zoo|gate

a forecourt to the National Zoological Gardens

this thesis is dedicated to my parents and my sister

your unending love and support throughout my life, and especially this year, has made me the man i am today. thank you

Dusty Wood Saunders

23012511

Submitted in fulfilment of the requirements for the degree Magister in Architecture (Professional) in the Faculty of Engineering, Built Environment and Information Technology,

University of Pretoria. 2010

Study Leader: Gary White

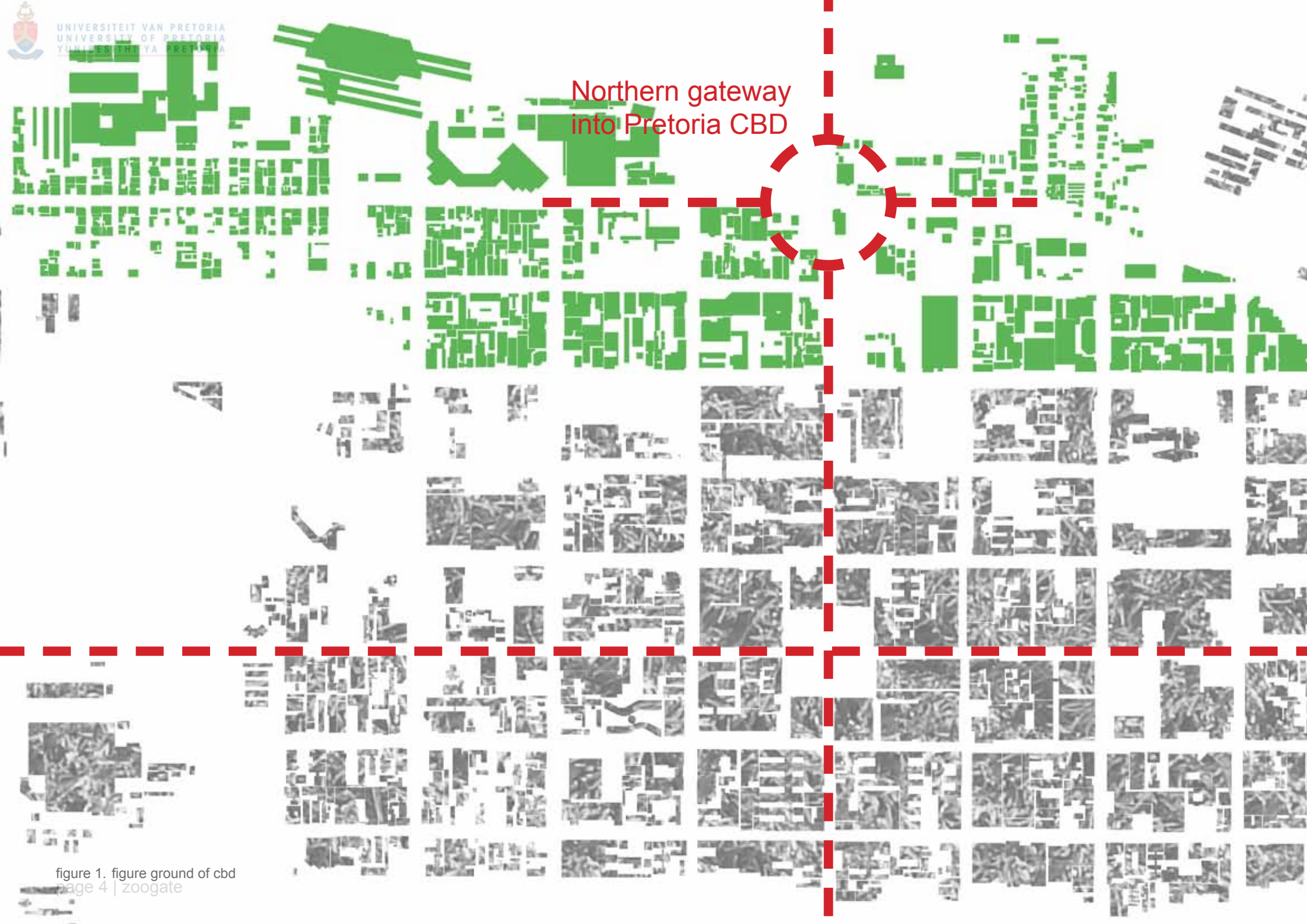

figure 1. figure ground of cbd

ABSTRACT

The project originated as a means to find a solution to the lack of legibility that the National Zoological Gardens' entrance expresses where it is situated on the Northern gateway into the Pretoria CBD.

In order to develop an appropriate responsive architecture, the proposed solution aims to find the requirements for a successful public interface for tourist attractions and the local community. Attention will also be given to the transitional spaces between the natural environments of the Zoo and the city.

The aim firstly is to steer away from mono-functional urban spaces and tourist attractions hidden behind built barrier, in order to ensure that the architecture will be an asset to tourism and the general public.

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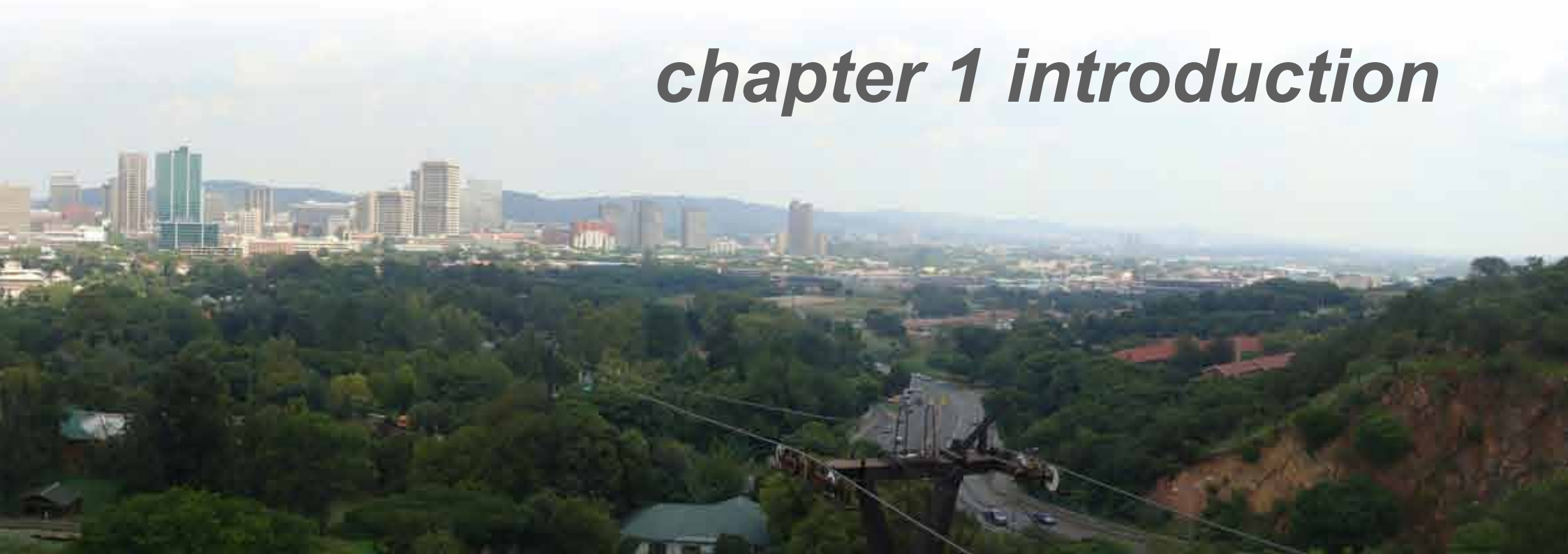
“By endeavouring to impart an order to the world of our own making as a kind of human counterpart to the order found in nature, there emerged something we might call ‘the idea of a man-made world.’ That ‘idea’ continues to guide how we shape our world today and how we change nature to accommodate the presence of our world within it”.

(Crowe, 1995, Nature and the idea of a man-made world)

figure 2. panoramic view of Pretoria city, facing south

chapter 1 introduction



1. INTRODUCTION:

1.1 PRETORIA AND THE NATIONAL ZOOLOGICAL GARDENS:

Pretoria is a culturally rich city with exceptional physical qualities and economic opportunities. It is not only the capitol of our diverse and beautiful country, but it also hosts many exciting activities and tourist attractions. The National Zoological Gardens (henceforth referred to as the Zoo) is the biggest natural attraction in the inner city.

The Zoo has come a long way. It was established in 1899 on an uninhabited farm and ,through its own Strategic Plan, has transformed into an internationally recognized Zoo.

It plays a major social and ecological role in Pretoria, not only for the obvious conservation and research components they house, but also in educating the community and thousands of visitors in environmental issues that threaten our delicate eco-systems.

figure 3. sketch of paul kruger statue

1.2 HISTORY

The establishment, known today as the National Zoological Gardens of South Africa, was founded in 1899 by the then-director of the State Museum (now Strijdom Square), Dr. Jan Boudewyn Gunning.

A collection of animals, that were to be stuffed and put on display, were kept in the backyard of the museum. Dr. Gunning, however, had other plans for the animals.

With the intention of establishing a zoological garden, the government bought the farm, Rus in Urbe, in 1895. In 1899 the men, who occupied the farm, moved out to join the Anglo-Boer War and Dr. Gunning jumped at the chance to relocate his animals there.

"Dr. Gunning encouraged residents living in the area adjacent to the Museum to complain about the noise and odour caused by the animals living in its backyard. Very soon he obtained permission to transfer a group of animals to "Rus in Urbe" on 21 October 1899" (http://www.nzg.ac.za/).

This was the humble beginning of the Zoo. In 1916 the Zoo received national status, and became known as the National Zoological Gardens of South Africa. At this point the Zoo could not afford many animals, and merely served as a stop-over point for animals travelling from Africa to Europe and America.

The main entrance was originally built in 1903 when the Zoo consisted of only a few farm houses and enclosures for a small collection of animals. Since then the Zoo has expanded greatly, with the most Northern enclosures and boundary fence now forming the ridge between the CBD and Pretoria-North.

The grounds on which the Zoo is situated is now owned by the Department of Public works. All renovations and additions have to be submitted to, and approved by, the department.

figure 4. historical photos of study area

figure 5. aerial showing location of zoo in cbd

figure 6. corner of boom and paul kruger street. zoo blocked off

figure 7. view down boom street from

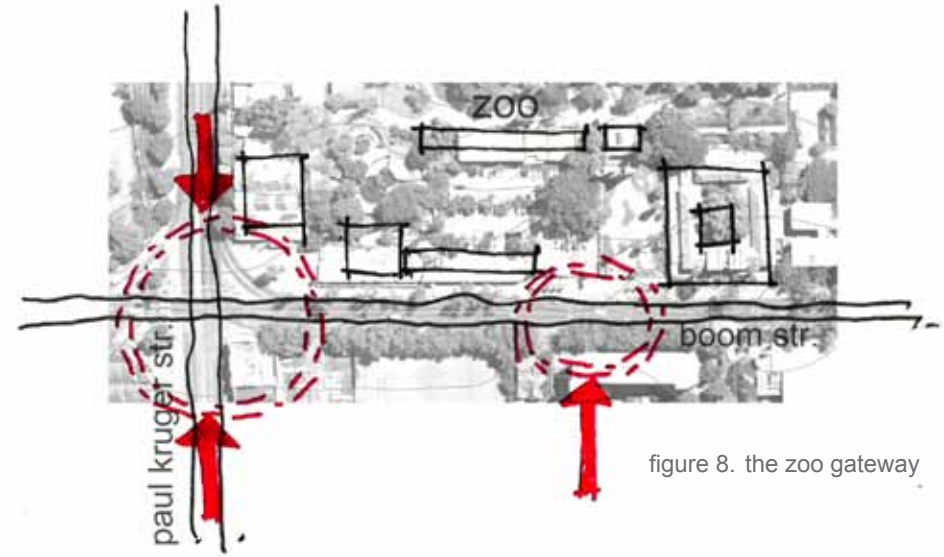


figure 8. the zoo gateway

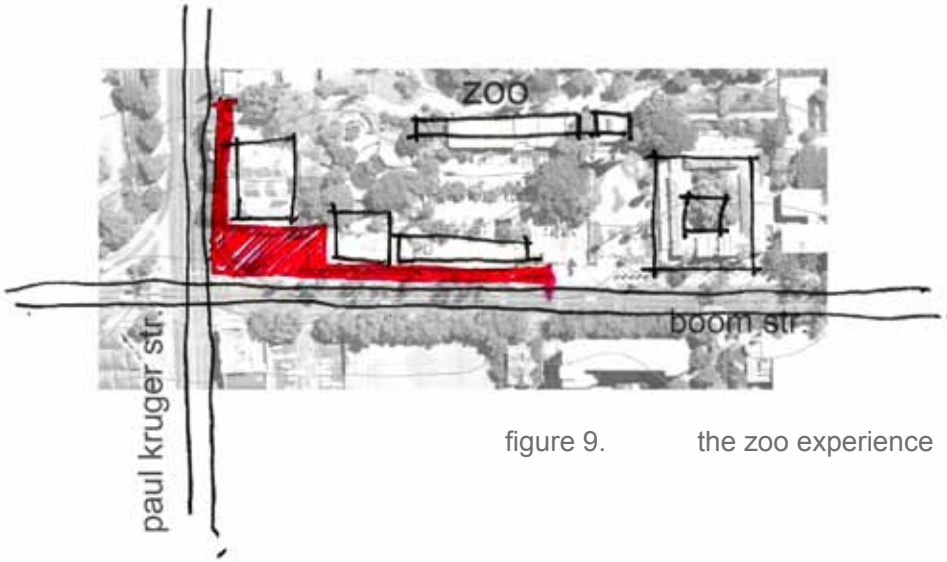


figure 9. the zoo experience

1.3 THE PROBLEM AROUND THE ZOO

The Zoo forms a visual and tactile green edge along the Northern ridge of the CBD and the Paul Kruger Street entrance into the city creates a beautiful natural backdrop to the city's skyline. The area is, however, not without its problems.

THE ZOO GATEWAY

The corner of Boom and Paul Kruger Street forms a main entrance point into the CBD. This makes it the ideal location for the Zoo, as it is easily accessible to everyone entering the area. The corner also hosts various heritage buildings and trade opportunities, adding history and a richness to the surroundings.

The main entrance to the Zoo facilities is undefined and hidden behind existing infrastructure. This lack of announcement and importance to the gateway does a great injustice to a major attraction node in Pretoria.

THE ZOO EXPERIENCE

The "face" of the Zoo on Boom Street lacks a pedestrian interface and an attraction factor that will encourage more visitors into the area. because of the entrance being hidden away behind fences and existing infrastructure. The hidden entrance seems to deter people from lingering in the area, and promotes fast pedestrian movement along the sidewalk. An opportunity should be created for passersby to stop and admire the view. Funding for the Zoo's projects is an ongoing problem, as their main income is dependent on the revenue made from paying visitors coming to the Zoo.

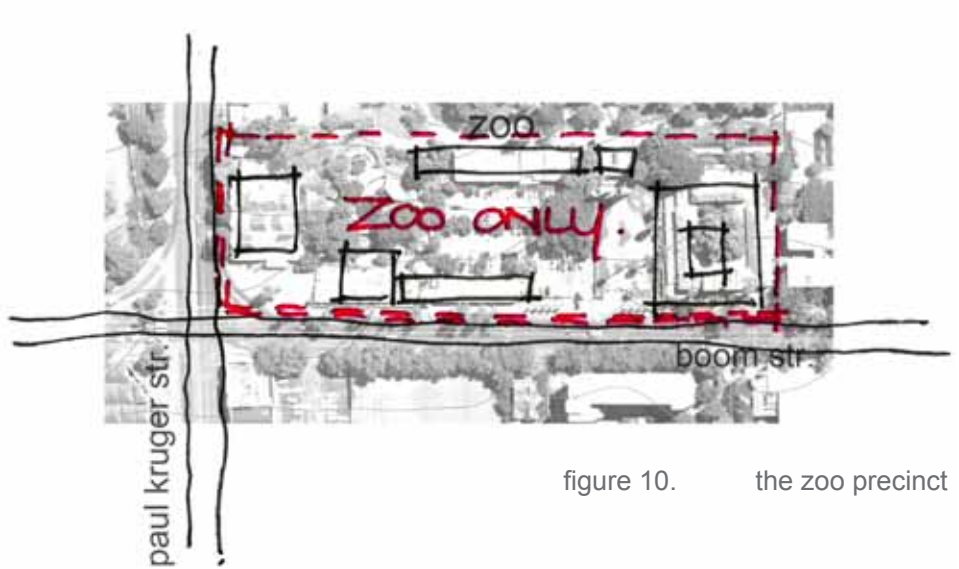


figure 10. the zoo precinct

THE ZOO PRECINCT

The National Zoological Garden's Strategic plan states that the Zoo currently receives around 600 000 visitors per annum. Increasing this number to 1 000 000 will only be possible if the Zoo and its associated facilities can accommodate, and encourage more activity in the region.

