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IPE
IRRAWADDY POLICY EXCHANGE

HARDWARE MASTERPLAN FOR THE UNIVERSITY OF YANGON

KILBURN NIGHTINGALE ARCHITECTS

29TH AUGUST 2018

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CONTENTS

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FOREWORD (TO BE COMPLETED)

HE State Counsellor
Daw Aung San Suu Kyi

HE Minister for Education
Professor U Myo Thein Gyi

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1. EXECUTIVE SUMMARY

1.1 Purpose

This Hardware Masterplan sets out guidelines for the physical development of the University of Yangon up to the year 2030. It is intended to be read in conjunction with the University of Yangon Software Masterplan and thus reflects the University's ambitions in terms of growth, faculty structure, autonomy and quality of education.

This provides the University with a coherent strategy for the future development of the two campus sites – Hlaing and Kamayut.

1.2 Objectives

The following key objectives are central to the masterplan:

Arrange academic and residential facilities on Kamayut and Hlaing campuses to best suit the efficient functioning of the University.

- Create the physical environment to facilitate the revitalisation of the University as an autonomous world-class institution.

- Conserve the architectural and social heritage of this important historic establishment.

- Maintain and enhance the green landscape setting.

- Create a heart for the university community through a University Centre (including Library and Canteen) with facilities available for all students and staff.

- Provide good buildings which are comfortable, efficient and adaptable to new ways of teaching.

- Ensure buildings are seismically resilient and environmentally sustainable.

1.3 Masterplanning Process

The Hardware Masterplan has been undertaken by an international team of Architects, Structural and Environmental engineers in close collaboration with Myanmar based professionals. An analysis was made of the existing estate and buildings including an assessment of fitness for purpose and development potential. This was measured against the needs of the growing University (as set out in the Software Masterplan) and the requirements of modern, high standard teaching establishments across the world. A preliminary series of strategic options for the occupation of both campuses was drawn up and presented for consultation with key University stakeholders. The Masterplanning has been guided throughout by a process of stakeholder consultation. This commenced with a presentation to a steering committee chaired by the Minister of Education and followed by a series of periodic meetings with University authorities, key staff members and students including follow-up questionnaires and analysis of the resulting feedback.

1.4 Use of Both Campuses

From both organisational and educational points of view, it is considered very desirable that all academic facilities should be located on a single campus (rather than being divided between two locations as at present). The Masterplan demonstrates that it is possible, by 2030, to accommodate all academic faculties on Kamayut campus. This leaves the Hlaing campus available for accommodating student residences along with ancillary university facilities.

1.5 Layout of University Facilities

The Masterplan proposes five faculties, as set out in the Software Masterplan, occupying existing and new buildings on Kamayut Campus. In addition, new student hostels are proposed to the east of the historically significant existing male hostels, forming a 'zone' of student accommodation.

Moving academic activity to Kamayut gives the University an opportunity to develop Hlaing Campus with student residential accommodation in the place of existing low-quality, single storey academic buildings. The existing 1970s concrete frame buildings are to be retained and used for ancillary academic purposes, (such as specialist research).

In order to create a traffic free centre to the University, Chancellor Road, the main route linking the main entrance to the Kamayut Campus with Convocation Hall is to be pedestrianised, with vehicular traffic strictly limited and priority given to walking and cycling. Existing roads are to be upgraded and linked by new connections in order for vehicles to access the campus without having to use Chancellor Road. Site wide security is to be improved.

The park-like character of the Kamayut Campus is to be enhanced by the removal of selected fences which currently surround many of the buildings, especially around Chancellor Road. This will improve connections between the faculties and between academic and residential areas, encouraging wider interaction between students and staff of different departments.

Improved connections to the lake (including the new Research Centre and nearby swimming pool) and sports facilities to the south are also proposed.

1.6 Design Guidelines

Guidelines are also set out for the design of new academic and student residential buildings, and the enhancement of the landscape.

Key aspects include:

- Buildings to be flexible and adaptable and provide a range of spaces to suit the changing requirements of a modern university.

- New buildings to be in keeping with the park-like setting and wider historical context.

- Buildings to employ sustainable systems of environmental control (including 'passive' design principles) e.g. orientation, shading, natural ventilation, good natural lighting.

- Provision of space for mechanical ventilation and air conditioning where appropriate.

- Provision of social spaces interspersed between classrooms (academic buildings) or study bedrooms (residential buildings).

- Refurbish and update existing buildings including the addition of sensitively designed extensions where necessary and appropriate.

- Create new 'green' routes through the campus to allow easy connections between buildings, interspersed with outdoor sheltered areas and walkways.

1.7 Services

The growth in student numbers and the physical development of the University's estate will have a significant impact on its electrical, drainage, sewage and communications infrastructure. New modernised systems should be implemented, and maintenance regimes established, to underpin the enlarged institution. New buildings will be designed to minimise reliance on mechanical plant, and to be flexible to accommodate future requirement changes.

1.8 Structure

The seismic resilience of the University's buildings has been examined in a preliminary Rapid Visual Screening exercise. The majority of structures pass the screening, but additional analysis should be carried out on the Research Centre adjacent to Inya Lake, the Myat Lay Hostel and Kay Tu Ma Ti Hostels, and the mid-Twentieth Century laboratory and lecture hall buildings on Hlaing Campus.

Outline structural analysis has also confirmed that at least one additional storey could be added, where appropriate, to most of the existing historic, three-storey academic and hostel buildings on Kamayut Campus.

1.9 The University Centre

A new heart of the university community is proposed centred on Chancellor Road. This will include existing refurbished buildings, such as the Recreation Centre and the Library, along with a new Student Hub building, accommodating shared facilities for students such as a large lecture hall and welfare facilities.

The proposed University Centre

1.10 Phasing/ Programme

The final section of the report sets out how the Masterplan can to be implemented, stage by stage. The programme takes into account the important milestone of the centenary of the University to be celebrated in 2020 and sets out further development to the year 2030. The planned, phased approach will aid the University in allocating its resources efficiently and enable the accommodation of the increased student numbers in a way that allows the continued functioning of the university with as little disruption as possible.

1.11 Recommendations and Actions

Short term (2018 - 2020)
Further structural investigations to buildings highlighted in the seismic assessment (Rapid Visual Screening) carried out by Michael Hadi Associates. Refer to Appendix B.

Structural and services quick wins such as upgrading mechanical ventilation in laboratories and jet-washing existing sewage lines.

Design and construct new Student Hub building.

Medium term (2020 - 2025)
Pedestrian landscaping to Chancellor Road

Construct two new faculty buildings, student accommodation and staff housing on the Kamayut Campus.

Commence design of three further faculty buildings and remaining student hostels.

Long term (2025 - 2030)
Construct new hostel buildings on Hlaing Campus.

Complete construction of three faculty buildings and new residential accommodation on Kamayut Campus

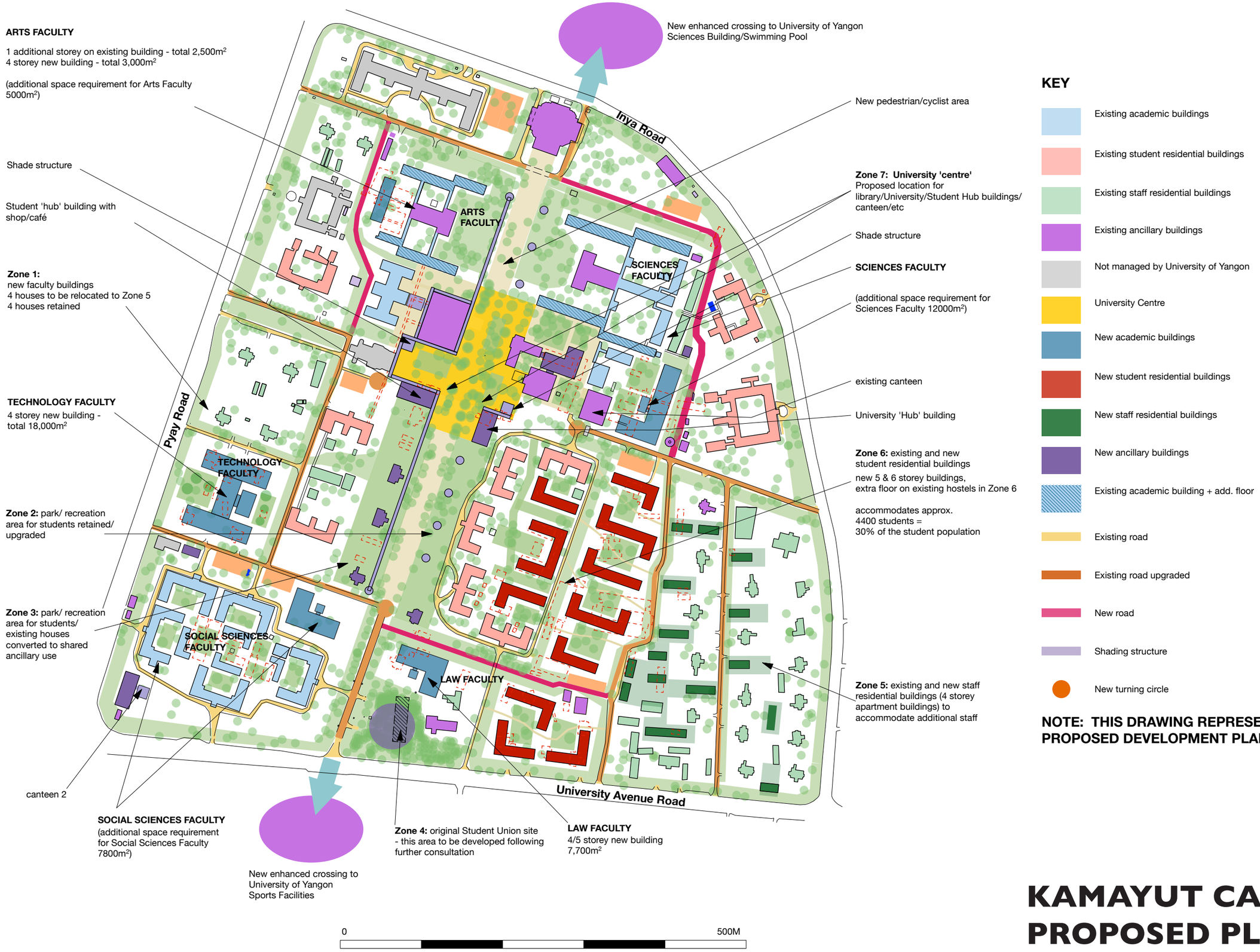
Complete landscaping works to University Centre and Student Hub

CONTRACTOR TO VERIFY ALL DIMENSIONS ON SITE
CROSS REFER TO ALL RELEVANT SPECIFICATIONS, SCHEDULES
DETAILS AND CONSULTANTS DRAWINGS
THIS DRAWING IS BASED ON SURVEY INFORMATION BY OTHERS

KEY

- Existing academic buildings
- Existing student residential buildings
- Existing staff residential buildings
- Existing ancillary buildings
- Existing sports facilities
- Not managed by University of Yangoı
- New academic buildings
- New student residential buildings
- New staff residential buildings
- New ancillary buildings

Three-dimensional model of proposals for Kamayut and Hlaing campuses in the year 2030



ARTS FACULTY

1 additional storey on existing building - total 2,500m²
4 storey new building - total 3,000m²

(additional space requirement for Arts Faculty 5000m²)

Shade structure

Student 'hub' building with shop/café

Zone 1:
new faculty buildings
4 houses to be relocated to Zone 5
4 houses retained

TECHNOLOGY FACULTY
4 storey new building - total 18,000m²

Zone 2: park/ recreation area for students retained/ upgraded

Zone 3: park/ recreation area for students/ existing houses converted to shared ancillary use

canteen 2

SOCIAL SCIENCES FACULTY
(additional space requirement for Social Sciences Faculty 7800m²)

Zone 4: original Student Union site - this area to be developed following further consultation

LAW FACULTY
4/5 storey new building
7,700m²

New pedestrian/cyclist area

Zone 7: University 'centre'
Proposed location for library/University/Student Hub buildings/ canteen/etc

Shade structure

SCIENCES FACULTY

(additional space requirement for Sciences Faculty 12000m²)

existing canteen

University 'Hub' building

Zone 6: existing and new student residential buildings
new 5 & 6 storey buildings, extra floor on existing hostels in Zone 6

accommodates approx.
4400 students =
30% of the student population

Zone 5: existing and new staff residential buildings (4 storey apartment buildings) to accommodate additional staff

KEY

- Existing academic buildings
- Existing student residential buildings
- Existing staff residential buildings
- Existing ancillary buildings
- Not managed by University of Yangon
- University Centre
- New academic buildings
- New student residential buildings
- New staff residential buildings
- New ancillary buildings
- Existing academic building + add. floor
- Existing road
- Existing road upgraded
- New road
- Shading structure
- New turning circle

NOTE: THIS DRAWING REPRESENTS THE PROPOSED DEVELOPMENT PLAN UP TO 2030

KAMAYUT CAMPUS PROPOSED PLAN

HLAING CAMPUS PROPOSED PLAN

2. INTRODUCTION

2.1 Purpose

The purpose of the Hardware Masterplan is to outline the future development of the University of Yangon's buildings and land to enable it to become an autonomous, world-class flagship university. This is a long-term planning exercise which is intended to aid the University in allocating resources efficiently.

The Masterplan also gives guidelines on best practice for the design of new buildings as well as the improvement and refurbishment of existing ones.

2.2 The Hardware Masterplan Process

Below is a brief overview of the work carried out by the Hardware Masterplan team so far in the production of this report:

Autumn 2017: Hardware Masterplan team appointed.

September 2017: visit to Central European University (CEU) to meet Software Masterplan advisory team and co-ordinate objectives and working processes.

December 2017: initial team visit to gather site information and discussion with stakeholders.

January - March 2018:
- Initial site analysis of the existing estate to assess the potential for development of both campuses
- Analysis of Software Masterplan numbers and room requirements up to 2030
- Developed masterplan options for Hlaing and Kamayut Campuses

12-16 March 2018: interim presentation of options to University stakeholders.

March 2018 - May 2018
- Feedback from interim presentation, analysed and incorporated into Masterplan where appropriate.
- Presentation of draft Hardware Masterplan to stakeholders
- Amend report following feedback

End May 2018: issue final draft of report

The scope of the Hardware Masterplan includes the following:

- Create the physical environment to facilitate the revitalisation of the University as an autonomous world-class university
- The Masterplan will incorporate the Hlaing and Kamayut Campuses of the University of Yangon
- The University of Yangon Software Masterplan will be adopted, including the proposed Faculty structure
- The two milestones for the reinvigoration of the University of Yangon are the centennial year, 2020 and 2030
- The University's priorities are the library, University Centre and canteen facilities as well as a number of infrastructure improvements

2.3 The Hardware and Software Masterplans

This Hardware Masterplan has been co-ordinated with the Software Masterplan and is intended to be implemented alongside it.

The Hardware Masterplan project team have worked with the information provided in the Software Masterplan, which includes the projected growth of the student and staff population until 2030, as well as the future room requirements for each faculty.

These numbers have provided the basis of the proposed development shown in the Masterplan drawings.
They have also informed this report's recommended approach to how the two campuses are used in the future.

Convocation Hall

UNIVERSITY OF YANGON ESTATE

View from Chancellor Road towards Convocation Hall

PLAN OF KAMAYUT CAMPUS AS EXISTING

3. SITE ANALYSIS

3.1 Location

The University is currently located on two main campuses, Hlaing and Kamayut.

The Kamayut Campus covers approximately 60 hectares (150 acres) and is situated around 5km (3 miles) to the north of Downtown Yangon. It is bordered by Pyay Road to the west, University Avenue Road to the south and Inya Road to the north and east. The south-west shore of Inya Lake is on the opposite side of Inya Road.

The lake is the largest in the city and a popular recreational area for Yangonites.

The Hlaing Campus is 2km (1.2 miles) north along the Pyay Road from the Kamayut Campus. It covers approximately 9.6 hectares (23.5 acres). The shore of Inya Lake is adjacent to the eastern edge of the campus.

The University has use of several additional pieces of land, including:

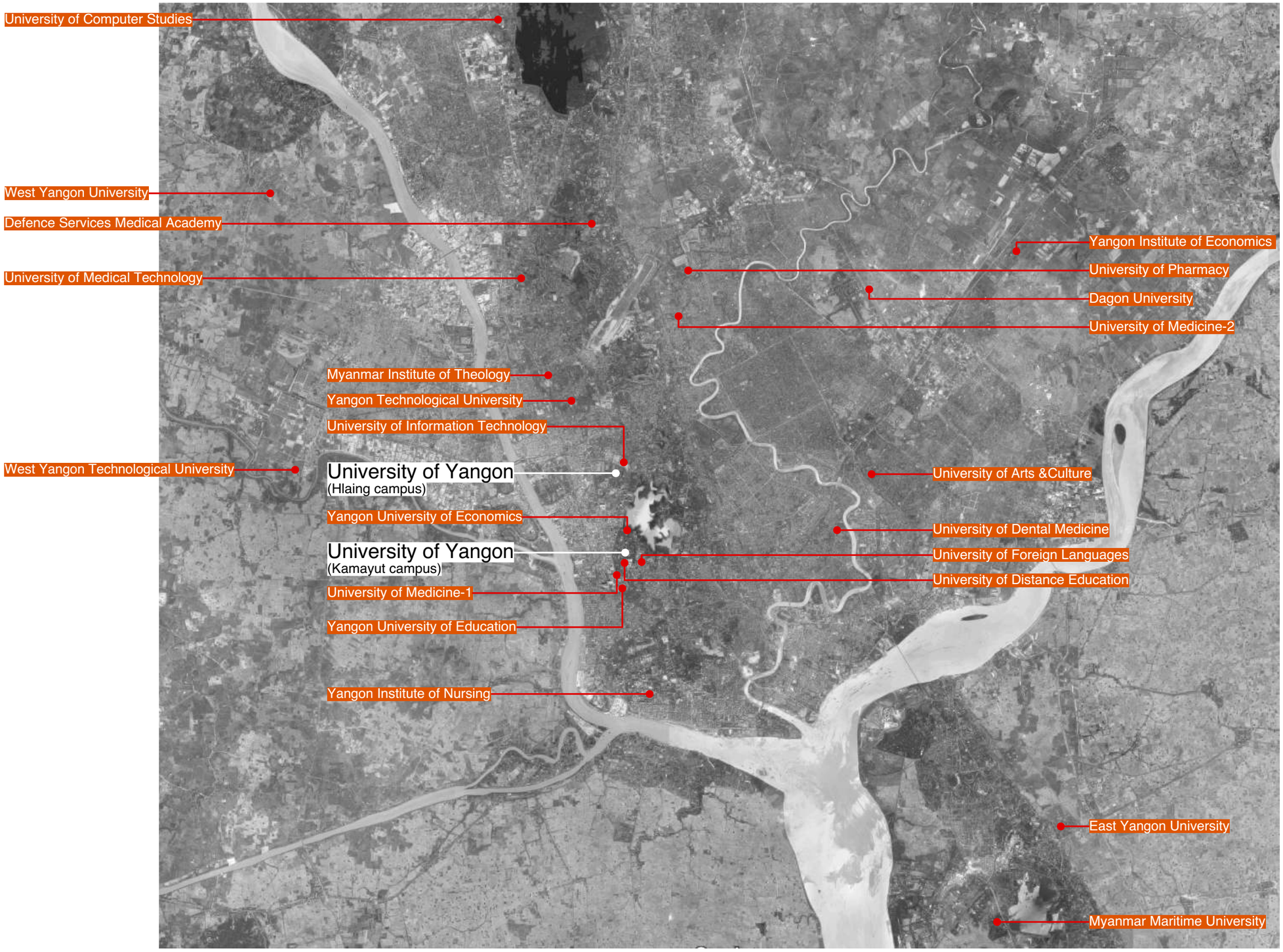
- Sports facilities to the south of the Kamayut Campus
- The new Research Centre and adjacent public swimming pool, bordering the lake, to the north of the Kamayut Campus
- The disused sewage treatment plant to the west of Pyay Road
- Two student hostels to the south of the Hlaing Campus on Yaw Gi Kyaung Street
- One teachers' hostel on the junction of Yaw Gi Kyaung Street and Thamine College Street near Hlaing Campus

The University also leases out two plots of land to either side of the existing Sailing Club, immediately north of Kamayut Campus.

3.2 Higher Education in Yangon

The University of Yangon is oldest of several Higher Education facilities in the city. Generally, these other institutions offer more specialist courses catering for particular areas of expertise, for example, medicine, economics and technological subjects.

The Kamayut Campus is well placed in the city to benefit from potential partnering with nearby institutions. There are several other universities occupying the southern portion of the old Rangoon University site, including the University of Medicine - 1, Institute of Education and the University of Distance Education.



HIGHER EDUCATION INSTITUTIONS IN YANGON

3.3 Quality of Place

The proposals set out in this Masterplan seek to preserve and enhance the special quality of the University's campuses. A brief commentary on the positive qualities of the sites is set out below:

Park-like Setting

One remarkable aspect of both campuses is the abundance of mature planting. Combined with the loosely distributed, generally low-rise buildings across the Campuses, this creates a parklike character which distinguishes the university from the surrounding city. This special quality is very valuable and can help to create a setting which is conducive to studying, teaching and learning

Incremental Development

From studying the historic map of Rangoon University alongside a modern survey map of the University of Yangon, it is striking how the original layout is still readable today.

The fact that no sudden, comprehensive changes have happened to the layout in nearly 100 years lends a special historic character to the site, which should be preserved.

Robust Buildings of Historic Value

Many of the historic buildings on Kamayut Campus are not only still functioning, but perform the same role for which they were originally intended. They are also robustly constructed, with solid masonry walls, overhanging roofs, shaded access balconies, large windows giving good natural light and allowing through ventilation.

Their historic value is enhanced by the important historical figures which have used and occupied them, such as General Aung San's residence in Bago Hall hostel.

The historic buildings add significantly to the character of the University and its campuses. Their preservation, adaptation and continued use will add a sense of permanency and continuity, and so enhance the experience of students and staff.

3.4 History

Kamayut Campus

The Kamayut Campus has accommodated Higher Education facilities since the 19th Century. Rangoon College (later re-named University College) was established under British colonial rule in 1878 and was joined by Judson College, managed by the American Baptist Foreign Mission Society, in 1894. These institutions, along with the Training College for Teachers, were incorporated into Rangoon University in 1920.

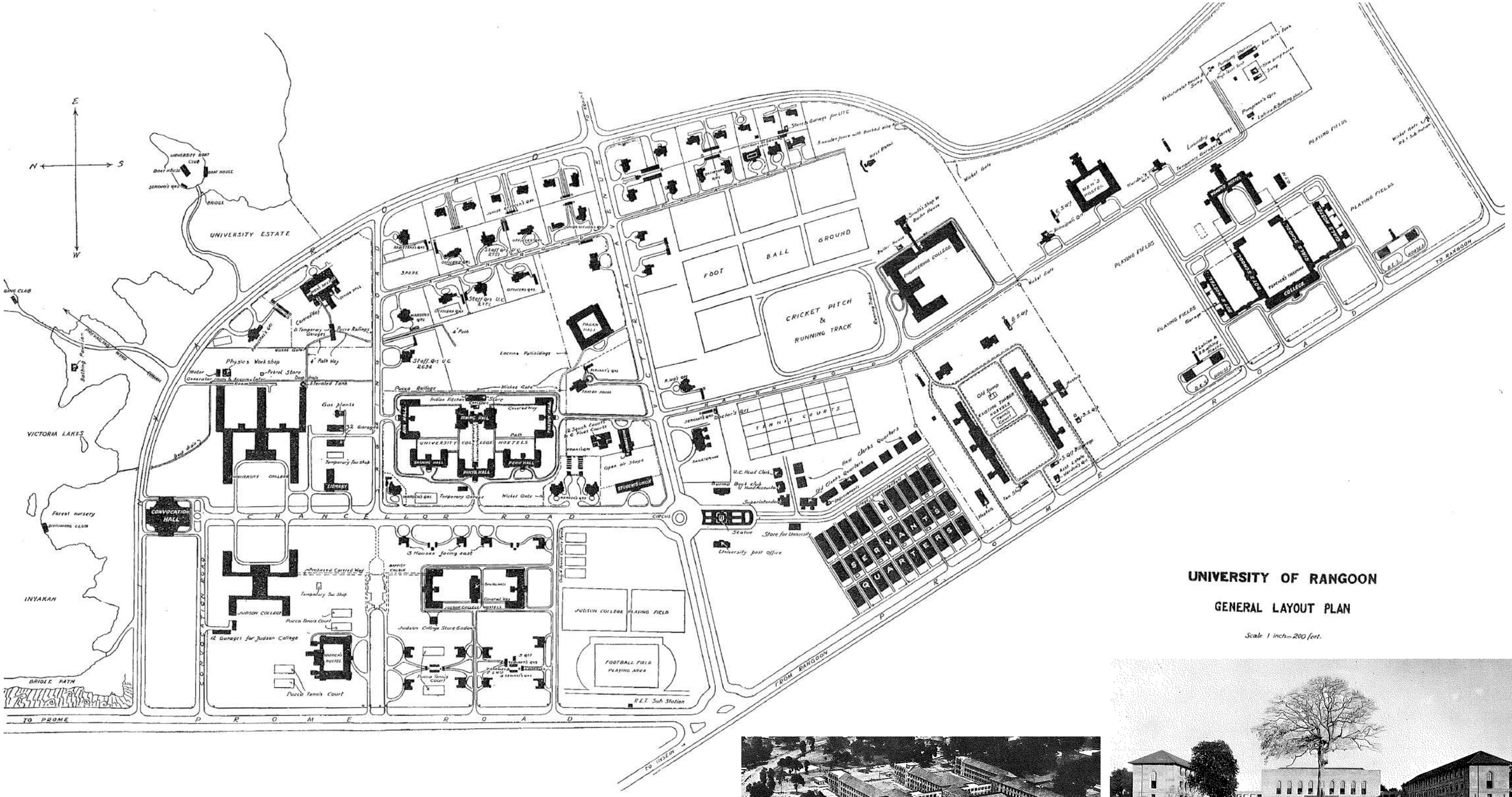
A map of the site from the late 1920s shows the original extent of the University's single campus, which contained student hostels, staff accommodation, academic buildings, sports facilities and social spaces.

The original University occupied what is now the Kamayut Campus, as well as an additional large area of land to the south of University Avenue Road. On the map, the Convocation Hall is evident, as well as many of the academic and residential buildings present today. The two constituent colleges are arranged to either side of the road leading to the Convocation Hall: Judson is to the west in what is now the Arts Building and University College to the east in the present-day Sciences Building.

