

Sri Nakharinwirot University Wangnoi Campus Development Plan

This document, which is published in both the Thai and English languages, has been prepared by a team from Sri Nakharinwirot University and the Unesco Regional Office for Education in Asia, Bangkok. Opinions expressed in the document are those of the authors and do not necessarily represent the official views of Unesco.

ABSTRACT

Monograph; describes campus planning for new university campus in Thailand; gives educational objectives; discusses social environment desired; provides data on enrolment projections and staff; analyzes existing campuses; concludes new university campus required; discusses site selection and reviews site area in relation regional planning considerations; describes development of new campus planning for enrolment of 20,000 students phased over 50 years; describes space requirements, space types, space standards for teaching areas, student housing, staff housing, administration spaces and communal spaces; describes site development; costs the plan and schedules development activities; provides bibliography.

Unesco Regional Office for Education in Asia
Darakarn Building, 920 Sukhumvit Road
C. P. O. Box 1425
Bangkok, Thailand

INTRODUCTION

The Wangnoi Campus Development Plan involves Sri Nakharinwirot University in the creation of a new major educational centre which will amalgamate the undergraduate schools of its four Bangkok campuses, namely, Prasarnmitr, Pathumwan, Bangkhen and Palasuksa. The proposed move has been made necessary by overcrowding and other inconveniences. For instance, Pathumwan Campus is located within the boundary of Chulalongkorn University, which has repeatedly indicated its desire to recover the land. Bangkhen Campus shares the site along with Phra Nakorn Teacher Training College, which is also straining under its own pressures for expansion. Similarly, Palasuksa Campus facilities are intermingled with those of the Department of Physical Education and Palasuksa Teacher Training College, - a situation involving considerable space shortage and posing a real obstacle to the academic and physical aspects of Physical Education. Even at Prasarnmitr, by far the largest in area, the overcrowding has been aggravated by efforts to provide degree programmes at all levels, up to the doctoral degree.

If the undergraduate school, currently operating in the four Bangkok campuses, is transferred to Wangnoi, the facilities at Prasarnmitr could then be devoted exclusively to postgraduate education, offering facilities not to a mere hundred, but to a thousand or more postgraduate students. The need to send students abroad for postgraduate study and the concomitant drain on the foreign exchange would be reduced proportionately. There is another important aspect of the move. The Central Plain of Thailand has not, up to the present, been served by a university.

The case for the establishment of a new campus at Wangnoi is thus highly cogent on the grounds that the move will reduce overcrowding and furnish the surrounding communities with greatly improved higher education services.

Accept, Ladies and Gentlemen, the expression of my appreciation for your interest in this document.



(Professor Sudchai Laosunthara)
President

ACKNOWLEDGEMENT

Sri Nakharinwirot University offers its thanks to the various agencies listed below for kindly permitting the University to consult with their professional staff. The University also offers its thanks to the staff concerned for so willingly providing information needed in the preparation of the plan for the Wangnoi Campus.

1. Mr. Manas Pitivongse Director-General, Royal Irrigation
Department
2. Dr. Bancherd Balangkura Director-General, Land Development
Department
3. Mr. Pisoot Sudasna Director-General, Department of
Mineral Resources
4. Mr. Chaleo Vajarabukka Director-General, Department of
Highways
5. Lt. Gen. Chumporn Kulkasem Director, Armed Forces Survey
Department
6. Mrs. Anuri Wanglee Director, Population Survey Division,
National Statistical Office
7. Mr. Suchin Suyanandana Director, Technical and Planning
Division, Department of Land Transport
8. M. L. Chinchai Kambhu Director-General, Department of Town
and Country Planning
9. Mr. Sakol Wongbuddha Director, Planning and Civil Works
Department, Provincial Electricity
Authority
10. Professor Kasarn Chartikavani Rector, Mahidol University
11. Professor Rapee Sagarik Rector, Kasetsart University
12. Mr. Kanok Devahastin Promotion Manager, Nava Nakorn Co. Ltd.
13. Mr. David A. Bailey Chief Executive, Nava Nakorn Co. Ltd.
14. Mr. Channarong
 Chantanavarangkoon Technical Officer, Nava Nakorn Co. Ltd.
15. Dr. Vicharn Poopath Civil Engineer, Materials and Research
Division, Department of Highways

CONTENTS

CHAPTER ONE - SUMMARY OF THE DEVELOPMENT PLAN

- 1.1 Sri Nakharinwirot University in Bangkok
- 1.2 Alternative sites
- 1.3 The University in the future
- 1.4 The site of Wangnoi Campus
- 1.5 Development of infrastructure
- 1.6 Development of the campus plan
- 1.7 Residences
- 1.8 Costs
- 1.9 Implementation

CHAPTER TWO - THE UNIVERSITY IN THE FUTURE

- 2.1 Philosophy and new directions
- 2.2 Functions and activities
- 2.3 Organization
- 2.4 Wangnoi - the justification for a new campus
- 2.5 A new emphasis in the role of the University

CHAPTER THREE - FUTURE DEMANDS AND EXISTING FACILITIES

- 3.1 Projected academic expansion
- 3.2 Projected enrolment to B. E. 2544 (2001)
- 3.3 Growth of academic and non-academic staff
- 3.4 Facilities needed to meet projected expansion
- 3.5 Sites of the four Bangkok campuses
- 3.6 The facilities in Bangkok
- 3.7 The limit to growth
- 3.8 The case for development of the Wangnoi site

(ii)

CHAPTER FOUR - A PLAN FOR DEVELOPMENT
OF A CAMPUS AT WANGNOI

- 4.1 Macro-location : a review
- 4.2 The site
- 4.3 Review of future academic objectives and social aims
- 4.4 Development of a plan for the campus

CHAPTER FIVE - IMPLEMENTATION AND COSTS

- 5.1 A policy for phased development
- 5.2 Resources and expenditure
- 5.3 Schedule of development activities

LIST OF TABLES

- Table 1.10 Undergraduate enrolment for the period B. E. 2524-2544 (1981-2001)
- Table 1.11 Capital cost of campus development by 5-year plan periods
- Table 2.30 Organization of the University
- Table 3.20 Undergraduate enrolment for the period B. E. 2524-2544 (1981-2001)
- Table 3.30 Academic staff for the period B. E. 2524-2544 (1981-2001)
- Table 3.31 The academic staff : abstract student ratio (SASR) for the period B. E. 2524-2544 (1981-2001)
- Table 3.32 Non-academic staff for the period B. E. 2524-2544 (1981-2001)
- Table 3.50 A comparison of campus site areas
- Table 4.40 Land use at period of enrolment of 20,000 students
- Table 4.41 Schedule of accommodation for 20,000 students
- Table 4.42 Vehicles and parking
- Table 4.43 Gross area in m² of new construction by 5-year plan period
- Table 4.44 Phased programme for development of sports facilities
- Table 5.20 Estimated quinquennial capital expenditure (Bahts in thousands)
- Table 5.21 Estimated annual capital expenditure (Bahts in thousands)

LIST OF FIGURES

- Figure 1. 20 Bangkok and the Wangnoi area
- Figure 1. 60 Components of the development plan
- Figure 1. 61 Phases of development of the campus
- Figure 3. 20 Growth of student population from B. E. 2524-2544 (1981-2001)
- Figure 4. 10 Bangkok and the Wangnoi area
- Figure 4. 12 Probable general development of the Wangnoi area
- Figure 4. 20 The site of the new campus at Wangnoi
- Figure 4. 21 The infrastructure of the area
- Figure 4. 31 Functional diagram showing possibilities for adaptation to future needs
- Figure 4. 40 General plan of the campus for an enrolment of 20, 000 students
- Figure 4. 41 Flood protection and drainage
- Figure 4. 42 Roads, pedestrian-ways and parks
- Figure 4. 43 Sewage and rain-water disposal and other services
- Figure 4. 44 Relationships between academic areas
- Figure 4. 45 Summary of net areas of academic space in B. E. 2544 (2001)
- Figure 4. 46 Teaching and research areas : schematic development
- Figure 4. 47 Teaching group sizes at Prasarnmitr Campus
- Figure 4. 48 Summary of net areas of communal space
- Figure 4. 49 Students to be housed to B. E. 2544 (2001)

- Figure 5.10 5-year plan period ; phased development
- Figure 5.11 Schedule of annual development activities
by year B. E. 2521-2529 (1978-1986)
- Figure 5.12 Phased development plan : initial phase
- Figure 5.13 The development plan-final phase
- Figure 5.20 Relationship of plan period to academic year
and construction
- Figure 5.30 Schedule of development activities for year
B. E. 2521 (1978)
- Figure 5.31 Proposal for project implementation unit

CHAPTER ONE

SUMMARY OF THE DEVELOPMENT PLAN

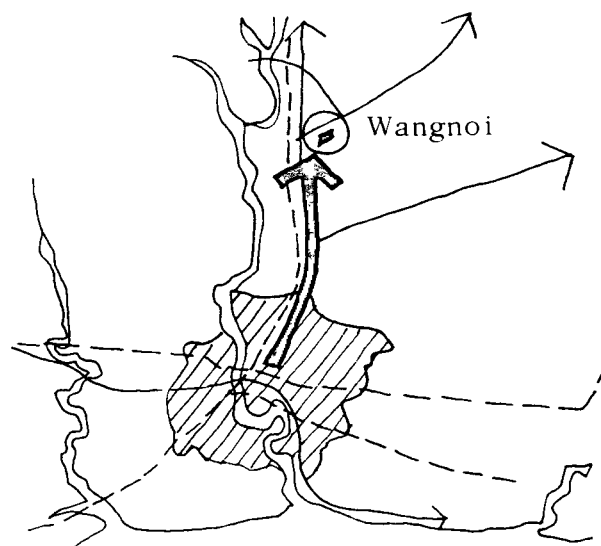
1.1. Sri Nakharinwirot University in Bangkok

The University consists of eight campuses, four of which are in Bangkok. The Bangkok campuses are small in area and already overcrowded with students. The University is the owner of only one of these four campuses. The owners of the remaining three have indicated that they would like to recover them for their own use as soon as possible.

1.2. Alternative sites

The University authorities considered various alternative sites for relocation of the Bangkok campuses and decided that a site at Wangnoi, 62 km. north of Bangkok, was the only one that met the requirements (Figure 1.20). A group consisting of senior staff of the University and staff of the Unesco Regional Office for Education in Asia, was convened to prepare a plan for the development of a campus for the University at Wangnoi.

Figure 1.20 Bangkok and the University Site



1.3. The University in the future

The functions of the University are to promote training, research, academic extension and preservation of arts and the cultural heritage. The branch of the University at Wangnoi will realise these functions through the Faculties of Education, Science, Humanities, Social Sciences and Physical Education which will move there from Bangkok. The location of the site in a rural area at the northern tip of the Metropolis will provide this branch of the University with a unique opportunity to offer an innovative academic service to the rural and urban communities around it and this will find reflection in the establishment of a new Faculty of Continuing Education. Subsequently, other faculties will be added to the campus giving a student population of about 11,000 in B. E. 2544 (2001) and of 20,000 in B. E. 2570 (2027). The undergraduate enrolment and faculties, as they develop from B. E. 2524 - 2544 (1981 - 2001), are shown in Table 1.10.

Table 1.10 Undergraduate enrolment for the period
B.E. 2524-2544 (1981-2001)

Faculty/Year	BE 2524 1981	BE 2525 1982	BE 2526 1983	BE 2527 1984	BE 2535 1992	BE 2544 2001
Education	450	950	2,445	3,935	4,235	4,585
Social Sciences	50	120	189	257	377	517
Humanities	100	200	298	393	435	505
Science	200	405	605	805	885	975
Physical Education	200	425	645	860	1,010	1,185
Continuing Education	-	-	-	-	635	985
Nursing	-	-	-	-	110	525
Political Science	-	-	-	-	200	465
Economics, Business Ad.	-	-	-	-	-	590
Home Economics	-	-	-	-	-	543
Engineering	-	-	-	-	-	50
Architecture	-	-	-	-	-	50
Medicine	-	-	-	-	-	-
T o t a l s	1,000	2,100	4,182	6,250	7,887	10,955

1.4. The site of Wangnoi Campus

The site of area 3535 rai (566 ha.) is 700 m south of the Paholyothin Road and bounded on the north and south by two klongs. It is a level site with subsoil similar to that found all over the Bangkok area. Electricity will be available before 1981; water can be obtained from bore holes at about 130 m.

1.5. Development of infrastructure

A road will be built from Paholyothin Road to the north of the site, to a bridge to be constructed over Klong 26 which forms the northern site boundary.

The site will be impoldered with a light earth bund and pumps will keep the area free of the rain water that floods the land annually. Very heavy rain will be retained in lakes to be excavated for the purpose. Water supply will be provided from deep wells on the site and one day's requirement stored in tanks.

The oxidation pond system will be used for sewage treatment. Landscaping will be of critical importance in the development of the site which is totally flat and featureless.

1. 6. Development of the campus plan

The four components of the plan comprise academic, residential, sports and garden and reserved areas (Figure 1. 60).

The access to the site would be by a major road from north to south and located on the west. A subsidiary road would run from the north access, along the eastern and southern site boundaries. Access to the heart of the site would be by means of subsidiary roads leading to each group of buildings. The grouping of the academic buildings is arranged on each side of an exclusively pedestrian way which forms the central spine of the site. Communal buildings are located in the centre of the academic group.

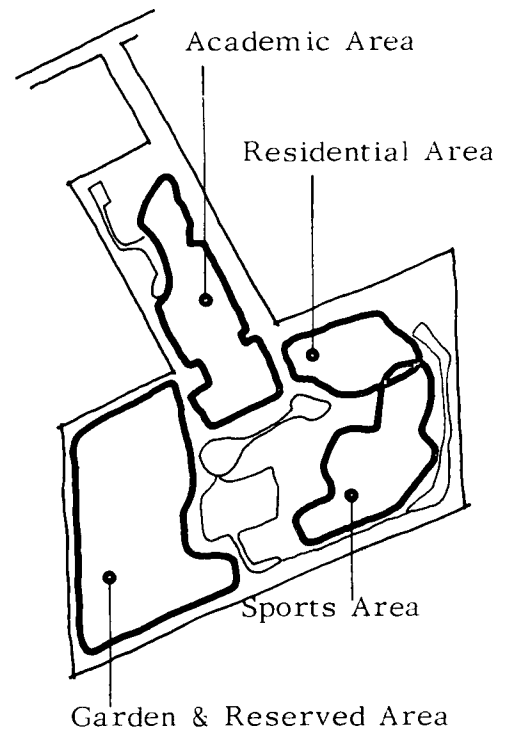


Figure 1. 60 Components of the Development plan

As explained below, the site will be developed by phases to match the growing enrolment and the establishment of new faculties. Figure 1.61 shows both an early as well as the final phase of development as it can be foreseen on the basis of present plans for academic expansion.

1.7. Residences

The policy of the University will be to provide residential accommodation for all first year, undergraduate students, for maintenance staff and a very limited number of residences for academic staff. The residential area for students and staff is planned at the east of the site, adjacent to the sports area and with easy access to the academic zone.

1.8. Costs

The estimated capital costs of the development of the campus, calculated at 1977 prices, are given in Table 1.11 for 5-year plan periods to B. E. 2544 (2001).

1.9. Implementation

The enrolment of the first 1,000 students at Wangnoi is planned for B. E. 2524 (1981). As the degree courses are of four years duration, the last enrolment to give each faculty a full complement of students in each year, will be in B. E. 2527 (1984). At that time the total number of students at the campus will be 6,250.

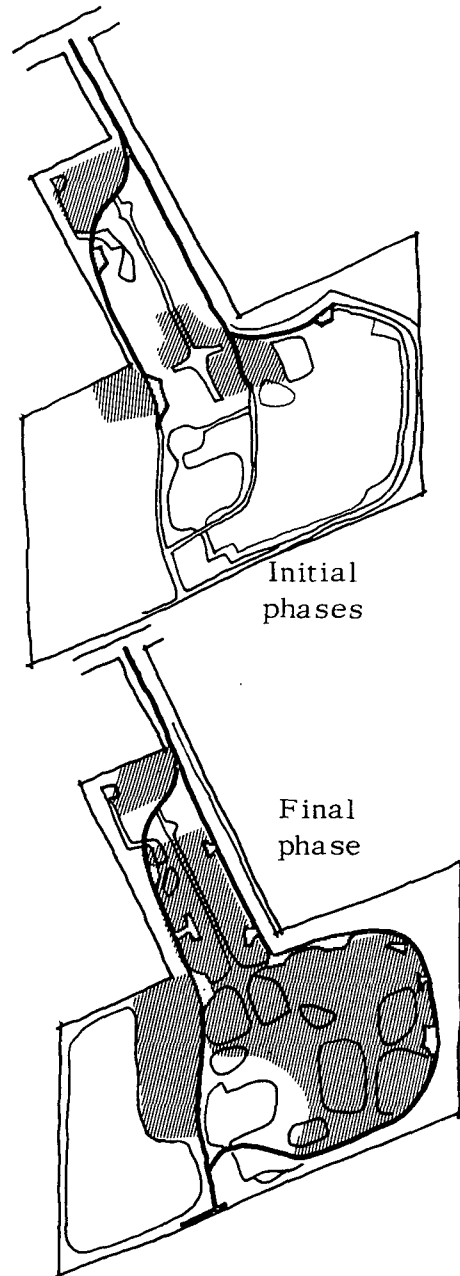


Figure 1.61 Phases of Development of the Campus

Table 1.11 Capital Cost of Campus Development by 5-year Plan Periods

Item \ Plan Period	2520-24 (1977-81)	2525-29 (1982-86)	2530-34 (1987-91)	2535-39 (1992-96)	2540-44 (1997-2001)	Totals
Site development and services	115,280	21,400	52,435	9,900	5,874	204,889
Faculty buildings	67,134	123,081	37,796	40,047	50,165	318,223
Communal buildings (including library, administration, Convocation Hall, etc.)	30,460	67,255	11,586	152,468	47,941	309,710
Residential buildings	63,648	79,620	35,634	31,247	31,599	241,748
Other expenditure (including furniture, equipment, fees, contingencies)	110,761	131,719	41,790	58,736	57,331	400,337
GRAND TOTAL	387,283	423,075	179,241	292,398	192,910	1,474,907

(The data is given in thousands of Bahts)

If an adequate infrastructure, academic, communal and residential facilities are to be ready to receive 1,000 students just 4 years from the date of publication of this Report, the University Authorities will have to arrange for work to commence on site in a year's time. This will presuppose that surveys, architects' briefs, engineering and architectural design, specifications and tender documents are all prepared in the first half of B. E. 2521 (1978).

Such a complex of activities requires the very early appointment of highly qualified and well-experienced persons to manage a project office to provide the technical direction and co-ordination necessary if the work is to proceed according to schedule.

CHAPTER TWO

THE UNIVERSITY IN THE FUTURE

2.1. Philosophy and new directions

Social and economic conditions in modern Thailand differ from those of the past.

As a result, and understandably, the people's ways of life have undergone change and new social problems have emerged.

In response to these changes and new problems, the government is focussing its attention on improving and upgrading the standard of living of the people. It is the business of the university to do all that can be done to help implement and support this effort. This requires that certain modifications be made to the philosophy of the university and a willingness to adapt its methods to the new needs. Whatever changes take place require, however, that the high academic standard, and outstanding quality of research programmes of the past, be maintained.

An appreciation of these factors facilitates a brief definition of the philosophy of Sri Nakharinwirot University as being designed to assist in the development concurrently of both society and the individual in the light of national progress and with special reference to:-

a) Social development

The social changes mentioned above have inevitably affected, somehow or other, both rural and urban society in Thailand.

For instance, in the rural area, farmers without land for farming have grown in numbers bringing about economic regression which in its turn may lead to a struggle resulting in undesirable change. In the urban areas there has been an influx of rural youth, largely to the metropolis, which has resulted in many problems both social and economic, and endangered public welfare. Coupled with this, economic difficulties have often led to the loosening and deterioration of the warm relationships between urban parents and their children who are often deprived of a decent up-bringing and of family affection. Failure to foster and to cultivate the personality and to inculcate a sense of cultural values in children is not only detrimental to them generally but may also subsequently lead to criminal and sexual problems.

Full realization of this situation has encouraged the university to take measures to reorient the courses and academic activities offered by its various faculties with the dual objective of solving social problems and at the same time maintaining high academic standards.

While the university cannot undertake this task alone, it will, in part, help to shoulder some of the burden of social development of society if it can encourage its students, its staff and also the public at large to take an interest in the causes and circumstances of current social problems and assist in finding ways and means to solutions.

b) Individual development

People associated with a university undergo, in some measure or other a process of personal development. Teaching, research and other university activities probably make their greatest impact on the students. Also affected, though obviously to a lesser extent, are the teaching staff, other university officials, the people living in close proximity to the university's campuses and, finally, the public at large.