The Northern precinct lacks the complexity of a successful urban environment as most of the urban space North of Boom Street has become large mono-functional areas. These areas provide vital facilities and opportunities needed in the precinct, but fall short in integrating a successful mixed-use methodology.

The Zoo precinct, while being a major tourist attraction in a well located area of the city, currently faces a state of degeneration and despair. It does not portray the stature of importance and vitality that one would expect from a world renowned tourist attraction.

A sustainable city should increase the quality of the lives of the people living and working in it, and architecture can be utilized in this regard .

A possible solution could be to integrate the economic opportunities that Marabastad provides into the city. The precinct around the Zoo needs to address issues around attracting more tourists and local residents into the area.

“Thresholds are where transformations begin, where identities are declared”
(Pollak, 1999, inside outside)

figure 11. photo of zoo the entrance

chapter 2 urban context

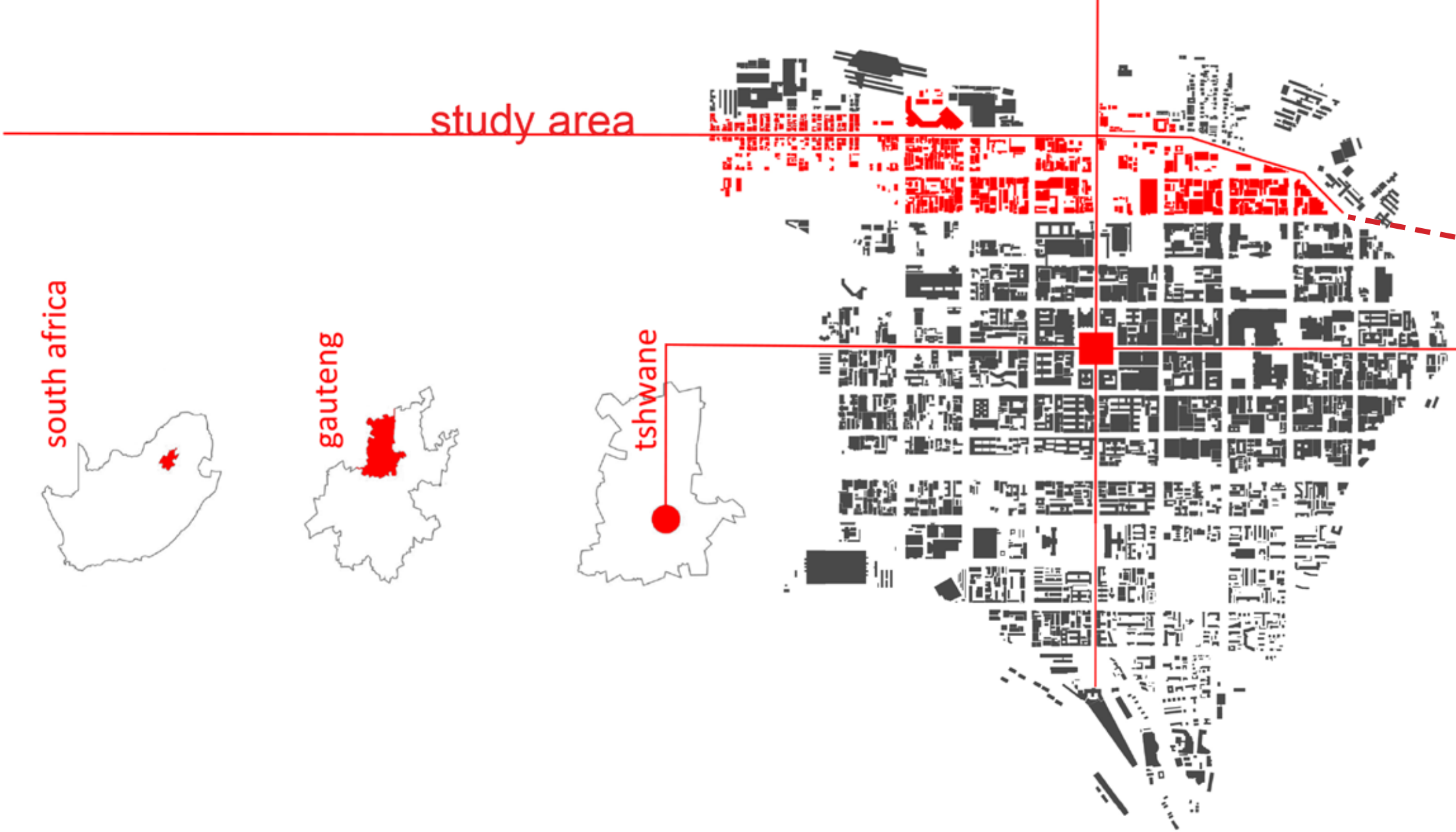
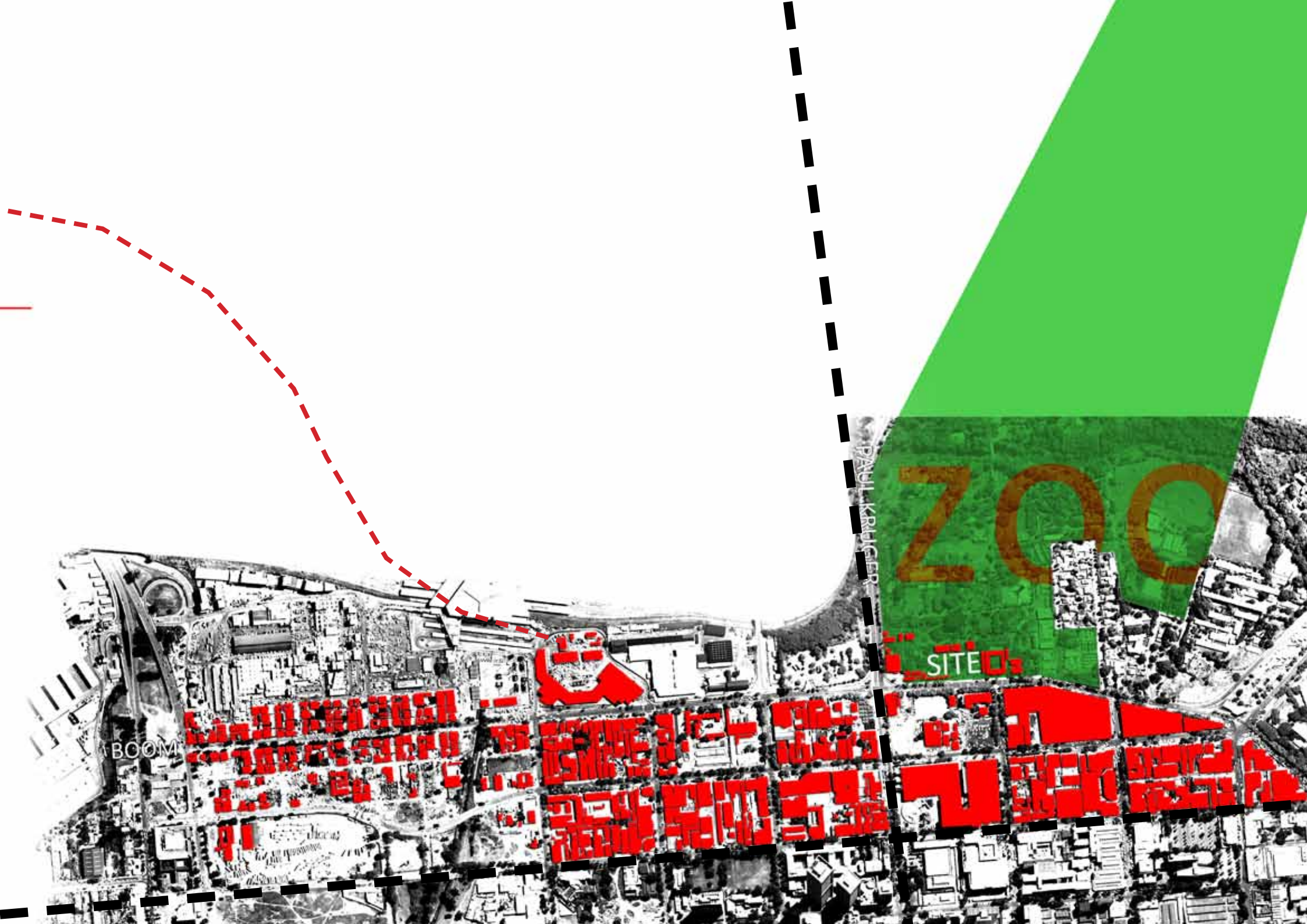


figure 12. national context and figure grounds of regional context


ZOO
SITE
PAUL KRUGER
BOOM

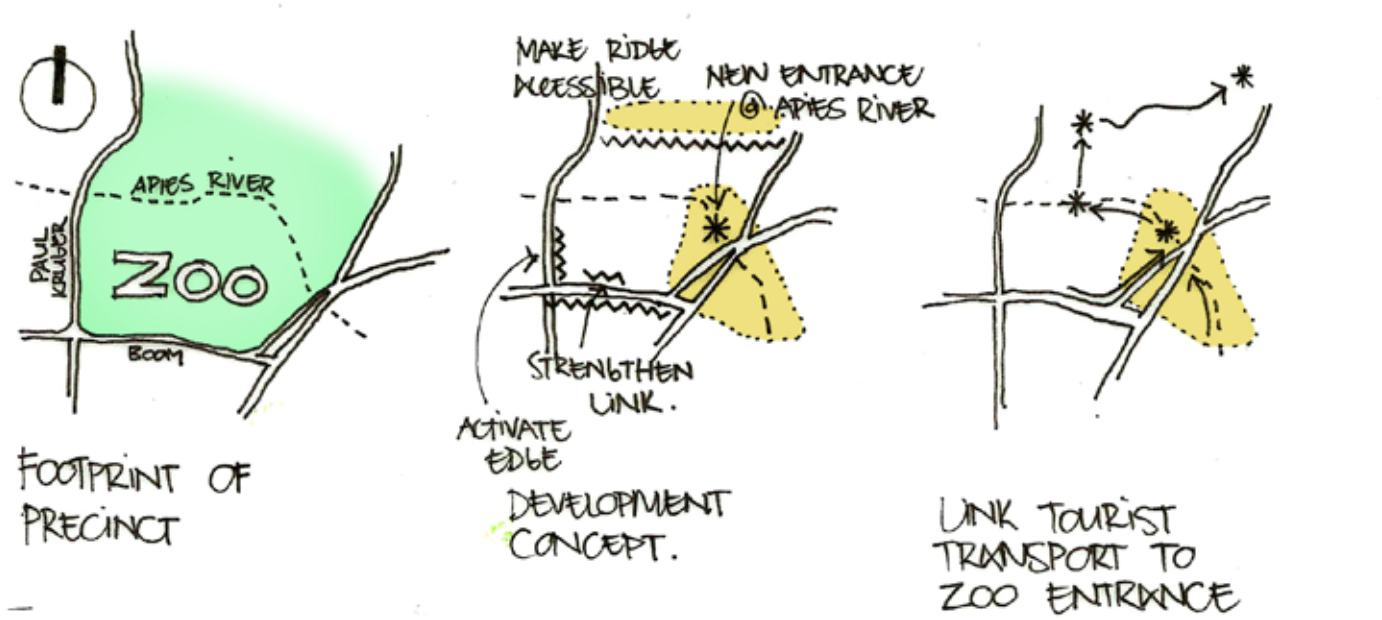


figure 13. zoo precinct developments from Pretoria Inner City Integrated Spatial Development Framework

2. URBAN CONTEXT

2.1 INVESTIGATION OF THE AREA

2.1.1 EXISTING FRAMEWORKS

Previous studies focusing on the Northern precinct of the CBD have dealt with similar problems in this region. In this regard, the Pretoria Inner City Integrated Spatial Development Framework proposed a series of interventions in and around Boom Street. These interventions include upgrading the existing environment around Marabastad, introducing a formal entrance into the city at the crossing of Boom and Paul Kruger Street and creating a new entrance to the Zoo in the Apies River Open Space Development.

The framework, however, fails to mention that the existing entrance should be optimised in order to promote the public face of the Zoo on street level. The proposed new entrance seems detached from the main entrance and is definitely not a part of the gateway into the city.

Another key point, that the framework does not address, is the lack of proper urban density in the Northern region. A successful density is missing at present, and does not contribute to rebuilding the decaying urban fabric.

The framework mentions the implementation of a mixed use theory, but does not describe where or how this will be implemented, or what the positive outcomes might be. The framework successfully proposed to conserve the tree lanes currently found in Boom Street. This is vital for the promotion of natural environments in the city and frames the East West gateway through the precinct. It is also a historical element in Boom Street; an element which led to the streets name. and frames the East West gateway through the precinct.

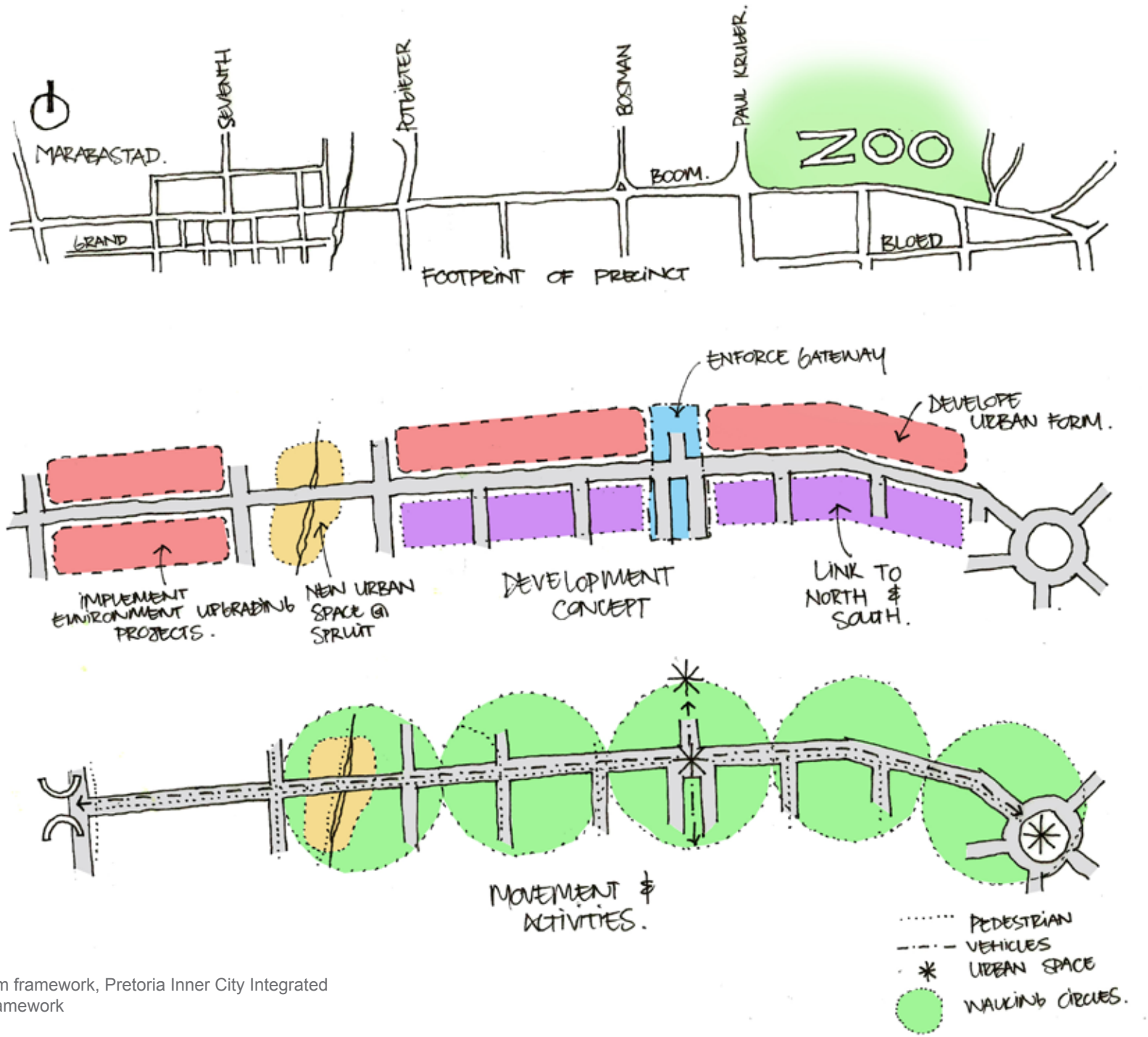


figure 14. boom street concept from framework, Pretoria Inner City Integrated Spatial Development Framework