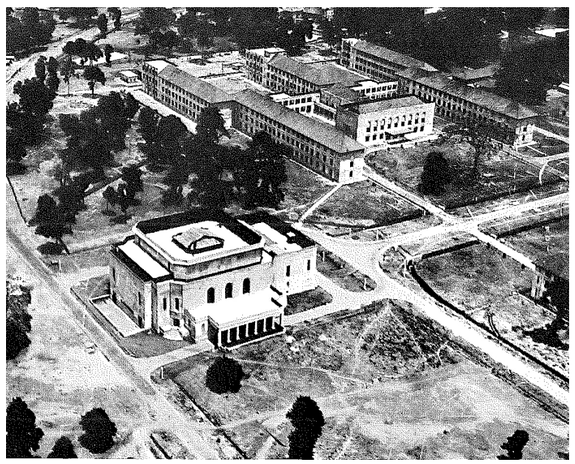
The original heart of student life, the Student Union, was located at the centre of the original campus, near what is now the main entrance gate. The building was destroyed as part of the suppression of student protests in 1962. The site currently contains a memorial and is planted with a grove of trees.

In the later years of the 20th Century the University numbers were reduced until only post-graduate courses were taught on site.

The Kamayut Campus currently accommodates academic years 3 and 4, and post-graduate courses.



Map of University of Rangoon, c1930
from "University of Rangoon, New Buildings", published by Unwin Brothers 1932



Aerial photograph of Convocation Hall and University College (now Science Building), c1930
from "University of Rangoon, New Buildings"

Photograph of University College (now Science Building), c1930
from "University of Rangoon, New Buldings"

General Aung San

Hlaing Campus

In 1969 the Hlaing Campus was occupied by the Athlete's Village for the South East Asian Peninsular Games. The buildings in the north east corner of the site, currently laboratories and single-storey lecture theatres, were constructed as residential accommodation for the athletes.

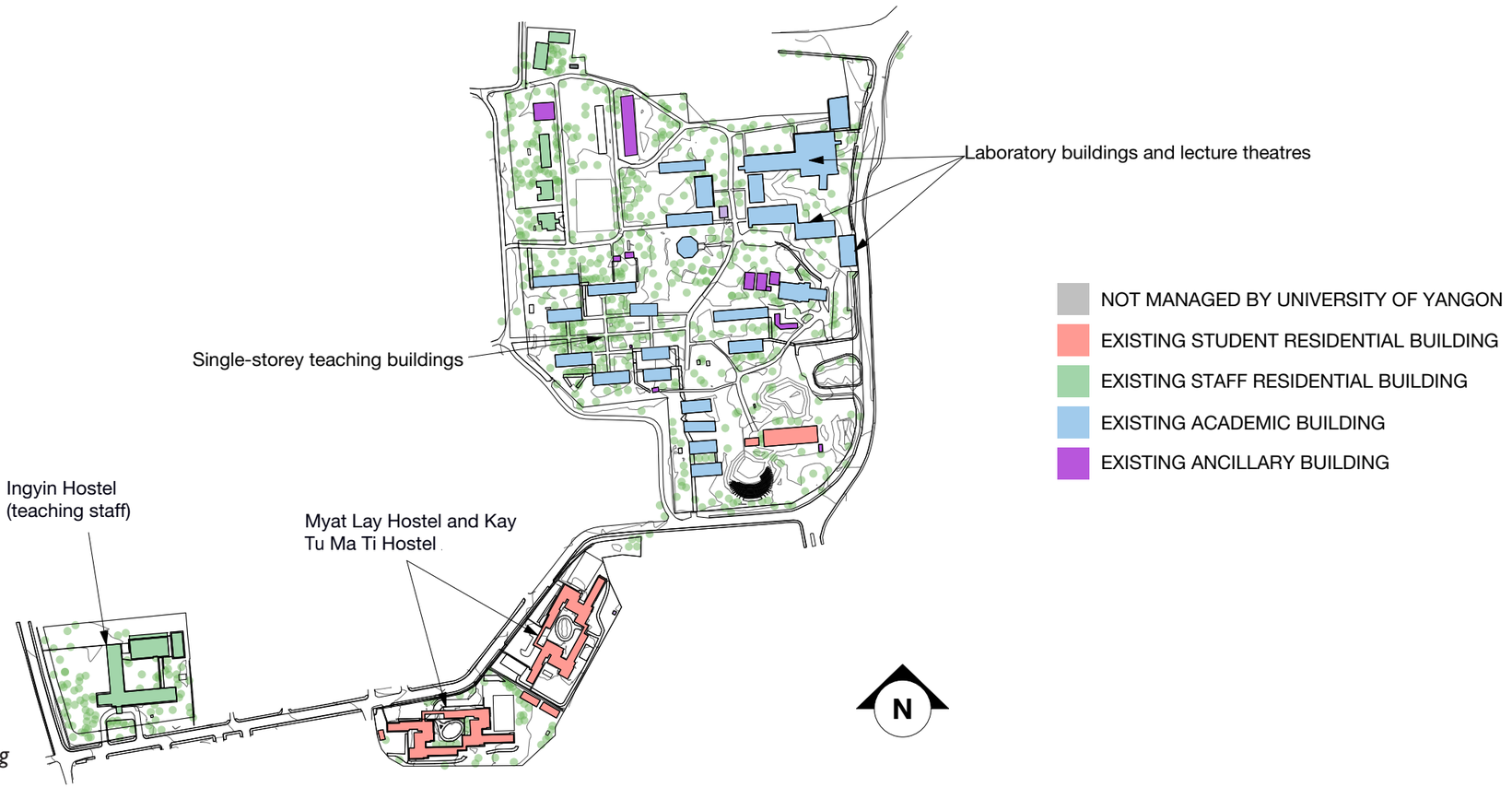
The Hlaing Campus was developed in the 1970's to accommodate Regional College 2 (RC2). Between 1988 and early December 2017 the Campus was either entirely closed, or at times used as part of the Teacher Training College.

It is generally remembered fondly by alumni, and has recently re-opened for use as academic facilities for the University. As of early December 2017, it accommodates over 1,000 students from academic years 1 and 2. Two new hostels nearby accommodate around 700 students between them.

Photograph of temporary building on Hlaing Campus with athlete's accommodation (now labs) in the background.

The Hlaing lab buildings, under restoration

Typical masonry unit used to construct the walls to the laboratory and lecture buildings of Hlaing Campus



Plan of existing Hlaing Campus and nearby hostels

3.5 Principal Academic Buildings on Kamayut Campus

Convocation Hall

The principal administrative and ceremonial building for the University. Consists of a large, double-height central hall with a stage and some balcony seating, in addition to offices and meeting rooms.

This building dates from c.1920 and has been altered very little since.

It is understood that repair work is required to the render on the facade, rainwater goods and roof.

Arts Building

A large masonry building, dating from the early 20th Century, situated to the west of Chancellor Road. It is three storeys high, and accommodates teaching spaces, staff offices and the large 'Arts Hall' lecture room. Ceilings are generously high and most rooms have windows on two sides, allowing for good levels of ventilation and natural light. Later internal partitions have been added to create smaller offices, but these are of low quality and are detrimental to daylighting, ventilation and the use of the building.

Sciences Building

This is similar in age and construction to the Arts Building, and acts as a counterpart to it in the overall composition of the site.

Rooms have high ceilings and circulation is provided by covered external walkways. The ventilation systems in the laboratories, however, are in urgent need of renewal.

University Labs Building

A specialist laboratory building understood to have been built in the 1980's. It is characterised by a central courtyard which provides light and ventilation to the centre of the building.

The 'Arts Buildings' (Vesali, Ramanya, Toung Goo, Amara, Mandalay Halls and Adjacent Single-storey Buildings)

The Halls are of a later date - possibly 1950's - but similar scale to the original academic buildings. They are three storeys high and, like the Arts and Sciences buildings, have verandah access to the classrooms.

The Halls form a courtyard which has been subsequently filled in with single storey academic buildings. Some of these are of low quality construction and are ill-suited to modern teaching, and it is recommended that these are removed as part of the implementation of the Masterplan.

Pang Long Hall

A five storey building housing teaching facilities, constructed in 2016. It appears to be in generally good condition.

Research Building

Recently completed laboratory facilities situated on the shore of Inya Lake. A Rapid Visual Screening for earthquake resistance has shown that this building has a weak ground floor storey and remedial work may be required to strengthen it.

Recreation Centre

A single-storey indoor sports hall and gathering space covered by an expansive pitched roof. An upper level surrounding the sports area provides a viewing gallery and roof terrace for students to meet and socialise.

Library

The original library dates from the 1920's and, like other buildings of this period, has thick masonry walls and a hipped pitched roof.

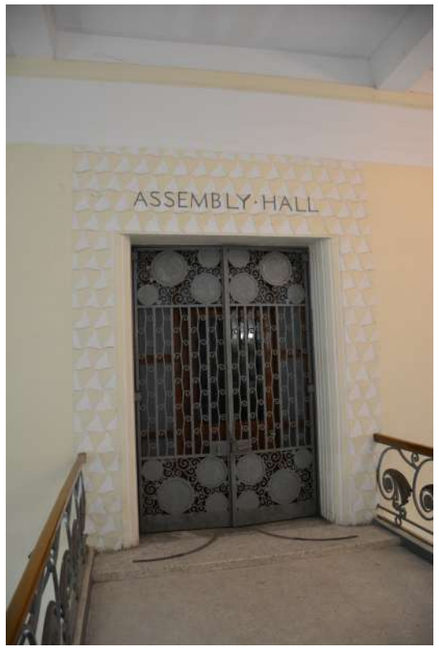
Internally, its book stack rooms have a metal gridded floor to promote air-flow.

Canteens

There are several canteens across the Kamayut Campus, including a two-storey concrete-framed building to the

The University Library

The Arts Building



Fine detailing to the entrance of the Arts Building Assembly Hall

The entrance to the Recreation Centre

east of the libraries, a single storey structure to the rear of the Arts Building and an informal collection of shelters in the south-west area of the site. There is one canteen at the northern end of the Hlaing Campus.

All canteens share key characteristics:
- Multiple kitchens offering a wide choice of meals
- A mixture of sheltered and external eating space

Central Universities Library
A central library for all universities in the country, and not currently managed by the University of Yangon. It was constructed in 1973 and appears to be a robust, good quality building.

Judson Chapel
This building dates from the 1930s and it is understood not to be under direct management of the University of Yangon.

University of Economics
This is a separate institution to the University of Yangon. Its academic buildings occupy a block in the north west corner of the Kamayut Campus and it also manages Marlar Hostel to the rear of the Art Building.

3.6 Principal Academic Buildings on Hlaing Campus

Laboratory Buildings
The three-storey laboratory buildings are of good architectural quality and were undergoing renovation works at the time of the Masterplan team's visit. They are constructed from a concrete frame and distinctive orange masonry units.

Lecture Halls
The lab buildings are complemented by single storey lecture halls of a similar age and construction.

3.7 Student Residential Buildings

Male hostels on Kamayut Campus
Inwa, Sagaing, Pinya, Bago and Thaton Hostels are the original male hostels for University College, the precursor to the University of Yangon. They have been occupied by numerous important historical figures, including Aung San (Bago Hall).

They are all three storeys high, with thick masonry walls and pitched roofs. Student rooms are accessed via a shared external verandah connected to a central staircase. Rooms, which are either singly occupied or shared, are arranged back-to-back with through-ventilation being provided by perforated brick partitions. There are several associated out-buildings near to the hostels

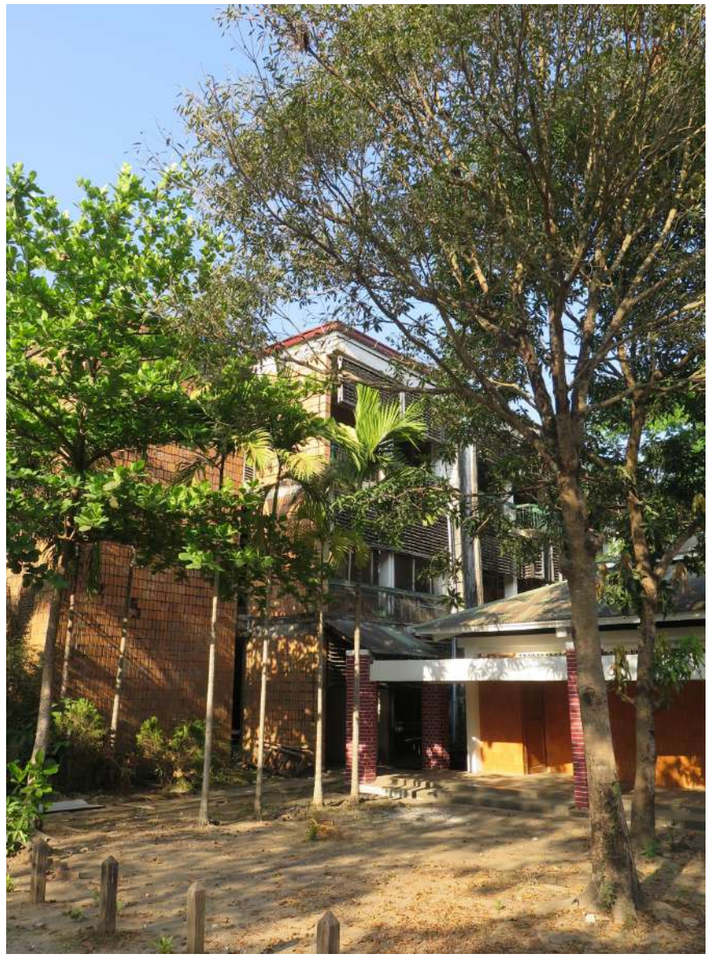
The buildings are generally in poor condition and require renovation. The perforated internal partitions mean there is little privacy for residents, which makes the hostels unfit for a modern, international university without thoughtful re-planning.

Female hostels on Kamayut Campus
Dagon and Shwe Bo Halls were the original male hostels for Judson College but are now occupied by female students. The buildings are very similar in appearance and construction to the male hostels, and will also require renovation.

Inya Hostel was University College's female hostel. Although similar in materials and construction to the male hostels, it is one storey lower (ie two storeys).

Yadana Hostel is to the immediate north of Inya, but was built at a later date. It is similar in height and scale to its neighbour and also needs significant renovation.

Typical male hostel frontage



Hlaing Campus laboratory building and lecture hall

A Hlaing Campus hostel

Shwe Bo Hostel (female) and garden

Hlaing Campus Hostels (Myat Lay Hostel and Kay Tu Ma Ti Hostel)

Two new hostel buildings have been constructed to the south of the Hlaing Campus. These are almost identical in plan, are generally six storeys high and feature a central courtyard. The majority of bedrooms are shared between two students, with some larger individual rooms for overseas students.

Although new and in generally good condition, these buildings have failed the Rapid Visual Screening for earthquake safety and will require further structural investigation.

3.8 Staff residential buildings

Villas

The Kamayut Campus has several groups of individual villas which accommodate university staff: to the west of Shwe Bo and Dagon Hostels.

These villas date from the time of the founding of the university or before and are evident on the historic Rangoon University map.

Staff Apartment Buildings

There are four modern four- and five-storey apartment buildings for teachers to the west of the main cluster of historic villas. These appear to be in good condition.

Typical views of villas

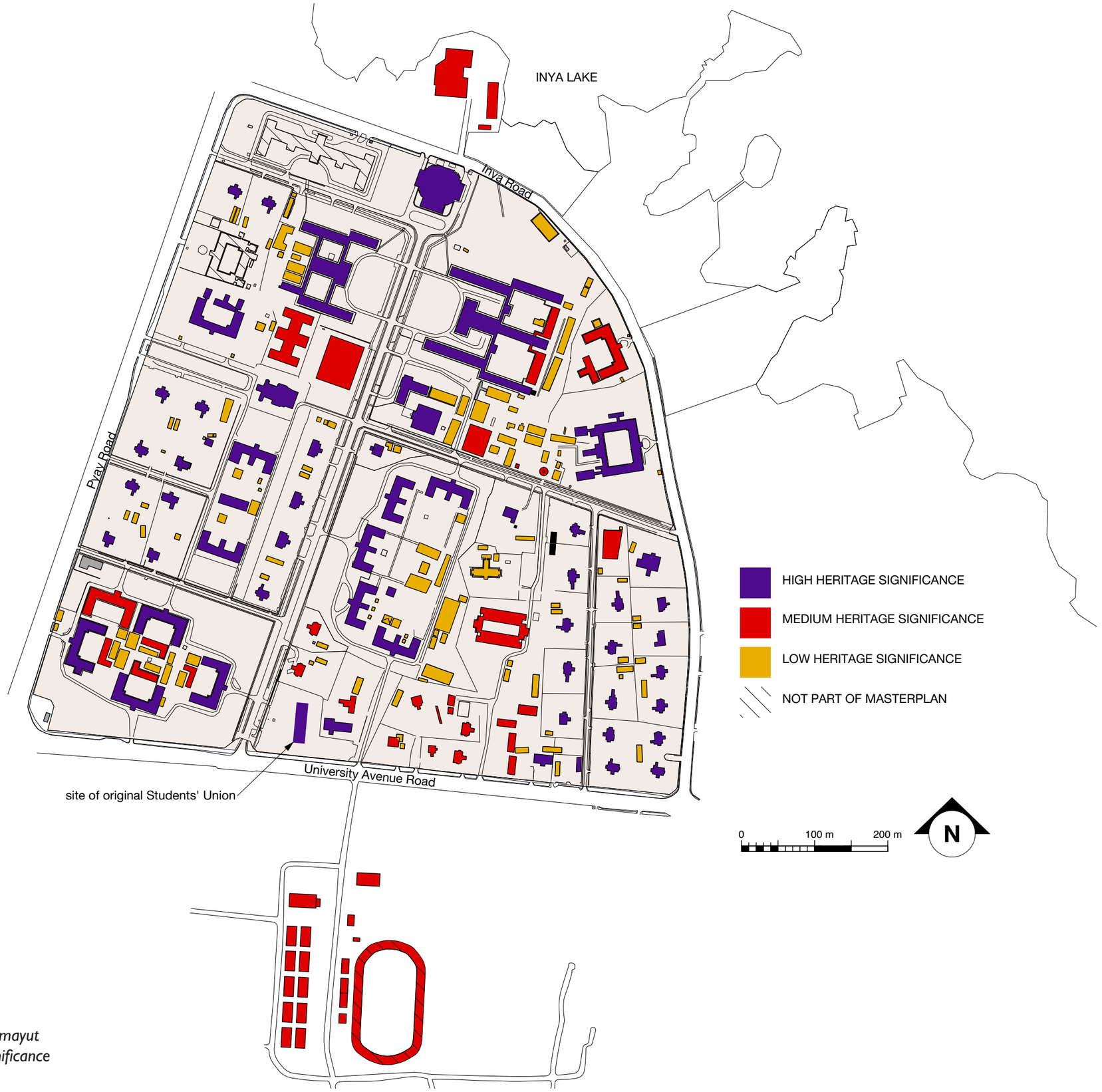
3.9 Heritage Significance of Buildings

The Kamayut Campus has many historically significant buildings which require preservation and, in many cases, renovation.

The existing buildings have been assessed for:
- Fitness for purpose
- Historic and/or historic value
- General condition
- Efficient use of site
- Siting and connections to other facilities
- Potential for refurbishment, adaptation, extension

With reference to the criteria above, the plan opposite shows the University's buildings ranked into three categories:

- *High significance* denotes buildings with great heritage value and which contribute to the character of the campus. High significance buildings should generally be retained unless there is a strong argument that their site should be used for a better purpose. These should be enhanced through renovation and removal of low quality extensions and outbuildings.
- *Medium significance* buildings are of good architectural merit and/ or some historic value and should be kept if appropriate.
- *Low significance* denotes buildings which do not contribute to the character of the campus and should be removed or replaced as part of the masterplan.



Plan ranking buildings on the Kamayut Campus in order of heritage significance

3.10 Traffic and Movement

Kamayut Campus

The main Kamayut Campus is surrounded on all sides by busy arterial roads. The advantage of this is that the site is well connected to the rest of Yangon and beyond. However, the roads are wide with multiple lanes and fast-moving traffic, making them difficult to cross on foot.

Within the Campus, the principal vehicular road, Chancellor Road, runs north-south from Convocation Hall to the main entrance gate on University Avenue Road. Other access roads connect to this from various secondary entrance points into the campus. Although not as wide or busy as the surrounding major roads, Chancellor Road is dominated by vehicles, rather than pedestrians. This creates a dividing line down the campus, which restricts movement across the campus.

Connection to Inya Lake

Although the Kamayut Campus is very close to Inya Lake, it is difficult to get between the two because of the busy Inya Road. An improved pedestrian crossing here would allow students to more easily access the Research Centre, swimming pool and amenities on the lake shore.

Connection to Sports Facilities

Similarly, the University's sports facilities are difficult to access on foot because the busy University Avenue Road acts as a barrier. This area provides much-needed recreation space for students and should be made more accessible.

Hlaing Campus

Currently, students and staff have to commute by road between Hlaing and Kamayut Campuses, relying on either public busses or cars. This adds to the existing congestion in the city, and makes journey times difficult to predict.

Hlaing Campus has significantly less vehicular traffic, having only a few single-lane concrete tracks and pedestrian paths.

View looking south down Pyay Road, with the University perimeter fence to the left

View looking south down Chancellor Road

3.11 Security

The Campuses are surrounded by perimeter fences and walls, with points of entry generally guarded.

Hostels have a secondary fence and additional guards at gates. The entrances to academic buildings are usually staffed.

A secure campus is seen as highly desirable, especially amongst students.

3.12 Accessibility

The current provision for staff and students with special mobility requirements appears to be quite limited. Few buildings, with the exception of the new Hlaing Campus hostels and the lake-side Research Centre, have lifts and generally all buildings require users to climb steps to access internal spaces.

3.13 Site Infrastructure

Besides the extensive planting mentioned above, there are other aspects of the landscaping to Kamayut Campus which should be considered by the Masterplan.

Fences

There are a number of fences between the academic buildings which could potentially be removed. It is understood that many of these are relatively recent additions, installed after the 1988 student protests.

Drainage Channels

The Kamayut Campus also has several brick-lined open drainage ditches, for example, to either side of Chancellor Road. These form an important part of the rainwater drainage system and appear to work well for this purpose. However, they also tend to collect rubbish and, since their edges are often ill-defined, create a falling hazard to pedestrians.

Maintenance

The campus is largely maintained by a centrally organised team. Some gardens of individual houses are maintained by private contractors.

Waste

Generally, waste is collected at specific points around campus by the local authority (YCDC). It is understood that the burning of waste on campus is prohibited, but sometimes occurs.

Typical drainage channel with debris and rubbish building up at its base

Fences bordering Pang Long Hall

Typical view of fences adjacent to Chancellor Road

3.14 Summary of Existing Utilities

A full Utilities Report has been produced by Max Fordham, which is included in the appendices. The following pages contain a summary of its key points regarding existing utilities:

Masterplan Utilities

Well designed, planned, managed and maintained services will help enable the university to deliver a world class education to its students.

The university is supported by its infrastructure and it is important that it has a solid base. The process of changing the campus to allow the masterplan to be delivered is disruptive, but offers a good opportunity to resolve problems with current infrastructure, along with allowing the improvement and future proofing of services on the university campus.

There is significant impact of the masterplan on the existing utilities infrastructure. This is unavoidable with the proposal to pull together all facilities onto one campus, increase residential accommodation, expand existing facilities along with introducing new facilities, services and incorporating new technologies.

It is key that the utilities strategy and phasing of the works is central to the proposed phasing of the building and development works.

Major alterations, diversions and new services are required across site. Without these being considered and accounted for in the development and phasing of the works the university will experience significant problems moving forward.

The changes to the utilities infrastructure will help the university to move forward into the future and provide the desired level of international education; however the level of financial investment required in the infrastructure is significant and should not be underestimated.

Steel water tower, Kamayut Campus

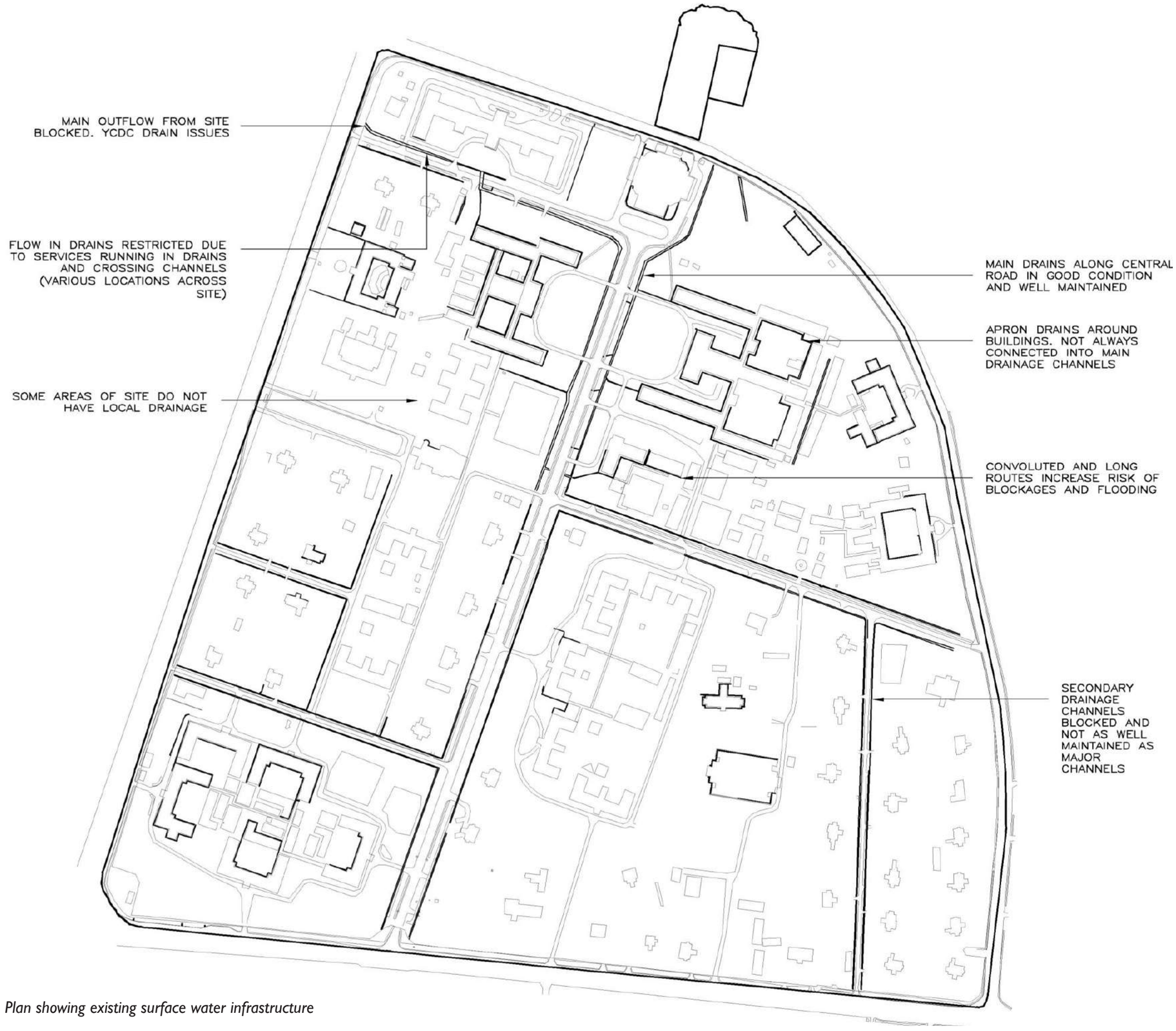
View of pavement and drainage channel to the east side of Chancellor Road

Existing Surface Water Drainage

Some of the surface water drainage channels on the main campus are in poor condition and require repair. However it is understood that the system performs well and there are no issues of flooding in the monsoon. The damaged channels should be repaired.