The university is particularly concerned with both man's self development and his contribution to the development of society. Thus the focus of its endeavour is to provide education and training which enables its students to contribute to social progress. This in turn requires not only the development of a knowledge base but also of a capacity on the part of every individual graduate to earn a living independently, and not necessarily, as so often has been the case in the past, relying on the civil service for a career prospect.

Coupled with this independence, the graduate should have a deep understanding and appreciation of Thai culture and attitudes which would assist, among other things, in the important goal of achieving rapport between rural and urban populations, both of whom constitute inseparable components of the Thai way of life.

2.2. Functions and activities

The commitment of the university matches not only that of all Thai universities, but also adheres to a generally accepted, international norm. This commitment is to Training, Research, Academic Extension and the Preservation of the Arts and Cultural Heritage of Thailand.

i) Training

The programmes resulting from this commitment are directed to developing the student as a worthy citizen, actively participating in university programmes and oriented, through academic and extra-curricular activities, towards promoting a personal sense of spiritual improvement, democracy, good human relationships in general and, in particular, unison and harmony between urban and rural communities.

Possibilities for realization of this last aim will be real indeed, for the university will admit a proportionately greater number of students from the rural areas where some 80% of Thailand's population lives and works. As a result, students from the towns and from the countryside will reside and study together in the university - a situation in which they will have the best possible opportunity of getting to know each others conditions and problems.

The subject matter of courses has been arranged to reinforce this mutual understanding and is such that successful graduates will be able, on completion of their studies to work in urban or rural areas with equal facility.

ii) Research

The university is, of course, already known for its outstanding work in statistical research and programmes connected with this field will be developed and form part of studies at undergraduate level. Other research programmes connected especially with rural problems will be established as the university develops, particularly programmes that have direct relevance to the needs of the people.

iii) Academic extension

It is clear that a university has a commitment not only to its own students, but also to the public at large. Apart from its existing extension services, the University will launch a specific programme of Continuing Education designed to assist local development through the facilities it offers for upgrading of technical and professional skills.

Last, but not least, attention will be paid to the in-service training of teachers to meet the special requirements of education as they may arise from time to time.

iv) Preservation of arts and the cultural heritage

Located in Changwad Ayuthaya, the Wangnoi Campus of the

University will be in a strong position to encourage research and academic extension work in relation to the invaluable national heritage of arts and culture.

2.3. Organization

The work of administration is ultimately the responsibility of the University Council, which comprises not less than 4 and not more than 9 members by Royal Appointment from outside the University and ex-officio officers of the University including the President, Vice-Presidents, the Directors and Deans. This Council is a policy making body responsible, inter alia, for high-level appointments to the University, the promulgation of regulations and approval of awards of degrees.

Sri Nakharinwirot University is unique in having eight campuses at widely scattered places in Thailand. The headquarters of the University is, however, at Prasarnmitr Campus in Bangkok. Due to the great distances that separate the campuses, one of which is over 1,000 km. from the headquarters, the administration of the university is based on a maximum degree of decentralization with as many decisions as possible being taken at the campus level.

A Model Administration Method also forms another unique feature of the university. The method takes the organization of the Prasarnmitr Campus as its model and this organization is then reflected in all other campuses.

Thus, while at Prasarnmitr, the President (who is the highest authority in the University and responsible for all campuses) is responsible for Prasarnmitr Campus, at each of the other campuses there is a Vice-President. At Prasarnmitr each of the faculties is the responsibility of a Dean and this is matched at all other faculties by Associate Deans. Similarly while there are Chairmen of Departments at Prasarnmitr, at the other campuses there are Acting Department Chairmen. In short, the officials at Prasarnmitr are reflected by similar officials having similar duties at all other campuses.

However, because Prasarnmitr is the headquarters of the University, four Vice-Presidents are assigned additionally to the office of the President and, under his direction, are responsible respectively for administration, academic matters, planning and development and students' activities. The organization is explained in Table 2.30.

However, although each campus is modelled from administrative and academic view-points on the Headquarters campus, this does not prevent the development of special interests in similar faculties at different campuses. Thus the Science Faculty of one campus may specialize in Chemistry while at another the specialization may be Physics and at another, Biology.

There is, of course, a need for co-ordination of the work of the varying campuses and the opportunity for this is provided by monthly meetings of the President, Vice-Presidents, Directors and Deans at which matters affecting policy, co-ordination and other topics relating to the administration and management of the University are discussed.

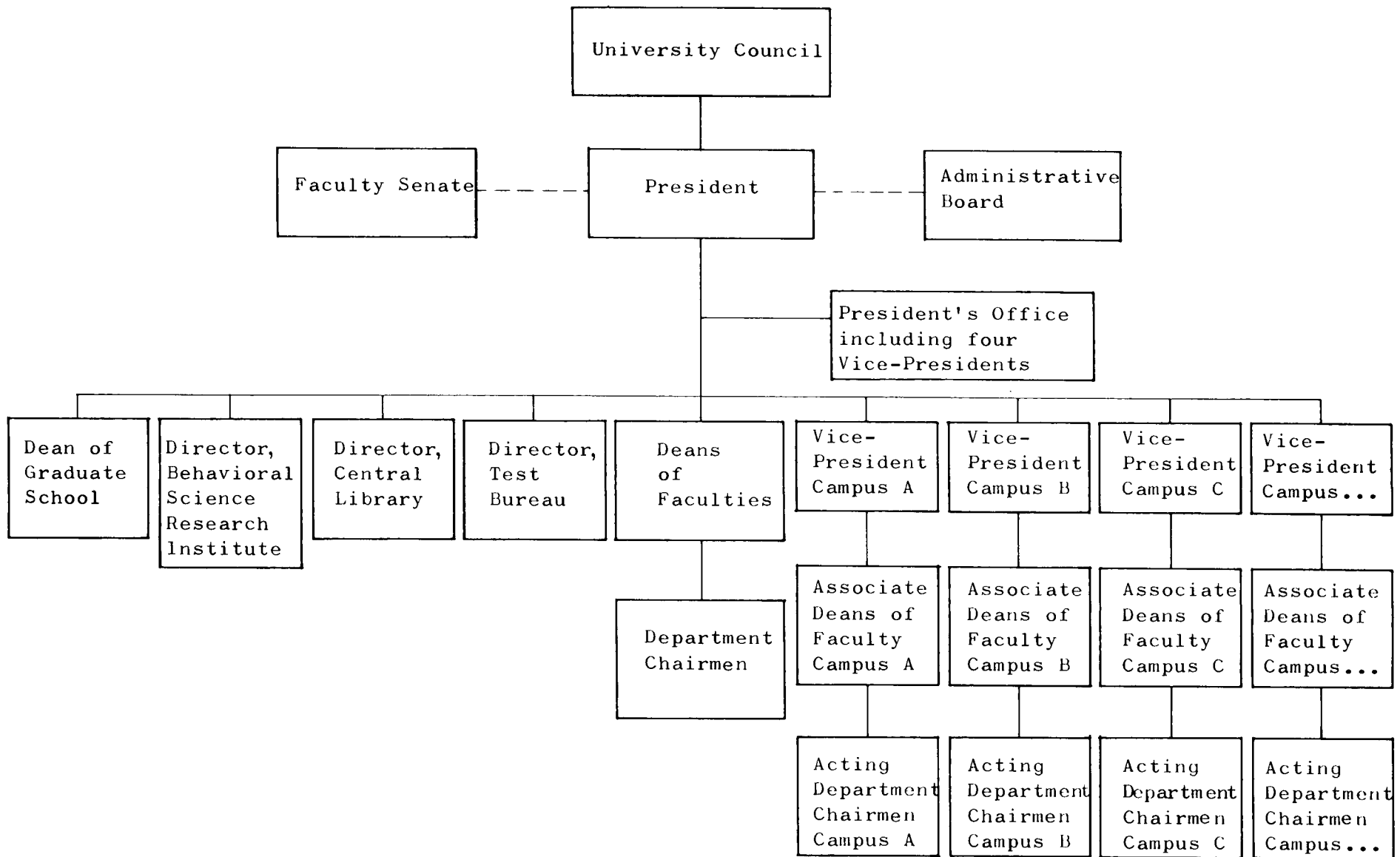


Table 2.30 Organization of the University

Faculty-level administration is dealt with at periodical faculty meetings attended by Deans, Associate Deans and Chairmen or Acting Chairmen of Departments. Academic seminars are held occasionally and as appropriate during the vacations.

The Wangnoi Campus will, when it is established, serve as the new administrative centre for the University which will then comprise six instead of eight campuses and have a correspondingly more economical and less complex administration.

2.4. Wangnoi - the justification for a new campus

a) The need for relocation

Four of the eight campuses that constitute Sri Nakharinwirot University are located in Bangkok. They are at Prasarnmitr, Prathumwan, Bangkhen and Palasuksa. Of these, only Prasarnmitr occupies land owned by the University. The owners of the Prathumwan and Bangkhen campuses have indicated that they require the sites to be vacated as soon as possible and it has also been intimated by the owners of the Palasuksa site that they will eventually wish to reoccupy it too.

b) Increasing enrolments

It is certain, however, that even if the Bangkok branches of the University were able to continue to occupy their present campuses, the increasing enrolment of students is such that the present overcrowded situation would become impossible.

Future enrolments are foreseen to increase as follows:-

B. E. 2529 (1986)	the enrolments will rise to	6,515
B. E. 2534 (1991)	" " " "	7,562
B. E. 2539 (1996)	" " " "	9,000
B. E. 2544 (2001)	" " " "	10,955
B. E. 2570 (2027)	" " " "	20,000

c) The need for a new site

As three of the four Bangkok campuses have to be relocated and as all four campuses are, in any case, too overcrowded to accommodate the expansion in the undergraduate population, it is necessary to seek a new site.

Kasetsart and Mahidol Universities as well as the Asian Institute of Technology, have acquired new sites in recent years with an average area of land provided per student place of some 260 m². Using this

per place area as a "standard" to be applied in selecting a new site on which to integrate the undergraduate activities of the four Bangkok campuses, the size of site required would be as follows:-

B. E. 2529 (1986)	6,515 students at 260 m ² per place require 1,693,900 m ² or 1,059 rais
B. E. 2544 (2001)	10,955 students at 260 m ² per place require 2,848,300 m ² or 1,780 rais
B. E. 2570 (2027)	20,000 students at 260 m ² per place require 5,200,000 m ² or 3,250 rais

There are, of course, other criteria for site selection including suitability for development of a master plan in keeping with the norms associated with universities in Thailand. The site should also be suitable from a technical view-point; it should be accessible and services such as water-supply should be such as to allow for future expansion in the numbers of students and staff. Finally, the site should be located in juxtaposition with both the rural and urban communities which it will be the function of the university to serve.

d) The feasibility of Wangnoi as a campus site

Aware of the need to move and integrate the undergraduate population of the four Bangkok campuses and with criteria for a new campus established, the University Authorities commenced (prior to preparation of this report) the collection of data needed for a study of four sites that were thought might be likely to meet the requirements. These sites were:-

Ongkarak Village, Nakorn Nayok; 947 rais (1,515,200 m ²)
Kao Hin Son, Chacheungsao; 790 rais (1,264,000 m ²)
Wangnoi, Ayuthaya; 3,535 rais (5,656,000 m ²)
Bangsaen Campus, Chonburi; 590 rais (944,000 m ²)

Of these it was concluded that Wangnoi was the only site that met the criteria in respect of area, of adaptability to the development of a workable, long-term master plan and general suitability in relation to the University's commitments to students and to a rural community.

Accordingly, it was decided to prepare a development plan for a campus at Wangnoi, a joint University-Unesco team was convened and this document represents the outcomes of its work.

2.5. A new emphasis in the role of the University

The move of the Bangkok Campuses of the University to a new site in a rural area at the northern tip of the Metropolis will inevitably lead to a reassessment of academic programmes for, if the University is to serve society then, at the new site, to the previous exclusively urban clientele will have to be added the people of the countryside of Ayuthaya and beyond.

The shift in emphasis of the University's offerings to meet this changed situation will be realized, not only in the programmes of the existing faculties but also by the establishment of a new Faculty of Continuing Education, the task of which will be that of serving both the urban and the rural people of the area.

To assist the rural population, it will be necessary to develop formal and non-formal education programmes, and to design and support pilot projects for community development.

The urban population, many of whom will have graduated at different educational levels, should be offered opportunities for re-education and re-training through specially designed, mid-career courses. For both urban and rural populations, whose integration in a well-balanced society is an essential feature of life in Thailand, there would be both joint opportunities for learning and, perhaps more important, for participation in courses of study linked to the location of Wangnoi in Ayuthaya the culture of which would form a focus for attention of artists, writers and scholars in the campus and the area around it.

Operationally this shift in the emphasis of the University's offerings would be through evening and summer degree programmes for those unable to study full-time in the day; through short courses for professionals in industry, business, engineering, teaching etc. in which knowledge and skills are upgraded; through extension courses which may be at the Campus or conducted by the academic staff in the surrounding districts and provinces.

These endeavours, while organized by the new Faculty of Continuing Education, would involve, as appropriate, all Faculties at the Wangnoi Campus ensuring thus not only sound academic offerings, but also drawing all of the Faculties into the task of serving both rural and urban communities in the surrounding area.

CHAPTER THREE

FUTURE DEMANDS AND EXISTING FACILITIES

THE DEMAND

3.1. Projected academic expansion

Sri Nakharinwirot University was founded in B. E. 2517 (1974). Based on one long established programme - Education, its status as a University was established by the addition to its campuses of new programmes in Social Sciences, Science, Physical Education and Humanities. There are thus now five undergraduate faculties at Bangkok as follows:-

Education
Social Sciences
Science
Physical Education
Humanities

There is also a graduate school at Prasarnmitr Campus.

While degrees have been awarded to graduates from the older education faculty for many years, undergraduates have only been admitted to the new faculties since B. E. 2519 (1976) and the first of them will receive their degrees in B. E. 2523 (1980).

The faculties have various Departments relative to their broad areas of interest. Thus, for example, the Social Sciences Faculty has Departments of History, Economics, Sociology and Geography: The Departments of the Humanities Faculty include Fine Arts, Music, Applied Design and Languages: Science has Departments of Physics, Chemistry, Biological Sciences and Mathematics.

Some of these Departments are well developed; others are in the process of development. As time passes, they will continue to expand and to them may be added Departments catering to new but related areas of interest. For example, Criminology may become a Department of the Social Sciences Faculty and Computer Science, a Department of the Science Faculty.

While it is possible to foresee considerable academic expansion within the framework set by the present faculties, it is also possible to anticipate the establishment of new faculties to meet the developmental needs of the country for more vocationally oriented, educated manpower in the future.

For example it will be necessary to increase the numbers of physicians and nurses to improve the medical services; graduates in business administration will be needed to match the country's growing industrialization and, for the same reason, there will be a continuing need for engineers and architects; the University should also provide opportunities in a fast changing society for the updating of professional skills through a Faculty of Continuing Education; Home Economics would also be developed, providing teachers to the schools and the specialists in nutrition and food sciences that are needed for medicine and industry.

The development of the four Bangkok campuses would finally be foreseen as follows:-

Education)	
Social Sciences)	existing Faculties but with
Science)	development foreseen at
Humanities)	departmental level
Physical Education)	

Continuing Education established in	B. E. 2529	(1986)
Nursing	"	B. E. 2534 (1991)
Political Science	"	B. E. 2534 (1991)
Economic and Business Administration	"	B. E. 2539 (1996)
Home Economics	"	B. E. 2539 (1996)
Engineering	"	B. E. 2544 (2001)
Architecture	"	B. E. 2544 (2001)
Medicine	"	B. E. 2549 (2006)

It might reasonably be assumed that with this vision of development, the Campus would, at some time in the future, aspire to the status of a university in its own right.

3.2. Projected enrolment to B. E. 2544 (2001)

a) The five existing Faculties will, it is planned, have completed the move of their undergraduate students to the new site by B. E. 2527 (1984).

The enrolment at that time will be:-

Education	3,935	students
Humanities	393	"
Social Sciences	257	"
Science	805	"
Physical Education	860	"
Total	<u>6,250</u>	<u>students</u>

The growth of enrolment in the Faculties by B. E. 2544 (2001) is foreseen as follows: The figures in brackets represent the increase in enrolment.

Education	4,585	(650 = 14%)
Humanities	505	(112 = 28%)
Social Sciences	517	(260 = 101%)
Science	975	(170 = 21%)
Physical Education	1,185	(325 = 38%)
Total	7,767	(1517 = 19.5%)

The growth rate for the 17 year period is thus planned at about a modest 1% per annum, or 5% in each 5-year, Plan Period.

- b) The first of the new faculties to be introduced - The Faculty of Continuing Education - will be established in B. E. 2529 (1986) and other faculties will be established in successive Plan Periods. By the year B. E. 2544 (2001) the enrolment in these new faculties will be as follows:-

Continuing Education	985	students
Nursing	525	"
Political Science	465	"
Economics and Business Administration	590	"
Home Economics	543	"
Engineering (1st year only)	50	"
Architecture (1st year only)	30	"
Total	3,188	students

This enrolment, together with that in the old established faculties will, by B. E. 2544 (2001), thus total 10,955 students - an increase over the B. E. 2527 (1984) enrolment of 72%.

It may be added that the Medical Faculty, mentioned in 3.1 above, would enrol its first students in B. E. 2549 (2006) and this would be the last new faculty foreseen. Figure 3.20 illustrates the growth of student population by years from B. E. 2524-2544 (1981-2001), while Table 3.20 illustrates the enrolment growth pattern in detail.

3.3. Growth of academic and non-academic staff.

a) Academic staff

Table 3.30 shows the academic staff needed for the period B. E. 2524-2544 (1981-2001). The data are, of course, more meaningful if related to the numbers of undergraduate students and to their courses. This relationship is shown in Table 3.31 which is based on a formula that takes into account the number of credit hours per course, the number of students and

Table 3.20 Undergraduate enrolment for the period
B.E. 2524-2544 (1981-2001)

Faculty/Year	BE 2524 1981	BE 2525 1982	BE 2526 1983	BE 2527 1984	BE 2535 1992	BE 2544 2001
Education	450	950	2,445	3,935	4,235	4,585
Social Sciences	50	120	189	257	377	517
Humanities	100	200	298	393	435	505
Science	200	405	605	805	885	975
Physical Education	200	425	645	860	1,010	1,185
Continuing Education	-	-	-	-	635	985
Nursing	-	-	-	-	110	525
Political Science	-	-	-	-	200	465
Economics, Business Ad.	-	-	-	-	-	590
Home Economics	-	-	-	-	-	543
Engineering	-	-	-	-	-	50
Architecture	-	-	-	-	-	30
Medicine	-	-	-	-	-	-
T o t a l s	1,000	2,100	4,182	6,250	7,887	10,955

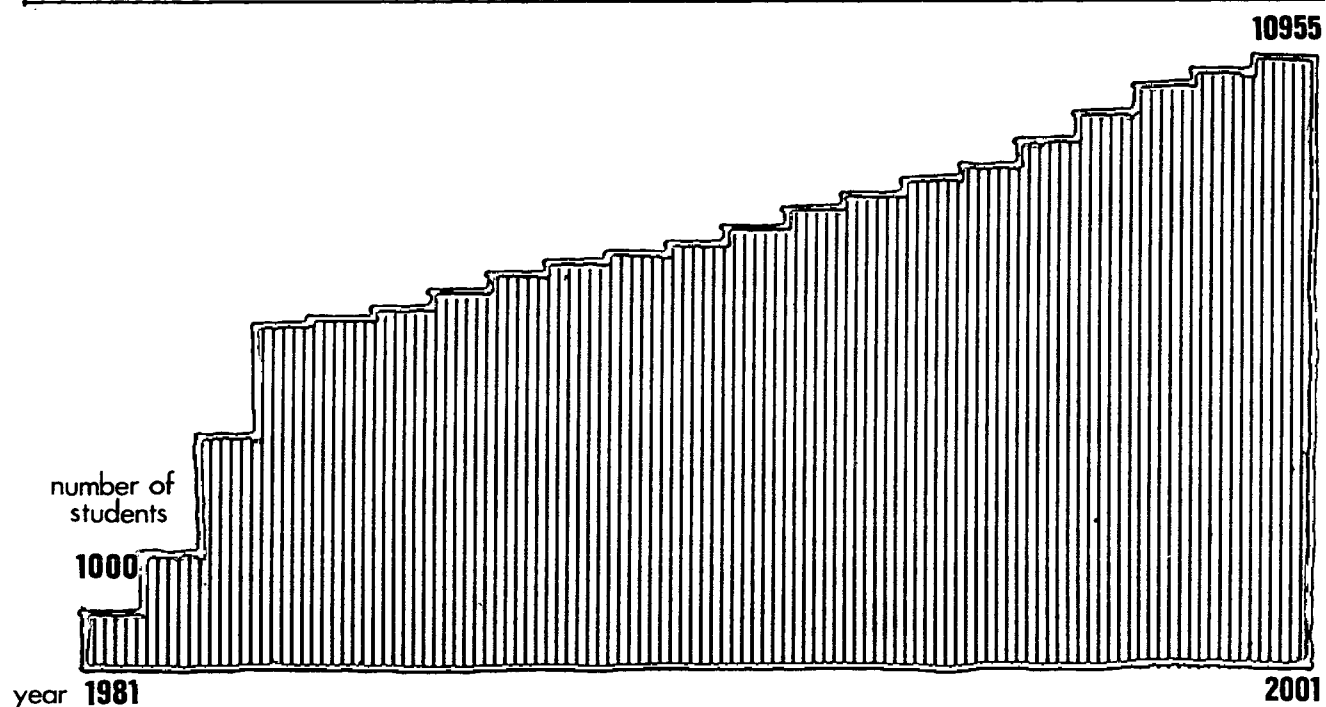


Figure 3.20. Growth of student population from B.E. 2524-44 (1981-2001)

Table 3.30 Academic staff for the period
B.E. 2524-2544 (1981-2001)

Faculty/Year	1981	1982	1983	1984	1992	2001
Education*	12	33	49	71	92	123
Social Sciences	15	30	55	100	105	110
Humanities	25	40	70	130	135	140
Science	30	70	150	180	190	200
Physical Education	15	30	60	90	95	98
Continuing Education	-	-	-	-	21	31
Nursing	-	-	-	-	7	35
Political Science	-	-	-	-	9	23
Economics, Business Ad.	-	-	-	-	-	25
Home Economics	-	-	-	-	-	30
T o t a l s	97	203	384	571	652	815

(*) The teachers at the Demonstration School are not included.

the number of academic staff. The table reflects, for example, the lower staff: student ratio that would be anticipated for science and physical education and also shows a slow improvement of the staff: student ratio as the campus develops.

b) Non-academic staff

The growth of the non-academic staff for the Wangnoi Campus is important. At present the level of non-academic staff in relation to academic staff is low indeed, casting the burden of much administrative work on teaching staff whose abilities could much better be otherwise engaged in the academic work for which they have been employed. This situation is inherited from the days before the University was established and is changing.

