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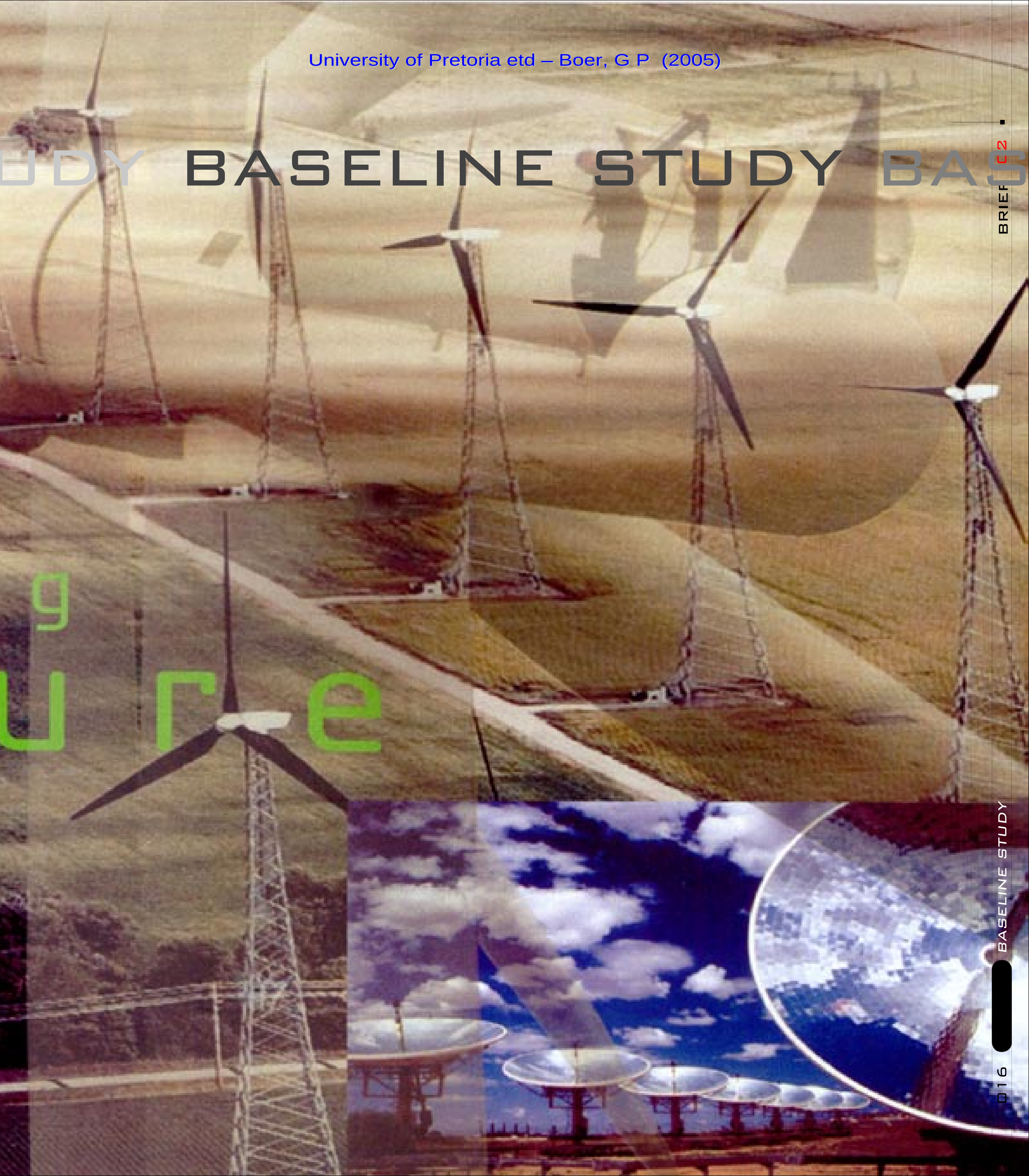
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2. Baseline Study