There appears to be no functioning surface water drainage system for the whole of primary Hlaing Campus. It is understood that the site suffers from flooding. A surface water drainage system should be installed.

Surface water drainage for the satellite Hlaing sites to the south of Yaw Gi Kyaung Street and to the east of Thamine College Street appear to be connected to the YCDC drainage system.



Plan showing existing surface water infrastructure

Existing Foul Drainage

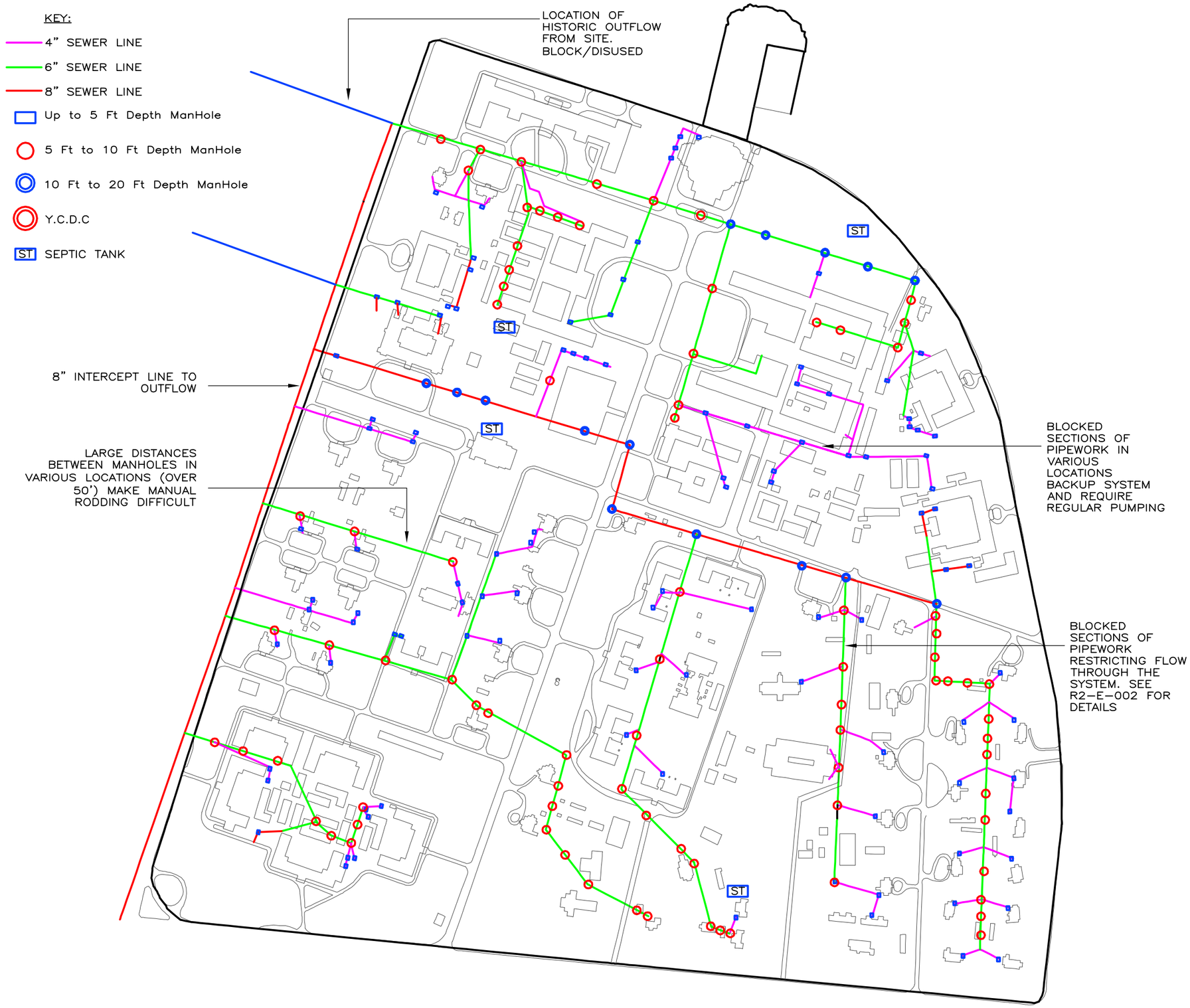
Sewage from the main campus was originally piped to a treatment plant to the west of the Pyay Road. The lines were broken at some indeterminate time in the past. The sewage treatment plant is derelict.

Drawings provided by the University indicate an 8" line running along the western boundary of the main campus which appears to intercept the original lines to the treatment plant and several other lines crossing the western boundary. The function of this pipe is not known: it appears unlikely that it delivers sewage to a septic tank or treatment plant and it is understood that it does not connect to the YCDC sewage system (which is confined to the downtown area of Yangon).

At present sewage is pumped from the system and the pipes manually rodded when manholes overflow. In recent years such pumping and rodding has taken place between once and 3 times per year in various areas of the campus.

There are problems with rodding in some areas of the site because the distance between manholes is greater than the length which can be physically rodded with the available equipment. 50' is understood to be greatest 'roddable' length.

It appears that the sewage pipes are acting as storage tanks rather than conduits to the city system. Reinstatement of the original sewage plant appears not to be a viable option because work to recreate the lines to the plant would be costly and disruptive to the campus and the surrounding area.



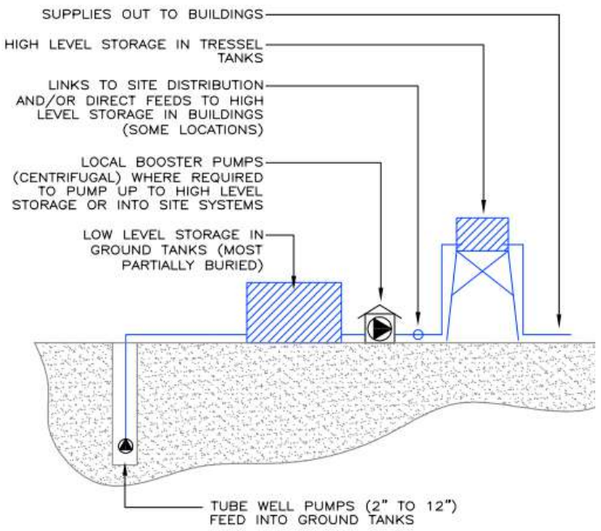
Plan showing existing below-ground drainage infrastructure

Existing Cold Water

The Yangon City Development Committee (YCDC) water system only covers downtown Yangon and does not link to the university site. Both Hlaing campus and he main site system is supplied from a number of tubewells (boreholes) across site.

On the main site total tube well production is estimated to be 408,000 Gallons/day.

Water is pumped and transferred either to high level in buildings or external high level storage tanks, around 60' up, to gravity feed into buildings. This is shown in the overview schematic below.



Water storage schematic

On the main site known ground tank storage is calculated to be 218,000 Gallons. Total known high level storage is calculated to be 184,000 Gallons. These are reported to be full after borehole operation, but thought to be too small as they are empty before the pumps operate again.

Water is also pumped into a basic water network on site that links some locations on site. This is shown on drawing SE-001 overleaf.
There were problems noted with some of the historic boreholes that are either not working or producing the usual volume of water. We recommended that the investigation and checks noted in the main utilities report are carried out. This recommended checking the existing pumps and tubewells for damage, silting up or collapse.

There were some issues noted with leaks from tanks and pipework across the site and in buildings. Free flowing overflows were also noted. These all waste water and mean that the university uses energy and pays to pump water out of the ground and around site that is never used. It is estimated that around 25% of the existing pumped supply is wasted due to leaks.

There are no meters on the system and so water use and wastage is not properly understood. We recommended that:

- Meters are installed on all main supplies, building feeds and also on tube wells to monitor water abstraction, leakage and system flows.

Irrigation is common and it is estimated that the irrigation system uses around 15% of the pumped supply.

Following accounting for water lost due to leaks and irrigation around 285,600 Gallons per day is left to serve the main campus.

Current estimated demand for the main campus is 286,991 Gallons per day. As only 99% of this is available and it is not surprising that the tanks run dry. This could be improved by reviewing pump controls, more frequent pump operating hours and increased high level storage.

Plan showing existing cold water infrastructure

Existing Electrical

Hlaing campus has no transformers on site and power is fed by underground cables from the University of Economics and Hnin Si Hostel via overhead lines.

A new transformer (1000kVA) is proposed for the budget year 2018/19 to serve Hlaing Campus.

On the main site, incoming 3 phase supplies from the city substations are provided by Yangon Electrical Supply Corporation (YESC). These are fed via buried and overhead cables to various transformer locations across site.

Several central transformers and generators each supply a number of buildings. Known details are shown on drawing V-E-001 opposite.

Partial information has been received about service routes or cable runs. These are only roughly known by site staff and no information is shown on received drawings for the main campus. It is therefore not clear exactly which buildings are served from which transformers.

We recommend that:

- A cable tracing study and mapping exercise is carried out for any area prior to development. This should be carried out for the whole campus to allow the design of the future electrical system and diversionary works to be planned. The study will also reduce risk of death or injury during the works.

Existing equipment seems reasonably well maintained, but disorganised and in some cases dangerous with exposed live parts (i.e. circuit breaker covers missing, exposed terminals etc).

There is a mixture of armoured and non-armoured cables installed. Some of the cables running in the ground were noted to be non-armoured. All cables run in the ground should be armoured.

Generators are manually switched and do not use Automatic Transfer switches. This is a reasonable strategy as there is available manpower and the backup is only partial (i.e. 250kVA generator supporting a 500kVA transformer). This means that manual load shedding at the buildings (i.e. isolating some services and supplies) is required in order to allow the generator to start up without being overloaded.

Generators were noted to have recent (i.e. within the last 12 months) service stickers indicating that they had are properly maintained. The generator units look aging, but generally in a good state of repair.

Central switching and isolation at substations is poor and some buildings/area fed from transformers cannot be individually isolated as they do not have isolating switches or breakers.

We recommend that:

- All building and main supplies have separate isolation installed and existing circuits are amended to allow this.

There is no metering on main supplies out from transformers or in buildings. This means that electrical energy use on site is not well understood and there is no information to base studies of current electrical usage on.

We recommend that:

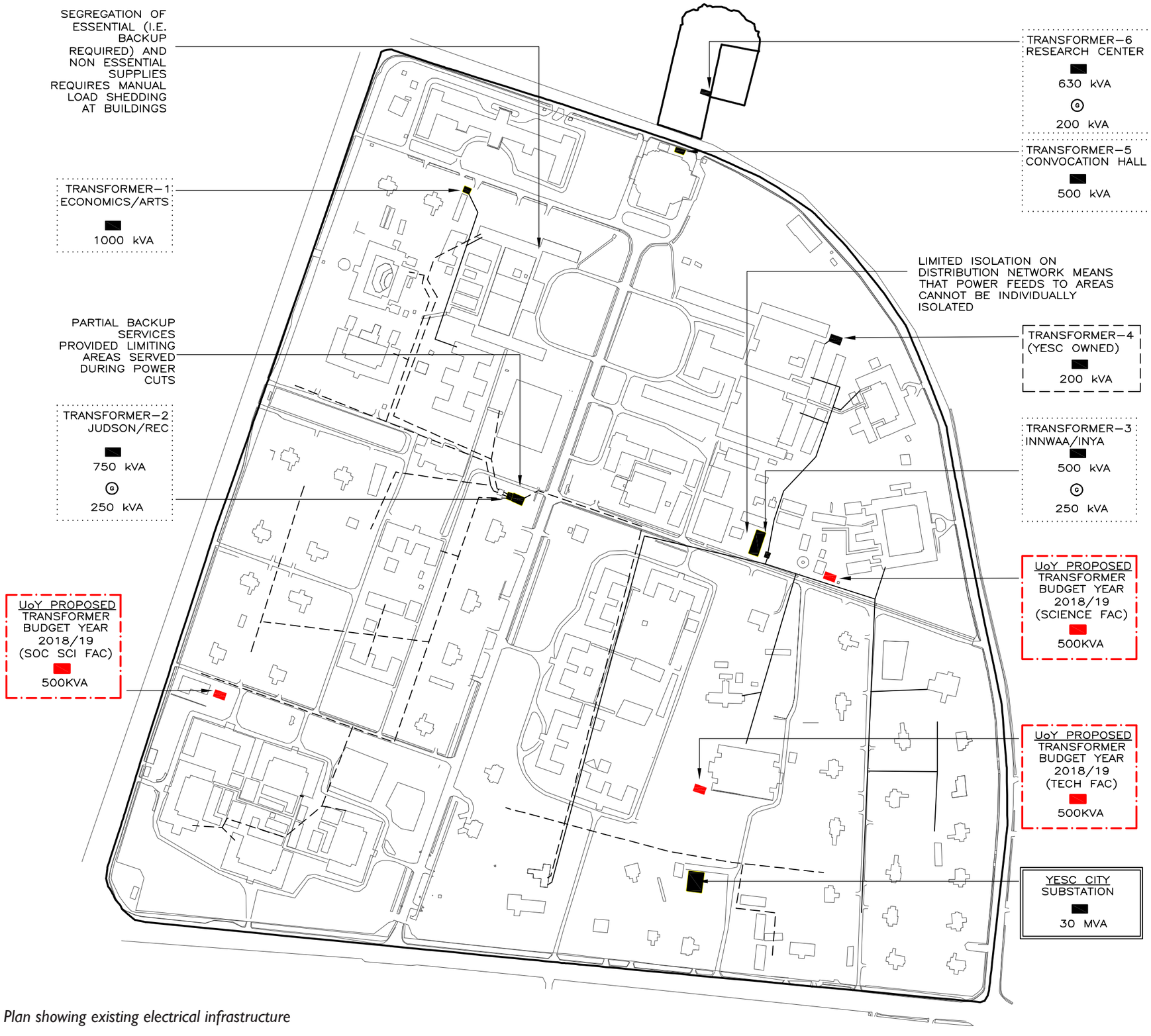
- There are meters installed on all main supplies to allow assessment of power usage

Current assessment of the existing transformer installation on the main site is 2950kVA.

It is calculated that the existing site demand is approximately 2529kVA and so the existing transformers are approximately 86% loaded this is only a general figure across site as the locations the transformers feed out to, is not clearly understood. An additional 3 transformers (500kVA each) are proposed for the budget year 2018/19 to serve the Science Faculty, Technology Faculty and Social Sciences Faculty as shown on the drawings.

We recommend that:

- The installation of the transformers is reviewed against the masterplan proposals and locations/ cable feeds planned and installed to link with the masterplan.



Plan showing existing electrical infrastructure

Existing Data Network and IT services

The University of Yangon has incoming fibre connection. An existing 48 Core Fibre Optic network links to faculties as shown on W-E-001 opposite. This distributes around the majority of the campus to 48 Network termination
points. The network is not yet fully linked to for a loop which would offer better resilience.

While there is internet connectivity, there is currently little/no utilisation of the networks for University service such as library searches, matriculation, student email etc.

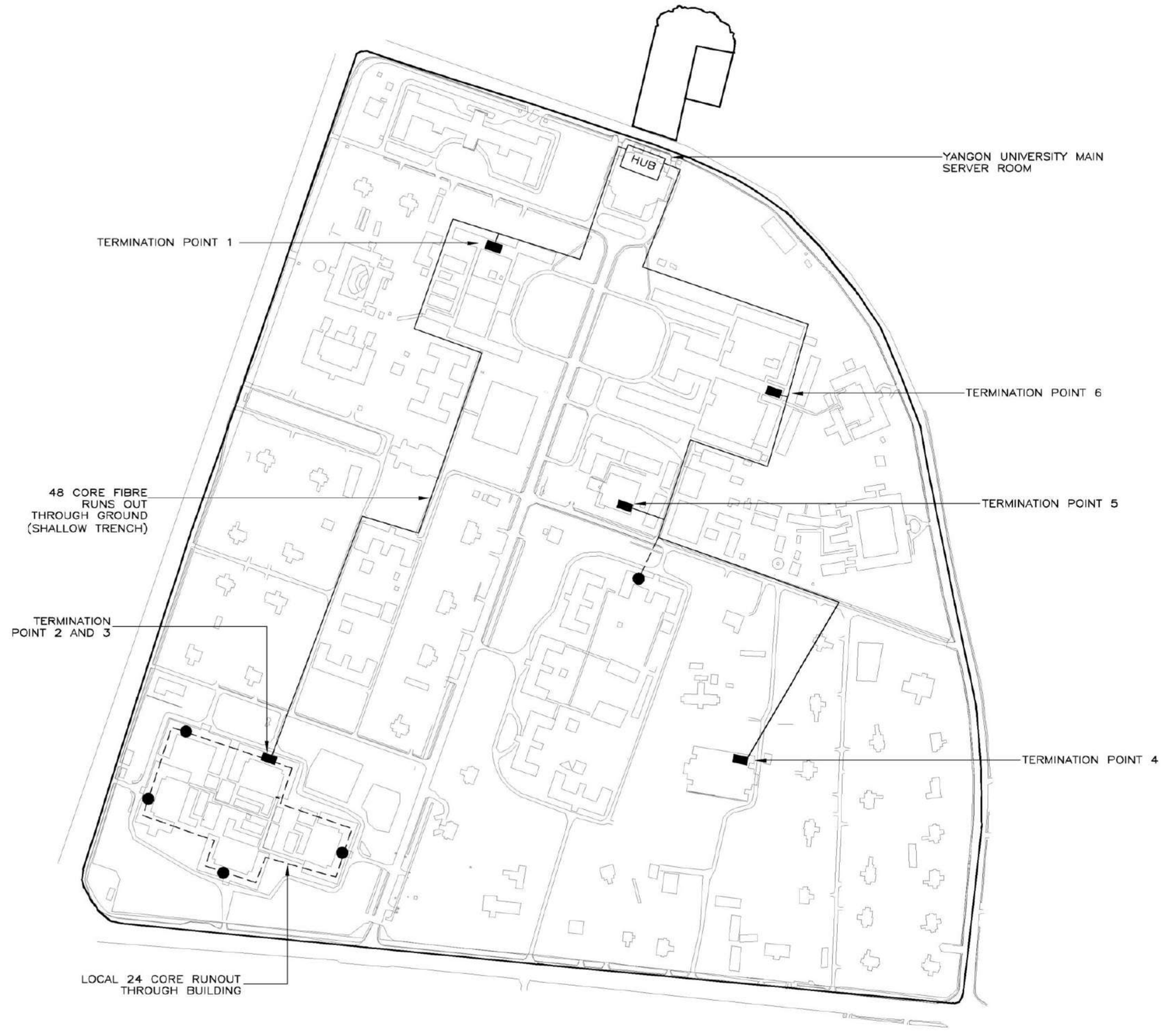
Data and IT systems are under-utilised on site and there are many examples of local systems being partially used.

For example in the library there are traditional card indexes that can be searched to find books. There is also a computer system and data base where books can be searched. Following this the student has to write the book reference number onto a slip of paper, pass to a librarian, who puts the slip in a small lift (dumb waiter) to go to the large book storage area in the basement where the book is found and manually logged out of the library. With an updated system this could all be done electronically.

When discussed with student's data and internet connections were noted to be poor on site and many students utilise 3G or 4G connections on their mobile phones to get internet connections for communication, email and research purposes.

Following this staff noted that the data systems were better than the students thought and that students were not aware of the systems installed.

We recommend that the students are kept informed of updates to the university systems so that the investment in the systems can be fully utilised.



Plan showing existing electrical infrastructure

3.15 Structural Commentary

Condition of Building Structures

The condition of the buildings is typical for their age and type of construction, set in an aggressive environment and which have not been maintained for many years.

The most common defects in the buildings are:

- Deterioration of reinforced concrete (RC) structures including cracks, spalled concrete and exposed reinforcement, some of which is corroded [Photo 1, 2].

- Damaged timber elements due to rot and infestation, particularly where the timber is at grade or in contact with the ground [Photo 3].

- Cracks in loadbearing masonry walls [Photo 4].

At present building maintenance appears to be reactive rather than proactive: repairs are carried out when the defects are considered to be severe and are brought to the attention of the maintenance department.

Seismic Resilience of Existing Buildings

A Rapid Visual Screening (RVS) exercise has been carried out in accordance with the US Federal Emergency Management Agency (FEMA) P-154.

FEMA P-154 provides an objective scoring methodology based on superficial visual inspection and a Data Collection Form quickly to evaluate the seismic safety of a large inventory of buildings with minimal access to the buildings in order to determine those buildings that require a more detailed examination. Thus it is an appropriate screening technique at masterplanning stage for the University.

The RVS method allocates scores based on building characteristics and details that may contribute to poor seismic performance in damaging earthquakes. There is a minimum pass score allocated for each building type, below which the probability of partial or total structural collapse in an earthquake is deemed to be unacceptably high.

FEMA P-154 is a coarse and conservative tool, intended as an initial phase of a detailed, multi-phase evaluation exercise. Note that buildings that pass the screening exercise are not necessarily seismically competent in all respects. Conversely buildings that fail the screening are not necessarily seismically incompetent in all respcts and failure does not indicate that a building is in need of demolition.

The results of the RVS for all of the main buildings are included in Appendix 1.

Key results of the RVS:

- The Research Centre to the north of Inya Road has failed the RVS. It has a soft and weak ground floor storey and a split level diaphragm [Photo 5]. Subject to further analysis, remedial works including additional bracing and shear walls or both may be required to ensure acceptable seismic performance.

- The residential service quarters building R17 has failed the RVS due to a soft and weak storey. This is a small building and it is possible that demolition might offer better value than remedial work.

- Myat Lay (H2) and Kay Tu Ma Ti (H3) Hostels on the Hlaing Campus [Photo 6] have failed the RVS due to minor defects in several areas including local soft and weak storeys, split level diaphragms and captive columns. Further analysis is required to confirm acceptable seismic performance. Remedial works may be required.

- The FEMA building type for one group of buildings on the Hlaing campus, the 'Orange' buildings understood to have been built with Russian involvement, appear to comprise a proprietary hollow tile wall loadbearing system with grouted and reinforced voids [Photo 7, 8]. Further evaluation is required.

- Many buildings contain non-structural hazards which require mitigation.

Building features and defects seen during the superficial inspections and which may contribute to poor seismic performance or present life-safety hazard have been noted.

Photo 1

Photo 2

Photo 3

Photo 4

Non-Structural Seismic Hazards

In an earthquake non-structural components may present a life-safety hazard if their fixings or support are inadequate or if free-standing objects become unstable.

Non-structural components include but are not limited to architectural fixtures and fittings such as cladding, partitions and ceilings; mechanical and electrical installations including air conditioning units, boilers, ductwork, light fittings, cable trays and pipes; and furniture and equipment items such as filing cabinets, bookcases, testing equipment, gas bottles, stored goods and refrigerators.

In common with buildings throughout the world, non-structural items have been installed in the buildings at Yangon University without consideration of seismic risk. Non-structural components throughout the YGH campus should be reviewed and improvement and remedial works carry out as necessary.

Improvements and remedial works to non-structural items may provide significant reduction to life-safety seismic hazard without significant cost.

Structural Commentary on Hlaing Campus

Buildings on the Hlaing campus are included in the RVS exercise as above.

An unusual structural feature of the campus is approximately 10 single-storey buildings which have multiple starter bars for substantial columns arrayed along their flank walls.

It is understood that the starter bars were for 2 or 3 storey buildings which were aborted in 1962 or 1963 on government instructions. The single storey buildings which currently occupy the site were built on the footprint of the aborted buildings. It's possible that there is an intermediate row of columns/foundations concealed beneath the ground floors of the single storey buildings.

It might be possible to re-use and incorporate the foundation and starter bars for the unfinished columns in new buildings. Self evidently investigations would be required to confirm the condition and capacity of the foundations.

In addition to the starter bars for the substantial columns, there are other closely spaced groups of 4 starter bars. It appears that these were intended for structural mullions or a reinforced concrete balustrade.

Photo 5

Photo 6

Photo 7

Photo 8

4. DEVELOPMENT OF THE MASTERPLAN

4.1 Making a World-Class University

The Vision

The Masterplan Team have looked at the best international universities, old and new, in order to identify key qualities important to the development of the University of Yangon.

A fundamental ambition for modern universities is to create a holistic learning experience for students, based around the quality of teaching and the quality of the environment.

In achieving this, we have highlighted a number of important characteristics that can be adopted by the University as it develops over the coming years.

A meeting place for minds

The masterplan proposes a number of ways of encouraging interaction between academics and students to facilitate a culture of idea sharing and discussion.

The types of spaces where this interaction takes place are:

- A centralised university 'hub' where the university community can come together formally and informally;
- In academic facilities (e.g. shared laboratories, lecture theatres and classrooms);
- In the landscape in informal covered areas

These areas are serviced to provide IT connectivity, power provision, space for groups or individuals to gather, and so on.

Spaces to suit the modern teaching and learning experience

Increasingly, universities have a more flexible approach to learning, with wider ranging degree programmes, allowing students more choice in terms of what they study. On-line learning (e-learning) is becoming more standard across Higher Education, as is problem/enquiry based teaching, in conjunction with more traditional methods of learning

Modern universities now provide greater flexibility in their buildings in a number of ways:

- Spaces that can be easily subdivided (e.g. with moveable partitioning)
- Fewer large lecture theatres and more seminar rooms of different sizes
- Facilities shared by different faculties (many universities now share laboratory space, lecture theatres, etc)
- Improved IT infrastructure to facilitate 'e-learning'
- Informal spaces for learning/group discussion/etc
- Libraries that provide access to books, as well as places for group study/research, computer and wi-fi access and a café

Other facilities which are typically provided are:

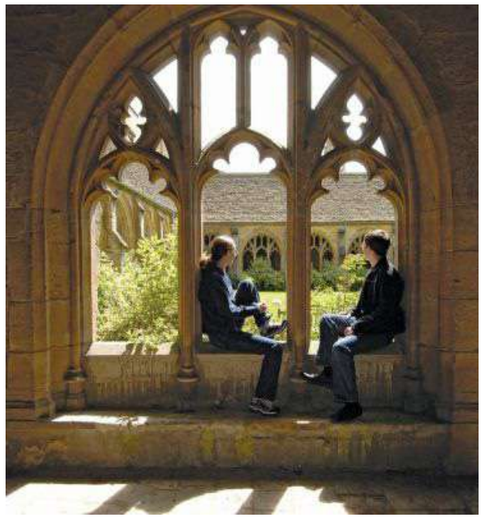
- Student Services Facilities: this is a place for students to access welfare and support, course information, timetabling, fee payments and other financial issues, accommodation etc. and preferably organised as a 'One-Stop-Shop'.