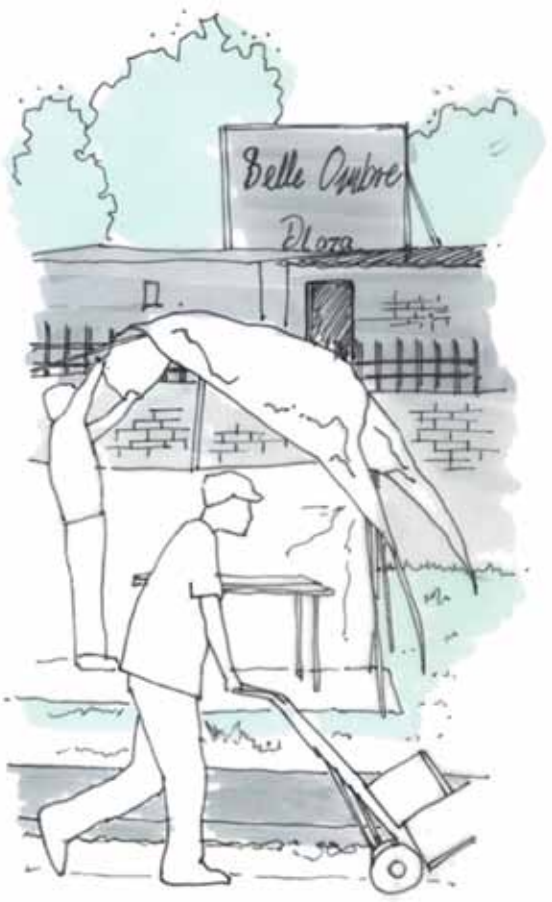


figure 15. sketch of men setting up informal trade stalls

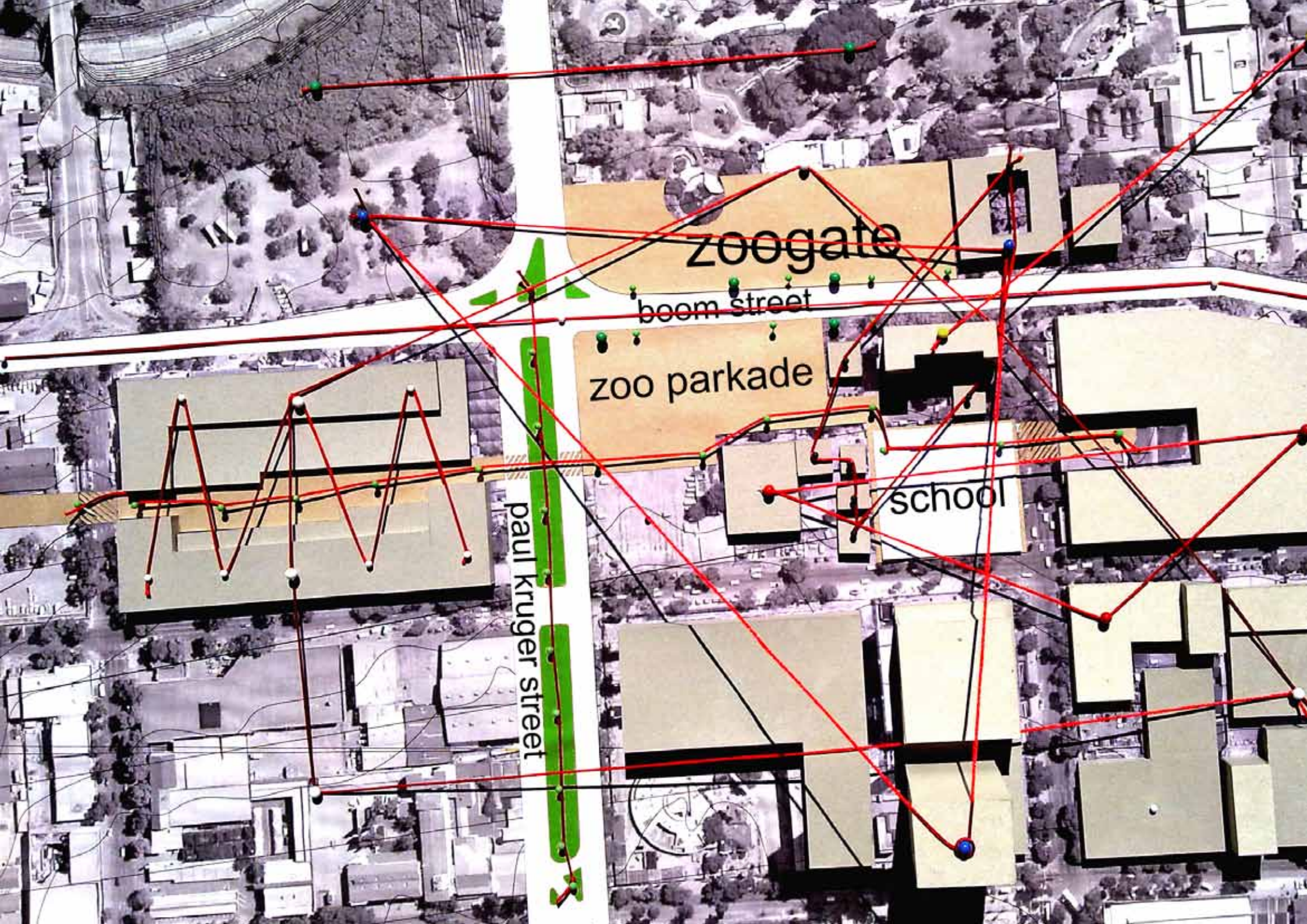
2.1.2 PROPOSED FRAMEWORK

"CONNECTIVITY THROUGH ACTIVITY"

With the lack of clarity and resolution in the researched frameworks, our group set out to prepare an urban framework that will address all the issues we feel necessary to rejuvenate this vital precinct of the city.

Our framework, entitled "Connectivity through Activity", is based on connecting civic, public, transport and tourism nodes in the city. By integrating activity spines and more multi-functional spaces and buildings in the CBD, the framework will not only solve the density problem in the area, but also create activity nodes to cater for all needs. By linking these nodes together through viewpoints, activity spines and pedestrian routes, the urban fabric becomes a finer weaved environment, able to accommodate more functions and serve a greater number of users.

figure 16. context model showing connectivity between activities


zoogate
boom street
zoo parkade
school
paul kruger street

The first strategic goal of the framework proposes to enhance tourism around the National Zoological Gardens. This will be done by creating a tourism hub around the Zoo, stretching from Paul Kruger Street to Andries Street. The hub will contain multi-functional areas for tourists and general public, as well as heritage and learning facilities.

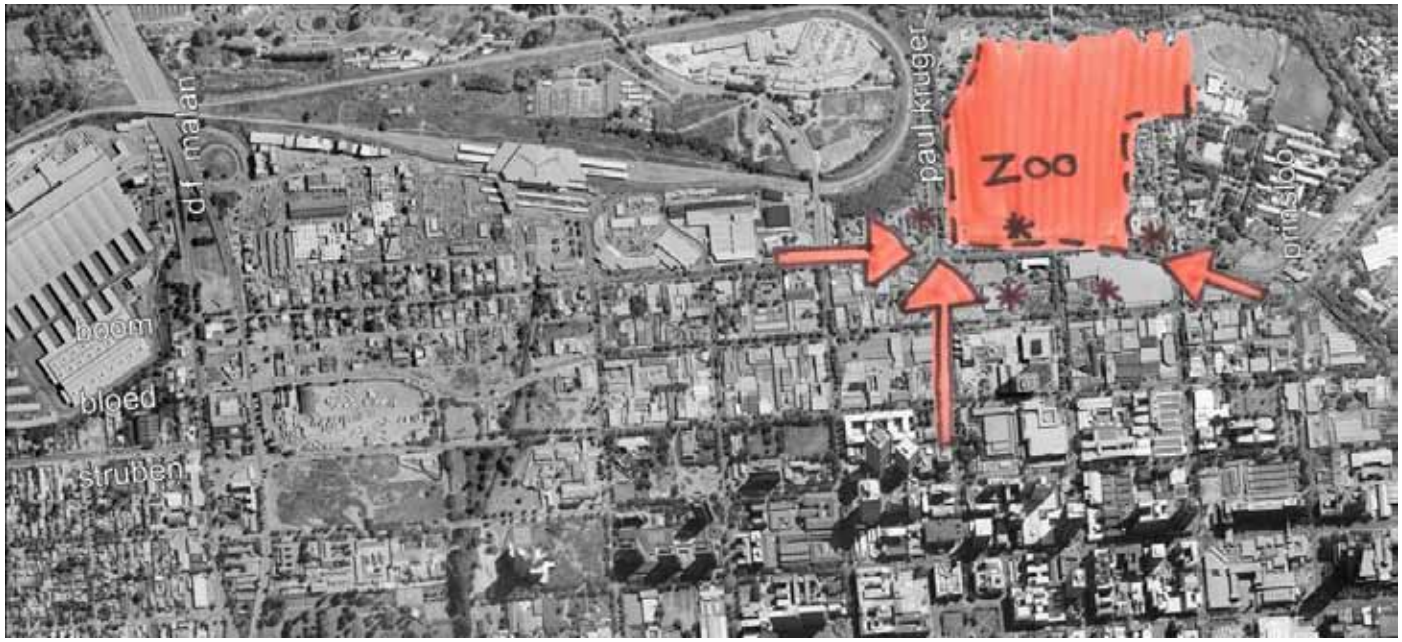


figure 17. enhance tourism around the National Zoological Gardens

The second strategic goal aims at creating a creative industries zone between Paul Kruger Street and Marabastad. This area will be re-developed with a pedestrian walkway mid-block, from which various coffee shops, restaurants, theatres and galleries will be accessible.

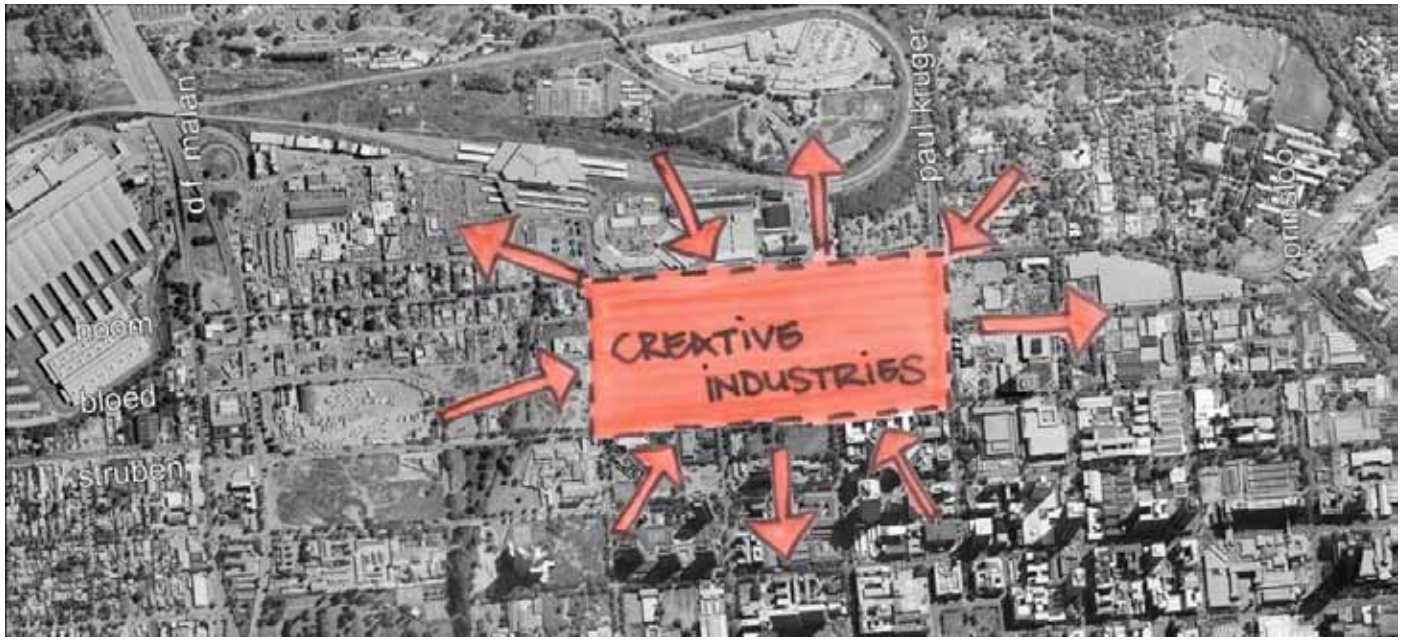


figure 18. zone between Paul Kruger and Potgieter Street to act as catalyst for regeneration of inner city activity

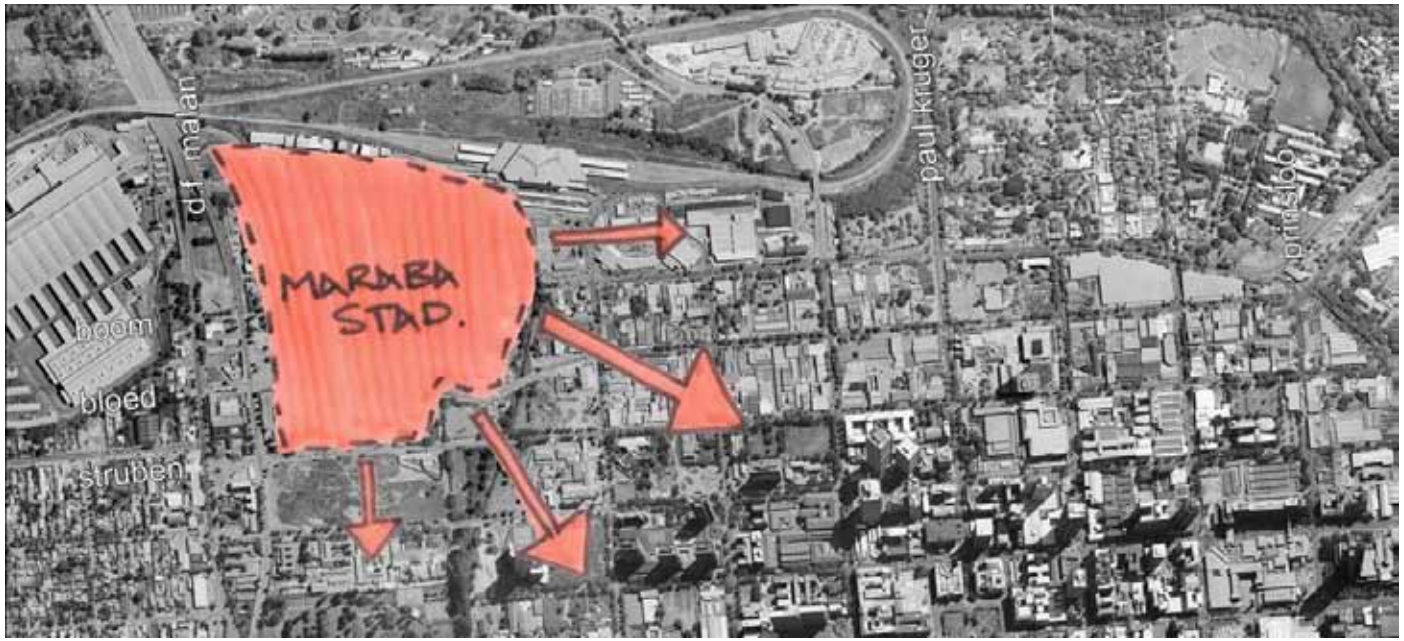


figure 19. r e-connect Marabastad to the CBD

Another aim of the framework is to re-connect Marabastad to the CBD. The afore mentioned creative zone will serve as a strong link. Development in Marabastad will also aid this, as street fronts and public areas will be regenerated in order to create a more tourist friendly environment.