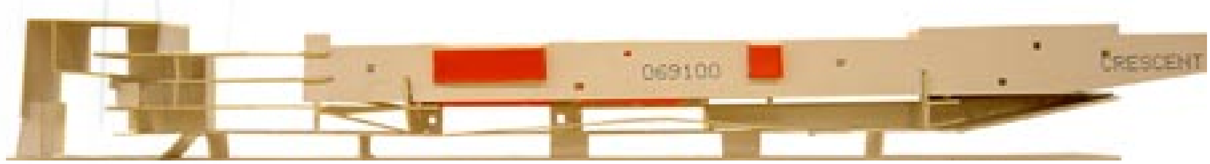
One of the largest problems facing humanity today is the irrevocable harm being done to the ecosystem. The designer of the future will not be governed by aesthetics but by the responsiveness to ecological systems.

According to Wines 2000:32, the built environment has been a cause of the current ecological problems rather than a solution. The built environment consumes up to a quarter of the earths' fresh water supply and is therefore a major contributor to the ecological problems.

The baseline study conducted is seen as a design guideline only. The baseline study informs the design process prior to conceptualising. The study proposes a number of issues that the designer should be aware of. This will ensure an adaptive system where the building is not a static ensemble of elements but rather systems interacting with the advantage of continuous improvement. [Earthscan 2002]

The architectural issues that influence the climatological responsiveness of a building are the materials employed, the compatibility of the design with prevailing site-specific climatic conditions, energy usage and the environmental performance of the building. [Girardet 1997]. Amelioration measures shall thus focus on aspects of the above mentioned issues.

The baseline study can also be seen as the manifestation of the man-nature connection. The connection pertains solely to the systems that limit the impact of the built artifact on the environment. The man-nature connection per sé is not implied, because man and nature is not entities apart, but one and the same thing. The approach in 'connecting' 'man and nature' will therefore be the establishment of a building as a landscape.



Concept model 01. Subtraction and addition on > 200m structure.

2.1 South African green architecture

The concept of green architecture is ever more elusive to define. Locally, sustainability is rooted in an existing eco-systemic world view that is part of South Africa's pastoral and agriculturist heritage. [Castle 2001]. The principles of inter-connectedness and interdependence stems from the principles of the African philosophy of Ubuntu. It can also be related to the philosophy of Holism that General Jan Smuts advocated. [Du Plessis 2001]. Green architecture is an architecture that is sensitive to the interdependence of man and nature, the individual and the community.

2.2 Environmental issues

Issues to be considered are:

· Seasonal cycle of the natural landscape and its transitional role in the project.

· The use of recycled and renewable materials.