Well designed buildings that can stand the test of time

Many of the world's finest universities are ancient institutions with a core of historic buildings. To serve the needs of a modern university there is, however, a continuing need for buildings to be adapted, altered and supplemented with modern interventions that are designed to sit happily within and enhance their heritage setting while facilitating modern patterns of study and accommodation.

The University of Yangon has a significant number of fine 20th Century buildings which are well built, robust and adaptable. These buildings will, with suitable refurbishment and additions, last for many years to come. Any development on the site should be done in a manner that is sympathetic with its well established while equipping the institution for the future.

The Hardware Masterplan sets out a number of



Informal, sheltered meeting places
(New College, University of Oxford)

New and historic buildings providing a varied learning environment
(Emmanuel College Library, Cambridge)

Landscaping and buildings designed to create meeting places
(American University Cairo)

carefully considered phases of development intended to enhance the core characteristics of the existing estate. These phases are designed to provide a university environment that can be easily adapted to accommodate the future needs of the modern university.

Buildings and Landscape

There are many examples of international universities which have been planned to be integrated with their immediate landscape. Outdoor space is a valuable asset to any university, allowing places for recreations and sport as well as study, informal discussion, impromptu interaction and relaxation, and also providing beneficial microclimates, shading and sensory delight.

The University of Yangon is a fine example of this (particularly the Kamayut Campus), and the Hardware Masterplan suggests a number of ways in which the landscape setting can be enhanced, for example:

- Removal of superfluous fencing, railings and outdated outbuildings to encourage inclusivity
- Careful pruning and thinning of existing trees to encourage healthy growth
- Developing 'greenways' through the site to allow ease of external circulation within the environment
- Pedestrianisation of the central circulation area and as part of the University Hub

A variety of places to study
(Central European University)

Generous circulation spaces creating places to meet
(Central St Martins, University of the Arts, London)

Buildings integrated with landscape
(Thomas Jefferson University)

4.2 Feedback from Stakeholders

The development of the Masterplan relies on input from a wide range of stakeholders, in order to give a more accurate overview of the University's needs and priorities.

Feedback and comments have been gathered at several times using different methods:

Masterplan Team Visit December 2017.
Meetings with stakeholders, including academic staff, maintenance staff and students.
This led to the production of draft masterplan options.

Masterplan Team Visit March 2018
Presentation of initial design options. Generally, stakeholders preferred options showing all academic facilities and all student years together on the Kamayut Campus (Options C, D).

Meeting with the Hardware Masterplan Committee, 18 March 2018
Further comments on the draft masterplan options.

Meeting with the Chair of the Hardware Committee Prof Nyi Hla Nge, the University of Yangon Pro Rector Dr Aung Kyaw, Prof Nyan Myint Kyaw (Head of Civil Engineering at YTU) 23 March 2018
Further comments on the draft masterplan options.

Report Compiled by Dr Aung Kyaw, 9 April 2018
Confirmed stakeholders' preference for all faculties and years on one campus.

Masterplan Team Visit, May 2018
Presentation of draft masterplan. This led to additional adjustments and refinement of the masterplan, including the positions of some proposed faculty buildings and student hostels to create residential and academic 'zones'.

Hardware Masterplan Questionnaire, Compiled by Masterplan team, 16 May 2018
Confirmed stakeholders' views on more detailed issued such as a preference for the removal of selected fences, and views on the use of the original Student Union site.

Questionnaire Compiled by University Hardware Committee, May 2018
Again, this confirmed stakeholders' views on more detailed issued such as the possibility of pedestrianisation of Chancellor Road.

Feedback and comments are set out in Appendix D of this report.

Kilburn Nightingale Architects meeting Hlaing Campus staff to present the Masterplan options, March 2018

Preferred draft masterplan option

Masterplan team meeting students to discuss initial ideas, December 2017

4.3 Space Planning

Academic Buildings

In conjunction with the Software Masterplan (draft issue of 20 March 2018), the Hardware Masterplan team have derived a target overall floor area for each of the proposed faculties by the year 2030.

Sciences Faculty	23,500m^2
Technology Faculty	8,800m^2
Arts and Humanities	15,800m^2
Social Sciences Faculty	18,500m^2
Law Faculty	7,700m^2

The above figures include teaching spaces such as lecture theatres, classrooms, seminar rooms, offices for academic and administrative staff, meeting rooms, storage, WCs and circulation (for example stairs, corridors and foyers).

Specialist laboratories are not included in the above figures, as more detailed consultation with each faculty and department will be required to establish the University's needs.

The masterplan includes an allowance for labs of 5,000m^2 each for the Sciences and Technology Faculties.

Use of Existing Buildings

This calculation accounts for the full use of existing buildings This Masterplan therefore includes an expectation that the existing facilities will be used with greater efficiency. Specifically, redundant and under-used spaces will need to be used ti a normal academic level.

This will require significantly greater co-operation between faculties and departments in order to put existing faculty buildings to full use.

Student Residential Buildings

Kilburn Nightingale have researched international standards for student accommodation, in order that the University can attract students from abroad.

The new proposed student hostels will include the following spaces:

- Individual study bedrooms with ensuite bathrooms
- Common rooms/ social areas
- Laundry rooms
- Wheelchair accessible rooms
- Kitchen and cooking facilities
- Circulation including stairs and lobbies

Shared Facilities, Including the University Centre

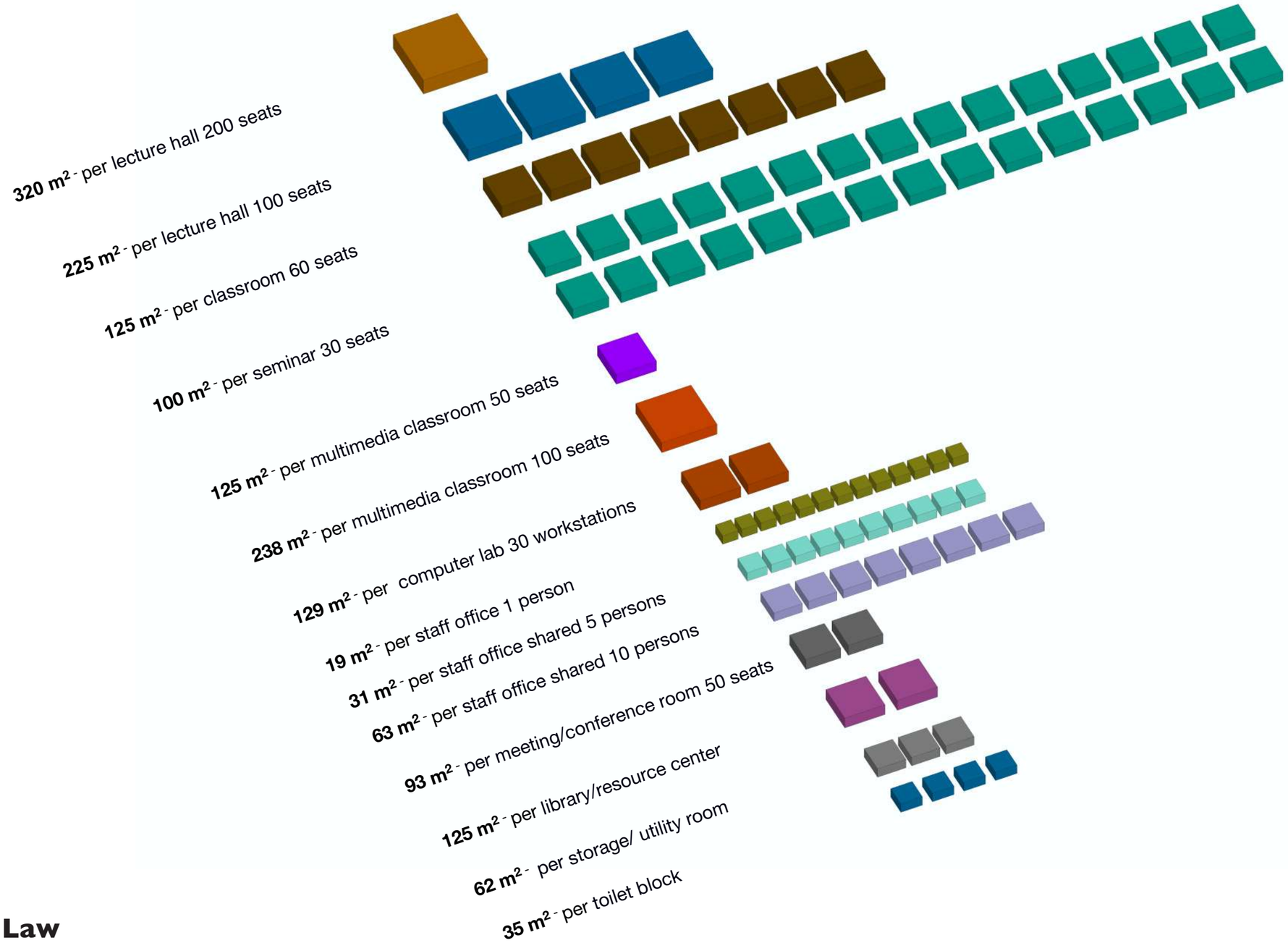
The spaces considered for this area include:

- A multi-purpose hall for events, lectures or performances.
- Meeting rooms
- Informal meeting areas, for example cafes and 'garden pavilions'
- Games area
- A 'one-stop shop' for student advice and welfare facilities
- Canteens in various locations, with spaces including kitchens, dining areas, food storage, waste storage and toilets

Next Step

A detailed brief should be developed with each faculty, in order to set out their current requirements and future needs. This process should be carried out by the University in collaboration with a Masterplan Architect, who should co-ordinate the detailed plans with the implementation of the overall Masterplan.

Space planning drawings for all faculties, residential buildings and the University Centre are in Appendix A, Architectural Drawings.



Space planning drawing for Law Faculty, 2030

(space planning drawings for all faculties, residential buildings and the University Centre are in Appendix A, Architectural Drawings)

5. MASTERPLAN OBJECTIVES

GREEN LANDSCAPE SETTING

The Masterplan should maintain and enhance the special park-like quality of the campuses.

- Generously planted open public spaces
- Maintain existing mature planting and identify and protect special trees
- Low-rise development
- Removing fences where appropriate to encourage movement and interaction
- Prioritise pedestrians and cycling through the heart of the campus

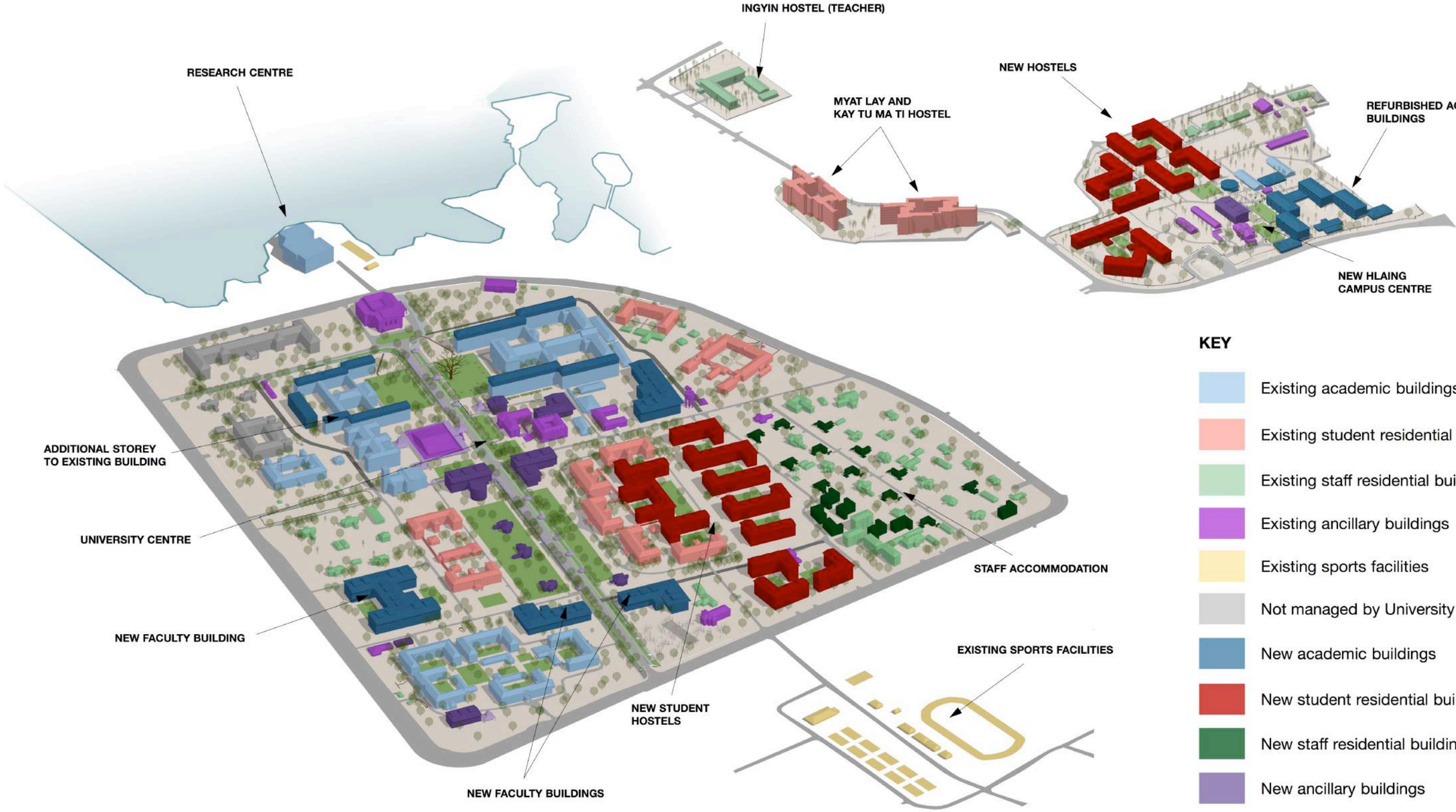
INTEGRATE ALL FACULTIES ON ONE CAMPUS

All academic activity to be moved to the Kamayut Campus by 2030

- Faculties and year groups closer together, giving more opportunities for collaboration and interaction

- New academic buildings designed to respect the existing park-like character of the campus

- Efficient use and re-use of existing faculty buildings


INGYIN HOSTEL (TEACHER)
RESEARCH CENTRE
MYAT LAY AND
KAY TU MA TI HOSTEL
NEW HOSTELS
REFURBISHED ACADEMIC
BUILDINGS
NEW HLAING
CAMPUS CENTRE
ADDITIONAL STOREY
TO EXISTING BUILDING
UNIVERSITY CENTRE
NEW FACULTY BUILDING
STAFF ACCOMMODATION
EXISTING SPORTS FACILITIES
NEW STUDENT
HOSTELS
NEW FACULTY BUILDINGS
KEY
Existing academic buildings
Existing student residential buildings
Existing staff residential buildings
Existing ancillary buildings
Existing sports facilities
Not managed by University of Yangon
New academic buildings
New student residential buildings
New staff residential buildings
New ancillary buildings

CREATE A HEART FOR THE UNIVERSITY COMMUNITY

A University Centre for all students and staff to meet, socialise and exchange ideas

- A Student Hub offering welfare services
- Shared facilities including lecture halls, meeting spaces, libraries and performance spaces
- Social and cultural facilities to enhance students' experience of university life
- Places for informal study, socialising and eating
- Covered walkways to encourage walking and cycling through the campus

GOOD BUILDINGS TO ACCOMMODATE A WORLD-CLASS UNIVERSITY

Sustainable and robust buildings that are fit for purpose and adaptable for future needs

- New buildings that use less energy by employing passive cooling and ventilation where possible

- Academic buildings that accommodate a range of teaching spaces, reflecting the teaching methods of a modern university

- Flexible and adaptable spaces to accommodate future ways of learning and living

- Well serviced buildings with suitable air filtration and digital data provision

- Simple and robust construction to provide safety in an earthquake

Sketch of proposed University Centre building

CONSERVATION AND RESTORATION OF AN HISTORIC INSTITUTION

Conserve and restore significant buildings for the use, enjoyment and education of future generations.

- Maximising the use of existing heritage buildings
- Restoration and sensitive adaptation of historic buildings to make them fit for a modern, autonomous, flagship university
- Making the park-like Kamayut campus more open and accessible by introducing new pedestrian routes

CONVOCATION HALL, COUNCIL CHAMBER, UNIVERSITY OFFICES, COMMITTEE ROOMS

6. THE MASTERPLAN PROPOSALS

6.1 Traffic and Movement

Chancellor Road currently acts as the central spine of the Kamayut Campus, providing a visual link from the main entrance to the Convocation Hall, as well as vehicular access to many buildings on the site. However, it is often busy with traffic and acts as a barrier for pedestrians going from east to west.

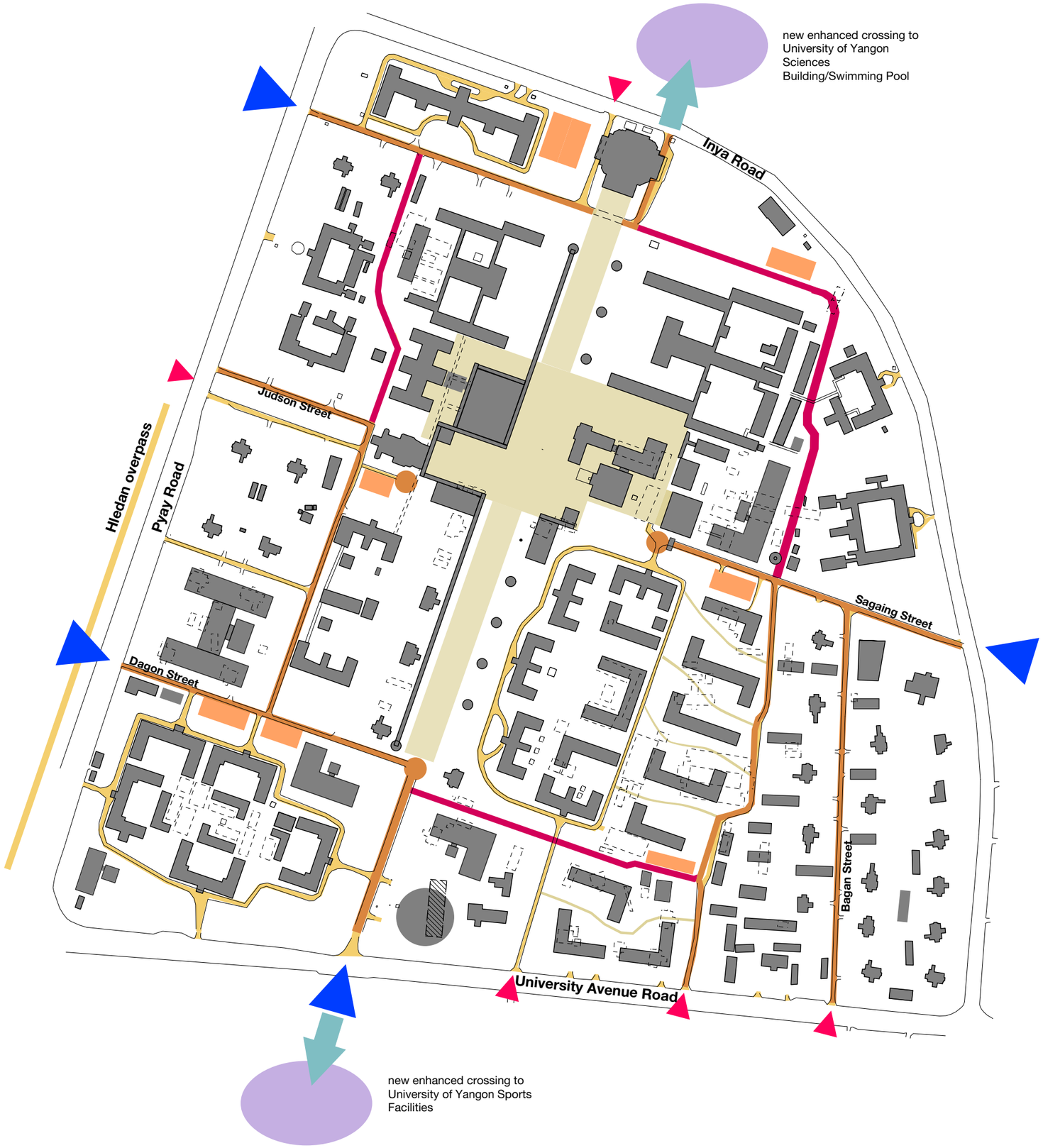
The Masterplan proposes that Chancellor Road is closed to vehicles between the Convocation Hall and the southern end of the existing cluster of male hostels. The area will then be re-landscaped to provide comfortable pedestrian/cyclist access integrated with circulation routes around the campus.

New and existing buildings will still require vehicle access by users, and for deliveries and servicing. For this, a new loop of roads open to cars is proposed, with new connections linking existing roads together. This has meant that every major building is still accessible, whilst Chancellor Road can be pedestrianised.

At present there is not a huge problem with excess traffic or shortage of parking but, as the University grows and modernizes, this is likely to become a major issue. It is important that the masterplan should establish a traffic and circulation system that is practical and efficient without severely compromising the life of the University generally.

It is assumed that with the anticipated growth in students and staff, there will also be an increase in cars on campus. Therefore, small areas of new car parking space are proposed across the site.

At the southern end of the pedestrianised section of Chancellor Road is a drop-off point for taxis and cars. Users may then proceed through the campus on foot or using a University bicycle sharing or hire scheme.



KEY

- Building as 2030 Masterplan
- Proposed new car park
- New pedestrianised route
- Existing road
- Existing road upgraded
- New road
- Shaded walkway
- New turning circle
- Main access gate (enter/exit) - security monitored (e.g. guard/barrier)
- Access gate (enter/exit) - secure access only (e.g. fob activated barrier)

0 500M

ROAD LAYOUT

6.2 Landscape

Green Corridors

The park-like character of the campus should be kept, despite the amount of development required to realise the Masterplan proposals. An important part of this is to establish a series of connected routes through the Kamayut Campus which include well maintained and mature planting.

These 'green corridors' are mostly pedestrian routes and so promote a feeling of openness and accessibility throughout the campus. Provision of mature, tall trees along these routes is important for providing shade and shelter.

To the east of Chancellor Road there are currently recreation grounds between the road and the male hostels. These will be integrated into planted park-land leading up to the University Centre. The sports facilities will be moved to the existing grounds to the south of University Avenue Road and reached by improved pedestrian connections.

The existing private houses on the west side of Chancellor Road will be refurbished and opened for wider use such as meeting spaces or galleries. Their gardens will also be opened up to become a continuous park in the centre of the campus. Removing the garden fences will improve access though the site, promoting better links between faculties and departments.

Courtyards

Low quality, single-storey buildings which have been constructed in the courtyard formed by Mandalay, Amara, Toun Goo, Ramanya and Vesali Halls will be removed. This gives the opportunity to create a large outdoor garden for learning and socialising, slightly separated from the rest of the University.

New courtyards will be formed between and around the new hostel buildings and, with good, appropriate design, will become spaces for informal study, relaxation and recreation.

Shaded Walkways

In order to promote pedestrian access throughout the site, in any weather, shade structures are proposed for either side of the pedestrianised Chancellor Road.

On the east side these will be simple, open-sided pavilions which can have seating or street lighting integrated into their structures.

On the west side of the road these will be shade canopies, arranged to provide continuous covered pedestrian access from the entrance up to Convocation Hall

Green Perimeter

In many areas of the campus already, the perimeter is densely planted. The Masterplan proposes that this continues around the campus to provide a buffer from the pollution and noise of the surrounding busy roads.

Fences

Most of the feedback received during the creation of this report was in favour of removing fences where possible.

The fences detract from the park-like character of the Kamayut Campus, as they restrict movement and create visual clutter. Their removal may encourage more efficient movement across the site.

New green routes provide connections through the site

Fences removed, area opened up to provide a green space at the heart of the university.

Chancellor Road pedestrianised.

Existing villas renovated and repurposed for shared use eg offices, galleries, meeting rooms.

