall is 1.6 meters high, constructed from large laterite block 800 x 400 x 400 cm with a base and capping detail. At the four cardinal axial points once stood *gopuras* (entrance pavilions).



Detail of southern laterite enclosure wall, which in part has collapsed or are missing laterite blocks. (ME March 2005)

Laterite is prone to disintegrate with cyclical wetting and drying; parts of the enclosure wall are missing, have been obliterated from hydraulic erosion or crushed when trees took root.

threats and site condition

## 9.8 Structural Risk Map

The 'Structural Risk Map' provides a more rational and economical means of undertaking the project management, conservation, and maintenance of the pyramid temple complex.

The first phase of the project has been to record, collate, process, and manage both photographic and alphanumeric data of vertical and horizontal displacement of the pyramid temple sandstone veneer walls. The connection between environmental pressures; mainly hydraulic and risk to the structural failure is highlighted through this mapping process, by analyzing the degree of displacement of stone platform walls and adjacent structures.

The second phase has ensured that the table data (see *Structural Risk Map Inventory*, located in *Volume 2: Supporting Data*) were homogeneous through defining standardized schedules at different levels of detail. These schedules contain information both on the environment of the territory and the conservation status of the monuments. Future development, according to the methodological approach adopted by the Risk Map project, foresees the census area as a smaller territorial unit. Moreover, it is the opinion of the Team that an improvement in documentation and recording of all formal and constituent elements of the monument is essential in order to obtain a true reconstruction (either real or virtual) of damaged cultural property.

Repairs are separated into 2 categories, as illustrated in the corresponding Risk Maps:

- *Immediate repairs*: ascribed to structures or portions of structures that represent a threat of collapse with little or no additional movement or material deterioration. It is recommended that these repairs be conducted within the next 3 to 5 years.
- *Deferred repairs*: for those locations where some additional movement and deterioration may be tolerated without compromising structural stability. "Deferred" repairs should be undertaken in the next 5 to 10 years.



View of the southwest corner of the sandstone shrine E2, which has been identified as needing immediate repairs in the Structural Risk Map, see Figure 9. (ME May 2005)

Factors contributing to part collapse of the shrine include; collapse of the platform wall beneath the shrine's outer southern wall and original construction technique that allowed vertical joints to align on top of one another making the shrine walls very unstable. Often a whole wall will collapse if one stone near the base becomes dislodged.



View of the Sandstone Shrines B4, C4 and D4; note that the shrine capping stones are missing on C4 and D4, although capping stones have been identified among the displaced stones artifacts at the site. (ME March 2005.)



View of the eastern elevation of Bakheng with visitors ascending the east stairs for sunset viewing. Note the collective contribution the sandstone shrines make to Bakheng's form silhouetted against the sky; in particular, their four upper tiers and one still with its decorative sandstone crown in place. (ME March 2005)

**9.8.1 Sandstone Shrines:** 60 sandstone shrines, 12 per terrace at Bakheng temple, were evaluated for structural risk during *Mission II*, March 2005. Observations were made on site to evaluate the level of structural damage for each structure, including measurements of wall plumb, crack mapping, evaluation of foundations for movement, and collapse of adjacent structures. Information was input into a database for analysis.

Results of the risk mapping for the sandstone shrines are detailed in the *Structural Risk Map Inventory*, located in *Volume 2: Supporting Data* and illustrated in the Figure 9 *Sandstone Shrines Structural Risk Map*. A general "risk index" was arrived at for each structure (or structural component) based primarily on visual observations of damage. Additional risk factors related to foundation condition and measured lean are also listed for consideration. Individual repairs are prioritized based on the risk index; the final prioritization will likely be modified slightly depending on related foundation and leaning risks.

Sandstone shrines were built using dry-laid sandstone with a separate structural element at the east doorway opening. Risk mapping was conducted for the structures themselves, based on overall stability issues, as well as the lintels and door frames.

The majority of observed damage appears to be directly related to movement at the bearing below the shrines' base course. Three of each shrine's four walls rest directly on bedrock or on laterite infill at the corner shrines. Bedrock bearing conditions were observed to be stable throughout although much of the laterite infill has deteriorated. The fourth shrine wall was originally built to be resting directly on the platform wall below, and the majority of damage to the shrines appears to be directly related to movement of the platform walls on which they rest. Stabilization of platform wall sections beneath and adjacent to the stone shrines will be a major component of the work on site.

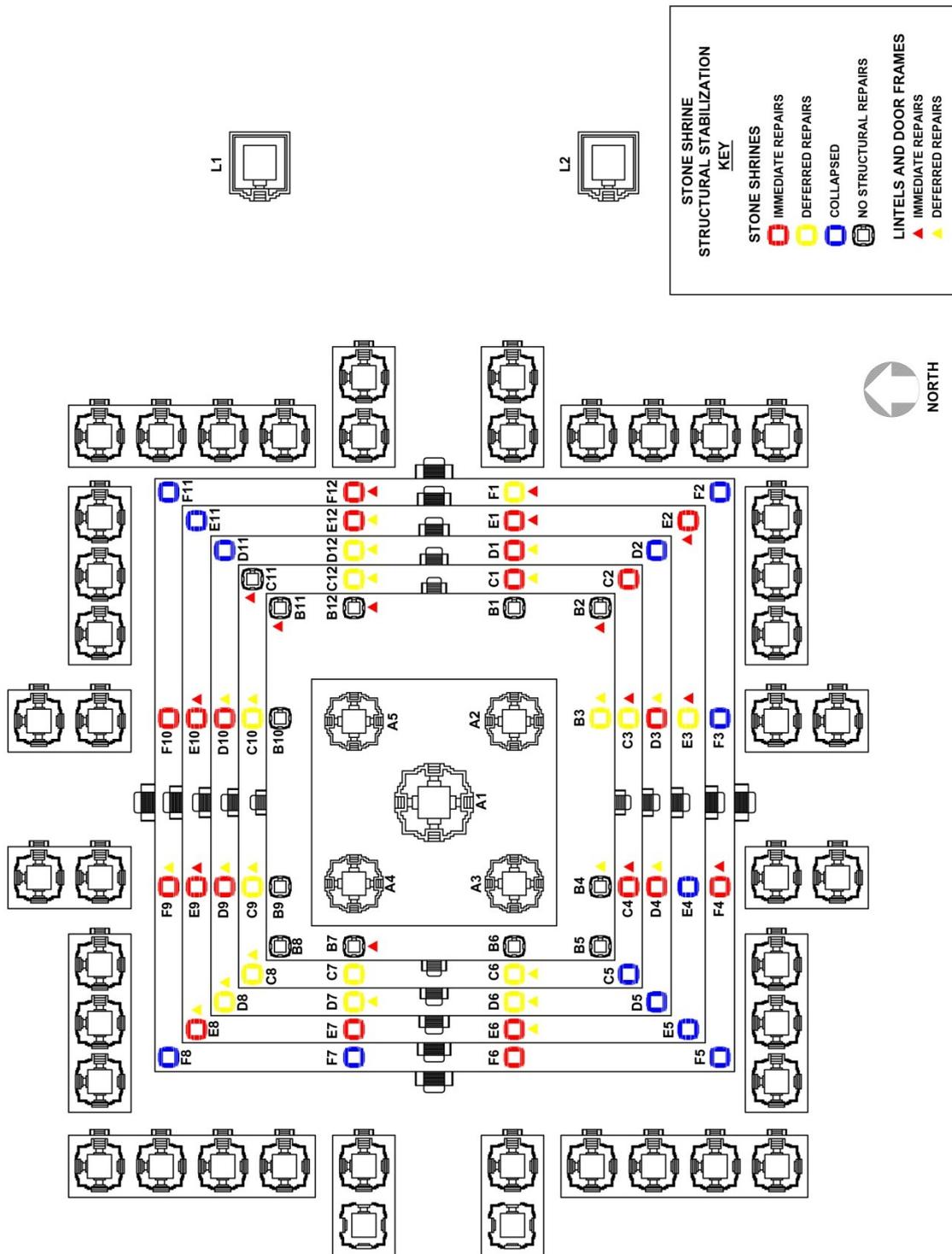
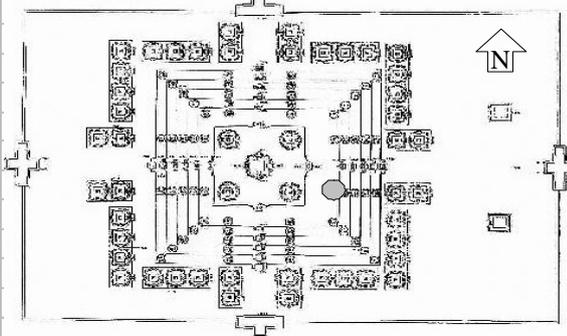


Figure 9 Sandstone Shrines Structural Risk Map (MS 2006)

<b>JOB NAME:</b>	PHNOM BAKHENG				<b>ASSESSMENT</b>	3/27/05	MPS																																															
<b>JOB #:</b>	05-012				<b>DATA ENTRY</b>	5/11/05	MGM																																															
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<b>REPAIR/STABILIZATION NOTES</b>																																																						

Sample Sheet 1 Stone Shrine B1  
 A completed survey of all the stone shrines is located in *Volume 2: Supporting Data*.

*threats and site condition*

**9.8.2 Platform Walls:** the original bedrock of the *phnom* was excavated and shaped to fit the general form of the temple. Dry-laid sandstone was used as a veneer to face the bedrock at each of the five platform levels. Platform walls range in height from 1.79 m (top level, or Level 5) to 3.5 m (bottom Level 1). The total length of all platform walls is nearly 1,200 m.

Platform walls were evaluated for risk during Mission II, March 2005. Observations were made on site to evaluate the level of structural damage for each wall section, including measurements of wall plumb and mapping of major issues such as wide cracks, displaced stones, missing stones, and collapsed areas. Information was input into a database for analysis.

Results of the risk mapping for the platform walls are detailed in the *Structural Risk Map Inventory*, located in *Volume 2: Supporting Data* and illustrated in *Figure 11 Structural Risk Map – Platform Walls*. Conditions to be addressed are described for each location, and measured lean is also listed for consideration, when recorded. Unstable locations, characterized as those where walls are leaning more than 6 to 8 degrees, should be addressed promptly. Individual repairs are prioritized based primarily on site observations and measured lean.

Platform walls were built as dry-laid walls facing the underlying bedrock. Many of the bed joints between stones also have a rudimentary key joint to provide lateral resistance. Platform walls are not anchored into or otherwise attached to underlying bedrock.

All wall types are founded on bedrock and no significant movement related to foundation settlement has been observed. All walls were originally designed and built as a facing, where lateral loads are naturally quite low in the as-built condition. Over time, however, soil has washed in to fill the gap between the stone facing and bedrock. Soil infill and related vegetation growth develops large lateral pressures, loading the stone facing in a manner which it is incapable of resisting. Lateral pressure increases significantly if soils are permitted to become saturated or if water even temporarily fills the gap between the bedrock and its stone facing.

The three main types of platform wall configurations are:

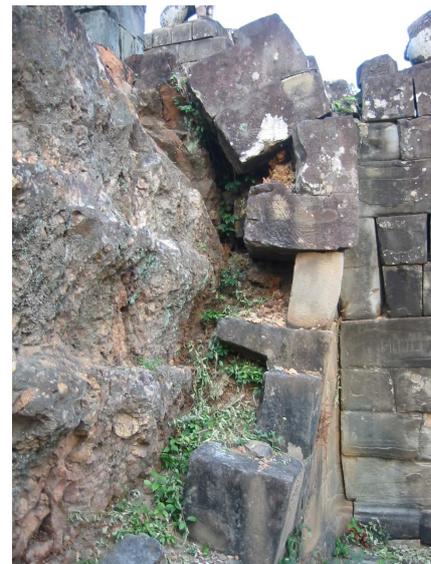
**Facing Wall (Figure 10 (a))** – In this case the wall is built close to and, in some cases, keyed into the underlying bedrock. In this situation lateral pressures are small and the stone acts as a simple facing or veneer to the bedrock.

**Facing and Retaining Wall (Figure 10 (b))** – The space between the bedrock and stone facing wall is filled with sand and earth. In the wall's original configuration, the infilled zone appears to be less than 0.5 m wide.

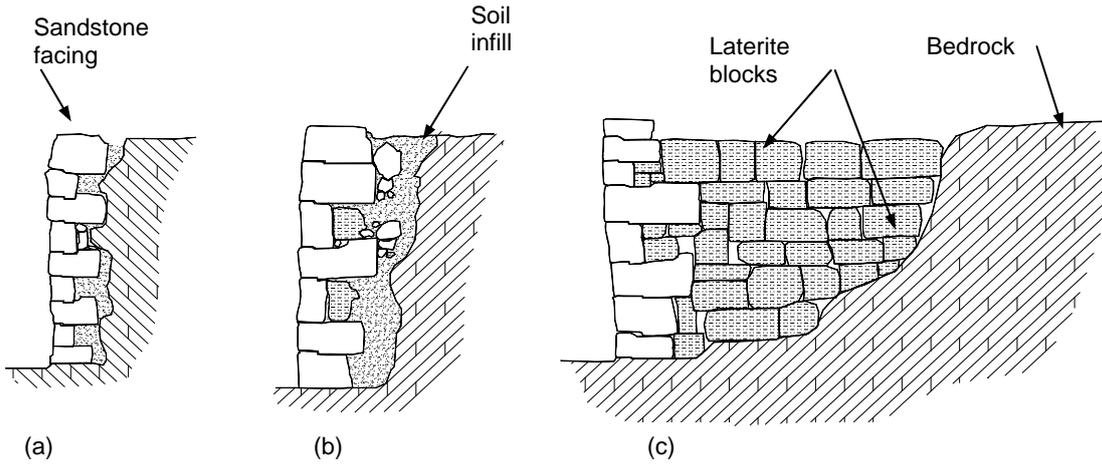
**Retaining Wall (Figure 10 (c))** – This situation occurs at all four corners of the platforms, and the space between over-excavated bedrock and the sandstone facing is infilled with laterite blocks, rubble stone, and soil. The extent of the laterite blocks is unknown, but at exposed areas, the infill extends a distance of more than 4 m along the wall alignment from each corner.



View of the south elevation of sandstone shrine C2 (southeast corner of Bakheng); note the south facade of the shrine has completely collapsed due to the collapse of the platform wall on which its footing was resting. (ME March 2005)



Detail view of keying provided in parts of the platform wall to bedrock; location 1st tier of the west platform wall. (BW Dec. 2004)



**Figure 10 Typical platform wall configurations. (a) Stone facing constructed in close contact with bedrock. (b) Platform wall with soil and rubble infill between stone and bedrock. (c) Wall section at corners, where laterite and rubble blocks were used to infill the space between the bedrock and facing. (MS 2006)**



**View of southeast corner of Bakheng where collapse of platform walls has exposed the laterite infill and bedrock, and lead to loss of fabric. (ME March 2005)**

Overall stability appears to be compromised by a number of factors, including:

- Vegetation growth prior to clearance in the early 20th century;
- Soil and debris washing in to fill the space between the facing wall and underlying bedrock;
- Hydrostatic pressure from soil saturation and water buildup behind the facing wall;
- Decay of laterite used as fill behind facing stone; and
- Localized spalling or movement of small bedrock sections.

Stabilization of platform walls is a high priority item. Due to their construction, there is no redundancy to resist lateral loads when the space behind platform walls becomes filled with soil and/or water. Further, stone shrines rest partly on the platform walls, and it appears that many of the stone shrine instability issues are caused in turn by instability of the platform walls on which they rest.

Repairs to platform walls will likely include rebuilding at some locations, and possibly anchorage into the underlying bedrock. Simple shoring can be installed now to prevent short-term movement at critical areas while more involved repairs are implemented. All platform wall repairs should include a moisture management component, to either direct water away from (or over) walls or to transport collected water out of the wall system.

**threats and site condition**

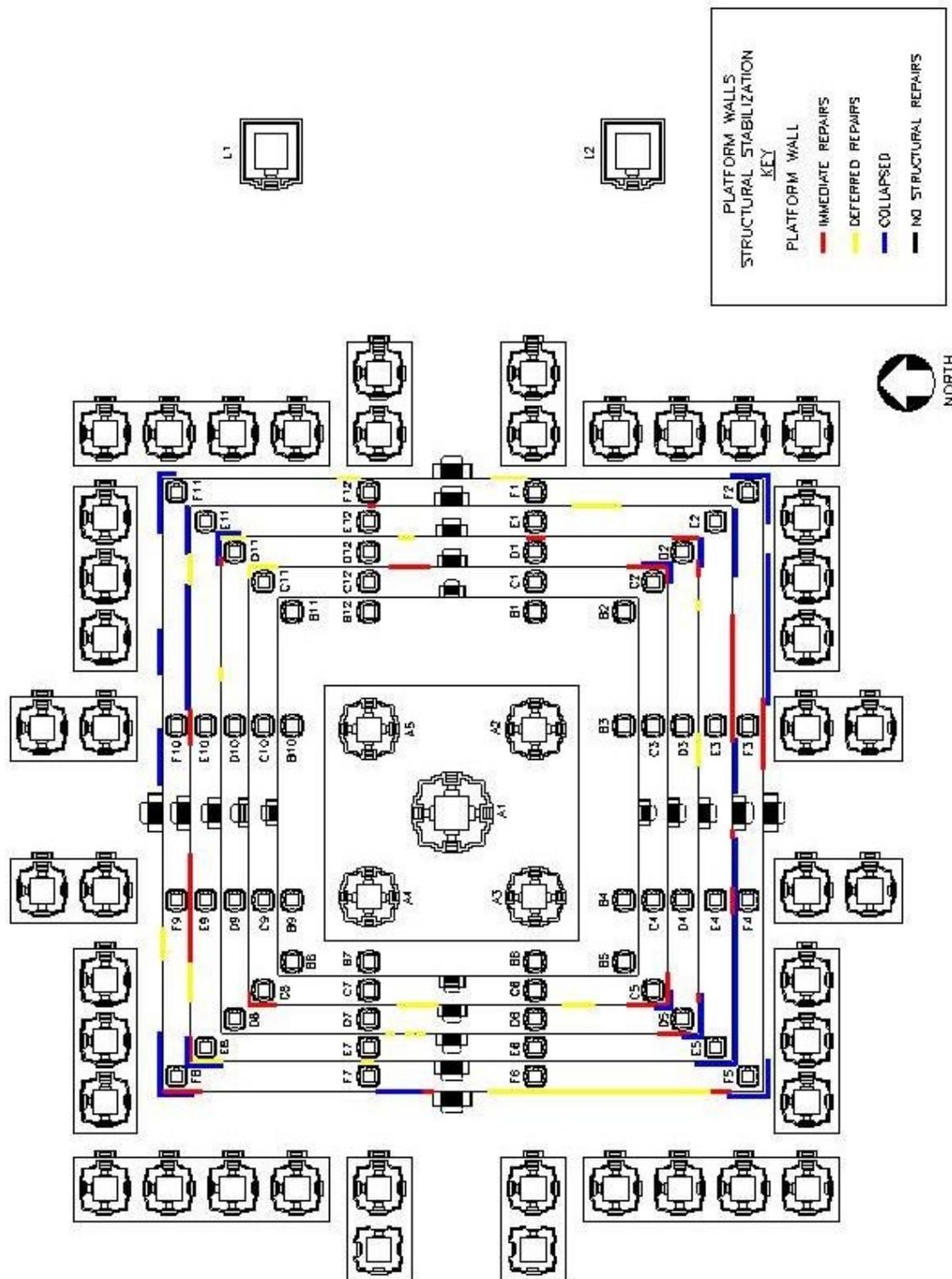


Figure 11 Structural Risk Map – Platform Walls (MS 2006)



View of brick shrines along the western side of the temple. The shrine in the foreground, G25 has collapsed and the fabric has been obliterated or removed, in the mid-ground the shrine, G23 has been assessed as needing deferred repairs, while the shrine in the background, G21 requires immediate repairs. (ME March 2005)



Detail view of brick shrine G23, identified as requiring deferred repairs. (ME March 2005)



View of brick shrine G15; note the tree which has become entangled with the brick shrine. Analysis will be required to determine whether the tree should be removed on structural ground or remain on the basis that it contributes to the sites significance. (MS March 2005)

**9.8.3 Brick Shrines:** a total of 44 brick shrines are constructed around the lowermost platform wall of Bakheng. Brick shrines were evaluated for structural risk during the Mission II, March 2005. Observations were made on site to evaluate the level of structural damage for each structure, including measurements of wall plumb, crack mapping, evaluation of foundations for movement, and condition of lintels and door frames. Information was input into a database for analysis.

Results of the risk mapping for the brick shrines are detailed in the *Structural Risk Map Inventory*, located in *Volume 2: Supporting Data* and illustrated in *Figure 12 Structural Risk Map – Brick Shrines*. A general “risk index” was arrived at for each structure (or structural component) based primarily on visual observations of damage. Additional risk factors related to foundation condition and measured lean are also listed for consideration. Individual repairs are prioritized based primarily on the risk index, as modified by foundation risk and related observations.

Brick shrines were built using tightly fitted clay brick. Joints are extremely thin, but it does appear that some type of organically-derived compound was used as a binder at the bed and head joints. Walls are massive, multi-wythe construction, with connection between wythes provided by variable width brick rather than header or rowlock courses. Sandstone door frames, comprised of jambs, lintels, and thresholds, were used throughout, and some of the shrines have large stone frontons above the east entry lintels. The shrines are elevated above ground level by a podium consisting of a laterite core resting on bedrock, with sandstone plinth and paving over.

Most of the observed damage appears to be related to movement at the foundation level. Foundation settlement, coupled with lateral thrust resulting from the corbelled configuration of the massive brick walls, has led to settlement and leaning of walls and door frames above. Foundation settlement is especially pronounced at many of the building corners. At many locations the laterite is severely weathered and collapsing, having a direct effect on the structure above. At other locations the perimeter sandstone blocks have been removed, resulting in erosion of the underlying soil and laterite and undermining of wall supports.

A secondary cause of damage is vegetation growth within the shrines’ foundations and walls. Nearly all major vegetation has been cleared from the shrines, but there is at least one large tree remaining that may need to be removed (reference note in *Structural Risk Map Inventory*, for shrine G15).

Repairs to many of the brick shrines are minor in nature, limited to removal or stabilization of brick and stone in danger of falling, and bracing of leaning walls and lintels. Some lintel stones will require pinning or other reinforcement to repair cracks and spalls. Several of the brick shrines require major intervention, stabilization of the laterite podium foundation, and replacement of sandstone plinth around the podium perimeter to confine deteriorated laterite.

Some prior repairs were also noted, consisting primarily of concrete props, lintels, or infill. Historically brick infill, metal straps, and rods have also been used to provide support to collapsing wall sections or tie leaning walls and door frames back to the main brick mass. The adequacy of existing repairs should be verified and it is likely that at least some of these repairs must be replaced or augmented.

### threats and site condition

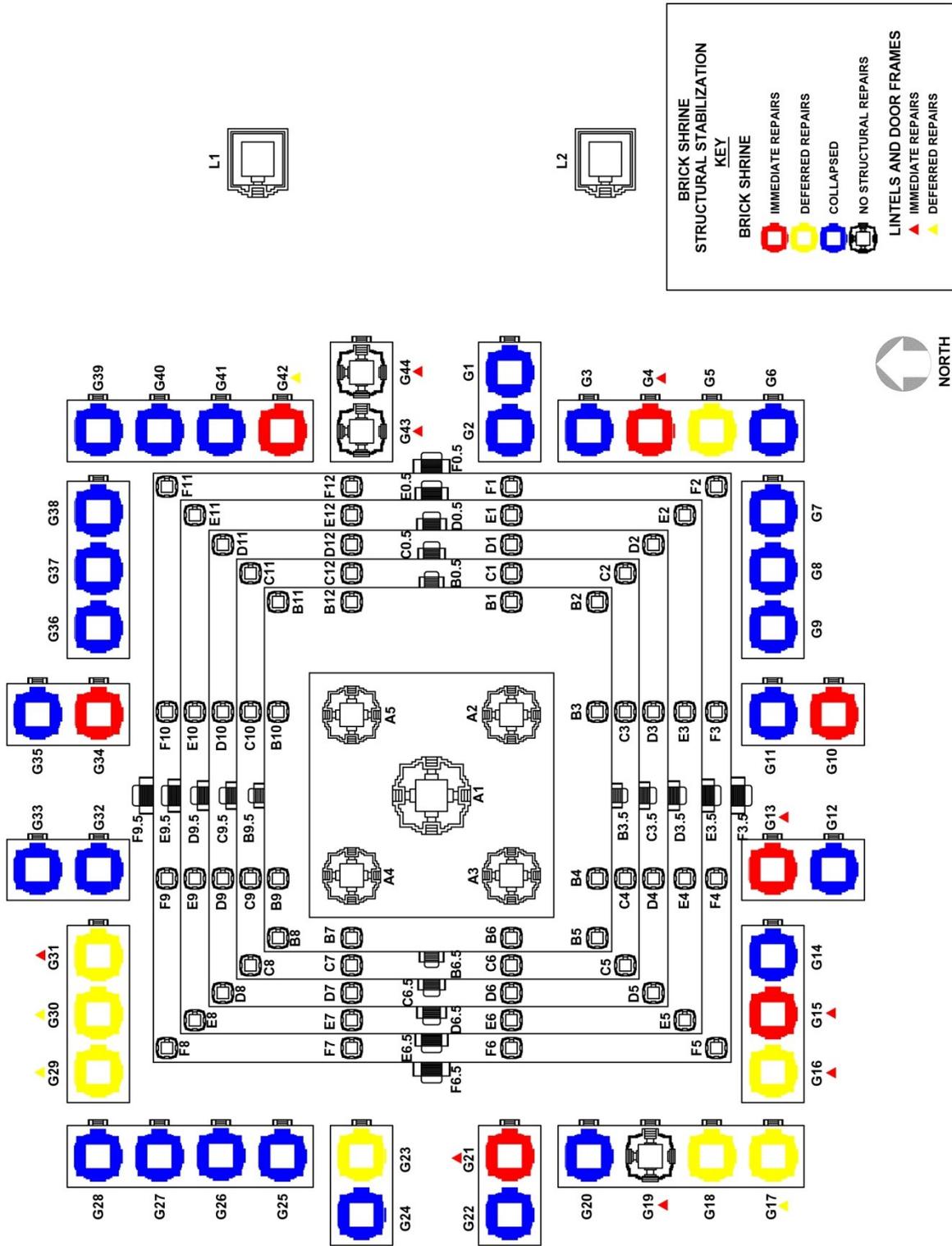
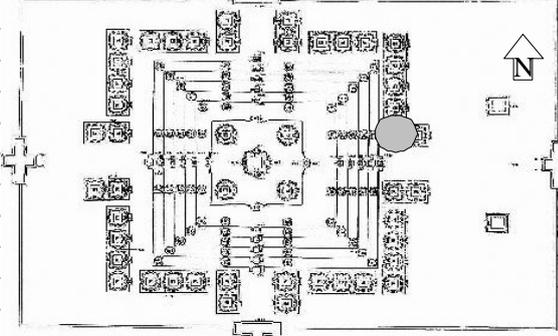


Figure 12 Structural Risk Map – Brick Shrines (MS 2006)

JOB NAME:	PHNOM BAKHENG	ASSESSMENT	3/27/05	MPS	
JOB #:	05-012	DATA ENTRY	5/13/05	MGM	
<b>BRICK SHRINE ASSESSMENT</b>					
LOCATION:	<b>G43</b>				
	<b>PHOTO REFERENCE</b> 181-8120 NE 181-8121 DET W 181-8122 SW 181-8123 S				
	 <p style="text-align: center;">NORTHEAST EL.</p>				
<b>STRUCTURAL/FND DAMAGE (% DAMAGED)</b>					
	WALLS	FRAMES	FND		
INSIGNIFICANT	10	35	70		
MODERATE	10	10	0		
SEVERE	20	40	25		
COLLAPSED	40	15	5		
Damage Index	0.25	0.45	0.30		
<b>LEANING/PLUMB (DEG. OUT OF PLANE)</b>					
ELEVATION	N	S	E	W	DEG.
	3	6	2	4	
<b>EXTERNAL INFLUENCE (X=YES)</b>					
	VEGETATION	X			
	ADJACENT COLLAPSE	-			
	UNDERMINING AT BASE	X			
<b>CRACKS</b>					
<b>REPAIR/STABILIZATION NOTES</b>					
Walls: severe leaning					
Door frames critical: severe leaning					
Foundation damage, some repairs needed					
 <p style="text-align: center;">VEGETATION AT WEST EL.</p>					
 <p style="text-align: center;">SOUTHWEST EL.</p>					

Sample Sheet 2 Brick Shrine G43.

A completed survey of all the brick shrines is located in *Volume 2: Supporting Data*

*threats and site condition*

**9.8.4 Sandstone Libraries:** the two stone libraries stand within the laterite wall enclosure on the east side of the temple. The structures were evaluated on site to approximate the level of structural damage for each structure, including measurements of wall plumb, crack mapping, condition of the lintels and door frames, and laser level measurements at the base stone course. Information from the site survey, including photographic documentation, was input into a database for analysis.

Results of the risk mapping for the stone Libraries are detailed in the *Structural Risk Map Inventory*, located in *Volume 2: Supporting Data*. Individual repairs are listed and prioritized based on the site evaluation and associated measurements.

There are two main deficiencies at the libraries. Of particular concern is the current condition of stone lintels and door frames at the east and west entries. Lintels at both libraries are cracked, heavily deteriorated, or missing, and there is a potential public risk hazard should the lintels fail completely. The corbelled stone arches over these openings are also in critical condition, as movement of adjacent walls has led to uneven loading of corbel stones, cracks, and in one case significant displacement of the corbel. Rubble infill at the south library provides some support to the failing lintels and corbels but the quality of this infill is poor.

A second issue is that the walls of both libraries are “spreading” laterally, leading to stress concentrations at the building corners and displacement of stones in the wall and roof above. Base course stones near the corners show large displacement, cracking, and spalling due to the concentrated loads. Corners at each library require propping to re-distribute loads and prevent further movement and damage. Consideration should be given to rebuilding critically damaged corners as listed below. The north library shows greater wall movement than the south library.

Measurements were taken with a laser level to quantify the magnitude of foundation settlement as well as out-of-plane bulging at the base of the north and south walls. At both libraries, the corners are displaced outwards relative to mid-length of the wall, by 4 cm at the south library and up to 7 cm at the north library. Foundation level measurements show that the northeast corner of the north library has settled 7 cm relative to the foundation high point. The foundation at the south library has less than 2 cm differential settlement around the base.



**View of the north library H6 prior to the emergency stabilization works; note the severe damage to the east end where the wall is ‘spreading’. Further assessment is required to determine the optimum conservation measures to be undertaken. (MS March 2005)**



**View of the south library H2 east elevation prior to the emergency stabilization works; note the lintel has collapsed and is supported by stone rubble and block fill. Further assessment is required to determine the optimum conservation measures. (KK Dec. 2004)**



View of sandstone steps on the east cardinal axis. Repairs identified at C0.5 include: south buttress stone pushed out 6 - 10 cm at top 2 courses, which requires resetting. (ME May 2005)



Sandstone step structure F6.5 is founded partially on bedrock and soil fill. Due to movement of the soil fill and collapse of adjacent walls severe movement has occurred. It is recommended that the north buttress be reset and at the same time repair the two steps with deep spalls. (MS March 2005)

**9.8.5 Bakheng's Sandstone Steps:** a series of stone steps on each cardinal axis provide access to the platform levels. A total of 20 stone step structures are built integral with the platform walls at mid-point along the east and west sides of the temple and offset towards the west on the south and north sides. Each stone step structure rises to the next platform level with between 7 and 11 steps, flanked with integral buttresses projecting out from the platform walls.

The structures were evaluated on site to approximate the level of structural damage for each structure, including measurements of wall plumb, crack mapping, condition of the steps themselves, and water runoff in the immediate vicinity. Information from the site survey, including photographic documentation, was input into a database for analysis.

Results of the risk mapping for the stone steps are detailed in the *Structural Risk Map Inventory*, located in *Volume 2: Supporting Data* and illustrated in Figure 13 Structural Risk Map – Stone Steps. A general “risk index” was arrived at for each stone step structure based primarily on visual observations of damage. Individual repairs as listed in *Structural Risk Map Inventory* were prioritized based on the risk index, modified by observations of step damage. Safety of pedestrians climbing the steep steps prompt an increased level of repair for the steps themselves to mitigate potential tripping or falling hazards.

Almost all of the stone step structures are in stable structural condition, with no significant hazard from falling stones or potential instability. Repairs are mostly limited to resetting occasional displaced stones, typically in the top 2 to 3 courses. The exception is the lowermost step structure at the west elevation, which is founded partially on bedrock and partially on soil fill. Movement of the soil fill and collapse of adjacent walls has resulted in severe movement of the step structure, necessitating prompt action. Many of the other step structures have wide cracks and bulging or leaning buttresses. This damage appears to be a result of prior vegetation growth within the buttresses and is not considered to be an indication of any imminent hazard.

Some of the individual stone steps are spalled, broken, or displaced and represent a hazard to persons using the steps to access the platform levels. Repairs to these individual steps are a priority to provide safe access to the site. Not shown on the accompanying risk map is the fact that almost all of the steps at the east elevation are rounded and eroded due to heavy foot traffic. The current condition of these steps also presents an access hazard.

Water collects at almost all of the step locations and at many areas water drains directly into either the steps themselves or the flanking buttresses. Depressions where water collects ranging from 6 to 12 cm deep were noted. Addressing drainage issues at the steps is a high priority item.