A summary of the non-academic staff by faculties and by years from B. E. 2524-2544 (1981-2001) is given in Table 3.32.

Table 3.31 The academic staff : abstract student ratio (SASR) for the period B.E. 2524-2544 (1981-2001)

Faculty \ Year	1981		1982		1983		1984		1992		2001	
	AS	SASR	AS	SASR	AS	SASR	AS	SASR	AS	SASR	AS	SASR
Education*	147	1:12.25	429	1:13	686	1:14	1,064	1:14.98	1,471	1:15.98	2,081	1:16.91
Social Sciences	150	1:10	343	1:11.43	634	1:11.53	1,036	1:10.36	1,101	1:10.49	1,493	1:13.57
Humanities	294	1:11.76	558	1:13.95	1,090	1:15.57	1,481	1:11.39	1,620	1:12.00	1,884	1:13.46
Science	260	1:8.67	562	1:8.03	1,080	1:7.2	1,585	1:8.81	1,731	1:9.11	1,996	1:9.98
Physical Education	151	1:10.07	242	1:8.07	775	1:12.92	986	1:10.96	1,042	1:11.20	1,264	1:12.90
Continuing Education	-	-	-	-	-	-	-	-	325	1:15.48	495	1:15.97
Nursing	-	-	-	-	-	-	-	-	110	1:15.71	485	1:13.86
Political Science	-	-	-	-	-	-	-	-	150	1:16.67	349	1:15.17
Economics, Business Ad.	-	-	-	-	-	-	-	-	-	-	407	1:16.28
Home Economics	-	-	-	-	-	-	-	-	-	-	389	1:12.97

(*) The teachers of the Demonstration School are not included.

Table 3.32 Non-academic staff for the period
B.E. 2524-2544 (1981-2001)

Faculty/Year	1981	1982	1983	1984	1992	2001
Education*	4	7	11	23	24	24
Social Sciences	3	5	9	17	18	18
Humanities	6	10	18	33	34	35
Science	10	23	50	60	63	67
Physical Education	4	8	15	23	23	25
Continuing Education	-	-	-	-	3	5
Nursing	-	-	-	-	2	9
Political Science	-	-	-	-	2	4
Economics, Business Ad.	-	-	-	-	-	4
Home Economics	-	-	-	-	-	8
President's Office	60	70	70	80	100	160
T o t a l s	87	123	173	236	269	359

(*) The staff at the Demonstration School is not included.

3.4. Facilities needed to meet projected expansion

Educational institutions located away from a major centre of population need facilities for teaching and learning and for residence.

The quality and scale of the facilities provided will depend upon the availability of resources. There is no absolute standard for establishing the physical size of any university, as is evident from a cursory examination of existing establishments. Study of new universities in Thailand and of the physical facilities provided for them provides something of a guide - certainly an adequate enough measure to enable the order of magnitude of provision needed for the newly developing Bangkok campuses to be estimated.

The site areas provided per student place in a variety of situations are thus of interest and some comparisons are made below. It is, of course, well understood that by constructing very high-rise buildings, very small areas of site are needed. The expense and dysfunctional nature of such high buildings in relation to Sri Nakharinwirot's programmes is sufficiently self-evident to make further discussion of the high-rise approach unnecessary here.

Kasetsart University provides the first of several useful examples in respect of site areas. The development plan for this agricultural university was published in 1973. Two sites are involved and if care is taken to omit from the calculations the large area of agricultural land, the need for which is peculiar to Kasetsart, the site areas per student place are:-

- | | |
|--------------------------------|---------------------------|
| a) At the Bangkhen Campus | |
| - capacity 5,500 places | 193 m ² /place |
| b) At the Kamphaengsaen Campus | |
| - capacity 12,900 places | 480 m ² /place |

At the new Salaya Campus of Mahidol University, the students will be accommodated at 167 m²/place, while at the Asian Institute of Technology the 1,100 students occupy a site providing 515 m²/place, of which about one half is planned for development giving an area of 257 m²/place.

The range provided by the small sample is from 167 m² to 480 m² per place; the mean is 274 m²/place. How do these areas compare with the provision on the existing campuses at Prasarnmitr, Bangkhen, Pratumwan and Palasuksa?

THE EXISTING FACILITIES

3.5. Sites of the four Bangkok campuses

a) Prasarnmitr Campus

The site area of Prasarnmitr is 16.19 hectares. The enrolment in B. E. 2520 (1977) is some 2,650 students and the site area is thus 61 m²/place. By B. E. 2524 (1981), the undergraduate population will have risen to 2,692 and the site area have fallen to 60 m²/place. The overall increase of enrolment of 74% by B. E. 2544 (2001) would mean by that time the per place site area at Prasarnmitr Campus would have fallen still further to 15 m²/place - a situation which would require replacement of virtually all the existing buildings with high-rise structures.

b) Bangkhen Campus

This campus is shared with another institution and for this reason does not lend itself to area analysis.

c) Prathumwan Campus

The site area of Prathumwan is 1.21 hectares. The enrolment in B. E. 2520 (1977) is 891 students giving a site area of 13.58 m²/place. By B. E. 2524 (1981) this per place area will have fallen to 8.89 m² and by B. E. 2544 (2001) to 6.63 m² - an area less than that normally provided for the site of a secondary school.

d) Palasuksa Campus

The site area of Palasuksa is 4.05 hectares. The enrolment in B. E. 2520 (1977) is 1,332 students giving a site area of 30 m²/place. By B. E. 2524 (1981) this area will have reduced, due to increases in enrolment, to 26 m²/place and by B. E. 2544 (2001) to 17 m²/place - a situation which, like that at Prasarnmitr, would require high-rise buildings for teaching accommodation.

It may be concluded that unless very substantial future investment is made in a programme of high-rise building, that three of the campuses are totally inadequate and the fourth, Bangkhen, is unsuitable as a site due to the fact that the land is shared with another institution.

Table 3.50 summarizes the situation in respect of sites.

Table 3.50. A comparison of campus site areas

University	Campus	Area in m ² per place			
		Planned	in 1977	in 1981	in 2001
Kasetsart	Bangkhen	193			
	Kamphaengsaen	480			
Mahidol	Salaya	167			
AIT		257			
Sri Nakharinwirot	Prasarnmitr		61	60	15
	Prathumwan		13.58	8.89	6.63
	Palasuksa		30	26	17

3.6. The facilities in Bangkok

Details of the built areas available for teaching at the four Bangkok campuses are given below. The figure in brackets expresses the teaching area as a percentage of the total built area.

Prasarnmitr	6,055 m ² (52%)
Prathumwan	1,477 m ² (62%)
Bangkhen	2,876 m ² (58%)
Palasuksa	<u>2,101 m² (67%)</u>
Total	<u>12,509 m² (56%)</u>

Assuming that it is possible to achieve the rather high utilization of accommodation of 70% and assuming the contact hours of the average student group are 50% of the period for which accommodation is available, then the per place areas available at each campus are as follows:-

Prasarnmitr	2.17 m ²
Prathumwan	1.58 m ²
Bangkhen	3.65 m ²
Palasuksa	1.50 m ²

These data, when compared with a general figure of 7 m² per place which might be applied as a minimum for academic space in a modern university built in conditions of stringent resource constraint, show dramatically that the areas available at the four existing campuses fall far below those at which it is possible to function effectively - a fact very well understood by those using the present accommodation.

As to the areas available for administration, they are as follows:-

Prasarnmitr	4,083 m ² (35%)
Prathumwan	654 m ² (28%)
Bangkhen	1,430 m ² (29%)
Palasuksa	<u>851 m² (27%)</u>
Total	<u>7,018 m² (32%)</u>

The area per student place used for administration on the four campuses is 1.25 m². A minimum norm would be of the order of 6 m² per place.

Communal facilities, were they to be provided at a minimum area of 2.5 m² per place, would require 14,060 m² which is 63% of the total built area of the existing premises of the four campuses.

3.7. The limit to growth

Of the four Bangkok campuses of the University, three have to be closed sooner or later as the land and premises they occupy are required by the owners of the sites. Only Prasarnmitr belongs to and can remain in use as a Bangkok campus. Logically, it is necessary to investigate whether the Prasarnmitr site could be developed to accommodate the students, staff and activities from the three other campuses in Bangkok.

The total enrolment in B. E. 2524 (1981), by which time the new faculties will each have its full complement of students, will be 6,687. If a per place area of 15.9 m² is regarded as an acceptable minimum for buildings for teaching, administration and communal use, then the total built area required would be 106,323 m², which is 9.11 times the present available built area.

If the area was provided in buildings each 100 metres long and 15 metres wide, then four blocks, each 18 storeys high would be required. Alternatively, if the accommodation was provided in new, 3-storey blocks, they would occupy 35,441 m² at ground level or 22% of the entire site. By B. E. 2544 (2001), when the student population would have increased over that of B. E. 2524 (1981) by some 4,268 places, then the area of 3-storey buildings needed would occupy 89,329 m², or almost two thirds of the entire site.

THE CONCLUSION

3.8. The case for development of the Wangnoi site

The preceding section leaves no doubt whatsoever that the development of Prasarnmitr as the sole campus in Bangkok accommodating, eventually, some 11,000 students is totally impossible for reasons of space, amenity and cost.

What has been sought is thus a site which offers reasonable opportunity for development, consonant with the sort of standards of amenity that have already been recently approved for other similar institutions such as Kasetsart and Mahidol Universities and for the Asian Institute of Technology.

Assuming that on this basis a per place area of 260 m² is selected as a planning figure, then a site is required having an area able to meet the university's needs for expansion to nearly 11,000 students by B. E. 2544 (2001) and 20,000 students 50 years hence - itself a short time in the life of such an institution. The area required would be 285 hectares in B. E. 2544 (2001) and 520 hectares 50 years from the present.

The Wangnoi site of 566 hectares is thus almost tailor-made for the University in respect of area. Its other attributes are discussed in the following Chapter.

CHAPTER FOUR

A PLAN FOR DEVELOPMENT OF A CAMPUS AT WANGNOI

4.1. Macro-location : a review

The village of Wangnoi sits astride the junction of two roads. From Ayuthaya in the north-west, to the village is a distance of some 20 km, while the old road to the north runs on to Saraburi. Thus, in a sense, Wangnoi is one of the gateways to Greater Bangkok as beyond it, to the south the road quickly enters an area of factories, shops and houses which forms the northern tip of the city. It is at this tip, some 10 kilometres nearer to Bangkok, that one of the latest of Thailand's urban centres is developing. Nava Nakorn, or 'new town' will house 100,000 people and with its own industrial estate, provide work for many of them. The Nava Nakorn - Ayuthaya - Wangnoi triangle is thus an area already touched by an expanding Bangkok and further development will penetrate the triangle itself (Figure 4.10). The location of a university campus at Wangnoi is an example of the need to accommodate the over-spill of four overcrowded campuses from the metropolis in an area which forms its northern gateway.

Away from Bangkok and to the north of Wangnoi is riceland supporting a population of farmers, villagers and towns-people numbering over half a million. Into this area, the university will bring in the near future, some 11,000 students and staff and with them the population concerned with service industries who will occupy the shops and houses and other premises that may be expected to spring up around the new campus.

Within a short time, it seems very likely that the location of the campus in this riceland will result in fairly rapid, town-scale development and, in turn, this will require the early attention of the Government's physical planners, if advantage is to be taken of the new situation to zone the surrounding land in such a way that its overall growth takes place in a manner which is to be beneficial to both local people and to new-comers (Figure 4.12).

The advent of a university to Ayuthaya is, of course, of some significance. It will provide a forum for activity based on the rich cultural history of the district; at the gateway from the north it will filter students from Ayuthaya, Saraburi, Lopburi and Nakhorn Rachasima, who might otherwise have had to enter Bangkok itself to obtain their university education; it will, as it develops, provide facilities and organize

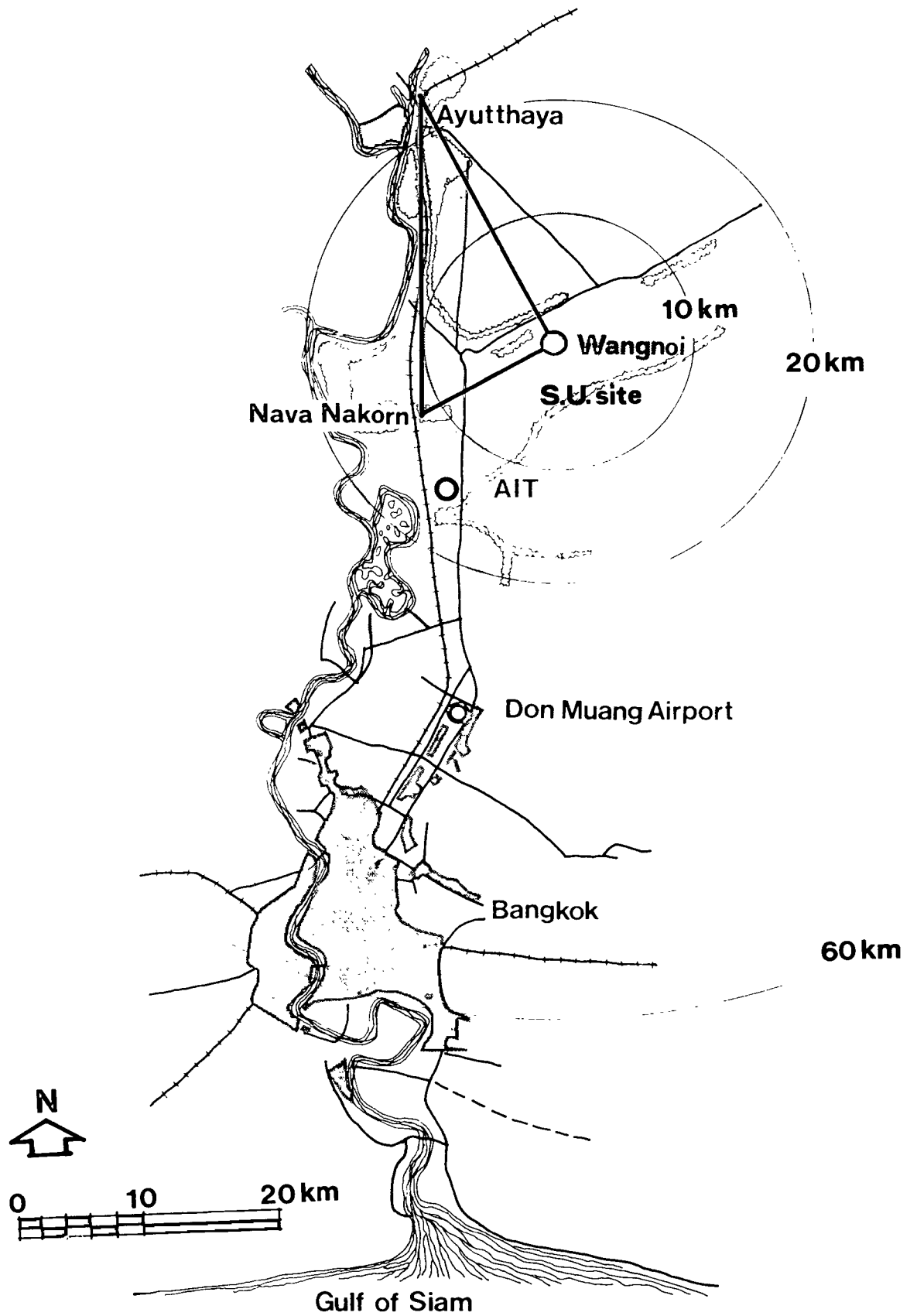


Figure 4.10 Bangkok and the Wangnoi area.

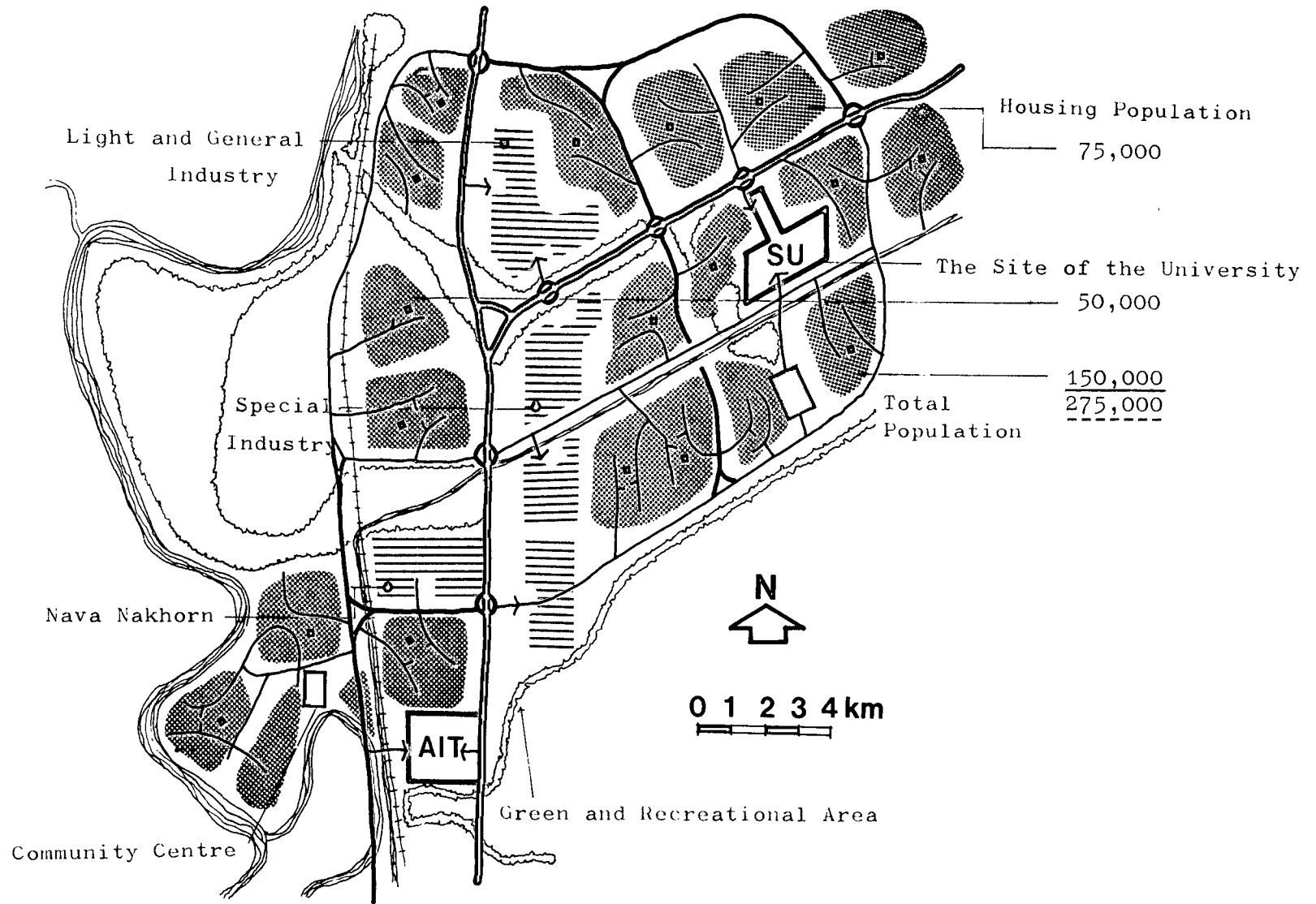


Figure 4.12 Probable general development of the Wangnoi area.

activities to enrich the quality of life of the farmers and of their families living in the surrounding countryside - the library, the sports stadium, the future medical faculty with its teaching hospital - exemplify the possibilities.