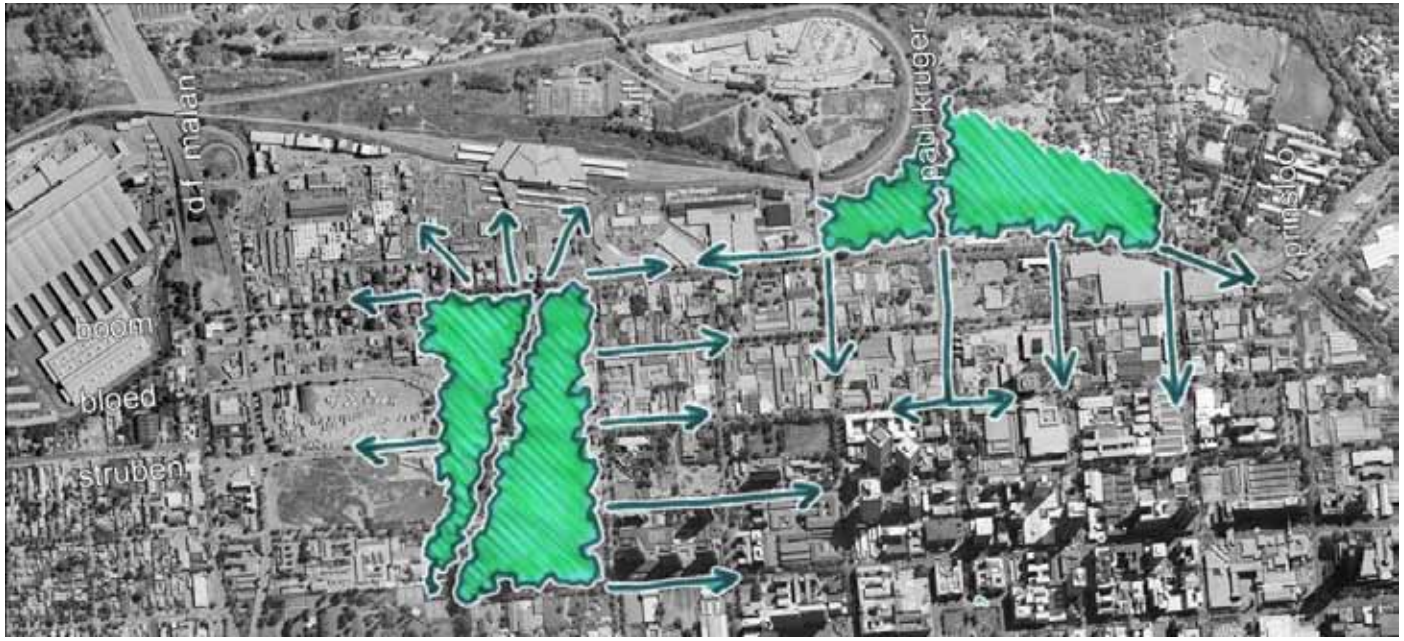


figure 20. branch and infuse the natural environments into the CBD

Lastly, the framework proposes that the natural environments in and bordering the CBD should branch out and spread through the city. Areas around the Zoo and the Steenhoven Spruit are tree rich, and the expasion of these areas can aid the process of striving towards a greener city.

The greatest element of the framework is the establishment of a gateway into Pretoria via Paul Kruger Street. The current entrance lacks identity and does not announce a proper arrival when entering the area, while buildings built to the edge of sidewalks along Boom and Paul Kruger Street does an injustice to the gateway.

The framework proposes a gradual approach; a mixture of infrastructure with pedestrian crossings and natural elements such as trees and lawns.

The methodology of “Connectivity through Activity” can be utilized to create a tourism hub around the Zoo, and increase the public perception of the Zoo.

The framework proposes a pedestrian route running mid block between Boom and Bloed Street, from Grand Street in Marabastad up to Andries Street, and will terminate in the Bloed Street Mall. This route will branch off into places of activity, with the main link, crossing over Boom Street, into the entrance of the Zoo.

This link will connect the Zoo to the inner city in a way that is at present prohibited by the fences and buildings around the Zoo. It will also serve as an opportunity to branch out the greenery, confined inside the Zoo, into the city fabric.

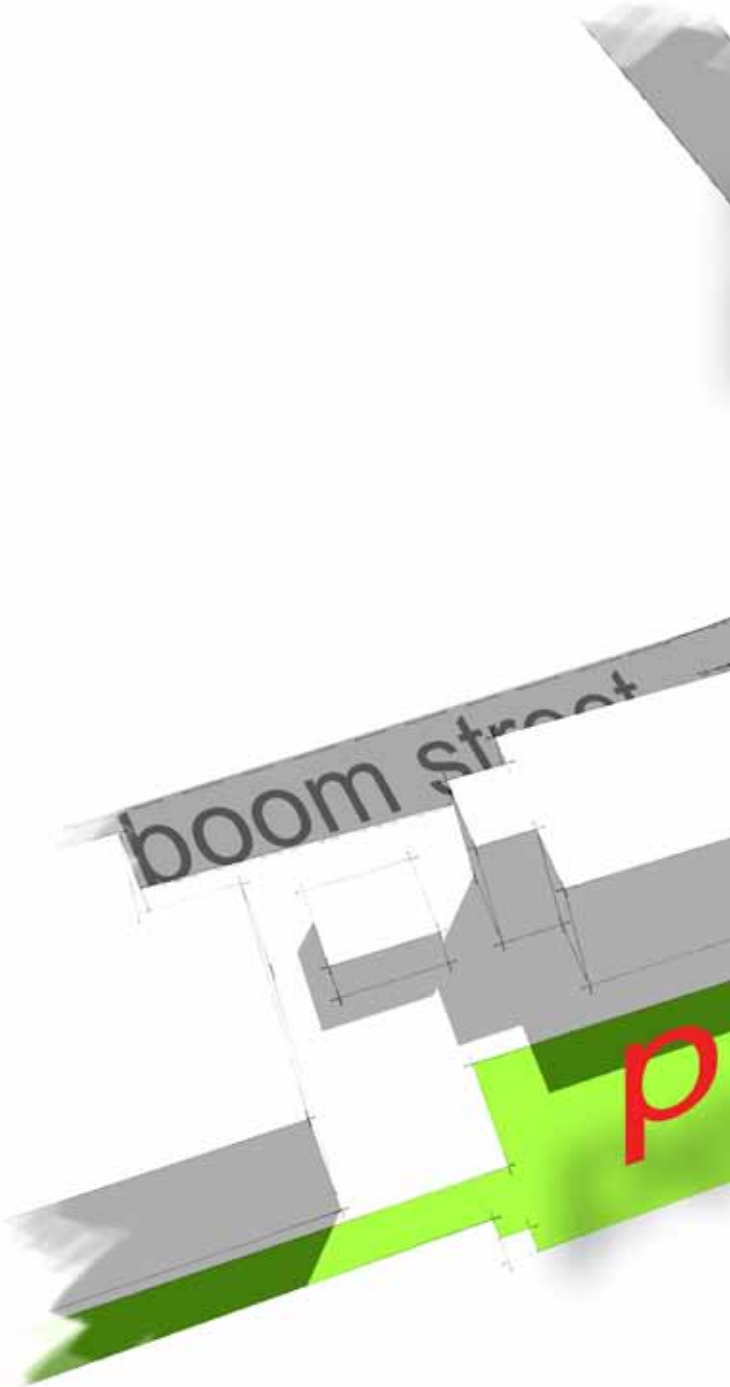
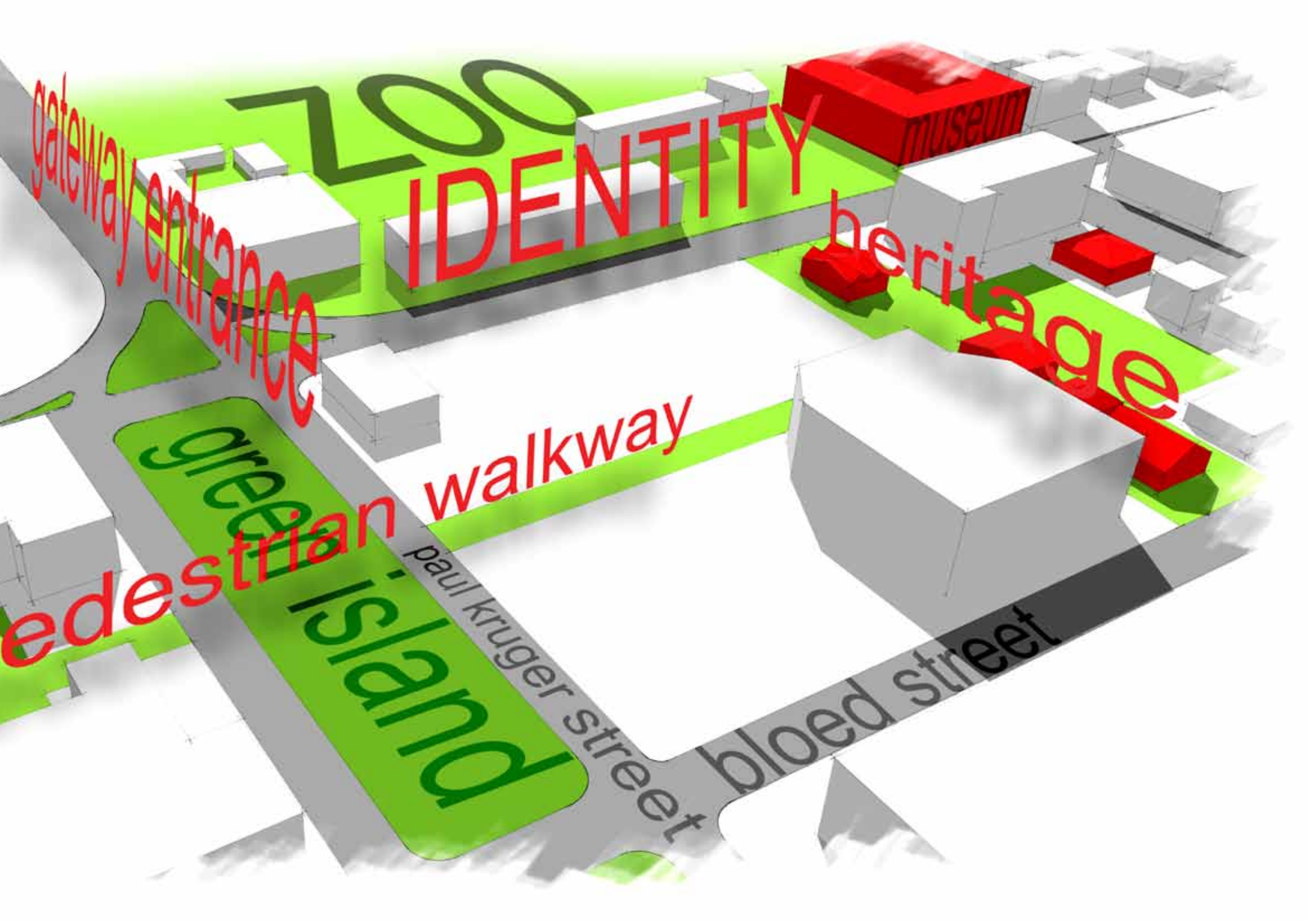


figure 21. 3d sketch showing beginnings of framework interventions


zoo
IDENTITY
museum
heritage
gateway entrance
walkway
edestrian
green island
paul kruger street
bloed street

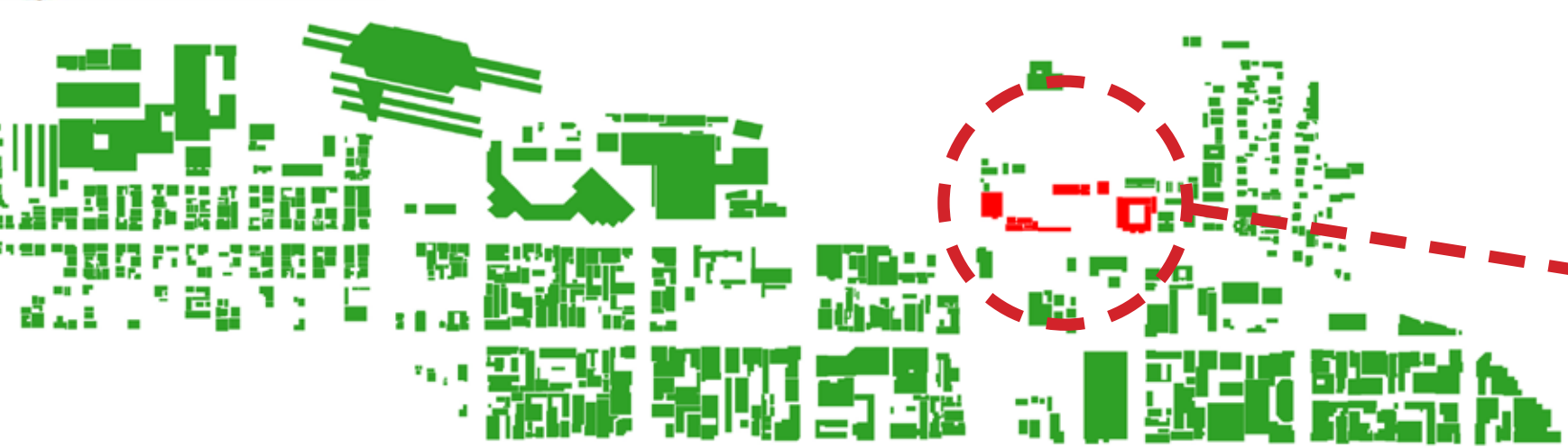


figure 23. study area with site marked in red

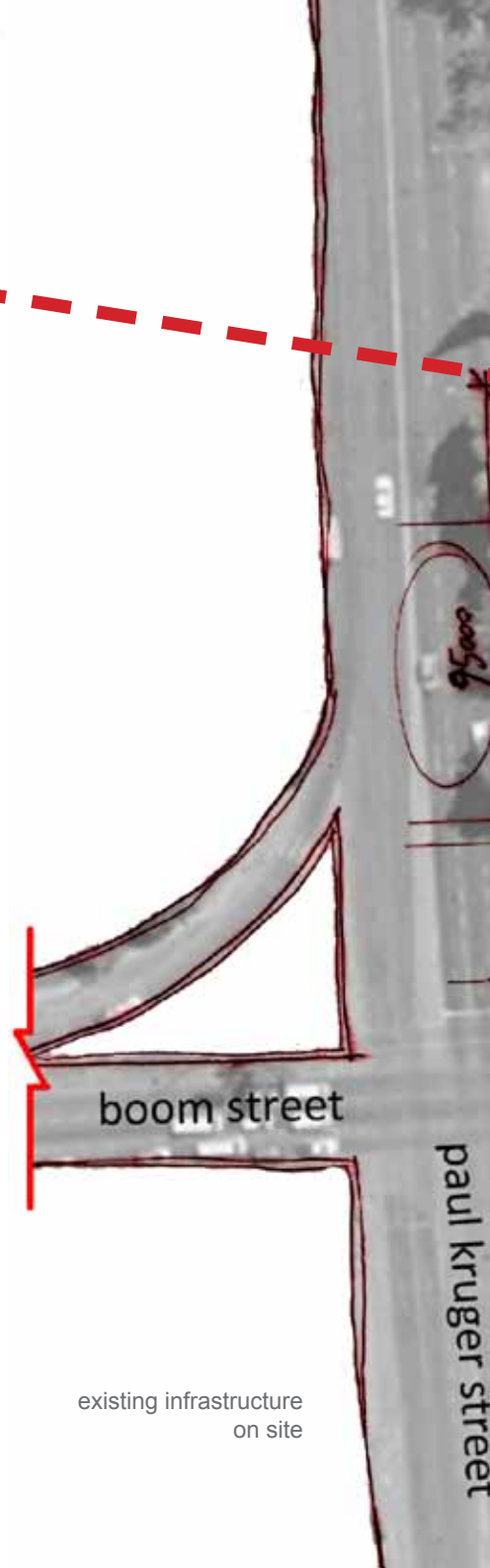


figure 22. existing infrastructure on site

2.2 SITE

2.2.1 LOCATION

The chosen site is the existing parking lot and infrastructure at the entrance to the Zoo, on the corner of Boom and Paul Kruger Street. The site is surrounded by the main entrance and State Museum to the East, the information centre and old penguin pools to the North, Boom Street to the South and the reptile enclosure and aquarium to the West.