### threats and site condition

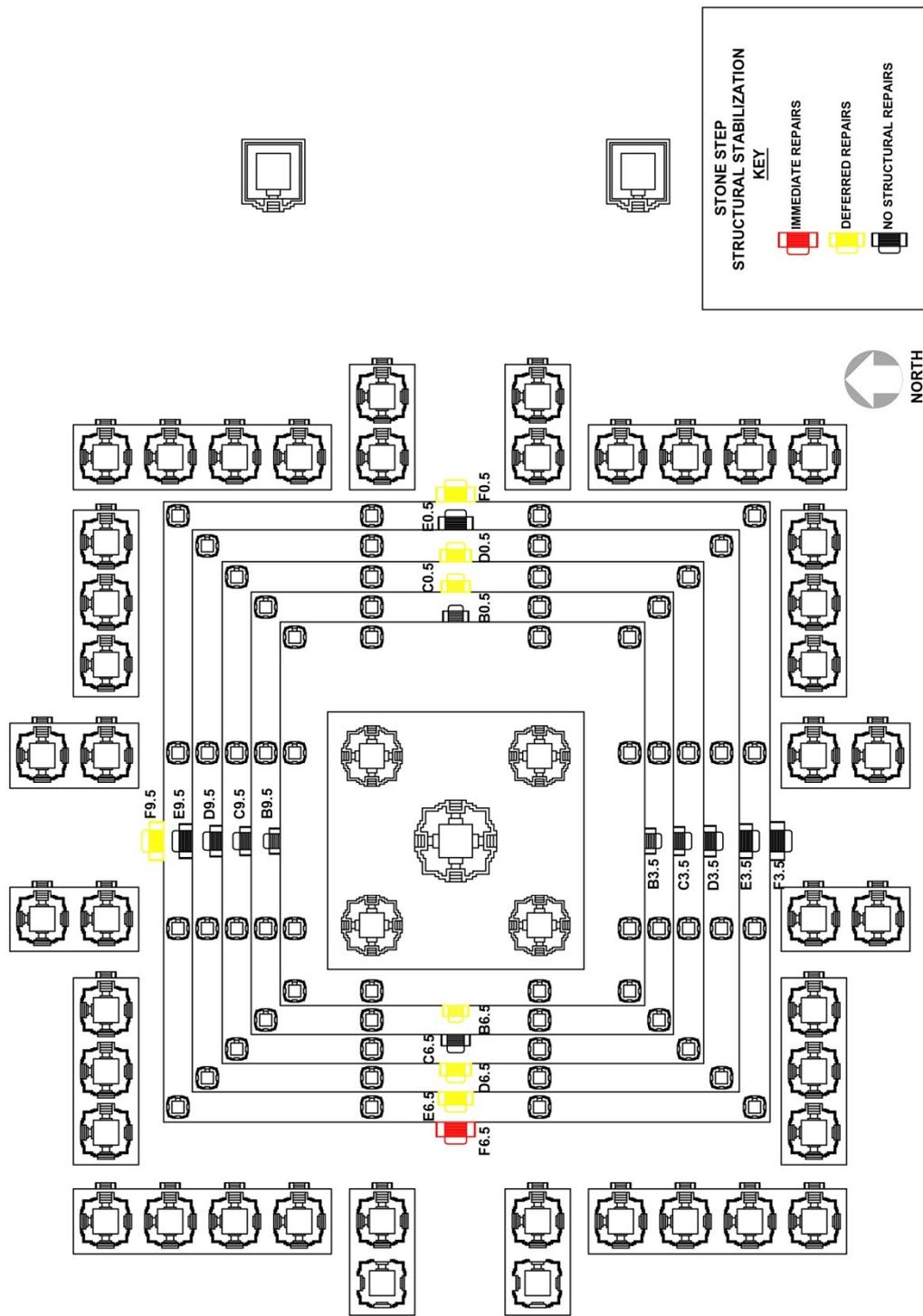


Figure 13 Structural Risk Map – Stone Steps (MS 2006)



View of the quincunx platform; note part of the southwest prasat A3 remains in situ (left-hand far ground) while little of the original stone remains in situ for A2 and A4, parts of prasat A5 remain. (ME March 2006)

**9.8.6 Towers of the Quincunx:** the four minor towers are essentially collapsed with little of the original stone remaining in situ or on the platform itself.

**9.8.7 Central Tower:** lacks a superstructure although a significant portion of the central tower remains but has suffered significant damage. Repairs to the main tower are listed below in *Table 2 Central Temple Tower: listing of prioritized repairs*.

Exfoliation of the decorative and figural relief, including the irregular peeling, scaling, or flaking off of the stone surface, resulting in unevenly layered loss has occurred.

Location	Repair No.	Notes	Repair Type
Entry lintels, all elevations	1	All lintels are in critical condition. Lintels are either: entirely collapsed, propped with a stack of stones, or propped with a concrete beam. Stabilization is required to provide full support to the stone above.	Immediate
Corbels over entries, all elevations	2	Large portions of some corbels are collapsed; others are cracked. Support of stones above is questionable.	Immediate
Tower walls	3	Some displacement, cracks, and isolated mortar repairs exist.	No repairs

Table 2 Central Temple Tower: listing of prioritized repairs



Detail of a stylized plant relief on the south door lintel of the Central Tower; note the rude cementitious repairs that detract from the aesthetic value evident in the exquisite execution of the plant relief. (ME Dec. 2005)

**9.9 Materials Conservation**

An initial needs assessment of the architectural materials at Phnom Bakheng Areas 1a and 1b was conducted on December 8, 9 & 10, 2004. This preliminary conditions survey (see *Volume 2: Supporting Data*) of this site revealed numerous and widespread materials deterioration conditions affecting the sandstone, laterite, brick and stucco. Among these conditions are deep surface losses resulting from delamination and exfoliation, cracked and broken stones, fallen stones, displacement and missing units. Of particular concern are the many locations where clean, crisp areas of loss indicate recent damage, suggesting deterioration is currently active, ongoing and possibly accelerated.

The majority of these conditions are secondary priority conditions – if not treated, they will worsen and lead to further decay and loss of the historic building materials, but they are not emergency conditions and do not necessitate treatment within one year.

The initial review of the site has led to the identification of three primary materials conservation concerns:

**9.9.1 Central Tower of the Quincunx:** the central stone tower of the quincunx is in a state of active decay. Many of the decorative and figural reliefs have been lost, and those remaining appear in imminent danger. The devatas have suffered severe exfoliation and loss. The faces remain on only two of the original eight devatas. Other decorative carving on the temple is also in danger of extensive loss and numerous large cracks and breaks exist on both the interior and exterior of the temple. Because the central tower of the quincunx is the focal point of the temple, and the only structure on the site with figural and extensive decorative reliefs, conservation of the temple should begin as soon as possible, starting with a detailed conditions survey.



The Central Tower, the most significant element of the temple complex has suffered severe exfoliation and loss. Dec. 2004 (ME)

**threats and site condition**

**9.9.2 Brick Shrines:** the majority of the brick shrines which stand on podiums in Area 2 are in a state of ruin. The walls have collapsed, and much of the historic material is missing or crumbled to dust. However, there are three brick shrines still partially standing which might be saved. Two have significant remnants of pigmented stucco on their interiors. Due to the scarcity of intact brick structures with interior stucco on the site, at least one of these shrines should be conserved as soon as possible to preserve a record of their specific historic architecture.

**9.9.3 Dispersed Artifacts:** hundreds of fallen stones are dispersed over the *phnom*. It appears some are resting near the original location they fell from; however the position of others may be completely unrelated to their original structures. Many of these stones still show intricate decorative carving, and some show figural carvings. Several of the stone tower cap stones are lying on the ground. These stones are in danger of accelerated deterioration and potential looting due to their scattered locations. The first step in addressing this issue is to conduct a comprehensive survey of the fallen stones documenting the type, condition, location, and defects of each stone.

### 9.10 Existing Conservation Measures

Early conservation efforts are evident throughout the Bakheng temple-complex.

Previous repairs may or may not be aesthetically and physically compatible with the historic building materials. Physically incompatible repairs may be causing accelerated decay of the historic materials.

Isolated mortar repairs to the Central Tower are beginning to fail; in parts these rude cementitious repairs detract from the aesthetic value evident in the exquisite execution of the plant relief.

### 9.11 Interpretation and Tourism

The visitor experience at Phnom Bakheng encompasses tourism, visitor management, and interpretation of the site. While these three areas can be approached as discrete fields of inquiry, *managed together they can transform the visitor experience and work to conserve the physical and intangible heritage of the site.* Elevated tourism numbers combined with ineffective operational management and a lack of interpretation are main factors that have led to the current critical conditions and poor visitor experience at Phnom Bakheng.

The ICC has described Phnom Bakheng as the “most threatened temple in Angkor.” As Angkor continues to draw a new influx of tourists each year, an integrated plan for the visitor experience at Phnom Bakheng is necessary to ensure a “managed visit” where visitors are accommodated and educated about the history of Phnom Bakheng and the ongoing conservation methods developed to protect and maintain the site. Strategic promotion of the site and involvement of local communities in decision-making will continue to draw the interest of the travel industry and provide tourism revenues to enhance the local economy.

An analysis of the current visitor experience at Phnom Bakheng identifies the following significant challenges:



View of the south elevation of brick shrine G34. The majority of the brick shrines are in a state of ruin whereas G34 is relatively intact, proving a rare physical record of the external brick detailing. March 2005 (MS)



Detail view of the north elevation of the Central Sanctuary where past conservation efforts included inserting a concrete lintel. March 2005 (MS)



View of tourists approaching the east *phnom* stairs to ascend for sunset viewing and elephants returning to the elephant station from the top of the *phnom* to transport further paying customers via the south trail to the mountain top. (JHS Dec. 2005)

It is proposed to relocate the elephant station to eliminate possible visitor safety issue and to protect the historically significant Approach Platform.

### *threats and site condition*



In their desire for the best vantage-point for sunset viewing tourists ignore the 'No Climbing on Tower' signage on the Platform of the Quincunx. (KK Dec. 2004)

The *Interpretation and Tourism Plan* will seek to increase visitors' appreciation and stewardship of this important site.



Local vendor stores are not managed by the local communities around Phnom Bakheng; these communities are forced to travel elsewhere to find work. (KK Dec. 2004)

**9.11.1 Sunset hour phenomenon:** tourism pressure at Phnom Bakheng is strikingly higher during the sunset hour. A visit to Phnom Bakheng is described by guidebooks and travel brochures as the ideal way to end a trip to Angkor because of its prime hilltop location for watching the sunset,<sup>17</sup> over 80% of tourists who visit the site have sunset viewing as a goal. Crowd-management problems at this temple stem not from its size—the site is not especially small—but rather from this very unequal hourly distribution.<sup>18</sup>

**9.11.2 Impact of high visitation on the physical site:** human impact on the site results from crowding, direct physical contact, incidental damage and more rarely, by casual vandalism or theft. Unprotected archaeological areas are vulnerable to irreversible destruction. Other structural degradation includes the temple monument and also the hilltop plateau, causeways, and eastern entrance area.

**9.11.3 Visitor safety:** areas of the site identified as dangerous for visitors include, the east stairs,<sup>19</sup> displaced stones on the temple plateau, the elephant path and stairs to the summit. Crowding and monsoon rains add additional levels of hazard.

**9.11.4 Pre-set tour routes:** many tour routes are pre-set by tour guides and tour companies and have locked schedules for transportation, timed site visits, dinners and shopping hours. Phnom Bakheng is slotted into these agendas for the sunset hour.

**9.11.5 Lack of communication between site managers and the tourism industry:** representatives from the tourism industry and park planners do not have an established format for communication. As a result, there is little understanding of the driving forces behind fixed tour itineraries and the interests of tour guides and operators and their visiting clients. Opportunities are missed to cooperatively address shared concerns including crowding and site degradation.

**9.11.6 Park entry is free after 5 PM:** the free hour offered after 5 PM at Angkor Park contributes to the throng of tourists at the summit of Phnom Bakheng. Tourists have just enough time to rush to the Phnom Bakheng for sunset viewing.

**9.11.7 No interpretation:** a lack of understanding of the site and its history contributes to the visitor behavior observed at the site, including climbing on the sacred areas, rushing up and down the east stair, and an interest in the view to Angkor Wat over other site offerings.

**9.11.8 Tourism management:** a lack of organizational resources including human resources results in unmanaged tourism and inadequate facilities to accommodate high numbers of people. There is no existing framework for profit-making ventures physically present at the site to be required to contribute to the needs of the site.

**9.11.9 Economic benefits from tourism are not realized on the local level:** communities surrounding Phnom Bakheng do not benefit directly from tourism at Phnom Bakheng. Most people from these communities have to go elsewhere to work because they don't speak English and selling at the Phnom Bakheng markets requires locals to sell goods to an intermediary. Locals do not realize full revenue unless they sell their items further away.

### threats and site condition

## CULTURAL SIGNIFICANCE

### 10.0 INTRODUCTION

Cultural significance is a concept which helps in estimating the value of places. Cultural significance means aesthetic, historic, scientific, social or spiritual value for past, present or future generations. Having regard to the criteria set out in the *Operational Guidelines for the Implementation of the World Heritage Convention* and the subsequent listing of Angkor, and the current study process, this section provides an overview of the intrinsic cultural values associated with Phnom Bakheng.

### 11.0 KHMER ART AND ARCHITECTURE

While the first roots of the Khmer plastic arts lie in India, the Angkor dynasty transformed Indian cosmology and developed its own Khmer cosmology; even a cursory glimpse will dispel any notion that it remained a derivative art. The Khmer shaped and changed it until it expressed a masculine essence and a foursquare strength, which is quite unlike later Indian art.<sup>20</sup>

Hindu cosmology gave rise to Khmer architecture, Mount Meru is a sacred mountain in Hindu and Buddhist mythology considered to be the center of the universe. It is believed to be the abode of Brahma and other deities of both religions. Phnom Bakheng and Angkor Wat were built as a symbolic representation of Mount Meru.

Although Khmer architecture was influenced by its Hindu counterpart, the Khmer architect elaborated upon Hindu structures and designs in a wholly original way. The temple compiled with the symbolic criteria dictated by the Brahmans, the centralizing presence of the sovereign and his claim to deification more or less consciously required architectural procedures and ritual use of the shrine which differed from their Indian counterpart.<sup>21</sup>

Khmer architecture developed in a series of stages under the Khmer empire: the approximate date of a structure can be determined from the elements and styles used. Hardly any secular architecture remains from this time, as only religious buildings were made of stone or brick.

#### 11.1 Architecture

Perhaps the strongest and most pervasive Indian influence on the architecture of Angkor was not structural but symbolic: the mythology of Mount Meru derived from Indian cosmology. In architecture, this myth has been expressed either through natural phenomena, the construction of temples on top of *phnom*, such as Phnom Bakheng, or manmade structures, such as the temples of Angkor Wat and Baphoun, where the mount is created from the material that has been excavated to form the moats and canals. In many cases the *sikhara* (Central Tower) on the highest level form a quincunx that represent the five peaks of Meru. These towers stand atop descending platforms that symbolize the continents encircling Meru, and the entire complex is surrounded by a moat that signifies the ocean.<sup>22</sup>

These ideas in Hindu cosmology, epistemology and art theory influenced Khmer architecture. Like the Egyptians, Greeks and Indians, Khmer architects wished to build temples that would suit their divinities' expectations, and continued to search for rules that would help them generate what they believed were divinely determined forms. They found these rules in geometry, proportion and cosmology. Over time the temple



Part view of the Pancha Rathas, which form part of The Group of Monuments at Mahabalipuram, World Heritage site, India. It has various historic monuments built largely between the 7th and the 9th century.



Brihadeeswarar temple, 10th century, which forms part of the Great Living Chola Temples, World Heritage site, India.



The Khmer adopted the concept of repetition of form from the micro level to the macro level as seen in Hindu architecture culminating in the exquisite execution of the quincunx at Angkor Vat in the 13th century. (June 2005)



Detail of interwoven plant decoration on one of the south pilaster of the Central Tower. (ME March 2006)

mountain emerged with the Central Tower of the quincunx representing the center of their world – Mount Meru.

Egyptians, Indians and Khmer employed planning principles and proportions that rooted the buildings to the cosmos, considering the movements of sun, stars, and other heavenly bodies.

In recent times, the concept of fractals has been used to analyze many historical or interesting buildings and demonstrate that such buildings have universal appeal and are visually satisfying because they are able to provide the viewer with a sense of scale at different levels/distances of viewing. Fractals have been used to study Hindu temples where the part and the whole have the same character<sup>23</sup>. Similarities can be identified in Khmer architecture.

This repetition of form is not only evident in the temple proper but in the spatial urban planning from the micro level to the macro level.

Architectural form is defined by the relationship of the parts to each other and the Khmer understood how to exaggerate the form of their temples to give the impression of greater height through reducing scale of repetitive built elements as seen in the tiered platforms, stairs and quincunx towers at Phnom Bakheng and Angkor Wat.

Khmer cosmologies geometry might be considered a reflection of the divine, now geometry is considered the underlying structure of the modern physical world.

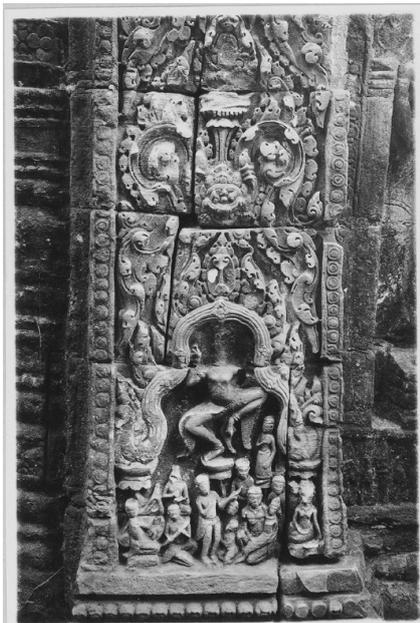
## 11.2 Art

Art played an important part in this cosmological system, and reveals early ideas about the source of artistic ideas. Paintings, reliefs and sculptures were employed variously to capture the spirit of and represent gods, to portray myths so they could be understood by an illiterate population. Their art was conceptual rather than naturalistic. The artists focused not so much on the sensory world but on the world of the gods and spirits. Although artists clearly wished to portray real objects in the natural world like animals, plants and men, they largely ignored the phenomenal appearance of individual objects, and expressed instead the abstract, generic characteristics common to all objects of that type.

Although the individual creates the art, there is no sense of individuality: artistic form derives neither entirely from the outside world nor entirely from within creative internal resources.

**11.2.1 Central Tower Relief Details:** the central tower and towers of the quincunx exhibit the most important and exquisitely executed reliefs and sculpture at Phnom Bakheng.

The decoration of the octagonal pillars is simple and stylized; the architraves are more modest than the earlier ones at Hariharalaya. The interwoven plant decoration on the pilasters and niches containing the devatas at the sides of the doors is exquisitely executed. The artists obtained a clearer, more elegant relief effect by carving and engraving the sandstone directly rather than stucco as seen on earlier shrines.



Detail view of the base of a pilaster on the east elevation of the Central Tower. (EFO 1923)

### 11.3 Bakheng Style

The Bakheng style is a clear case of sudden mutation, it developed under the reign of Yasovarman (889-910) and continued until about 925 before the emergence of the Koh Ker style which favored gigantism, movement, and more natural, sensitive modeling.

Phnom Bakheng marked the beginning of a particularly refined style in which Khmer sculptors were to excel. Khmer court styles were highly conservative, particularly in the three-dimensional sculpture of the Angkor period, from the ninth to the thirteenth century. Most were hieratic, iconic, motionless, with both feet uniformly planted on their pedestal. Only the different hand positions broke up the strict symmetry of the images, and surface decoration was minimal.<sup>24</sup>

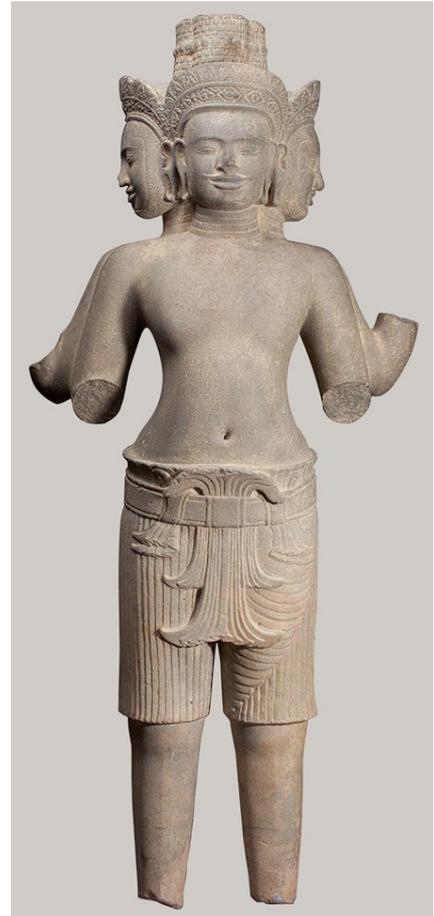
The painstakingly executed imagery in the Bakheng style seems to echo the work in precious metals that abounded in the sanctuaries. Male and female costume took on a new appearance, consisting of a piece of fabric entirely pleated and secured in place by a belt, which, for female divinities in particular is sometimes tooled and decorated with pendants.<sup>25</sup> The stylized faces, rather spiritual and indifferent in their perfection, are a juxtaposition of tranquility and haughty composition. The schematization of the beard and hair and elaborate decoration of the diadem contribute to their formal beauty. The subtle expression on these faces, peculiarly tinged with a certain intrinsic state of benevolence, is one of the crowning achievements of Khmer statuary.<sup>26</sup>

This highly refined image of a four-armed Brahma displays all the ingredients found in the art of the early tenth century. The *sampot*, in the style of the Bakheng, shows the pleated "double-anchor" or "fishtail" pendants in the front, with the outer one hanging over and lower than the inner one. The unusual silhouette of the torso ends abruptly at the very full hips, where it is encased in a garment of unexpected thickness. The transition from bare flesh to the rich linear patterning of the garment is abrupt, providing a visual jolt common to most Khmer sculpture.<sup>27</sup>

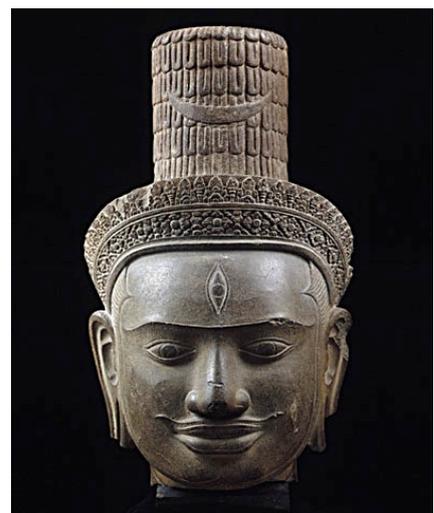
The Hindu deity Shiva is easily recognizable by the presence of a third eye on his forehead. The hairstyle that frames this somewhat unnatural face, with its simplified, clearly defined modeling, falls in a straight line from the temples down to the beard; the lips and eyes are highlighted by carved incisions, while the beard and hair are represented by light studding and fine grooves, and the eyebrows form a sharp, unbroken arch. This type of total facial stylization and marked delineation is specific to the Bakheng style from the late 9th and early 10th centuries and gives its statuary a certain coldness and geometrically hieratical appearance. Yet here, the ultimate effect is to impart the sense of Angkorian grandeur, while the faint smile, emphasized by the slim moustache, conveys an expression of benevolence. The work was destined for the central shrine tower of a Shivaite temple erected on the summit of the *phnom* Bok near Angkor.<sup>28</sup>

**"The first roots of Khmer sculpture lie in India, but even a cursory glance will dispel any notion that it remained a derivative art. The Khmer mentality shaped and changed it until it expressed a masculine substance and a foursquare strength."**

**George Montgomery**



Standing Brahma, Angkor period, ca. first quarter of 10th century; Khmer style of the Bakheng (The Metropolitan Museum of Art)  
Stone; H. 53 in. (134.62 cm)



Head of Shiva from Phnom Bok. (Musée national des Arts asiatiques-Guimet – RMN)

Angkorian period, Bakheng style late 9th-early 10th, sandstone 46cm high.



Figure 14 Artist impression of sculpture heads in the Bakheng style.

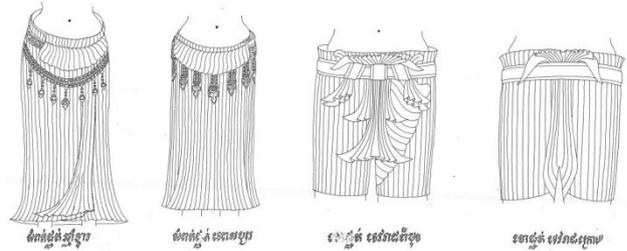


Figure 15 Artist impression of the female and male *sampot* in the Bakheng style, a garment which consisted of a piece of fabric entirely pleated and secured in place by a belt.



View of north elevation of brick shrine G43 with a sandstone blind door, the east elevation has a true door opening. (MS March 2005)



View of the east facade of the Central Sanctuary; note the colonnettes flanking the doorway. (BW Dec. 2004)

#### 11.4 Architectural Features<sup>29</sup>

The architecture of the Angkor period used certain specific structural features and styles which (along with inscriptions) are one of the main methods used to date the temples.

**11.4.1 Apsaras and devatas:** Apsaras, or celestial dancing girls, originated in Indian mythology, but their widespread decorative use was a Khmer innovation. The term is commonly used to cover not only dancers but any heavenly nymphs, although the latter are technically devatas rather than apsaras. True (dancing) apsaras are found in the Halls of Dancers and are seen in bas-reliefs flying above sacred scenes, while the largest population of devatas (around 2000) is at Angkor Wat, where they appear individually or in groups.

**11.4.2 Barays:** were reservoirs, generally created by excavation and embankment respectively. The two largest at Angkor were the Western Baray and the Eastern Baray, located on either side of Angkor Thom. Temples were built in the middle of both of these (the West and East Mebons), while Neak Pean was built at the center of Preah Khan's Jayatataka. It is not clear to what extent the significance of the reservoirs was religious, agricultural, or a combination of the two.

**11.4.3 Blind Doors and Windows:** blind doors were typically used to balance true doorways. Shrines frequently opened only towards one direction: the other three sides therefore featured blind doors to maintain symmetry. Blind windows were often used along otherwise blank walls.

**11.4.4 Central Sanctuary (or Central Tower):** was home to the temple's primary deity, that to whom the site was dedicated. The god or Buddha, as appropriate, was represented by a statue (or in the case of Shiva, sometimes by a linga). As the temple was not a place for worship by the population at large, the sanctuary needed only to be large enough to hold this statue; it was never more than a few meters across. Its importance was instead conveyed by the height of the tower above it, by its location at the center of the temple (both indicative of the sanctuary's representing Mount Meru) and by the greater amount of decoration on its walls.

### cultural significance



Figure 16 Artist concept of the architectural features at Phnom Bakheng, including from left, a colonnette, pilaster reliefs and capital and base relief details.

11.4.5 **Colonnettes:** were used as decoration on either side of doorways.

11.4.6 **Corbelling:** rather than a true arch, the Khmers used corbel arches. These were constructed by adding layers of stones to the walls on either side, with each layer projecting further towards the center. This method, while adequate, made the temples particularly prone to collapse once the buildings were no longer maintained.

11.4.7 **Enclosure:** Khmer temples were typically enclosed by a concentric series of walls, with the central sanctuary in the middle: this arrangement represented the mountain ranges surrounding Mount Meru. The enclosures are numbered from the center outwards. Galleries frequently ran along them, while passage through them was through *gopuras* at the cardinal points. At the beginning of the empires birth the enclosure was typically a low wall, absent of a gallery as at Bakheng.

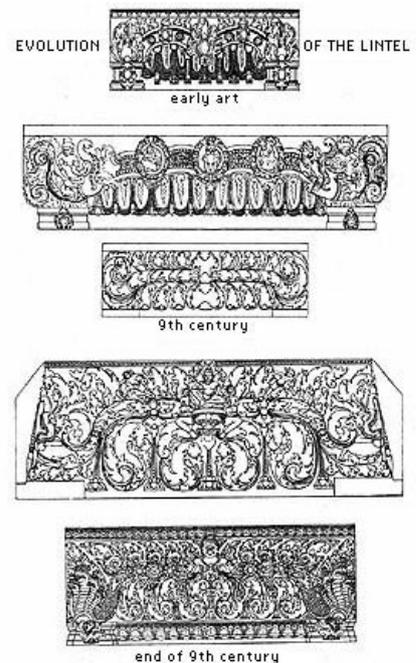
11.4.8 **Hall of Dancers:** the Hall of Dancers is a structure found at Ta Prohm, Preah Khan, Banteay Kdei and Banteay Chhmar. In each case it is a rectangular building elongated along the temple's east axis; and divided into four courtyards by galleries. The roofs were made of perishable materials and have disappeared. The pillars of the galleries are decorated with dancing apsaras, hence the presumption that the buildings were used for dancing.

11.4.9 **Library:** the library is one of the most common features of Khmer temple architecture, but it is still not certain what they were used for. Most likely they were shrines rather than actual libraries. Free-standing buildings, they were normally placed in pairs on either side of the entrance to an enclosure, opening to the west. These buildings are called "libraries" because they were formerly thought to contain copies of the scriptures. They might have been storerooms or treasuries, containing temple paraphernalia, or possibly shrines containing the sacred fire.

11.4.10 **Lintels and pediments:** because of their position at the point of entrance to the temple, lintels (horizontal blocks at the top of doorways) and pediments (triangular panels above the lintels) had particular significance in Khmer temple architecture. The decoration of lintels passed through a series of styles which provide a useful guide for the dating of temples: protective kalas, nagas and makaras were common motifs.



View from the top of Bakheng towards the southwest; note the laterite wall enclosure in the mid-ground, and the mature trees on the outside of the wall enclosure. (ME March 2005)



Evolution of the 9th century lintel. (M Glaize)

Also frequently appearing were the gods associated with the direction in which the particular lintel faced.

**11.4.11 Quincunx:** the identification of the central sanctuary with Mount Meru was often emphasized by the inclusion of four towers surrounding the central prang in the form of a quincunx (Mount Meru having five peaks in this arrangement). The rectangular plan of the typical Khmer temple easily lent itself to this design. The quincunx also appears elsewhere in designs of the Angkor period, as in the riverbed carvings of Kbal Spean.



View of the southeast corner of Phnom Bakheng a temple mountain form which represents Mount Meru. (KK Dec. 2004)

**11.4.12 Temple Mountains:** took the form of representations of Mount Meru, home of the gods in Hindu mythology. The temples were built in a series of tiers, each shorter than the last to create an illusion of greater height. To further provide correct, although somewhat exaggerated optical perception, the height and width of the stairs at Bakheng became imperceptibly smaller towards the top as the architect applied the laws of proportional reduction. Each terrace of the pyramid is slightly recessed to the west, again to correct perspective.

### **11.5 Construction Materials<sup>30</sup>**

Sandstone, laterite and clay brick are the main construction materials used in the monuments at Angkor. Brick is used for only relatively old monuments constructed during the 9th to 10th century. The perimeter shrines are mainly constructed of clay brick.

**11.5.1 Sandstone:** is the dominant construction material used in the monuments from the late 9th century. At Angkor, three types of sandstones are evident, gray to yellowish brown sandstone, red sandstone and greenish greywacke. In the construction of Bakheng, gray to yellowish brown sandstone is used.

**11.5.2 Laterite:** is one of the main construction materials in the monuments at Angkor. At Phnom Bakheng laterite is used as a foundation stone, in part, throughout the temple structure. This laterite is exposed due to the displacement of the finishing sandstone.

The enclosure wall of the temple complex is completely constructed in laterite.

Laterite can be roughly classified into porous laterite and pisolitic laterite. Laterite used at Phnom Bakheng is porous laterite of low quality.

## 12.0 TRANSFORMATION OF THE CULTURAL LANDSCAPE – DOCUMENTARY EVIDENCE

### 12.1 Organically Evolved Landscape

The great Khmer city of Angkor has breathtaking artistic, design and planning values – it is justly described in World Heritage terms as *a unique artistic realization, a chef d'oeuvre of the human mind*. The lack of development in Angkor from the 15th century has resulted in the survival of a unique collection of 9th to 14th century religious monuments.

This group is unique in its dimensions and its originality and it is important to note that the value derives not only from the aesthetic value but also from the achievements in civil engineering, especially hydraulic.

The originality of the hydraulic system of Angkor is incontestable and is an integral part of the religious landscape. The remarkable arrangement of space marked out by the canals fed by the *barays*, would alone merit consideration for listing as a cultural landscape on the World Heritage List.

This archaeological landscape in which its main human evolutionary processes came to an end with the demise of the Khmer Empire in the 14th century exhibit significant and monumental features.

The following historical outline draws together the trends of all previous studies and documentation of Phnom Bakheng 'the first Angkor city' consecrated in 907 AD and provides a brief chronological overview of historical development of the place.

### 12.2 Re-discovery of Angkor

Henri Mouhot is often credited with 'discovering' Angkor in 1860, although the location and existence of the entire series of Angkor sites was always known to the Khmers and had been visited by several westerners since the 16<sup>th</sup> century.<sup>31</sup>

The Khmers seemed to have abandoned in part the immense site of the former capitals; only the temple of Angkor Wat, flanked by its two pagodas, remained really alive. On Phnom Bakheng's plateau, there was only one Vietnamese pagoda, of which monks became the guardians of the *Buddhapada*, dug on the plateau, in the middle of the ceremonial route.

Mouhot popularized Angkor among the western public. Perhaps none of the previous European visitors wrote as evocatively as Mouhot, who included interesting and detailed sketches. In his posthumously published "Travels in Siam, Cambodia and Laos" Mouhot compared Angkor to the pyramids, for it was popular in the west at that time to ascribe the origin of all civilization to the Middle East. For example – he described the Buddha heads at the gateways to Angkor Thom as "four immense heads in the Egyptian style," and wrote of Angkor.

"One of these temples—a rival to that of Solomon, and erected by some ancient Michael Angelo—might take an honourable place beside our most beautiful buildings. It is grander than anything left to us by Greece or Rome, and presents a sad contrast to the state of barbarism in which the nation is now plunged."<sup>32</sup>

Another Frenchman, Francis Garnier in 1866 noted on arriving at Bakheng

"At the center of the superior terrace is a base of about 1 meter high, having 30 meters in the north and south direction, 31.5 meters east and west. It was on this base that the towers that overlook the surrounding land were elevated. Their examination enables one to

"One of these temples—a rival to that of Solomon, and erected by some ancient Michael Angelo – might take an honourable place beside our most beautiful buildings. It is grander than anything left to us by Greece or Rome, and presents a sad contrast to the state of barbarism in which the nation is now plunged."

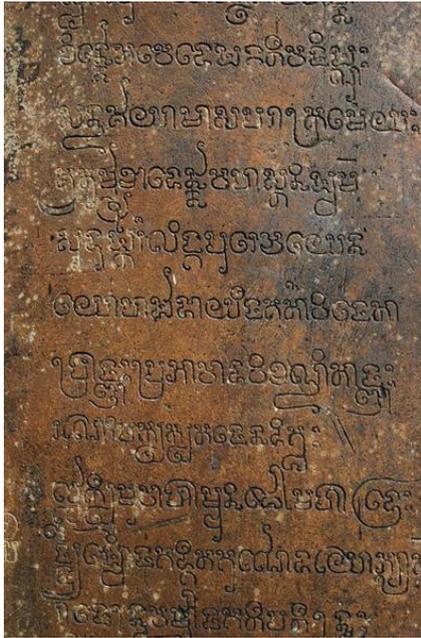
Henri Mouhot 1860



Historical view of Angkor Wat, 1860s. (Delaporte)



A drawing of Henri Mouhot done by H. Rousseau from a photograph.



During the reign of Yashovarman inscriptions were often digraphic, i.e. written in two alphabets of Indian origin, Pallava (southern) and Nagari (northern), as demonstrated by the entrance piers of Baksei Chamkrong temple. Detailed here part of the Pallava inscription. (Dec. 2005)

"The Khmers thought of the earth as a great quadrangle circled by a necklace of mountains, beyond which stretched the unknown oceans. Their gods resided on a sacred mountain called Meru, and the highest temple in any city was meant to represent Meru, while the city itself, surrounded by its walls and moats, stood for the earth, its mountains and its oceans.