Green perimeter to screen off traffic

KEY

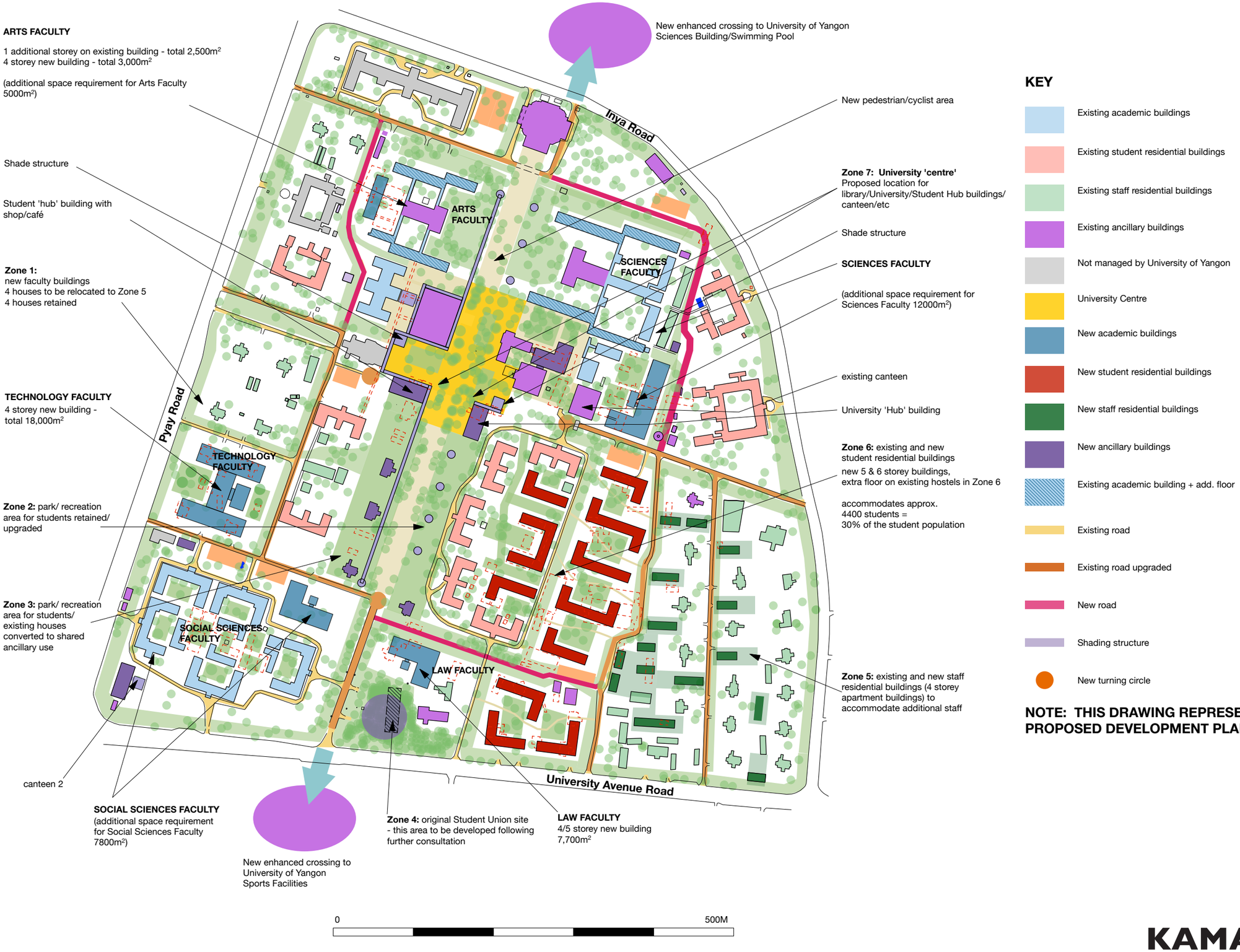
- Proposed car parking
- Pedestrianised area
- University centre

LANDSCAPING LAYOUT

0 500M

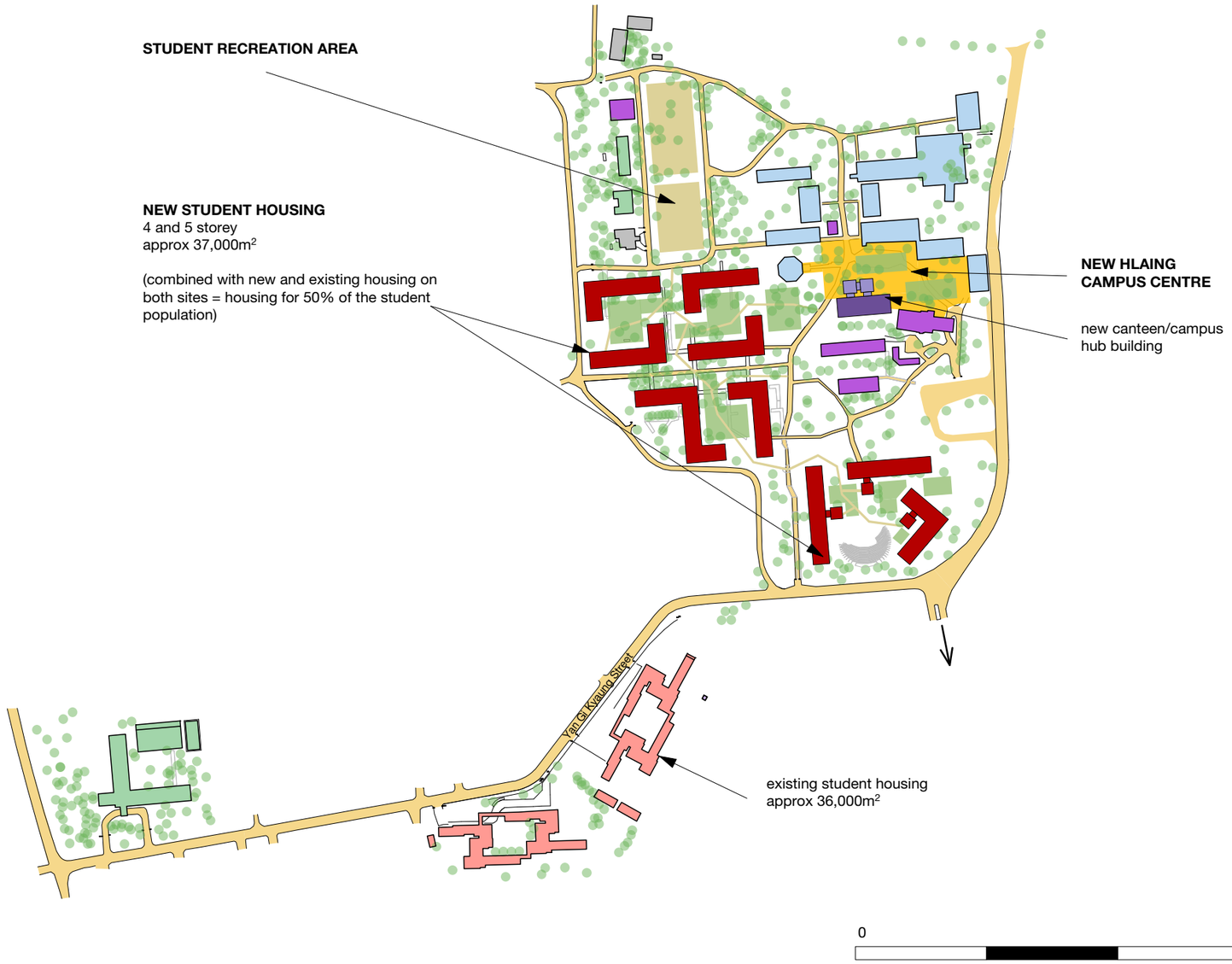
Shade canopies acting as places for informal gatherings

6.3 THE MASTERPLAN PROPOSALS



NOTE: THIS DRAWING REPRESENTS THE PROPOSED DEVELOPMENT PLAN UP TO 2030

KAMAYUT CAMPUS



KEY

- Existing academic buildings
- Existing student residential buildings
- Existing staff residential buildings
- Existing ancillary buildings
- Not managed by University of Yangon
- Hlaing Campus Centre
- New student residential buildings
- New ancillary buildings
- Existing road
- New road

HLAING CAMPUS

6.4 Heritage Strategy

Existing Historic Buildings

The masterplan sets out a strategy for the development of the University which is sympathetic with its historic character. This includes a respect for the heritage buildings which formed part of the original University in the 1920s.

The campus accommodates a range of academic, administrative and other buildings devoted to teaching and learning. In addition to this there is a certain amount of residential accommodation for both students and staff. The staff accommodation is partly provided in modern blocks of flats and partly in individual houses set in their own private gardens.

The masterplan shows that no historically significant academic buildings need to be removed to achieve the University's ambitions. The majority of proposed buildings occupy unbuilt land, however, in order for the University to grow and exist largely on one campus, some space needs to be released. This has resulted in seven of the 33 original surviving houses (ie 21%) being suggested for demolition (or relocation) in order to make room for new academic buildings. The majority of historic staff houses will be retained with some probable adjustment to the size of their surrounding gardens.

Five of the original houses along Chancellor Road are shown as being restored, re-purposed and opened to the public, with potential uses including galleries, meeting rooms or offices. This allows staff, students and the general public to access historic buildings currently closed-off.

Throughout the site the historic buildings have accrued low quality, single storey extensions or outbuildings over the 20th and 21st Centuries. A number of these are proposed to be removed so that the heritage buildings can be better seen and understood in their original setting.

Sketch showing a restored villa which has been re-purposed to accommodate a shared facility, ie a gallery

New Buildings Which Respect Their Setting

New development should enhance the University's park-like setting. The campus should not become over-developed, meaning a balance must be struck between the required new buildings and outdoor space. This can be achieved through the careful siting of proposed buildings to create well proportioned, usable spaces between themselves and their neighbours, and making new buildings relatively low rise so they do not intrude on the skyline across the site.

New buildings exist successfully in historic or park-like settings in many of the world's universities. Their success depends on several general principles:

- Scale in keeping with adjacent or nearby buildings or landscape features.

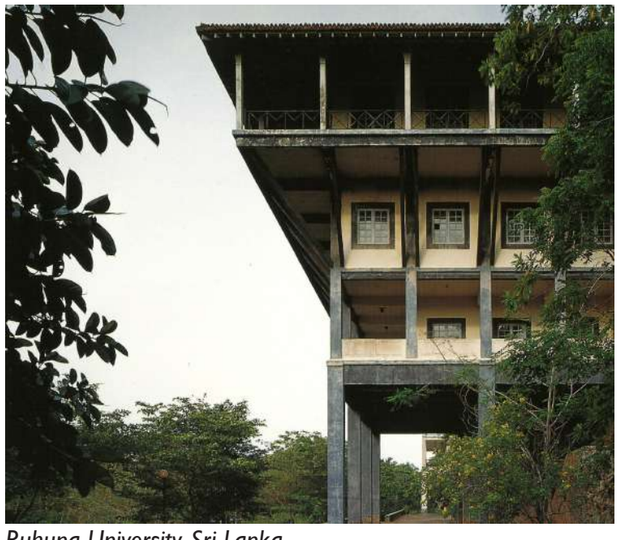
- Materials which complement the building's surroundings.

- Well defined, useful and thoughtfully planted space around the building

The images opposite show examples of well designed university buildings which are sympathetic to their surroundings and exhibit the above principles.

Student residences, Somerville College, Oxford, UK
Niall Mclaughlin Architects

Kroon Hall, Yale University, USA
Hopkins Architects



Ruhuna University, Sri Lanka
Geoffrey Bawa, Architect

Museum of Modern Literature, Germany, David Chipperfield Architects

6.5 Summary of Proposed Utilities

Water, Electrical and sewage infrastructure are most affected by the proposals .The following is a brief summary with more details on the following pages:

- Water - A significant number of tube wells, ground tanks, trestle tanks, pump houses, compressors and pipework will need to be re-located or diverted.

- Electrical - Several transformers and generator locations are affected and, while exact cable routes are not known, it is expected that a large proportion of the cable will need to be re-routed

- Sewage – A large portion of the below ground drainage will be affected by the works. And significant re-working of the drainage will need to be undertaken.

- Surface water – Drains are affected in a number of locations. It is important that the new building are considered in the drainage design otherwise flooding could be a problem in the future

It is important that the changes and diversions to the utilities are well designed, planned and considered when considering the phasing of the masterplan. This is a complex process requiring; time, consideration and proper design of the utilities network. This is outside the scope of this report, but key points are noted to aid the university in this process.

Future utilities

The documentation of existing site services is known to be incomplete as no Record drawings exist. This means that the drawings created do not show all site services and it must be assumed that other services exist.

Works to the utilities need to be carried out in a thoughtful and structured way to enable the masterplan.

The university will remain 'live' during the masterplan development and works will need to be phased in order to allow this.

The proposed phasing of the development (i.e. which buildings or part of the site will be built initially) will depend on budget and the universities priorities. Phasing therefore at this stage is unclear and so the report considers general guidance for diversion of service, running new services to buildings along with the overall strategies for the site services.

It is important that all new and existing services are well maintained and the FM team should maintain up to date information on services and implement a Planned Preventative Maintenance program (PPM) in order to achieve this.

Enabling works investigation

A series of further data gathering exercises, investigations and surveys are recommended to the site services to allow future coordinated, phasing and detailed proposals to be formed for the utilities. Specifically:

- Surface water drain survey including detailed level study, channel sizes and conditions

- A sewage system survey to identify invert levels, capacity, damage and conditions

- Ground radar/CAT scans

- A cable tracing study to identify and locate main power supply cables and routes to buildings from transformers and generators

- Water quality testing

These will compliment and add to the known information gathered in the topographic survey and utility information gathering exercise. It will help in the planning of works to services for the masterplan

Aerial sketch view of the north end of the campus

Strategic design

Following the investigations a comprehensive proposal for the phasing and amendments to the design of the site utilities should be carried out.

This will allow the strategic design of an enabling works package for the site services to take place prior to the initial building and renovations phase. For example this may include:

- New central services such as transformers, sewage treatment plants, drainage or water services

- Adjustments, re-routing and repairs to existing systems

- Diversionary works required

- Other central works that are required to facilitate the masterplan.

For all works it is recommended that:

- As masterplan work are carried out on site, main service routes are introduced, coordinated and arranged to address the issues noted with existing services noted above. This will allow easier future development and planning to take place on the university site.

- Any proposals for the development and improvements to the site services allow the university to remain operational throughout the works, with only some buildings being shut down at a time.

- Works to the utilities are phased across site with the masterplan proposal to reduce disruption to the university and services while keeping the university "live".

- As the next phase may not immediately follow the previous phase, proposals for each phase of works should be self-contained and not rely on future works being carried out.

Service Routes

Within the recommendations for electrical utilities and data it is proposed that links are created between transformers to improve resilience in the event of a power cut and to allow data and IT services to be shared across campus along with water. Due to this it is recommended that:

- A central service routes are created and looped around the site.

- The proposed new roads are utilised to form part of this route and allow services across site to be linked.

While services may not be linked for some time, it is important to incorporate these routes as the roads, are built, to allow the services to be installed in the future. This will make the introduction and amendment of services as the university grows easier and less disruptive.

Following review of the proposed new roads and buildings it is recommended that a central loop is created as indicated in the site plan to the right (Z-P-001)

Proposed site plan showing service loop for infrastructure

Future Foul Drainage - Short Term

A detailed survey of the existing system and analysis of sewage volumes must be undertaken to allow design of a new system that will cope with current and future demand.

Pending renewal of the system, partial repair and reinstatement of the sewage lines should be carried out along with a pre-emptive regime of emptying manholes and rodding lines to prevent overflowing of manholes.

New manholes could be built to reduce the intervals between manholes to 50' and so facilitate rodding of all pipes. However, this would result in a large number of additional manholes, some of which would be lost beneath new buildings as the masterplan is rolled out.

A better solution would be for the University to acquire and obtain training in the use of jetting equipment to allow all lines to be properly cleared. Jetting will be cheaper than a host of new manholes and be appropriate for the future when the infrastructure needs to cope with increased demand.

Subject to the above survey and analysis, septic tanks might be introduced to intercept current lines in the most problematic areas (those manholes that have overflowed the most – locations to be confirmed by University).

Future Foul Drainage - Medium Term (to 2025)

During this stage all of the infrastructure will be improved or renewed to support the increased student and staff population of the university.

Whilst details of the existing system are not understood it appears certain that it will not be able to cope with increased demand as student numbers increase from 3,002 to 15,310 with corresponding increases in staff numbers.

Detailed studies are required to determine the most appropriate system for the university taking into account lifetime cost (capital, running and maintenance); ease and frequency of maintenance; and reliability. There is also a need to develop ways of treating chemical waste.

Options for renewal of the sewage system, include, but are not limited to:

Local Septic Tank System
Provision of septic tanks for individual or clusters of buildings.

Local Package Treatment System
Provision of self-contained sewage treatment plants for individual or clusters of buildings.

Local Biocell Treatment Plant
Provision of containerised and modular treatment plants for individual or clusters of buildings.

Large Scale Biocell Treatment Plant
Biocell treatment plants are typically capable of treating the waste for populations up to 20,000. Such plants could be scaled up as the University's population increases.

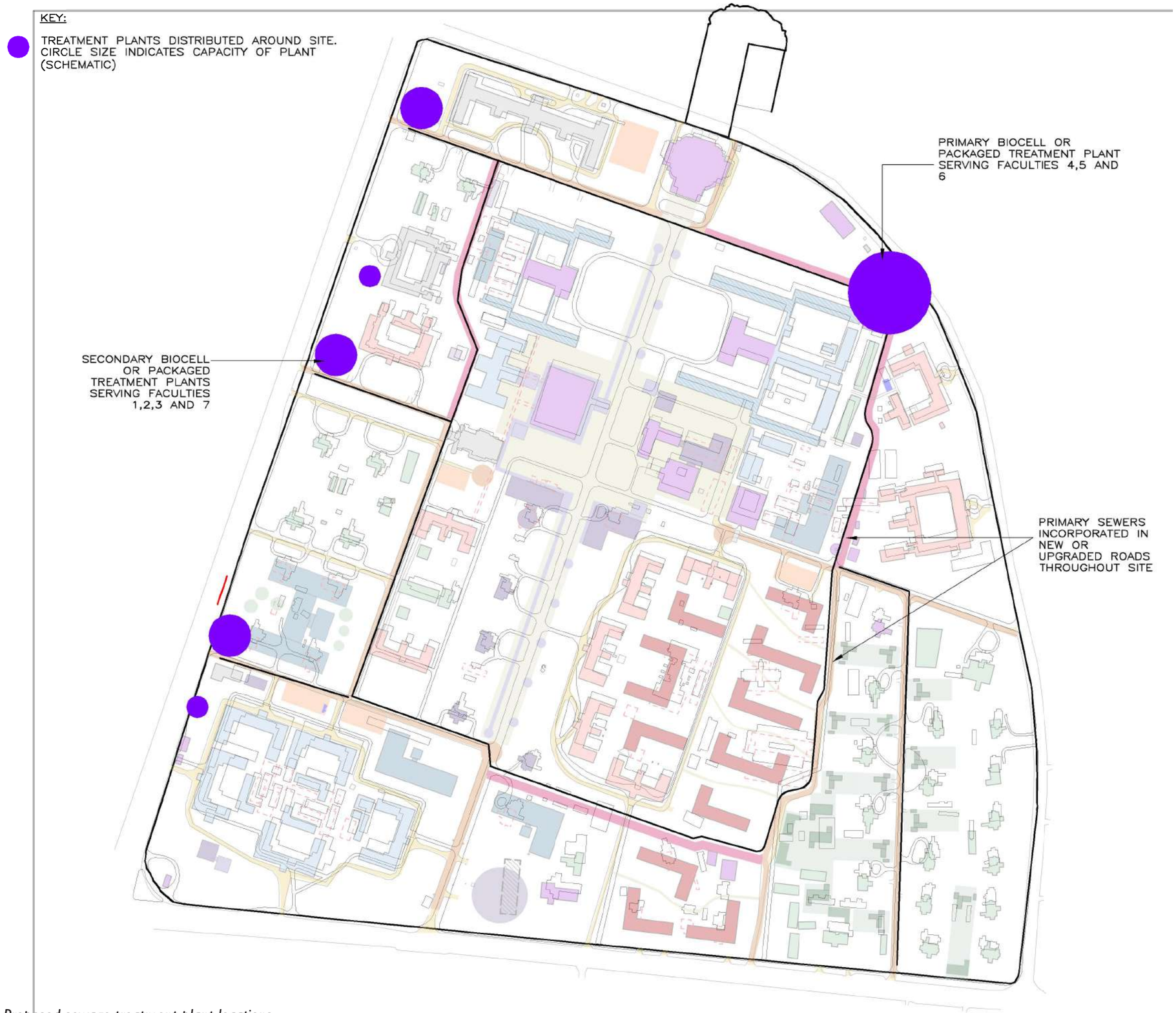
A Combination of the Local and Large Scale Treatment Plants
A combination of local storage and treatment and site wide treatment might be appropriate.

In addition, sceptic tanks could be dispersed around the site and then replaced with local treatment plants.

Traditional Sewage Treatment Plant
It is anticipated that the area required for a traditional plant would be too great and provide too great a constraint on the future development of the University.

In order to provide capacity and flexibility for future development this Masterplan recommends that primary sewers be integrated with new and upgraded roads.

A full statement on future foul drainage can be found in Appendix B of this report.



Proposed sewage treatment plant locations

Future Cold Water

Due to the masterplan proposals there will be a significant impact on the cold water services on site. Many boreholes affected and will need to be abandoned with new wells being drilled for supply.

Many ground and trestle tanks are also affected due to the proposed building works. The pipework of the water supply network is also heavily affected with buildings being proposed on top of current distribution routes.

The increased population on site over the development will require an increase in the water supply volume. Around 440,000 Gallons/day. This indicates that new boreholes are required. However there are several ways the impact of the increased population can be reduced:

1. Improvements to the network, reducing leaks, repairing or re-instating currently poorly performing boreholes is recommended to improve supply and reduce wasted water.

2. Introduction of water efficient appliances for WC flushing, taps and showers (i.e dual flush WCs, low flow taps and shower heads)

These measures could mean that the existing water supply network is adequate for the increased population as avalible water would increase to 377,400 Gallons/Day and total demand drop to 373,789 Gallons/Day.

However this does not take account of the buildings required, which as noted above has a large impact on the exiting network and storage. New boreholes will be required.

It is understood that YCDC plan to introduce regulations for tube wells and water abstratction in 2020.

YCDC have been contacted, but not responded at this time. Therfore the exact nature of these regulations are not clear, though from previous discussions with officialis in the YCDC- Water and Sanitation department it is expected that there will be restrictions placed on new tube wells, a registration/ applicatoin process and restrictions on volume of water abstraction from wells to limit the ground water across the city. It is not clear what the process will be for existing wells.

The measures by YCDC will make water use and efficiency more important in the future.

We recommended that:

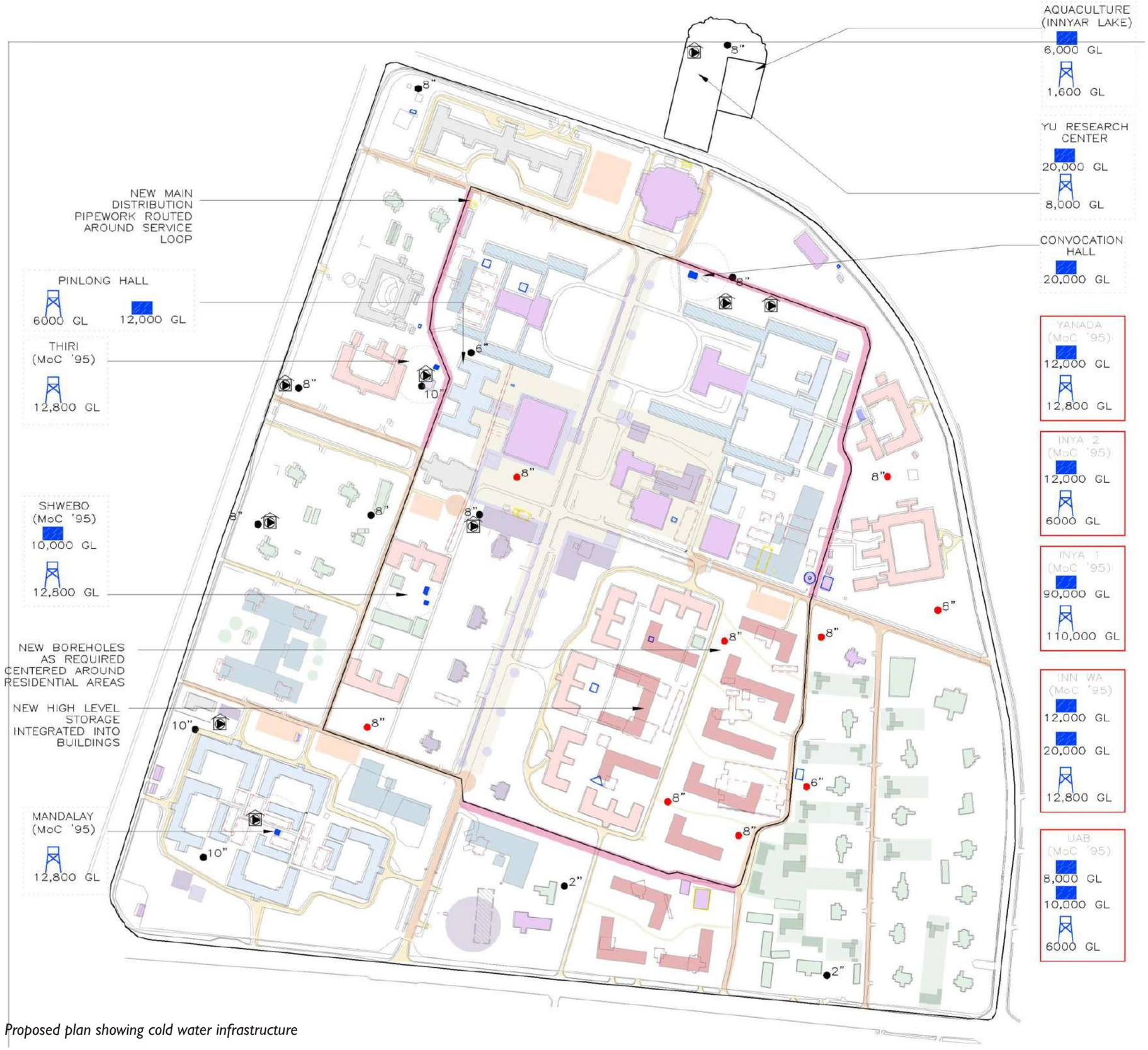
- A new site system is designed so it can be installed in a phased manner as the site develops. This will require new boreholes to replace those that will be built over along with a number of new boreholes ground tanks and high level storage to be incorporated in the works. The distribution network will also require being fully re-designed. Boreholes or ground tanks that are unaffected by the works can be linked into the new system.

- The water pipework is arranged to follow the proposed service routes shown on drawing ZP-001

- All new buildings are built to contain high water level storage (in insulated tanks) with generously sized gravity fed pipework to minimise pressure losses in the distribution within the buildings. This needs to be taken into account in the structural design of buildings. This is especially important in areas such as residential accommodation and hostels where water use will be highest on campus. Local high buildings can also be used as water centres and feed lower level neighbouring buildings

- As recommended in the Sustainability targets table, water meters should be installed on all tubewells and main supplies to buildings to allow the Facilities team to monitor record and report on water use. Water management will be more important in the future as the university grows and the population of Yangon increases putting pressure on the water network and supplies.

- The university discuss plans with YCDC and investigate the water abstraction regulations being brought in by the YCDC Water and Sanitation Department in 2020



Proposed plan showing cold water infrastructure

Future Electrical

Due to the masterplan proposals there will be a significant impact on the electrical services on site. Two main transformer and generator locations are affected by the proposed works. This is shown on drawing V-P-001. The affected generators and transformers can be relocated and re-used.

We recommended that:

- Cable tracing is carried out to identify and record existing cable routes and supplies.

- A new electrical network for the site is designed so it can be installed in a phased manner as the site develops.

- New and existing transformers are linked and installed in a ring network, with transformers fed from different YESC substations to improve esilience if there is a supply issue such as one of the city substations overloading or network cables failing.

As the new electrical system is installed in phase's transformers, generators and cables can be installed in an organised manner to support new building work and allow the removal of old services so the new buildings can be built.

Temporary supplies will be required as even unaffected transformers or generators will still need to have cable diverted during the works to keep university buildings 'live'.

Transformer loads will depend on a number of factors such as the area, type and how many buildings they serve. The design of the buildings will also heavily influence power demand on site as cooling using split air conditioning or central air source heat pumps are large energy users. Cooling set points should be raised from the normal seen 18°C to 24-28 °C to reduce cooling demand.

Good environmental design of buildings (See the Environmental design report and Sustainability targets table) will minimise cooling loads on the electrical system. This is important as calculations carried out as part of the masterplan show that the required capacity and number of transformers is significantly increased with cooling in all buildings.

Rough estimates of new transformers required are indicated on the drawings See drawing V-P-002, opposite. It should be noted that these are estimates only and calculations rely on a number of factors.