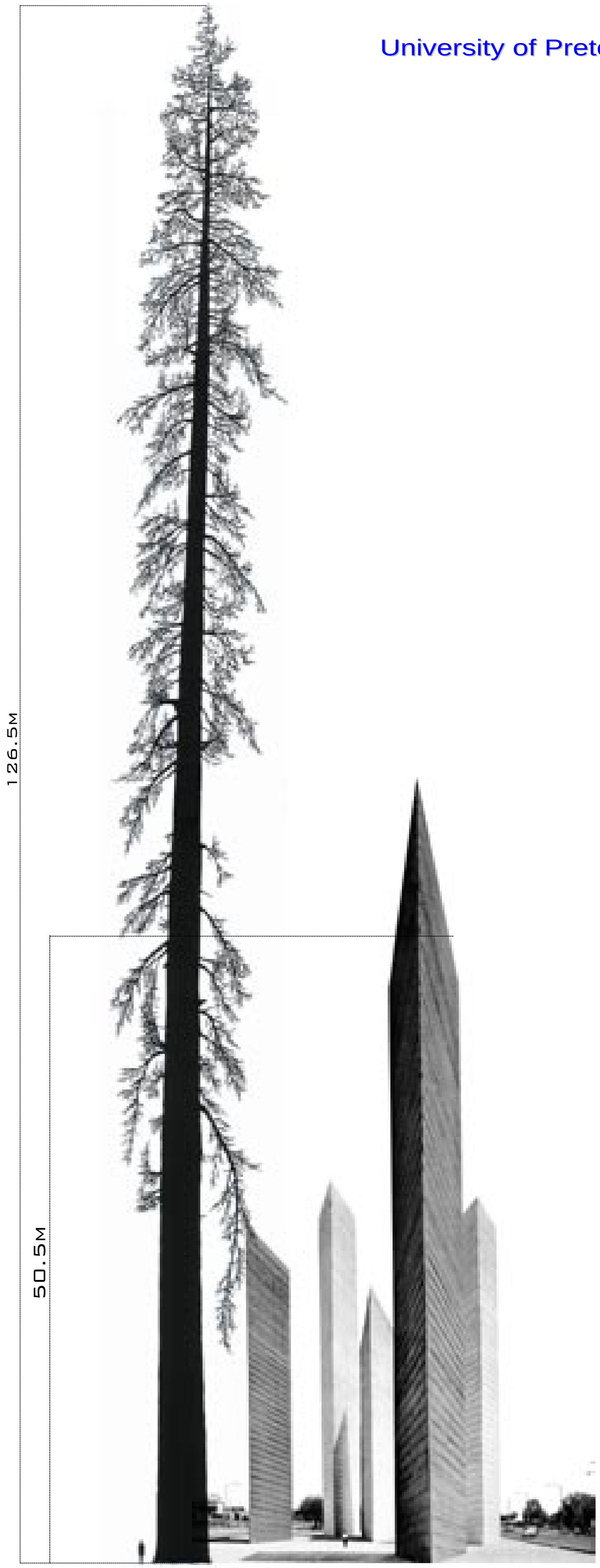
· Water catchment system

· Decreasing energy demand

- Solar orientation

· Specifying building materials with low embodied energy.

· Design components that can be manufactured by un-schooled labourers and or artisans. In the manufacturing of said components, a 'specialist' is promoted.
The amount of labour can be altered with differing degrees of mechanisation through phases in the project life cycle. [Gerneke 1992:5/6]



2.2. Social issues

2.2.1 Occupant comfort

The social-emotional condition is the principle aspect of a favourable learning situation and can be affected by the design of the school. A positive climate is affected by:

· Contentment; designing a challenging atmosphere where learning can also be un-intentional.

· Involvement; active participation rather than passive viewing of a static structure. [Schooling 1973]

· The building as an educational medium not only for the end user but also for each user of an visual resource.

A built environment should achieve the maximum of occupant comfort with the minimal cost to the natural environment. [Gibberd 2003]

-Lighting

The School for the Built Environment should utilise natural lighting as far as possible. This invariably induces a situation of using fenestration to admit solar incidence, while necessitating the need for sun screens.

Materials should be of a colour that limits the amount of glare in direct sunshine. Glare occurs mainly from viewing a bright source from an area in relative darkness. [Daniels 1998:72]. A white wall in direct sunshine will therefore constitute a high glare infraction.

All artificial lighting should be energy efficient and can also form part of an automation system whereby a movement

The worlds' tallest tree_126,5m Coastal Redwood. [NG, January1997, Vol 191, no.2]
vs.
Barragan's Towers of Satelite City_50.5m. Mexico City, 1957. [Ambasz 1976:52]

and or lux sensors determine which lights to switch on.

The entrance and or exits of the building should be designed as a transition zone in terms of illuminance.

-Noise

The adjacent M6 [Lynnwood road] to the proposed site location produces a great noise impact during peak traffic hours. The design should provide the necessary attenuation between external and internal areas where deemed necessary to acceptable noise levels. Devices used for sound attenuation should be designed in such a manner as to be multi-functional.

-Ventilation

The School for the Built Environment should be ventilated by natural means as far as possible. Investigate the critical dimension for adequate ventilation required.