Time,' Land of Eternal Smile'

"It is a testimony to the love of symmetry and balance which evolved its style...in pure simplicity of rectangles its beauty is achieved. It is a pyramid mounting in terraces, five of them...Below Bak-Keng lies all the world of mystery, the world of the Khmer, more mysterious than ever under its cover of impenetrable verdure."

H Churchill Candee, Angkor: The Mystery of the Deserted Khmer Cities and their Vanished Splendour, p 72.

recognize that there were three towers, facing east, and that the middle one must have been the most considerable. From the summit of these ruins, the view is ravishing: at the feet of the spectator stretches the moving dome of the forest, whose waves and indefinable murmurs come up to him."

12.3 Inscriptions

Inscriptions sculpted on the temples stone and stele provide precious information for the dating of the kings' reigns, of religious constructions, and sometimes also for the organization of the temples.

A large number of inscriptions date from, or refer to, the reign of Yasovarman, during which the borders of the Khmer empire are said to have extended as far north as Yunnan, as far west as coastal Burma and eastwards into Champa<sup>33</sup>. According to inscriptions, Yasovarman's authority was recognized from Vat Phu in the north to Hatien in the south.<sup>34</sup>

An inscription still visible on the central tower north door reveal dating from Jayavarman V (968 – 1001) later than Yasovarman's reign; recalling the foundation of Yasodharapura.

12.4 Establishment of Yasodharapura – Symbolic Center of the Universe

The son of Indravarman I, Yasovarman, took power in 889 and remained a few years at Hariharalaya. In the middle of Indratataka, he built the four brick towers of the temple of Lolei, which was dedicated to the memory of his parents. After this display of filial piety, he decided to build his own capital, Yasodharapura not far from Hariharalaya, on the site of the present-day Angkor.<sup>35</sup>

Yasovarman only reigned for approximately twenty years, but exerted such a deep influence that no king who came after him dared to modify the symbolical structure of his capital, Angkor. There is little information about his two sons, Harshavarman I and Isanavarman II, who assumed power successively from 910 to 928. Yasovarman named his new city Yasodharapura, which remained the official name of the capital until the end of the Angkor period. The center of Yasovarman's city was the hill, which is now called Phnom Bakheng.<sup>36</sup>

He erected a temple on the top of Bakheng hill, around which he built his new capital. As his father had done at Hariharalaya, he created a vast baray 2 km wide and 7 km long (the Eastern Baray) to the east of his city. The waters of the river coming down from Phnom Kulen gathered in the enormous reservoir, replenishing the city; Yasovarman also built several monasteries south of the reservoir.<sup>37</sup>

The god in the Bakheng temple was a Siva-linga called Yasodharesvara. He also built temples on Phnom Bok and Phnom Krom, north and south of the Bakheng. Both Sivaite, each of these temples, whose main buildings comprise three sanctuary towers, housed a Brahmanistic triad composed of the gods Brahma, Siva, and Visnu (see 11.3 Bakheng Style, p.61).

According to his inscriptions he also built many other religious buildings in the Angkor area for different religious groups, people who worshipped Siva, or Visnu, and perhaps also for Buddhists. Two large temples far way from Angkor were begun by Yasovarman, at Preah Vihear (Sikhañśvara), and at Phnom Sandak (Sivapura).<sup>38</sup>

Recent research has shown that this temple-complex is the focal point of a sophisticated cultural landscape centered on the mount temple, Phnom Bakheng. Between its center and the outlying area of Yasovarman's city

cultural significance

remain remnants of temples, shrines, water tanks, water channels, historic field systems, settlement sites, and the overlaying settlement patterns of the Angkor dynasty, including Angkor Wat and Angkor Thom.

### **12.5 Symbolism of Bakheng**

Our route to understanding the nature of these temple-complexes is, for the Western scholar, circuitous. It involves an understanding of Hindu cosmology partially construed through the interpretation of inscriptions in Sanskrit and archaic Khmer.

A complex study by French scholar Filliozat (1954) has resulted in an understanding of the number of towers and their position in space that demonstrates the ensemble is a materialization of the Indian cosmic calendar.

Bakheng symbolizes a celestial period, the quincunx arrangement of towers set on the fifth platform represents Mount Meru—the center of the world according to Indian cosmology—and its four surrounding mountains, the four directions of space also being invoked.

There are 109 towers in all, the central shrine representing the axis mundi (polar axis) and the 108 towers that surround it evoking the cosmic revolutions around this axis. One hundred and eight is the base number that corresponds to a "great year," a yuga, which means the stretch of time necessary for the appearance, the evolution and the disappearance of a world that numbers four million three hundred twenty thousand human years. By dividing 108 by four, one obtains the four phases of the moon.

From the vantage point of each of its diagonals, Bakheng has only thirty-three towers, representing the same number of gods who according to Indian tradition live on Mount Meru, the center of the world with its five peaks. Nevertheless, only three towers corresponding to the three peaks that shelter the divine triad of Vishnu, Brahma and Shiva appear in this monument.<sup>39</sup>

Angkorian cities were designed to recreate the world of the gods. The ultimate purpose of this quest for perfection may be found in the divine nature of kingship. The great *lingas* which occupied the center of the Saivite temples bore the name of the god combined with that of the king.<sup>40</sup>

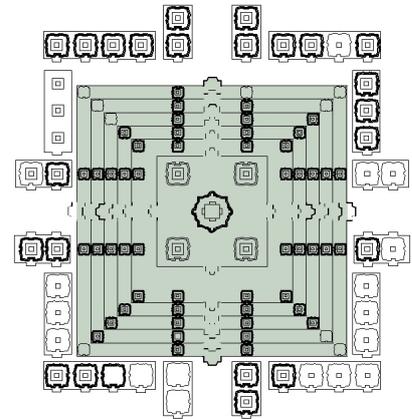
### **12.6 Water – Spiritual**

The uniqueness of Angkor's water features strongly suggests that a highly sophisticated identification with ancestral spirits and water prompted and sustained the repeated construction of water related structures.

Separating religion and daily life is inappropriate to understanding ancient Khmer culture, therefore it follows that it is not adequate to assign a single function to hydrological elements.

Yasovarman built the Eastern Baray soon after establishing his capital at Angkor at the close of the 9th century. The Eastern Baray (1.8 x 7 km) was part of the cosmic vision of the Khmer religion. It provided the city with its water supply and may have also served as an irrigation system. Due to technical difficulties, the Eastern Baray dried up forty-four years after it was built. Its successor, the Western Baray (2 x 8 km), was only completed at the beginning of the 11th century.<sup>41</sup>

Khmer inscriptions stress the holy nature of water. A text in each corner of the Eastern Baray under Yasovarman placed it under the protection of goddess Ganga, representing the Ganges. Many other texts compare the Kulen uplands, whence the rivers flowing to Angkor originated, with the



**Bakheng symbolizes a celestial period. It represents Mount Meru, the center of the world according to Indian cosmology.**

**Jean Laur**

**One inscription honors a king, not for his conquests but for creating a reservoir "beautiful as the moon, to refresh mankind and to drown the insolence of other kings"**

**Time, 'Land of the Eternal Smile'.**

**According to Khmer beliefs, water is transformed when passed over a *linga* into holy water.**

**Hundreds of *linga* dating from the 9th century are carved into the stone riverbed of the Siem Reap river in the Kulen Mountains. In the 10th century Yasovarman rerouted the Siem Reap river to direct the holy water in his newly built East Baray.**

**cultural significance**

Himalayas, and their water as sacred. Under this interpretation, the barays represent the oceans surrounding the home of the gods.<sup>42</sup>

### 12.7 Religious Site and Landscape



View of the central tower with remnants of sandstone blocks around the Central Tower used to form the Buddha prior to EFEO removing in the 1920s. (EFEO 1923)

Angkor provides an outstanding example of looking beyond the ensemble of built elements and seeing a landscape deriving from religious observance, Hinduism in this case, yet simultaneously being an expression of religiosity.

Consecrated in 907 AD Bakheng was dedicated to the Hindu god Śiva-linga called Yasodhariesvara.

The 16th century seems to have marked a period of renewal of this place and a conversion to Theravada Buddhism. The temple became a symbolic beacon for pilgrimages to the Angkor region with the quincunx of the highest towers almost completely engulfed within an immense seated stone Buddha. The lower part of this image was still partially visible in the early 1920s.

Sacred deposits found under the Bakheng Buddha during the restoration process are also of note. In a sandstone receptacle at the bottom of a shaft under the central sanctuary were a number of Buddha statuettes measuring up to nine centimeters in height and made of silver or gold leaf molded around a resin-based substance. Other gold and silver statuettes were found in the masonry of the colossal image.<sup>43</sup>

A Middle Period inscription records the name 'Bakheng', or 'Virile' that suggests (despite the fact the central sanctuary was covered by this Buddhist image) the earlier concept of a *linga* was still present in the historic collective memory. It is curious but significant to note that Muslim pilgrims left an inscription at the monument in Arabic praising Allah. This stele was removed in the 20th century for preservation reasons.<sup>44</sup>



View of the west elevation of Bakheng's Central Tower. This EFEO documentary record will contribute to research and education by providing an opportunity for comparative analysis of the existing condition with the past condition of the Central Tower. (EFEO 1948)

### 12.8 First National Park in Southeast Asia

Angkor Archaeological Park was established in 1925 as the first national park in Southeast Asia.

### 12.9 Previous Research and Interventions at Phnom Bakheng

**12.9.1 École française d'Extrême-Orient, the School of the Far East:** in 1907, the EFEO assumed the responsibility for the conservation of the monumental site of Angkor in Cambodia. Thus the great works of restoration and maintenance and the topographic and photographic surveys of the ancient royal capital of the Khmer, as well as the large scale reconstitution of the site based on the methods of authentic reconstruction known as 'anastylosis' were carried out under the supervision of EFEO archaeologists and architects.

In the wake of contemporary political events, the EFEO was compelled to leave Cambodia prior to the Khmer Rouge takeover in 1973.

The history of the library of the EFEO parallels that of the institution since the beginning of the 20th century. It forms an important part of the Asian Studies collection in Paris. The library comprises some 60,000 volumes and more than 1,000 periodical titles, including 350 active journals. It preserves, in addition, a unique collection of 159,000 photographic documents, mostly concerning former French Indochina, especially the monuments of Angkor; a rich collection of some 2,000 manuscripts on various media, of which two-thirds are in numerous Asian languages; a

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large collection of rubbings, maps, and plans, as well as audio-visual materials and objects (bronzes, coins, etc.).

**12.9.2 L'association des amis d'Angkor:** has undertaken studies at Phnom Bakheng which will contribute to the overall knowledge needed for a comprehensive understanding of the site. Their report titled *Projet du Conservation et de mise en valeur du site du Phnom Bakheng; Rapport Final* provides a summary of the work of the various AAA experts in their efforts at technical collaboration primarily from October 31 to November 4, 2005 in connection with the Phnom Bakheng seminar.

### **12.10 Documentary Evidence**

Part of the value of the documentary evidence is its availability for research and education. Cataloguing is essential for conservation and access. At present there is an extensive collection of site notes and photographic record of the research undertaken by EFEO at Phnom Bakheng dating from 1907. The photographic records have been digitized and are available to view at EFEO, Siem Reap. Future development of the electronic data and catalogue by the APSARA Authority would enhance significance by making documentary evidence readily available.

## **13.0 TRANSFORMATION OF THE CULTURAL LANDSCAPE – PHYSICAL EVIDENCE**

Cultural landscapes include more than just morphological characteristics of an area and act as symbolic record. The study of cultural landscape and its transformations in morphological, economic, ecological and symbolic terms can thus provide a comprehensive picture of the social, ecological and productive changes in an area. Such a study can be used for understanding the major driving forces behind the dynamics of the changes and investigate future trends.<sup>45</sup>

The following summary describes the extent of physical evidence that survives which indicates the pattern of development at Yasodharapura, the first Angkor city with Phnom Bakheng at this center.

### **13.1 Built Environment**

The existing built form of Phnom Bakheng and its heritage curtilage reflects changes and adaptation that have taken place in the area throughout the 10th – 15th century. This period of empire building saw the layering of successive cities, the realignment of hydraulic features and the building of monumental temples dedicated to their gods and kings.

Despite these significant changes, the earlier topography and development patterns are beginning to be understood. The siting and design of temples, the peculiar alignment of moats and *barays*, the unnatural straight Siem Reap river, and glimpses of temples from Phnom Bakheng serve as continuous reminders of the significance of this monumental temple landscape.

### **13.2 Early Twentieth Century Conservation Interventions**

EFEO archaeologists and architects from 1907 undertook restoration and maintenance, as well as the large scale reconstitution of the temples based on the methods of authentic reconstruction known as *anastylosis*.

The scientific value of past conservation works are evident throughout the site and represent a significant period in conservation, which is a testament

Cultural landscapes include more than just morphological characteristics of an area and act as symbolic records. The study of cultural landscape and its transformations in morphological, economic, ecological and symbolic terms can thus provide a comprehensive picture of the social, ecological and productive changes in an area. Such a study can be used for understanding the major driving forces behind the dynamics of the changes and investigate future trends.



View of the north axial stairs during site clearing and conservation efforts by the EFEO in the early 20<sup>th</sup> century. (EFEO 1929)

to the history of technical development in conservation and the development of conservation methodology.

The conservation methods employed in the early 20th century are a rare physical record, the evidential quality of past conservation, which may warrant conserving.

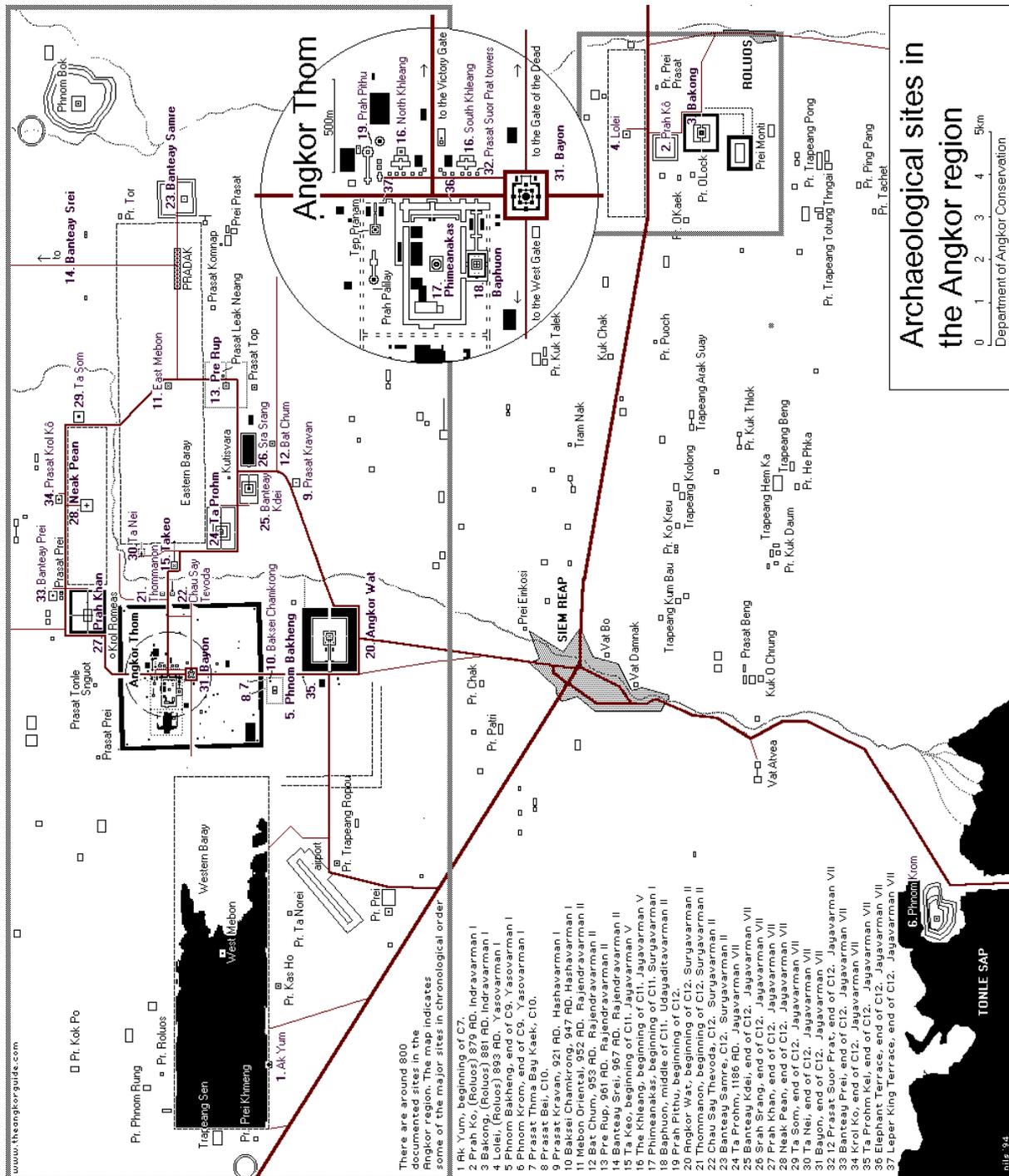


Figure 17 Archaeological Sites in the Angkor region

cultural significance

**13.3 Archaeological Resource**

The historical archaeological resources at Angkor are amongst the most extensive in Southeast Asia in terms of their chronology and the range of possibilities that they present. They are the produce of more than six centuries of continuous, intensive Khmer occupation; encompassing activities associated with domestic occupation, defense, religion, trading and transport.

At the foot of Phnom Bakheng, and in the surroundings of Baksei Chamkrong, important Iron Age settlements have also been found dating from the same chronological period as the prehistoric mounds at Rolous and appearing to be of the same culture.<sup>46</sup>



**Preah Ko completed by Indravarman I, Yasovarman's father in 879 AD.**

**13.4 Transformation of Khmer Architecture**

Pre-Angkor temples built between the 7th and 9th centuries generally have simple layouts, consisting of a single shrine surrounded by a square or rectangular moat. The access to the temple is through an east-west oriented causeway situated on the axis of the monument. In several temples, however, an enclosure wall separates the main structure from the moat in order to enhance the importance of the sacred area.

At the end of the 9th century and the beginning of the 10th, there was a tendency to create odd numbered groups of shrines placed on a single low podium. The groups were dominated by a central shrine, such as the one at Phnom Krom (see paragraph 8.4.15 for plan). This type of construction evolved into the practice of arranging the shrines into the quincunx pattern that typifies the temple mountain.



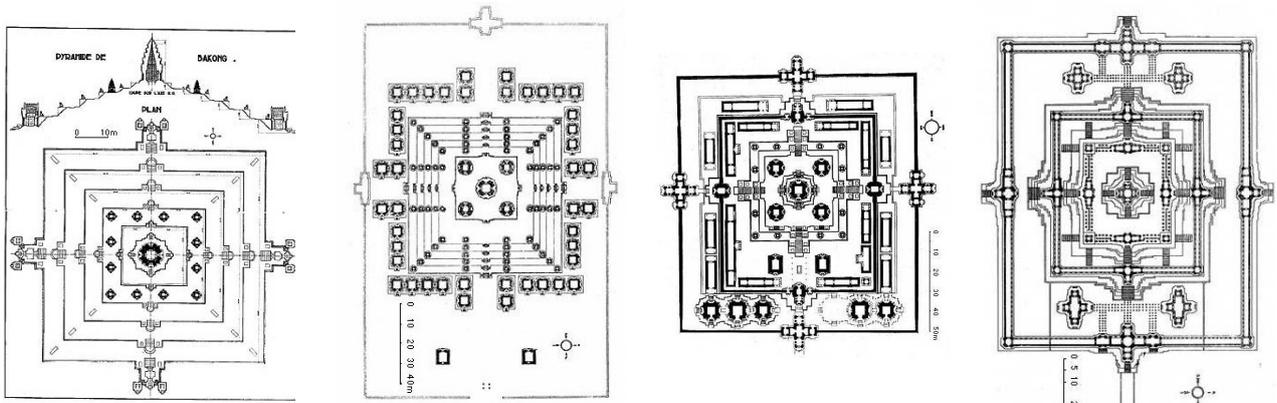
**Bakong built by Indravarman I, Yasovarman's father in 881 AD. June 2005**

**13.5 Transformation of the Temple Mountain**

At Roluos, the Bakong is the first sandstone temple mountain in the history of Khmer architecture, built by Indravarman I, Yasovarman's father; followed by that at the summit of Phnom Bakheng. Before the Bakong, this architectural type had not fully emerged.<sup>47</sup>

Phnom Bakheng is the first temple at which the quincunx arrangement of towers was established, setting a precedent for the development of later grander temple mountain forms.

Temple mountains at Angkor in chronological order include; Bakong, Bakheng, Pre Rup, Ta Keo, Baphuon and most notably Angkor Wat. Each of these was in turn the state temple, and thus the religious center of the whole empire.



Plan Bakong (Glaize)

Plan of Bakheng (Glaize)

Plan of Pre Rup (Glaize)

Plan of Baphuon (Glaize)

*cultural significance*



This Nandi Bull is located on the south axis; note the silver metallic necklace and the vessel for incense burning at the front base of the bull indicating daily religious use by the local Khmer. (ME March 2005)



Detail view of the Vietnamese pagoda over the Buddha footprint with iron strapwork surround. (ME May 2005)



View of the makeshift shrine in front of the south library. (KK Dec. 2004)

### 13.6 Religious Site and Landscape

The design of the temple-complex was codified by an immense number of rules that regulated the choice of the site, the time when work began, its orientation, calculation of its dimensions, and stages or buildings. The complex calculations performed prior to architectural operation were designed to reproduce in the temple the harmony that governs the universe.

Because the temple symbolized the tangible irradiation of the Divine towards the four corners of the universe, it was not supposed to have a façade. However, the temple-complex was oriented in accordance with a precise axial layout, facing east, the place where the sun began to shine anew every morning.<sup>48</sup>

**13.6.1 Nandi Bull:** in Hindu mythology, each god is associated with an animal, called the god's vehicle. Nandi, which means "the bull", is Shiva's vehicle.

**13.6.2 Buddha footprint:** or Buddhapada was dug out off the ceremonial access route and a Vietnamese pagoda constructed over of which monks were noted as the guardians in the 1860s.<sup>49</sup> Today vessels for incense burning are present indicating daily religious use by the Khmer.

**13.6.3 Makeshift shrine:** a modern makeshift shrine located on the east side of the south library. Community consultation is required to determine the significance of the *neak ta*, Ta Kas Krohom evoked here by the local community.

**13.6.4 'Living Heritage':** the families of the old hamlets of Bakheng, Kok Dong, Teaksen, Tropeang Peuk Teuk and Tropeang Seh claim tight links among one another. Locally, this community worships several *neak ta*, of which the most important are the *neak ta* Ta Kuang, living in a small hut east of Kok Dong village, and the *neak ta* Ta Raj in Angkor Wat. Concerning Phnom Bakheng the people evoke the *neak ta* Ta Kas Krohom on the hill top.<sup>50</sup>

**13.6.5 Linga:** the temple mountain was the tabernacle of the *linga*. The *garbhagriha* (embryo chamber) or the sanctum sanctorum. The Central Tower housed the royal *linga*.

The *linga* and Mount Meru are both images of the *axis mundi*, the imaginary focal point around which the universe unfolds in space and rotates in time, and the link between heaven, earth and the underworld.<sup>51</sup>

Phnom Bakheng, a mountain of the physical world and a high point in the Angkor plain reinforces the *axis mundi*. The royal *linga* sited in the sanctum sanctorum of the quincunx—the central high point of Bakheng; ensures the link between heaven, earth and the underworld.

The *linga* is the symbolic representation of Shiva, in the shape of a phallus, stylized at Bakheng; it is composed of three sections: the square base corresponds to Brahma, the creator, the octagonal middle section corresponds to Vishnu, the preserver, and the circular upper section, corresponds to Shiva; coupled with the Yoni, the whole symbolizes male and female forces of Shiva.

The small square niches in the foundation stone of the *linga* would have contained precious stones associated with the *navagraha*, the nine chief celestial beings of Hindu tradition: the Sun, Moon, Mars, Mercury, Jupiter, Venus, Saturn, Rahu, the demon of the eclipse, and Ketu, the personification of the node of the moon or the comets.

### cultural significance

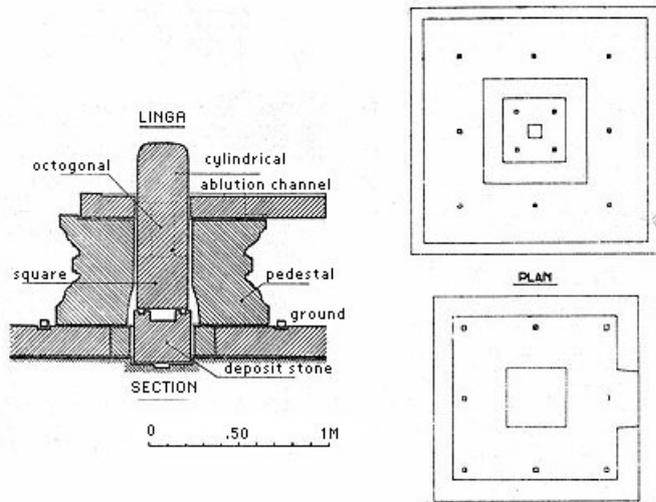


Figure 18 Plan and section of a *linga* with pedestal (Glaize)



View of the foundation stone of a *linga* pedestal at Bakheng. (EFEO 1920)

The small square niches in the foundation stone would have contained precious stones associated with the navagrah, the nine planets of Hindu tradition, namely the Sun, Moon, Mars, Mercury, Jupiter, Venus, Saturn, Rahu, the demon of the eclipse, and Ketu, the personification of the node of the moon or the comets.

### 13.7 Harvesting the Water – Moats, Basins and Reservoirs

Irrigation was a well known and widespread phenomenon in Southeast Asia in the early centuries AD. This is particularly true of areas like Cambodia that are subject to heavy seasonal rains and long dry periods, weather conditions which made water-storage and distribution essential for successful rice growing.

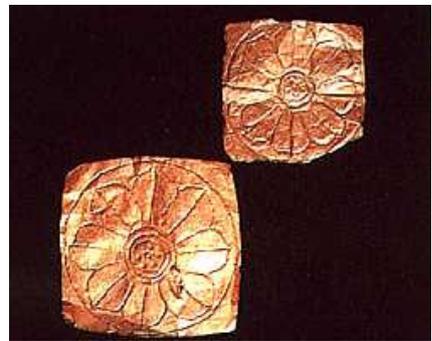
This complex linear network, a matrix of overlaying moats and canals interconnected to harvest the monsoon rains into and out of the *barays* is a remarkable water management network; a multipurpose risk mitigation system which deals with the impact of the monsoon and for maintaining the supply of rice in poor monsoon seasons.

Off to the south side of the south-east corner of the Western Baray bank, is a major embankment that is about 100 meters wide running due south to cross the line of the modern road that links the airport to Angkor Wat. This is the eastern-most bank of two banks about 200 meters apart. Previously this feature was thought to be part of the old moat of the city of Yasovarman, the Goloupura. The feature is now believed to be a water management feature that assisted with the movement of water from the SE corner of the Western Baray to the south and then to the east of Angkor Wat, see *Figure 5 Aerial survey of Phnom Bakheng and Angkor*.

Although the water harvesting system has a functional aspect, not to be underestimated is the religious significance in the context of setting and ultimately spatial planning which is balanced masterfully through building masses, landscape elements and open space.

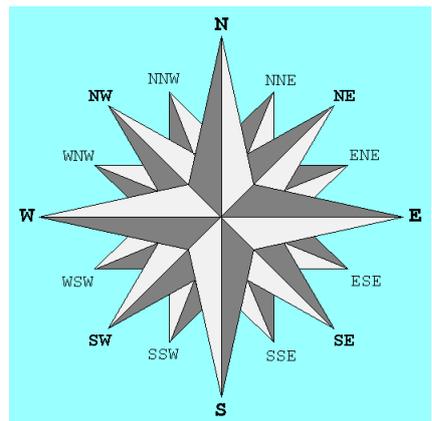
### 13.8 Oral History

The memory of the actual local populations rarely goes beyond the time of the grandparents. The older people recall the recent eventful history. They place emphasis on the insecurity and fighting that prevailed during several periods from the Siamese invasions, the Issarak and the Khmer rouge as well as the numerous displacements of villages specifically in the area of Angkor Thom, Angkor Wat, and Phnom Bakheng. From the oldest times, they evoke bits of stories about the Siamese razzia, and the exodus of populations. Displacements of villages in front of Angkor Wat and inside Angkor Thom are also remembered during the period when the French undertook conservation works.



The Khmer used precious metals in their buildings; the inner walls of temple and shrines were covered with bronze plate.

Sheets of gold leaf in the shape of a leaf were probably included among the symbolic objects placed in the foundation stones of the temples and the base of the *linga*.



Cardinal directions played an overarching influence in Khmer architecture. The religious significance in the context of setting and ultimately spatial planning is evident throughout the entire landscape from the micro to the macro level.

It is also recalled that Vietnamese monks were practicing Hinayana Buddhism in a monastery on the top of Phnom Bakheng. This religious community was moved by the French<sup>52</sup> in the early 20th century.

### **13.9 Military Site**



**Spalled loss with small central holes caused by gunfire above the breast of a devata in the stone relief on the Central Tower occurred when the site was under control by the Khmer Rouge. (ME Dec. 2005)**

Progress that had been made in cultural heritage management since Independence was lost throughout the 1970s. The activities of the Angkor Conservation Office were considerably reduced from the early 1970s on. Military presence in the region progressively rendered the archaeological sites inaccessible. As the Park itself fell into the hands of Khmer Rouge and Vietnamese troops, the Conservation shifted its efforts to sites in and south of Siem Reap town. The research, conservation and restoration program that had expanded and reinforced its internal coherency, especially in the 1960s, was dismantled. With the rise of the Khmer Rouge to power in April 1975, all the elements of the living Buddhist cult, were purposely destroyed (religious leaders, Buddhist monasteries, Buddha images, manuscripts, etc.), but the Khmer Rouge had no systematic policy concerning the vast quantities of archaeological material at their disposal. Indifference seems to have been the general rule, and the monuments, as well as objects placed in the Angkor Conservation Office were for the most part simply neglected.<sup>53</sup>

Phnom Bakheng provided a strategic location for observation; an elevated height of 70 meters within the alluvial plain provided a desirable location for monitoring military activities within Angkor Park, including a direct line-of-sight to the airport runway.

A military communications tower was erected on the uppermost platform, where remnants of the base are visible today.

In 1970, the country was at war. Fearing the bombings, the local populations left their houses and found refuge in the nearby temples of Angkor Thom and Angkor Wat. Lon Nol troops controlled the area with machine guns installed on top of Phnom Bakheng. Quickly, the Khmer Rouge were in command of Angkor and displaced the local population to the Northern zones. From 1975 until 1979, the area was deserted by its people and inhabited temporarily by the mobile brigades Krom Chalat for agricultural tasks and sugar palm exploitation. The old rice field dikes were destroyed and replaced by bigger square rice fields.<sup>54</sup>

## ASSESSMENT OF SIGNIFICANCE

### 14.0 INTRODUCTION

The term ‘cultural significance’ and ‘heritage value’ embrace the concept that a place or item has an intrinsic value which cannot be expressed in financial terms. Cultural significance may be embodied in the fabric of a place (including its setting and relationship to other items), the records associated with the place, its current or former use, associations and the meanings that the place may have for people to whom it is important.<sup>55</sup>

Inscription of a site on the World Heritage List depends on meeting one or more of the criteria set by UNESCO in the *Operational Guidelines for implementation of the World Heritage Site Convention*. A site should also meet the test of authenticity.

This section sets out a summary of Phnom Bakheng values, including values which contribute to Angkor’s *outstanding universal values* that were recognized at the time of inscription in the list of World Heritage sites. This is followed by a detailed analysis of Phnom Bakheng’s attributes, tangible and intangible, which are unique and outstanding. The analysis is presented as a Statement of Significance and it represents the current understanding of Phnom Bakheng. Finally, the ways in which Phnom Bakheng meets and contributes to the test of authenticity are discussed.

Determining the different values of the Phnom Bakheng Site is the key to assessing the significance of the place. The Burra Charter Process provides an outline of the sequence of investigations, decisions and actions, of the conservation process (see paragraph 29.0 BURRA CHARTER PROCESS). The diagram below draws from this process for assessing Phnom Bakheng’s significance.

Significance involves a detailed understanding of the historic fabric of the site and how it has changed through time, and then an assessment of the values – both historic and contemporary – ascribed to the fabric. Significance may lie both in the earliest phase of the site, and any changes to it. If the site has been deliberately ruined in the past, this may be an important factor of the site’s significance as may its previous history of repair and conservation. Any assessment of significance should be based on an appropriate program of conservation-based research, analysis and investigation.

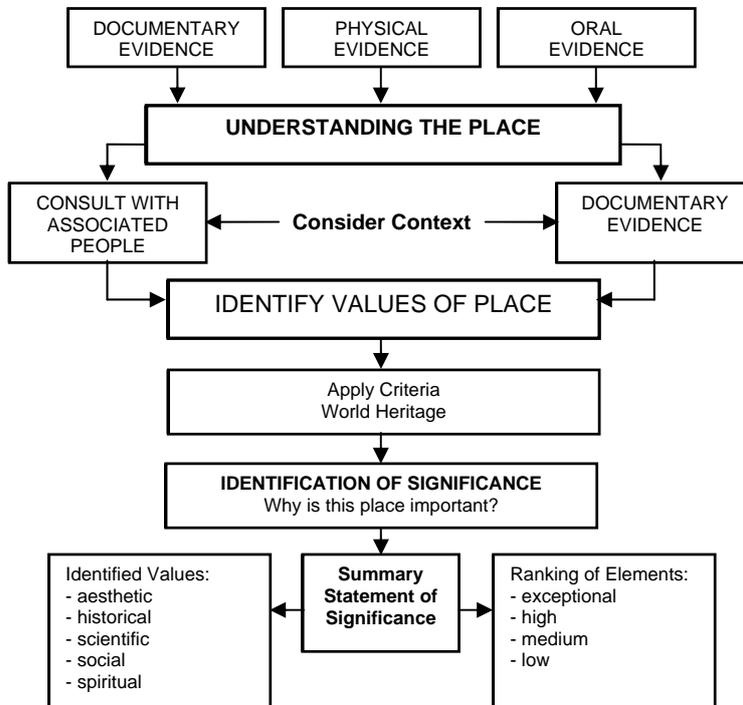


Figure 19 Process of investigations, decisions and actions



View of Banteay Srei; Guardian devatas (left) and dvarapalas (right) on a background of textured carving decorate the walls of the south and central towers. April 2000 (Wayne Mc Lean)

Banteay Srei consecrated in 967 AD is sited 25 km northeast of Angkor. It is built largely of red sandstone, which is covered with elaborate and deeply carved decoration. The buildings themselves are miniature in scale. These factors have made the temple extremely popular with tourists, and have led to its being widely praised as a precious gem, or the jewel of Khmer art. (Maurice Glaize)



The main entrance to Angkor Vat temple proper, seen from the eastern end of the Naga causeway. 2005 (Andrew Lih)



View of the Bayon face towers on the upper terrace constructed in the 13th century.