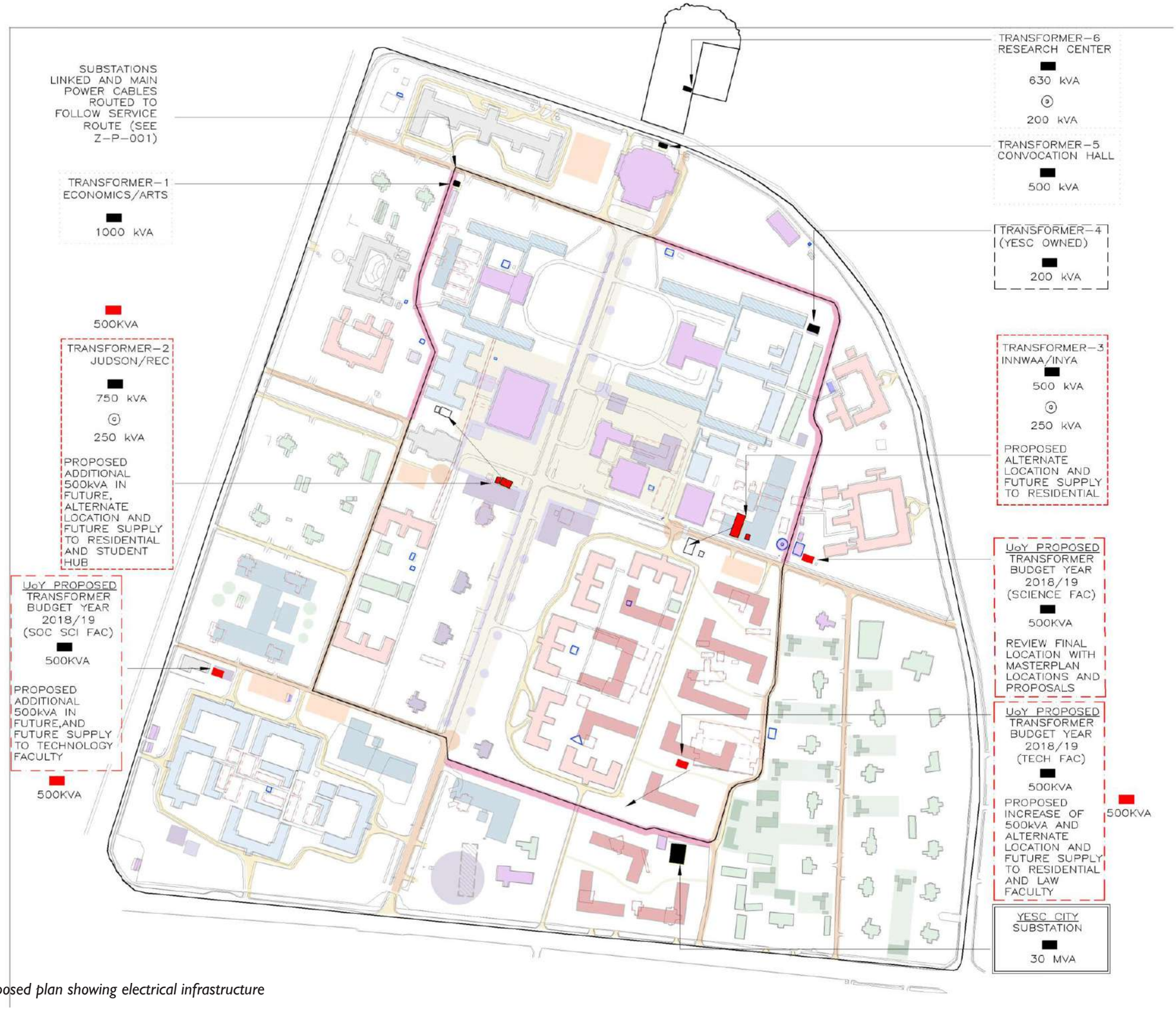
Further calculations should be carried out to inform the detailed design of the utility infrastructure. This must involve the building designers as well as the electrical network infrastructure designers
Energy efficiency and management will be important as the university grows. Yangon is also growing and there are large increases in the population of expected in the near future. YESC has improved the network and supplies into the city over recent years, but power cuts are still frequent. The increase in population will further stress the electrical network.

We recommended that:

- Electrical meters and Submeters are fitted on all main supplies to buildings along to allow the acilities team to monitor, record and report on energy use.

- The electrical services in buildings are designed so the essential (with generator backup) and non-essential (no backup) circuits are separated. This will allow better manual load shedding and also the incorporation of Automatic Transfer switches (ATSs) if the university wished to move away from manual switching of backup supplies. It should be noted that ATSs are required to be properly maintained to function properly.

Year	Building Design	Main Site (kVA)
2018	Current installed capacity	2950 kVA
2018	Current estimated electrical load. Approximately 98% utilisation	2529 kVA
2030	Poor environmental design 60 % cooling to academic areas (20% to other areas)	9338 kVA
2030	Good environmental design 25% cooling to academic areas only	4812 kVA



Proposed plan showing electrical infrastructure

Future Data Network and IT Services

Due to the masterplan proposals there will be some impact on the data network serving the site. Many of the fibre routes will be affected and require re-routing.

The proposed network topology is shown in the image to the right. This indicates linking of the different networks on site to allow communications between systems.

Linking the systems in a ring provides some resilience should accidental damage occur to one of the links . We recommended that as the university grow:

- The existing and new areas are linked up over a site network to facilitate the use of site wide electronic systems

- Use of single mode fibres is recommended to allow data transfer over the long distances between different buildings on site.

- This Masterplan recommends that rodent proof/ resistant fibres are used to minimise the possibility of damage from vermin.

- Ducts for future installation of fibres can be laid during construction works of new areas and, with suitable draw pits should allow data connections to be fed into each of the new buildings.

New IT systems commonly found in modern universities are outlined in the main utilities report for the University of Yangon to consider.

It is important to note that the university will need to ensure that they have inhouse specialists to plan and manage the IT system as it grows. This department effectively provides a service to the university

Proposed plan showing network data and IT infrastructure

7. DESIGN GUIDELINES

7.1 Introduction

The following pages set out guidelines for the appropriate, sustainable design of new buildings, and principles for the refurbishment of existing ones.

All design work should follow the same basic recommendations for environmental design which is appropriate to Yangon's climate. These are set out below.

Section through proposed student hostel

7.2 Environmental Recommendations

Form and Orientation

Buildings should run East to West, with the majority of the façade and windows being North and South Facing.

Normally occupied spaces should be on an external façade to provide them with natural light and ventilation.

Wet or sanitary spaces should be grouped together, oth on floors and vertically throughout the building.

Cooled spaces should be grouped together away from external facades. These spaces should always be accessed through a buffer space with two sets of doors.

The floor to ceiling height should generally be 3m (10ft) to allow for good light and ventilation.

For single sided glazing and ventilation, plan depth = 2x floor to ceiling height maximum

For double sided glazing and ventilation, plan depth = 4x floor to ceiling height maximum

A façade length to room depth ratio (L / D) of 1 to 1.5

Materials

400mm of thermal mass should be used with night time cooling.

100mm of Insulation should be used to insulate thermal mass from external conditions.

Where metal roofs are installed, adding at least 100mm insulation will improve the internal temperatures.

Daylight and Ventilation

A 2.0m (6ft) horizontal shade or covered walkway for each north and south window would be appropriate for this site.

A 4.5m (15ft) shade can cover 2 floors

Avoid windows on the east and west facades.

Glazing should be between 40% and 60% of the external wall area, not below 800mm height and evenly distributed.

External blinds or louvres on east and west windows.

Natural ventilation should be designed to provide required fresh air and night time cooling.

Minimum of 25% of the North and South façade area should be openable free area for ventilation.

Of this area 30% should be secure ventilation openings, and 70% window openings.

Using the Spaces

While the spaces are unoccupied background ventilation should be provided by the secure ventilation paths with windows left closed.

During classes and other occupied times the spaces should be ventilated through a combination of the secure ventilation paths and the opening windows to allow increased airflow.

User controlled ceiling fans and opening windows will make people feel more comfortable.

In the middle of the day, when the air temperature is highest, more fresh air can actually reduce comfort. During this time only the minimum fresh air should be provided.

Important Things to Remember

Wall mounted Air Conditioning units DO NOT provide ventilation.

Double sided ventilation is more effective at supplying fresh air. However, it must be controlled to be beneficial.

Low level vents on one side and high level vents on the other will drive ventilation more effectively.

Adjacent buildings and trees should be taken into consideration as they may provide beneficial shading or effect airflow to the building.

Aerial view of new academic buildings, University Centre (top) and Dagon and Shwe Bo Hostels (centre)

7.3 Academic Buildings

New academic buildings will require considered design in order to make a positive contribution to the life of the University. Allowing sufficient periods for carrying out design work will be central in the programming of any building works project. Below are key design guide criteria for the design of academic buildings, which are illustrated in a typical cross section, right.

The new academic buildings will provide appropriate facilities suitable for a forward-thinking, modern university.

Scale and dispersal around the site

- Similar to existing.

- Maintain low-rise character of the campus.

Layout

- Central vertical and horizontal circulation, which is unlike the existing buildings' veranda access. The proposed layout gives shelter to the circulation areas by bringing them inside the building. It also brings the maximum amount of daylight into the teaching spaces by allowing windows on the outside walls which are not overly shaded by adjacent balconies.

- Good thermal mass makes the most of diurnal temperature changes allowing buildings to passively cool overnight

- Appropriate room sizes for a variety of spaces and uses including classrooms, seminar rooms, offices and libraries.

- Break-out spaces open to the outside but sheltered and shaded - these allow for informal meetings, waiting areas or social spaces.

- Structural layout to allow maximum flexibility.

Services

- Openable windows to encourage natural ventilation, where possible.

- Space in roof voids etc. to accommodate full air-conditioning for selected areas.

- Natural ventilation stimulated by air rising through central circulation areas and escaping through vents at high level (known as 'the stack effect')

Energy use

- Reduction in the need for air conditioning due to careful shading of rooms from overhanging eaves and deep window reveals.

Accessibility

New buildings should be accessible to all users in order that the widest range of students and staff can be accommodated and that the University stays in line with its international competitors. Lifts should be standard in all new buildings with usable floor space above one storey. Where ground floors are raised in order to protect from damp or flooding, provisions should be made for those who cannot use steps to access a building, such as ramps.

Concept sketch for the lobby and stair hall of an academic building

prevailing wind on campus site (from south)

insulated roof

large overhangs to provide shade and shelter from rain

SOUTH SIDE
planting & landscaping provides shade and cooler microclimate

roof vent - orientation encourages stack effect cooling/ventilation and can support photovoltaic panels

plant space in roof/risers to feed classrooms below

stack effect passive ventilation

NORTH SIDE
planting & landscaping provides cooler microclimate

attenuated ventilation bulkheads for cross ventilation

generous landing spaces encourage informal discussion/working

new buildings designed to maximise benefits of thermal mass, and be seismically robust

projecting bay windows

additional vertical/horizontal shading where building orientation is running north south

new buildings allow flexibility for installing a/c if required.

open stairwell and staircases to assist airflow

open area for break-out/ socialising

high ceilings help with passive ventilation/comfort

light shelf bounces light into classroom

some shading required for north side lower windows

deep window surround provides shading to east/west sun

natural ventilation through large openings at high and lower level

canopy for extra shading/rain protection and light scoop

services can be 'designed in' to allow ease of maintenance and flexibility

upper floors overhang to provide shaded walkway

raised ground floor walkways with ramps/steps at entrances

0m 5m 10m

SECTION THROUGH NEW ACADEMIC BUILDING

7.4 Student Residential Buildings

Below are key points for the design of new student hostels, which are illustrated in a typical cross section, right. At typically five storeys, these are of a larger scale to the existing three storey hostels and will again require thoughtful design in order to maintain the park-like character of the campus. In addition, careful landscaping and planting in the courtyards between buildings will make them enjoyable places in which to study, socialise and relax.

The new student residential buildings will provide appropriate facilities suitable for a forward-thinking, modern university.

Scale and Dispersal Around the Sites

- Similar to existing academic buildings
- Maintain low-rise character of the campus

Layout

- Central vertical and horizontal circulation (see above commentary for academic buildings)
- Private study bedrooms, social spaces and ancillary facilities such as kitchens and laundry
- Break-out spaces open to the outside but sheltered/ shaded - allow for informal meetings, or social spaces
- Courtyards between buildings create sheltered places for student recreation and relaxation

Services

- Natural ventilation with mechanical assistance where appropriate
- Room to accommodate full air-conditioning for selected areas
- Natural ventilation stimulated by air rising through central circulation areas and escaping through vents at high level

Energy Use

- Reduction in need for air conditioning due to careful shading of rooms from overhanging eaves, projecting balconies and deep window reveals
- High ceilings promote natural ventilation and create a generously proportioned space
- Potential to install photovoltaic solar panels on the roof to supplement electricity supply

Study Bedrooms

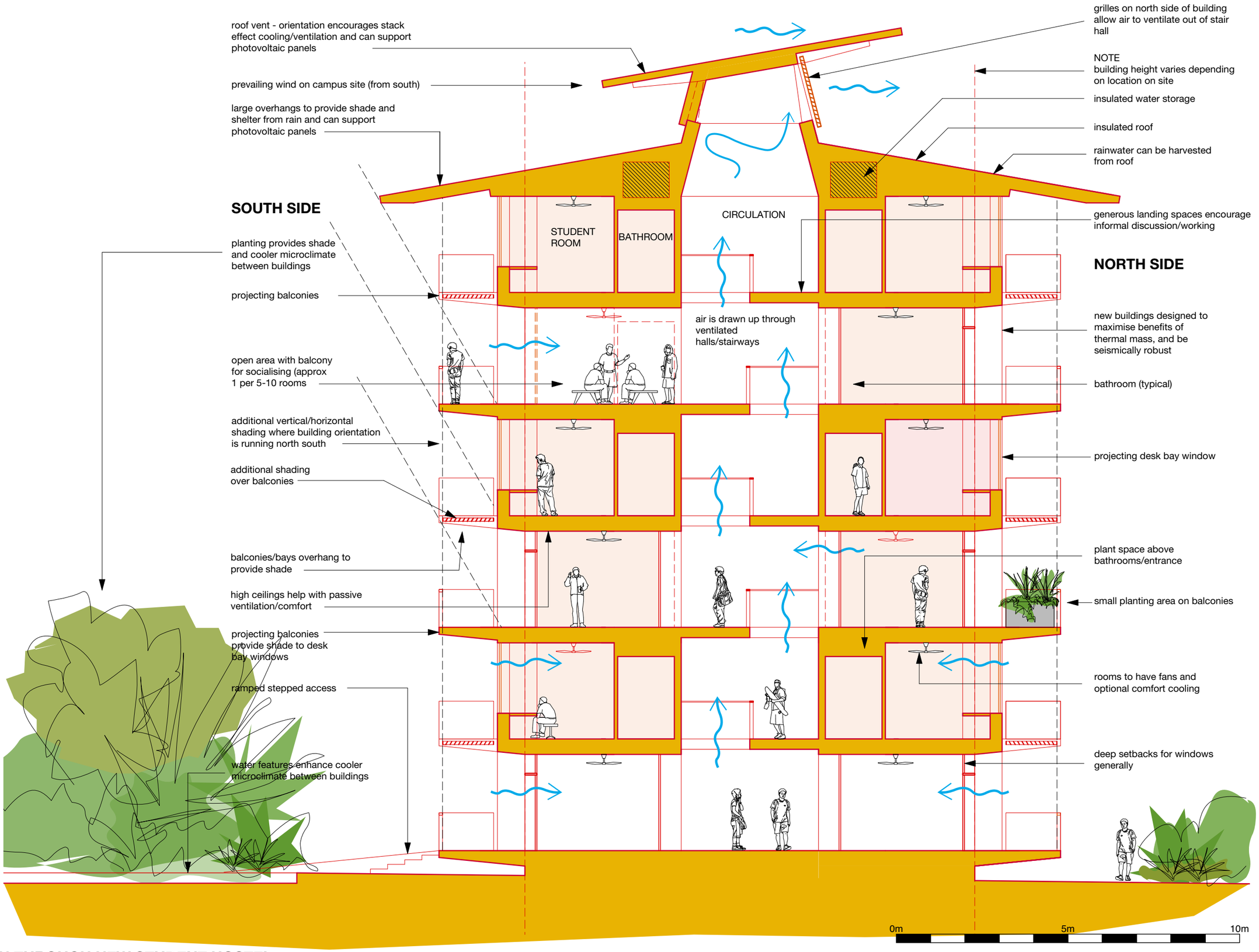
- For single occupants
- Include a balcony and bathroom facilities
- Can vary in size to suit different types of students
- Conforms to internationally accepted space standards (minimum internal floor area 13m^2)

Security

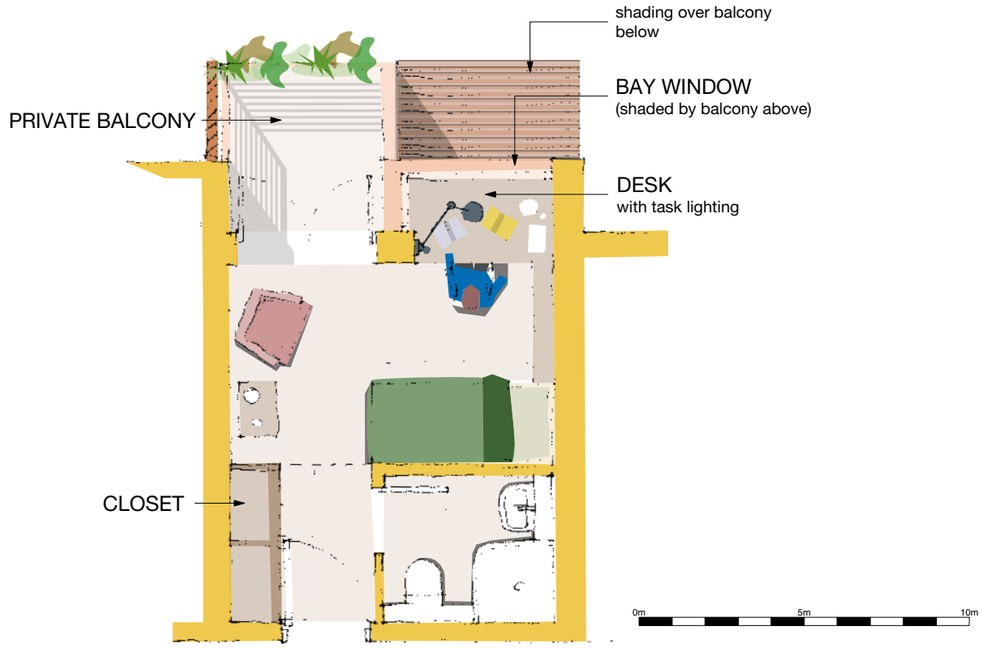
- New residential accommodation should be designed with the security and safely of their occupants paramount.

Disaster Risk Reduction

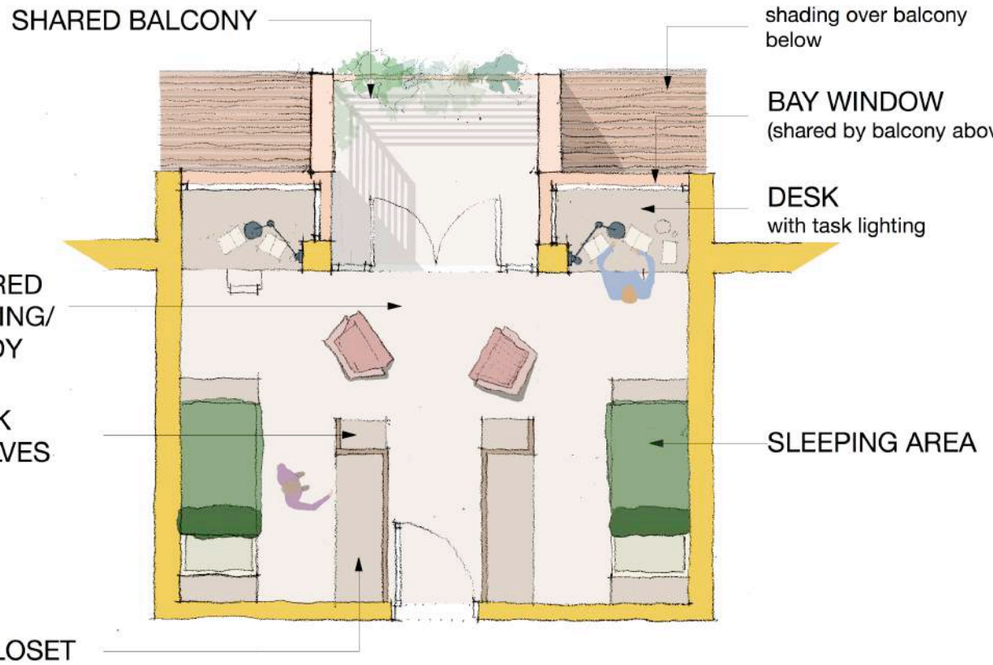
- Current seismic regulations and guidelines must be adhered to during the design and construction of any new building.
- Means of escape from a building must be considered early in the design process.



SECTION THROUGH NEW STUDENT HOSTEL

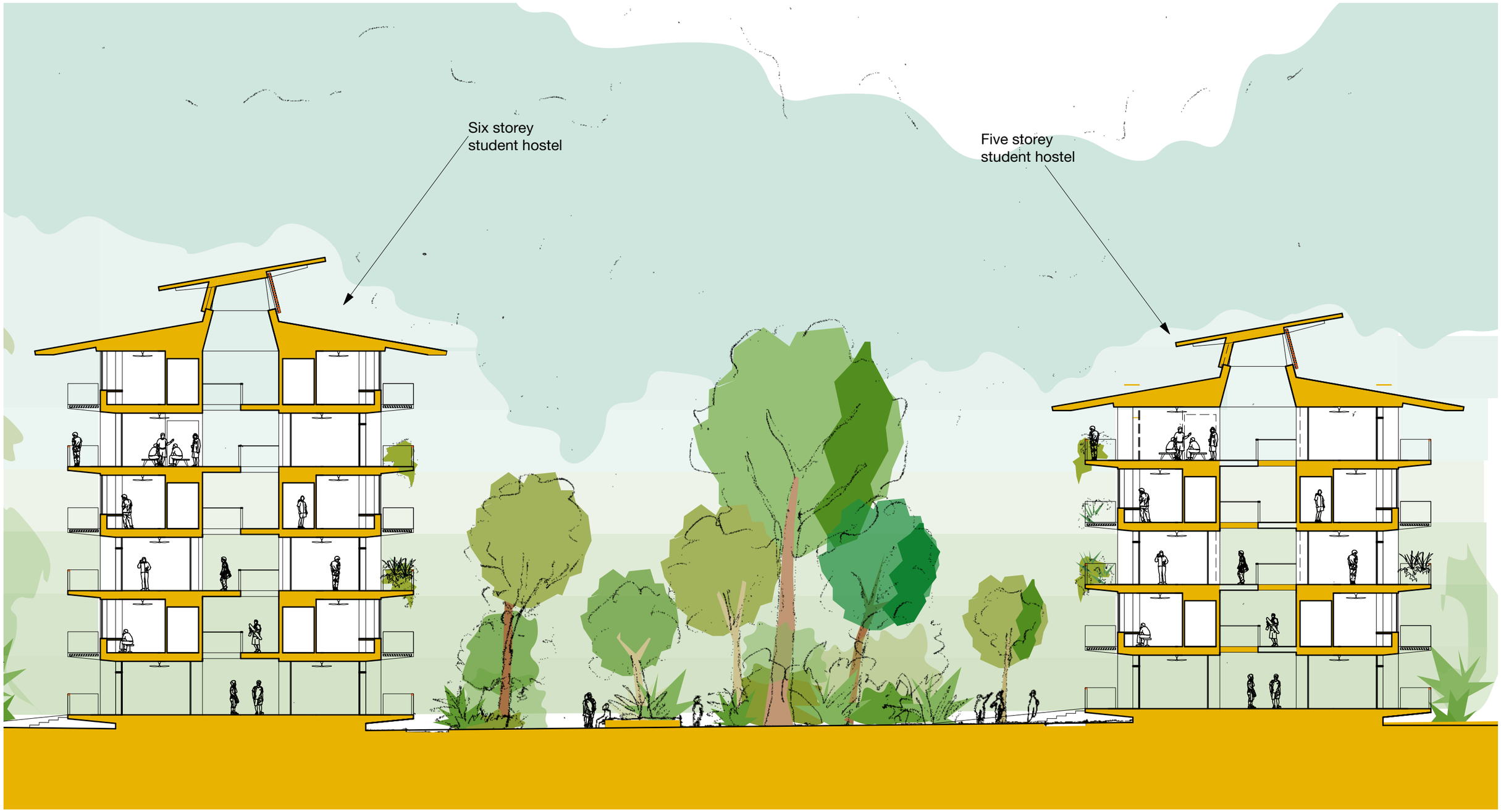


Plan of a typical study-bedroom - 14m²
This exceeds the minimum recommendation of 13m²
(Metric Handbook: Planning and Design Data, 5th Ed)



Plan of a possible shared study-bedroom

Sketch view of balconies on a new student hostel building



Section through a courtyard between two new student hostels

7.5 Refurbishment of Existing Buildings

The majority of existing buildings appear to be structurally sound but require significant refurbishment to modernise services, replace finishes and carry out local repairs.

New additions which are sympathetic to the original building could also be added. These include:

- Lifts to provide better accessibility and movement of equipment between floors.

- An additional storey could also be added to academic buildings (see Structural commentary below) to provide additional teaching, administration or laboratory space.