274 000
98 000
72 000
59 000
43 000
entrance
info centre
old penguin ponds
aquarium
zoo parking
63 000
65 000
reptile enclosure
museum
pedestrian entrance
vehicular entrance
corner shop
group member's site
heritage house
apartments

figure 24. panormaic view of flats to South of Zoo entrance

2.2.2 CONTEXT

The site is surrounded by a great deal of heritage and significance to Pretoria.

The State Museum, established in 1892, is situated to the right of the main entrance. It is the oldest museum in the city, and after renovations, to become the new Museum of Life Sciences. Across Boom Street is a series of residential properties marked as heritage buildings, stretching from Andries to Paul Kruger Street. To the south of the parking lot entrance we find a 6 storey block of apartments, with a great view over the gardens thanks to its orientation.

To the West of the site, across Paul Kruger Street, is a vacant plot owned by the Department of Justice. The lot is currently being loaned to the Zoo and used for parking over the weekends. The Department of Justice plans to erect a new departmental building on the erf.

The two most significant pieces of context that will be taken into consideration is the Zoo itself and the vacant plot to the South, where Andries Haasbroek (March Prof. 2010) proposed his thesis project.

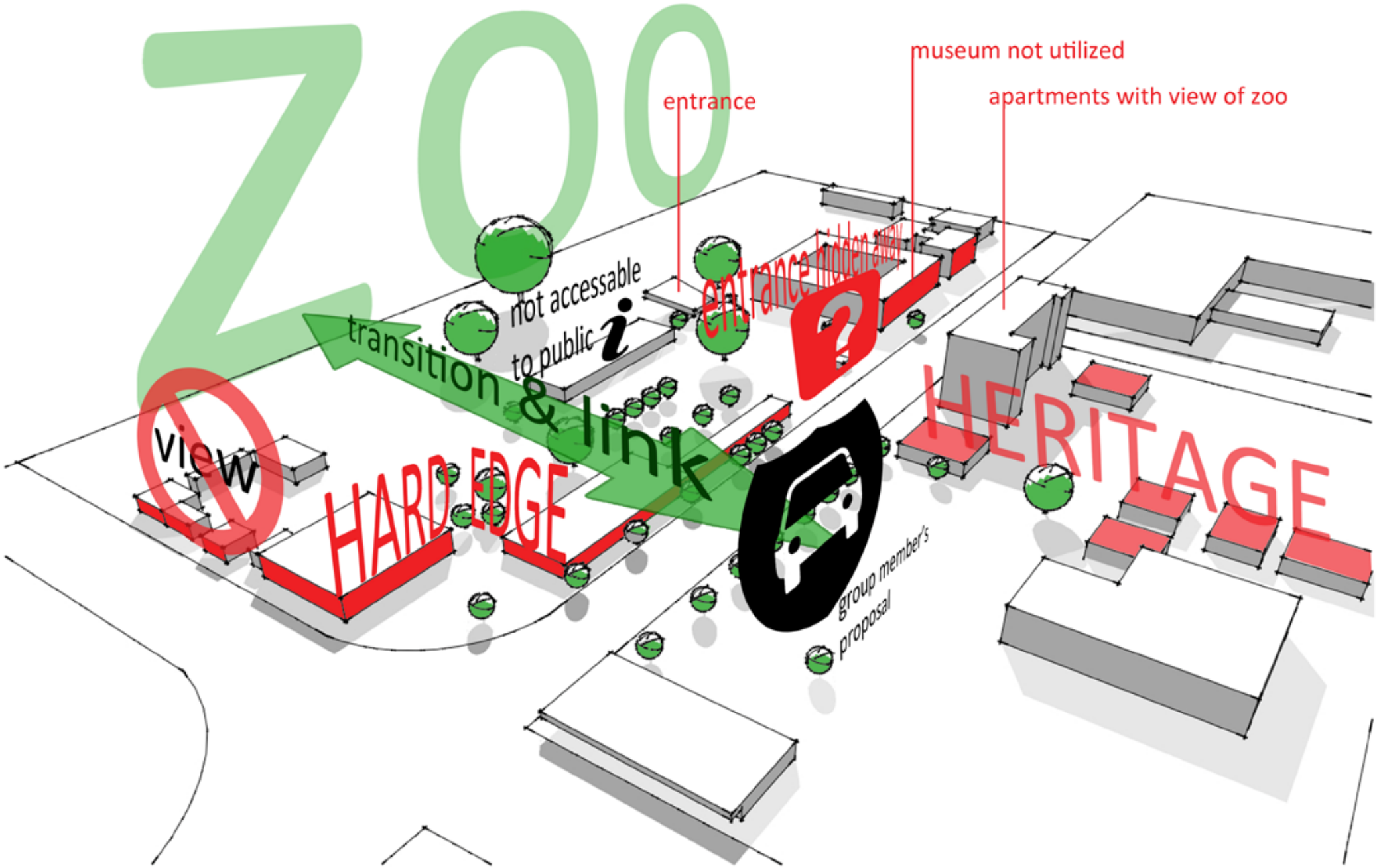


figure 25. 3d site analysis


boom street
(facing east)
curio sales stands
vehicle entrance to
dedicated zoo
parking area
natural surroundings
in and around zoo
Welcome
To The
National
Zoological Gardens
of
South Africa

pedestrian entrance to zoo

state museum

figure 26. site context indicated on panoramic photo. facing North

“One of the top 10 Zoos in the World needs a proper forecourt.”

(Prinsloo, J. 2010, during MProf. June exams)

figure 27. panoramic photo of zoo corner

THE "FACE"

chapter 3the proposal

3. THE PROPOSAL

3.1 PROBLEM STATEMENT

The entrance to the National Zoological Gardens' entrance lacks the presence and stature needed for a successful and international tourist attraction. The Northern gateway, defined by the Paul Kruger Street and Boom Street crossing is understated to the extent that visitors coming from the north might not even realize they have entered the city.

Paul Kruger Street chicanes over green hills into the city and sets up for a majestic entrance, but the impact is quickly lost when natural elements turn into the degenerating Northern suburb of the CBD.

It is at this junction that one fully experiences the dissociation of the natural elements to the North and the built environment of the city. The Zoo lies between these green hills and the bustle of Boom Street. With only a few trees on the sidewalks, nature seems to be an afterthought in the region.

The architecture and layout of the entrance to the zoo completely blocks the view that visitors might have of the natural elements contained by the Zoo and its surrounding areas.

The portion of Boom Street in front of the Zoo also lacks pedestrian orientated activity on the sidewalks, as well as at the entrance to zoo. It is vital to add an activity factor to this area in order to turn it into a truly recognized tourist site.

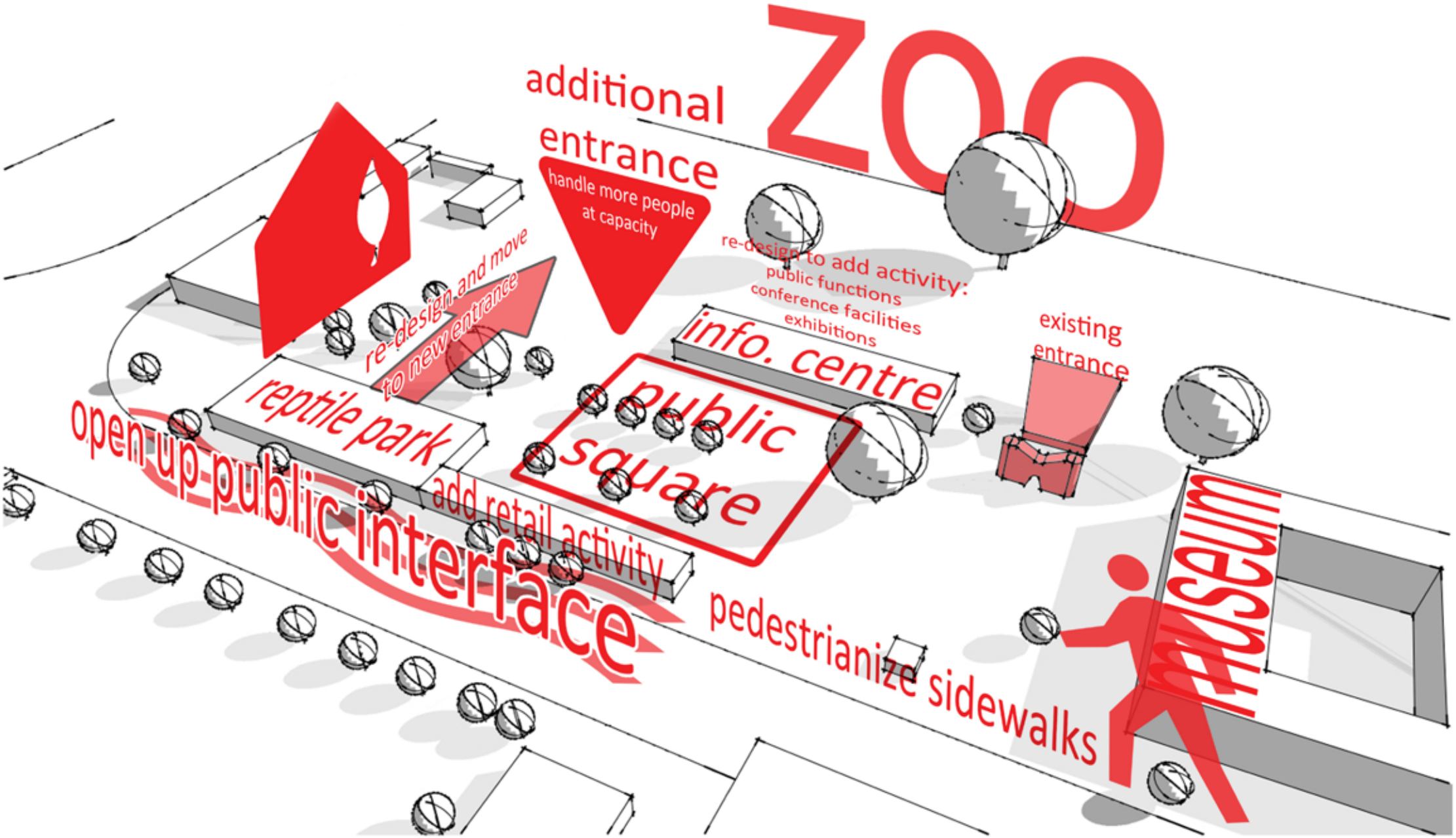


figure 28. 3d of proposed programme & intervention

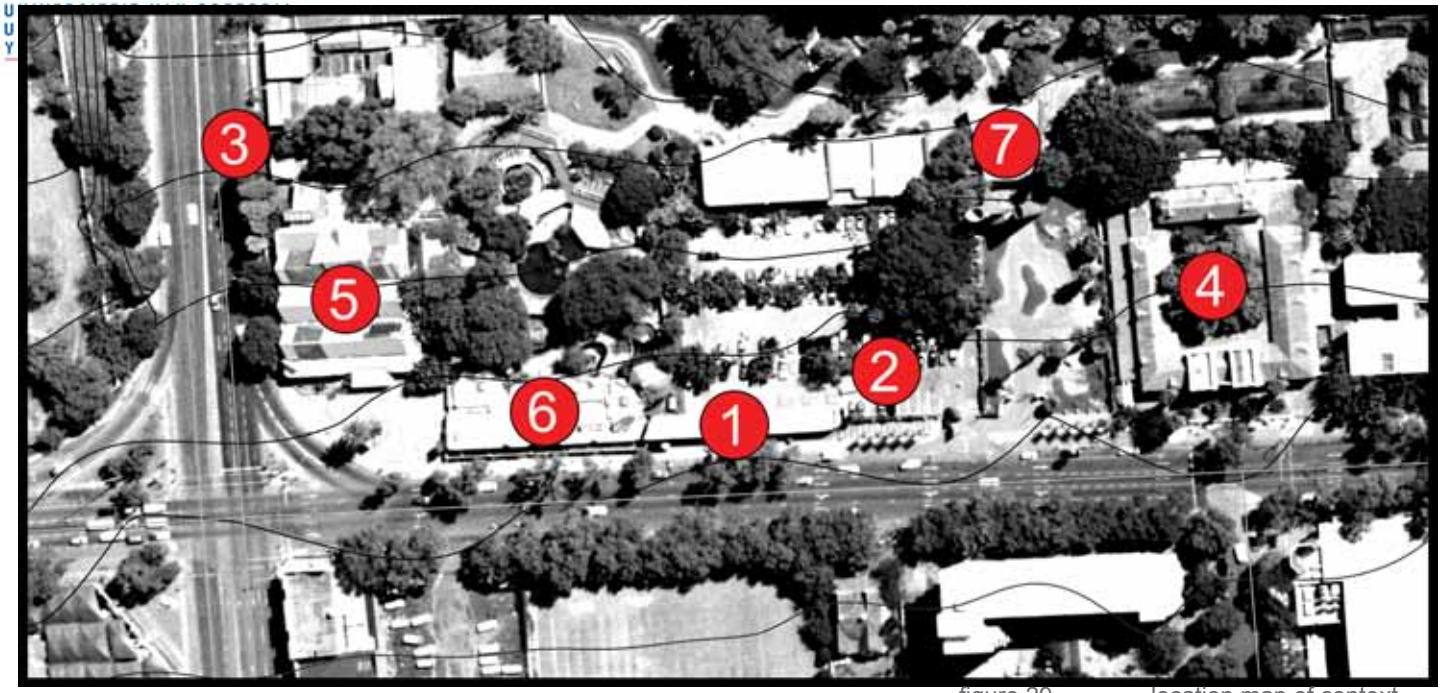


figure 29. location map of context

3.2.1 EXISTING PROGRAMME

Currently the chosen site hosts a series of buildings with different functions. All the buildings are associated with the Zoo and, except for the trade stalls (1), there are no public services or functions that are freely accessible from Boom Street. After paying the entrance fee, visitors have to pass through the gated entrance (2), in order to access any of the activities hosted by the Zoo. The Zoo is surrounded by a palisade fence(3), which evolves into the portal to the Zoo's parking (2). This is confusing for first time visitors. An integration of its entries, coupled with pedestrian activity and public function, in this boundary serves a much better resolution than to use up space that can be better utilized by the Zoo.

The State Museum (4) is obscured by high walls and gates and serves no public function. The information centre, which is only accessible from within the Zoo, is greatly under-utilized. It only serves as an auditorium for the Zoo itself and houses a few administrative offices. The back of the information centre forms the largest barrier between the parking lot and the zoo. The Aquarium (5) and Reptile enclosures (6), though both vital exhibitions at the Zoo, does a great injustice to the gateway into the city, as well as the Zoo. They are situated right up to the sidewalk against Paul Kruger and Boom Street, and forms a hard impenetrable edge that breaks down the legibility of the Zoo's entrance. The Zoo's main gate (7) is completely obscured by the Reptile enclosure, and also blocks any view of the natural softscaping that the Zoo offers.

It is apparent that zoos all around the world are moving into a new paradigm in terms of the activities and functions they provide. Zoological Gardens were originally built to house animals for the public's viewing pleasure. It was almost an inhumane spectacle, as animals were trained to perform tricks, while the actual care of the animals was understated to their entertainment value.