## 15.0 WORLD HERITAGE VALUES OF ANGKOR

Angkor was inscribed on the World Heritage List in 1992. The World Heritage criteria against which Angkor was listed remain the formal criteria for the site. These criteria have been included in the Values Table below. The World Heritage criteria are periodically revised and the criteria against which the site was listed in 1992 are not necessarily identical with current criteria. Examples of the World Heritage values for which Angkor was listed are included in the Values Table for each criterion. These examples are illustrative of the World Heritage values of the property, and they do not necessarily constitute a comprehensive list of these values.

Values Table	
Cultural criteria for the assessment of outstanding universal value	Outstanding universal value for which Angkor was inscribed on the World Heritage List in 1992
<b>Criterion (i)</b> represent a masterpiece of human creative genius.	The Angkor complex represents the entire range of Khmer art from the 9th to the 14th centuries, and includes a number of indisputable artistic masterpieces (e.g. Angkor Wat, the Bayon, Banteay Srei).
<b>Criterion (ii)</b> exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design.	The influence of Khmer art, as developed at Angkor, was a profound one over much of Southeast Asia and played a fundamental role in its distinctive development.
<b>Criterion (iii)</b> bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared.	The Khmer Empire of the 9th – 14th centuries encompassed much of Southeast Asia and played a formative role in the political and cultural development of the region. All that remains of that civilization is its rich heritage of cult structures in brick and stone.
<b>Criterion (iv)</b> be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history.	Khmer architecture evolved largely from that of the Indian sub-continent, from which it soon became clearly distinct as it developed its own special characteristics, some independently evolved and others acquired from neighbouring cultural traditions. The result was a new artistic horizon in oriental art and architecture.
<b>Criterion (v)</b> be an outstanding example of traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change.	
<b>Criterion (vi)</b> be directly or tangibly associated with events of living traditions, with ideas, or with beliefs, with artistic and literary works.	

### assessment of significance

## 15.1 Comparative Analysis

A comparative archaeological study by theme is a logical step in the analysis of a site and in determining its context and values. A typical comparative study will include a brief history of the type of cultural property, detailing its structural and functional evolution through time, and set of criteria (World Heritage) to evaluate it according to its own specificities.<sup>56</sup>

Historical archaeological sites require an approach that emphasizes the link between territory, culture and time.<sup>57</sup>

A comparison of the outstanding universal value identified for World Heritage listing of Angkor and Vat Phou and Associated Ancient Settlements within the Champasak Cultural Landscape<sup>58</sup>, a cultural landscape inscribed in 2001, reveals marked similarities.

Vat Phou brought a cultural landscape with heavy religious content but this time it added to the range as it is a great temple complex, impressive, geometric and well-preserved monumentally but also of great historical significance. An extensive landscape around the central temple area, including hydraulic features, is associated both visually and ceremonially with the temple and archaeologically with the long and morphologically dynamic history of the place.<sup>59</sup>

The table on the following page compares the *outstanding universal value* of Angkor with Vat Phou and identifies how Phnom Bakheng contributes to Angkor's *outstanding universal value*. The analysis expands, drawing out comparisons with Vat Phou.

**15.1.1 Vat Phou and Associated Ancient Settlements within the Champasak Cultural Landscape, Laos:** the Champasak cultural landscape, including the Vat Phou Temple complex, is a remarkably well-preserved planned landscape more than 1,000 years old. It was shaped to express the Hindu vision of the relationship between nature and humanity, using an axis from mountain top to river bank to lay out a geometric pattern of temples, shrines and waterworks extending over some 10 km. Two planned cities on the banks of the Mekong River are also part of the site, as well as Phou Kao mountain. The whole represents a development ranging from the 5th to 15th centuries, mainly associated with the Khmer Empire.

ICOMOS recommended this property be inscribed on the World Heritage list on the basis of *Cultural criteria iii, iv and vi* which is shown on the following page.



Vat Phou and Associated Ancient Settlements within the Champasak Cultural Landscape in the wet season.



Vat Phou and Associated Ancient Settlements within the Champasak Cultural Landscape in the dry season.

Comparison between the Cultural criteria for the assessment of outstanding universal value ICOMOS identified for recommendation for listing on the World Heritage List			How Phnom Bakheng contributes to Angkor's Outstanding Universal Value
Cultural criteria	Vat Phou and Associated Ancient Settlements within the Champasak Cultural Landscape	Angkor	Phnom Bakheng
(i)		The Angkor complex represents the entire range of Khmer art from the 9th to the 14th centuries, and includes a number of indisputable artistic masterpieces (eg Angkor Wat, the Bayon, Banteay Srei).	Consecrated in 907 AD Bakheng is part of an unparalleled architectural and religious legacy of a group of monuments spanning five hundred years from the 10th to the 14th century.
(ii)		The influence of Khmer art, as developed at Angkor, was a profound one over much of Southeast Asia and played a fundamental role in its distinctive evolution.	Yasovarman was the first king to establish a temple in Angkor. Phnom Bakheng represents a key evolutionary stage of Khmer art and architecture.
(iii)	The Temple Complex of Vat Phou bears exceptional testimony to the cultures of Southeast Asia, and in particular to the Khmer Empire which dominated the region in the 10th-14th centuries.	The Khmer Empire of the 9th-14th centuries encompassed much of Southeast Asia and played a formative role in the political and cultural developments of the region. All that remains of that civilization is its rich heritage of cult structures in brick and stone.	During the reign of Yasovarman (890 – 921) the Khmer Empire encompassed much of Southeast Asia. Phnom Bakheng marked this transition point when the Khmer Empire dominated the region in the 10th–14th centuries
(iv)	The Vat Phou complex is an outstanding example of the integration of a symbolic landscape of great spiritual significance to its natural surroundings.	Khmer architecture evolved largely from that of the Indian sub-continent, from which it soon became clearly distinct as it developed its own special characteristics, some independently evolved and others acquired from neighboring cultural traditions. The result was a new artistic horizon in oriental art and architecture.	Phnom Bakheng complex is an outstanding example of the integration of a symbolic plan and landscape of great spiritual significance to its natural surroundings. Phnom Bakheng temple is a development of the temple mountain form established in the pre-Angkor period at the temple of Bakong (Roulos group). Phnom Bakheng is the first temple at which the quincunx arrangement of towers was established, setting a precedent for the development of later grander temple mountain forms.
(v)			
(vi)	Contrived to express the Hindu version of the relationship between nature and humanity, Vat Phou exhibits a remarkable complex of monuments		Contrived to express the Hindu version of the relationship between nature and humanity, Phnom Bakheng contributes to a remarkable complex of monuments at Angkor.

## 15.2 Test of Authenticity

15.2.1 In addition to Phnom Bakheng contributing to the criteria for which Angkor was inscribed on the World Heritage List, the *Operational Guidelines for Implementation of the World Heritage Convention* states that 'to be deemed of *outstanding universal value*, a property must also meet the condition of integrity and/or authenticity'.

Therefore, Phnom Bakheng must demonstrate that it can meet the conditions of authenticity and contribute to Angkor's *outstanding universal values* through a variety of these attributes:

- form and design;
- materials and substance;
- use and function;
- traditions, techniques and management;
- location and setting;
- language, and other forms of intangible heritage;
- spirit and feeling; and
- other internal and external factors

The analysis of these attributes permits elaboration of the specific aesthetic, historical, scientific, social and spiritual dimensions of the cultural heritage being examined.

15.2.2 The first measure of the authenticity of Phnom Bakheng is the great predominance of authentic fabric, particularly the 10th century and how this fabric contributes to the *outstanding universal value* of Angkor monuments between the 10th and 15th centuries.

15.2.3 A second indication is the significant archaeological deposits lying in situ, above and below ground.

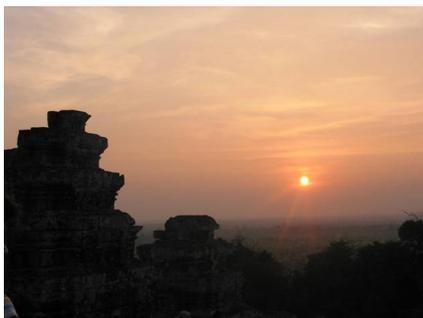
15.2.4 A third measure of the authenticity of Phnom Bakheng is the great predominance of form, particularly the pyramidal form silhouetted upon the plateau of Phnom Bakheng.

15.2.5 A fourth indication is its design and plan derived from Hindu cosmology integrated into the landscape.



**The great predominance of authentic fabric at Phnom Bakheng contributes to Angkor's outstanding universal value. (JICA 1997)**

## 16.0 STATEMENT OF SIGNIFICANCE



Phnom Bakheng provides an exceptional vantage point for sunset viewing. (ME Dec 2004)

A site and landscape may have many values, including its value as a source of inspiration.

Recognition of a site's heritage values is a continuous and open-ended process that deepens as society develops and its scientific and cultural awareness increases.

### 16.1 Introduction

The Statement of Significance provides detail of the current understanding of the cultural qualities which contribute to Angkor's *outstanding universal values*.

It begins with the key overarching significances, which is followed by detailed discussion of the significant values. While these values outlined below overlap, it is important to understand these as different values, because they correspond to different ways of conceptualizing the value of the heritage, to different stakeholder groups, and therefore to different bases for making management or conservation decisions.<sup>60</sup>

Cultural significance is a concept which helps in estimating the value of places. The places that are likely to be of significance are those which help an understanding of the past or enrich the present, and which will be of value to future generations.<sup>61</sup>

Phnom Bakheng's fundamental significance resides in its inherent values. Inherent values identified for Phnom Bakheng are aesthetic, historical, scientific, social and spiritual.

The categorization into aesthetic, historical, scientific, social and spiritual values is one approach to understanding the concept of cultural significance. However, more precise categories may be developed as understanding of a particular place increases.

The table<sup>62</sup> below lists a summary of heritage typologies devised by various scholars and organizations. The categories identified in *The Burra Charter* (ICOMOS Australia, 1999) have been used to analyze the values which contribute to Phnom Bakheng and Angkor's cultural significance.

The last category, social includes spiritual values, due to the important spiritual values at Angkor and Phnom Bakheng – they derive from religious beliefs. The analysis has been separated into two identifiable groups, social and spiritual.

Reigl (1902)	Lipe (1984)	Burra Charter 1999	Frey (1997)	English Heritage (1997)
Age	Economic	Aesthetic	Monetary	Cultural
Historical	Aesthetic	Historic	Option	Educational and academic
Commemorative	Associative-symbolic	Scientific	Existence	Economic
Use	Informational	Social (including spiritual, political, national, other cultural)	Bequest	Resource
Newness			Prestige	Recreational
				Aesthetic

## 16.2 Overarching Significance

16.2.1 Phnom Bakheng is a dramatic expression of the genius of the Khmer people and their king Yasovarman. Yasovarman named his new city Yasodharapura, which remained the official name of the capital until the end of the Angkor period. At the center of Yasovarman's city was the hill, Phnom Bakheng.

16.2.2 Consecrated in 907 AD Bakheng is part of an unparalleled architectural and religious legacy of a group of monuments spanning five hundred years from the tenth to the fourteenth century.

16.2.3 Phnom Bakheng was the state temple of the first city of Angkor, Yasodharapura, the capital city established by Yasovarman in the 10th century. Yasodharapura remained the city name throughout the Angkorian period.

16.2.4 Phnom Bakheng is a key temple within the ancient Angkor city significantly contributing to Angkor's outstanding universal value.

16.2.5 Phnom Bakheng is a rare and unique integration of a planned symbolic form with the natural landscape.

16.2.6 Phnom Bakheng temple-complex is the most important and symbolic monument of the 10th century in Angkor and one of the most important 10th century monuments in a world context.

16.2.7 The cultural landscape of Phnom Bakheng; an extensive planned landscape around the temple mountain; including hydraulic features, is associated both visually and ceremonially with the temple and archaeologically with the long and morphologically dynamic history of Angkor.

**Angkor is more than the temples of Banteay Srei and Angkor Vat or the Kulen Mountains. Angkor encompasses the civilization of our ancestors. It is a geographical region with hundreds of temples and vestiges of monuments and infrastructure. It also lends its name to a historical period. Angkor is a unique cultural heritage, a living testimony of our past, and the foundation of our identity as a nation. Angkor continues to contribute to Cambodia's evolution.**

### **APSARA**



View towards the southeast corner of Phnom Bakheng. (MS March 2005)



View from the North Trail to the West Baray, c1010. The West Melbon temple, which stood in the middle of the reservoir, has almost entirely disappeared. The artificial island which the West Melbon was constructed on is visible in this view. (ME Dec. 2005)

**Phnom Bakheng provides rare physical glimpses and views – a chronicle of Khmer history, due to its physical location enabling views over the ancient Angkor city.**

### **16.3 Historical Value**

Historical values are at the root of the very notion of heritage. The capacity of a site to convey, embody, or stimulate a relation or reaction to the past is part of the fundamental nature and meaning of heritage objects. Historical value can accrue in several ways: from the heritage material's age, from its association with people or events, from its rarity and/or uniqueness, from its technological qualities, or from its archival/documentary potential.<sup>63</sup>

Assessing historic value involves considering whether a place is significant because it demonstrates part customs, philosophies or systems which are important in understanding historical evolution. The item or place may be associated with a significant historic event and/or it may have the ability to demonstrate overlays of patterns of human use and occupation.

A place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may also have historic value as the site of an important event. For any given place the significance will be greater where evidence of the association or event survives in situ, or where the settings are substantially intact, than where it has been changed or evidence does not survive.

**16.3.1** Phnom Bakheng is a dramatic expression of the genius of the Khmer people and their king Yasovarman. Yasovarman named his new city Yasodharapura, which remained the official name of the capital until the end of the Angkor period. At the center of Yasovarman's city was the hill, Phnom Bakheng.

**16.3.2** During the reign of Yasovarman (890 – 921) the Khmer Empire encompassed much of Southeast Asia. Phnom Bakheng marked this transition point when the Khmer Empire dominated the region in the 10th to 15th centuries.

**16.3.3** Phnom Bakheng provides rare physical glimpses and views – a chronicle of Khmer history, due to its physical location enabling views over the ancient Angkor city.

**16.3.4** Phnom Bakheng is the temple at the center of the 'first Angkor city' – Yasodharapura, arising from, associated with and representing the Khmer culture, which successive kings followed to build overlaying settlements throughout 10th to 15th century.

#### **16.4 Aesthetic Value**

Aesthetic value includes aspects of sensory perception for which criteria can and should be stated. Such criteria may include consideration of the form, scale, color, texture and material of the fabric; the smells and sounds associated with the place and its use.

The many interpretations of beauty, of the sublime, or ruins, and of the quality of formal relationships considered more broadly have long been among the most important criteria for labeling things and places as heritage. The design and evolution of a building or site can be another source of aesthetic value. It is also argued that the category of aesthetic can be interpreted more widely to encompass all the senses: smell, sound and feeling, as well as sight. Thus, a heritage site could be seen as valuable for the sensory experience it offers.

Assessing aesthetic values involves considering whether items have distinctive aesthetic attributes that are held in esteem by the community, or demonstrative of creative or technical excellence, innovation or achievement.

**16.4.1** Khmer culture dominated much of Southeast Asia for least 900 years. Phnom Bakheng is the only place in Angkor in which to obtain an overall view; the visual qualities of all aspects of the morphological process that have taken place in Angkor within this landscape setting.

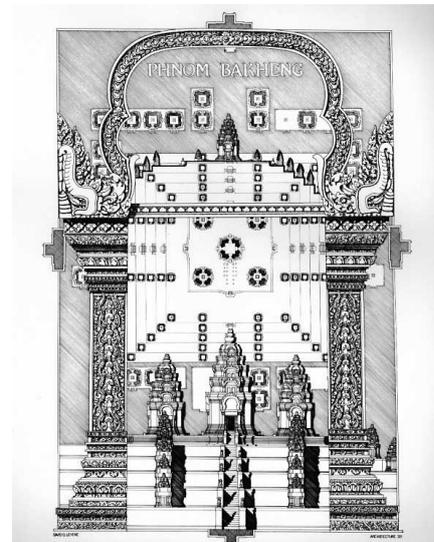
**16.4.2** The resulting expression of ideas in architecture and art at Phnom Bakheng were a unique fusion of indigenous natural symbols, religious inspiration and technical prowess which set the standard for the following centuries and influenced aesthetic developments at Angkor

**16.4.3** Phnom Bakheng represents a key evolutionary stage of Khmer art and architecture, known as the Bakheng style.

**16.4.4** It represents a masterpiece of human creative genius for the high quality of its artistic work and the integration of its symbolic form with the natural landscape to create a physical manifestation of a Hindu cosmological template of the perfect universe.

**Angkor is not orchestral; it is monumental. It is an epic poem which makes its effect, like the Odyssey and like Paradise Lost, by the grandeur of its structure as well as by the beauty of the details. An epic in rectangular forms imposed upon the Cambodian jungle.**

**Arnold J. Toynbee**



Aesthetic value refers to a wide range of qualities as represented in this drawing. The artist inspired by Bakheng's aesthetic qualities analyzed and expressed Bakheng through selection and composition of various views at a variety of scales. It includes plan, section, elevation, and detail views. (David Levine)

### 16.5 Scientific Value



Extensive EFEO archival records of conservation efforts undertaken by EFEO in the early 20th century, provides a chronicle of outstanding research potential. (EFEO 1948)



This view taken from a similar vantage point to the EFEO photograph above allows a comparative analysis of changes to the physical fabric, for example – it can be observed that the stone capping on the northeast temple on the 5th platform is absent. (KK Dec 2004)

The scientific value of a heritage site refers to the history of scientific and technological development and derives from the plan and design, including the selection and layout of a site, response to threats of disaster and architectural form and structural design; construction, materials, and techniques and the level of scientific and technological achievement they represent for their time, or their importance as a link in the development of science and technology.

Scientific significance is embodied in the fabric of a place and in associated records, and it is often the combination of documents and physical evidence which provides the key to unravelling a complex story.

The scientific or research value of a place will depend upon the importance of the data involved, on its rarity, quality or representativeness, and on the degree to which the place may contribute further substantial information.

**16.5.1** The originality of the hydraulic system of Angkor is incontestable and is an integral part of the religious landscape. Yasovarman built the Eastern Baray and rerouted the Seam Reap river to fill the *baray* so as to have a sufficient supply of water throughout the alternating wet and dry seasons.

**16.5.2** Phnom Bakheng contains a rare physical record of the large scale conservation works spanning 100 years being undertaken at Angkor by the international community throughout the 20th century to present, which is a testament to the history of technical development in conservation and the development of conservation methodology.

**16.5.3** The Phnom Bakheng site, including landscape and archaeological features, in conjunction with the extensive EFEO and other documentary records, provides a physical chronicle of outstanding research potential, which illustrates both former uses and changing use over time.

**16.5.4** The nature and extent of archaeological resources at the Phnom Bakheng site provides an outstanding opportunity for investigation and interpretation of the birth of the Classical Angkor period.

## 16.6 Social Value

The concept of social value follows closely the notion of “social capital,” a widely used concept in the social sciences and development fields. The social values of heritage enable and facilitate social connections, networks, and other relations in a broad sense. The social values of a heritage site might include the use of the site for social gatherings such as celebrations (Cambodian New Year), markets, picnics, or bush walks – activities that do not necessarily capitalize directly on the historical values of the site but rather on the public space, shared-space qualities.

Social value embraces the qualities for which a place has become a focus of spiritual, political, national or other cultural sentiment to a majority or minority group.<sup>64</sup>

Assessing social significance involves identifying and consulting with communities or groups of people to understand their social or cultural association with a place; to appreciate its significance to them; and to understand whether significance resides in the fabric of the place, or in other aspects such as its use or accessibility.<sup>65</sup>

**16.6.1** The significance of Phnom Bakheng is linked not just to physical artifacts and the way we perceive them, but to the way the buildings and spaces are, through traditional celebrations such as Cambodian New Year lasting from April 13 through 15 used.

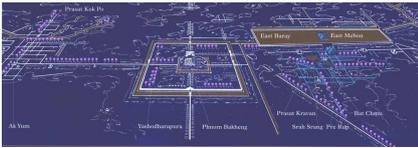
**16.6.2** Phnom Bakheng is one of the key tourist attractions of Angkor. It is a place of interest, inspiration and beauty. As the focus for sunset and monument viewing, it is important that people are able to come to see and experience at first hand the important temple landscape of Angkor from this rare vantage point in Angkor Park including at sunset viewing times.

**Significant associations between people and a place should be respected, retained and not obscured. Opportunities for the interpretation, commemoration and celebration of these associations should be investigated and implemented.**



**Khmer people are drawn to Angkor to celebrate significant events in their life or National Holidays such as Cambodian New Year.**

**In traditional dress two Cambodians celebrate marriage at Angkor. (ME March 2005)**



An artist's impression of what the symbolic form of Phnom Bakheng may have resembled in 907 AD.

Note the outer moat around Phnom Bakheng, the concept of the Goloupura, which has subsequently been refuted.

The distinctive 'L' shaped moat (see Figure 5 Aerial survey of Phnom Bakheng and Angkor) was once believed to be part of this larger square shape moat system enclosing Yasovarman's city Yasodharapura with Phnom Bakheng at its center, known as the Goloupura.



Khmer monk atop Bakheng temple for sunset viewing, enjoying and valuing the setting and view towards Angkor Vat. (ME Dec. 2005)

**"Inspirational landscapes are landscapes that evoke a response – awe, excitement, creativity, action, reflection, or curiosity.**

**They are the landscapes that people celebrate and reflect on, and their meanings and symbolism are frequently expressed through art – in painting, photography, music, performance, poetry or literature.**

**They are the landscapes we take pleasure in and enjoy exploring, that people take action to protect.**

**And most of all, they are the landscapes that give meaning and spiritual connection."**

**Australian Heritage Commission**

## 16.7 Spiritual Value

Heritage sites are sometimes associated or imbued with religious or other sacred meaning. These spiritual values can emanate from the beliefs and teachings of organized religion, but they can also encompass secular experiences of wonder and awe<sup>66</sup> such as inspirational landscapes.

16.7.1 Angkor with its matrix of built features is symbolic of the Khmer religiosity and now emblematic of the Cambodian national identity. Phnom Bakheng forms an integral part of this Angkorian landscape glorified by its position and prominence over the surrounding landscape.

16.7.2 The cultural significance of Phnom Bakheng as a whole is provided by not only the survival of the temple-complex, but by the unique integration of its symbolic form with the natural landscape.

16.7.3 Phnom Bakheng provides an outstanding and rare vantage point of looking beyond the ensemble of built elements and seeing a whole landscape deriving from religious observance, Hinduism in this case, yet simultaneously being an expression of religiosity.

16.7.4 Phnom Bakheng provides an outstanding and rare view of the inspirational landscape of Angkor.

16.7.5 Hinduism is one of the great religions and oldest belief systems in the world. For 2000 years its ideas held sway, gave form to and founded the basis of civilization in Southeast Asia, influencing all aspects of socio-economic and political life. The Angkor and Phnom Bakheng landscape provides evidence of how one of the great Hindu-influenced cultures of the region transformed their environment, engineering its landscape to conform to the template of the perfect universe prescribed by their belief system.

### *assessment of significance*

**16.8 Levels of Significance**

The Statement of Significance explains the general nature of the significance of Phnom Bakheng. The assessment of levels of significance below helps justify a flexible approach to the treatment of the place: the greater the significance the greater the need for careful decision making. The corollary is also valid: the lesser the significance the more free may be its treatment – always provided that aspects of greater significance remain undamaged.

As these assessments are made without regard to management and conservation issues, there is no formal link between the level of significance and the subsequent policies. Significance is, however, the most important of the factors to be considered when developing policies.

The hierarchy of levels chosen for Phnom Bakheng is best explained by a four-rung ladder. The top rung (A) is for items of exceptional significance in a broad context, any loss would be detrimental to Angkor as a whole and it's World Heritage Listing. The next rung (B) contains items of considerable significance which warrant inclusion for its national contribution. The second rung from the bottom (C) contains the threshold for items of significance that contribute to the items significance. A capital letter indicates the level of significance of a major element or aspect (for example, the Stepped Pyramid: A) and a lower case letter shows the level of an item within it or component of it (main shrine: a).

Where a range of significance is provide (*phnom* trees b – d), individual assessment will be undertaken, with supplementary data provided in the Action Plans. In this case, the supplementary data will be provided in the Landscape Plan.

Levels of Significance		
A	<b>Exceptional</b>	<ul style="list-style-type: none"> <li>▪ Bakheng temple-complex</li> <li>▪ Hydraulic features</li> <li>▪ View to and from Angkor Wat, Angkor Thom and Baksei Chamrong</li> </ul>
B	<b>High</b>	<ul style="list-style-type: none"> <li>▪ North and South Trails</li> <li>▪ Displaced stones</li> </ul>
C	<b>Medium</b>	<ul style="list-style-type: none"> <li>▪ Elephant rides,</li> </ul>
D	<b>Low</b>	<ul style="list-style-type: none"> <li>▪ Police Station</li> <li>▪ Elephant Station</li> </ul>

**Figure 20 Levels of Significance**

Assessment of levels of significance in the schedule have been made on the basis of the independent value of the element in question, tempered by consideration of the degree to which the element tends to reinforce or reduce the significance of the whole. For, example, some items are visually intrusive and damage the character and spatial quality of the space. They are identified in the schedule as intrusive (int.) the vendor stores on the eastern approach, the police station on the Phnom. Intrusiveness and significance are not always mutually exclusive, occasionally a structure may be both intrusive and of significance.<sup>67</sup>

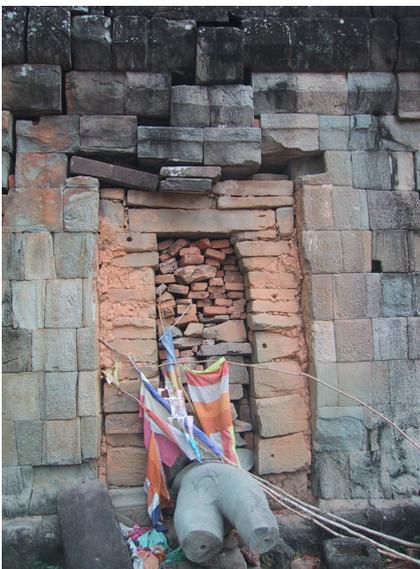
16.9 Schedule of levels of Significance



Aerial view of Angkor showing in part, the topographical setting around Phnom Bakheng. (NASA)

- Topographical setting** **A**
- Unencumbered exposure within Angkor Park, permitting view to Phnom Bakheng from neighboring *phnom*s (hills), Angkor Wat and Western Baray a
  - Its setting provides visitors with panoramic views, including sunrise and sunset a
  - View to and from Angkor Wat a
  - View to and from Angkor Thom's moat a
  - Views along the *phnom* cardinal directions i.e. the *phnom* axial stairs a
  - Hydraulic features, e.g. moat, East Baray a
  - Views to and from Baksei Chamrong b
  - Views to Phnom Bok and Phnom Krom b
  - Views to the West Baray b
  - General vistas progressively or suddenly enlarging to views, from the North and South Trail b - c

- Area 1: Phnom Bakheng Temple Pyramid** **A**
- Bakheng Temple including; Stone Steps, Buttresses and Lion Statues, Sandstone Shrines and the Towers of the Quincunx a
  - Bakheng's distinctive form a
  - Displaced stones a - b
  - Conservation interventions c - d int
  - Rubbish Bins d
  - Signage d
  - Emergency stabilization measures int



A part of the makeshift shrine is inserted in the east door opening of the south library. The remnants of the shrine are intruding of the form and scale of the library (MS March 2005)

- Area 2: Plateau** **A**
- Brick Shrines a
  - Ceremonial Access Route a
  - Libraries a
  - Enclosure wall a
  - Nandi Bull Statue a
  - Remains of a stone building a
  - Dispersed Stone Artifacts a - b
  - Earth mound and archaeological contents a - d (int)
  - Buddha Footprint b
  - Conservation repair c
  - Makeshift shrine b (int)
  - Vietnamese pagoda over Buddha Footprint c (int)
  - Trees c - d (int)
  - Heritage Police Station d
  - Heritage Police Station antenna int
  - Emergency stabilization measures int
  - Elephant Station int
  - Impediments to visitor vision towards key Angkor monuments int

assessment of significance

**Area 3: Natural Slope**

- *Phnom* axial stairs
- Lions and/on podiums
- Dispersed Stone Artifacts
- Woodland Habitat
- North and South Trail
- Trees
  
- Trail form
- Trail management features i.e. timber bridges and stairs
- Signage
- 'Beware of Elephant' signage

**Area 4: Historic Extent of Yasodharapura**

- Historic Approach Area
- Basksei Chamkrong
- Prasat Thma Bay Kaek
- Basksei Chamkrong Parkland
- Royal Scenic Road
- Signage
- Eastern Plaza or *Parvi*
- Location of Vehicle Parking Bay
- Traffic and parked vehicles at the base of the east axis
- Location of Elephant Station
- Seating/assemble area for the Elephant Station
- Location of Vendor Stores
- Rubbish bin located in the historic Approach Area
- Eskys (drink coolers) place on the historic Approach Area

A  
a  
a  
a – b  
b  
b  
b –  
d (int)  
c  
d  
d  
d int



View from the North Trail towards the Vendor Stores which are sited over the historic east cardinal direction. Note the intrusive elephant station to the left in the mid-ground. (KK Dec 2004)

A  
a  
a  
a  
b  
b int  
d  
int  
int  
int  
int  
int  
int  
int  
int



## PLANNING AND MANAGEMENT

### 17.0 EXISTING PLANNING AND MANAGEMENT FRAMEWORK

#### 17.1 World Heritage Listing

Cambodia currently has one site inscribed on the UNESCO World Heritage List: Angkor, which is one of the main archaeological sites of Southeast Asia.

#### 17.2 International Conventions

Cambodia is signatory to:

The UNESCO Convention for the Protection of Cultural Property in the Event of Armed Conflict (The Hague, 1954) and its Protocol: ratified by Cambodia in 1962.

The UNESCO Convention on the means of Prohibiting the Illicit Import, Export and Transfer of Ownership of Cultural Property (Paris, 1970): ratified by Cambodia in 1972.

The UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention, Paris, 1972): ratified by Cambodia in 1991.

UNIDROIT Convention on the International Return of Stolen or Illegally Exported Cultural Objects: Cambodia was one of the original signatories to this convention in Rome in 1995.

#### 17.3 Royal Decrees and Laws

There are three major royal decrees and one law protecting the cultural heritage of Angkor:

- Royal Decree establishing APSARA
- Second additional Royal Decree, 1998
- Royal Decree establishing Protected Cultural Zones
- Law on the Protection of Cultural Heritage

#### 17.4 ZEMP

In 1993 UNESCO undertook to assist the government with the creation of a Zoning and Environmental Management Plan (ZEMP). The ZEMP for Siem Reap/Angkor was unique in the management of cultural heritage, in that it acknowledged the long term protection of Angkor is linked to the sustainable development of the surrounding areas. The ZEMP recognized that to conserve the archaeological resources Angkor offered, the population residing in and around the World Heritage sites needed opportunities to improve their quality of life and alleviate poverty. Tourism and its flow-on industries was acknowledged as being able to achieve this and, thus, the ZEMP encouraged this 'appropriate' tourism to assist in the conservation of the archaeological resources.<sup>88</sup>

The central outcome from the ZEMP was a series of five zones, based around the "buffer zone" concept employed in many world heritage sites.

**The impact of proposed changes on the cultural significance of a place should be analysed with reference to the statement of significance and policy for managing the place. It may be necessary to modify proposed changes following analysis to better retain cultural significance.**

**Burra Charter, Article 27.1**

These five zones are:

- Zone 1: Monumental Sites;
- Zone 2: Protected Archaeological Reserves;
- Zone 3: Protected Cultural Landscapes;
- Zone 4: Sites of Archaeological, Anthropological or Historic Interest
- Zone 5: The socio-economic and cultural development zone of the Siem Reap/Angkor region

Each of the zones was assigned a different level of protection, permitting different levels of modern development and activity. Zone 1 has the highest level of protection, containing the Monuments listed on the World Heritage List, including Phnom Bakheng.

This management plan is outdated in parts, significant research had occurred since 1993. There are errors in part, notably historical.

Hierarchically the ZEMP is overarching this document, although the APSARA Authority should be consulted to determine which aspects have been superseded.

## **18.0 MANAGEMENT PLANNING**

### **18.1 General**

**18.1.1** An optimal planning team to be comprised of APSARA Authority personnel, consultant and community members and an APSARA Authority project manager with cross-departmental access and authority.

**18.1.2** Protection and management of Phnom Bakheng should ensure that the *outstanding universal value*, the conditions of integrity and/or authenticity at the time of inscription are maintained or enhanced in the future.

**18.1.3** Effective management involves a cycle of long-term and day-to-day actions to protect, conserve and present Phnom Bakheng. Moreover, in the context of the implementation of the Convention, the World Heritage Committee has established a process of Reactive Monitoring.

**18.1.4** Good management planning requires:

- a thorough shared understanding of the property by all stakeholders;
- a cycle of planning, implementation, monitoring, evaluation and feedback;
- the involvement of partners and stakeholders;
- the allocation of necessary resources;
- capacity-building; and
- an accountable, transparent description of how the management system functions.