Easily accessible by road or water, the links with the surrounding countryside are already well established, while the juxtaposition of the site with Bangkok and, nearer, with Nava Nakorn, means that building work, when it commences, can rely for speedy execution on one or more of the many expert firms from the metropolis - all well familiar with the typical construction problems posed by the site which is part of the silty flood plain that extends from the Chao Phraya River a few kilometres away.

4.2. The site

The site comprising two adjacent parcels of land having a total area of 3,535 rai (566 ha.) lies approximately 700 metres off Paholyothin Road some 62 kilometres north of Bangkok and is bounded by Klong 26 on the north and Klong Rapipat on the south (Figure 4.20). Some small scale settlement has taken place along a narrow front to both klongs. The site is typical of the flat landscape and open farmland of the Delta Region.

Investigation of the sub-soil has been limited to enquiries of recent development projects in the area and of the Highway and Irrigation authorities. These enquiries indicate that the nature of the sub-soil is similar to that of the Greater Bangkok area in general and should thus pose no unusual construction problems.

General indications are that the land is flooded to depth of 1 m during the rainy season and that the ground water level is about 1 m below the soil surface during the dry season. Permeability and run-off are slow. The sub-soil is reported to be highly corrosive to metal.

Access to the site will be provided at the north from Paholyothin Road and negotiations are presently underway with the owner of the land through which the main access road will run. It is recommended that this road is raised to the same level as the Paholyothin Road and that it be designed as a dual carriage-way with a median strip. There should moreover, be no subsidiary access from the main access road to whatever development takes place around the access road. A strip of land of minimum width 40 metres is required for the main access.

A second access from the south can be obtained by developing and widening the existing unsealed road running from the Wangnoi intersection on the Paholyothin Road and along Klong Rapipat.

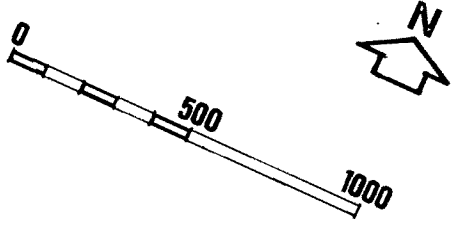
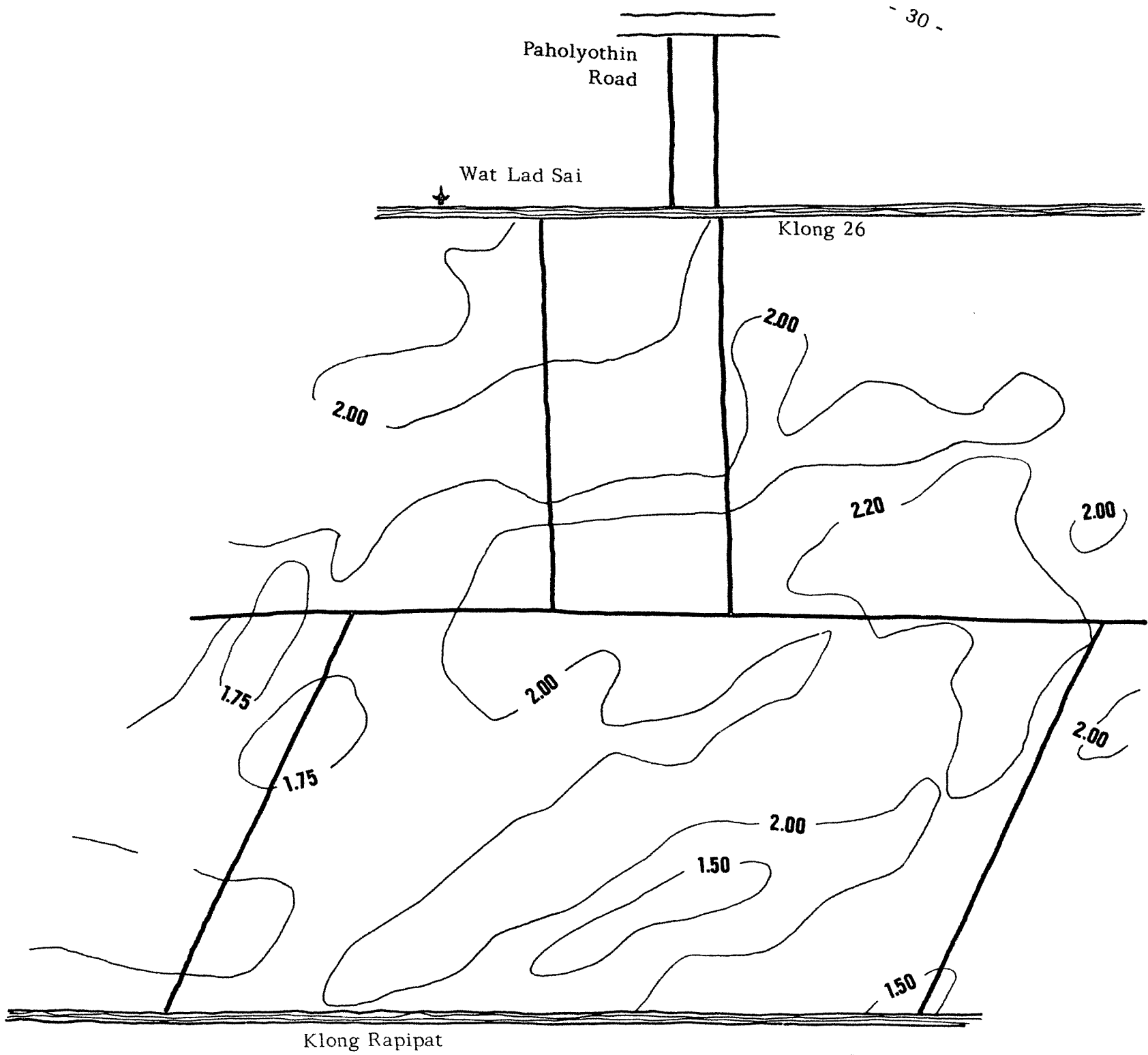


Figure 4. 20 The site of the new campus at Wangnoi.

a) Flood control

It seems clear from a study of similar development projects in the locality that a system of bunds with a crest level above the anticipated flood level is likely to provide the most satisfactory and economical method of flood control. Rain-water falling within the area protected by the bunds, including the run-off from roads and buildings, will be collected in open drains which will run into storage lakes, and then be pumped into the existing klongs.

It might be mentioned that an alternative to provision of bunds would be to raise the level of 60% of the land proposed to be developed, above the anticipated flood level. This would require 4.5 million cubic metres of fill. Even if this quantity of earth filling could be readily obtained, its cost would be prohibitive. Filling the site to this depth would also pose construction problems in relation to settlement of the filled earth.

b) Water

Potable water is available at a depth of about 130 m and water supply could be obtained from this source by sinking a bore hole and pumping. Additional demands could be met by sinking additional bore holes or from other sources which may be available, such as from Klong Rapiat.

c) Electricity

EGAT is proposing to run a 22 kv line along the Paholyothin Road (Figure 4.21). No problems are foreseen in providing adequate electrical services within the campus.

4.3. Review of future academic objectives and social aims

The objectives of the university are, as explained in Chapter two, above:-

- i) training;
- ii) research;
- iii) provision of extension services;
- iv) preservation of the cultural heritage.

The projected academic expansion is discussed in Chapter three. During the next three decades, faculties such as Continuing Education, Home Economics, Nursing, Architecture, Engineering, Economics, Business Administration and Medicine will be developed. Five decades hence it is estimated that the enrolment will stabilize at about 20,000 students.

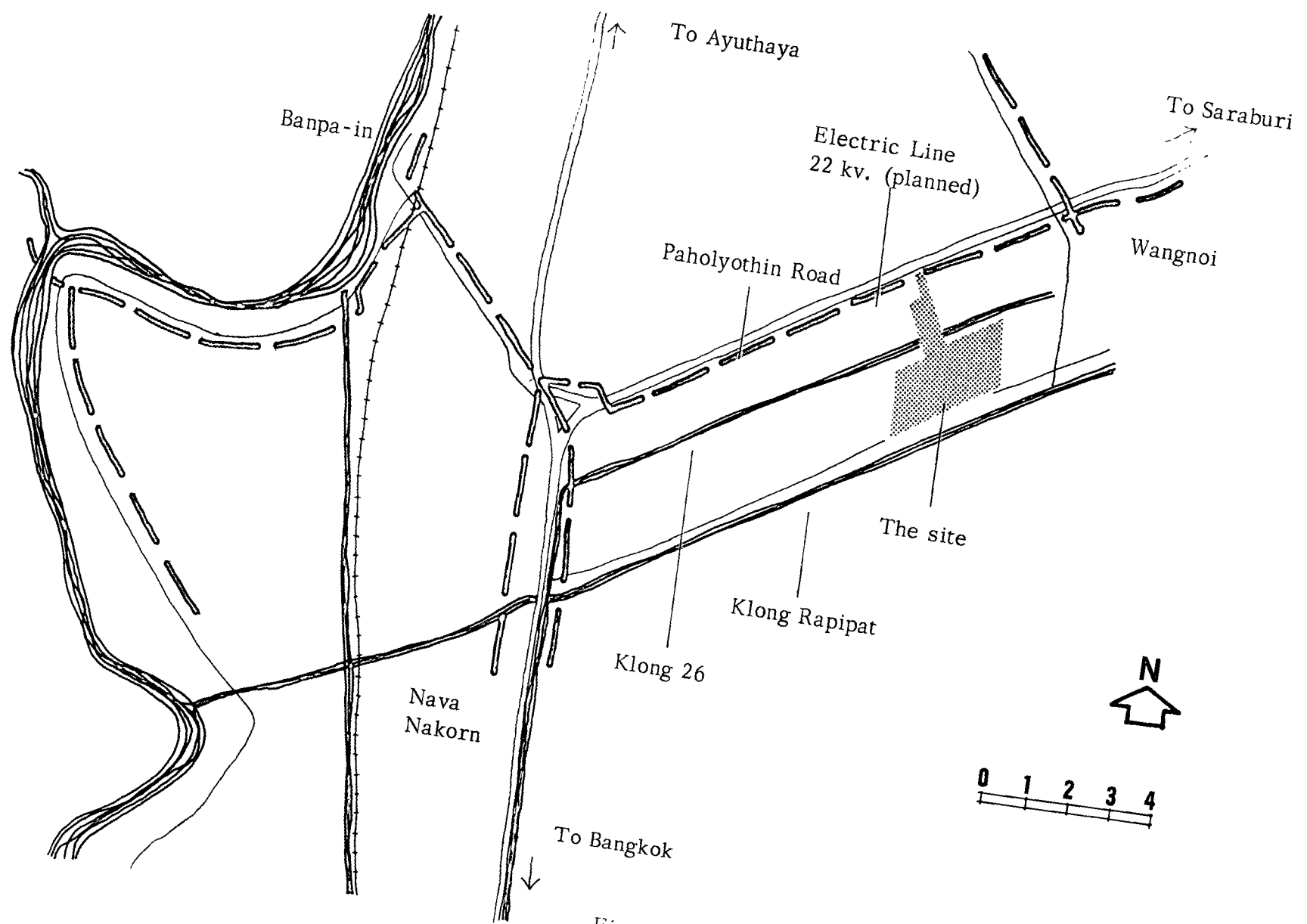


Figure 4. 21 The infrastructure of the area.

This academic expansion will be accompanied by expansion in other areas which, while not planned at the present, seem likely developments for an academic institution of this size and character. These future developments might include research and post-graduate studies, community services such as an extended library, more provision for sports, a teaching hospital and horticultural areas.

The growth of the institution, foreseen and unforeseen, suggests that the main criteria in preparing the plan for the new campus at Wangnoi should be flexibility and expandability to meet future and changing needs (Figure 4. 31).

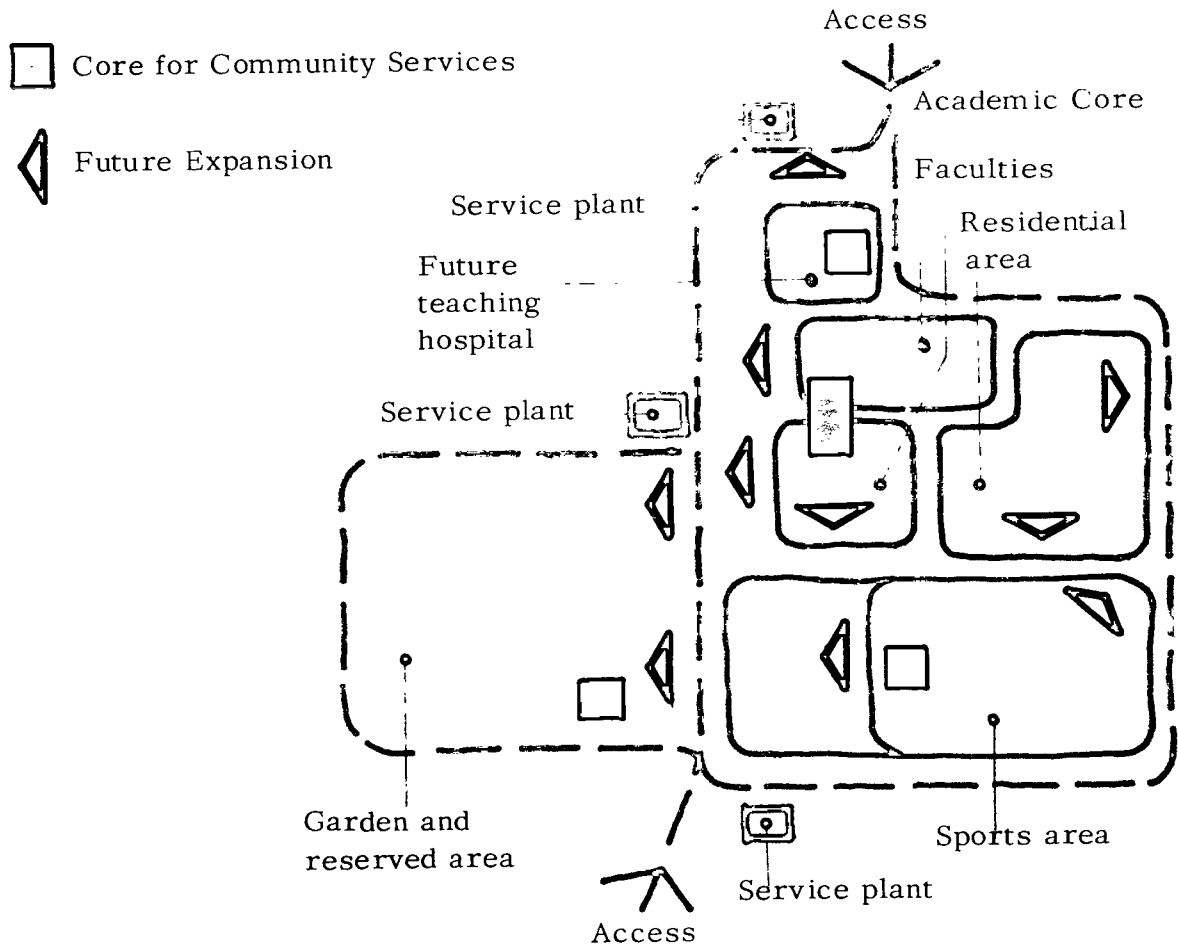


Figure 4. 31 Functional diagram showing possibilities for adaptation to future needs.

4.4. Development of a plan for the campus

(a) Zoning within the campus

The campus will comprise the following areas:

- i) academic area;
- ii) sports areas;
- iii) residential area;
- iv) roads, pedestrian paths and parking areas;
- v) lakes and canals;
- vi) gardens and reserved areas.

The policy followed in designing the physical plan for Wangnoi has been to make outline provision to the point in time when enrolment will have stabilized at about 20,000 students (Figure 4.40). Of course, during such a long period it would be natural, as is mentioned above, to expect changes of academic organization within the University, different rates of development between faculties and other changes, perhaps in the status or character of the institution. It is no easy matter to forecast these changes.

For this reason developmental flexibility has been provided in two ways. First, each faculty is allocated a sub-area of the site which is ten times the probable eventual ground floor area of any buildings that might be built on it during the first fifty years of development. In other words, the ratio of built up area to the area of land assigned to a faculty will be 1 : 10.

Secondly additional areas for development are allocated at the north and south of the academic area as well as to the south of the sewage treatment plant. Provision is thus made for a variety of unforeseeable future development.

The assumptions made on the use of land and the area of building needed when the student enrolment reaches 20,000 are shown in Tables 4.40 and 4.41.

(b) Development of the site and infrastructure

i) Site development

a) Flood protection and site drainage

The physical conditions of the Wangnoi site in respect of soil profile, soil condition and floods are similar to those at