In the early 1980's, with the emergence of animal protection groups, emphasis was placed on changing the manner in which animals were treated at these facilities. In the past 30 years zoos have changed their focus to the conservation of the animals in their care and the protection of endangered species.

We are on the verge of yet another shift, as zoos start to engage in biological research and breeding programs to ensure the existence of thousands of animal species on our planet. More attention should be paid to public activities hosted by the zoos themselve, because these projects are only possible with the involvement of teh public sector.

The NZG's Strategic Plan states that it is one of their biggest ambitions to educate the public in matters of conservation and ecology. This seems ambitious as this information is only available to the general public by paying to enter the Zoo. Restricting this information is counter-productive to the Zoo's goals. By making the information freely available it will create opportunities to attract interested parties to their goals. Public perception of the Zoo will improve and more people will be educated on matters of conservation and other vital ecological issues.

3.2.2 PRECEDENT STUDY

Architects: BAU Architects

Project: Urban Zoo

Location: Tokyo, Japan.

This precedent was chosen as a study in programme development.

"The zoo, as a place where you experience live animals, has gone from being a garden with caged animals to a cultural experience. Similar to scientific museums or public libraries" (www.b-a-u.dk).

BAU architects suggests that the traditional zoological gardens, that previously only functioned as a weekend destination for the family, will now change into being an integrated part of modern life. "The future zoo will become a centre of knowledge, actively interacting with the surrounding society" (www.b-a-u.dk).

The project proposes vertical structures that will become environmental landmarks with views of the modern city. Most importantly, the proposal combines holistic biotypes with changing exhibitions, new media and scientific research in an urban context.

Urban Zoo hosts a series of public functions, both educational and entertaining, in order to attract more people into the zoo. These functions ultimately create a better public perception of the goals and desires of the zoo. This motivates public sector investment and participation of the local community in projects that the zoo initiates on a smaller scale.

figure 38. artist impression of urban zoo

figure 39. sections of urban zoo

figure 40. floor plans of urban zoo

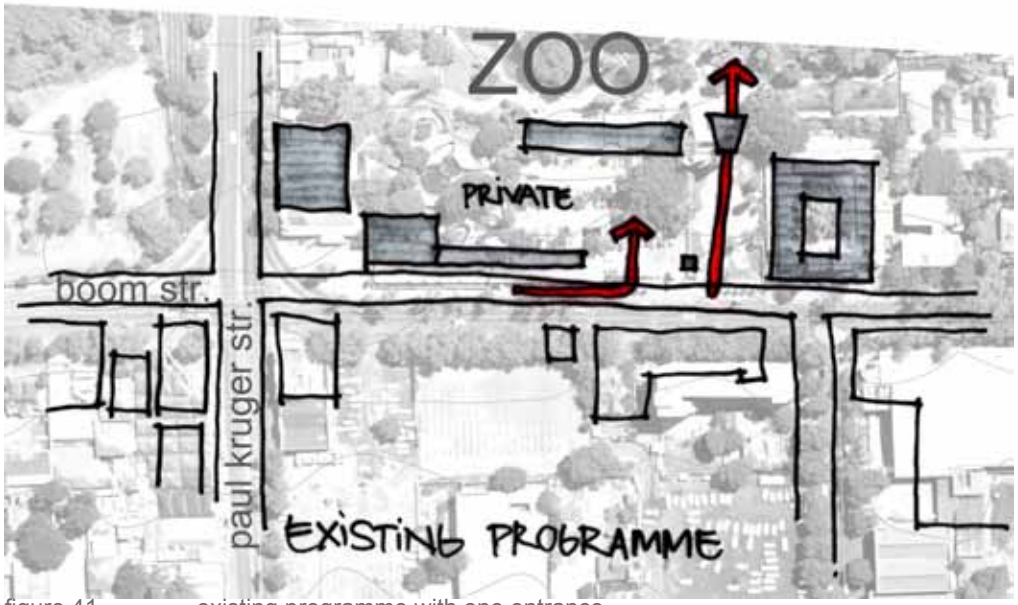


figure 41. existing programme with one entrance

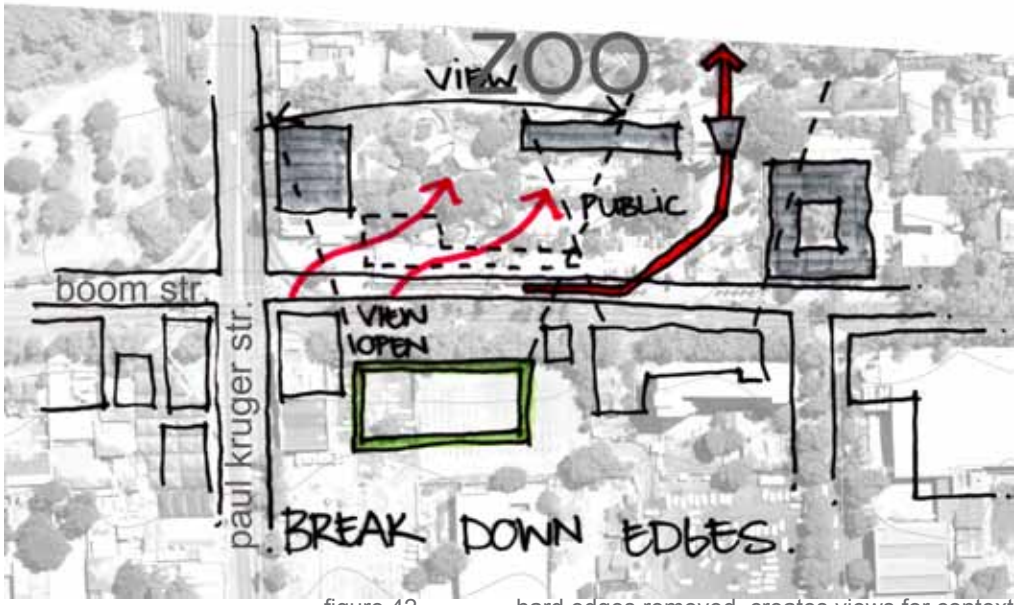


figure 42. hard edges removed. creates views for context buildings

3.3 PROPOSED PROGRAMME

The concern of the proposal deals with the issue of re-designing the “face” of the Zoo. This implies breaking down the hard edges, pronouncing the gateway to the city and the entrance to the Zoo, introducing 24hr public activities and publicizing the conservational aspect that the Zoo has at its core.

The Zoo is a landmark in Pretoria and the public interface should reflect that in an international way.

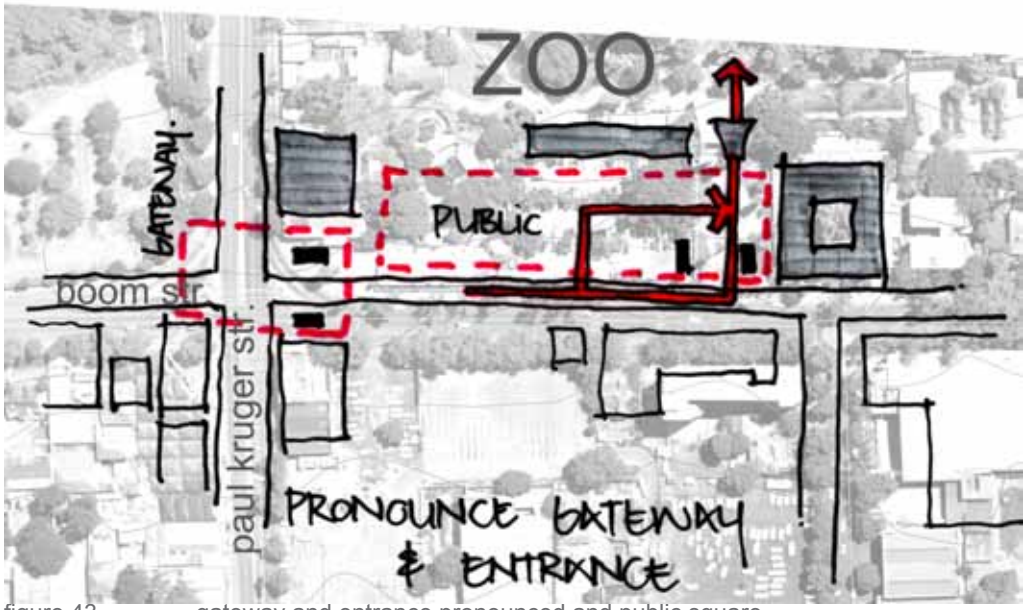


figure 43. gateway and entrance pronounced and public square added

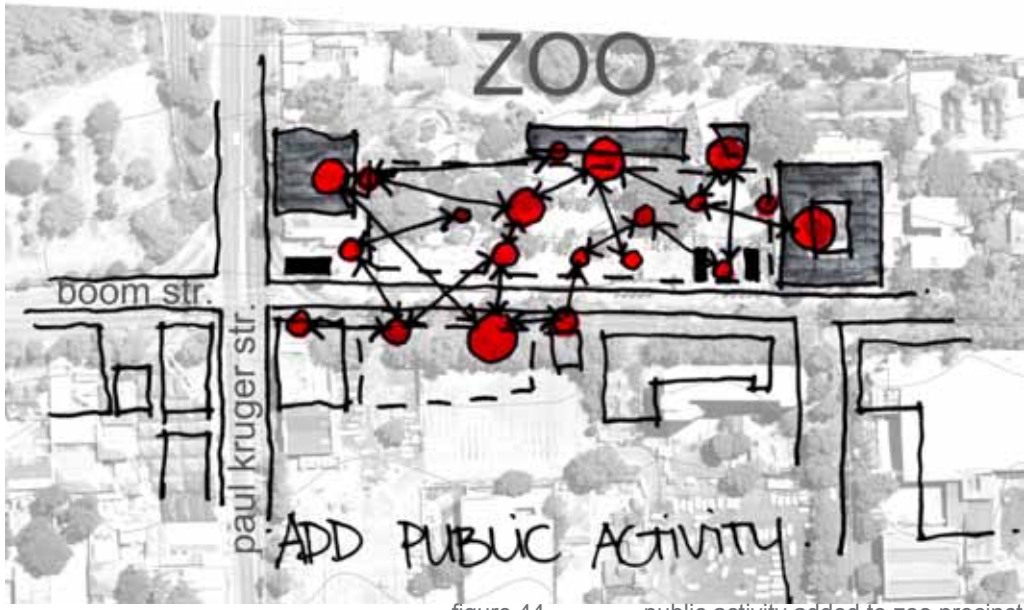


figure 44. public activity added to zoo precinct

3.3.1 THE PUBLIC FACE

As previously discussed, the public face of the Zoo along Boom Street lacks a pedestrian interface that is not only engaging, but will also draw people into the Zoo. Some informal trade happens on the Southern sidewalks, but the only trade activity offered along the Zoo's edge is the curios sales next to the existing zoo parking.

"The formalising of informal trade is pivotal in addressing South Africa's imbalanced first-third world existence. Without the ubiquitous mini-bus taxis", and the trade activity associated with them, "our local economy would be grossly impoverished and the social and economical lives of the majority of South Africans severely curtailed" (Lipman, 2009, 10 Years 100 Buildings, p. 140).

The proposal introduces covered informal trade along Boom Street. This will engage the project with the general public, create income opportunities for the local community, and establish a pedestrianised interface to the entrance to the Zoo. The informal trade will be linked with new facilities for the curios sales. This will form a permeable entrance to the new retail square. All of these features will combine to create an open and inviting approach to the zoo experience.

On the South-Eastern edge of the Zoo's grounds, four empty greenhouses are situated between tall trees and protected by the Prinshof School to the South. These greenhouses create the perfect setting for a local community project to grow and sell their own fresh produce. All the produce can be sold in the informal market at the Zoo, or to the restaurants and cafés in the public square. As an incentive to the Zoo, all the waste materials collected from the markets and restaurants can be used as feed for animals, or go back to composting at the greenhouses. This initiative will not only empower the community members involved in the project, but can also serve as additional exhibition space for school trips visiting the Zoo.

figure 45. public activity added to zoo precinct

3.3.2 THE PUBLIC ZONE

The transitional space between the hardscape of the city and the softscaping of the Zoo is a vital area in the proposal, and will greatly enhance the inclusion of public functions. An open public square and a retail component will attract more people into the area, and facilitate the public "face" of the Zoo. This will create opportunities for 24hr activity in the precinct, and increase the urban density of the area, as proposed by the urban framework.

When the public features are coupled with zoo functions, the public zone becomes more than a 'stop-and-shop' experience; it adds an instructive factor that benefits ecological awareness and the Zoo's efforts to educate the community.

PUBLIC SQUARE

The public square forms the unifying element in the proposal, as all other interventions are accessible from here. More importantly; it is here that the public can gather to not only enjoy views of the natural environment in the zoo, but to relax and break away from the frantic city.

Various retail shops and restaurants will spill out onto the square, offering visitors a unique shopping and dining experience in the zoo environment. Ultimately the square will form the forecourt, that the Zoo so desperately needs, in order to create a change in public perception.

"Squares and plazas are now becoming more animated and are probably the most utilized type of public space, especially when they are inhabited by cafés, bars and markets." (Gaventa, 2006, p.18)

"In a global marketplace the image of individual cites is increasingly important. Governments are encouraging city authorities to work with the private sector to invest in urban design and regeneration, and new city squares are providing the focus for this activity." (Gaventa, 2006, p.23)

figure 46. artist impression of public square

figure 47. entrance diagram

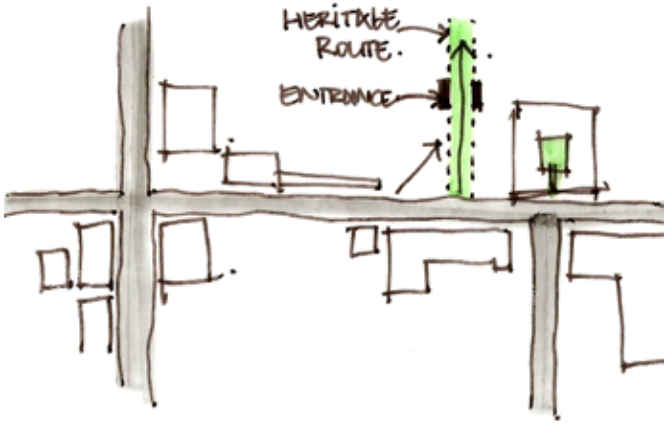


figure 48. reptile park diagram

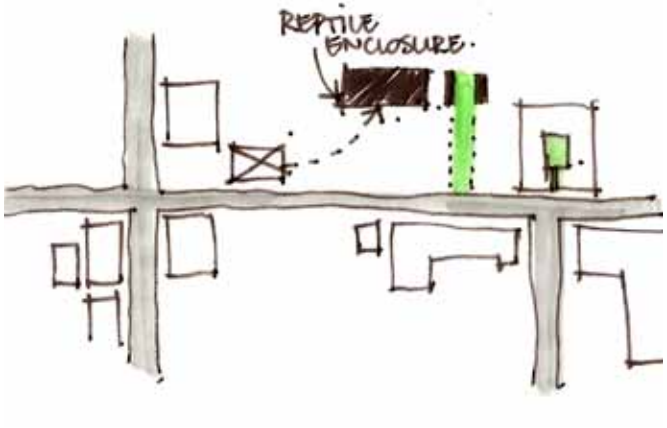
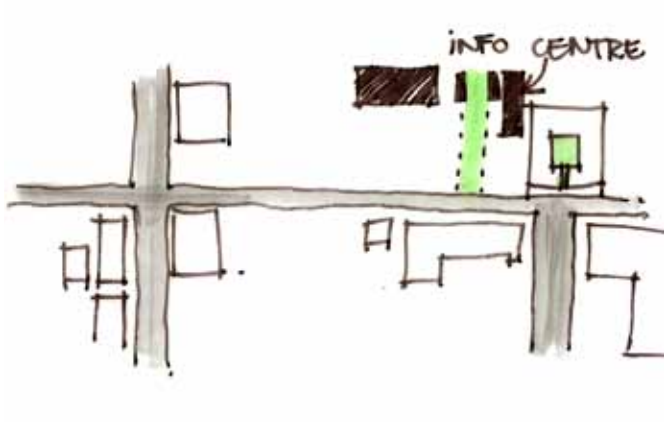


figure 49. information centre diagram



ENTRANCE

On peak days such as public and school holidays, the Zoo can receive up to 16 000 visitors a day. Even though this is extremely advantageous to the Zoo, a problem exists with handling the mass volume of people moving into the Zoo. The single entrance to the Zoo is unable to efficiently deal with the queuing of so many people, processing of ticket sales and security checks at the gates. The proposal introduces an improved centralized entrance, able to carry the maximum number of visitors, while offering them an entertaining experience. Visitors can choose to move through the reptile park that spills out onto the new entrance, or move through the square directly to the entrance. The entrance is situated on the Heritage route that has been present at the Zoo since its inception, and forms part of our development framework. It hosts heritage buildings and runs parallel to the State Museum.