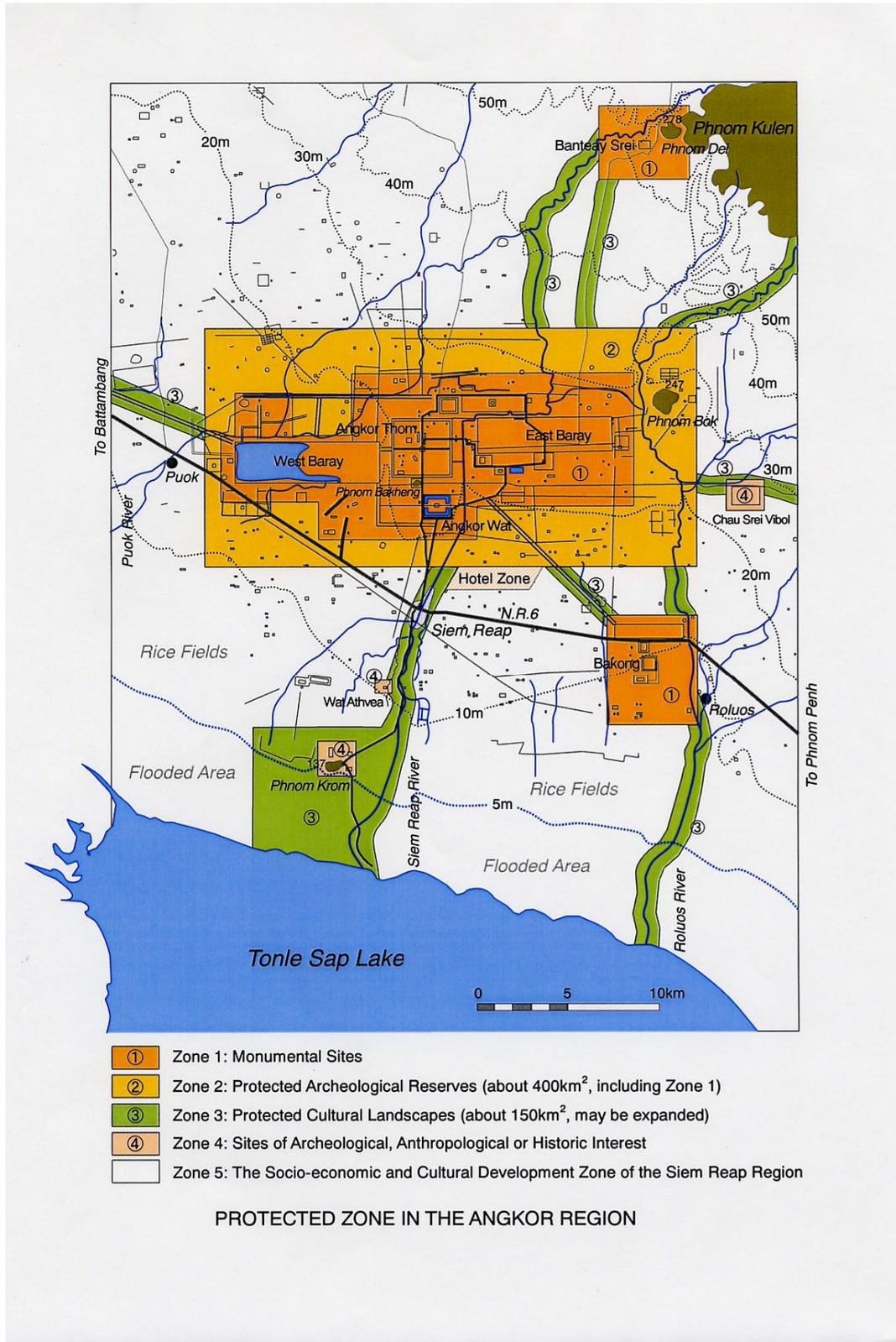


Figure 21 Protected Zones identified in the ZEMP report (APSARA)

## **18.2 Assurances of Authenticity and Integrity**

**18.2.1** Extant remains of moats, Approach Platform and historic urban planning are strong surviving features of the Yasodharapura landscape, accompanied by the distinctive settlement topography of successive Khmer kings. The future continuity of authenticity and integrity can be assured through a comprehensive framework of management planning, coupled with active research into, and management of, Khmer remains which will ensure a high degree of archaeological survival of this well preserved landscape.

**18.2.2** Exceptional records remain of the early 20th century conservation efforts. The future continuity of authenticity and integrity can be assured through a comprehensive cataloguing of these records.

## **18.3 Maintenance and Monitoring**

**18.3.1** Maintenance means continuous protective care of the fabric and setting.

**18.3.2** It is good practice, for asset management and for conservation, to schedule maintenance in an ongoing cyclical program. The needs of conservation should be integral to the program, not an extra. Regular maintenance can reduce the need for repairs later on.

**18.3.3** Routine maintenance is the most basic and important means of conservation. A routine maintenance program is to be established to carry out regular monitoring, to identify and eliminate potential threats, and to repair minor deterioration.

**18.3.4** Routine maintenance is a preventive measure to reduce damage from the cumulative effects of natural processes and human actions.

**18.3.5** Routine maintenance includes work on the site itself, any ancillary protective installations, and related physical interventions to the setting.

**18.3.6** Maintenance of areas susceptible to damage or disaster is particularly important. Monitoring should be integrated with maintenance.

**18.3.7** An appropriate maintenance program, which includes continuous monitoring of potential problems and archiving of records, must be established and carried out in accordance with the relevant standards.<sup>69</sup>

**18.3.8** Appropriate maintenance procedures will be developed, documented and implemented to ensure the ongoing long-term maintenance of the built elements of the site.

**18.3.9** Ongoing monitoring is a basic conservation tool for the Phnom Bakheng Site, which will provide information needed for management decisions. A program of regular monitoring will be instigated. The monitoring program will focus on identification and measurement of indicators which provide useful data that is easily gathered.

**18.3.10** It is important that those proposing such works assess the long term requirement and cost of maintenance, and can demonstrate that such work can be sustained economically.



**Maintenance work being carried out by HCC to remove weeds from the base of a brick shrine on the south side of Bakheng pyramid. (ME March 2005)**

**18.4 Action Plans Process, Content and Procedures**

18.4.1 The Action Plans are integral to the success of the Phnom Bakheng site planning structure proposed in this CMP.

18.4.2 As required Action Plans must include management planning components that:

- make explicit all the implications of the statement of significance;
- be acceptable to all the owners or authorities who control the resource;
- provide for maintenance and monitoring;
- provide a long-term management framework; and
- be flexible to allow for an even facilitate review, improvement or alteration.

18.4.3 The process for preparation and adoption of Action Plans should be 'inclusive' so as to foster ownership, involvement and strong support for their implementation.

18.4.4 As a matter of cost effectiveness and staff resource availability, it may be relevant to use external expertise in the preparation of Action Plans. However, if this occurs, there must be a high level of internal staff involvement, so that the resulting documents are oriented to day-to-day management needs and cover relevant operational requirements. An opportunity should be provided for comment/contributions from interested stakeholders during the preparation of Action Plans.

18.4.5 The chart below provides an indicative outline of the structure and content of a generic Action Plan

Process	Content
<b>Define Resource</b>	Identification of Resource <ul style="list-style-type: none"> <li>▪ Schedule of Elements</li> <li>▪ Plans/photographs/illustrations</li> <li>▪ Descriptive Text</li> </ul>
<b>Identify Values</b>	Significance <ul style="list-style-type: none"> <li>▪ Statement of Significance for physical elements</li> <li>▪ Relevance or contribution for non-places (eg 'Research or Interpretation)</li> <li>▪ Identify specific values</li> </ul>
<b>Analyse Issues</b>	Issues Analysis <ul style="list-style-type: none"> <li>▪ Requirements or needs arising from significance</li> <li>▪ Existing situation (condition/nature of resource/current program)</li> <li>▪ Statutory obligations</li> <li>▪ APSARA Authority's policies and requirements.</li> <li>▪ Objectives</li> </ul>
<b>Determine Strategy</b>	Strategy <ul style="list-style-type: none"> <li>▪ General policy (reproduced from this CMP)</li> <li>▪ Specific discipline-based policies</li> <li>▪ Strategies (discipline-based, for example:                             <ul style="list-style-type: none"> <li>- archaeology = research framework/physical. conservation/procedures/excavation/analysis etc.</li> <li>- interpretation = themes/devices/messages. media/printed material.</li> </ul> </li> </ul>

## **18.5 Work Procedures**

**18.5.1** An important element in the implementation of a Conservation Policy provided by this CMP is a preparation of a series of Work Procedures.

**18.5.2** To assist in understanding how these procedures will work, two example documents, covering 'Trees' and 'Trails' have been prepared and are provided on the following pages.

**18.5.3** For the Work Procedures to be effective, it is essential that they are prepared by the people on site who will use them and have existing knowledge. This can be achieved most effectively through facilitated workshop sessions.

**18.5.4** The preparation of Works Procedures is afforded a high priority, as this is an effective means to document existing personal knowledge, for the ongoing benefit of the place.



<b>PHNOM BAKHENG LANDSCAPE PLAN: Work Procedures</b>	<h1 style="color: green; text-align: center;">TRAILS</h1>
<p><b>Polices:</b></p> <ul style="list-style-type: none"> <li>▪ Original trails will be retained and conserved in their original location.</li> <li>▪ Original trails fabric will be retained and conserved, wherever possible.</li> <li>▪ Trails location should reflect conservation needs, rather than just desire lines.</li> <li>▪ Trails should be constructed in original/traditional fabric wherever possible, but alternative fabric may be used if required for operational reasons.</li> <li>▪ Trail's fabric should have the following attributes: not loose, correct color, correct texture, weather resistant, available to site, hardwearing and durable where practical.</li> <li>▪ Maintenance of trails shall not use toxic chemicals. Such as synthetic fertilizers, herbicides or pesticides.</li> </ul>	
<p><b>Methods:</b></p> <p><b>Maintenance:</b></p> <ul style="list-style-type: none"> <li>▪ All trails will be regularly inspected.</li> <li>▪ For gravel trails: <ul style="list-style-type: none"> <li>- potholes will be filled and pavement will be compacted;</li> <li>- remove silt and debris deposited after rain, and topping-up the sand and gravel surface; and regular trimming of vegetation alongside;</li> <li>- associated drains will be repaired and made good; and</li> <li>- gravel surface will be replaced;</li> </ul> </li> <li>▪ For timber trails: <ul style="list-style-type: none"> <li>- defective timbers will be replaced;</li> <li>- trails will be closed off, if unsuitable for visitor or staff use</li> </ul> </li> <li>▪ Hard surfaces will be monitored: <ul style="list-style-type: none"> <li>- repaired using mixes of appropriate performances and color; and</li> <li>- trail tested before large areas are laid.</li> </ul> </li> </ul> <p><b>New Paths:</b></p> <ul style="list-style-type: none"> <li>▪ The need for new trails and location of new trails will be determined by the APSARA Authority.</li> <li>▪ New trail decisions will have regard to need and impact – conservation/ archaeology /design/works.</li> <li>▪ New trails will be laid out on site, for comment and feedback, prior to construction.</li> <li>▪ Where practical, a test area will be laid out for review before construction.</li> <li>▪ All personal involved in construction will be briefed about relevant archaeological and heritage issues.</li> <li>▪ Material used will be based upon assessment of need/performance/impact.</li> </ul>	
<p><b>Procedure Adopted:</b></p> <ul style="list-style-type: none"> <li>▪ Fortnightly inspection of all trails.</li> <li>▪ Additional inspection following heavy storms.</li> <li>▪ Three to six-month resurfacing, as required.</li> <li>▪ Emergency repairs, as required.</li> </ul>	<p><b>Contacts:</b></p> <p><b>Buildings and Works Supervisor:</b></p> <ul style="list-style-type: none"> <li>▪ Business hours [insert telephone no.].</li> <li>▪ After hours</li> </ul> <p><b>Routine Maintenance Officer :</b></p> <ul style="list-style-type: none"> <li>▪ Business hours [insert telephone no.].</li> </ul>



<b>PHNOM BAKHENG LANDSCAPE PLAN: Work Procedures</b>	<b>TREES</b>
<p><b>Polices:</b></p> <ul style="list-style-type: none"> <li>▪ Trees will be retained, conserved and maintained.</li> <li>▪ Priority will be given to requirements for staff and public safety.</li> <li>▪ Significance of individual trees will be taken into in management decisions.</li> <li>▪ Weed species will be removed, wherever possible, although individually significant specimens may be retained.</li> <li>▪ Trees which block significant view lines will be removed or vistas through the canopy created by selective pruning. No topping permitted.</li> <li>▪ Decisions regarding management actions will be made on the basis of assessment of each tree.</li> <li>▪ New tree planting will be species endemic to Angkor.</li> </ul>	
<p><b>Methods:</b></p> <p><b>Removal and Pruning:</b></p> <ul style="list-style-type: none"> <li>▪ Tree removal will be determined by the Department of Water and Forests in consultation with other APSARA Authority Staff.</li> <li>▪ Appropriate and relevant methods will be determined and equipment and safety needs will be assessed.</li> <li>▪ Tree removal will always be undertaken by at least two people and warning signs will always be placed.</li> <li>▪ Where possible, useful timber will be recovered and surplus timber will be gathered for use as firewood.</li> </ul> <p><b>Planting of New Trees:</b></p> <ul style="list-style-type: none"> <li>▪ Decisions about location and solution of new trees will be made by the Department of Water and Forests, in consultation with other relevant APSARA Authority staff.</li> <li>▪ Wherever possible, new trees will be propagated on-site (using seeds or cuttings from the site or Angkor) and in relevant circumstances, mature specimens may be used.</li> <li>▪ Existing trees that need to be removed will be 'recycled' wherever possible.</li> <li>▪ All personnel will be briefed about surrounding area and historic fabric.</li> <li>▪ Archaeological potential and sensitivity will be assessed and archaeological input will be sought in sensitive areas.</li> <li>▪ Where trees are relocated this will, where possible, be done during the period when they are dormant.</li> </ul>	
<p><b>Routine:</b></p> <ul style="list-style-type: none"> <li>▪ Monthly inspection and additional inspection following storms and extreme weather.</li> <li>▪ Annual visit by tree surgeon for overview inspections.</li> <li>▪ 'Towers' and other major equipment will be used for additional work whilst on site, where possible.</li> </ul>	<p><b>Contacts:</b></p> <p><b>Landscape Supervisor:</b></p> <ul style="list-style-type: none"> <li>▪ Business hours [insert telephone no.].</li> <li>▪ After hours</li> </ul> <p><b>Routine Maintenance Officer :</b></p> <ul style="list-style-type: none"> <li>▪ Business hours [insert telephone no.].</li> </ul>

## 18.6 Documentation and Detailed Conditions Survey

A thorough understanding of the temple-complex and site is necessary to be able to undertake conservation within the principles established by the Venice Charter. The Burra Charter, builds upon the Venice Charter by placing understanding at the heart of conservation. Article 6 of the charter states that 'the cultural significance of a place is best understood by a sequences of collecting and analyzing information before making decisions.'<sup>70</sup>

**18.6.1** The necessary detailed survey and analysis of the fabric should normally take the form of a set of plans and elevations capable of resolution at an appropriate scale (usually at least 1:20 or 1:50) identifying surviving masonry or built elements. Those drawings should be analyzed to identify all previous phases of alteration. A short report should be prepared to accompany the drawings, placing that detailed analysis in the context of the overall understanding of the site and its significance, set out in the CMP.

**18.6.2** These drawings should be used as a basis for a set of drawings explaining what is proposed, which will clearly identify the relationship between existing remains and what is proposed

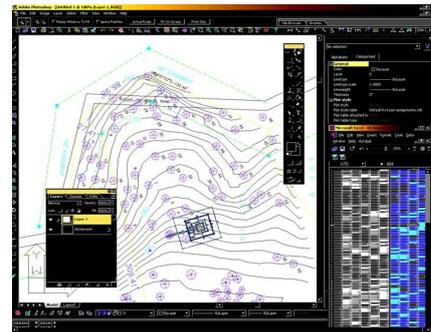
**18.6.3** The drawings should be accompanied by a method statement and specification for work. The method statement should explain what measures will be taken to protect the existing remains during work, as well as details of the materials and techniques to be used in the new work.

**18.6.4** The method statement should also explain what arrangements will be made for the ongoing analysis of the structure during work, and for the creation of a proper record of the research, analysis, investigation and work. It is likely that an archaeologist or material conservation specialist will need to be part of the team supervising the work. The role of this specialist will be to update the base drawings as new information is revealed, and to feed the results of their analysis into the day to day decision making process. At the end of the work undertaken, they should prepare a final report detailing what has been found and the work undertaken. This will in turn feed into future revisions of the CMP and Action Plans.

## 18.7 Photogrammetry

**18.7.1** Photogrammetry is used in different fields, such as topographic mapping, architecture, engineering, and geology, as well as by archaeologists to quickly produce plans of large or complex sites.

**18.7.2** Photogrammetry can assist in setting out knowledge about the temple-complex and the site in a systematic way making it possible to make informed and appropriate decisions about proposals for change.



ID	Name	Area	Volume	Material	Notes
1	...	...	...	...	...
2	...	...	...	...	...
3	...	...	...	...	...
4	...	...	...	...	...
5	...	...	...	...	...
6	...	...	...	...	...
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9	...	...	...	...	...
10	...	...	...	...	...



**The organization and management of multidisciplinary cultural resource spatial & attribute data (e.g. graphics, photographs, texts & inventories) will aid in project organization, research, analysis, conservation and implementation. (DF Dec. 2004)**

**Existing fabric, use, associations and meanings should be adequately recorded before any changes are made to the place.**

**Burra Charter, Article 27.2**

## **19.0 MANAGEMENT ISSUES**

### **19.1 Pressures on the site's values and significance**

**19.1.1** There are a number of management issues which need to be addressed if the values for which the site was inscribed are to be safeguarded for future generations. It is important to understand the ways in which the issues closely interrelate and how they may pose threats, both to the outstanding values and the appreciation of those values.

**19.1.2** The maintenance of the architectural significance depends on good conservation practice but poor visitor experience, which is dominated by noisy traffic, congested trails and inadequate orientation, will mean that the architectural significant cultural landscape cannot be appreciated to the full.

**19.1.3** The appreciation of the symbolic significance, which depends so much on the setting of the site, the views to key built elements and the dignity of the area, would be undermined by development, which did not respect these qualities in the WHS.

**19.1.4** Conflicts between competing priorities are most likely to arise when a site and its surroundings are not administered to take into consideration the impacts both now and anticipated, which can lead to loss of cultural heritage and values. Phnom Bakheng like many other temple complexes at Angkor is experiencing pressures from tourism and the environment, mainly rain.

**19.1.5** The issues are how to manage and balance both touristic interests and archaeological research and restoration needs, with the socio-economic needs of the Cambodian people.

Situations identified for improvement and/or conservation include:

- Scenic Royal Road re-route and/or restoration;
- Improve landscape entrance and eastern parking area;
- Traffic and visitor redirection;
- Relocate Vendor Market;
- Provide an interpretive gateway pavilion;
- Protection of the historic Approach Platform;
- Provide interpretive kiosk and platform at the North Path;
- Way-finding signs and directional maps;
- Provide interpretive signage along trails and viewing areas;
- Provide safety and solar lighting improvements;
- Provide new plantings, landscape enhancements, viewpoint clearings and vegetation management;
- Protection of all archaeological zones identified;
- Controlled access to the monument: lightweight demountable metal and/or wood western and northern stairs, with railings;
- Protection of restoration and archaeological zones;
- Provide a sunset viewing area to the west of the plateau;
- Provide belvederes and viewpoint clearing to the south and southeast portions of the plateau;
- Relocate both elephant stations to mitigate potential damage of historic fabric.

## **19.2 Hydrology**

The most complex hydrological issue associated with Phnom Bakheng is structural instability caused by infiltration storm water in the temple structure.

**19.2.1** The continuous infiltration of rainwater into the temple structure has resulted in decay of the laterite fill blocks which has contributed to the structural instability of the sandstone veneer walls. Centuries of abandonment, coupled with the encroachment of woody vegetation, has resulted in the displacement of many of the original well-fitting paving stones on the temple platforms. Additionally, many of the stones are missing, resulting in sizable gaps in the pavement. The net affect is that the temple surface, while once fairly to very impermeable, now readily accepts incident rainfall.

**19.2.2** This rainfall, about 1500 mm/year, mainly concentrated in the wet season, infiltrates directly into the temple structure and upon reaching the underlying impermeable bedrock is forced outward to the side walls and corners of the temple mountain structure. Long duration storms have the potential to surcharge the spaces between the free-standing walls and the bedrock, creating substantial hydraulic pressure on the lower tiers of the structure. While the hydraulic pressure is not capable of displacing the platform walls on its own, it serves as a constant stress to the structure by depositing material, which overtime has contributed to the partial collapse of the platform walls.

**19.2.3** In addition to the hydraulic pressure, this repeated saturated condition has led to marked deterioration of the laterite blocks used as dry-masonry fill material between the sandstone walls and the bedrock, mainly on the temple-complex corners. Consequently, areas of the temple-complex that contain large volumes of laterite blocks are largely in a state of structural distress.

**19.2.4** Yasodharapura developed in a complex relationship with the regions hydrology. Increasing tourism and regional economic development are impacting the regions hydrology. History and worldwide experience teach us that fluctuating hydrology will seriously threaten the built environment. Every effort will be made to retain and filter storm water on site in order to enhance the natural hydrologic system.

## **19.3 Erosion**

**19.3.1** Soil erosion undermines the stability of natural and manmade structures. It contributes to water pollution and impacts the health of humans and wildlife. Erosion at Phnom Bakheng is predominantly caused by uncontrolled water runoff, and vehicular and pedestrian traffic. The CMP seeks to develop a sustainable visitor infrastructure that enhances the sites conservation, interpretation and natural systems.



**View of the southwest corner of the Platform of the Quincunx in a monsoon downpour. (May 2005)**



**View of hydraulic erosion at the historic Approach Platform during a monsoon downpour. (ME Dec. 2005)**



View of a tree contributing to the displacement and destruction of the southern laterite enclosures wall. (ME May 2005)

A detailed survey and assessment of the site is required to ascertain which trees are threatening the historic fabric.



Tourists tend to respect and care for sites that provide authentic experiences, including indigenous people telling their own stories about their culture and land (JG Dec. 2005)

Shadow puppetry is an authentic method of telling folk tales and mythology.

#### **19.4 Landscape**

Many of the landscape management issues at Phnom Bakheng are also evident at several other temple sites within the Historic City of Angkor.

**19.4.1** Overgrown vegetation is threatening historic resources, diminishing site character and obscuring important views.

**19.4.2** Hydraulic erosion is threatening historic resources and diminishing site character.

**19.4.3** The preparation of a Landscape Plan which sets out vegetation management for the site, which integrates resource management, interpretation objectives and serves as an effective tool to guide management decisions and field operations is required. The APSARA Authority has begun implementing selective tree pruning to provide view corridors along the north trail.

**19.4.4** Creation of these views and vistas and the control of the form of the hill through vegetation management are paramount to the success of this Plan.

**19.4.5** Hazard tree assessment, stabilization and management.

**19.4.6** Capitalize on the existing North trail by investigating ways it can contribute positively to the site.

#### **19.5 Transport and Access**

**19.5.1** Physical access to Phnom Bakheng is important as the means whereby visitors can enjoy fully first-hand experience of the site without compromising its fabric, character or setting

#### **19.6 Interpretation and Tourism**

Cultural tourism is seen as offering opportunities to preserve and restore heritage properties around the world, and because of the economic benefits of tourism, many individual communities and national governments are developing properties for tourists.

Angkor is seen as an icon of Cambodia and as a potential driver in regeneration of the environment and economy, both because of its high level of international recognition and because of its significance as a tourist attraction. Its international fame has the power to attract visitors from all over the world and contributes therefore directly to the national economy.

However it is to the regional and local economy that the Angkor is most beneficial. It runs through a living working landscape of active communities which host a variety of trading markets provided primarily for local community and tourists.

A detailed understanding of the tourism industry needs to be at the heart of the heritage management and site presentation framework for Bakheng.

**19.6.1 Research:** thorough and accurate archaeological and historical research is vital for sustaining and presenting the layers of meaning of the site. Interpretive materials rely on accurate information to arouse visitor interest and to reinforce the message of the site as a location of meaning. Once visitors see the value of knowledge about the past that can be recovered from archaeological resources they are more inclined to promote conservation. Community involvement is crucial, providing local insight and information to the historical context.

**19.6.2 Involve the tourism industry:** effective marketing and communication with the tourism industry should be ongoing. A marketing plan for Phnom Bakheng should promote the site as more than sunset destination. Areas identified to focus on include a sunrise visit, public awareness of conservation activities, linking Phnom Bakheng to less-visited public sites, including Baksei Chamkrong and the Eastern Baray (to expand on a thematic visit, for example – ‘the tenth-century way’. Such a plan should be developed in consultation with tourism industry representatives and should include mechanisms for providing site closing and access restriction information in a timely fashion. Effective promotion ensures people visit the site; interpretation ensures they learn something about it. Guide training to be offered to Khmer tour guides on ways to interpret the site for diverse audiences using the most current research.

**19.6.3 Visitation Management:** tracking visitation numbers and controlling visitor-related damage to site is a primary challenge that has not, to date, been adequately met. A carrying capacity should be determined and heeded, including the identification of a numerical limit of people to be allowed on the temple platform.

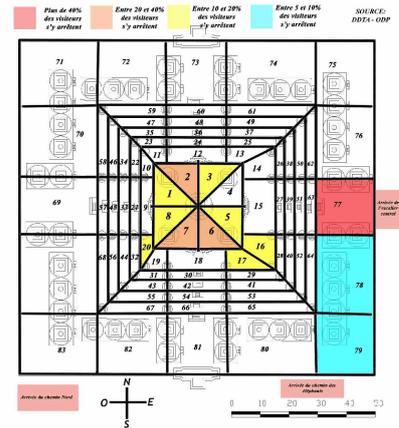
**19.6.4 Ongoing audience research:** determining the audience has ramifications for the entire project, including interpretation, management practices and possible need for future alterations or additions to the site. Interpretive materials can be tailored to the specific desires, needs and abilities of the audience. Explosive growth in Asian tourism demands in-depth study into diverse audience needs and expectations.

Develop strategies for testing and analyzing solutions for visitor flow and access with the APSARA Authority.

**19.6.5 Pressures on the significance of the symbolic fabric:** the setting and views: There has been a gradual loss of appreciation of the architecture and spaces resulting from the steadily increasing unmanaged tourist numbers. Most tourists are unaware of the significance of the site and temple, their primary goal is sunset viewing. The impact on the built elements has been catastrophic, particularly the primary route the tourists use, the east *phnom* stairs, which has resulted in near complete loss of fabric.

The pressures of increased tourist numbers on the sensitive fabric of the built elements present a conservation problem that must be considered as part of the normal conservation and maintenance arrangements. Tourist visitors impose wear and tear on the fabric, by direct physical contact, by casual vandalism or theft of fabric. Wear and tear is of particular concern in relation to sensitive built fabric, such as the fragile laterite stairs, clay bricks and unstable built elements. Examples of where visitor numbers exceed the trails and stairs capacities can be seen throughout the site. Phnom Bakheng has a particular challenge in that Angkor tourist numbers are expected to increase significantly in the near future.

Tourism at Angkor is a vital source of economic growth for Cambodia, but currently unmanaged tourism at sunset viewing is threatening and causing loss of cultural fabric within the landscape setting of Phnom Bakheng.



Initial studies by APSARA have analyzed visitor numbers and flows at Bakheng, which is shown in this zonal plan. (APSARA 2005)

Further studies are required to determine the carrying capacity, including the identification of a numerical limit of people to be allowed on the temple platform.



Tourists ascending Phnom Bakheng via the east axial phnom stairs for sunset viewing on top of Bakheng temple.

Note the loss of laterite stairs and one of the many organized tour buses that arrives between 5:00 PM and 5:30 PM for their customers to alight at the *parvi* near the base of Phnom Bakheng. (ME Dec. 2004)



Displaced temple stones are scattered over the temple, in parts the decorative stones have been arranged to prevent access to areas of the temple; note the shrine crown stone, bottom right. (KK Dec. 2004)

The arbitrary use and placement of the displaced shrine stones has contributed to visitors not respecting the temple structure and displaced stones.



View between Bakheng and the southern laterite wall; note the displaced temple stones throughout the site. (BW Dec. 2004)

**19.6.6 Seasonal Tourism:** the highly seasonal nature of tourist visits to Angkor, and the concentration of visitor activity at certain key points within Phnom Bakheng site, leads to a number of localized pressures. The Approach Platform and east axial stairs, the southeast corner of the pyramid and the base of the Platform of the Quincunx.

**19.6.7 Authentic experiences:** in the 21st century, the tourists place increasing importance on enjoying authentic experiences – authentic settings, objects and stories, and if possible a guide or storyteller who lives in the setting and owns the objects and stories. Therefore using local people to interpret their heritage is likely to lead to high visitor satisfaction. And respect of the historic fabric.

**19.6.8 Visitor behavior and impacts:** The natural and built resource cannot be effectively managed without taking account of visitor behaviors and impacts. In order to achieve the sustainable use of Phnom Bakheng and Angkor, equal management attention has to be focused on both resource issues and visitor activity.

## **19.7 Displaced Temple Stones**

**19.7.1** Protection and conservation of the displaced temple stones are central to the maintenance of the Site's values. They are non-renewable, and damage or loss can only be superficially repaired or replaced.

**19.7.2** The value of the displaced stones needs to be reinforced to abate the slow but continued removal of stones by local Khmer and tourists.

## CONSERVATION POLICY

### 20.0 CONSERVATION POLICY OBJECTIVES

The CMP should be reviewed periodically in order to evaluate its overall effectiveness and to draw lessons from the experience gained in the course of its implementation. If deficiencies are discovered or new circumstances arise, then the CMP should be revised accordingly.

Statements of significance and policy should be kept up to date by review and revision as necessary.

### 20.1 Introduction

20.1.1 The objectives set out below reflect the concerns and aspirations of all those organizations represented on the Team regarding the issues raised in the evaluation of the management issues of the site. The objectives flow from: an understanding of the 'living' and diverse nature of the component parts of the site as a place of tourism, trade, and education; from pressures on the *outstanding universal values* and significance of the site; understanding its opportunities, and from the vision for its future.

The cultural significance of a place and other issues affecting its future are best understood by a sequence of collecting analysing information before making decisions, Understanding cultural significance comes first, then development of policy and finally management of the place in accordance with policy.

20.1.2 The objectives begin with the overarching objective of the Master Plan. This is followed by objectives raised by the management issues and from the vision for the future which is to the benefit of all those who visit, worship, trade, learn and reside within the site. Some objectives, for example – those which address the need to safeguard the views to and from the site, reflect the need for further understanding of Phnom Bakheng before firm management proposals can be developed.

The policy for managing a place must be based on an understanding of its cultural significance.

### 20.2 The Objectives

#### THE OVERARCHING OBJECTIVES

##### Objective 1

To safeguard the *outstanding universal values* for which Angkor WHS was inscribed which are embodied in the historic built elements, spaces, monuments and archaeological deposits within the Phnom Bakheng Site.

Policy development should also include considerations of other factors affecting the future of a place such as the owner's needs, resources, external constraints and its physical condition.

Burra Charter, Article 6

##### Objective 2

The cultural landscape forms part of the site's setting, and contributes to its significance and should be integrated with its conservation.

##### Objective 3

The natural heritage landscape is the underpinning of the cultural landscape. Stewardship practices shall be grounded in sound science.

### 21.0 POLICY

Having determined the heritage significance of Phnom Bakheng, the next task is to investigate the best ways to manage, conserve and interpret this significance. This section examines the issues that affect the future management of the place, such as the requirements arising from the nature of significance, statutory issues, stakeholder concerns, and issues associated with the conservation of the monument and archaeological remains.

The authenticity concept is vital, because it is the only way to preserve scientifically the information needed to reconstruct our history and, thus, our identity – to lose the authenticity in the archeological site is to lose an important part of human history forever.



Permanent stabilization works are obscuring the form of Bakheng and diminishing its authenticity. (ME May 2005)

**Preservation is appropriate where the existing fabric or its condition constitutes evidence of cultural significance, or where insufficient evidence is available to allow other conservation processes to be carried out.**

#### **Burra Charter, Article 17**

**Preservation protects fabric without obscuring the evidence of its construction and use. The process should always be applied:**

- where the evidence of the fabric is of such significance that it should not be altered, for example – all fabric of the Khmer empire;
- where insufficient investigation has been carried out to permit policy decisions to be taken.

**New work, for example – stabilization may be carried out in association with preservation when its purpose is the physical protection of the fabric and when it does not distort or obscure the cultural significance of the place, or detract from its interpretation and appreciation.**

All cultural sites have to meet criteria of authenticity and in the case of cultural landscapes of their distinctive character and components; and to enjoy adequate legal, contractual or traditional protection (and nowadays, in effect, a management plan). It is also accepted that its contextual integrity is an essential quality of World Heritage cultural landscape.

Unsympathetic development around the site, or within its landscape, detrimental to the sites intrinsic qualities would, for example, be considered in World Heritage terms, to have diminished its authenticity.

It is essential that policy development reinforces and/or improves contextual integrity.

### **21.1 Authenticity**

21.1.1 A primary value of Phnom Bakheng is that it contains genuine physical, documentary and associational evidence covering Angkor's history. The physical and philosophical approach to any proposals for change, even regular maintenance, should at all times be founded on an overarching requirement that authenticity be maintained.

21.1.2 A key value of Phnom Bakheng and Angkor is the perception of it as an ancient city complex. Authenticity is therefore an important element in all management decisions or actions at Phnom Bakheng.

21.1.3 Authenticity also requires continuing respect for the original design and fabric of built elements, works and site. It follows that stabilization efforts both temporary and permanent should respect the form scale and materials at Phnom Bakheng.

21.1.4 Actions to suit other management agendas, such as tourism management or belvederes, may lead to loss of original features or alter the historic ambience of Phnom Bakheng. Such actions need to be preceded by a careful process to assess impacts.

21.1.5 Minor maintenance and repair operations can incrementally lead to major loss of significant features if undertaken without recognizing heritage values and the need to retain a patina of age.

21.1.6 Preservation of the surviving fabric and archaeological deposits is fundamental because such fabric is, in effect a historical document which should be capable of reappraisal by future scholars. Such preservation is an essential part of maintaining the authenticity and integrity of such sites.

21.1.7 The removal of later 'accretions' or changes to a site can damage a place either through the loss of historical information about how a place was constructed, used or altered through time (perhaps in association with significant events or people), or through loss of its aesthetic qualities.

21.1.8 It is also recognized that it is desirable on some occasions to make additions to a site or to an individual structure within a site. This can be for repair needs, for example – reinstatement of a missing stone element in order to improve structural integrity.

21.1.9 The concept of authenticity of material, design, and construction techniques is of paramount importance and has priority over other notions for monuments constructed of durable materials such as stone.<sup>71</sup>

#### **conservation policy**

21.1.10 The conservation of archeological sites requires the strictest use of the authenticity concept. Archaeological sites contain information and messages of our past that have not been fully deciphered, understood, classified and recorded in a secure manner so as to protect the interests of generations to come. No intervention ought to be allowed that alters the authenticity of the elements in such sites. In these cases, clearly, in doing so there is a danger of imposing foreign values.

## 21.2 Integrity

21.2.1 Integrity is best achieved by consolidating surviving site features as ruins.

21.2.2 A large number of displaced stone components of the main temple are piled up on the temple or throughout Area 2 and must be inventoried and analyzed to determine appropriate usage and placement, both for structural integrity and architectural and historical authenticity.

21.2.3 Integrity of the interconnections between the Angkor temples can be enriched through interpretation.

## 21.3 Setting

Conservation requires the retention of an appropriate visual setting, ecological and other relationships that contribute to the cultural significance of the place.

21.3.1 Two aspects of Phnom Bakheng make it an exceptional landscape monument: its form and its relationship to its setting. It follows that views and vistas to and from Phnom Bakheng identified are of high significance. It is important that they are taken into account in the design of any development with an actual or potential visual relationship with the temple mountain.