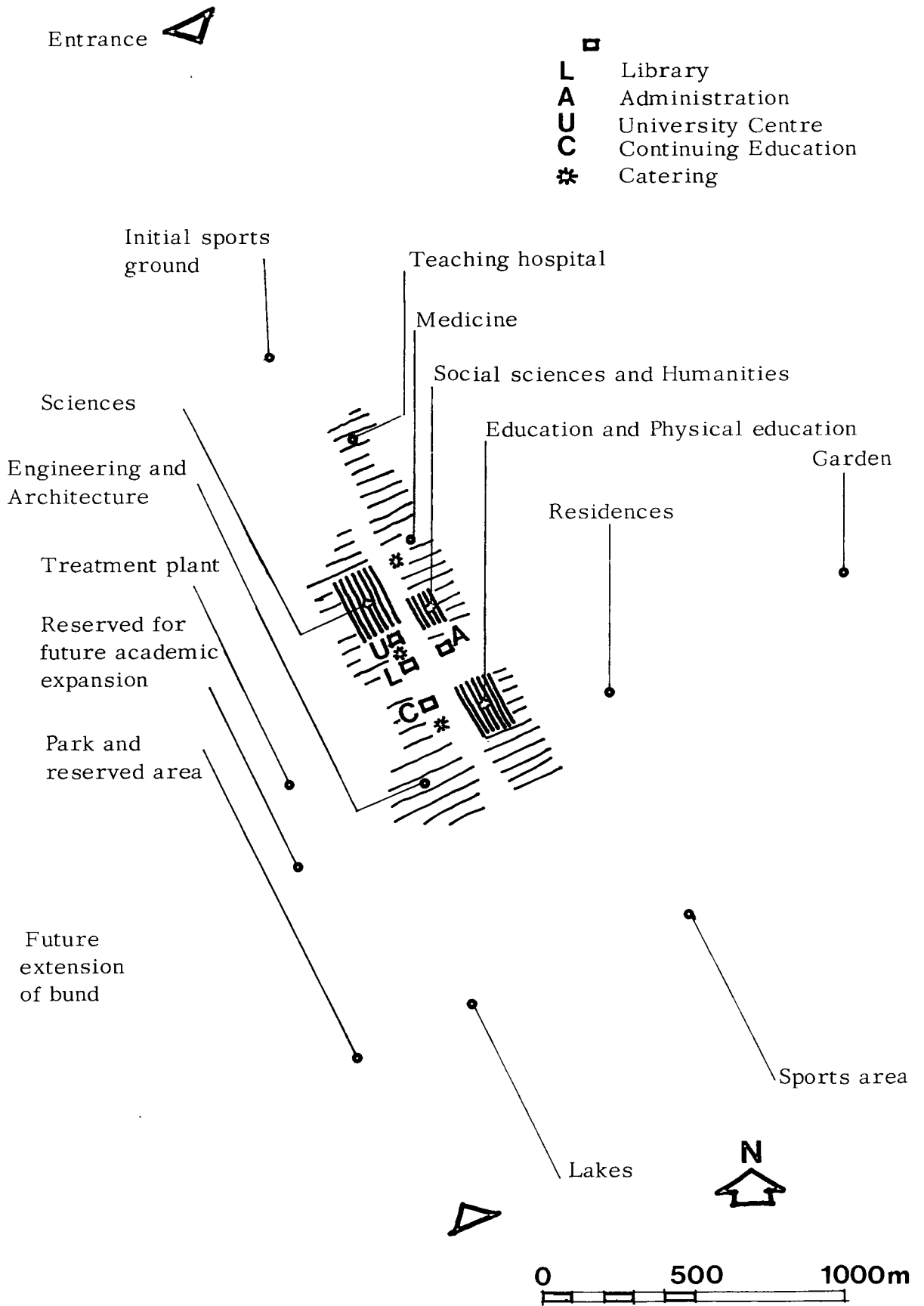


Table 4.40 Land use at period of enrolment of 20,000 students

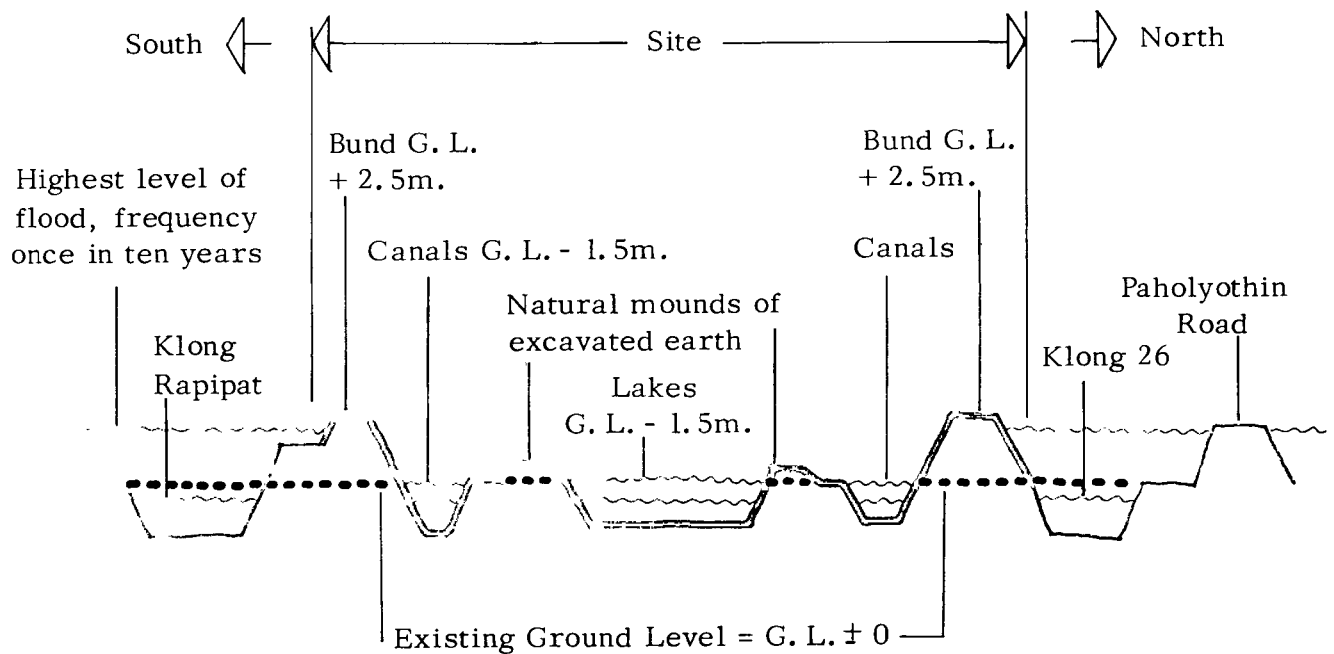
Description	Area ha.	Per cent
Academic area	72.0	12.7
Hospital area	9.0	1.6
Sports area	74.0	13.0
Residential area	28.0	4.9
Main roads and parking	47.5	8.4
Lakes and canals	54.0	9.5
Service area	16.5	2.9
Open space including pedestrian routes	137.6	24.4
Garden and reserved area	127.4	22.6
T o t a l	566.0	100.0

Table 4.41 Schedule of accommodation for 20,000 students

Buildings	No. of places	Floor area m ²
Faculty Buildings	20,000	160,000
Research Institutes		40,000
Teaching Hospital	600 beds	29,400
Central Library	20,000	23,800
Administrative Centre	20,000	15,000
Sub-total Academic and Administrative Facilities		268,200
University Centre and Communal Facilities	20,000	50,000
Sub-total Communal Facilities	20,000	50,000
Students' Residence	5,000	80,500
Staff Residence	800	64,000
Visitors' Residence	100	1,300
Sub-total Residences	5,900	145,800
T o t a l	20,000	464,000

two developed sites some 10 km away, namely at Nava Nakorn and the Asian Institute of Technology. The system of flood protection and drainage which is successfully operating at those sites is thus proposed for the site of the new campus. Essentially the method used is that of the 'Dutch polder' in which a site subject to flooding is surrounded by an earth bund from within which the flood waters are pumped out as they rise. The site itself will be designed with drainage canals and lagoons sufficient to hold 24 hours flood water, the volume being based on the heaviest rainfall occurring in a 24 hour period during recent years. The water, as it accumulates, will be pumped, subject to consultation with the irrigation authorities, into one or both of the klongs to the north and south of the site.

The essential features of the system proposed are shown in Figure 4.41.



b) Landscaping and planting

As the site is large, flat and absolutely featureless and the university buildings in their various zones - academic, communal and residential - are somewhat centrally located, there will be substantial areas of road, lakes, sports fields and also artificial land-marks such as water towers which need very careful design to give a sense of scale, amenity and delight to those entering and working on the campus.

The 30 metre wide, double-carriage highway is a functional requirement but it can also, if well designed, contribute to improvement of the landscape. A good example is provided by the entrance to the University at Ibadan, Nigeria, where the median strip is of variable width and the carriage-ways are at slightly different levels.

From the academic zone to the northern and southern entrances to the site are distances respectively of 2.2 and 1.5 km. Landscaping, as well as building design within the landscape can do much to divide the vast, flat area into attractive, discrete spaces (Figure 4.42). Planting of fast growing trees will be an important aspect of landscape design and opportunity should be taken at the very earliest stage of development to provide a nursery to supply the thousands of plants needed for both landscaping as well as for economic gain (timber and/or fruit) in the reserved area in the south-west corner of the site.

ii) Infrastructure

a) Sewage disposal

From the joint considerations of economy, efficiency and ease of maintenance, the oxidation pond system of sewage treatment has been suggested. The ponds would require some two hectares of land for the period down to B. E. 2544 (2001) and for the ultimate population of 20,000 students, a further two hectares of ponds would be needed.

Ponds are located some 300 metres, at the nearest point, from the residential and academic zones to reduce the cost of piping to a minimum. The arrangement proposed is included schematically in Figure 4.43. It should be noted that as the ponds may subsequently receive effluent from the laboratories and as, in any case there will be an outflow, probably into the northern klong, a treatment plant may have to be installed at a later date to control and improve effluent quality.

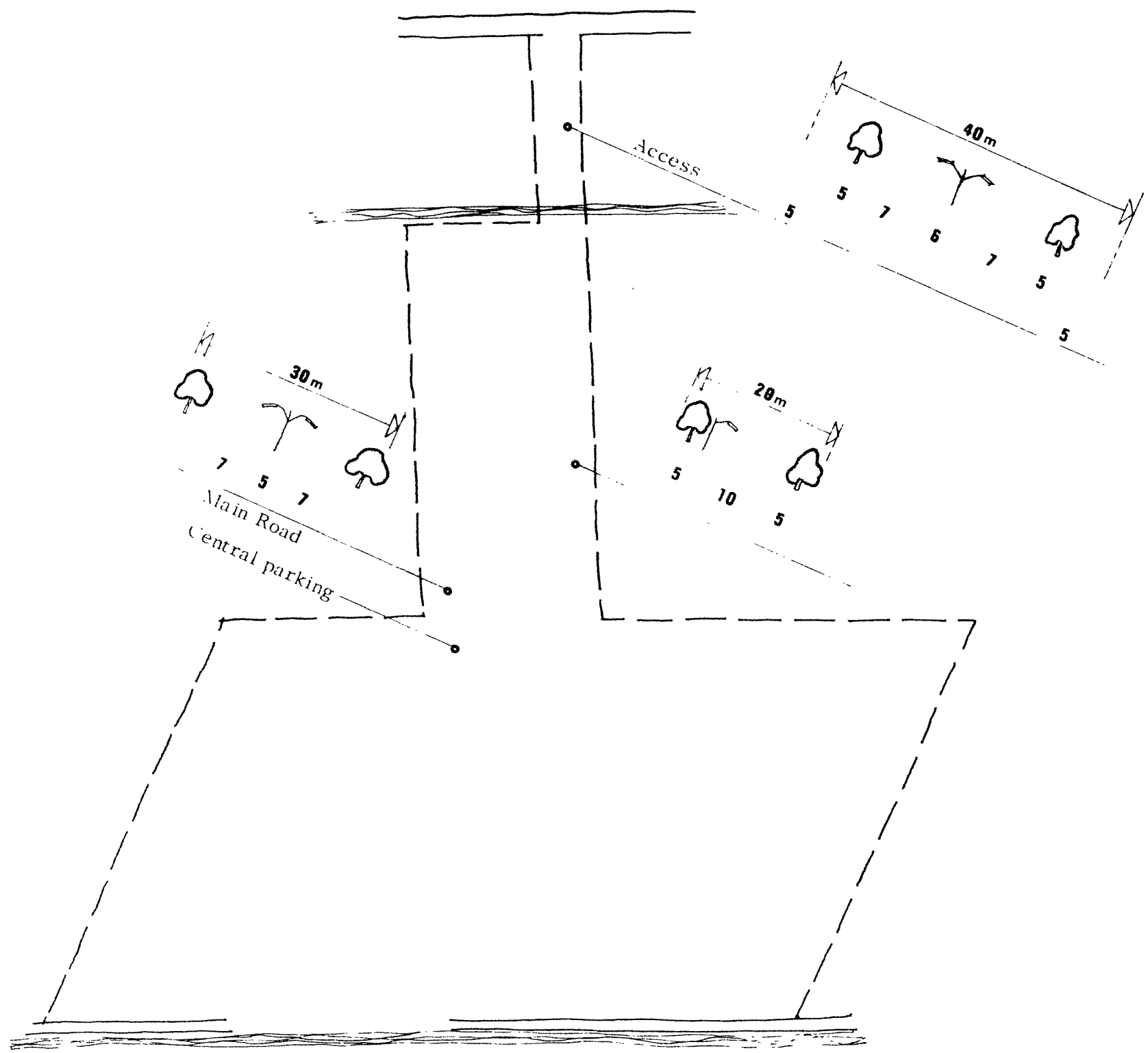


Figure 4.42 Roads, pedestrian-ways and parks.

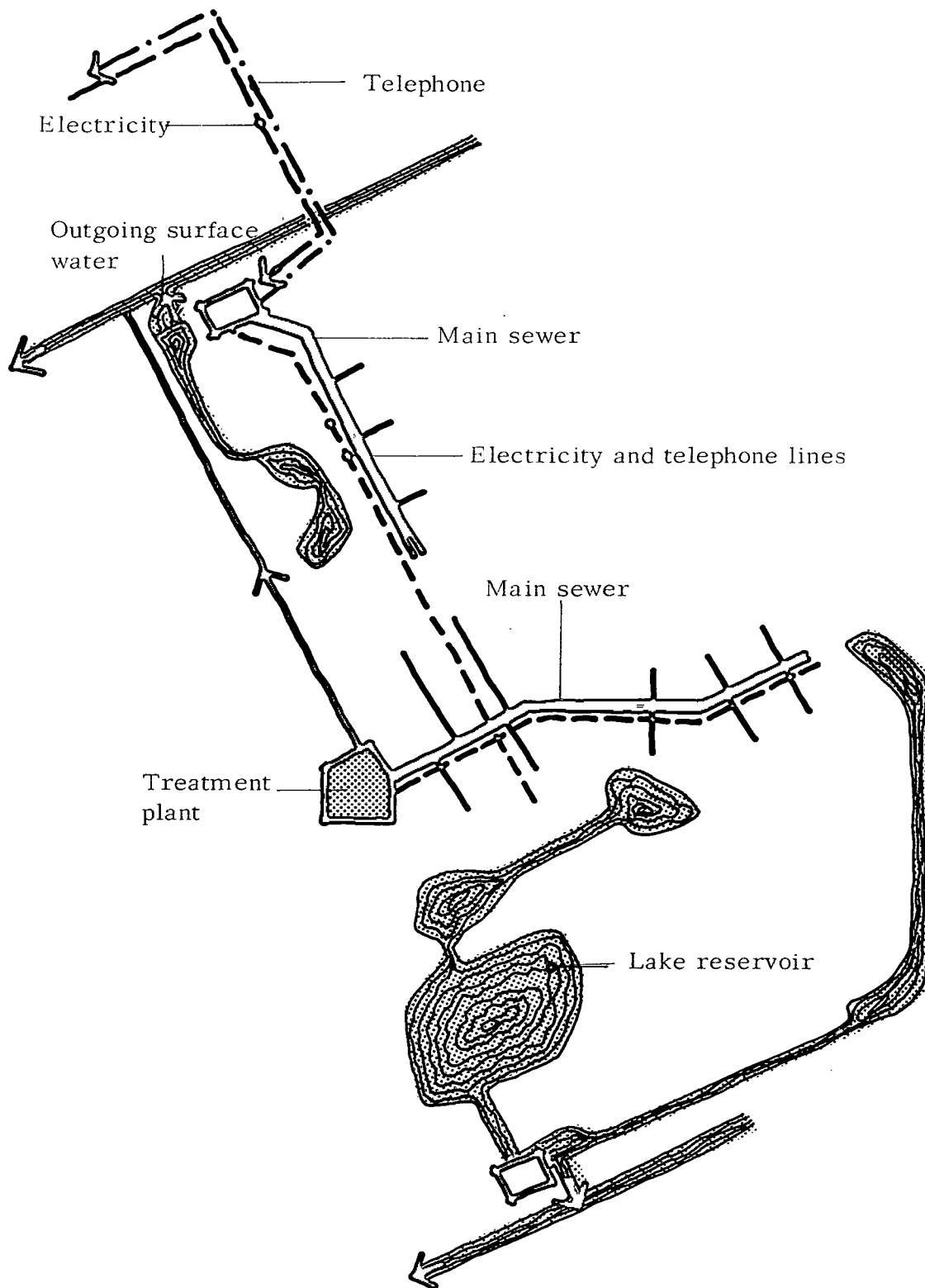


Figure 4.43 Sewage and rain-water disposal and other services.

b) Water supply

The main source of water supply for the initial years of the project would be from two deep wells. These would probably provide the 125 litres required per head per day down to B. E. 2544 (2001) when the daily requirement would have reached 1369 m³. Storage of some 70% of the daily water requirements of the campus is planned in two water towers each of 500 m³ capacity. Water for gardening and similar purposes would, of course, be available from the lakes and klongs on the site.

It should be noted that the increasing use being made of underground water in the area from Don Muang to Wangnoi may eventually be such that pumping from deep wells will have to be restricted. In that event water could be drawn from Klong Rapiat, treated and fed into the campus water supply system. The water in Klong Rapiat, it is understood, presently provides part of the water supply system for Bangkok and would thus be a suitable source.

c) Roads and parking

An access of minimum width 40 metres is required from Paholyothin Road to the northern boundary of the site. This access, which should be fenced on both sides and under the complete control of the University authorities, would provide a 4-lane divided road, with median, two pedestrian paths and cycle paths. It would be carefully landscaped to provide a fitting entrance to the campus.

The second access from the southern road bordering Klong Rapiat will be developed in the future and serve commuters and others from the community coming from the south, east and west.

Within the site itself, the two access points will be connected by a 4-lane road with median, while a 2-lane road for vehicles will be located along the eastern and southern boundaries of the site. From both of these major roads, smaller feeder roads will provide access to the various buildings.

Two main pedestrian routes are planned for the centre of the academic area and linking the academic and residential areas.

Parking for personal cars, cycles and buses has been provided on the basis of anticipated ownership and parking spaces for vehicles provided along main roads and for cycles near buildings as indicated in Table 4.42.

Table 4.42. Vehicles and Parking

Anticipated vehicle ownership

Year	1982		2001		2027	
	Cars	Cycles	Cars	Cycles	Cars	Cycles
Students	50	200	900	2,700	6,600	10,000
Staff	200	100	1,170	450	2,600	1,300
Total	250	300	2,070	3,150	9,200	11,300

Parking Space

Year		1982	2001	2027
Cars	No.	250	2,070	9,200
	Unit area	30 m ²	30 m ²	30 m ²
	Area	7,500 m ²	62,100 m ²	276,000 m ²
Cycles	No.	300	3,150	11,300
	Unit area	5 m ²	5 m ²	5 m ²
	Area	1,500 m ²	15,750 m ²	56,500 m ²
Buses	No.	5	50	90
	Unit area	50 m ²	50 m ²	50 m ²
	Area	250 m ²	2,500 m ²	4,500 m ²
Total Area		9,250 m²	80,350 m²	337,000 m²

d) Electricity and telephone

Electricity will be supplied by the Metropolitan Electricity Authority from 22 kv primary planned for installation along Paholyothin Road in B. E. 2524 (1981). As electricity will be needed in B. E. 2521 (1978) earlier implementation of the installation programme should be requested by the University.

A transformer station will be planned at the north corner of the campus from which main lines will run on poles along the main road as illustrated in Figure 4.43.

Consumption of electricity is estimated in the range of 2 kilowatts per head or 22 megawatts for 11,000 persons.

30 direct telephone lines from the University are suggested and will be connected with the substation at Rangsit planned in November of B. E. 2520 (1977). The telephone exchange would be located in the campus, in one of the buildings at the Academic Centre.

Other services

Supplies of fuel and gas, methods of garbage disposal and fire protection should be further planned at the detailed design stage, suggested for early B. E. 2521 (1978).

(c) Buildings

Within the framework of the total development plan, this part of the Report deals with buildings to be constructed during successive 5-year, plan periods ranging from B. E. 2520-2544 (1977-2001) as follows:-

Academic and administration buildings;
communal facilities;
student and staff residences.

Table 4.43 summarizes the accommodation to be constructed during each of the 5-year plan periods. Of the buildings planned for the year B. E. 2544 (2001), slightly over 50% will be constructed during the first two of the 5-year, plan periods, that is by B. E. 2527 (1984). This initial construction is more fully explained in 5.1 below in which the phasing of the project is discussed.

Table 4.43 Net area in m² of new construction by 5-year plan period

Type of Accommodation	Total Development Year BE 2544 (2001)		New Construction in M ²				
	Capacity No. places	Total Area M ²	2520-24 (1977-81)	2525-29 (1982-86)	2530-34 (1987-91)	2535-39 (1992-96)	2540-44 (1997-2001)
FACULTY ACCOMMODATION							
Education	4,585	33,010	6,840	22,570	1,800	1,080	720
Humanities	505	2,630	1,040	1,110	220	155	105
Social Sciences	517	2,695	625	1,030	520	310	210
Sciences	975	11,090	4,660	5,060	690	460	220
Physical Education	1,185	13,630	4,890	5,870	1,440	860	570
Continuing Education	985	4,925		1,500	1,925	1,000	500
Nursing	525	3,300			660	1,530	1,110
Political Science	465	3,160			1,360	1,450	350
Economics, Business Ad.	* 685	3,425				1,125	2,300
Home Economics	* 610	4,450				1,640	2,810
Engineering	! 185	1,550					1,550 !
Architecture	! 199	1,300					1,300 !
Sub-total		85,165	18,055	37,140	8,615	9,610	11,745
COMMUNAL FACILITIES							
Central Library		13,100	1,300	6,570	1,270		3,960
Central Administration		6,720	1,580	2,010	830	1,190	1,110
Student Union **		9,065	2,400	3,200		2,025	1,440
Faculty Club		1,800		900		900	
University Centre		10,170	2,400	5,100	630		2,040
Convocation Hall		3,330					3,330
Stadium						1 unit	
Maintenance Facilities		760	380	380			
Primary School		750		750			
Sub-total		45,695	8,060	18,910	2,730	4,115	11,880
RESIDENTIAL ACCOMMODATION							
Student Residences		46,810	15,120	15,130	3,600	5,760	7,200
Staff Residences :							
Type 1 - 120 m ²	51 units	6,120	1,080	2,160	1,080	960	840
" 2 - 80 m ²	104 "	8,320	1,600	3,040	1,440	1,120	1,120
" 3 - 60 m ²	252 "	15,120	2,700	5,640	2,820	2,160	1,800
Minor Staff							
Type 4 - 60 m ²	40 "	2,400	720	420	780	480	
" 5 - 40 m ²	121 "	4,840	1,040	880	1,760	1,160	
Sub-total		83,610	22,260	27,270	11,480	11,640	10,960
T O T A L		214,470	48,375	83,320	22,825	25,365	34,585

Note : (*) Includes enrolment to year BE 2546 (2003).
 (!) Includes enrolment to year BE 2547 (2004), gross area m² provides for year 1 & 2 only.
 (**) Includes dining facilities.

i. Academic buildings

Within the zone set aside for academic buildings, some faculties will have stronger relationships than will others. Where strong functional relationships are evident then it will be sensible to arrange for the juxtaposition of the faculties in the physical plan. Examples of such relationships (which are shown schematically in the upper part of Figure 4.44) include:-

Education and Physical Education;

Social Sciences and Humanities;

Sciences and Medicine;

Sciences and Engineering;

Engineering and Architecture.