-Thermal Comfort

The approach to the project as 'a building as a landscape' induces the notion of utilising, amongst others, plants to regulate internal temperatures.

Measures such as 'planting screens' and roof gardens will be employed in the structures to functionally regulate internal temperatures.

-Access to green outside

The design development should incorporate as much of the existing natural environment located on the site. Access and usage of green external spaces can be promulgated by locating them to function as transitions zones between internal and external areas. Green spaces should be incorporated into the structure itself.

The planters that occur throughout the building can be used as education medium by the Department of Landscape Architecture. Students in Landscape Architecture can be divided into groups that are responsible for maintaining a specific planter and or specie. The concept of a school consisting of areas demarcated to teaching and non-teaching is outdated and should extend throughout the school and beyond. The environment aimed to be created, ought to have a managed complexity accommodating varied activities. [Schooling 1973]

The extended linear structure [+160m] should provide a host of access points to ensure proper circulation within the structure. These access points create a number of connections between internal and external spaces.

2.2.2 Inclusive environments

-Transport

The main campus was pedestrian permeable prior to the construction of the palisade security fence. A number of bus stops were located in all the main arterials surrounding the campus. At present, most of the bus stops are obsolete due to the limited number of pedestrian access gates along the periphery of the campus. The site at the main entrance is ideally located to congregate all the existing bus stops into a specific point. A slipway from the M6 will improve traffic flow as the public transport vehicles currently stop in Lynnwood road, thereby adversely affecting traffic. Amelioration measures may include:

-Upgrading shuttle services to and from student residential areas. It includes the Gautrain Rapid Rail station to be situated in Hatfield. The introduction of the 'Gautrain' will enhance the accessibility of the campus for people living as far as Johannesburg.

-The above mentioned slipway for vehicles travelling in a west-east direction.

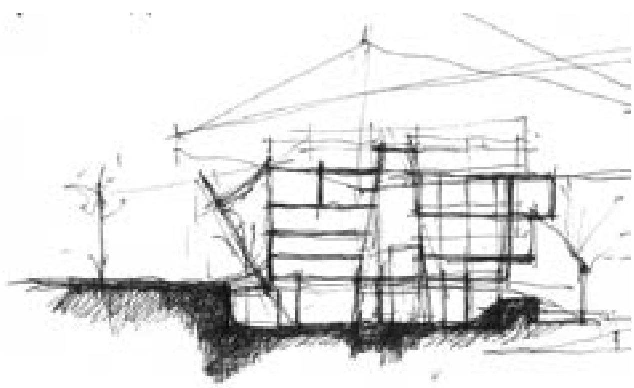
Introducing a slipway for traffic moving in a west-east direction.

Concept model 01. Subtraction and adition on > 200m structure. Integrating the structure with the site to increase energy flow to and from the building.

-Circulation

The School for the Built Environment is mainly a three storey building, with four storeys on its western extremity. Vertical circulation will therefore be largely provided by a series of stairwells and ramps. It is however necessary for mechanical vertical circulation from basement level to the four storeys on the western part.

Walkways entwine the internal and external spaces to bring both the building into nature and nature into the building. All routes between and within the building should have an even finish with no level changes to ease movement through the building and allow wheelchair moveability with ramps of 1:12 fall.



2.2.3 Access to facilities

Facilities to be considered should in the long term be for its primary user which is the student. Aspects dealt with will therefore be 'student-related'

-Banking

Secure banking facilities are located on the main campus of the University of Pretoria.

-Restaurants

A host of different restaurants and other eateries are also available on the main campus.

-Communications

All users of the School for the Built Environment will have permanent access to internet facilities.

2.2.4 Participation and control

-Environmental control

Users of the structure can control ventilation requirements by opening windows and adjusting blinds for optimum user comfort. External shading devices on the northern façade of the structure can be adjusted to control the level of solar incidence.

-Social spaces

A high level of social interaction spaces should be provided for students. These spaces should be placed throughout the structure.