21.3.2 All agencies of government involved in planning the continued development of Angkor should give consideration to the creation, retention and recovery of views and vistas to and from Phnom Bakheng when considering proposals. These objectives should be progressively incorporated into any relevant development strategies.

21.3.3 The APSARA Authority should ensure that no erection in the area under its control interferes with any view or vista to or from Phnom Bakheng.

21.3.4 Management policy shouldn't prevent a range of lively performances, pageants and functions held for a specific occasion, for example, Cambodian New Year. It would, however, preclude the erection of temporary structures or tents so large that they obscured favorite views to or from Phnom Bakheng to the disappointment and disgruntlement of tourists. Tourists are an important part of the commercial lifeblood of Angkor. They should leave the site bearing an unspoilt memory and photographic record of their pilgrimage.

21.3.5 Based on research and investigation, a long-term plan for the setting should be implemented.

**Conservation requires the retention of an appropriate visual setting and other relationships that contribute to the cultural significance of the place.**

**New construction, demolition, intrusions or other changes which would adversely affect the setting or relationship are not appropriate.**

### Burra Charter, Article 8

Aspects of the visual setting may include use, setting, bulk, form, scale, character, color, texture and material.

Other relationships, such as historical connections, may contribute to interpretation, appreciation, enjoyment or experience of the place.



View of Angkor from the southeast corner of Phnom Bakheng's plateau. (ME March 2005)

**Maintaining and improving a visual relationship between Phnom Bakheng and other Angkor temples and built elements is important in understanding the development of Angkor. These relationships significantly contribute to Angkor's outstanding universal value.**

21.3.6 Aspects of a landscape that may reduce the values of a site should be addressed on a case-by-case basis through analysis and discussion among professionals; there should be no single, rigidly determined, and generally applied solution to deal with such problems.

## 21.4 Use

Where the use of a place if of cultural significance it should be retained.

### Burra Charter, Article 7.1

*The policy should identify a use or combination of uses or constraints on uses that retain the cultural significance of the place. New use of a place should involve minimal change, to significant fabric and use; should respect association and meanings; and where appropriate should provide for continuation of practices which contribute to the cultural significance of the place.*

Significant meanings, including spiritual values, of a place should be respected. Opportunities for the continuation or revival of these meanings should be investigated and implemented.

Sustainability remains the key to both the survival of World Heritage and its credibility. Conservation is by definition long term – not for a year or two, but forever.

### Francesco Bandarin

21.4.1 Use should first guarantee that the historic condition is not changed, that the physical remains are not damaged, and that there is no interference in managing conservation of the site.

21.4.2 The primary use of the Phnom Bakheng site is as a conserved national monument which is available and promoted to visitors. All other uses are subservient to this primary purpose.

21.4.3 Reestablishment of former/traditional site uses will be encouraged, where consistent with other policies.

21.4.4 The use of individual elements within the site will be compatible with the significance of the site itself and with the significance of individual elements.

21.4.5 Site elements of significance may be used for other operational purposes, provided that these uses are not in conflict with the significance of the site or the individual elements.

21.4.6 Use of site elements for commercial purposes may occur where these purposes are not in conflict with the significance of the site, the significance of the elements concerned or with the site interpretation. Physical alterations to significant fabric must not occur simply to suit commercial activities

21.4.7 Proposals for change of use to the site, parts of the site or individual elements will only be considered on the basis of a thorough understanding of the impact of the proposal on the significance of the place.

## 21.5 Sustainable Development

Since the adoption of the *Convention* in 1972, the international community has embraced the concept of “sustainable development”. The protection and conservation of the natural and cultural heritage are a significant contribution to sustainable development.

21.5.1 All construction and maintenance products shall be composed of non-toxic materials. Impermeable surface area shall be kept to a minimum.

21.5.2 Conservation decisions should aim to address the conflicting demands of conservation, economic development and social equity to ensure long term sustainable development.

21.5.3 Develop an integrated and sustainable approach to meet the needs of locals, tourism and conservation.

21.5.4 The aim of sustainable development will be to identify how present and possible future tourism within the site can be developed in an environmentally and economically sustainable way for the benefit of the local economy.

## conservation policy

## **21.6 Interventions**

The main goals of conservation and management measures are to preserve the site's existing condition and to slow deterioration.

**21.6.1** Interventions should be minimal. Apart from routine maintenance, there should be no intervention on parts of the built elements or site that are not at imminent risk of serious damage. Interventions should only be kept at a minimum.

**21.6.2** Minor restoration comprises a general set of intervention measures which may be undertaken provided the original structure is not disturbed, new components are not added, and the existing condition is basically unaltered. This type of intervention most frequently involves rectifying components that are deformed, displaced, or collapsed; repairing a small number of damaged elements; and removing later additions that are without significance. Detailed records should be kept of elements that were removed or added.

**21.6.3** Major restoration (reconstruction) is an intervention involving the most impact to the original fabric. It includes returning a structure to a stable condition through the use of essential reinforcing elements and repair or replacement of damaged or missing components. The decision to restore through complete disassembly of the structure should be taken with caution. All problems revealed in the course of disassembly should be rectified so that the structure should need no further treatment for a considerable time. Restoration should as far as possible, preserve the vestiges and traces of periods judged to have significance. Both the design and materials for replacement elements should be consistent with the evidence provided by existing fabric. Only those contents or components liable to damage during the restoration work should be dismantled and removed; after restoration is complete, they must be returned in their historic condition. Relocation, when approved, also belongs in this category.

**21.6.4** In order to establish whether or not a proposal for major restoration is appropriate, it will then be necessary to assess the impact of any proposals on the significance of the site and to establish whether any damage can be mitigated. Proposals which mitigate the significance of the site – and where that damage cannot be mitigated through careful design or the consideration of alternate solutions – are not likely to be acceptable.

**21.6.5** Proposals must be based on a full understanding of the fabric of the site – including buried and above ground structures, as well as landscape, ecology, planting and habitats, and an assessment of how fabric is significant. The assessment of significance should address archaeological potential and importance, as well as aesthetic, landscape, natural, community, spiritual and other values. This list is not exhaustive.

**21.6.6** Proposals for restoration or reconstruction should be framed within an overall conservation strategy for the site showing how they will contribute to retaining the site's significance. In all but the most minor interventions there will need to be an impact assessment based on a full understanding an analysis of its significance and ways in which all its values are vulnerable.

**21.6.7** Proposals must not damage the original fabric or archaeological context of the site since these should be available for future study. Their implementation should not adversely affect archaeological context elsewhere including stratified deposits below ground as well as visible structures above it. Nor should they adversely affect the setting or



This view includes a sandstone shrine which requires minor restoration; it has been displaced and deformed by the pressure of the collapsed sandstone veneer wall on its south side. To rectify the displaced components major reconstruction of the veneer wall will be required. (ME March 2005)

*Reconstruction of the veneer platform wall is recommended. Without this major intervention collapse of the sandstone shrine will occur.*

**Change may be necessary to retain cultural significance, but is undesirable where it reduces cultural significance. The amount of changes to a place should be guided by the cultural significance of the place and its appropriate interpretation.**

**Burra Charter, Article 15.1**

*When change is being considered, a range of options should be explored to seek the option which minimizes the reduction of cultural significance.*

appearance of the site, or other non-archaeological value (e.g. wildlife habitat and associated species).

**21.6.8** Proposals must not be hypothetical or speculative but based on the best available evidence, which must be sufficient in terms of quality and quantity to justify the detailed design of the scheme.

**21.6.9** Proposals must be reversible so that they can be removed if they are subsequently found to be wrong.

**21.6.10** Reconstruction should be distinguishable from original fabric, whilst still being visually acceptable.

## **21.7 Management**

**21.7.1** The policy for managing a place must be based on an understanding of its cultural significance.

**21.7.2** Policy development should also include consideration of other factors affecting the future of a place such as owner's needs, resources, external constraints and its physical condition.

## **21.8 Visitor Management**

**21.8.1** Visitation to Phnom Bakheng will be actively encouraged to occur throughout the opening hours of Angkor Park to minimize visitor capacity limits being exceeded in peak periods.

**21.8.2** The site will be marketed to a range of communities – locals, Cambodia, International, and identified special interested groups.

**21.8.3** A primary objective of visitor management will be interpretation of the history and significance of the site.

**21.8.4** Visitor management will also endeavor to provide high quality visitor experience, consistent with the conservation requirements and enabling visitors an understanding of the meanings and significance of Phnom Bakheng within the context of Angkor Park.

**21.8.5** Visitor management should encourage an understanding of the special conservation requirements of the place, so that visitor expectations are adjusted accordingly.

**21.8.6** Visitors if properly managed should improve the quality of life for the local population without compromising the indigenous culture.

**21.8.7** Ongoing visitor evaluation will occur, to assess the effectiveness of interpretation and conservation measures, visitor access and visitor facilities.

## **21.9 Associated Communities**

**21.9.1** People throughout the Cambodian and international community have an interest in the future management of the Phnom Bakheng site, and consultation is a key component of this plan. The social significance of Phnom Bakheng will be managed in relation to the following identified communities:

- local Khmer community, for whom it is a key element in their cultural identity and economic livelihood;
- the Cambodian community, for whom it is a key element in their cultural identity; and
- the international community, for whom have felt compelled to visit.

The nature of significance that arises from these associations requires special protection.

**21.9.2** The existence and interests of these associated communities is acknowledged, and their right to be involved in making decisions that affect the social significance of the Phnom Bakheng site to each community is accepted.

## **21.10 Local Community**

**21.10.1** The importance of Phnom Bakheng to the community as a central part of local cultural identity will be acknowledged.

**21.10.2** Community activities and uses that help restore and reinforce past associations to Phnom Bakheng will be accommodated and encouraged (except where this conflicts with retention of cultural significance of the site).

**21.10.3** Specific Phnom Bakheng site features have been identified in the plan as having particular importance to the local community. Decisions on the management of these features will involve extensive consultation.

**21.10.4 Traditional agricultural uses:** of the surrounding, including rice framing, collecting firewood, tapping resin, and making palm sugar, have diminished due to stricter polices within Angkor Park, which were established to protect the physical sites and maintain an environment amenable to tourists. Access to natural resources has been noticeably reduced to the detriment of the local communities and there way of life. Polices should ensure both the local community and conservation are developed in an equitable and sustainable manner.

**Co-existence of cultural values should be recognised, respected and encouraged, especially in cases where they conflict.**

**Burra Charter, Article 13**

**Conflicting cultural values may affect policy development and management decisions, for example – the tapping of trees for resin.**

**In this article, the term cultural values refers to those beliefs which are important to a cultural group, including but not limited to political, religious, spiritual and moral beliefs. This is broader than values associated with cultural significance and includes traditional agricultural uses**

## 22.0 ACTION PLANS<sup>72</sup>

### 22.1 General Policy

It is necessary for interventions of each discipline to be closely coordinated and cross-reviewed by other concerned disciplines. Each intervention should be considered holistically, taking into account any possible effects on the site or fabric. For example – the intact brick shrines have been categorized a high priority structural issue as they are in imminent danger of collapse. Structural interventions will take place to prevent a collapse that would threaten visitor safety and damage historic material. The Materials Conservation team should be consulted during the structural stabilization planning and implementation to ensure an appropriate, non-destructive interface between historic material and contemporary intervention. It may also be necessary to stabilize or otherwise protect fragile materials adjacent to any such structural work.

### 22.2 Archaeology

22.2.1 The archaeological resources of Phnom Bakheng will be managed in accordance with the Archaeological Plan.

22.2.2 Management of the archaeological resources of the site will be undertaken in accordance with the *ICOMOS Charter for the Protection and Management of the Archaeological Heritage*.

22.2.3 Archaeological management will involve the least possible intervention.

22.2.4 Archaeological management will address all aspects of significance (including the value of associated archival records and collections).

22.2.5 A comprehensive Archaeological Zoning Plan, which identifies the relative sensitivity of different areas of the site, will be prepared as a basis for archaeological heritage management. The following provisions will apply to zones within the plan:

- in areas of exceptional sensitivity, physical disturbance will be avoided. Where physical disturbance is essential, comprehensive archaeological investigation will be undertaken;
- in areas of considerable sensitivity, physical disturbance will be considered where required for conservation or operations. Physical disturbance will be preceded by site-specific archaeological assessment and appropriate archaeological investigation;
- in areas of some sensitivity, physical disturbance will be preceded by an assessment of potential impact and archaeological monitoring; and
- in areas of low sensitivity, procedures will be in place so that work will cease pending appropriate investigations if significant archaeological features are encountered.

22.2.6 Work at Phnom Bakheng will be designed in a manner that minimizes impact on archaeological resources.

22.2.7 Development projects or other works which have potential to impact on archaeological resources will be investigated and assessed, in accordance with the provisions of the Archaeological Zoning Plan. The



View of Approach Area at the base of the east phnom axial stairs. (ME Dec. 2004)

This area has been identified as an area which may yield substantial knowledge and is considered to have high archaeological potential.

**Disturbance of significant fabric for study, or to obtain evidence, should be minimized. Study of a place by any disturbance of the fabric, including archaeological excavation, should only be undertaken to provide data for decisions on the conservation of the place, or to obtain important evidence about to be lost or made inaccessible.**

**Burra Charter, Article 28.1**

### conservation policy

heritage impact and cost of required archaeological works will be addressed as part of the decision to proceed with such works.

**22.2.8** Archaeological investigations will be carried out, with the following aims:

- to record information which is not available from historic records, maps, plans, photographs or other similar records;
- to test the accuracy or validity of existing historical documents; and/or
- to provide site-specific information which can assist in understanding the potential impact of proposed works.

**22.2.9** Archaeological investigations will use non-destructive techniques, in preference to invasive techniques, so as to maximize long-term preservation of the archaeological resource. Invasive archaeological investigations, where essential, will be partial so as to leave a portion of site undisturbed for future research.

**22.2.10** No archaeological excavation will leave in situ subsurface deposits exposed, without provision for ongoing maintenance.

**22.2.11** Whenever archaeological investigation is undertaken, a report will be prepared.

**22.2.12** Applications from external institutions or individuals to undertake research-based archaeological investigations may be considered where they:

- justify the excavation as part of a total research program (for Phnom Bakheng or Angkor)
- demonstrate that sufficient resources are available;
- provide an acceptable project program; and
- demonstrate a capacity to provide ongoing resources for professional documentation of results and curation and storage of artifacts recovered.

**22.2.13** All historical archaeological artifacts recovered from works or investigations at Phnom Bakheng will be retained on site, other than those loaned for temporary exhibitions, or those removed from the Phnom Bakheng collections in accordance with the collections policy.

**22.2.14** The preservation, conservation and management of the archaeological resources of the Phnom Bakheng site will be promoted through state, national and international co-operation, sharing of information and technical expertise, and education.

**22.2.15** Buried archaeological remains can be damaged through excavation and subsequent exposure to weathering and to potential damage through vegetation growth. Once exposed, archaeological remains generate a long-term requirement for regular maintenance.

**22.2.16** Archaeological heritage should not be exposed by excavation or left exposed after excavation if provision for its proper maintenance and management after excavation cannot be guaranteed.

**22.2.17** The overall objective of archaeological heritage management should be the preservation of Phnom Bakheng in situ including proper long term conservation and curation of all related records and collections.

**Investigation of a place which requires disturbance of the fabric, apart from that necessary to make decisions, may be appropriate provided that it is consistent with the policy for the place. Such investigation should be based on important research questions which have potential to substantially add to knowledge, which cannot be answered in other ways and which minimizes disturbance of significant fabric.**

**Burra Charter, Article 28.2**



**Built elements including the laterite enclosure wall contribute to the significance of Phnom Bakheng temple complex. (ME Dec. 2004)**

## **22.3 Built Elements**

**22.3.1** The built elements of the site will be managed in accordance with the Built Elements Plan.

**22.3.2** Built Elements include buildings, walls, stairs, sculpture, ruins, and other structures which contribute to the significance of Phnom Bakheng.

**22.3.3** Significant built elements will be retained and conserved.

**22.3.4** Intrusive built elements may be removed, following archival recording.

**22.3.5** Significant fabric of built elements will be preserved or restored.

**22.3.6** Details and technical solutions will be analyzed in the Materials Conservation Plan.

**22.3.7** Found elements may be used for anastyloses where:

- sufficient information is available to identify original location of the found elements; or
- the found element was/is identical to another lost element and its original location cannot be determined.

**22.3.8** Missing elements of original fabric may be reconstructed where:

- sufficient information is available (hypothetical reconstruction should not occur); and
- reconstruction is considered essential to the conservation of original fabric; or
- reconstruction is considered for operational purposes and is reversible; or
- reconstruction is required for interpretation purposes and is reversible.

**22.3.9** Built elements may be adapted for new use, or through construction of new elements, provided that:

- the adaptation work is reversible; and
- adaptation is required for conservation, operational or interpretative purposes.

**22.3.10** Adaptation of built elements will occur at places of lesser relative significance, in preference to those of greater significance.

**22.3.11** Where built structures are adapted for new uses, these will be compatible with the significance of the element, and will not obscure important historical associations or the ability of the built element to demonstrate its historical use.

**22.3.12** New structures will only be constructed within the Phnom Bakheng site where they:

- do not have an adverse impact on the overall cultural significance of the site; and
- are essential for physical conservation of the site or individual elements; or
- are essential for operational requirements, can be removed and do not result in a negative impact on significance; or
- are part of a temporary, reversible, interpretation program.

22.3.13 New structures may also be appropriate as part of a program of development, such as the provision of visitor services or to bring it back into some other beneficial use. In such cases, restoration or reconstruction of elements of a site may be appropriate design solution in some instances. In others, modern but sympathetic design may be a more suitable approach, for example – the introduction of belvederes and interpretive signs. The decision on what course should be adopted will depend on an assessment of values and significance of the site and what is the most appropriate solution to protect them.

22.3.14 Built elements introduced as part of an interpretation program will convey accurate information about the history and cultural significance of the site.

22.3.15 Appropriate maintenance procedures will be developed, documented and implemented to ensure the ongoing long-term maintenance of the built elements of the site.

**Traditional techniques and materials are preferred for the conservation of significant fabric. In some circumstances modern techniques and materials which offer substantial conservation benefits may be appropriate.**

**Burra Charter, Article 4.2**

*The use of modern materials and techniques must be supported by firm scientific evidence or by a body of experience.*

## **22.4 Materials Conservation**

22.4.1 The historic built elements of the site will be preserved in accordance with the Materials Conservation Plan.

22.4.2 The Materials Conservation Plan will include a detailed materials condition survey.

22.4.3 **Archival research:** continue to seek and review all available historic and recent documentation regarding the site – its construction, use over time, repair campaigns, history of deterioration, etc.

22.4.4 **Conditions survey and documentation:** perform basic, comprehensive conditions survey and documentation of entire site, determine severity levels and estimate condition extents.

22.4.5 **Develop risk map:** based on the comprehensive site survey, develop a risk map based on the following conservation priority levels:

- **Priority 1 – Critical:** Priority 1 conditions are usually potential life safety issues, such as potentially unstable stone or repair materials which could fall and injure visitors to the site. Priority 1 items may also include material which may suffer rapid or catastrophic failure if not addressed in the near future, particularly if such material is rare on the site, such as the brick stucco or the figural carvings on the central temple. All structures which constitute high structural priorities will also be considered as high conservation priorities, in order to ensure that the structural work is coordinated with conservation work as needed.
- **Priority 2 - Active Deterioration:** Priority 2 conditions include all conditions which are in an active state of decay, or contributing to the decay of adjacent materials. These conditions are not immediately critical, but it is recommended that they be addressed as soon as feasible, to prevent continued deterioration.
- **Priority 3 – Stable:** Priority 3 conditions are conditions which are not actively causing harm. These are usually aesthetic conditions which



**View of termite nest structure in the brick shrine wall, which can be extremely hard and may cause accelerated decay of building materials and structural instability due to gradual forced separation of units and loss of bearing ground. (BW Dec. 2004)**

affect the appearance but not the stability of the affected material, such as general soiling or graffiti.



View of irregular peeling, scaling, and flaking off of the stone surface on the Central Tower, resulting in unevenly layered loss of the finely carved stonework. (BW Dec. 2005)

**22.4.6 Detailed survey of high risk areas:** perform detailed conditions survey and documentation of site locations identified as Priority 1 / High Risk on the risk map, such as the central temple and a representative intact brick shrine. Calculate severity and extent of each type of condition found. Detailed survey of fallen/dismantled stones may be assisted by aerial photographs which can be used as a base for a digitized GIS-based survey.

**22.4.7 Develop investigative testing program:** develop recommendations for further testing and investigation required to understand materials and causes of deterioration such as:

- Petrographic analysis
- Sounding
- Non-destructive testing to determine sub-surface deterioration, etc.
- Pigmented stucco analysis
- Monitoring
- Development of GIS-based survey system for fallen/dismantled stones

**22.4.8 Perform investigative testing:** perform required investigative testing as approved by the APSARA Authority.

**22.4.9 Analysis of survey and testing data:** analyze the findings of the conditions surveys and testing programs to determine cause and effect relationships between deterioration conditions and materials, structure, use, environment, and previous interventions.

**22.4.10 Develop potential methods and materials for repair:** based on our knowledge of existing conditions, materials, and causes of deterioration, develop a testing program to test the compatibility and effectiveness of potential repairs.

**22.4.11 Testing and mock-ups:** perform testing of potential repair methods and materials, and implement in situ mock-ups of successful methods for monitoring and review.

**22.4.12 Approval and implementation:** present successful mock-ups to the APSARA Authority and the ad-hoc committee for approval. Implement approved methods.

## 22.5 Interpretation and Tourism

22.5.1 Interpretation of Phnom Bakheng will be undertaken in accordance with the Interpretation and Tourism Plan.

22.5.2 A detailed strategy for interpretation and tourism at Phnom Bakheng will be outlined in the Interpretation and Tourism Plan. The plan is not intended as the definitive word on interpretation and promoting the site for the public, but rather as a foundation on which to build a strong program that can change and adapt as necessary.

22.5.3 Objectives of the Interpretation and Tourism plan include supporting conservation goals, redistributing tourism demand, providing directional, interpretive signage and exhibits for visitor orientation and education, developing cultural heritage themes for programs and special events and telling the story of Yasodharapura within greater Angkor.

22.5.4 Phnom Bakheng's significance is not readily apparent and will be explained by interpretation. The Interpretation and Tourism plan will enhance enjoyment, increase understanding and be culturally appropriate.

22.5.5 Interpretation will be based on the idea that an informed and interested public is more likely to feel invested in the site, and ultimately therefore, in becoming a steward.

22.5.6 Interpretation will be based in historic research, community consultation and will contribute to the development of the Phnom Bakheng *parvis*.

22.5.7 This Plan will define the historical and interpretive extent of *Area 4: Historical Extent of Yasodharapura*.

22.5.8 There needs to be an analysis of the carrying capacity of the site and interpretive areas open to the public. On the basis of this analysis, the objectives and content of interpretation can be determined. The Interpretation Plan should specifically include:

- a conceptual plan for revealing the overall site and its associated artifacts;
- a plan for the use of the site to exhibit artifacts and historical themes;
- methods proposed to interpret and explain the site and highlight specific elements therein; and
- a plan for promotion and tourism

22.5.9 Selection of themes and messages to be interpreted on site will have primary regard to the significance of the site.

22.5.10 The primary message of the on-site interpretation will convey the significance of the place and the physical evolution of the site including conservation processes.

22.5.11 In presenting and promoting Phnom Bakheng, it is important that it is promoted as providing 'tangible' or 'real' evidence of the heritage of Phnom Bakheng and Angkor, linked with authenticity.

22.5.12 Interpretation programs and initiatives will be undertaken in a manner which minimizes impact on the fabric of significant elements.



Signage at the Greater Blue Mountains Area, World Heritage site provides information on key significance features in the landscape from this main belvedere. (ME April 2006)

The *Interpretation and Tourism Plan* should identify key features within the cultural landscape which can be observed from Phnom Bakheng. These features of the Yasodharapura landscape and their stories can be presented through graphics and text on weatherproof signage such as stainless steel and aluminum.

**Phnom Bakheng provides rare physical glimpses and views – a chronicle of Khmer history, due to its physical location enabling views over the ancient Angkor city.**



Parkland to the north of Phnom Bakheng between Angkor Thom's moat offers potential to redistribute tourism demands throughout the site. Currently this area is underutilized. (KK Dec. 2004)

The *Interpretation and Tourism Plan* should examine how to disperse tourist participation into this area.



**The knowledge and skills of past research by APSARA will contribute to the Interpretation and Tourism Plan.**



**Khmer monks at Phnom Bakheng enjoying the sunset views. (ME Dec. 2005)**

**In the context of tourism, interpretation will facilitate an understanding of the site by the local community and by the international visitor in an equitable manner.**

**22.5.13** Interpretation will extend to historic activities, structures and landscapes and will, where possible, focus on real historic elements. The introduction of new, purpose-built interpretative elements will be minimized.

**22.5.14** Different ‘markets’ for interpretation, include education, tourism (Cambodian and International), workers and tenants, which should be considered and accommodated in formulating and interpretation strategy.

**22.5.15** All works undertaken on site (involving both cultural fabric and infrastructure) should be consistent with the broad aim of interpreting significance.

**22.5.16** The approach to interpretation will extend beyond Phnom Bakheng itself, providing an understanding of the place in its historical, geographical and social context with Angkor Park.

**22.5.17** In the context of tourism, interpretation will facilitate an understanding of the site by the local community and by the international visitor in an equitable manner. It is likely the historiography of Phnom Bakheng, including the story of its ‘re-discovery’, its research, excavation, and partial restoration by scholars of the EFEO will be featured as among the site’s several interpretive themes.

**22.5.18** Interpretation actions will assist in the protection of the site and its cultural significance. Interpretation policy will ensure the sustainability of Phnom Bakheng and supply a high quality visitor experience.

**22.5.19** If proposals for restoration or reconstruction are intended in whole or in part to improve interpretation, it is essential to consider whether the same result can be achieved by other means.

**22.5.20** Interpretive elements will be light on the landscape and not visually intrusive.

**22.5.21** Interpretive elements will be in four languages: Khmer, English, French and Mandarin.

**22.5.22** Protecting the cultural and natural environment and achieving successful tourism development are inseparable to the future success of this CMP.

**22.5.23** The goals of sustainable tourism in protected cultural landscape are:

- To provide people with the ability to learn, experience and appreciate the natural and cultural heritage of the site;
- To ensure that the natural and cultural heritage of the site is managed appropriately and effectively over the long term;
- To manage tourism in parks for minimum negative social, cultural, economic and ecological impact; and
- To manage tourism in parks for maximum positive social, cultural, economic and ecological impacts.

**22.5.24** In the twenty-first century, the tourist market places increasing importance on enjoying authentic experiences – authentic settings, objects and stories, and if possible a guide or storyteller who lives in the setting and owns the objects and stories. Therefore using local people to interpret their heritage is likely to lead to high visitor satisfaction.

**conservation policy**

**22.5.25** Current and projected visitor interests, use patterns and capacity; compare and analyze data with sensitivity of parts of resources e.g. too delicate to receive unrestricted use/visitation; too dangerous for unrestricted use, for example – axial *phnom* stairs, particularly the east stairs which is extremely eroded.

**22.5.26** Tourism should bring benefits to the local community, and be based on respect for local amenity and culture.

**22.5.27** Maintaining the integrity and productivity of the Phnom Bakheng site are essential for sustainable tourism use, and particular attention be given to: protecting the displaced artifacts and stones; respecting the cultural importance of the area to the Khmer and Cambodian people; and informing visitors about Phnom Bakheng and its values and its contribution to Angkor's World Heritage values.



A hut in Kok Dong village east of Phnom Bakheng. (Fabienne Luco 2005)

The *Interpretation and Tourism Plan* should examine ways tourism can bring benefits to the local community.

## **22.6 Landscape**

**22.6.1** Landscaping will be undertaken in accordance with the Landscape Plan.

**22.6.2** Sustainable landscape design will be an objective of the Landscape Plan.

**22.6.3** Phnom Bakheng will be managed as a complex cultural and natural heritage landscape. Landscape management decisions will recognize the contribution of all elements to the whole, and the inherent tension between a site for viewing greater Angkor Park and sunset viewing, and its significance and interpretative potential as a 10th century Angkorian temple site.

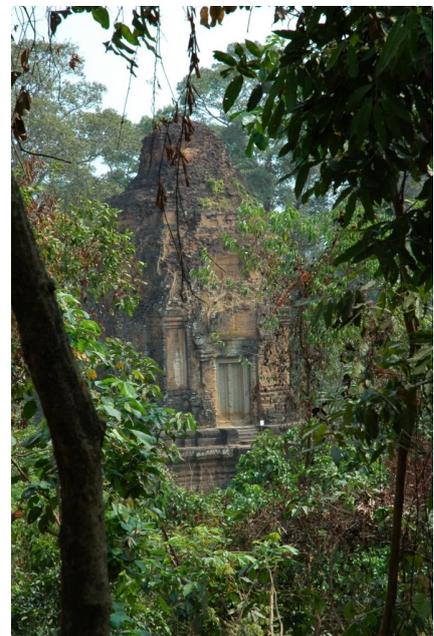
**22.6.4** The existing topography and landform of Phnom Bakheng, reflecting natural topography and layers of historic occupation and use, will be maintained.

**22.6.5** Major alteration to the current landform will only occur where essential for conservation or operational reasons. In such, landform modification will be undertaken in a manner which is reversible.

**22.6.6** Where existing intrusive elements are removed, former landform and topography may be reconstructed, provided that there is sufficient historical and archaeological evidence available. Where such evidence is not available, the physical evidence of the altered landform should remain.

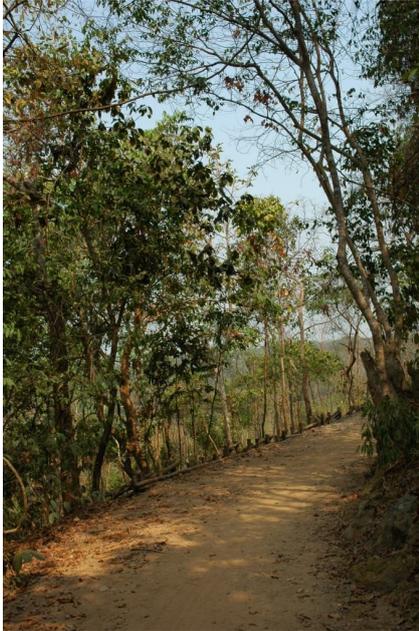
**22.6.7** Where existing landform and elements are displaced, former landform and topography may be reconstructed, provided that there is sufficient historical and archaeological evidence available. Where such evidence is not available, the physical evidence of the altered landform should remain.

**22.6.8** Indigenous vegetation will be maintained. Plantings of indigenous species will be restricted to those present at the site, known to have been at the site previously, or present in Angkor Park. The existing groundcover (biomass) and understorey shall be preserved and/or enhanced.



Trees pruned and vegetation managed by APSARA to provide a glimpse from the North Trail towards Baksei Chamkrong. (ME March 2005)

**22.6.9** Existing significant planting will be maintained. Significant vegetation which dies or becomes senescent will be replaced with the same species in the same location, unless there are compelling operational management reasons for not doing so.



View along the North Trail. (ME May 2005)

Regular maintenance will be required, for example – remove silt and debris deposits after monsoon rain, and topping up the sand and gravel surface; and regular trimming of vegetation alongside.

**22.6.10** Significant structural elements such as trails will be maintained in their existing location. Former structural elements may be reconstructed if adequate evidence exists. Material used in maintenance or reconstruction of structural landscape elements will be traditional materials, already used on site.

**22.6.11** Significant views and vistas within the site and to and from the site will be maintained. Former vistas may be reconstructed (where there is adequate evidence), by removal of visually intrusive elements (including vegetation), provided that such action does not have other adverse impact on the significance of the site

**22.6.12** The moat around the *phnom* base is no longer filled with water, and vegetation and sedimentation may need clearing in parts. This issue needs to be addressed in tandem with the Archaeology Plan.

**22.6.13** New planting may be introduced provided they:

- are consistent with the provisions of the Landscape Plan;
- are selected from species currently (or formerly) present on site;
- are not potentially invasive weed species;
- enhance the wildlife habitat value of the site;
- contribute to the overall interpretation of the site; and/or
- fulfill an important operational function and, in doing so, do not detract from the significance of the site.

**22.6.14** New materials may be introduced as part of structural landscape features only where:

- they are essential for operational or safety reasons;
- they are not toxic;
- they do not increase impermeable surfaces unnecessarily;
- there is minimal adverse impact on the significance of the site; and/or
- their introduction is reversible; and
- there are no feasible alternatives.

**22.6.15** The temple proper, Area 1 and built elements within Area 2: Plateau, should remain free of all vegetation. Trees that do not block important vistas and are away from archaeological resources can be conserved. Proximity evaluations should be based on the height and dripline of the trees. The tree height (distance from grade to top of canopy) and dripline (average distance from trunk to width of canopy) should be multiplied by 1.5 to obtain the general safe distance from an archaeological or monument resource.

## **22.7 Records**

Records including conservation records are part of the place's history. They contain information that people need, to understand present and past management policies and how they were developed.

**22.7.1** Historical records (including oral history) will be managed in accordance with the Records Plan.

**22.7.2** Records associated with the history and conservation of Phnom Bakheng should be placed in a permanent archive and made publicly available.

**22.7.3** Records are an important element of the Phnom Bakheng Site.

**22.7.4** Copies of all known relevant records will be kept at the APSARA Authority. These will include records of cultural heritage management decisions and actions, as well as other archival material.

**22.7.5** Records will be professionally catalogued.

**22.7.6** Archival material will be curated to a high professional standard.

**22.7.7** Record management will facilitate easy access by both site managers and researchers.

**22.7.8** Preliminary research at the EFEO, Siem Reap office identified digital images and French site notes c.1911 – 1960's. A rare early 20th century record of Phnom Bakheng, this photographic record of past conservation work by EFEO is of immense historical and scientific importance.

## **22.8 Research**

The historical research in conservation reports will be of interest to historians and other people researching the place, its setting, or related places and objects. The records made during and after changes will help people understand how the place has changed and might help in the care of present fabric.

**22.8.1** Research will contribute to the knowledge of Phnom Bakheng and Angkor, in accordance with the Research Plan.

**22.8.2** The results of research are fundamental to achieving excellence in physical conservation and interpretation of Phnom Bakheng.

**22.8.3** Research regarding the site will be co-ordinated, so as to ensure use of available resources to maximum effect.

**22.8.4** Ongoing research will provide a source of information that makes a regular, systemized contribution to both physical conservation activity and interpretation.

**22.8.5** There is substantial scope for comparative studies and further investigations.



**View of north side of Phnom Bakheng showing conservation efforts in progress in the early 20th century. (EFEO 1915)**

**Historic photographic records can contribute to comparative analysis of structural changes.**



**View of north side of Phnom Bakheng showing conservation efforts in progress at the beginning of the 21st century. (AAA)**



## RECOMMENDATIONS

### 23.0 VISION FOR PHNOM BAKHENG

23.1.1 The cultural significance of Phnom Bakheng as a whole is provided by not only the survival of the temple-complex, but by the unique integration of its symbolic form with the natural landscape.