The lower part of Figure 4.44 shows how the schema is realized in the campus design.

Estimation of the built areas needed for each faculty and, within each faculty, of the space requirements for different types of accommodation such as lecture rooms, laboratories, etc., presents a problem. Thailand has no organization such as the University Grants Commissions of India, Bangladesh or the United Kingdom, or such as the Western Interstate Commission for Higher Education of the U. S. A., all of which prescribe standards of accommodation and amenity for university level institutions. Nor has it space standards such as those published for National Universities by the Ministry of Education of Japan. It is thus necessary, where data are available, to study the area allocations proposed for recently designed Thai universities which have been scrutinized by the Ministry of State Universities and to use these data for guidance in estimating areas for faculty buildings. Where data are not available, then reasonable minimum assumptions have to be made after study of space allocations for universities in other countries.

As a result, it has been possible to establish per student place areas for four types of accommodation, namely:-

General teaching spaces;

bench-type laboratories;

heavy laboratories;

special buildings.

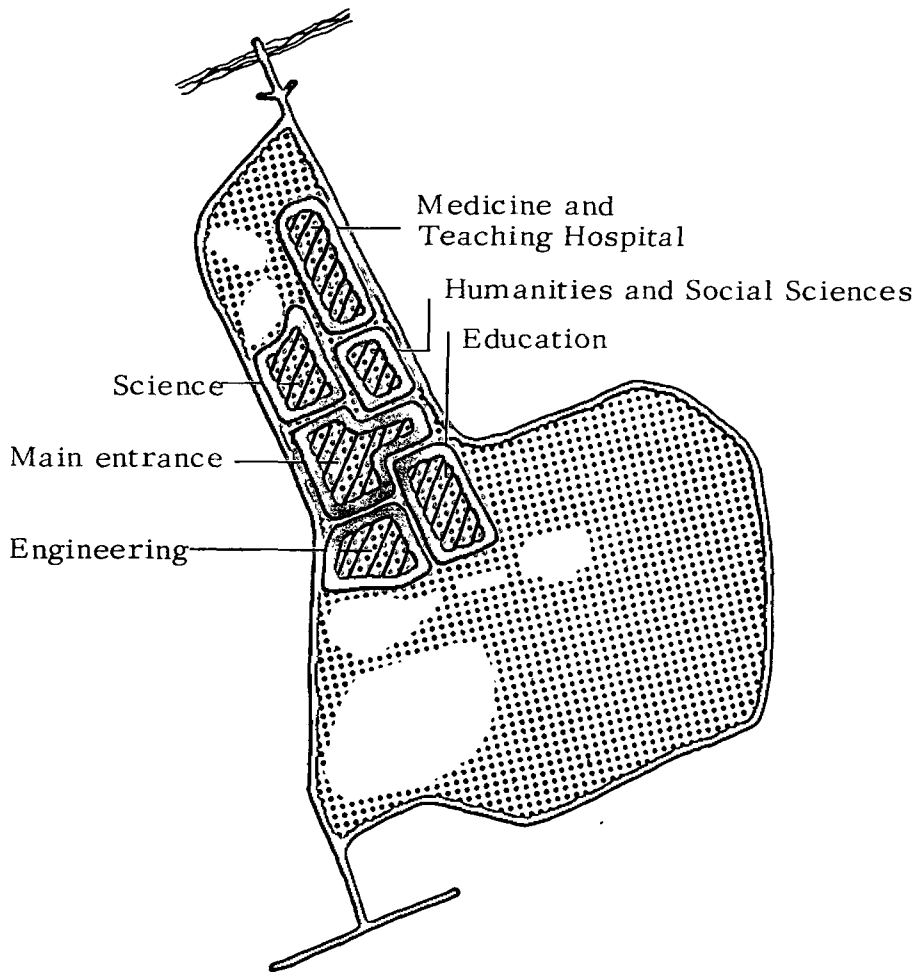
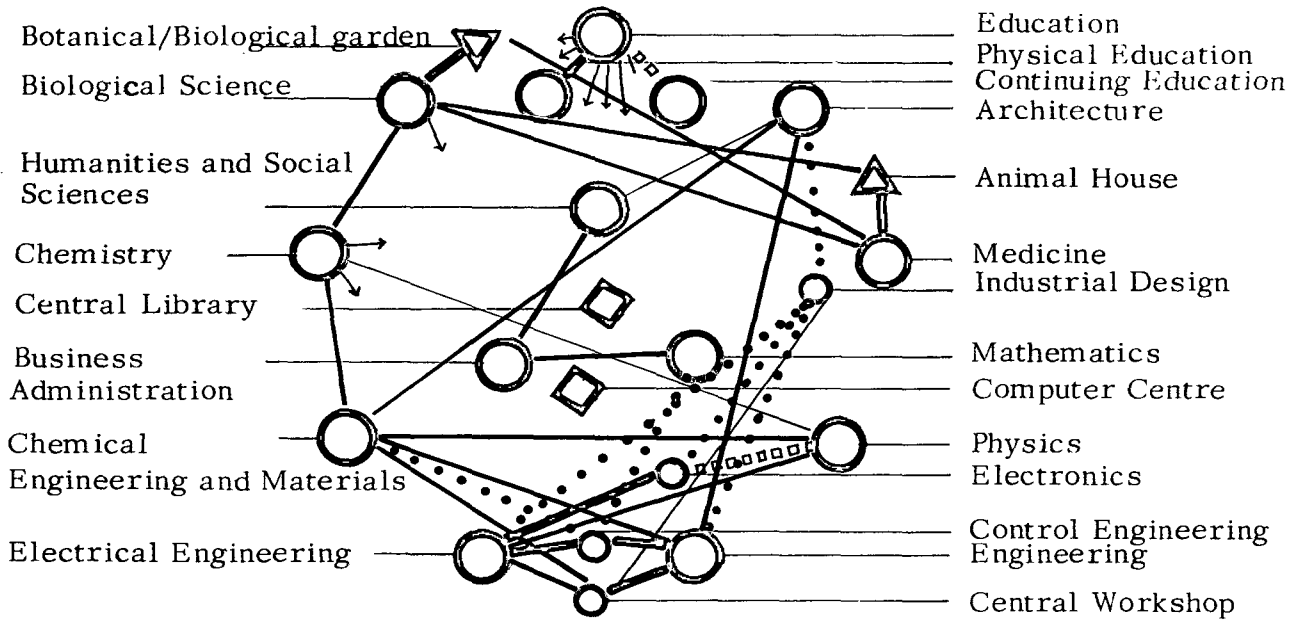


Figure 4.44 Relationships between academic areas.

and these are used to calculate the net areas for academic spaces shown in Figure 4. 45.

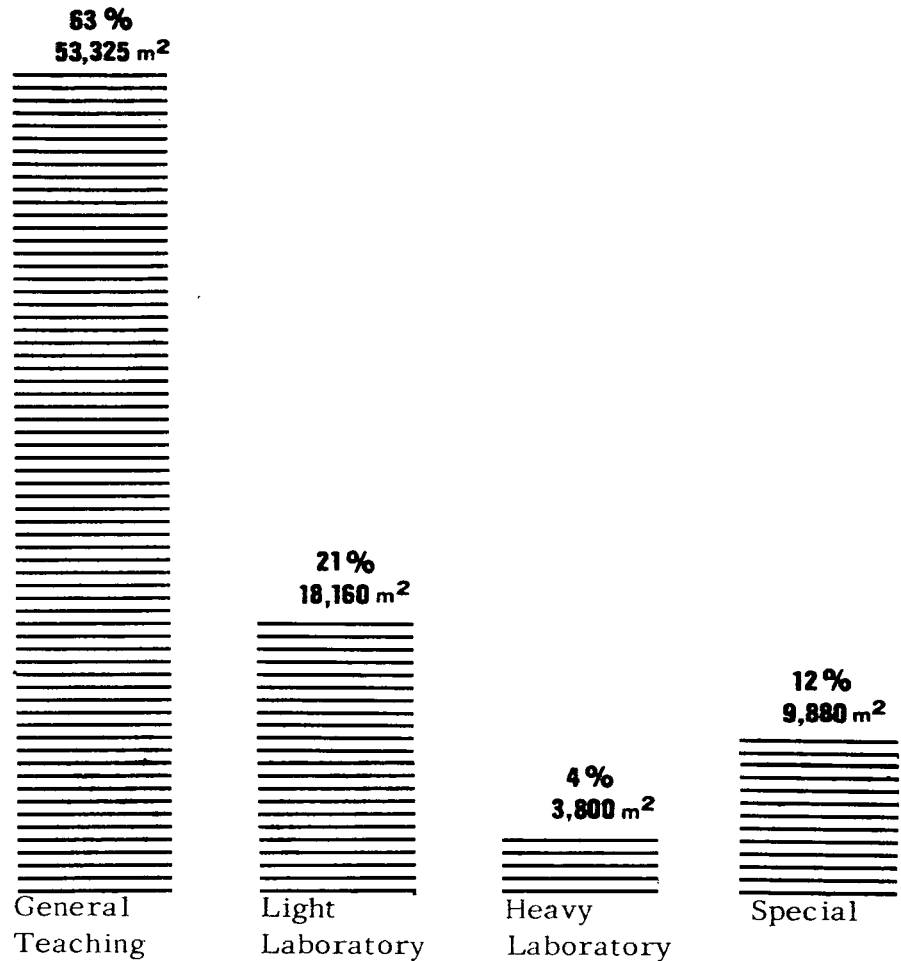


Figure 4. 45 Summary of net areas of academic space in B. E. 2544 (2001)

Table 4. 43 gives the allocation of areas to different types of buildings for each faculty. The areas are based on the needs of 11, 000 students in the year B. E. 2544 (2001). These may be summarized as follows:-

General teaching 53, 325 m²

Bench type laboratories 18,160 m²

Heavy laboratories 3, 800 m²

Special buildings 9, 880 m²

Figure 4.46 suggests the schematic development of academic buildings as successive 5-year plans are implemented. It shows an economical arrangement of a series of general teaching blocks which will be used by all faculties whose respective specialized faculty bases would be strategically interspersed between the blocks. Other specialized accommodation, such as laboratories, would also be juxtaposed with both faculty bases and the general teaching accommodation.

This arrangement ensures not only full use of the facilities as they are constructed, but also allows for different rates of development as between one faculty and another. It also facilitates future changes that might occur in academic organization.

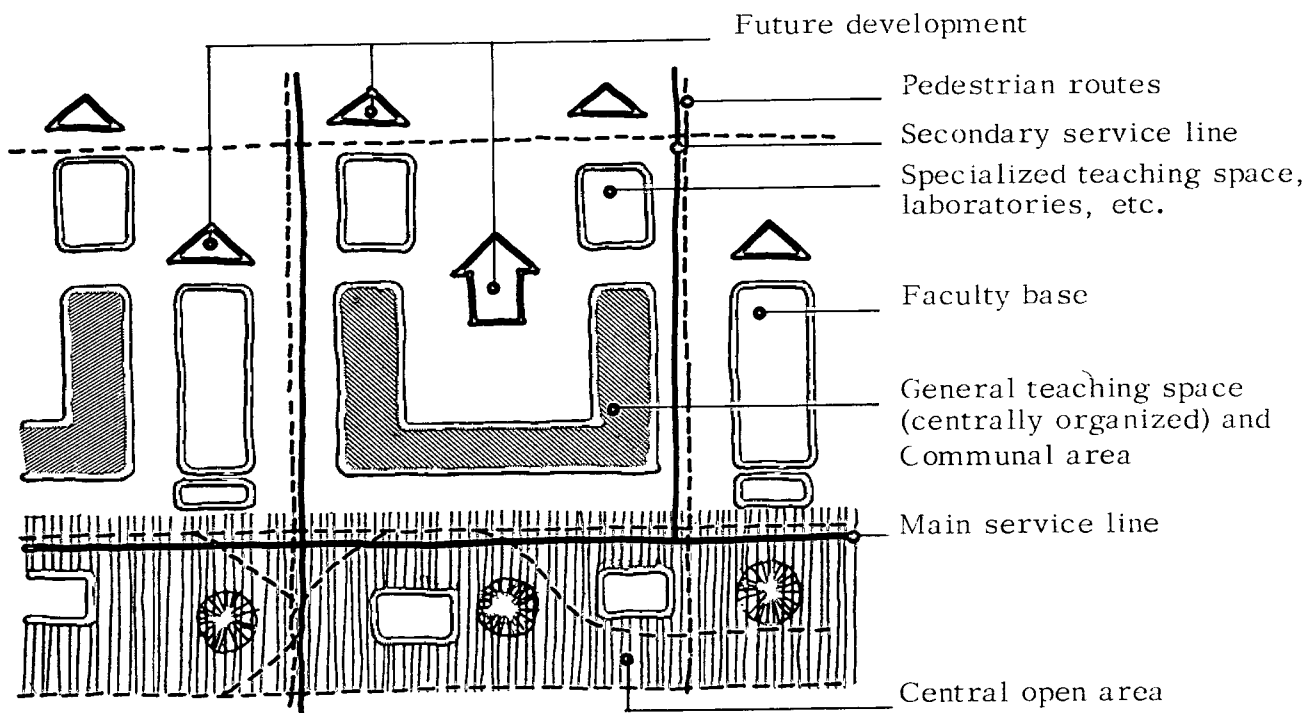
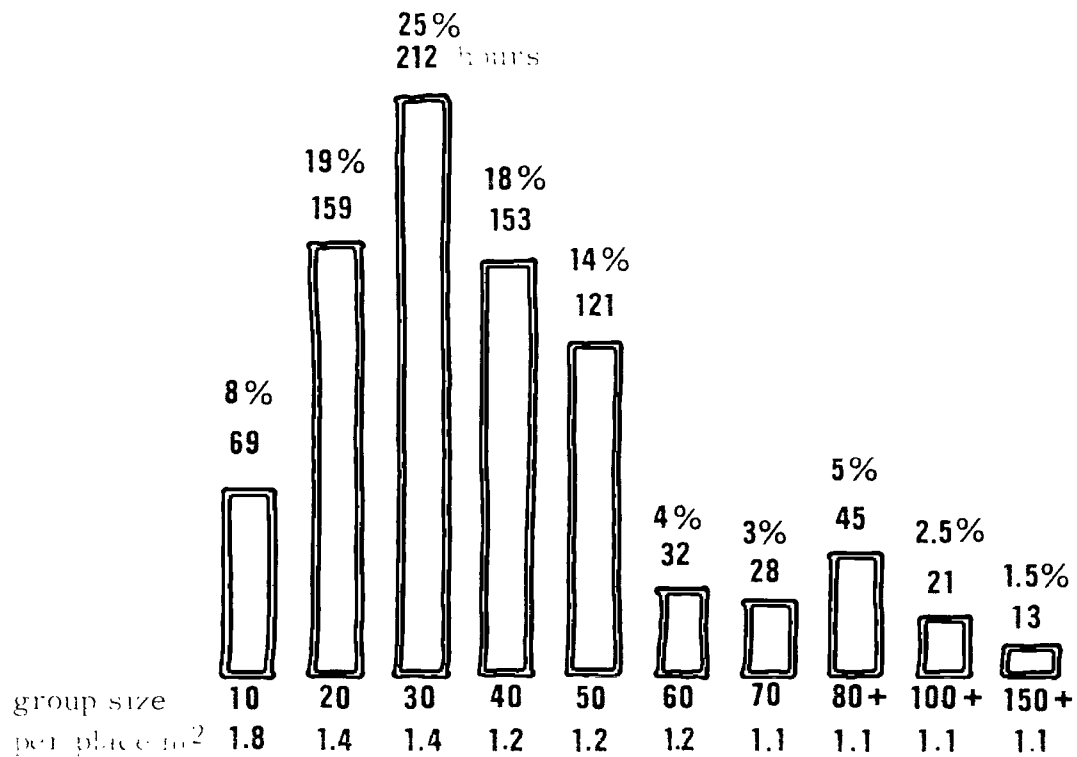


Figure 4.46 Teaching and research areas: schematic development.

Within the academic buildings it would, of course, be necessary to provide a range of sizes of teaching space which would relate in an economical way to the different sizes of teaching groups. The present distribution of teaching group size at the Prasarnmitr Campus, shown in Figure 4.47, gives an indication of the need to deal with this problem when the time comes to design the individual buildings.



Total lecture = 852 hours.

For students of years 1-4, faculties of Education, Social Sciences, Science, Humanities, Physical Education, at Prasarnmitr Campus.

Figure 4.47 Teaching group sizes at Prasarnmitr Campus.

Although sports facilities are planned primarily for educational purposes, there will be substantial extra-curricular use and, with a large resident population of students and staff, the facilities will provide excellent opportunities for recreation too. It may also be anticipated that extramural use of the facilities will develop as the campus becomes better established.

Proposals for development of sports facilities are phased as shown in Table 4.44 below:

Table 4.44. Phased programme for development of sports facilities

Plan period	B. E. 2520-24 (1977-81)	2525-29 (1982-86)	2530-34 (1987-91)	Total No.
Soccer field	3	2	2	7
Rugby field	1	2	2	5
Hockey field	0	2	1	3
Tennis court	6	0	18	24
Swimming pool (25 x 15 m)	1	1	0	2
Outdoor Basketball	2	0	4	6
Outdoor Volleyball	2	0	4	6
Stadium	0	0	1 or later	0-1

During the first phase of development, that is by B. E. 2524 (1981), provision for sports would be at the northern boundary of the site. Later development would be at the south-east of the site in a large area near the stadium, which would be constructed during the seventh Plan Period.

ii. Communal buildings

The term 'communal buildings' includes the following:-

Central facilities : Central library, the centre for administration, the university centre including the convocation hall

General facilities : Faculty club, students' union, health centre and restaurants

Supplementary facilities : Stadium, maintenance workshop buildings and primary school

The estimation of the amount of space needed was made on the same basis as that for academic buildings, described above, namely, to use data from published plans for recently submitted schemes for universities in Thailand, supplemented, where necessary, by data from published standards from other countries. In this connection, estimation of the area needed for the library was made easy due to the availability of excellent standards for university libraries in Thailand and published by the Thai Library Association.

The convocation hall was sized to accommodate all final year students.

Net areas are summarized in Table 4.43 and in Figure 4.48.

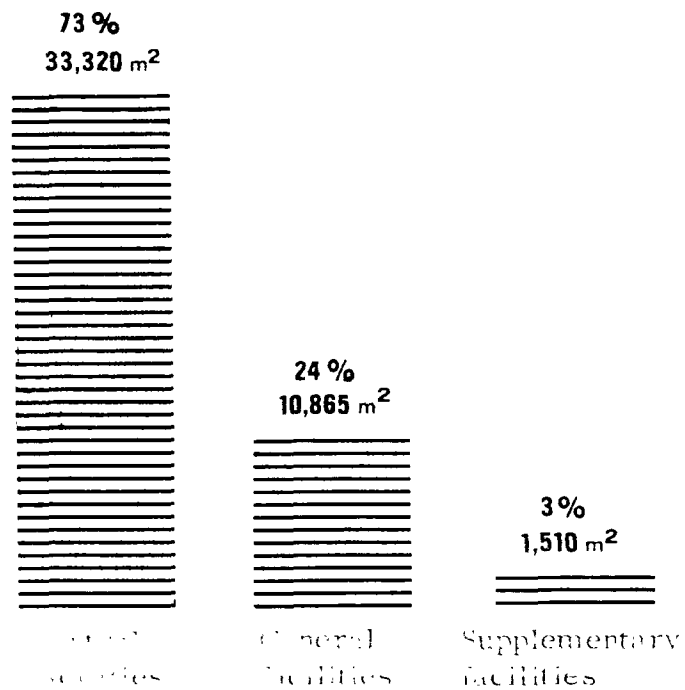


Figure 4.48 - Distribution of net areas of communal space.

It would be evident that some of the communal buildings have greater priority for construction than others. For example, the administrative centre is more important in relation to the initial functioning of the campus than say, the convocation hall or the sports stadium which can be constructed later. This explains the slightly uneven distribution of areas planned for construction in each of the five, plan periods down to 2001.

As to the location of the communal buildings, most of them are arranged near the centre of the academic zone, roughly 300 metres from each faculty and close to the central car park. The primary school, however, has been located between the Education Faculty and the residential area.

iii. Residential buildings

The residential zone includes housing for students, for academic and non-academic staff and for university guests. Catering facilities for residential students are also located in this zone.

Accommodation for students has been determined as follows:-

- a) All first year students will be provided with residential accommodation;
- b) the proportion of male and female students, it is assumed, will be approximately 1 : 1 ;
- c) each residential unit will provide 150 places;
- d) each unit will be occupied by students drawn from all faculties.

Dining facilities (dining hall, kitchens etc.) will be located centrally in the student residences and require initially a built area of some 720 m² in the first plan period to which would be added a further 720 m² at the commencement of the second plan period and a further 360 m² at the end of the third, 5-year, plan period. The total area then available would be sufficient for the resident student population to 2001. A per place area of 1.2 m² for the initial 300 places assumes a queue speed of 12 meals per minute, a time of 25 minutes per meal giving 1,000 meals in 3.5 sittings over a period of 110 minutes.