REPTILE PARK

The existing Reptile enclosure, situated next to Boom Street, will be demolished and new facilities will be proposed next to the new entrance. This will break down the built barriers that currently hide the Zoo's entrance from the public, and create a more open approach to the Zoo.

Recently, the Zoo built new penguin and seal enclosures, to a very high quality, that provides visitors an unprecedented experience in the Zoo. The new reptile park should equal this quality of exhibitions, and provide an unique and enriching experience to everyone. The new enclosure will be linked to the new entrance of the zoo, and will be freely available to the general public from the open square. This is done to create an inviting atmosphere that will draw people into the area and break down the preconceptions that the zoo is structured around making money by showcasing caged animals.

INFORMATION CENTRE

The new information centre will be located to the East of the entrance and is also accessible by the public.

The centre will host information on the exhibitions currently available inside the Zoo, but also on future plans and interventions that the Zoo will be involved in.

The aim is to attract and educate people in the ecological issues that the Zoo concerns itself with, and hopefully get them involved in these projects. The roof of the information centre, which links up with the restaurant and gallery space on the first level, will serve as a viewing deck for the public to relax on and enjoy views of the Zoo.

figure 50. state museum diagram

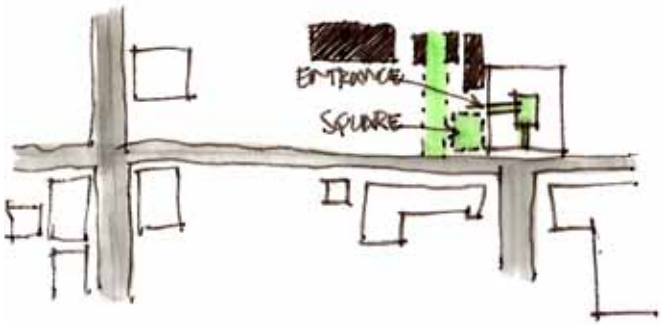


figure 51. offices diagram

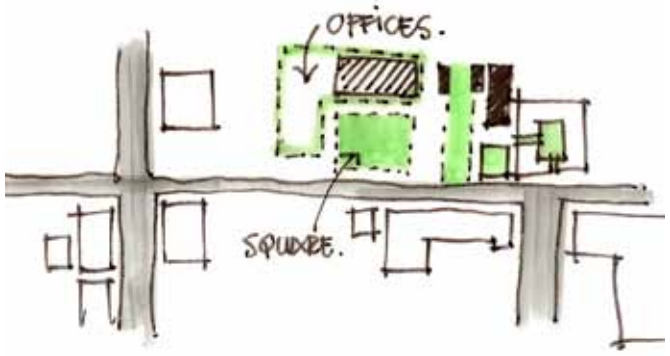
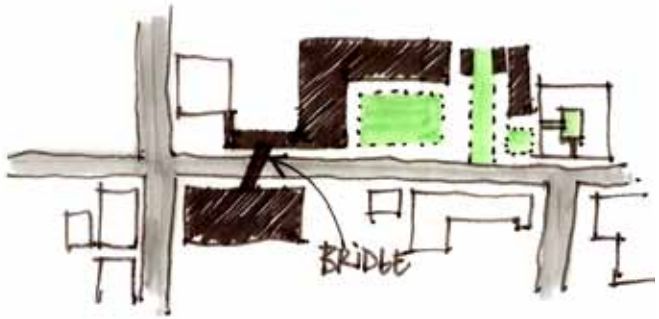


figure 52. linkage diagram



THE STATE MUSEUM

It is rumoured that a proposal to renovate the State Museum has been drawn up, and re-program it to serve as the new Life Sciences Museum. Unfortunately information on the proposal is very vague, and no clients responsible for the funding of this project can be identified. The thesis proposal responds to the Museum by proposing that a newer addition to the museum, along its Western edge, be demolished to expose the side entrance to the Museum. This entrance will lead directly into the public square in front of the new entrance. This space will serve as a heritage square, responding to surrounding heritage houses, routes, the museum, and the existing trees on site.

OFFICES

The Zoo has a close affiliation with many governmental and non-governmental organizations associated with conservation, animal protection, ecological issues and research foundations. The proposal creates a platform for closer integration between the Zoo and these entities by providing office space for them on the premises. These offices can be integrated into the information centre, so that the general public can access information on them as well.

LINKAGE

Andries Haasbroek (MProf. 2010) proposes a city parking lot on the open lot South of the Zoo entrance with specialty parking for the Zoo. The parking lot and the new Zoo facilities will be linked with a pedestrian bridge crossing Boom Street.

The bridge will exit the parking structure on the first floor and re-enter the Zoo on top of the informal trade structures. Here visitors will be led over a walkway, with exceptional views of the Zoo, that lead into a restaurant and exhibition gallery in the main building, next to the public square. From here visitors can walk through the building to the information centre, or travel one floor down to access the retail and square facilities.

3.3.3 PRECEDENT STUDIES

Architects: Albonica, Sack, Mzumara Architects and MMA Architects

Project: Faraday Market

Location: Johannesburg CBD, South Africa

This precedent was chosen as a study in programme.

"The architectural intervention is a combination of existing and new structures". "New and old have been combined with sensitivity, extending from mindful attention to the existing to independent, unobtrusive life for the new." (Lipman, 2009, 10 Years 100 Buildings, p. 142)

The Faraday market functions as a mixed use development catering for all the needs of visitors, commuters, shopkeepers and the surrounding community.

Facilities include shelters for multi-traders, administration, storage, a semi-covered market and shelters for taxis and commuters. The site layout is logical and does not conform to a rigid grid, yet each building occupies its own territory and feel, while relating sensibly to the buildings around it.

It is a prime example of an urban market being used to the maximum of its capabilities, in order to create a place that is sensitive to South Africa's culture, and at the same time expressing its own sense of place.

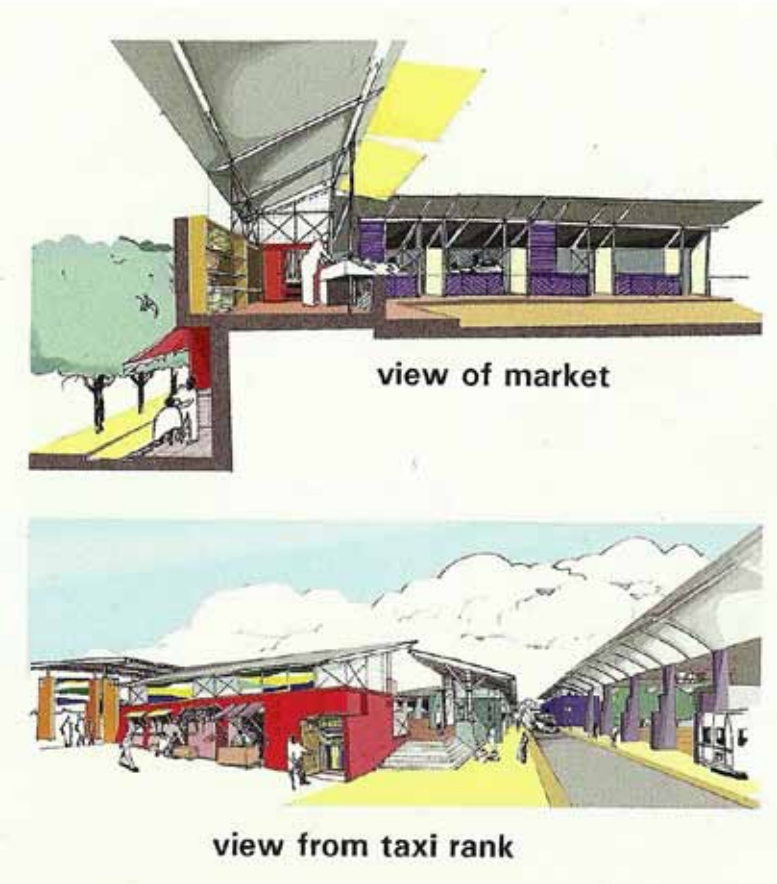


figure 53. artist impression of market

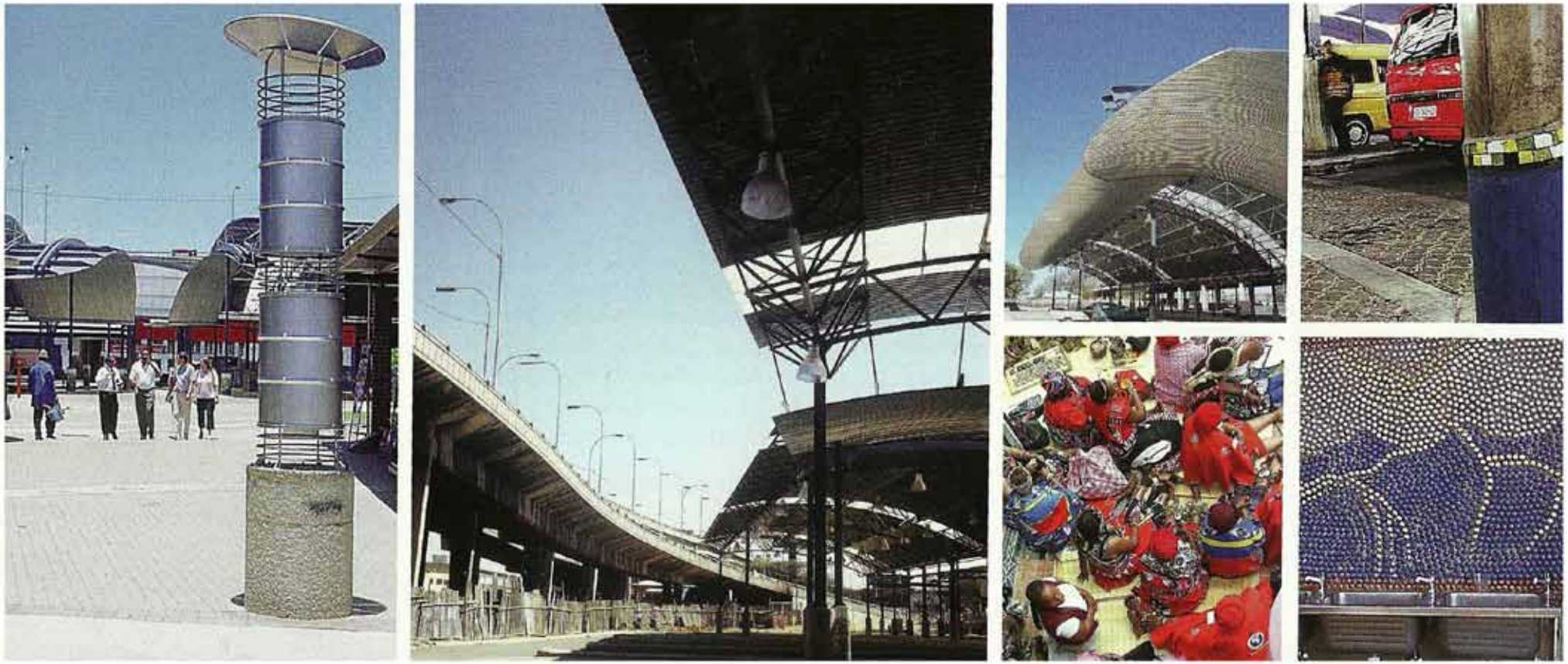


figure 54. photographs in and around market

Architects: LAB Architecture Studio

Project: Federation Square

Location: Melbourne, Australia

The precedent was chosen as a study in programme for urban squares.

"This has been a unique opportunity to create a new urban square in the heart of an already developed city. Its proximity to transport, tourist, and civic facilities has added to its popularity, as demonstrated by the fact that in the first year alone 6 million people visited Federation Square." (Gaventa, 2006, p.18)

The project is a mix of galleries, cinemas, restaurants and venues in a cluster of buildings formed around an irregular civic square.

With its versatile sloping topography and raised planters, the square forms the focus of the development. The topography, planters, and surrounding cafés offer ample seating for people passing by, having lunch, or enjoying a music concert. The square is a formal events arena, and also caters to the needs of everyday users using the space as a stop between work and their personal lives.

The project acts as a catalyst for future developments, stitching back together two halves of the city that were previously disjoined by railway tracks that run across the squares current site.

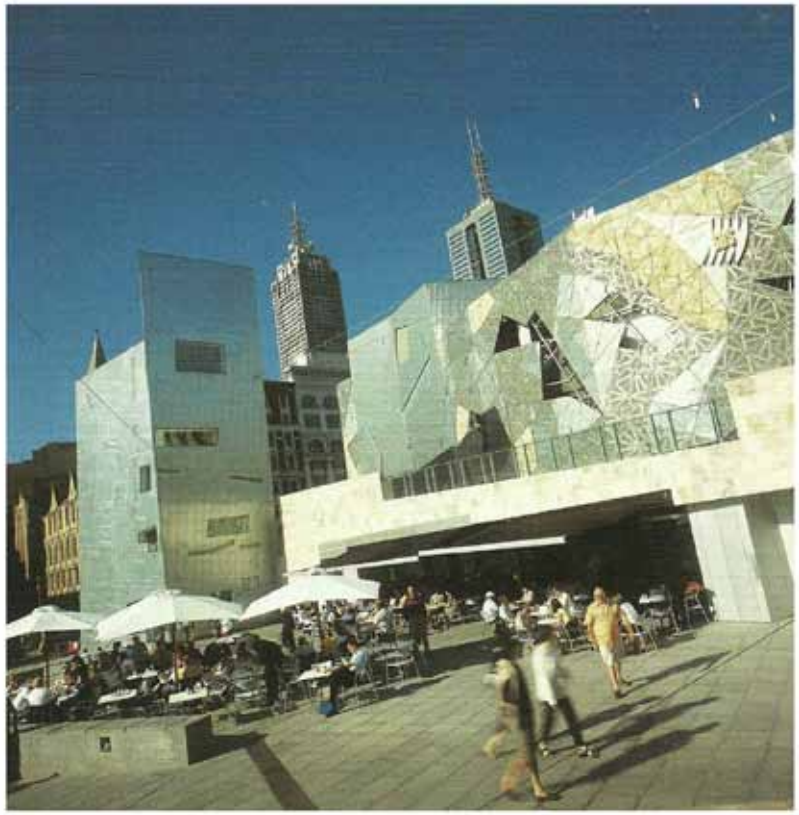


figure 55. photograph of retail in square

figure 56. photographs of federation square

"The fundamental sources of all our knowledge still remain rooted in nature". (Crowe, 1995, p.4)

figure 57. natural landscape

chapter 4theory

"Because the city and its architecture is an extension of culture, it cannot be considered natural. But does that rule out the involvement of human nature in its creation? By extension of these definitions, we should conclude that the city cannot be considered either strictly natural or wholly artificial." (Crowe, 1995, p. 213)

4. THEORY

4.1.1 NATURE, ARCHITECTURE and THE CITY

There is no doubt that architecture has a long standing relationship with the natural world. Whether it is imbedding buildings into the natural fabric of a site or using architectural elements to emphasize and frame views of the surrounding landscapes, nature plays a big role in the conceptual design of many projects all around the world.

Frank Lloyd Wright's Falling Waters is cut into the mountainous rock and seems to have evolved with its surroundings, where as Le Corbusier's Villa Savoye is set in a lush field, surrounded by a forest of trees. The gentle articulation with which these architects touch the earth seems lost when it comes to most developments set in an urban environment.