23.1.2 The vision for the future of Phnom Bakheng is based therefore on the fundamental need to conserve, enhance and interpret the cultural significance of the Yasodharapura landscape and values which contribute to Angkor's outstanding universal values while maintaining authenticity and integrity.

23.1.3 Phnom Bakheng will be conserved, interpreted and cared for by the APSARA Authority and community as an integral component of the 'Angkor city', which is the emblematic icon of the people of Cambodia and the shared heritage of the World community.

23.1.4 A place where people of all nationalities and abilities can be inspired by its unique character and its beauty, and its rich living heritage.



**A Khmer monk: the living heritage of Angkor inspired by Phnom Bakheng and the surrounding cultural landscape. (ME Dec. 2005)**

**Phnom Bakheng: a place where people of all nationalities and abilities can be inspired by its unique character and its beauty, and its rich living heritage.**

#### **Recommendation 1**

**The Vision for Phnom Bakheng should be**

### EXCELLENCE IN HERITAGE MANAGEMENT

#### 23.2 Procedures for Endorsement and Implementation

Preparation of this Conservation Master Plan is an important stage in the conservation of the Phnom Bakheng Site. For the plan to succeed, it is important that it is accepted by stakeholders, endorsed by the APSARA Authority and implemented by the staff and other interested parties.

#### **Recommendation 2**

**The final Conservation Master Plan document should be formally endorsed by the ICC and the APSARA Authority**

#### **Recommendation 3**

**Upon the APSARA Authority's endorsement, the Phnom Bakheng Conservation Master Plan should be forwarded to the Cambodia Governemnt for Royal Consent.**

#### **Recommendation 4**

**The Conservation Master Plan should be published and a copy of the Conservation Master Plan should be permanently available for inspection at the APSARA Authority.**

### 23.3 Conservation Planning

Action plans and the Work Procedures, form an important part of the CMP structure. Principles adopted in the preparation of this plan are an inclusive, conclusive approach, transparent, publicly available outcomes and the use of existing material and documents, where possible. These recommendations overarch all Action Plans.

#### **Recommendation 5**

Action Plans and Work Procedures should be carried out as quickly as possible. These should be prepared in facilitated workshop sessions which are attended by all of the relevant APSARA Authority and WMF Staff and consultants.

#### **Recommendation 6**

Involvement of local communities is integral to future site planning and function, which includes research into traditional knowledge and will provides residents with means of livelihood and decision-making input.

#### **Recommendation 7**

The conservation, interpretation and management of Phnom Bakheng should provide for the participation of people for whom the place has special associations and meanings.

#### **Recommendation 8**

Treatment of the setting is to be a comprehensive measure to prevent damage from natural processes and human actions, to reveal the historic condition of the site.

#### **Recommendation 9**

The authenticity and evidential quality of Phnom Bakheng's form, built elements, details and historic associations must be retained.

### **23.4 Archaeology**

Three archaeology projects were identified in the *Phnom Bakheng Workshop on Public Interpretation*. In addition, as the first step in preparing the Archaeology Plan, it is desirable that a detailed Archaeological Zoning Plan be prepared for the site and that an overall research framework be developed as the basis for all on-site archaeological investigations.

#### **Recommendation 10**

An Archaeological Zoning Plan contained within the Conservation Master Plan should be developed and regularly updated as the comprehensive Archaeological Plan for Phnom Bakheng.

#### **Recommendation 11**

An overall research framework (with specific research themes and questions) should be prepared for the Phnom Bakheng Site. This should be based upon a full overview and synthesis of previous archaeological works (and their value). Three projects identified for undertaking:

##### **Archaeological Project 1**

- Record and store displaced temple stones in Area 2, WMF and APSARA project.
- APSARA and WMF Partnership.

##### **Archaeological Project 2**

- Limited removal of undergrowth to investigate location of displaced temple stones in Area 3.
- EFEO, APSARA Authority and WMF Partnership.



View of displaced temple stone on the south edge of the plateau at Phnom Bakheng. (ME March 2005)

These stones and others within Area 1 and Area 2 have been identified to be recorded, catalogued and stored for possible future *anastylosis*.

### **recommendations**

### **Archaeological Project 3**

- Recommended for further archaeological research.
- Study of Approach Platform area.
- Research EFEO Reports.
- Archaeological potential at the Approach Platform is high. May reveal where the causeway was situated with the Eastern stairs.
- EFEO, APSARA Authority and WMF Partnership.
- Integrated into current project.

### **23.5 Built Elements**

Management and conservation of the built elements at Phnom Bakheng presents some of the major ongoing physical conservation challenges to the site. The structural condition survey is complete and will become the basis for the development of the long-term (five year) forward works program.

This structural condition survey has been used to identify those elements of the site requiring immediate physical conservation and stabilization.

#### **Recommendation 12**

**The detailed structural condition survey should be integrated into the Built Elements Plan and should provide the basis for financial planning for both short and long-term heritage capital works.**

#### **Recommendation 13**

**Access to the east *phnom* axial laterite stair be closed permanently.**

#### **Recommendation 14**

**Future temporary or permanent stabilization efforts should respect the fabric, form and scale of Phnom Bakheng.**

#### **Recommendation 15**

**Relocate mounting areas for elephants to the southeast quadrant of the site so as not to obstruct or conflict with visitor flows.**

### **23.6 Materials Conservation**

A major input to that plan is an up-to-date detailed condition survey which identifies current problems.

It is necessary for the conservation and structural interventions to be closely coordinated, so that each intervention is considered holistically, taking into account any possible effects on the historic material.

#### **Recommendation 16**

**Undertake geophysical survey and photogrammetry, which will enable a baseline data set.**

“World tourism flows are destined to grow exponentially in the 21st century. In the two most populous countries, India and China, a new middle class is emerging, which will soon be ready to spend and travel. World Heritage sites are a natural draw for cultural tourism, and are the first to find themselves confronted with the increase in tourism. Our ambition is to unite the wish to safeguard the sites and keep them intact for future generations with the possibility of short-term and sustainable enjoyment.”

Paolo Costa  
Mayor of Venice

### **23.7 Interpretation and Tourism**

In keeping with the comprehensive approach to the Plan, interpretation is bringing together a variety of disciplines in an unprecedented opportunity to conserve and present the monument. An essential element of this effort is the creation of an Interpretation Advisory Committee involving department heads in the APSARA Authority, consultants, and a selected liaison within the APSARA Authority to facilitate communication and decision-making. A second step will be the inclusion of representative stakeholders to be engaged by the steering committee and consultants.

Visitor management at Phnom Bakheng is an integral part of the wider issues and practices of heritage site management.

#### **Recommendation 17**

The history and significance of Phnom Bakheng should be communicated.

#### **Recommendation 18**

Investigate the interpretative possibility through computer modeling, which have the potential to reveal to the visitor the complete architecture as it was in the 10th century.

#### **Recommendation 19**

The Interpretation and Tourism Plan to include a visitor management plan and policies.

#### **Recommendation 20**

A detailed understanding of the tourism industry needs to be at the heart of the heritage management and site presentation framework for Bakheng, which includes a program of research that ascertains how Phnom Bakheng should be presented to, and made meaningful for, Cambodian and broader Asian audiences.

#### **Recommendation 21**

Discontinue post 5:00 PM free entry to Angkor.

#### **Recommendation 22**

Due to the explosive growth in visitation, particularly Asian tourism, an in-depth audience study and testing methods to regulate tourist traffic is recommended.

#### **Recommendation 23**

Develop strategies for testing and analyzing solutions for visitor flow and access with the APSARA Authority.

### 23.8 Landscape

There are a number of specific landscape issues which have been identified during the course of the CMP.

#### Recommendation 24

Capitalize on the existing North trail by investigating ways it can contribute positively to the site.

#### Recommendation 25

Investigate the option of a one-way route up the *phnom* and a one-way route down that's different. First from an interpretive point of view and second from a tourist flow.

#### Recommendation 26

Implement a natural resources program, including a database of existing trees to be completed and a plan for reforestation and vegetation management to be developed under the leadership of APSARA Authority Department of Water and Forestry.

#### Recommendation 27

Natural resource database to be completed and plan for reforestation and vegetation management to be developed under the leadership of APSARA Authority Department of Water and Forestry.

### 23.9 Records

#### Recommendation 28

Records associated with the conservation of Phnom Bakheng both historic and contemporary, should be placed in a permanent archive and made publicly available.

### 23.10 Research

#### Recommendation 29

Research to be ongoing throughout the duration of the conservation project.



View over the surrounding agricultural landscape from the North Trail at Phnom Bakheng, which contributes positively to the site. With selective and appropriate tree management views of the landscape can be retained and improved. (ME Nov. 2005)



A mock-up showing a sectional profile of the sandstone casing wall with laterite block backing, for the purpose of analysis and guide the reconstruction at the platform wall corners. (MS June 2006)

## 24.0 DEGREE OF INTERVENTION

Properly defining the degree of intervention required for the conservation and long term survival of Phnom Bakheng has been achieved through a detailed understanding and analysis of: the site, the methods of construction, the structural system and the effects of the natural system.

The restoration will be guided by a materials-based approach, resulting in varying levels of intervention which respond to the range of damage suffered. The rigorous conservation process will combine the application of modern scientific techniques and traditional crafts and materials. The removal of unsympathetic additions and the introduction of new infrastructural services will allow the complex to accommodate its modern use as a tourist park while preserving the sense of place embodied in the exquisite architecture and landscaping. The historic evolution of the site will be captured by respecting the various significant periods of the complex in the conservation work.

It has been determined that in parts major restoration (reconstruction) is required to return the structure to a stable condition.

The decision to restore through complete disassembly of parts of the walls and platforms was determined a necessity to ensure the long term stability of the temple form.

All issues revealed in the course of disassembly will be rectified, for example – reinstate the hydraulic/water management system. So the temple should need no further treatment for a considerable time. Both the design and materials for replacement will be consistent with the evidence provided by existing fabric.

### 24.1 Proposed Levels of Intervention

Selection of an appropriate level of intervention for *Area 1: Phnom Bakheng Pyramid Temple* was guided by a full understanding of the structure and material characteristics; and a clear understanding of the kinds of actions that were/are the cause of damage and decay – now mainly hydrological.

Diagnosis was based on historical, qualitative and quantitative approaches; the qualitative approach being based on direct observation of the structural damage and material decay as well as historical and archaeological research, and the quantitative approach mainly on material and structural tests, monitoring and structural analysis.

The proposed Levels of intervention investigated include:

#### **Level I – Minimal (Arrest decay process; structurally stabilize for 1-3 year term only)**

- Add timber shoring at most dangerous temple façade failures and at surrounding brick structures where most urgently needed.
- Cut tree and plant roots.
- Fill main surface water entry points with sandbags.
- Install one or two sandstone façade and paving repairs for performance testing and approval purposes.
- Catalogue and remove displaced stones from all terraces and high platform to safe storage area at Plateau Level below (Area 2).
- Stabilize and protect fine carved Bakheng Style artistic features at central shrine.

## recommendations

**Level II – Moderate (Structural stabilization of present partial ruin appearance, estimated 10-15 year solution, assuming proper maintenance)**

- Temporarily shore *all* potential areas of collapse at temple structure and surrounding brick shrines.
- Repair the most structurally unstable sandstone wall facades utilizing the proposed new laterite brick wall fill and tie system.
- Rock bolt suspected unstable remaining wall facades.
- Detail resulting uneven sandstone and laterite wall tops to shed water outwards.
- Install new matching sandstone pavers at tripping hazard locations on horizontal surfaces of upper platform of temple. Pack open horizontal joints using 'black-clay'.
- Install new laterite brick masonry water diverters at upper platform edge and all terrace levels to improve surface water runoff.
- Structurally stabilize stone shrines that adorn temple.

**Level III – Major Intervention (Restore the originally designed stone casing and water management system of the monument; a 100-year plus life solution, assuming proper maintenance)**

- Rebuild all unstable, damaged, and collapsed façade stonework by anastylosis method utilizing matching new sandstone material, with the proposed new laterite brick wall and tie system.
- Repair existing or install new sandstone horizontal surfaces as required with 'black-clay' pointing at joints as required. Slope newly paved surfaces to platform edges.
- Provide improved drainage system areas at base of structure.

**Level IV – Optimum Restoration (Fully restore the original early 10th century architectural appearance of the Bakheng temple and its shrines in Area 2 below)**

- Completely restore (based on archaeological and historical evidence) the temple walls, stairs, shrines and sculptural adornments of the Bakheng temple structure, plus its brick shrines, enclosure walls, and paved areas at Area 2.
- Return the complete original silhouette appearance of the principal monument.
- Option – restore the East, North and West stairs and stone adornments along slopes of Area 3 and entrances at Area 4.

**24.2 Recommended Level of Intervention**

**Recommendation 30**

**Level III – Major Intervention (Restore the originally designed stone casing and water management system of the monument; a 100-year plus life solution, assuming proper maintenance) to form the basis of a methodology for structural stabilization and conservation.**

### 24.3 Level III Intervention Pilot Project – Stone Façade Repair and Restoration



View of the southwest corner during dismantling; note the first two courses of sandstone and laterite backing material still in situ. (MS Feb. 2007)

The pilot conservation work at the southwest corner of the Bakheng temple (at plateau level) has yielded a variety of useful lessons. Including, information on the 10th century stone construction technology and what it takes to successfully repair partially or wholly collapsed sandstone walls and terraces (walking surfaces) as applied to shaped temple mountain core structures. This pilot project has proven to be a sizable undertaking, in part, because of the policy of using new stone where necessary in the *anastylosis* work.

Reconstruction methodology as applied at the southwest corner:

**24.3.1 Document Existing Condition:** individual stone locations within the wall, rubble and collapsed stone within the work area were recorded.

**24.3.2 Dismantle Sandstone Shrine:** the remaining portion of the sandstone shrine (E2) was dismantled to enable reconstruction of stone paving, and in turn, reinstate a level area for the shrine to be reassembled through *anastylosis*.

**24.3.3 Record and Store Collapsed Stone:** stones where number according to their location found and individual set aside until required.

**24.3.4 Dismantle Existing 1st Tier Displaced Wall:** all stone blocks were recorded and individual set aside until required.

**24.3.5 Remove Loose Bedrock Pieces:** there was no evidence of major instability although some loose bedrock fragments were identified and removed to ensure sound intact bedrock remained. Sounding investigations were carried out to identify any loose and spalling bedrock.

**24.3.6 Identify Stone Blocks Requiring Repair:** stone blocks requiring repair were set aside for repair. During the handling of the stone care was taken not to damage the loose and spalling face and the original tooled stone surface.

**24.3.7 Sandstone Block Repairs:** fractured stones were pinned using stainless steel rods set in epoxy. The use of fiberglass pins for repairing stones was also demonstrated.

**24.3.8 Remove Loose Debris from Bedrock:** the work area was cleaned of all soil, foreign material and debris; including horizontal areas at the base of the wall, the vertical bedrock faces, bedrock cracks and the area above the reconstructed area.

**24.3.9 Fill Bedrock Joints and Cracks:** Some larger fissures were discovered requiring treatment. Cracks were filled with gravel or sand to ensure interior drainage. The top crack surface was widened to at least 1 cm wide to a depth of 10 cm and packed with repair mortar to seal against moisture infiltration.

**24.3.10 Reset base course:** Original stones were reset and tightly butted together to reinstate original construction technique.



Tooling new laterite block in situ at the southwest corner to enable accurate keying in. (MS Feb. 2007)

## recommendations

**24.3.11 Reconstruct wall section with new laterite infill:** a key component of the original system was use of a laterite infill between the stone facing and the underlying bedrock. The original laterite was severely decayed and no longer usable. New laterite stones were tooled on site to key precisely with the sandstone blocks. Any small remaining spaces were filled with gravel to facilitate drainage.

**24.3.12 Install clay layer with geomembrane as water barrier:** a layer of clay was used on the horizontal terrace level to waterproof the terrace and provide a setting bed for the existing and new stone paving. Further, a sheet of geomembrane fabric provided containment of the clay bedding.

**24.3.13 Install pavement at platform with fall:** new and existing sandstone pavers (9cm thick) were laid atop the clay membrane to meet the original finished level, with a 1% fall provided to assist in the evacuation of water off the temple proper. Pavers were cut to fit very tightly together, with joints of 3 mm or less, and to imitate the original random pattern layout.

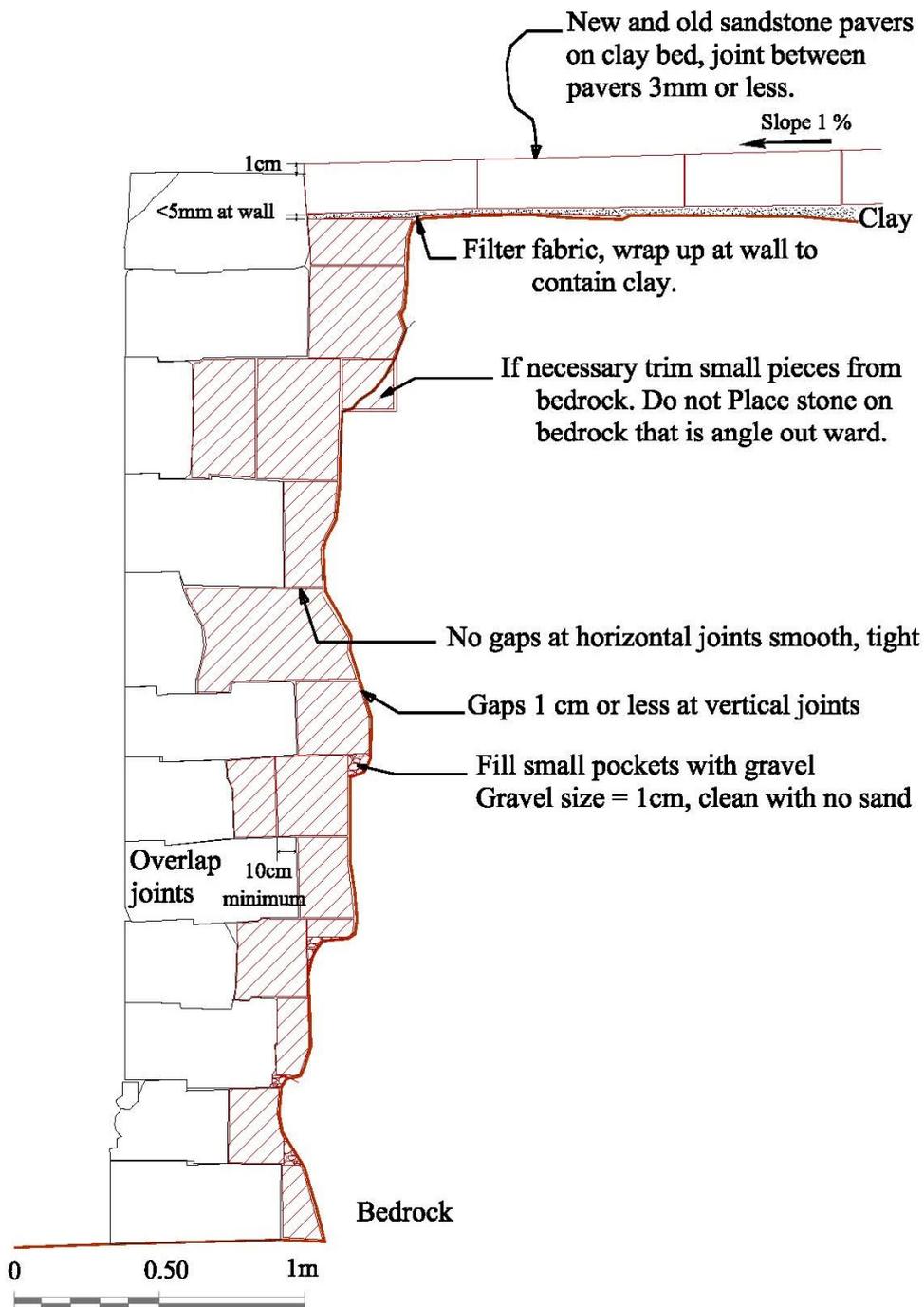
**24.3.14 Document all work as it progresses:** weekly reports were submitted to the entire team documenting work progress, including photographs of each stage and noting conditions encountered.

#### **Recommendation 31**

**Conclusions drawn from this Pilot Project will form part of the recommendations methodology for future conservation intervention at Phnom Bakheng**



**New sandstone block being positioned into place at the southwest corner. (SK March. 2007)**



Proposed construction methodology for the Level III Intervention of the southwest corner of Phnom Bakheng (MS Feb. 2007)

**recommendations**

## IMPLEMENTATION

### 25.0 IMPLEMENTATION OF THE CONSERVATION MASTER PLAN

#### 25.1 Timing of the Action Plans and Work Procedures

The following table (see 26.0 IMPLEMENTATION SCHEDULE) takes the Conservation Policy and outlines implementation strategies, responsibilities and time frames. Funding for the implementation of these plans and policies is competitive within the APSARA Authority and other funding bodies programs. In view of this, time frames suggested here indicate the priority of actions.

The program and timing for preparation of Work Procedures and Action Plans is a matter for the APSARA Authority and WMF determination. However, as a general guide to relative order of these works and appropriate time frame, the following indicative program is suggested.

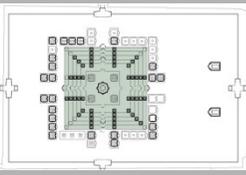
##### 25.1.1 Action Plans:

- Preparation of Archaeology Plan 1.5 years
- Preparation of Built Element Plan 1.5 years  
Documents exist which need to be reviewed
- Preparation of Interpretation and Tourism Plan 2 years  
APSARA Authority Tourism documents exist which needs to be synthesized into the Landscape Plan
- Preparation of Landscape Plan 1.5 years  
APSARA Authority landscape documents exist which needs to be synthesized into the Landscape Plan
- Preparation of Materials Conservation Plan 1.5 years
- Preparation of Records Plan 1.5 years
- Preparation of Research Plan 1.5 years  
Liaison with external institutions will be required, for example – EFEO.

##### 25.1.2 Works Procedures:

Because of their more immediate impact, and the obvious need to document procedures that are well known by APSARA Authority and WMF staff, it is proposed that the initial set of Work Procedures be prepared with a program that commences before, and overlaps with, the preparation of Action Plans. It is recognized that, in general, the Work Procedures will therefore be prepared prior to their corresponding Action Plan, with the result that the scope and content of the Work Procedures may require further revision after four years.

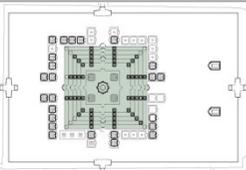
26.0 IMPLEMENTATION SCHEDULE<sup>†</sup>

		WORLD MONUMENTS FUND			
		PHNOM BAKHENG CONSERVATION MASTER PLAN: Project Management Timeline 2006 – 2010			
		PROJECT PLANNING AND MOBILIZATION		PROJECT PLANNING AND IMPLEMENTATION	
		Mission V January - March 2006 WMF/APSARA meeting – March ▪	Mission VI April - June 2006 ICC Technical Meeting – June 5-7 ▪	July - September 2006	Mission VII October - December 2006 ICC Plenary Meeting - December ▪
 <p style="text-align: center;"><b>Conservation Master Plan (CMP)</b> Action Plan (AP) ▪ Overarching issues ▪ Additional Data Collection ▪ Project Management ▪</p>	<ul style="list-style-type: none"> <li>▪ <b>March:</b> submit CMP Internal Consultation Draft to APSARA for comment and review</li> <li>▪ <b>March:</b> identify APSARA staff counterparts for the individual AP's</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>April:</b> review and synthesize APSARA's enrichments into the CMP</li> <li>▪ <b>April:</b> commence GIS site survey and/or photogrammetry</li> <li>▪ <b>May:</b> undertake further analysis of the bedrock and conduct the workshop to roundup geotechnical matters</li> <li>▪ <b>May:</b> issue final draft of CMP for comment</li> <li>▪ <b>June:</b> APSARA and WMF to reach consensus on geotechnical issues</li> <li>▪ <b>June:</b> present CMP at ICC meeting</li> <li>▪ <b>June:</b> identify and schedule the AP workshops to facilitate the completion of the Work Procedures. Ensure all stakeholders are represented</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>July:</b> coordinate GIS, geophysical survey and photogrammetry, which will enable a baseline data set for other disciplines to use</li> <li>▪ <b>Aug:</b> format the Project Management Timeline (PMT) into a Microsoft Project (MP) data file. Include; milestones, critical paths, tasks, budget cost estimates and project team capacity analysis. Update data file and issue at 3 monthly intervals throughout the duration of the project</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Nov:</b> review CMP and update where required, for example – synthesis geotechnical report into CMP</li> <li>▪ <b>Nov:</b> update the PMT to include all identified Primary, Action Plan and Work Procedure interventions proposed in the CMP</li> <li>▪ <b>Nov:</b> complete initial project planning</li> <li>▪ <b>Dec:</b> finalize detailed budget cost estimates and integrated into the MP data file</li> </ul>	
	<p style="text-align: center;"><b>Archaeology</b> Action Plan (AP) ▪ Geophysical Survey ▪</p>	<ul style="list-style-type: none"> <li>▪ <b>May:</b> Area 1 – commence above ground documentation recording and storage of displaced stones and artifacts</li> <li>▪ <b>June:</b> Area 2 – commence geophysical survey (Level 1 subsurface imaging)</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>July:</b> submit draft Archaeology AP for internal consultation review</li> <li>▪ <b>July:</b> Area 3 – commence detailed survey of north <i>phnom</i> axial stairs</li> <li>▪ <b>Aug:</b> Areas 3 and 4 (Approach Area) – commence geophysical survey (Level 1 subsurface imaging)</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Nov:</b> Area 3 – submit completed detailed survey and report on north <i>phnom</i> axial stairs</li> <li>▪ <b>Nov:</b> submit draft Archaeological Zoning Plan</li> </ul>	

<sup>†</sup> The execution of this project beyond the present planning and testing phase is contingent on the success of the WMF/APSARA Authority collaborative in raising additional funding for the implementation phases of the project.

<p><b>Built Elements</b> Action Plan (AP) ▪ Physical Interventions ▪ Area 1, 2, 3 and 4 ▪</p>	<ul style="list-style-type: none"> <li>▪ <b>Jan:</b> Area 1 and 2 – emergency stabilization works to be completed</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>May:</b> Area 1 – complete pilot project to assess techniques for stabilizing the sandstone veneer platform walls and present to the ICC Technical meeting in June</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>July:</b> Area 1 – commence stabilization of detached sandstone veneer platform walls. Provide internal drainage as per CMP policy recommendations</li> <li>▪ <b>July:</b> Area 2 – commence stabilization of brick and stone shrines</li> <li>▪ <b>Sept:</b> Area 4 – complete draft design of car park, vendor stores and point of arrival</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Oct:</b> Area 1 – commence waterproofing and drainage of paved surfaces</li> <li>▪ <b>Nov:</b> Area 1 – complete installation of timber stairs over West and South axial stairs to temple</li> <li>▪ <b>Nov:</b> Area 4 – submit design of point of arrival, car park and vendor stores to ICC for approval</li> <li>▪ <b>Dec:</b> submit draft Built Elements AP for internal consultation review</li> </ul>
<p><b>Interpretation</b> Action Plan (AP) ▪ Area 1, 2, 3 and 4 ▪ Signage ▪</p>	<ul style="list-style-type: none"> <li>▪ <b>March:</b> present December 05 Workshop to local community and stakeholders for feedback</li> <li>▪ <b>March:</b> develop strategy for PB to become a pilot site for the 'Living Heritage Program at Angkor' (Uni. Sydney)</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>April:</b> submit draft Interpretation AP for internal consultation review</li> <li>▪ <b>April:</b> Area 2 – submit design and budget for implementation of provisional interpretive materials</li> <li>▪ <b>June:</b> publish proceedings of Dec. 05 Workshop and present to ICC</li> <li>▪ <b>June:</b> presentation of preliminary interpretation initiatives and design</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Aug:</b> select illustrations and develop narrative description of themes and special tours and text for interpretive signage and wayside panels</li> <li>▪ <b>Sept:</b> Areas 3 and 4 – submit design and budget proposal for implementation of wayside markers/viewing points</li> <li>▪ <b>Sept:</b> Area 2 – install provisional wayside markers/viewing points</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Nov:</b> submit final draft of Interpretation AP for final review which includes; a conceptual plan for revealing the overall site and its associated artifacts; a plan for the use of the site to exhibit artifacts and historical themes; methods proposed to interpret and explain the site and highlight specific elements therein; and a plan for promotion and tourism</li> </ul>
<p><b>Landscape</b> Action Plan (AP) ▪</p>		<ul style="list-style-type: none"> <li>▪ <b>May:</b> meeting with APSARA, Department of Forestry (Hang Peou) to frame vegetation study, inventory, forestation and develop the workshop program</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>July:</b> schedule landscape workshops to advance AP Work Procedures</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Dec:</b> submit draft Landscape AP for internal consultation review</li> </ul>
<p><b>Materials Conservation</b> Action Plan (AP) ▪ Area 1 and 2 ▪ Archival Research ongoing ▪</p>	<ul style="list-style-type: none"> <li>▪ <b>Jan:</b> develop and propose investigative testing programs e.g. Petrographic Analysis, Soundings, Non-Destructive Testing</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>May:</b> Areas 1 and 2 – Materials Conservation team to continue Materials Conditions Survey and Risk Map. Including a detailed survey of 'at high risk areas'</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Aug:</b> Materials Conservation team to commence their data overlays onto the GIS data</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Nov:</b> Area 1 – commence testing and mock-up of proposed repair methods and materials</li> <li>▪ <b>Dec:</b> Area 1 – submit report on methods and material for repair</li> </ul>
<p><b>Records</b> Action Plan (AP) ▪</p>				<ul style="list-style-type: none"> <li>▪ <b>Dec:</b> submit draft Records AP for internal consultation review</li> </ul>
<p><b>Research</b> Action Plan (AP) ▪</p>		<ul style="list-style-type: none"> <li>▪ <b>May:</b> commence review of all available EFEO historical documents and conservation interventions</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Aug:</b> submit detailed report on the EFEO historical documents and conservation interventions in the early 20th century</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Oct:</b> Submit draft Research AP for internal consultation review</li> </ul>

<b>Tourism</b> Action Plan (AP) ▪ Site Access ▪	<ul style="list-style-type: none"> <li>▪ <b>March:</b> close access to the east axial stairs.</li> <li>▪ <b>March:</b> APSARA and WMF meeting to convene study of visitor flow/circulation management, visitor projections and ticketing approach</li> <li>▪ <b>March:</b> develop PB sustainable tourism proposal for the World Heritage Alliance and other potential funders.</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>April:</b> route all visitors via the North Trail nature trail</li> <li>▪ <b>June:</b> APSARA and WMF to frame all studies needed to complete the Tourism AP, including assessment of site access in consultation with other CMP Team members</li> <li>▪ <b>June:</b> convene travel industry stakeholders / experts for a one day workshop on tourism and site planning</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>July:</b> suspend access to the platform of the quincunx</li> <li>▪ <b>July:</b> studies to include current and projected visitor interests, use patterns and capacity; compare and analyze data with sensitivity of parts of resources e.g. too delicate to receive unrestricted use/visitation; too dangerous for unrestricted use e.g. eastern staircase which is extremely eroded.</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Nov:</b> APSARA to prepare draft Tourism AP for internal consultation review</li> </ul>
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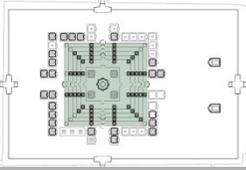
		WORLD MONUMENTS FUND			
		PHNOM BAKHENG CONSERVATION MASTER PLAN: Project Management Timeline 2006 – 2010			
		PROJECT IMPLEMENTATION		PROJECT IMPLEMENTATION	
		Mission VIII January - March 2007	Mission IX April - June 2007 ICC Technical Meeting – June ▪	July - September 2007	Mission X October - December 2007 ICC Plenary Meeting - December ▪
	<b>Conservation Master Plan (CMP)</b> Action Plan (AP) ▪ Project Management ▪	<ul style="list-style-type: none"> <li>▪ <b>March:</b> submit AP Internal Consultation Drafts to APSARA for comment and review</li> <li>▪ <b>March:</b> complete outstanding workshop to facilitate the production of the Landscape and Built Elements Work Procedures</li> <li>▪ <b>March:</b> update MP data file</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>April:</b> review and synthesis APSARA's enrichments into the Action Plans</li> <li>▪ <b>June:</b> Submit Action Plans to the ICC Technical Meeting</li> <li>▪ <b>June:</b> update MP data file</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Sept:</b> update MP data file</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Dec:</b> update MP data file</li> </ul>
	<b>Archaeology</b> Action Plan (AP) ▪ Geophysical Survey ▪		<ul style="list-style-type: none"> <li>▪ <b>June:</b> submit draft report on the previous 12 months archaeological works</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Sept:</b> Areas 1, 2 and 3 – completion of Archaeological surveys</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Nov:</b> submit completed Archaeological AP</li> <li>▪ <b>Nov:</b> submit Archaeological Zoning Plan</li> <li>▪ <b>Nov:</b> Area 4 – completion of Archaeological survey</li> </ul>
	<b>Built Elements</b> Action Plan (AP) ▪ Physical Interventions ▪ Area 1, 2, 3 and 4 ▪	<ul style="list-style-type: none"> <li>▪ <b>Jan:</b> Area 3 – commence foundation works to east <i>phnom</i> axial stairs</li> </ul>		<ul style="list-style-type: none"> <li>▪ <b>Aug:</b> Area 1 – completion of pyramid temple facade repairs</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Nov:</b> Area 2 – 80% completion of stabilization and partial restoration of brick and stone shrines</li> </ul>