2.2.5 Education Health and Safety

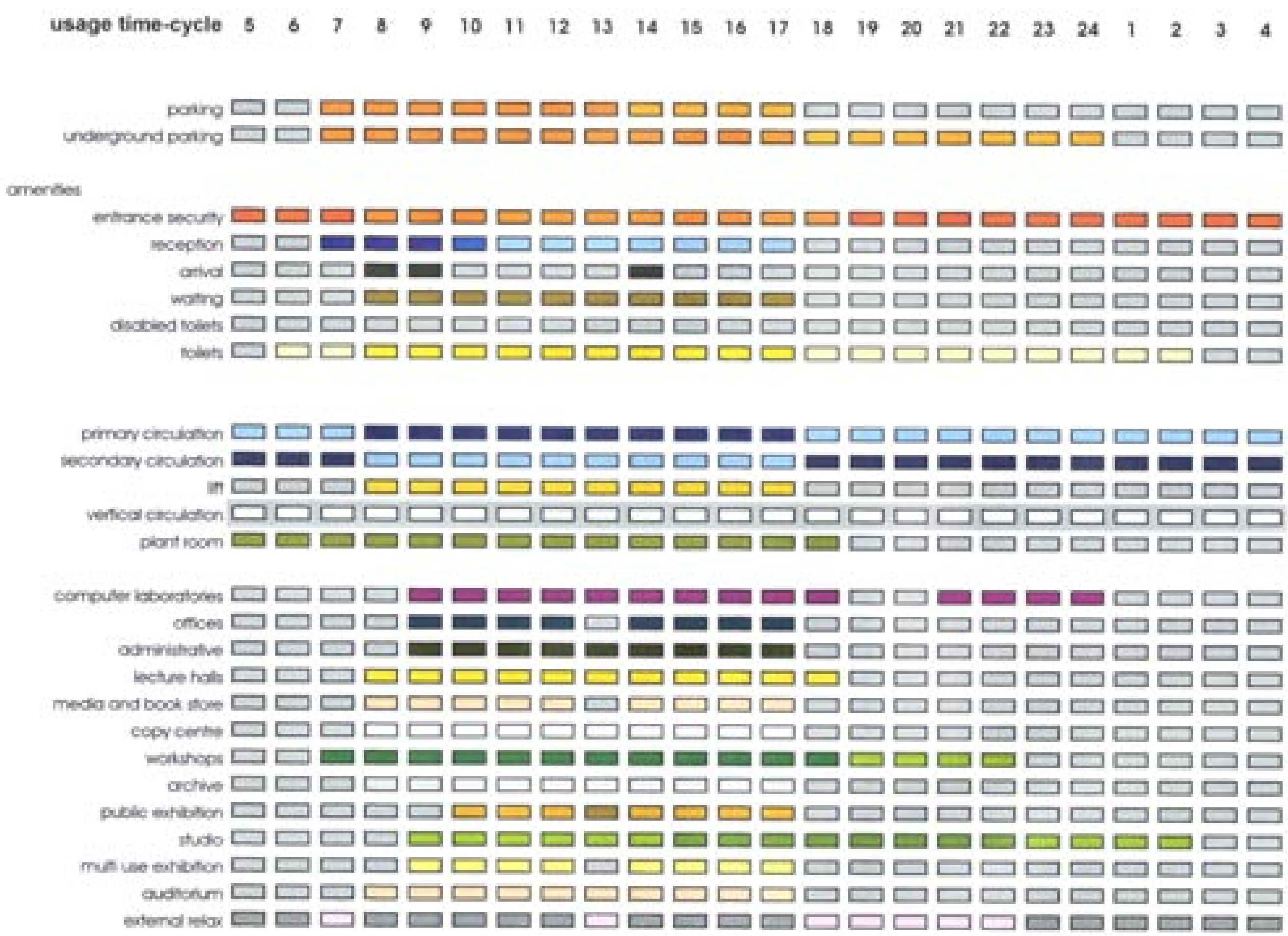
-Education

The project as such is a faculty building where education is its primary function. However, a series of notice boards on walkways and at social spaces can be used to explain aspects of systems within the building, such as the time line that runs the length of Lynnwood road.