These details are mentioned as a change in any variable would result in a change of the area required.

The provision for dining facilities has been estimated, is shown included in the area for student residences in Figure 4.49 and in Table 4.43.

Staff housing will be essential for some of the non-academic staff whose duties are such that they have to live on the site. A limited amount of academic staff housing may also be thought useful in the future. The plan thus provides housing for about one quarter of the total academic and non-academic staff as follows:-

In the first plan period 64 houses for senior and 38 houses for minor staff.

By 2544 (2001), there would be 568 houses for academic and non-academic staff.

Of these, some would be reserved for university guests and some designed for sharing by unmarried staff members.

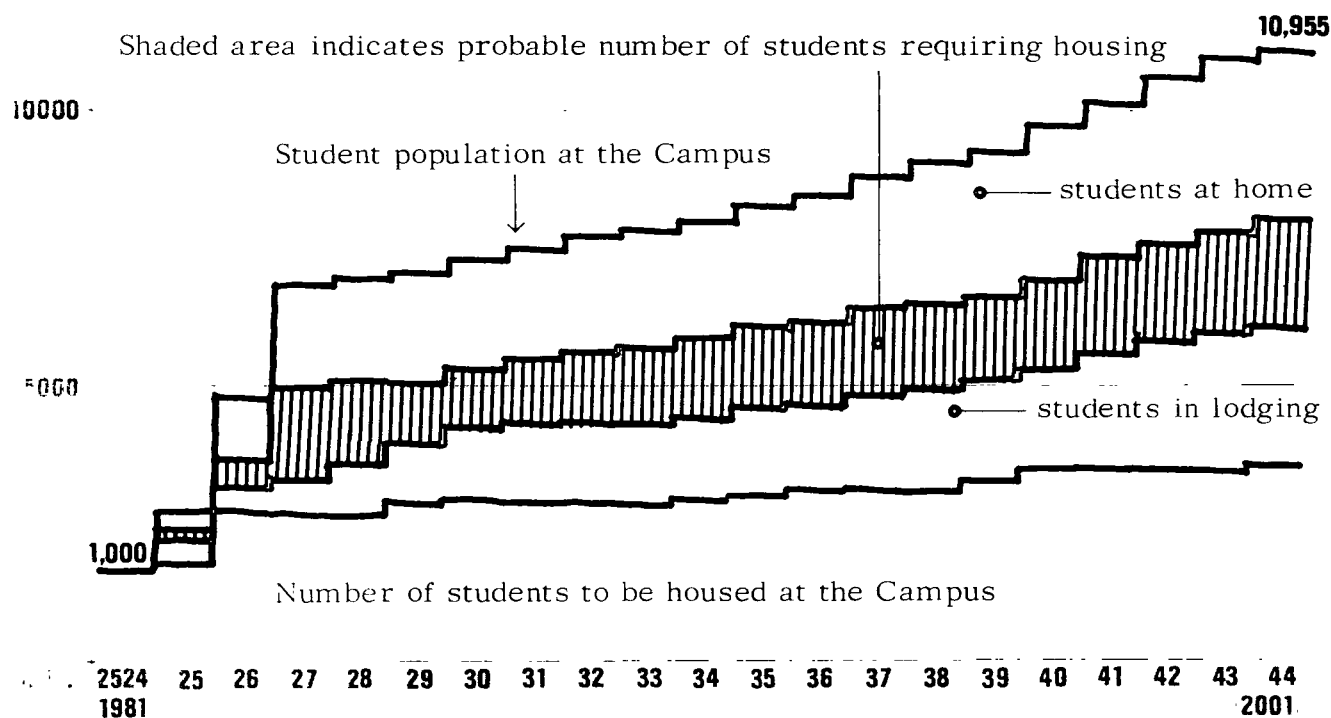


Figure 4.49) Students to be housed to B. E. 2544 (2001).

CHAPTER FIVE

IMPLEMENTATION AND COSTS

5.1. A policy for phased development

The phases of development have been broadly conceived as those occurring within the 5-year Plan Periods. It can be seen from Figure 5.10 that the present 4th Plan Period and the 5th Plan Period B. E. 2525-2529 (1982-1986) are the most critical periods in that 59% of the buildings and 66% of the site development and provision of essential services will need to be completed within these two plan periods.

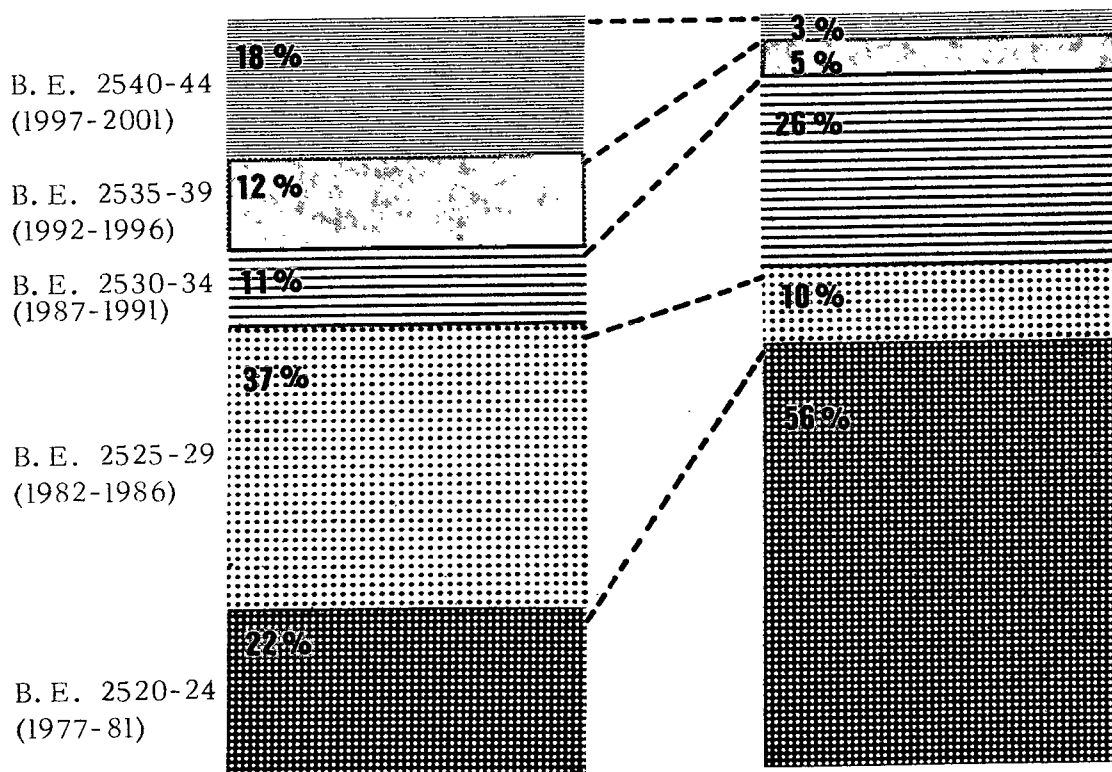
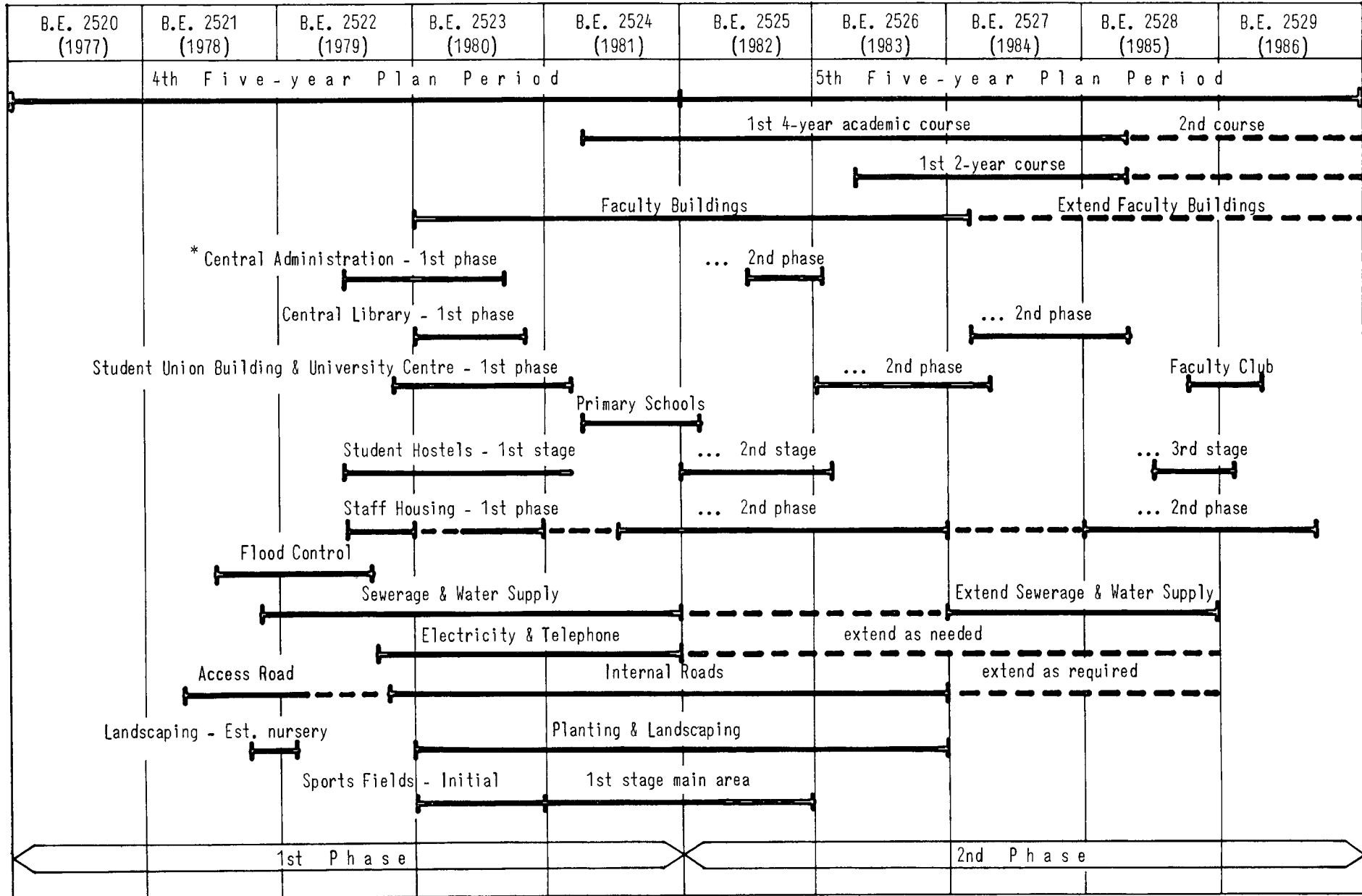


Figure 5.10 5-year plan period; phased development.

Figure 5.11 indicates the stages of development up to the year B. E. 2529 (1986). Beyond this date it is not considered feasible to project the development in detail other than to indicate the requirements of new construction as shown in Table 4.43.

Figure 5.11 Schedule of Development Activities by Year B.E. 2520 - 2529



* Includes maintenance facilities.

It may be added that the programme for moving the existing campuses to Wangnoi without the addition of new faculties requires a certain irreducible minimum investment as shown in Table 5. 20. In the post 1987 period, the programme is based on the expansion of existing faculties and the addition of new faculties and this would obviously be the subject of further discussion at that time.

It is clear that the bulk of the site development, the construction of bunds, canals, lakes; the construction of the sewage disposal plant and the laying of the main trunk sewers; the sinking of the bore holes and the construction of the water storage tanks and the laying of the main water pipes, need to be completed within the present plan period and that the work on the flood control system and the construction of the main access road from Paholyothin Road must be started early in the year B. E. 2521 (1978).

The first phase of development will include the construction of the main perimeter road consisting of the 30 m wide roadway on the western boundary from Klong 26 to a point opposite the sewage disposal plant and the secondary perimeter, 20 m wide roadway on the eastern boundary to a point adjacent to the car park to be located between the student and staff residential areas, see Figure 5.12. The 20 m wide roadway will be extended in the second phase of development to the car park area adjacent to the proposed stadium and the third phase will see the completion of the ring road. In all phases of development, the service roads and foot-paths serving the various faculty and other buildings will be provided in advance of the construction of the buildings.

The following buildings will be constructed in the first phase:-

- (i) The first stage of the maintenance facilities, central administration and central library;
- (ii) faculty buildings to accommodate the 1st and 2nd year students;
- (iii) hostel accommodation;
- (iv) residential accommodation for the academic staff, administration and maintenance staff;
- (v) first stage of the student union building;
- (vi) first stage of the university centre;
- (vii) first stage of the sports field.

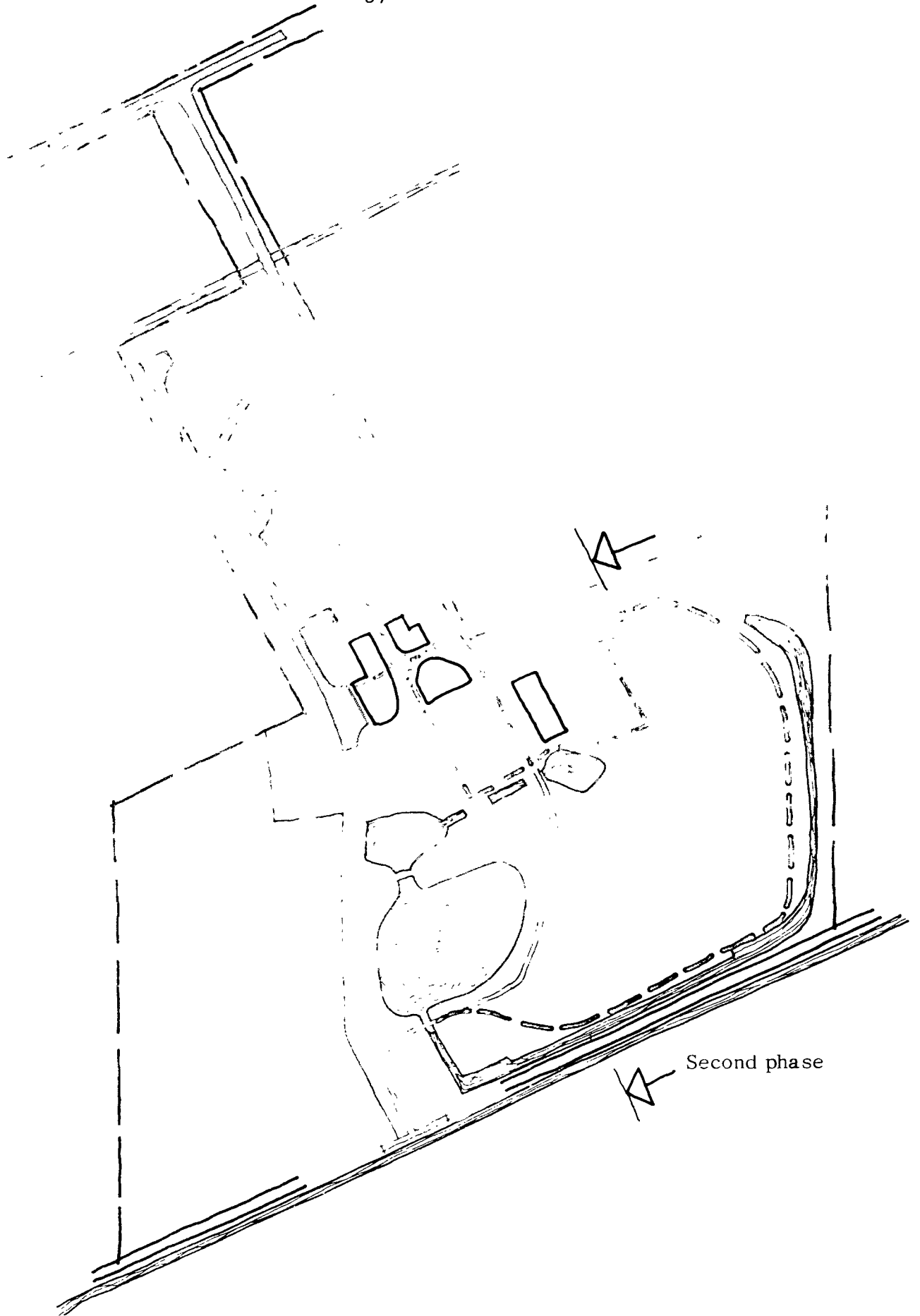


Figure 5.12 Phased development plan: initial phase.

The first stage of the construction of the central administration unit and the central library together with residential accommodation for certain of the administrative and maintenance staff will need to be completed towards the end of B. E. 2523 (1980) in order that the administration has the time to settle in and function efficiently by May 2524 (1981) when the first batch of students are enrolled.

The second phase, B. E. 2525-29 (1982-86) will see another intense period of construction with the completion of the main buildings for the Faculties of Education, Humanities, Social Sciences, Science and Physical Education and the construction of the first buildings for the Faculty of Continuing Education, the Faculty Club and second stage of the University Centre. This phase will also see the extension of hostel and residential accommodation, the second stage of the central administration unit as well as the library. The development of the main sports area will also commence in this phase.

Phase three in B. E. 2530-34 (1987-91) will include the commencement of the buildings for the Faculties of Nursing and Political Science, the extension of the main services, the extension of the academic buildings, central administration, library and the residential accommodation for students and staff.

The fourth phase in B. E. 2535-39 (1992-96), will include the commencement of the buildings for the Faculties of Economics and Business Administration, and Home Economics, together with the extension of the student union buildings; the completion of the main buildings for the Faculties of Nursing and of Political Science and the extension of the existing academic buildings, administration buildings and residential accommodation.

This phase will also include the construction of the Stadium.

Phase five, B. E. 2540-44 (1997-2001) will include the commencement of the buildings for the Faculties of Engineering and Architecture, the completion of the main buildings for the Faculties of Economics and Business Administration and Home Economics, the extension of the Student Union Building and the University Centre together with the extension of existing academic buildings, administration buildings and residential accommodation.

This phase will also include the construction of the Convocation Hall. Figure 5.13 shows the final phase of the development plan.

Landscaping will be a continuing development with the main outline completed in the first phase. In this regard it is essential that a horticultural nursery is established early in B. E. 2521 (1978).

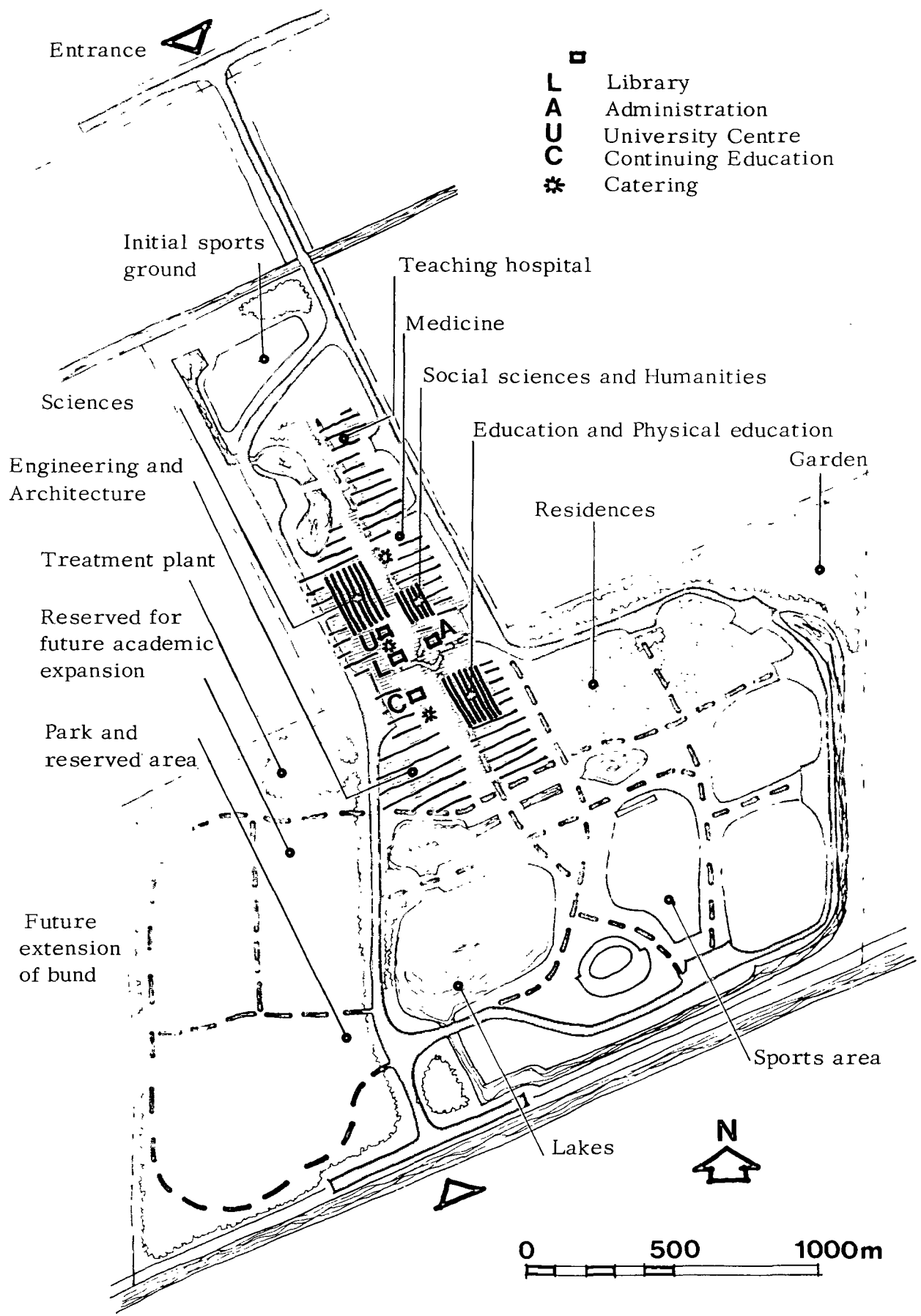


Figure 5.13 The development plan - final phase.