				<ul style="list-style-type: none"> <li>▪ <b>Nov:</b> Area 4 – commence alterations and installation of improvements to Parvi, including Parking Bay, Vendor Stores and Point of Arrival area</li> <li>▪ <b>Nov:</b> Area 4 – commence stabilization and drainage works to the historic Approach Area</li> </ul>
<p><b>Interpretation</b> Action Plan (AP) ▪</p>	<ul style="list-style-type: none"> <li>▪ <b>March:</b> submit completed Interpretation AP</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>June:</b> present Interpretation AP to the ICC Technical Meeting</li> </ul>		
<p><b>Landscape</b> Action Plan (AP) ▪</p>		<ul style="list-style-type: none"> <li>▪ <b>June:</b> present Landscape AP to the ICC Technical meeting</li> <li>▪ <b>June:</b> Areas 3 and 4 – implement trail, path and Approach Area drainage control systems prototype to mitigate erosion for assessment.</li> </ul>		<ul style="list-style-type: none"> <li>▪ <b>Nov:</b> Area 2 – conservation and installation of paths at temple base</li> <li>▪ <b>Nov:</b> Areas 3 and 4 – submit report on the proposed drainage control systems for the trails, paths and the historic Approach Area</li> </ul>
<p><b>Materials Conservation</b> Action Plan (AP) ▪ Materials Condition Survey ▪ Baseline data updates ▪</p>	<ul style="list-style-type: none"> <li>▪ <b>Jan:</b> Area 1 – commence materials conservation of fine sandstone elements</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>June:</b> Areas 1 &amp; 2 – completion of data overlays onto the GIS data</li> </ul>		<ul style="list-style-type: none"> <li>▪ <b>Dec:</b> Area 1 – completion of conservation of fine stonework at Central Sanctuary</li> </ul>
<p><b>Records</b> Action Plan (AP) ▪</p>	<p><b>Jan:</b> copies of all known relevant records relating to PB site to be catalogued by APSARA and made available to Team.</p>			<ul style="list-style-type: none"> <li>▪ <b>Nov:</b> submit completed Records AP</li> </ul>
<p><b>Research</b> Action Plan (AP) ▪</p>		<ul style="list-style-type: none"> <li>▪ <b>June:</b> present Research AP to the ICC Technical meeting</li> </ul>		<ul style="list-style-type: none"> <li>▪ <b>Nov:</b> submit completed Research AP</li> </ul>
<p><b>Tourism</b> Action Plan (AP) ▪ Site Access ▪</p>	<ul style="list-style-type: none"> <li>▪ <b>March:</b> submit Tourism AP for final review</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>June:</b> present Tourism AP to the ICC Technical meeting</li> </ul>		<ul style="list-style-type: none"> <li>▪ <b>Nov:</b> Area 1 – re-opening of full access and interpretation of the platform of the quincunx</li> </ul>

**WORLD MONUMENTS FUND**

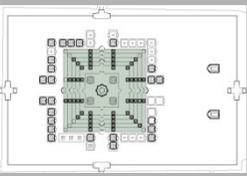
**PHNOM BAKHENG CONSERVATION MASTER PLAN: Project Management Timeline 2006 – 2010**

**Year 2008**

	PROJECT IMPLEMENTATION		PROJECT IMPLEMENTATION	
	Mission XI January - March 2008	Mission XII April - June 2008 ICC Technical Meeting – June ▪	July - September 2008	Mission XIII October - December 2008 ICC Plenary Meeting - December ▪
	<p><b>Conservation Master Plan (CMP)</b> Action Plan (AP) ▪ Project Management ▪</p> <p><b>Archaeology</b> Action Plan (AP) ▪ Monitor ▪</p> <p><b>Built Elements</b> Action Plan (AP) ▪ Physical Interventions ▪ Area 1, 2, 3 and 4 ▪</p> <p><b>Interpretation</b> Action Plan (AP) ▪ Signage ▪</p> <p><b>Landscape</b> Action Plan (AP) ▪</p> <p><b>Materials Conservation</b> Action Plan (AP) ▪ Baseline data updates ▪</p> <p><b>Records</b> Action Plan (AP) ▪</p> <p><b>Research</b> Action Plan (AP) ▪</p> <p><b>Tourism</b> Site Access ▪ Action Plan (AP) ▪</p>	<ul style="list-style-type: none"> <li>▪ <b>Jan:</b> review and update the CMP and AP's</li> <li>▪ <b>March:</b> update MP data file</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>June:</b> update MP data file</li> <li>▪ <b>May:</b> Area 4 – provide report on the stabilization works</li> <li>▪ <b>May:</b> Area 4 – commence stabilization and drainage works to the historic Approach Area</li> <li>▪ <b>April:</b> Area 4 – submit technical report on the condition of the historic Approach Area fabric.</li> <li>▪ <b>May:</b> Area 4 – update baseline data drawings as new information is revealed in the stabilization of the historic Approach Area</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Sept:</b> update MP data file</li> <li>▪ <b>Sept:</b> Area 3 – completion of reconstruction of east <i>phnom</i> axial stairs</li> </ul>

**WORLD MONUMENTS FUND**

**PHNOM BAKHENG CONSERVATION MASTER PLAN: Project Management Timeline 2006 – 2010** **Years 2009 and 2010**



**PROJECT COMPLETION**

**PROJECT PUBLICATION**

	Mission XIV January - June 2009 ICC Technical Meeting – June ▪	Mission XV July - December 2009 ICC Plenary Meeting - December ▪	Mission XVI January - June 2010 ICC Technical Meeting – June ▪	Mission XVII July - December 2010 ICC Plenary Meeting - December ▪
<b>Conservation Master Plan (CMP)</b> Action Plan (AP) ▪ Documentation ▪ Project Management ▪	<ul style="list-style-type: none"> <li>▪ <b>Jan:</b> review and update the CMP and AP's</li> <li>▪ <b>June:</b> complete draft monograph of The Conservation of Phnom Bakheng for internal review and comments</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Nov:</b> issue final draft of the monograph of The Conservation of Phnom Bakheng for internal review and comments</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>June:</b> publish monograph on The Conservation of Phnom Bakheng</li> </ul>	
<b>Archaeology</b> Action Plan (AP) ▪				
<b>Built Elements</b> Physical Interventions ▪ Area 1, 2, 3 and 4 ▪ Action Plan (AP) ▪	<ul style="list-style-type: none"> <li>▪ <b>May:</b> complete construction of the long-term visitor entrance pavilion</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Dec:</b> all conservation works scheduled for completion.</li> </ul>		
<b>Interpretation</b> Action Plan (AP) ▪ Signage/guides ▪	<ul style="list-style-type: none"> <li>▪ <b>Feb:</b> submit draft site guides for review</li> <li>▪ <b>June:</b> present printed site guides at the ICC meeting</li> </ul>			
<b>Landscape</b> Action Plan (AP) ▪				
<b>Materials Conservation</b> Action Plan (AP) ▪				
<b>Records</b> Action Plan (AP) ▪				
<b>Research</b> Action Plan (AP) ▪				
<b>Tourism</b> Action Plan (AP) ▪				

*implementation*

## APPENDICES

### 27.0 ACRONYMS AND ABBREVIATIONS

<b>AAA:</b>	Association des Amis d'Angkor
<b>APSARA:</b>	or APSARA Authority, Authority for Protection and Management of Angkor and the Region of Siem Reap
<b>CMP:</b>	Phnom Bakheng Conservation Master Plan
<b>EFEO:</b>	École française d'Extrême-Orient (The School of the Far East)
<b>ICOMOS:</b>	International Council on Monuments and Sites
<b>JSA:</b>	Japanese government team for Safeguarding Angkor
<b>JICA:</b>	Japanese International Cooperation Agency
<b>UNESCO:</b>	United Nations Educational, Scientific and Cultural Organisation
<b>WHS:</b>	World Heritage site
<b>WMF:</b>	World Monuments Fund

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#### **Web Addresses**

APSARA Authority

<http://www. autoriteapsara.org/>

The Getty

<http://www. getty.edu>

ICCROM

<http://www. iccrom.org>

ICOMOS

<http://www. icomos.org>

UNESCO-ICOMOS Documentation Centre

[http://www. international.icomos.org/centre\\_documentation/index.html](http://www. international.icomos.org/centre_documentation/index.html)

UNESCO

<http://www. unesco.org>

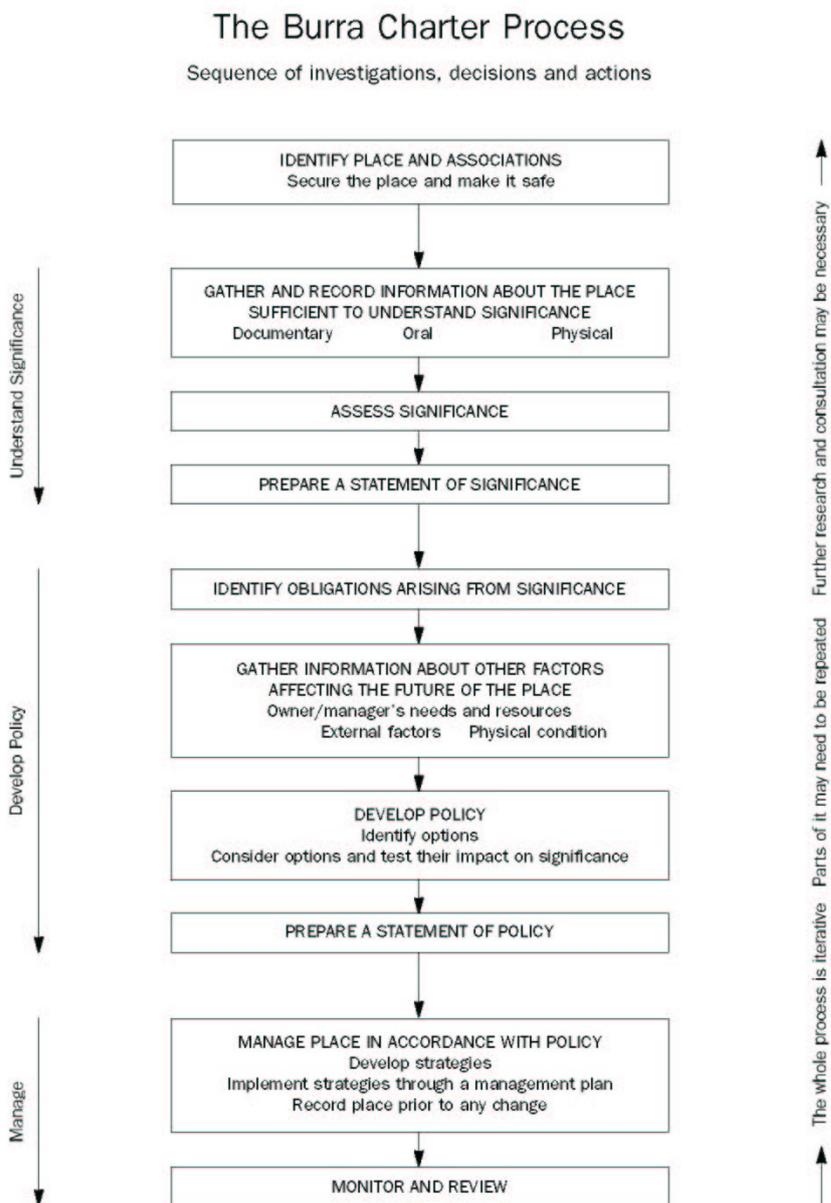
UNESCO World Heritage Centre

<http://www. whc.unesco.org>

#### **appendices**

29.0 BURRA CHARTER PROCESS

Figure 22 The Burra Charter Process: Sequence of investigations, decisions and actions.



### 30.0 DEFINITIONS

The following definitions explain the terms commonly used in Conservation Planning. They have been drawn from The Illustrated Burra Charter: Good Practice for Heritage Places.

**Place means site, area, land, landscape, building or other work, group of buildings or other works, and may include components, contents, space and views**

Place as used in the Charter has a broad scope: it is geographically defined and includes its natural and cultural features.

**Cultural significance means aesthetic, historic, scientific, social or spiritual value for past, present or future generations.**

**Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects.**

**Place may have a range of values for different individuals or groups**

The five terms listed alphabetically in the Charter, aesthetic, historic, scientific social, spiritual.

The cultural significance of a place may change as the result of the continuing history of the place. Understanding of cultural significance may change as a result of new information.

A place may have different meaning to different groups.

**Fabric means all the physical material of the place including components, fixtures, contents, and objects.**

Fabric includes the built elements of a place, as well as the natural material – the landform, vegetation, moats, soil and rock, etc. Fabric includes building interiors, sub-surface remains – as well as excavated material. Fabric may define spaces and these may be important elements of the significance of the place. Fabric includes contents, fixtures and objects temporarily removed, e.g. for repair, safekeeping, or exhibition.

**Conservation means all the processes of looking after a place so as to retain its cultural significance.**

The process of conservation includes the process defined in Articles 1.5 – 1.9, and listed in Article 14. It includes retaining the contribution that the setting, and related places and objects, make to the significance of a place.

**Maintenance means the continuous protective care of the fabric and setting of a place, and is to be distinguished from repair. Repair involves restoration or reconstruction.**

In the Charter, maintenance has a narrower meaning than in ordinary use – the ordinary meaning includes repair. Maintenance tasks that don't require repair include inspecting and removing weeds from the monument.

**Preservation means maintaining the fabric of a place in its existing state and retarding deterioration.**

It is recognized that all places and their components change over time at varying rates. The role of preservation is to slow the rate of change.

**Restoration means returning the existing fabric of a place to a known earlier state by removing accretions or by reassembling existing components without the introduction of new material**

This term has a narrower meaning in the Charter than in ordinary use. Restoration by removal is more common in practice than restoration by reassembly. At Phnom Bakheng restoration by reassembly will be more common.

**Reconstruction means returning a place to a known earlier state and is distinguished from restoration by the introduction of new material into the fabric.**

New material may include recycled material salvaged from other places. This should not be to the detriment of any place of culture significant: e.g. it should not involve removing significant fabric from another place and the new material should not convey false impressions of the history and characteristics of the place.

**Adaptation means modifying a place to suit the existing use or a proposed use**

Common examples of adaptation include works for interpretation – such as signs and paths, installing new wiring, piping, equipment and services. Adaptation can also include construction of substantial new structures

**Use means the functions of a place, as well as the activities and practices that may occur at the place.**

Use includes all the functions the place serves, including occasional or seasonal functions.

**Compatible Use** means a use which respects the cultural significance of a place. Such a use involves no, or minimal, impact on cultural significance.

Compatible use can be a number of different uses that overlap in space and time. The use for which the place was created, and later long established uses are likely to be ones that respect the cultural significance of the place.

**Setting** means the area around a place, which may include the visual catchments.

There are no hard limits to the extent of a place's setting – it depends on the nature of the place and its surroundings. In this instance the setting would include the visual catchments from Phnom Bakheng or the boundary of Angkor, whichever is the lesser.

**Related place** means a place that contributes to the cultural significance of another place.

Places that contribute to the significance of others include places that are alongside or near one another or within sight of one another; places that were part of a larger place that has been fragmented by development or vegetation; places with similar use, or part of a route or system (such as the connection between Roluos and Phnom Bakheng). Objects and other fabric removed temporarily, e.g. for safekeeping, conservation, or exhibition is removed fabric.

**Associations** means the special connections that exist between people and a place

Associations may include social or spiritual values and cultural responsibilities of people (past or present) for a place.

**Meanings** denote what a place signifies, indicates, evokes or expresses.

Meaning generally relate to intangible aspects such as symbolic qualities and memories, or stories or beliefs relating to the place

**Interpretation** means all the ways of presenting the cultural significance of a place.

Interpretation may be a combination of the treatment of the fabric (such as maintenance, restoration, reconstruction), the use of and activities at the place, and introduced explanatory material. It may include exhibitions, events, publications, art works and other forms of expression, and is not confined to the place.

#### **Other Definitions**

**Curtilage** and **heritage curtilage** means the area of land (including land covered by water) surrounding an item or area of heritage significance, which is essential for retaining and interpreting its heritage significance

## 31.0 GLOSSARY

- anastylosis:*** a process for monument stabilization and restoration in which a structure is (usually completely) dismantled in a systematic way that will allow, after stabilization of foundations and other work to strengthen the structure, for the exact reconstruction of the structure, with each structural element returned to its original position. This technique was pioneered and has been widely applied to stone monuments in Southeast Asia, particularly in Java (Indonesia) at Borobudur and at Angkor in Cambodia.
- axis mundi:*** (Latin) The axis mundi (world axis), in religion or mythology, is the world center and/or the connection between heaven and Earth. It exists in virtually all cultures on Earth. Many cultures consider a specific place, almost always a hill, a mountain or a pyramid to be the axis mundi. Whereas others mimic axis mundi; for example - the stupa of Hinduism, and later Buddhism, reflects the Mount Meru.
- baray:*** (Khmer) reservoir.
- Buddhapada:*** or Buddha footprint. The footprint of the Buddha, is an early aniconic and symbolic representation of Buddha.
- Burra Charter:*** The Burra Charter provides guidance for the conservation and management of places of cultural significance (cultural heritage places), and is based on the knowledge and experience of Australia ICOMOS members.
- buttress:*** is a structure built against or projecting from a wall which serves to support or reinforce the wall.
- garbhagriha:*** (Sanskrit) the 'innermost chamber,' sanctum sanctorum, of a Hindu temple.
- gopura:*** monumental structure above the entrance of temple enclosures.
- Cambodian New Year:*** or Chaul Chnam Thmey in the Khmer language is the name of the Cambodian holiday that celebrates the new lunar year. The holiday lasts for three days, from April 13th to 15th.
- cultural landscapes:*** are cultural properties and represent the "combined works of nature and of man" designated in Article 1 of the *Convention*. They are illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal.
- Khmer Rouge:*** the Khmer Rouge was a communist organization which ruled Cambodia from 1975 to 1979. The term "Khmer Rouge," meaning "Red Khmer" in French, was coined by Norodom Sihanouk and was later adopted in English. The official name of the Khmer Rouge was the Communist Party of Cambodia, later the Party of Democratic Kampuchea. It was also known as the Communist Party of Kampuchea, the Khmer Communist Party and the National Army of Democratic Kampuchea. It was deposed by the Socialist Republic of Vietnam in 1979, after which the latter installed a pro-Soviet communist regime in Cambodia.
- The Khmer Rouge regime is remembered mainly for the deaths of an estimated 1.7 million people (from an estimated 1972 population of 7.1 million), through execution, starvation and forced labor. It is often said to have been one of the most violent regimes of the 20th century — on par with the regime of Adolf Hitler. In terms of the number of people killed as a proportion of the population of the country it ruled and time in power, it was probably the most lethal regime of the 20th century.
- linga:*** (also, Lingam; Sanskrit lingam, meaning "gender" in general, and also "phallus" in particular by some etymologists) is used as a symbol for the worship of the Hindu God Shiva. Others state that the lingam simply means "mark" and has no gender or sexual connotations. The use of this symbol as an object of worship is a timeless tradition in India; mainstream scholars connect the origin of the lingam to the early Indus Valley civilisation. Lingam is usually found with Yoni. It was natural for the tribes of Indus Valley to look at the togetherness of genital parts of the male and female (Lingam and Yoni) as the point of energy, point of creation, and point of enlightenment. Such revelation was later enriched by many philosophies and theologies as man's knowledge of God widened with civilization.
- A stylized phallic symbol of the masculine cosmic principle and of the Hindu god Siva – compare yoni.

**laterite:** a soil type of sedimentary formation, predominantly composed of heavily weathered clay minerals and rich in iron. Lateritic soils tend to be ancient soils with long exposure to water leaching, typical of tropical monsoon environments, during which process the softer kaolinite clay minerals are washed away, giving the soil a porous, vesicular appearance. When exposed to air for extended periods, laterite soils harden, prior to hardening laterite can be cut into blocks for building purposes. Because of the long crystalline structure of iron, which gives it its typical reddish color, laterite is a very strong, if brittle, building material, which because of its porosity is also relatively lightweight. Laterite was used extensively throughout Southeast Asia for monumental construction before, during and after the Khmer Empire period.

**Mount Meru:** is a sacred mountain in Hindu and Buddhist mythology considered to be the center of the universe. It is believed to be the abode of Brahma and other deities of both religions. The mountain is said to be 80,000 leagues (450,000 km) high and located in Jambudvipa, one of the continents on earth in Hindu mythology. Phnom Bakheng, the first temple of Angkor and Angkor Wat, the principal temple of Angkor in Cambodia, was built as a symbolic representation of Mount Meru.

**Naga:** legendary being which were part cobra.

**Nandi:** [also spelled Nandin] in Hindu mythology, each god is associated with an animal, called the god's vehicle. Nandi, which means "the bull", is Shiva's vehicle. A sculpted image of Nandi, usually in a posture of worship or respect, is almost always found in front of a temple dedicated to Shiva.

**Navagraha:** in Hindu astrology, the Navagraha are the nine chief celestial beings:

- Surya (Sun)
- Chandra/Soma (Moon)
- Angaaraka/Chevaai (Mars)
- Budha (Mercury)
- Guru (Jupiter)
- Shukra (Venus)
- Shanaischara (Saturn)
- Rahu (Head of Demon Snake)
- Ketu (Tail of Demon Snake)

"Nava" means "nine". "Graha" is sometimes translated as "planet", but the Sun, Moon, and Rahu and Ketu are not "planets" according to western astronomy. "Graha" is sometimes translated as "celestial body", but Rahu and Ketu are not celestial bodies by western astronomy either. A third translation is celestial god or demi-god, but again, Rahu and Ketu are Asuras not Devas. Rahu and Ketu are further believed to be only positions in the planetary paths.

**neak ta:** (Khmer) spirit

**Outstanding universal value:** means cultural and/or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity. As such, the permanent protection of this heritage is of the highest importance to the international community as a whole. The Committee defines the criteria for the inscription of properties on the World Heritage List.

**Parvis:** a square or open space in front of a church. The term comes from paradise, because when one was in front of a church, one was closer to the sky. In the Middle Ages, the majority of the squares were enclosed by the church creating a courtyard and cloister. In the 19<sup>th</sup> and 20<sup>th</sup> century, they often were considerably extended in order to offer a sufficient retreat to the person wishing to admire the frontage of the building.

The meaning of parvis in the context of Angkor is a space or approach area usually to the east of a temple which provides a point of arrival and access for visitors, which can include facilities for parking, vendor stores and amenities and interpretive built elements.

**phnom:** (Khmer) mountain

**plinth:** in architecture, a plinth is the lower moldings of a podium, pedestal or skirting, or a block or slab upon which a column, pedestal, statue or vase is based. In the classical orders it is the square block of moderate height under the base moldings of a column or pedestal.

- podium:** a podium is a platform that is used to raise something to a short distance above its surroundings. In architecture a building can rest on a large podium.
- prang:** a tall, finger-like spire, usually richly carved. This was a common feature of Khmer religious architecture and was later adopted by Thai builders, typically in the Ayutthaya and Bangkok periods. In Thailand it appears only with the most important religious buildings
- prasat:** temple.
- sampot:** The sampot is the national garment of Cambodia. The traditional dress is similar to those worn in the neighboring countries of Laos and Thailand, but variations do exist between each countries. The similarities can be explained by the fact that traditional Thai and Lao dress are derived from the Angkorian-style sampot when the Khmers had immense cultural influence on Lao and Thai culture.
- Sanskrit:** an ancient Indian language and script, often used throughout South and Southeast Asia for Hindu or Buddhist writings and inscriptions on stone, and used during the Khmer Empire for official and historical texts.
- Shiva:** [also spelled Siva] one of the oldest and most important of the Hindu gods, associated with natural forces of both destruction and creation. Along with Brahma and Vishnu, Shiva forms part of the central trimurti (trinity) of Hindu gods where he embodies the active, ever-changing elements of the universe and the non-ending, all encompassing circle of life, death and rebirth. Shiva is usually represented by the Shiva linga.
- sikhara:** a Sanskrit word translating literally to "mountain peak", refers to the rising tower in the Hindu temple architecture of North India. Sikhara over the sanctum sanctorum where the presiding deity is enshrined is the most prominent and visible part of a Hindu temple of North India.
- World Heritage Convention:** (Convention) the United States initiated the idea of combining cultural conservation with nature conservation. A White House conference in 1965 called for a World Heritage Trust to preserve "the world's superb natural and scenic areas and historic sites for the present and the future of the entire world citizenry." The International Union for Conservation of Nature developed similar proposals in 1968, and they were presented in 1972 to the United Nations conference on Human Environment in Stockholm, Sweden.
- A single text was ultimately agreed on by all parties involved, and the Convention Concerning the Protection of World Cultural and Natural Heritage was adopted by the General Conference of UNESCO on 16 November 1972.
- The Convention aims at the identification, protection, conservation, presentation and transmission to future generations of cultural and natural heritage of outstanding universal value.
- Yasovarman:** or Yasovarman I "Protected by Glory". Khmer king who reigned between 889 and the early 10<sup>th</sup> century. His posthumous name is Paramashivakola.
- yoni:** a stylized representation of the female genitalia symbolizing the feminine principle in Hindu cosmology.
- The word yoni is the Sanskrit word for the 'female reproductive organ'. Translated directly into English, it could mean vulva or vagina. It also has a wider meaning in religious and spiritual contexts, where its meaning is 'creativity'. The yoni is also considered to be symbolic of Shakti or other goddesses of a similar nature.
- Yoni is perhaps the most misused and misunderstood word from the ancient Indo-Aryan language, Sanskrit. The word yoni was originally used more often in a spiritual sense rather than as a term to describe female genitalia – compare linga.

## *appendices*

## **32.0 PHOTOGRAPHIC CREDITS**

Generally photographic descriptions are followed by a photographic credit for the photographer or organization and date photograph was taken if known, for example – ([photographer's initials] [month year]).

The abbreviations or initials for the photographer or organization are listed below:

AAA:	Association des Amis d'Angkor
APSARA:	The APSARA Authority
EFEO:	École française d'Extrême-Orient
JICA:	Japanese International Cooperation Agency
ME:	Michael Ellis
JG:	Jill Gilmartin
SK:	Sam Kimheng
KK:	Kimball Koch
MM:	Michael Martin
CP:	Charlie Pepper
JPS:	John Sanday
MS:	Michael Schuler
JHS:	John Stubbs
BW:	Barbara Weider

### ***Cover Page***

Michael Schuller

## **33.0 SEPARATE APPENDIX**

**33.1 Appendix A: Phnom Bakheng Workshop on Public Interpretation Conference Proceedings**

**33.2 Appendix B: Projet du Conservation et de mise en valeur du site du Phnom Bakheng; Rapport Final**

## 34.0 ENDNOTES

<sup>1</sup> The conservation approach to be used at Phnom Bakheng will utilize many of the techniques perfected at Preah Khan by WMF since 1992.

<sup>2</sup> Fowler, P. J., (ed.), *World Heritage Cultural Landscapes 1992-2002*, World Heritage Paper No. 6, UNESCO, World Heritage Center, Paris 2003

<sup>3</sup> The report structure was modeled from a conservation plan produced by Godden Mackay Context for The Port Arthur Historic Site in 2000.

<sup>4</sup>Wikipedia contributors, "Khmer Empire," Wikipedia, The Free Encyclopedia, [http:// en.wikipedia.org/w/index.php?title=Khmer\\_Empire&oldid=54468420](http://en.wikipedia.org/w/index.php?title=Khmer_Empire&oldid=54468420) (accessed March 2, 2006).

<sup>5</sup> AusHeritage & ASEAN-COCI, Cultural Heritage Management Profile – Cambodia.

<sup>6</sup> Fraser Thomas Ltd & Boffa Miskell Ltd, *Angkor Forest Rehabilitation & Landscape Enhancement Project*, APSARA, Royal Government of Cambodia, 1998

<sup>7</sup> Information obtained from <http://www.cambodia-airports.com/siemreap/en>, (accessed February 22, 2006).

<sup>8</sup> Need to check/confirm source, obtained from the US National Park's hydrology report.

<sup>9</sup> Albanese, Marilia, *Angkor: Splendors of the Khmer Civilization*, Asia Books, 2002

<sup>10</sup> Fletcher, Roland, Keynote address for "Water in Mainland Southeast Asia", workshop organized by the Centre for Khmer Studies, Siem Reap, Cambodia, 2005

<sup>11</sup> Albanese, Marilia, *Angkor: Splendors of the Khmer Civilization*, Asia Books, 2002

<sup>12</sup> Jacques, Claude, *History of the Phnom Bakheng Monuments*, paper presented at the Phnom Bakheng Workshop on Public Interpretation: a cross-disciplinary workshop organized by the World Monuments Fund under auspice of the APSARA Authority, December 2005

<sup>13</sup> Nils Tremmel, 1994

<sup>14</sup> Glaize, Maurice, *A guide to the Angkor Monuments*, translation Tremmel, Nils, [www.theangkorguide.com](http://www.theangkorguide.com)

<sup>15</sup> Briggs, Lawrence Palmer, *The Syncretism of Religions in Southeast Asia, Especially in the Khmer Empire*, Journal of the American Oriental Society, 1951 - JSTOR

<sup>16</sup> The Huntington Photographic Archive of Buddhist and Related Art, College of the Arts, The Ohio State University, Columbus, Ohio, USA, <http://kaladarshan.arts.ohio-state.edu/seasia/khmertxt.html> (February 2007)

<sup>17</sup> Winter, Tim, 2005

<sup>18</sup> Kérya, 2005

<sup>19</sup> Of the four paths offered for ascending and descending the monument, 90% of visitors ascend using the east stair; 72% of visitors descend using the east stair (Kérya, 2005). The overuse of the already steep east stair combined with damage from heavy rains has resulted in erosion and hazardous conditions.

<sup>20</sup> Montgomery, George, *Khmer Sculpture*, Asia House Gallery, New York, 1961

<sup>21</sup> Marilia Albanese, *Angkor: Splendors of the Khmer Civilization*, Asia Books, 2002

<sup>22</sup> Jessup, Helen and Zéphir, Thierry (eds.), *Sculpture of Angkor and Ancient Cambodia: Millennium of Glory*, Washington, DC: National Gallery of Art, 1997

<sup>23</sup> Wikipedia contributors, "Mathematics and architecture," Wikipedia, The Free Encyclopedia, [http:// en.wikipedia.org/w/index.php?title=Mathematics\\_and\\_architecture&oldid=53815812](http://en.wikipedia.org/w/index.php?title=Mathematics_and_architecture&oldid=53815812) (March 24, 2006).

<sup>24</sup> "Standing Brahma [Cambodia] (36.96.3)". In Timeline of Art History. New York: The Metropolitan Museum of Art, 2000-. [http://www.metmuseum.org/toah/ho/06/sse/hod\\_36.96.3.htm](http://www.metmuseum.org/toah/ho/06/sse/hod_36.96.3.htm) (October 2006)

<sup>25</sup> To be totally accurate, the beginnings of this change were already apparent in the female dress of the Preah Ko style with the use of some pleating.

<sup>26</sup> Musée national des Arts asiatiques-Guimet, *Bakheng Style*, Museum information card, 2005

<sup>27</sup> "Standing Brahma [Cambodia] (36.96.3)". In Timeline of Art History. New York: The Metropolitan Museum of Art, 2000-. [http://www.metmuseum.org/toah/ho/06/sse/hod\\_36.96.3.htm](http://www.metmuseum.org/toah/ho/06/sse/hod_36.96.3.htm) (October 2006)

<sup>28</sup> Musée national des Arts asiatiques-Guimet.

<sup>29</sup> Wikipedia article, *Architecture of Cambodia*, [http:// en.wikipedia.org/wiki/Architecture\\_of\\_Cambodia](http://en.wikipedia.org/wiki/Architecture_of_Cambodia), accessed April 2006

<sup>30</sup> JSA, The Master Plan for the Conservation & Restoration of the Bayon Complex, 2005

<sup>31</sup> Wikipedia contributors, "Henri Mouhot," Wikipedia, The Free Encyclopedia, [http:// en.wikipedia.org/w/index.php?title=Henri\\_Mouhot&oldid=52296459](http://en.wikipedia.org/w/index.php?title=Henri_Mouhot&oldid=52296459) (accessed May 2, 2006).

<sup>32</sup> Wikipedia contributors, "Henri Mouhot," Wikipedia, The Free Encyclopedia, [http:// en.wikipedia.org/w/index.php?title=Henri\\_Mouhot&oldid=52296459](http://en.wikipedia.org/w/index.php?title=Henri_Mouhot&oldid=52296459) (accessed May 2, 2006).

<sup>33</sup> Animated TimeMap of the Khmer Empire 100 CE – 1550 CE, TimeMap Project, University of Sydney, Australia. <http://www.timemap.net>

<sup>34</sup> Jessup, Helen and Zéphir, Thierry (eds.), *Sculpture of Angkor and Ancient Cambodia: Millennium of Glory*, Washington, DC: National Gallery of Art, 1997

<sup>35</sup> Laur, Jean, *Angkor: An illustrated Guide to the Monuments*,

<sup>36</sup> Michael Vickery

<sup>37</sup> Laur, Jean, *Angkor: An illustrated Guide to the Monuments*,

<sup>38</sup> Vickery, Michael, *History of Cambodia*, Summary of lectures given at the Faculty of Archaeology Royal University of Fine Arts, 2001 – 2002, Center for Khmer Studies

## appendices

- <sup>39</sup> Laur, Jean, *Angkor: An illustrated Guide to the Monuments*,
- <sup>40</sup> Higham, Charles, *The Symbolism of the Angkorian City*, Viewpoints, Cambridge Archaeological Journal 10:2 (2000), 327-65
- <sup>41</sup> Laur, Jean, *Angkor: An illustrated Guide to the Monuments*,
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- <sup>44</sup> APSARA website [http://www.autoriteapsara.org/en/angkor/temples\\_sites/temples/bakheng.html](http://www.autoriteapsara.org/en/angkor/temples_sites/temples/bakheng.html), accessed 2 March 1996
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- <sup>46</sup> Molyvann, Vann, *Modern Khmer Cities*, Reyum Publications, 2003
- <sup>47</sup> The first known example was Ak Yum constructed in brick, although very little of that structure now remains.
- <sup>48</sup> Albanese, Marilia, *Angkor: Splendors of the Khmer Civilization*, Asia Books, 2002
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- <sup>50</sup> Luco, Fabienne, *The People of Angkor between Tradition and Development*, Paper presented at the WMF Workshop on Public Interpretation, 2005
- <sup>51</sup> Albanese, Marilia, *Angkor: Splendors of the Khmer Civilization*, Asia Books, 2002
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- <sup>53</sup> APSARA website <http://www.autoriteapsara.org/en/angkor/history/war.html>, accessed 2 March 2006
- <sup>54</sup> Luco, Fabienne, *The People of Angkor between Tradition and Development*, Paper presented at the WMF Workshop on Public Interpretation, 2005
- <sup>55</sup> de la Torre, M., (ed.), *Assessing the Values of Cultural Heritage*, The Getty Conservation Institute, 2002
- <sup>56</sup> The latter could mean isolating unique examples or models, considering multiple stages of construction, considering the ancient physical context, or the amount of documentation on the property.
- <sup>57</sup> Rivet, Christophe and Cleere, Henry (ed.), *Comparative Archaeological Studies in the Work of the World Heritage Committee*, A collection of papers presented at the 33<sup>rd</sup> annual meeting of the Canadian Archaeological Association, 2001
- <sup>58</sup> It is not clear from the ICOMOS evaluation report what type of cultural landscape Vat Phou was inscribed as. It is a planned, relict, landscape but the mountain which is central to the design, also has living spiritual associations.
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- <sup>67</sup> Kerr, J. S., *Sydney Opera House: A Plan for the Conservation of the Sydney Opera House and its Site*, Third (revised edition), 2003
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- <sup>70</sup> Gardner, J., *Informed conservation: principles and practice*, IHBC paper, 2002
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- <sup>72</sup> Generic policies for the Action Plans where derived, in part, from Godden Mackey Context, *Port Arthur Conservation Plan – Volume 1*, Port Arthur Historic Site Management Authority, 2003