2.2.6 Efficiency of use

-Occupancy

The structure is occupied almost daily / diurnally. The nature of the study courses located within the building is such that studio spaces are used extensively. A series of time-graphs generated from occupancy usage will inform the design. It is evident from the time-graph that occupancy far exceed a 40 hour usage per week in certain areas.



-Space usage

The structure should provide an adaptable plan with generic spaces that can be altered in future to changing requirements.

2.2.7 Adaptability and flexibility

-Vertical dimension

The vertical dimension of the building should be approximately 3.2m floor to ceiling height. The added vertical dimension acts as a thermal buffer as well as for occupant comfort.

-Internal partition

Generic space should be enclosed in a manner that allows ease of alteration. Non-load bearing internal walls can easily be altered if the need arises.

2.2.8 Local economy

-Local contractors & craftsman

The project will be built with contractors and work force that reside in the Pretoria region. Indirect support for the local economy stems from specifying products and materials that is manufactured or sourced from within the Pretoria region.

2.3 Economic issues

2.3.1 Capital Costs

The University of Pretoria as principle client will be responsible for the capital outlay. Although the initial investment will be high, the return on investment due to increased student numbers, and therefore the amount of subsidising received from Government, merit the project.

The project utilises a brownfield site on main campus. This leads to densification with limited new infrastructural requirements. Densification negates the buying of new properties, or the demolition of structures on said properties.

2.3.2 Construction and viability

The permanent concrete frame structure will be built on a grid to promote moduler dimensions of products that limit wastage.

2.3.3 Ongoing costs

-Maintenance

The concrete frame structure requires minimal maintenance.

Roofscaping requires maintenance that can be delegated to groups of Landscape Architecture students.

2.4 Environmental issues

2.4.1 Water

-Run-off

The vehicular parking on the campus of UP is characterized by large expanses of surface parking. It defines the grain of the campus, being the common denominator of the urban fabric. Apart from its visual and movement impacts, the parking areas constitutes a stormwater problem. The parking lots seal off any absorptive qualities that the soils may possess. Drainage systems associated with such parking areas are characterized by polluted run-off that invariably end up in river systems. The parking area will be designed to recharge the groundwater reserves, and limit the load on existing stormwater systems in each street. A series of linear retention basins, or rather 'bioswales', will be utilised to both filter run-off and to limit the amount thereof. In addition to the bioswales, rain water permeability can be increased by limiting the amount of impermeable surfaces. [Thompson 1996]

-Rainwater

The collection of rainwater from bioswales as well as from the roofs of the proposed structures into basins, will utilise the water for irrigation.

Amount of collected water:

=Collection area [m^2] x 0.7m/year

[Collection area still to be determined.]

Possible rain water collection from the site:

=12290m^2 x 0.7m/year

=8603 kl/year on average.

-Gray water

The waste that buildings produce increase their theoretical 'footprint'. In approaching a project one should strive not to subjugate nature, but to integrate the project with natural processes. Although mankind is a highly adaptable species, we cannot estimate the earth's capacity to provide us with the key survival elements of life, namely clean air, water and soil. [Du Plessis, 1999]. Urban growth is dependant on the availability of resources, as well as the earth's limited capacity to absorb waste; its sink limit. The sink limit therefore influences growth. [Ibid].

In the thesis, cognisance ought to be taken of the contextual impact of decisions, pertaining to their sphere of influence.

Sewage will preferably be collected at one point along the perimeter of the building. Wet core services should be limited to a maximum of two points.

-Landscaping

Specify endemic plants that are drought resistant to minimize the amount of water required for irrigation, such as *Acacia Xanthophlea* [Fever tree].