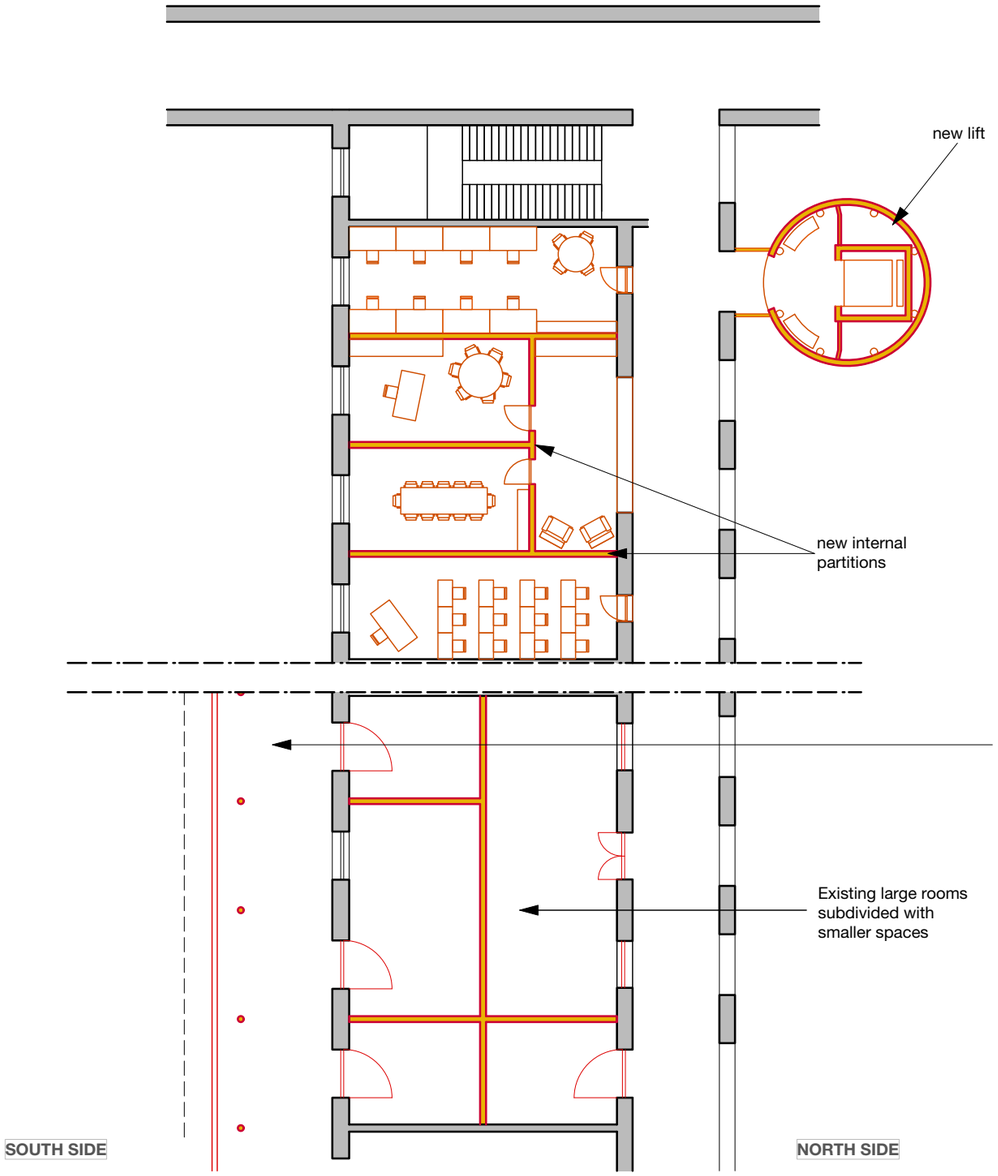
Internally, the academic buildings are generously proportioned, with high ceilings, which could allow the installation of new or additional air handling equipment. Some large rooms could also be partitioned up to provide smaller teaching or office spaces whilst still allowing air to flow naturally through the buildings.

Existing residential buildings will be re-configured to provide rooms for individual students which include a bed and desk. The current internal perforated partitions are to be blocked up to grant greater privacy to the bedrooms. The cross-ventilation the perforations allow can be replaced by mechanical ventilation placed in the ceilings of adjacent corridors.

Accessibility

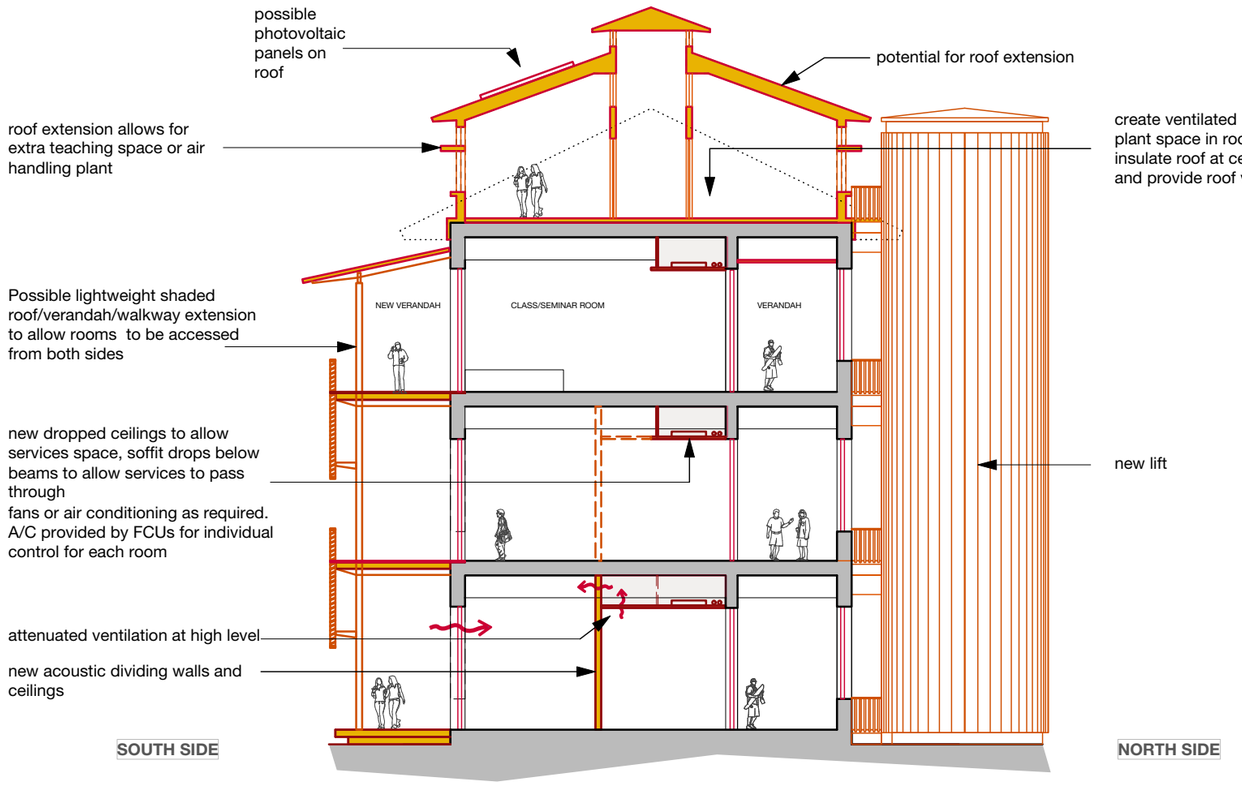
The refurbishment of historic buildings will give the University a chance to greatly improve their accessibility.

Most importantly, lifts could be installed inside a new structure, connected to the existing, in order that users who cannot use stairs may work or study alongside their more able-bodied colleagues.



PLAN

Plan of typical academic building with new sub-divisions



SECTION

Section through typical refurbished and extended academic building with additional new storey and lift core

7.6 Refurbishment of the Historic Male Hostels

The cluster of male hostels which include Bago Hall are an historically important part of the University, at the centre of the Kamayut Campus. However, their refurbishment and modernisation is highly necessary in order to make the University a world-class academic institution.

Works should be sensitive to the historic fabric of the structures, but address key points for improvement, including:

- Reduce or eliminate the sharing of student rooms in order to give each student a quiet place to study in private
- Improve privacy between rooms
- Provide a variety of places to study and socialise

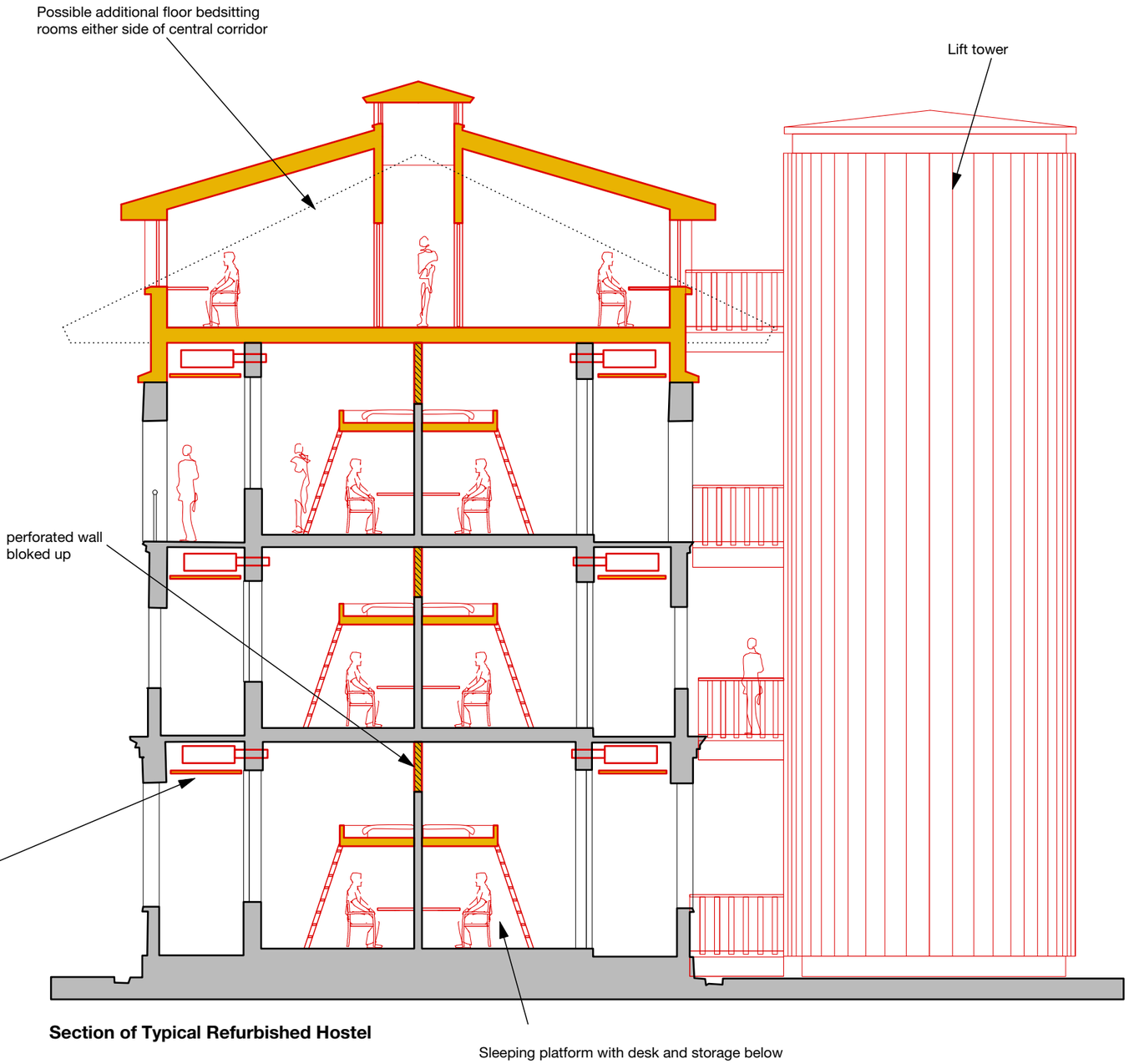
The drawing opposite suggests a typical plan and section showing how the buildings could be adapted in a way which is sympathetic with the existing fabric:

- Providing a study-bedroom for a single occupant.
- Blocking the perforated walls to decrease transmission of sound between rooms
- Mechanical ventilation via local air handling units at high level
- Making the most of the small rooms and high ceilings through providing a high-level bed and a desk below
- Refurbishment allows for the addition of an extra storey of accommodation and a new lift to provide level access to all floors

KEY

existing fabric

proposed fabric



Section of Typical Refurbished Hostel

Proposed section of a renovated and extended hostel building

7.7 Structural Commentary

General Structural Design Principles

Structures will be designed to be:

- In harmony with the architectural design (eg. bespoke design taking into account architectural intent, building type, location etc).

- In harmony with environmental designs (eg. thermal mass may contribute to good environmental performance; vertical & horizontal services distribution incorporated in structural design).

- Easy to build, robustly detailed and easy to maintain (eg. careful materials selection and detailing).

- Adaptable for future fit (eg. framed structures allow for re-configuration of spaces and change of use; facilitates vertical & horizontal distribution for replacement services).

Target Seismic Performance

All University buildings, whether existing or new, must meet Life Safety performance level.

This means that significant damage to both structural and non-structural components is acceptable but, after the maximum considered earthquake (MCE), a factor of safety against partial or total collapse must remain. Injuries may occur but the risk of life threatening injury or entrapment is low. Structural repairs will be required after the MCE before the building may be re-occupied.

Seismic Design and Performance

Seismic Design: in accordance with Myanmar National Building Code 2016

T3.1.2 & 3.4.6 Seismic Importance Factor, I: according to building use and occupancy.

T3.4.1 Spectral response accelerations: SS = 0.77ms-2. and S1 = 0.31ms-2.

T3.4.2 Site Class according to soil profile obtained from site specific investigations.

T3.4.7 & 3.4.8 Seismic Design Category: typically D for normal soil profiles in Yangon.

Sketch of a typical academic building

The Student Hub

Maintenance of Building Structures

A pro-active maintenance regime should be implemented to improve the utility and extend the lifespan of the University's assets. Such a regime would include:

- INVESTIGATE: causes of defects (eg. leaking roofs and gutters); the condition of the structure and fabric; and monitor cracks in loadbearing masonry walls for ongoing movement and to understand the nature of the movement.

- PLAN: appropriate repair techniques; a phased programme of repair works.

- REPAIR: carry out repairs.

- MAINTAIN: preventative maintenance to prevent deterioration of fabric and structure.

All RC structures should be investigated to determine the depth of carbonation and the condition of the reinforcement and make an assessment of the useful economic lifespan of the structures. At present it is understood that patch repairs are carried out using proprietary repair mortars. This is a traditional and valid repair technique. An alternative repair technique that should be considered is an impressed current cathodic protection system. These systems can offer better value and be less disruptive than traditional repairs, and have the benefit of repassivating all of the reinforcement in a building and thus extending the lifespan of all of the structure rather than just the areas subject to patch repair.

Damaged timber elements should be repaired or replaced.

Stitching and bonding techniques may be employed to repair cracked brickwork.

Damaged roofs and gutters should be repaired to prevent structural and fabric damage.

It is accepted that all of the University's buildings cannot be investigated and repaired simultaneously for financial reasons and because of the disruption caused by such extensive works. Thus a phased programme of works should be agreed in response to the University's educational needs.

Subdivision of Large Spaces

Erection of lightweight partitions to sub-divide some of the large spaces within the existing heavyweight academic buildings appears to be feasible .

Investigations and analysis would be required to confirm the strength of the floor slabs, the span of the same and their condition and thus ability to support additional weight.

Removal of Partitions in Residential Buildings

Partitions in the purpose built residential buildings appear to be loadbearing in general.

It is feasible partially or wholly to remove the partitions but such removal would require structural work.

There is greater structural latitude to remove the partitions on the upper floors than on the lower floors: for example formation of openings for a new doorway on the upper floors would require new lintels - a relatively minor structural intervention - whereas major openings on the lower floors might involve significant new framing to resist gravity and horizontal loading. Self-evidently, major works would be subject to cost-benefit analysis.

Seismic effects need to be considered when positioning new openings. A simple rule is that new openings remote from corners have the least structural impact.

Aerial view of existing and proposed hostels

Additional Floors on Existing Buildings

The majority of the buildings on the main campus were built before seismic design standards and codes were adopted. Note that the seismic force resisting systems found in these buildings would not be permitted under the current Myanmar building code.

However the buildings with a cellular arrangement of thick loadbearing walls incorporating some reinforced concrete framing are robust. Preliminary analyses indicate that provision of a single storey of new accommodation with lightweight construction in lieu of the original pitched roofs with heavy cladding (even where the original slate or clay tile cladding has been replaced with profiled metal sheeting) would reduce the seismic demand on the structure and therefore be an acceptable strategy for justification of an additional storey.

This strategy would need to be agreed with the relevant checking authorities.

The structures of the new extensions would generally replicate existing structural arrangements to maintain existing loadpaths and see that loads are applied uniformly to the existing structure to avoid differential foundation settlement.

Investigations and analysis of the foundations and superstructure would be required to confirm the local and global capacity of the existing structures and thus the ability to resist additional gravity and lateral loads (including seismic) from the extensions.

Preliminary analysis indicates that the following buildings are most suitable for additional floors: Arts Building, Science Building, Toung Goo Hall, Ramanya Hall (front block only) and Amara Hall (front block only).

Sketch view of a typical historic academic building

Sketch view of proposed alterations to an historic academic building

7.8 The University Centre

The proposed University Centre provides a heart for the University's community of staff and students.

It is located in the centre of the campus, to the immediate east of Judson Chapel and to the south of the historic Arts and Sciences Faculties. The Centre consists of several buildings, both new and existing, including:

- The existing Recreation Centre, refurbished
- The existing library, refurbished and extended
- The Central Universities Library
- A new Student Hub
- New shared facilities for staff
- New canteen facilities

These buildings are arranged in a loose square at the junction of Chancellor Road and Sagaing Street, leaving the view from the latter to Judson Chapel unobstructed.

The new buildings are set back from the line of the road in order to preserve the important view of the Convocation Hall when approaching it from Chancellor Road.

Although connected to the historic academic buildings and Convocation Hall by Chancellor Road, the University Centre retains a respectful distance and does not encroach onto their immediate surroundings.

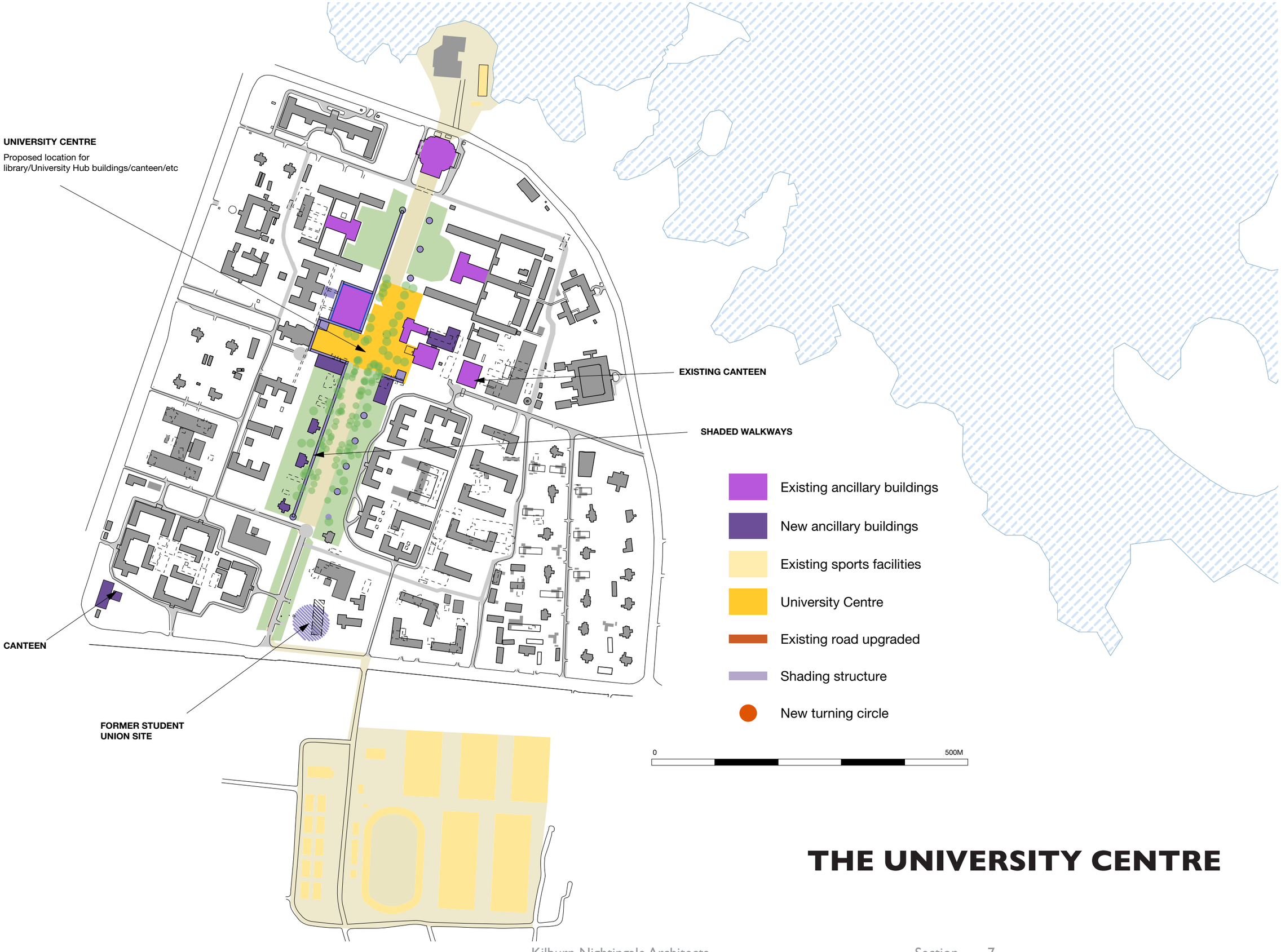
The new hub buildings will incorporate:

- Student facilities shared across academic years and faculties, such as a large lecture hall, meeting rooms for students and welfare. A diagram showing typical space requirements is included on the next page.

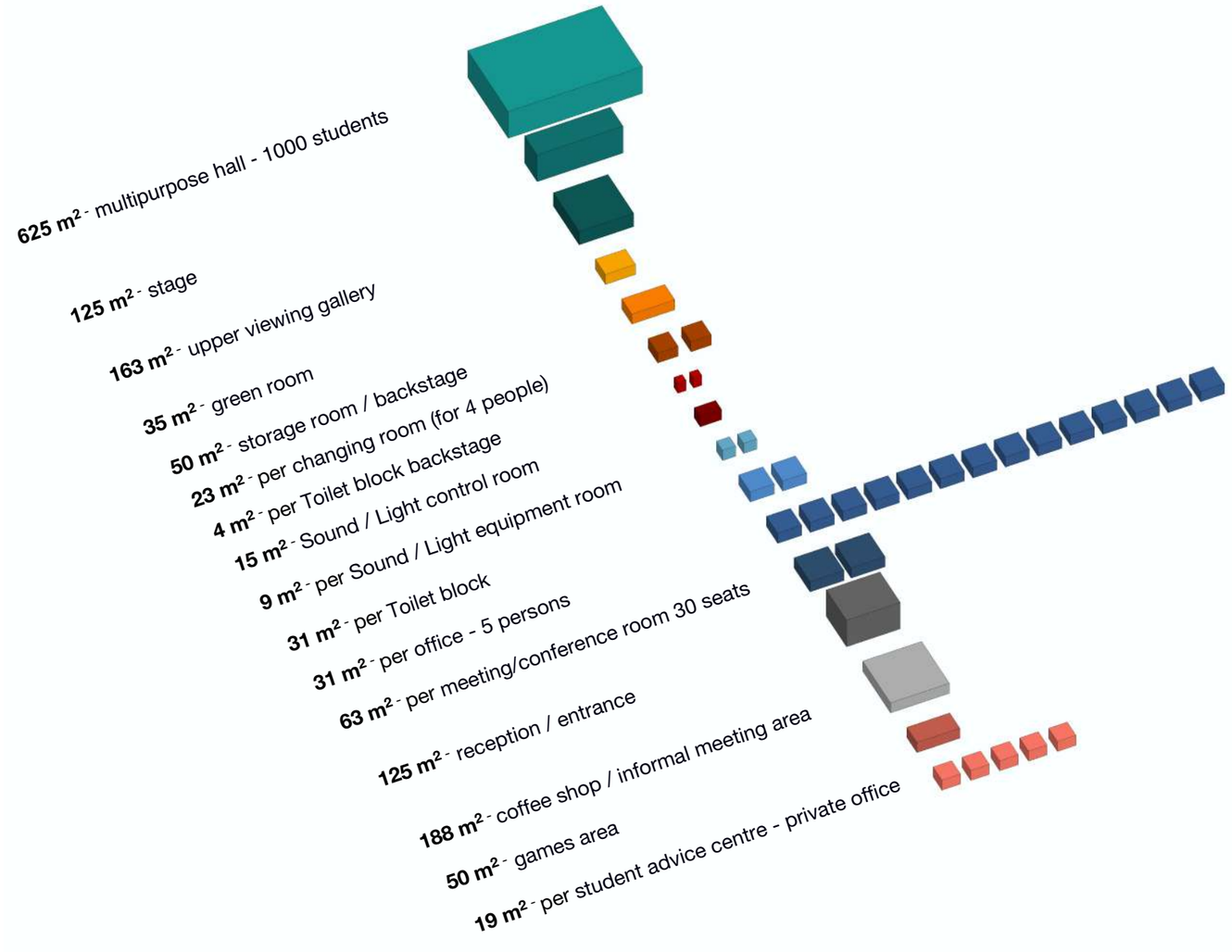
- Staff facilities including administration, common rooms, offices and meeting rooms

- Canteen facilities integrated into the hub buildings

- External shade canopies to continue the sheltered route from which starts at the vehicle passenger drop-off point at the south end of the pedestrianised section of Chancellor Road



THE UNIVERSITY CENTRE



Space planning drawing for the Student Hub

Aerial view of the Masterplan proposals

The Student Hub

8. DELIVERY OF THE MASTERPLAN

8.1 Programme

Work on implementing the Masterplan can begin at any time, subject to funding and other factors. Generally, works should be timed to minimise disruption to the academic life of the University.

8.2 'Quick Wins'

The Masterplan project team have identified a number of actions which need to be put in place to commence implementation of the Masterplan. These actions can be undertaken by the University itself, or with specialists, and can be done in the short term (and are therefore named 'Quick Wins'.)

These are set out in a separate 'Quick Wins Report'.

The 'Quick Wins' include the following:

- General improvements to the buildings and landscape, such as the removal of selected fences, the extent of repair works to roofs.
- Services and utilities improvements, for example improving ventilation systems to laboratories, and improving water supply across both campuses.
- An enhanced maintenance regime for surface water drainage and sewage.

8.3 Phasing

The implementation of the Masterplan will be a complex, long term project. This will require development to be phased in order to use resources most efficiently.

The Software Masterplan states that the population of the University will grow steadily until 2030. In order to accommodate this growth, building work will need to be completed according to an agreed timetable. The chart and drawings on the following pages suggest a sequence of development work which will deliver the Masterplan by 2030. This can be adjusted to accord with detailed requirements and priorities as they develop.

The drawings and chart describe three 'milestone' years in the implementation of the Masterplan:

- 2020, the University's centenary year
- 2025, the halfway point of the scope of the Masterplan
- 2030 the end of the development described in the Masterplan

In case of fundraising delays, the University can continue to function fully at all stages. There is never a point when either campus cannot function.

8.4 Impact of Long Term Building Works

The work should be phased in such a way as to minimise impact on the life and character of the University; the student experience should not be of living and learning in a building site. The following pages describe a phasing plan which is ambitious, but will mean the University can continually function throughout the Masterplan works.

8.5 Structural Engineering Comment

It is essential to follow a logical and well organised process for the design and delivery of the engineering elements of a construction project, whether it be work on a new building, an existing building, surface water or sewage system.

The work stages set out in ACE Schedule of Services (evaluation copy appended), harmonized with RIBA architectural work stages, is an ideal format for organising engineering work from briefing and feasibility stage to completion.

8.6 Masterplan Phases

The table opposite sets out a suggested sequence for the Masterplan proposals to be implemented, with completion in 2030. This takes into account the projected growth of the student population and the University's requirement for the University Centre/ student hub by 2020.

The following pages contain drawings which describe these phases set out in the table, right.