5.2. Resources and expenditure

The estimates given below have been based on costs at the end of B. E. 2520 (1977) and no attempt has been made to adjust the estimates to take into account the increase in building costs that are almost certain to occur in the forthcoming years. Building costs have been rising at the rate of 6% - 8% per year and it would be reasonable to assume that costs will continue to rise at this rate. Thus, this expected increase will need to be taken into account during the actual phases of development and the estimated costs will need to be constantly updated.

It should also be borne in mind that these estimated costs do no more than indicate the anticipated magnitude of capital expenditure for the development of Wangnoi Campus. The proposals in this report have been developed in such broad terms that detailed costing is not possible.

As already indicated in para 5.1 the first 9-year period of development, B. E. 2521-2529 (1978-1986), will be the most intense period of the programme since this period will see the transfer of the five existing faculties from Bangkok to the Wangnoi campus and the setting up of the new Faculty of Continuing Education.

It is estimated that Bahts 1,475 million (Table 5.20) will be required for the development of Wangnoi Campus over the next 25 years. Of this, Bahts 696 million will be needed during the next 6 years, B. E. 2521-2526 (1978-1983), to provide the essential facilities for the 6,250 undergraduate students of the five faculties to be transferred from Bangkok. During the following three-year period, B. E. 2527-2529 (1984-1986) a further Bahts 114 million will be required to provide facilities for the proposed Faculty of Continuing Education and to meet the needs of expanding enrolments in the established faculties. Table 5.21 gives the estimated capital expenditure by year of development needs over the period B. E. 2521-2529 (1978-1986).

The funds required in the first phase i. e. the present plan period, will be in the region of Bahts 387 million. In this regard it should be noted that if the first year students of the Faculties of Education, Humanities, Social Sciences, Science and Physical Education are to be enrolled by May B. E. 2524 (1981) the academic buildings and residential accommodation for these students must be completed early in B. E. 2524 (1981) and the buildings for the second year students must also be started by the beginning of the year B. E. 2524 (1981) if they are to be ready for occupation by May of the year B. E. 2525 (1982).

It should also be noted that the bulk of the site development, the construction of the roads and the provision of essential services must also be completed within this present plan period.

Table 5.20 Estimated Quinquennial Capital Expenditure (Bahts in thousands)

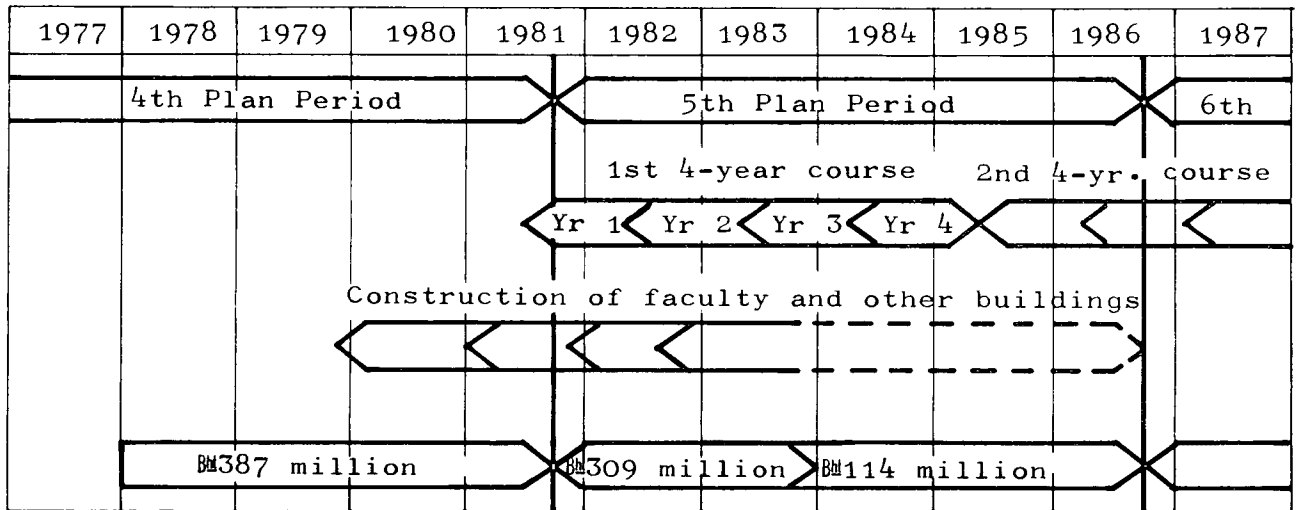
	BE 2520-24 (1977-81)	BE 2525-29 (1982-86)	BE 2530-34 (1987-91)	BE 2535-39 (1992-96)	BE 2540-44 (1997-2001)	Totals
SITE DEVELOPMENT AND SERVICES						
Flood control	19,830	-	-	-	-	19,830
Services	31,750	6,500	16,925	4,850	2,475	62,500
Roads	55,000	10,700	24,745	4,950	3,299	98,694
Sports field, landscaping	8,700	4,200	10,765	100	100	23,865
Sub-total	115,280	21,400	52,435	9,900	5,874	204,889
FACULTY BUILDINGS						
General and Special units	67,134	123,081	37,796	40,047	50,165	318,223
Sub-total	67,134	123,081	37,796	40,047	50,165	318,223
COMMUNAL BUILDINGS						
Library, Administration etc.	30,460	67,255	11,586	17,468	36,286	163,055
Convocation Hall					11,655	11,655
Stadium				135,000		135,000
Sub-total	30,460	67,255	11,586	152,468	47,941	309,710
RESIDENTIAL BUILDINGS						
Student housing	42,336	42,364	10,080	16,128	20,160	131,068
Staff housing	21,312	37,256	25,554	15,119	11,439	110,680
Sub-total	63,648	79,620	35,634	31,247	31,599	241,748
OTHER EXPENDITURE						
Furniture and Equipment	24,069	85,101	19,798	23,757	35,638	188,363
Land purchase	11,000					11,000
Access road	11,000					11,000
Consultant fees	35,940	17,482	8,247	11,613	8,135	81,417
Contingencies	28,752	29,136	13,745	23,366	13,558	108,557
Sub-total	110,761	131,719	41,790	58,736	57,331	400,337
G R A N D T O T A L	387,283	423,075	179,241	292,398	192,910	1,474,907

Table 5.21 Estimated Annual Capital Expenditure (Bahts in thousands)

Fiscal Year	BE	2521 (1978)	2522 (1979)	2523 (1980)	2524 (1981)	2525 (1982)	2526 (1983)	2527 (1984)	2528 (1985)	2529 (1986)	Total
<u>SITE DEVELOPMENT & SERVICES</u>											
Flood Control		10,170	9,660								19,830
Sewage Disposal		1,000	5,000	3,000				1,500			10,500
Water		3,000	5,000	3,000	1,500			750	750		14,000
Electricity			1,000	750	500	500		250	250		3,250
Telephone			3,000	4,000	1,000	1,000	1,000	500			10,500
Planting and Landscaping		300	100	100	100	100	100				800
Roads			22,000	15,000	18,000	7,000	3,700				65,700
Sports Field, Swimming				2,500	5,600	4,000					12,100
Sub-totals		14,470	45,760	28,350	26,700	12,600	4,800	3,000	1,000		136,680
<u>FACULTY BUILDINGS</u>											
General Spaces				14,820	16,380	37,752	37,584	1,620	2,415	3,975	114,546
Laboratories				9,792	10,176	9,984	9,888	576	528	624	41,568
Special Units				7,533	8,433	8,253	8,082	900		900	34,101
Sub-totals				32,145	34,989	55,989	55,554	3,096	2,943	5,499	190,215
<u>COMMUNAL BUILDINGS</u>											
Central Library				6,500				32,850			39,350
Central Administration			6,320			8,040					14,360
Student Union				8,400			11,200				19,600
University Centre				6,600			14,025				20,625
Maintenance Facilities			1,140			1,140					2,280
Primary School					1,500						1,500
Sub-totals			7,460	21,500	1,500	9,180	25,225	32,850			97,715
<u>RESIDENTIAL ACCOMMODATION</u>											
Student Housing			16,936	25,400		37,324			5,040		84,700
Staff Housing:											
Academic/Administration				8,446	8,446	7,280	11,336		10,456	4,980	50,944
Maintenance Staff			4,420			3,204					7,624
Sub-totals			21,356	33,846	8,446	47,808	11,336		15,496	4,980	143,268
<u>OTHER EXPENDITURES</u>											
Furniture and Equipment				13,495	10,574	18,012	34,283	23,847	7,584	1,375	109,170
Land Purchase		11,000									11,000
Access Road		11,000									11,000
Consultants Fees		10,000	7,000	7,000	4,752	6,000	4,000	2,000	1,200	785	42,737
Site Supervision		2,188	2,000	1,500	1,500	1,000	1,000	500	500	497	10,685
Contingencies 10%		2,547	7,458	11,582	7,165	12,558	9,692	3,895	1,945	1,046	57,888
Sub-totals		36,735	16,458	33,577	23,991	37,570	48,975	30,242	11,229	3,703	242,480
GRAND-TOTALS		51,205	91,034	149,418	95,626	163,147	145,890	69,188	30,668	14,182	810,358

Figure 5.20 shows the relationship between the plan periods, the academic year, the construction development periods, and the resultant concentration of capital expenditure in the 4th plan period and the early part of the 5th plan period.

Fig. 5.20 Relationship of plan period to academic year and construction/expenditure programme.



An important consideration in this critical period of development is that the planned expenditure must match the available resources, as there must obviously be a free flow of funds if the development of the campus is to proceed smoothly and according to schedule.

It might appear that the site development costs are high but these costs should be viewed against the background of the extent of the campus site. They in fact comprise about 14% of the estimated total development costs which, in this particular case represents a reasonable proportion.

Provision of Bahts 11 million has been made for the construction of the access road from Paholyothin Road and the bridge over Klong 26 and again the attention of the University is drawn to the need for this road to be built in such a manner that it cannot be obstructed by parked vehicles serving or using the property development that is bound to take place on either side of the access road. Consideration will also need to be given to the approaches leading off Paholyothin Road into the access road to ensure that the flow of traffic on Paholyothin Road is not obstructed.

Provision in the estimates for the initial phase has been made for a water supply and a sewage disposal system to serve approximately 8,000 persons. Both systems will need to be extended during the Plan Period B. E. 2535-2539 (1992-1996).

Telephone lines are in the vicinity of the Campus site but no reliable estimates of cost could be obtained for bringing in the telephone lines or for setting up a private exchange, etc. Enquiries indicated that this is an expensive service and provision has been made accordingly.

5.3. Schedule of development activities

Time is a critical factor in the initial phase of development as not only have the physical facilities to be ready by May of the year B. E. 2524 (1981), but the campus must be functioning as a viable unit and the administrative and maintenance infrastructure firmly established by this date.

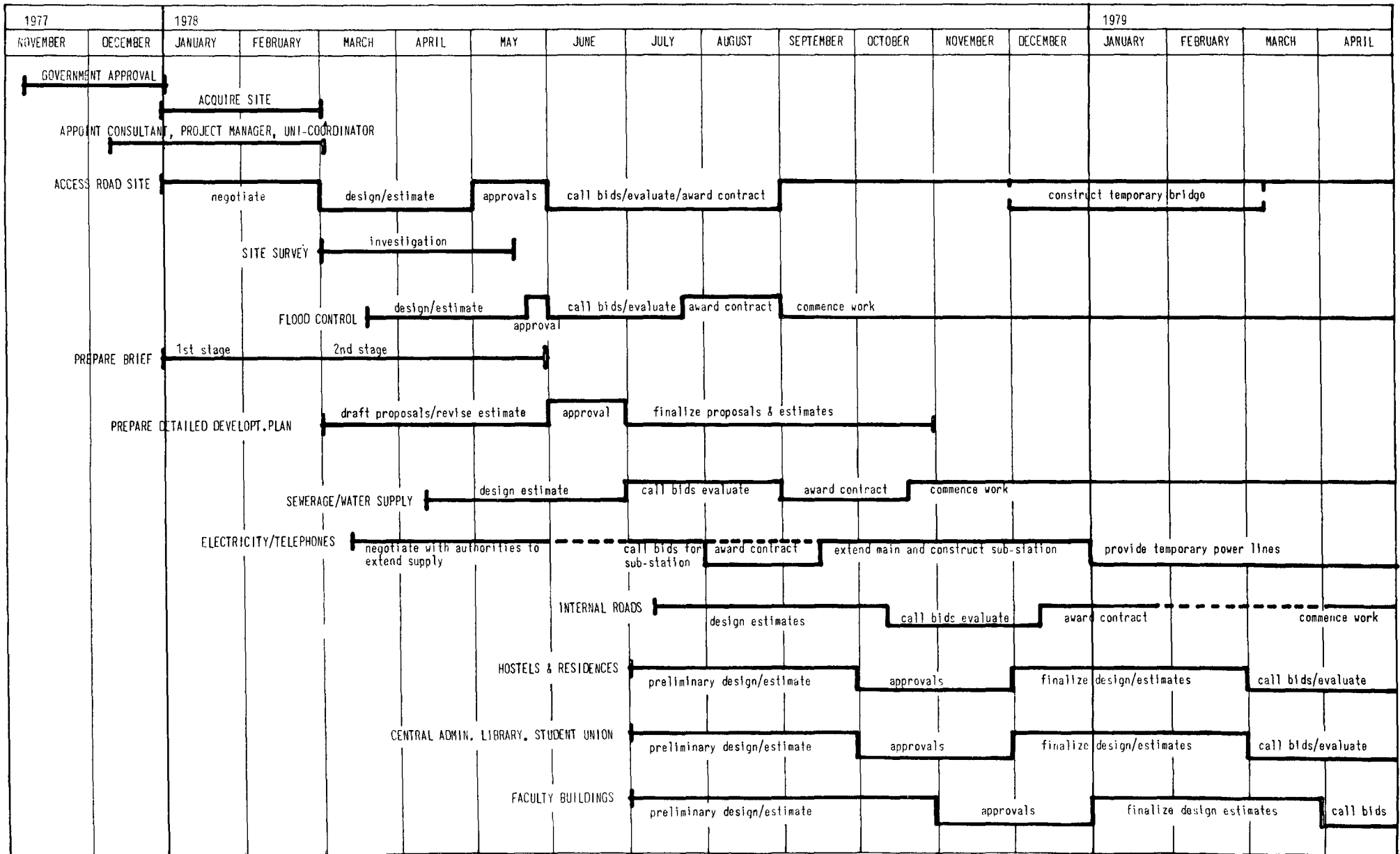
Similarly certain administrative actions will need to be taken immediately after Government approval has been given to this Report, viz: the acquisition of the site, completion of negotiations for the access road, the appointment of the architectural and engineering consultants, either government or from the private sector and the appointment of the Project Manager and University Co-ordinator.

Thus the actual time left for the site works and construction of the major portion of the buildings in the first phase will be approximately $2\frac{1}{2}$ years. This period should be sufficient providing there is good co-ordination of the site development and construction activities.

The proposals contained in this Report for the development of the Wangnoi Campus have been drawn up on a broad scale. They will, of course, need to be developed in much greater detail and that will be the first of the tasks to be undertaken. But prior to the start of this detailed planning work, the preparation of the Architects' brief must be completed. This document, which will need to be prepared by the University, will set out in precise terms the detailed needs and requirements of the University for the academic and other buildings, and the use of the land in relation to the aims and aspirations of the University.

Figure 5.30 outlines the activities that must be undertaken as early as possible.

FIGURE 5.30 SCHEDULE OF DEVELOPMENT ACTIVITIES



It is envisaged that in order to keep to the time schedule outlined in Figure 5.11 that a number of separate contracts will be awarded e.g. for the construction of the main access road and bridge from Paholyothin Road, the flood control works, the sewage treatment plant, main sewerage works and water supply, etc. and much of this work can be commenced whilst the detailed planning is underway. However this will need to be properly co-ordinated if confusion is to be avoided.

It is therefore proposed that a small administrative unit is established comprising an administrator to co-ordinate the affairs of the University - the preparation of the brief for the consultants, allocation of funds to the various faculties, to plan for and arrange for the move of the undergraduate population to Wangnoi and a Project Manager to co-ordinate the work of the architects and engineers, prepare a detailed programme of activities, to call for and evaluate bids for construction work for submission to the President's Office. Although in the early stages it may be convenient for the Project Manager to be in Bangkok he should establish his office at Wangnoi Campus as soon as possible. Figure 5.31 sets out this proposal in organigramme form.

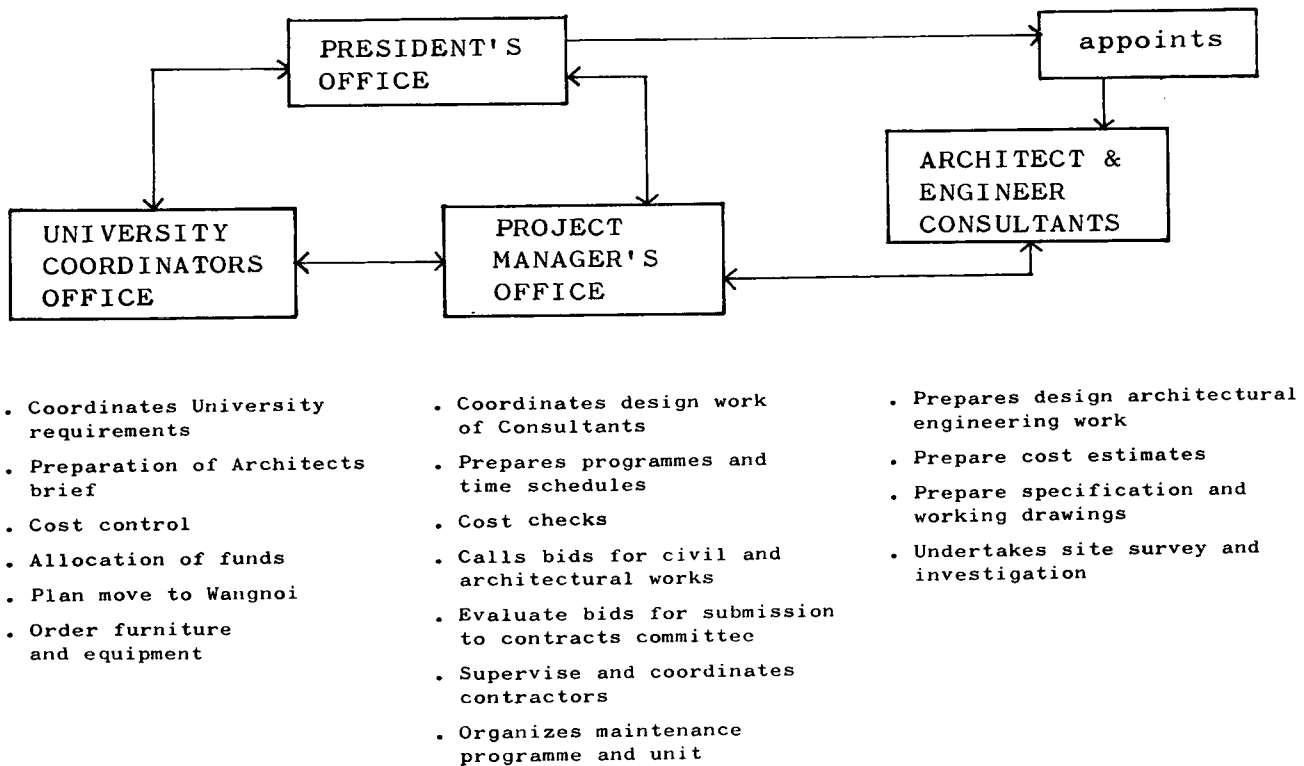


Figure 5.31 Proposal for project implementation unit