2.4.2 Energy

The energy efficiency of a building can be subdivided into two main influences. Firstly, an increased use of diverse energy sources, such as passive, wind, solar and water, determines the efficiency. Secondly, the construction of architecture in response to regional climates and contextual influences, contribute to the energy use. [Wines 2000:66].
The occupancy hours of a building also have an impact on its energy requirements.
The reception desk /security station should be fitted with an affordable building systems monitoring apparatus.
A time schedule should be established for general lighting conditions in various parts of the building. The time schedule can easily be used for an automation system for the building.

-Thermal energy

According to Holm 1996, thermal mass is effective for half the winter period and the entire summer.

-Solar control

The building should provide the users the opportunity to control their environment, through the level of ventilation and solar incidence.

-Heating, Ventilation and Air Conditioning system [HVAC]

Investigate the possibility of channelling cool air from 'green' shaded areas instead of from areas in close proximity to asphalt surfaces with high temperatures. Reduce the need for an HVAC system through employing passive ventilation principles. An HVAC system should only be employed in areas specifically requiring a constant temperature such as computer laboratories. To limit the amount of solar heat gain in summer, external materials and finishes with a light and or reflective colour should be specified.

-Recycle and re-use

· Paper. According to Wines 2000: 66, a single tree supplies enough oxygen for four people. The advent of the information age has fortunately limited the vast amount of paper used per person. It can be assumed that in time to come, this trend will hopefully lead to a largely 'paperless' society. Paper recycling is an established practise in South Africa with incentives such as 'Mondi Paper recycling'
· Glass
· Greywater
- Metal

-Site

The proposed project is situated on a brownfield site that is currently used as a parking lot. The parking area is finished with impermeable macadam that is detrimental to biodiversity. Amelioration measures include permeable paving to allow ground water recharge and the planting of endemic species as well as roofscaping.

2.4.3 Material and components

·Concrete

Concrete is possibly the structural material that is most commonly used. The production process of concrete is carbon [up to 3000 kg/tonne] intensive and uses limestone, a limited resource, as ingredient. [Smith 2003]

Concrete can successfully be employed as an agent for thermal massing, especially in conjunction with roof-gardens.

The recycling potential of concrete is limited, and can only be used as broken-down aggregate.

·Glass

Electrochromic glass functions by passing a low electrical voltage across a microscopically thin coating on the glass. This activates a tungsten bearing electrochromic layer that darkens. [Smith 2003]

Research the viability of using electrochromic glass in the South African context, coupled with a bank of PV cells as power supply.

·Smart materials

'Smart materials represents the epitome of the new paradigm of materials science whereby structural materials are being superseded by functional ones. Smart materials carry out their tasks as a result of their intrinsic properties. In many situations it will replace mechanical operations. We will see smart devices in which the materials themselves do the job of levers, gears and even electronic circuitry. There is even the prospect of a house built of bricks that change their thermal insulating properties depending on the outside temperature so as to maximise energy efficiency.' [Ball 1997]

-Steel

Steel is one of the primary structural components of the building. Steel can easily be recycled, thereby substantially decreasing its embodied energy. The main factor of consideration is however the decrease in construction time that can be gained from specifying steel components that can be pre-manufactured off-site and quickly assembled on-site.

2. 5 Design implications

Permeable landscape features should limit the amount of segregation between pedestrian and vehicular traffic routes.

Special consideration should be given to fast moving vehicular traffic noise through the use of transitional spaces.

Transitional spaces

The building should be designed to an accessible human scale. This can be achieved on ground floor through a tactile approach, signifying the sense of touch. Different textures and colours interweave to provide the user with a sense of connection on a human scale.

· Limit fenestration to a maximum of 20% on east and west facades.

· Avoid the use of white paint on external façades that receive direct solar exposure to reduce reflected glare.

· The legibility of the building should extend into surrounding areas, including appropriate street furniture.

· The structure and façades should provide a high degree of visual stimulation due to the prominence of the site in terms of passers-by.

· The specific microclimate of the site and surroundings should be investigated to respond to the needs.