MASTERPLAN PHASING

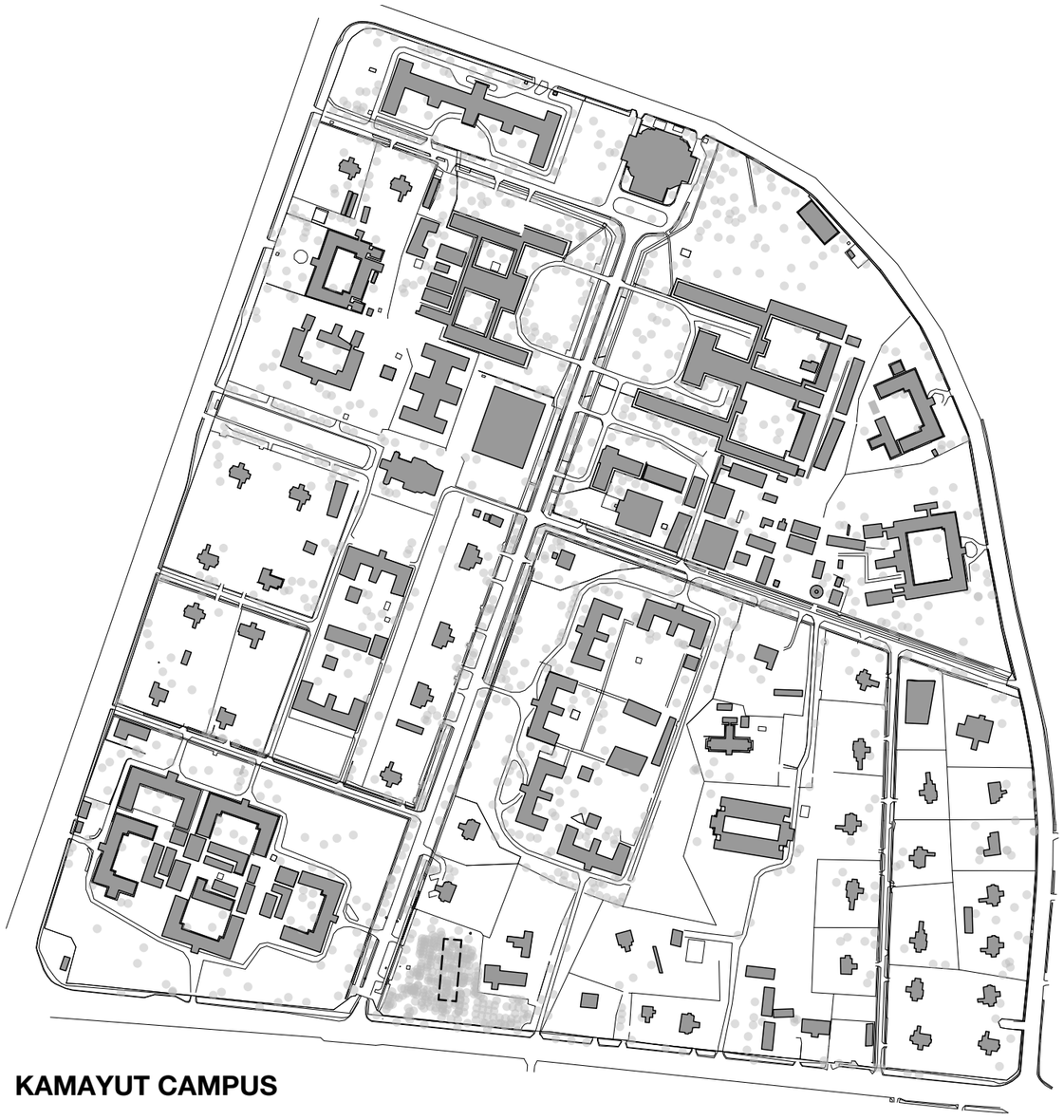
	Student nos		
CURRENT SITUATION	3,000		Horizontal separation of Faculties with Years 1 and 2 on Hlaing Campus Recent adition of 2 large hostels adjacent to Hlaing All other years on Kamayut Campus
By 2020	8,000	Infrastructure	Infrastructure quick wins Improvements to site wide drainage/sewage works/electrical . IT infrastructure. Installation of new infrastructure as required for Student Union/Hub area.
		Demolition	Commencement of decanting and phased demolition plan Remove unnecessary fences/walls Controlled maintenance felling of some on-site trees
		Construction	Complete new vehicle road construction Complete renovation of Convocation Hall for 2020 Centennial celebrations Construct new Student Union with adjacent landscaping Commence pedestrian landscaping inc. Chancellor Road Commence Canteen project/design Commence Library project/design Commence design of 2 Faculty Buildings
By 2025	11,500	Infrastructure	Complete all site wide infrastructure improvements/enabling works Complete pedestrian landscaping/Chancellor Road
		Demolition	As required for phased works
		Construction	Construct new staff housing in Zone 5 to allow existing houses in Zone 1 to be demolished. Complete Library Building/renovation of existing Complete memorial site landscaping/old Student Union Construct 2 new Faculty Buildings (alows some Year 1/2 students to move over from Hlaing Construct Zone 1 student hostels (80,000m2 for 6,000 students) New canteen(s) Commence construction of Zone 7 - Student Hub facilities Commence design of 3 Faculty Buildings
By 2030	15,000	Infrastructure	See above
		Demolition	Complete phased demolition
		Construction	Complete Zone 7 Student Hub facilities Complete remaining 3 Faculty Buildings Complete Zone 6 Student Housing
Post 2030	15,000 +	Infrastructure	
		Demolition	
		Construction	Further development as required and in accordance with masterplan zones. Possible development of additonal student housing on Kamayut Campus to allow Hlaing Hostels to be relocated to main campus

CURRENT SITUATION (2018)

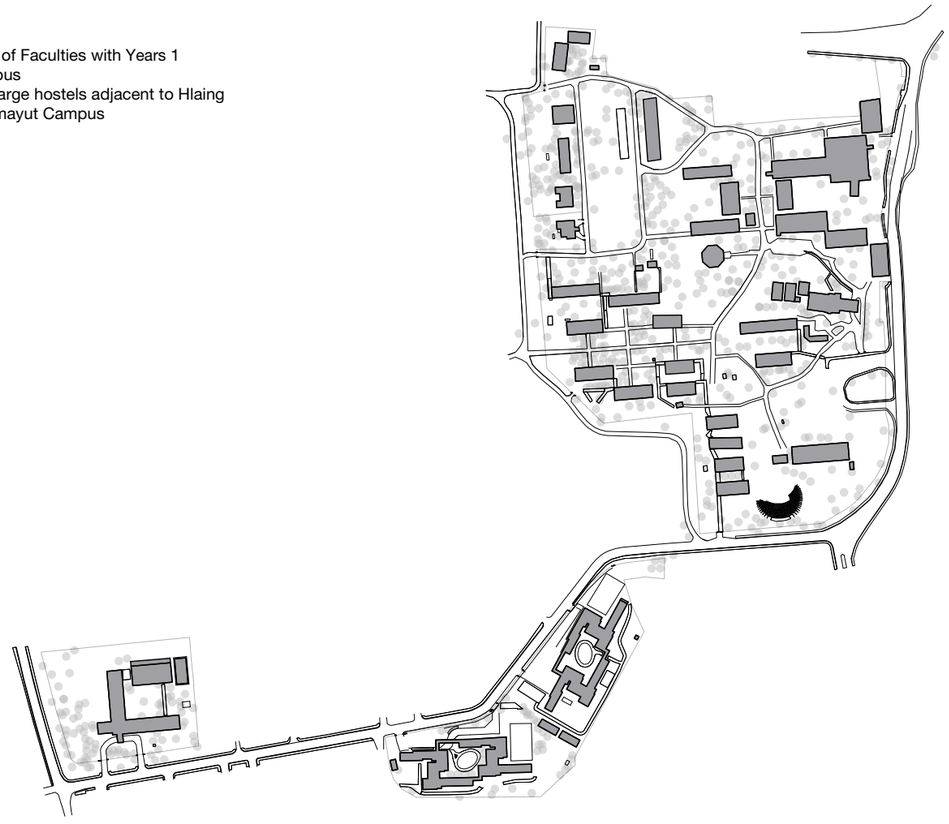
Student number: 3,002

Current Situation

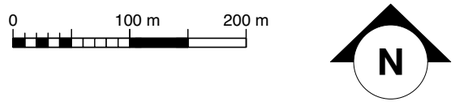
- Horizontal separation of Faculties with Years 1 and 2 on Hlaing Campus
- Recent addition of 2 large hostels adjacent to Hlaing
- All other years on Kamayut Campus



KAMAYUT CAMPUS



HLAING CAMPUS



Phase 1 2018 - 2020

Student number: 8,560

Planning and Design

- Appoint ongoing Masterplan Architect to advise UY/MoE on implementation of the Masterplan
- Appoint Landscape designer/complete landscape design
- Design and construct new Student Hub Building for 2020
- Commence Library project/design + coordination/integration with Central Universities Library Project
- Commence design of 2 Faculty Buildings
- Commence design part of zone 6 student hostels
- Commence Canteen project design
- Commence Student Union Memorial project

Infrastructure

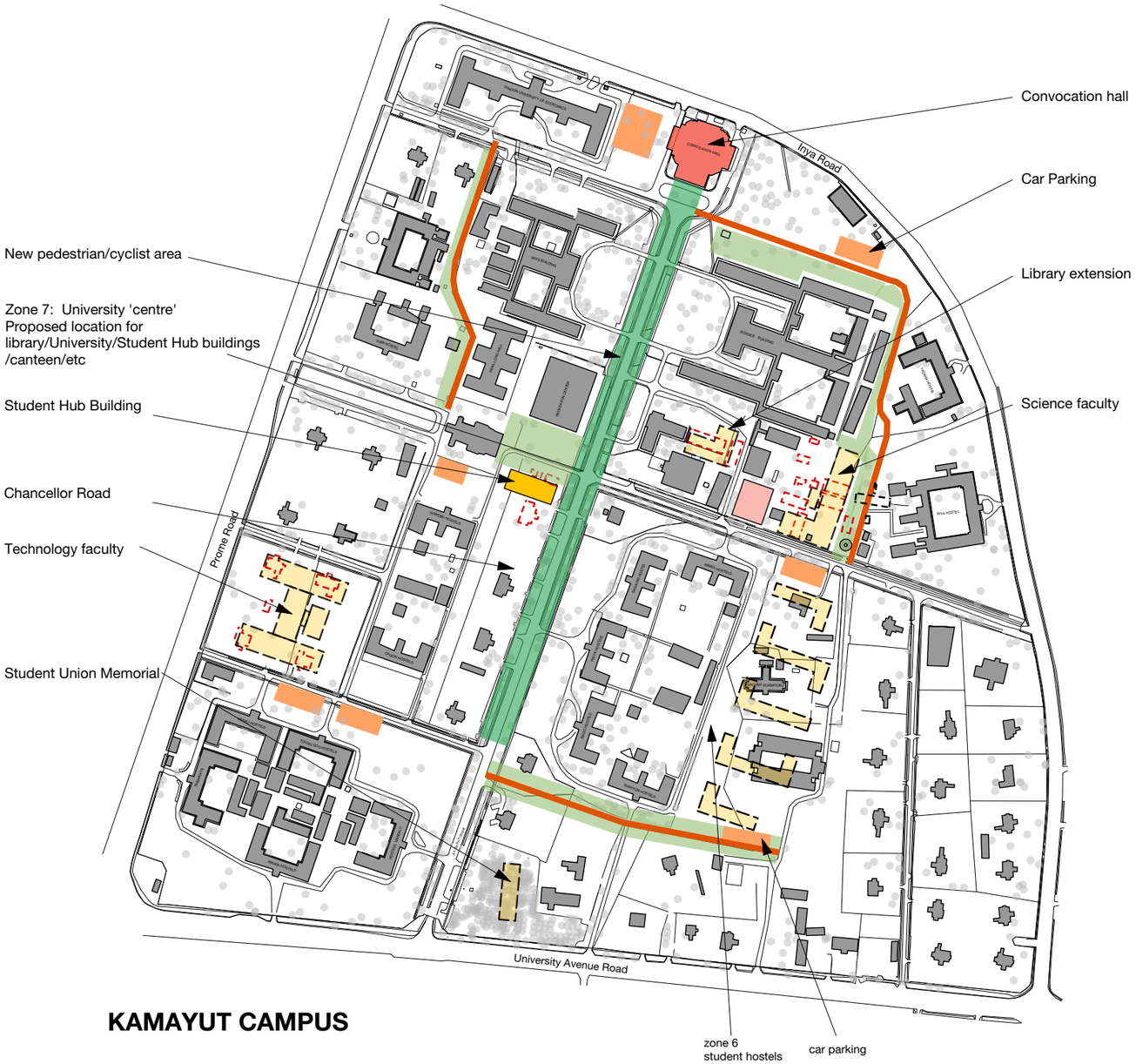
- Infrastructure quick wins
- Improvements to site wide drainage/sewage works/electrical
- IT infrastructure.
- Installation of new infrastructure as required for University Hub building.

Demolition

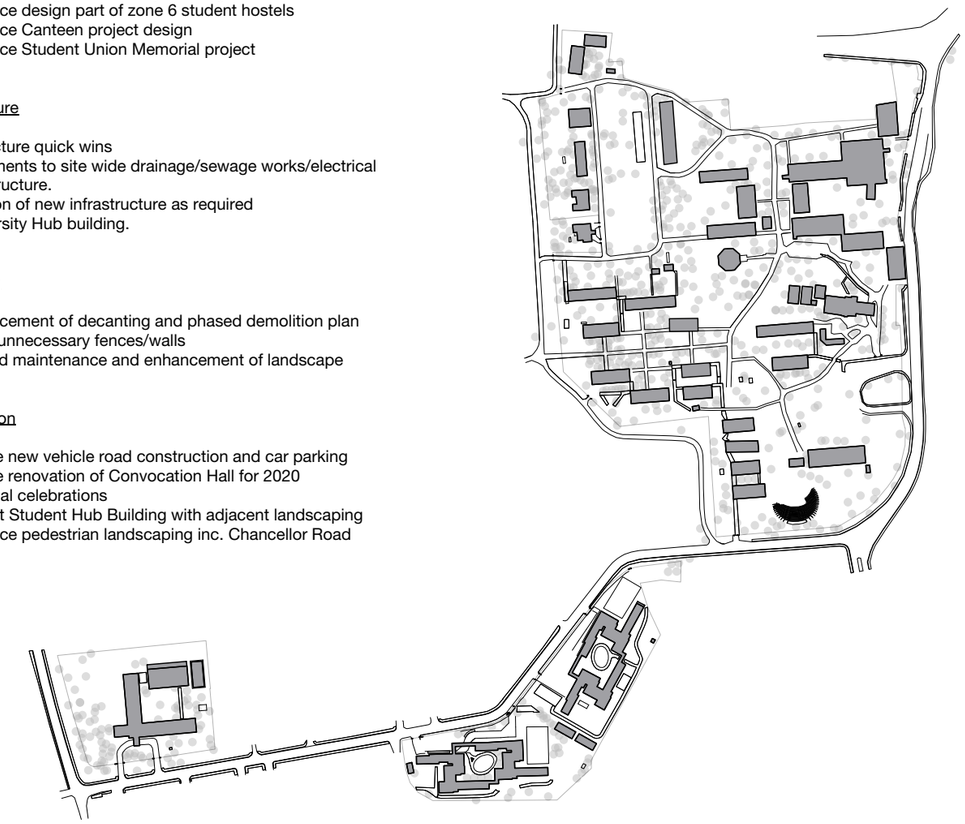
- Commencement of decanting and phased demolition plan
- Remove unnecessary fences/walls
- Controlled maintenance and enhancement of landscape

Construction

- Complete new vehicle road construction and car parking
- Complete renovation of Convocation Hall for 2020 Centennial celebrations
- Construct Student Hub Building with adjacent landscaping
- Commence pedestrian landscaping inc. Chancellor Road



KAMAYUT CAMPUS



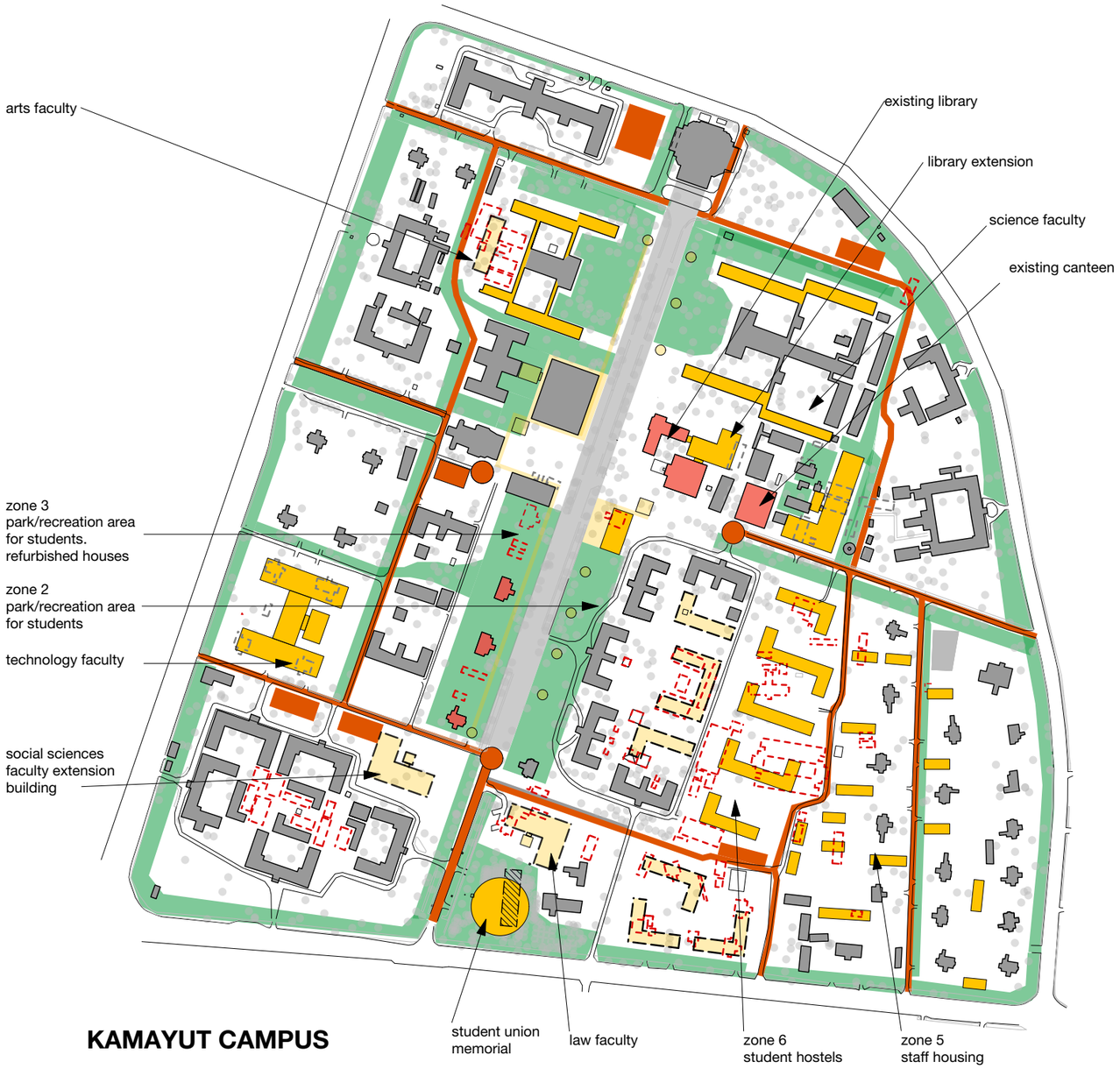
HLAING CAMPUS

KEY

- New-build
- Refurbishment / upgraded
- New road/ existing road upgraded
- New car parking
- Landscape works
- Commence design
- Demolition

0 100 m 200 m

N



KAMAYUT CAMPUS

Phase 2 2020 - 2025

Student number: 11,500

Planning and Design

- Commence design of 3 further Faculty Buildings
- Commence phased demolition of single storey substandard classroom buildings on Hlaing Campus as new faculty buildings are completed on Kamayut
- Commence design of zone 6 student hostels

Infrastructure

- Complete all site wide infrastructure improvements/enabling works required
- Complete pedestrian landscaping/Chancellor Road + area around University Hub

Demolition

- As required for phased works (including Hlaing campus)

Construction

- Construct new staff housing in Zone 5 to allow existing houses in Zone 1 to be demolished.
- Complete Library Building/renovation of existing
- Complete memorial site landscaping/old Student Union
- Construct 2 new Faculty Buildings - Sciences + Technology (allows some Year 1/2 students to move over from Hlaing)
- Construct part of Zone 6 student hostels
- Refurbish/upgrade existing canteen building (to rear of Library)
- Construct canteen 1
- Complete construction of Zone 7 - University Centre facilities
- Construct additional floors on Arts and Sciences Faculties
- Renovate and repurpose houses west side of Chancellor Road, zone 3.

HLAING CAMPUS

KEY

- New-build
- Refurbishment / upgraded
- New road/ existing road upgraded/parking
- Landscape works
- Commence design
- Demolition

0 100 m 200 m

N

KAMAYUT CAMPUS

Phase 3 2025 - 2030

Student number: 15,310

Infrastructure

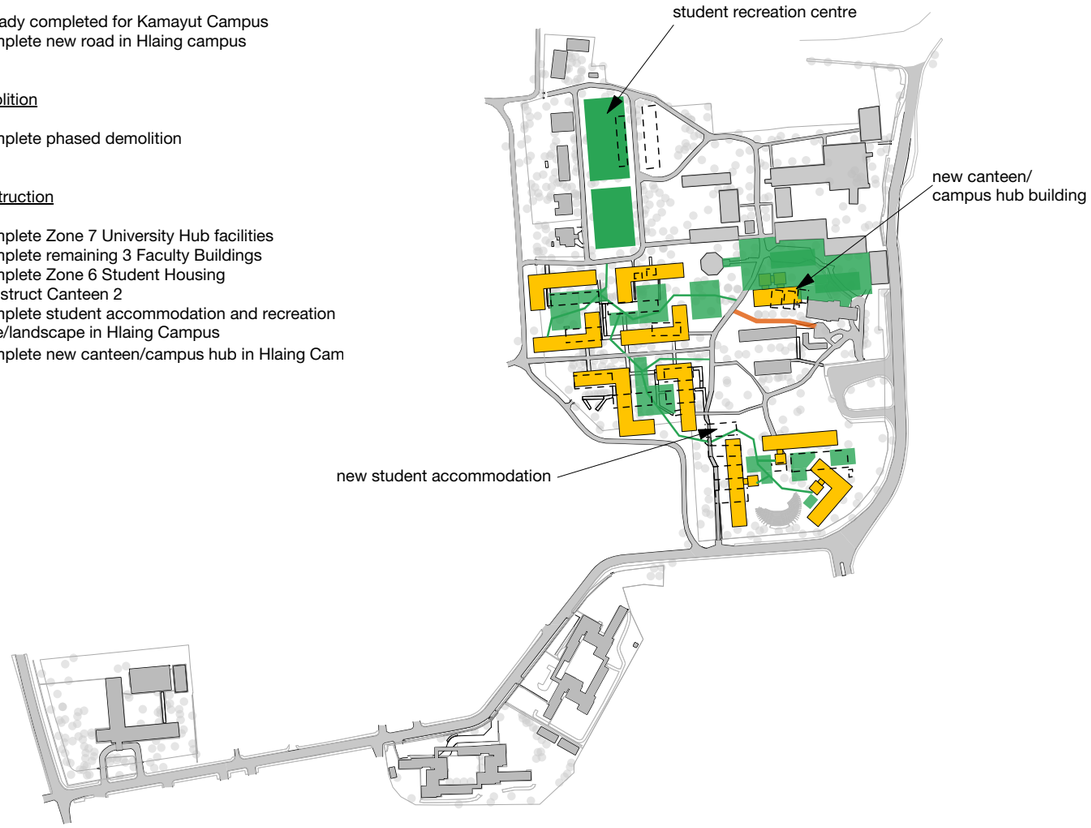
- Already completed for Kamayut Campus
- Complete new road in Hlaing campus

Demolition

- Complete phased demolition

Construction

- Complete Zone 7 University Hub facilities
- Complete remaining 3 Faculty Buildings
- Complete Zone 6 Student Housing
- Construct Canteen 2
- Complete student accommodation and recreation space/landscape in Hlaing Campus
- Complete new canteen/campus hub in Hlaing Cam



HLAING CAMPUS

KEY

- New-build
- Refurbishment / upgraded
- New road/ existing road upgraded/parking
- Landscape works
- Commence design
- Demolition

0 100 m 200 m

N

8.7 Future development beyond 2030

The University may wish to continue growing beyond 2030. Potential sites for further academic, residential or ancillary development beyond the scope of this Masterplan are identified in the drawing, right. In the longer term, the buildings situated on the Kamayut site which are not part of the Hardware Masterplan, including the University of Economics, Central Universities Library and Judson Chapel, may become more integrated into the University of Yangon.

KAMAYUT CAMPUS

HLAING CAMPUS

KEY (refer to Masterplan drawing no. 1709_D39)

Potential new sites for future development

N

8.8 Next steps

The following points set out important actions for implementing the Masterplan. The University should commence these immediately after the Hardware and Software Masterplans have been approved and signed-off.

1. Appoint Masterplan Architect.
This role should include responsibilities such as:
- Working with the University to develop more detailed briefs for building projects.

- Managing the programme for the delivery of each phase of the Masterplan.

- Assisting the University in the appointment of design teams for specific elements of the Masterplan.

- Ensuring actions highlighted in the separate 'Quick Wins' report are commenced.

2. Landscape strategy.
Commission an appraisal of the current landscaping and planting, and develop a strategy for the future in relation to the Masterplan. This should be carried out by a specialist landscape architect in co-ordination with the Masterplan architect.

3. Commence surveys and 'quick wins', including:
- Additional structural investigations of buildings highlighted in the Rapid Visual Screening seismic assessment.

- Additional utilities investigations such as detailed surface water and sewage surveys, cable tracing and water quality testing.

- Renewing and upgrading mechanical ventilation to Science Building laboratories.

4. Commence design of Student Hub/ University Centre.
- Develop a brief for this building with Masterplan Architect (this should describe the University's aspirations for the buildings and include types of space required (eg, lecture theatre), construction budget, and known information about the site, such as surveys).

- Appoint design team including architect, structural engineer, services engineer, cost consultant (quantity surveyor) and other specialists as required. This may done through an invited national or international competition.

- Develop a detailed programme for the procurement of the Student Hub, including time for initial sketch designs to help develop the University's brief, and a period of technical design to ensure that the building is considered at a detailed level.

The detailed project programme for the Student Hub will be a key document during the procurement process. This will take over from the initial steps described in this report.

For other building projects during the implementation of the Masterplan, the University should undertake a process similar to stage 4, above.

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