Buildings, set in concrete, tower over tarmac streets filled with gas guzzling vehicles and fast moving pedestrians on the sidewalks. Here the architecture becomes a space creating tool, to host the activities required by our cultures.

Our cities evolve as the generations living and working in them evolve, but they evolve from a need for non-natural activities and services. These needs arise as they are introduced to us by the Western world, and over time became a part of our culture. Therefore it is possible to say that our cities are an extension of our culture, playing host to people driven by material desires, instead of their natural needs.

figure 58. falling waters set into the natural landscape

figure 59. villa savoye framed by the natural surroundings

This draws back to Crowe's idea of man-made nature, where green parks and natural elements placed in the city are not seen as pure nature, but an outreach to re-connect our culture with the natural roots from where it stemmed.

People will always have a strong connection with nature, therefore it is vital to introduce the man-made nature into our cities. The same applies to the Zoo, which is seen as the largest green lung in the Pretoria CBD.

The natural elements contained within the Zoo's grounds, as well as the tree covered hills on its Northern edge are however cut off from the urban fabric. Walls built to the street edge, and solid facades block the view of the scenery. These green elements should become a part of the city, branching out and crossing over to the hardscape of the built environment.

It is the architecture that defines these perimeters, and so it is the architecture that has the power to remove these constraints. Architecture should become the transition between nature and our cities, serving as a catalyst to re-establish nature as an integral part of our cultures, and ultimately our knowledge of the world around us.

"We reveal our presence in the world by creating places – buildings, towns, villages, farms and cities. They are set either directly or indirectly into the world of nature, and they serve us as a kind of artificial nature", or man-made nature. "One that we are able to control just as the gods of our remote past were seen to control the natural world that lay outside the door". (Crowe, 1995, p. 4)

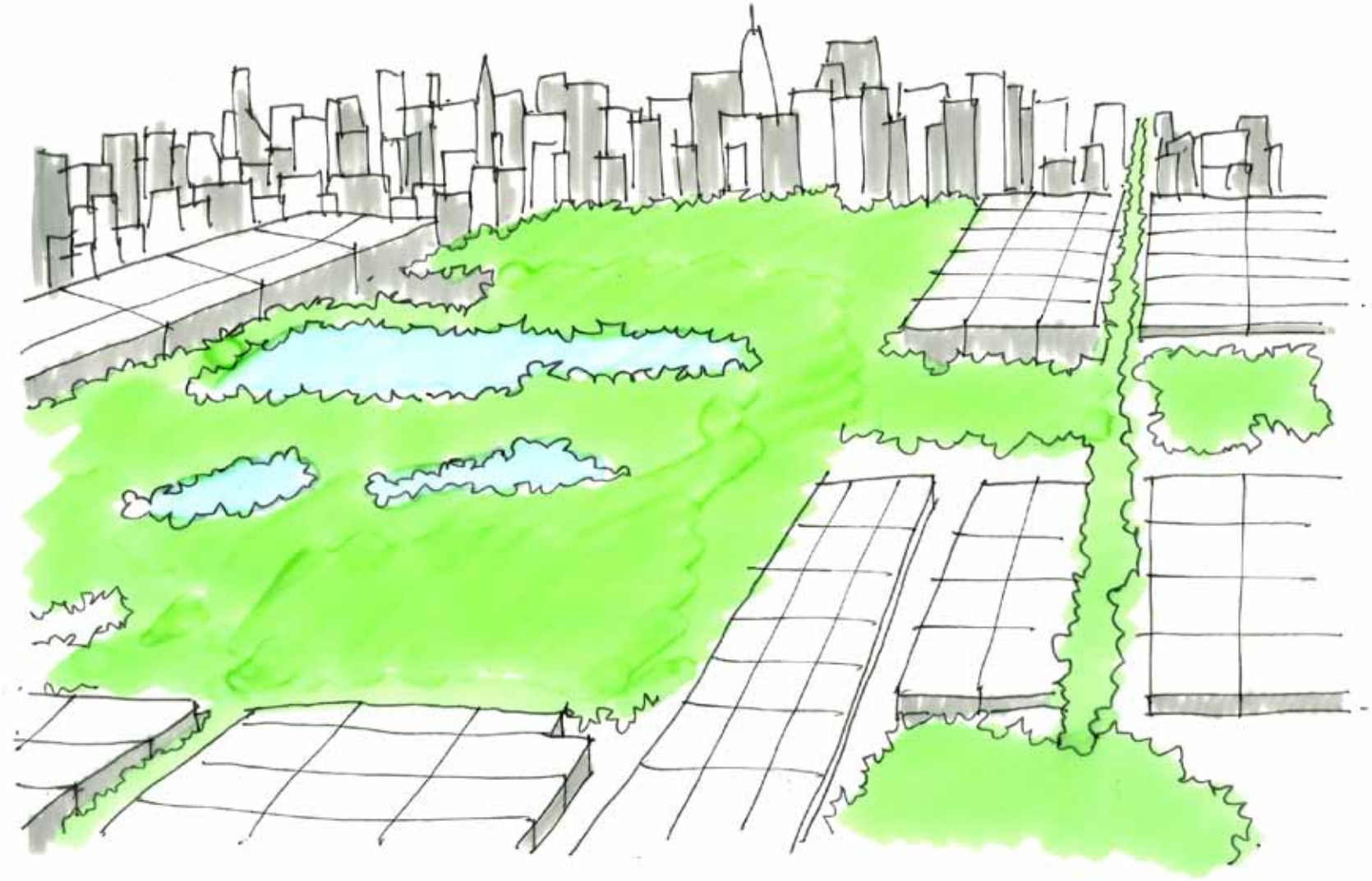


figure 60. sketch of natural elements in city

4.1.2 PRECEDENT STUDY

Architects: Kerry Hill

Project: Singapore Zoo Entrance Plaza

Location: Singapore

This precedent was chosen as a study of architecture within a natural landscape.

"The entry plaza of the zoo, designed in 1999 by Kerry Hill Architects, is an important landmark in Singapore architecture. It is both contemporary and in keeping with the place, and its calm open-air spaces forms an appropriate prelude to the open zoo and its natural setting. The entry organises functions of ticketing, arrival from different transport systems and support services, with its portico, plaza, courtyards and corridors connecting in a unified whole." (Ali, 2007, p. 1)

The Singapore Zoo is located in the central, forested part of the city, and is bordered by a large water dam. These two natural elements make it the ideal location for an open zoo.

The entry to the grounds is hidden amongst the forested area, and is successful in being unobtrusive, quiet and spontaneous. Once inside the grounds, the large angled roof, over the portico, reinforces the sense of arrival and hints at the forest reserve that lies beyond. The natural setting of the project is showcased, throughout the plaza, by a strong relation between indoor and outdoor: as nature is always evident no matter where one is.

The structure of the main plaza is a testament to 'simplicity is beauty', as there are no decorative motifs evident anywhere. This would draw attention from the surroundings and not lay focus on the natural beauty. By being simplistic and not hiding how it was made, the structure and materials add to the beauty of the building. The light and porous feel to the development compliments the natural landscape, as nature and architecture grow together to deliver a truly enchanting atmosphere.

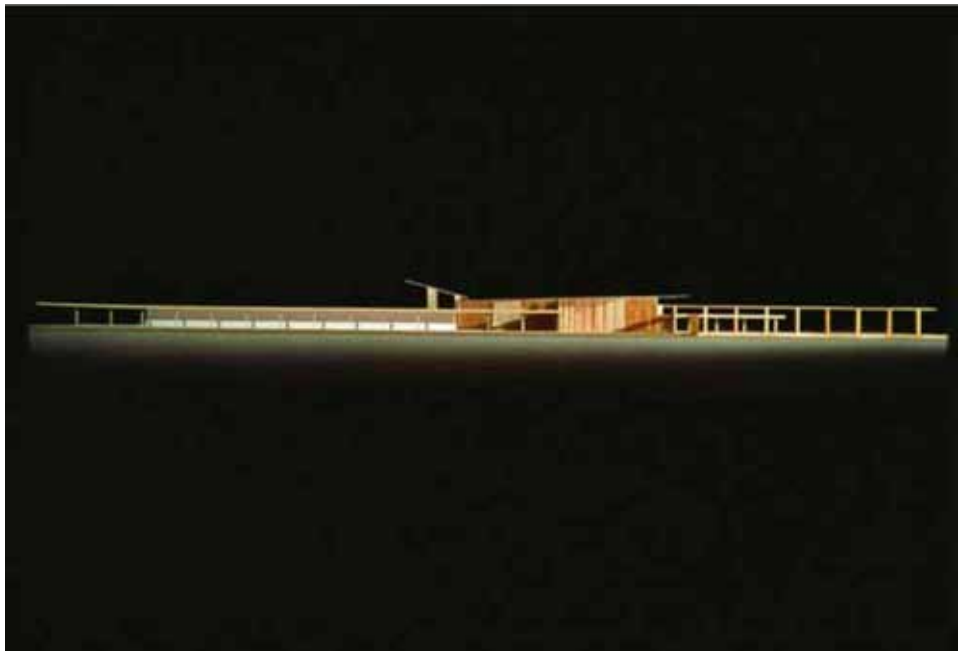


figure 61. architects impression of entrance plaza

figure 62. natural surroundings of Singapore zoo

figure 63. singapore zoo entrance

figure 64. indoor/outdoor

figure 65. simplicity of design

4.2 PATTERNS

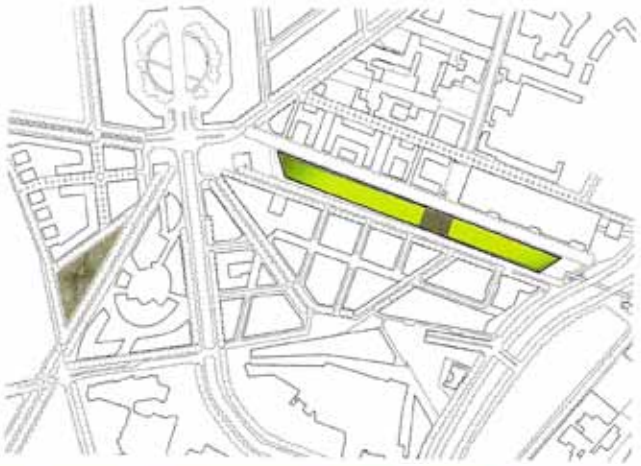
"When you build a thing you cannot merely build that thing in isolation, but must also repair the world around it, and within it, so that the larger world at one place becomes more coherent, and more whole; and the thing which you make takes its place in the web of nature, as you make it." (Alexander, 1977, p. xiii)

Christopher Alexander (1977) states that in our built world we find problems, or patterns, that repeat themselves over and over again when faced with design challenges. These patterns can be broken down into instructions that may help to solve challenges in creative ways. This section will deal with patterns evident in the proposal, and the theory behind them.

4.2.1 ACCESSIBLE GREEN

"People need green open places to go to; when they are close they use them. But if the greens are more than three minutes away, the distance overwhelms the need."

(Alexander, 1977, p. 305)



A problem arises when people living in the city, or even in suburbs, are not situated within three minutes from public green spaces. This is especially evident in the Northern region of the Pretoria CBD. The region is bordered by green hills to the North, but this is inaccessible to the public and parks to the South and East of the city are restricted. To ensure that everyone works and lives within three minutes from these landscapes, a lot of small public green spaces need to be introduced all over the city.

Professor Brian Hackett (1983) states that "perhaps you will agree that humans are still anatomically and physiologically mammals, even if our ability to think and behave has gone beyond other mammals. A fact that is symptomatic of nearly all mammals is that they live amongst vegetation. So, the question must be asked: whether we should aim for some kind of urban landscape in which we are close to elements of soft landscape for much of the working and recreational day?" The answer is definitely yes.

figure 66. tilla durieux park in Berlin

4.2.2 GREEN STREETS

"There is too much hard asphalt in the world. A local road needs a few stones for the wheels of the car; nothing more. Most of it can still be green." (Alexander, 1977, p. 267)

In most cities, concrete or asphalt makes up more than 65% of the area. This has detrimental effects on the local environment, micro climates and also the general well being of the people who live and work in these areas. In perfect conditions, streets and sidewalks could be covered in grass, with big lush trees planted along them for shade. Unfortunately, in city centres, where movement is often dictated by vehicles, this is not as easy. However, plans can be made to minimize vehicular traffic on streets. City parking lots can move cars off the sidewalks and restore them to pedestrianised areas. Parks and lawns can be recessed from the street to give children an area to play. Trees can be planted on sidewalks and in squares to create shade and places to rest.

4.2.3 ENTRANCE TRANSITION

"Buildings with a graceful transition between the street and the inside are more tranquil than those which open directly off the street."
(Alexander, 1977, p. 549)

Alexander argues that people adopt a style of "street behaviour" while walking on sidewalks. When they move into another space, their behaviour changes to something more appropriate to that environment.

This change is only possible if there is a transitional space that facilitates this transformation in the user. The path on which people move between the streets and a building is the all important vehicle for this change to occur. This path has to lead through the transitional area, and be emphasized by a change in light, sound, direction, surface texture, level, gateways, and most importantly, change of view.

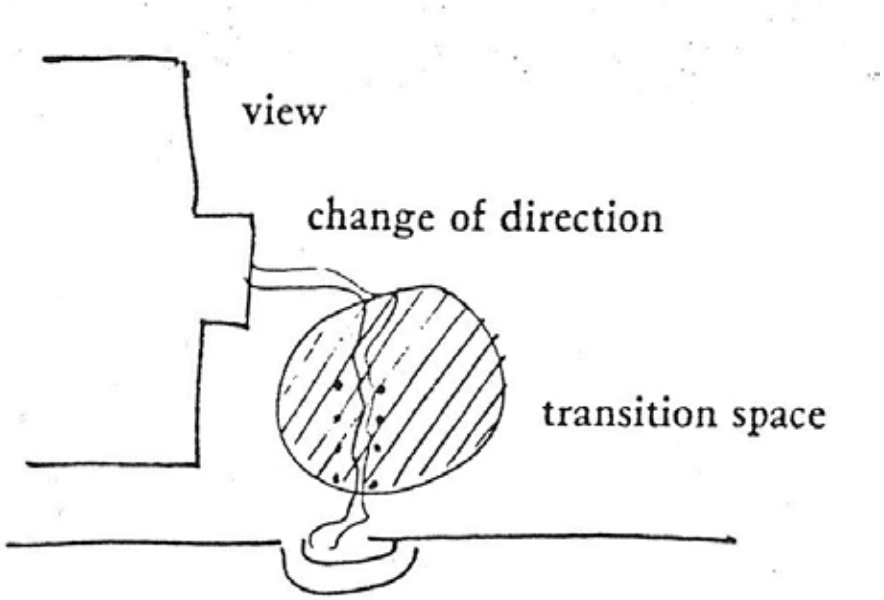


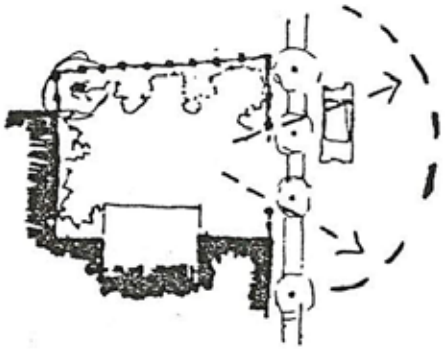
figure 67. sketch showing transitions between spaces

“A town needs public squares; they are the largest, most public rooms that the town has. But when they are too large, they look and feel deserted.”
(Alexander, 1977, p. 311)

4.2.4 SMALL PUBLIC SQUARES

It is only natural that streets, with pedestrian activity, will swell out where there is the most activity. It is at these points where public squares are the most successful. A tendency has been noted that these squares are designed too big, and this leaves people feeling isolated inside them.

As a rule, Alexander suggests that public squares should have a diameter between 18 and 20 meters. This is based on the distance that a person’s face is identifiable, a human voice is audible and the area per person needed for a sense of belonging. So the aim would be to make public spaces much smaller than one would at first imagine, this will directly improve the quality of the space and the experience inside it.



Terrace and street or square.

Square and vista.

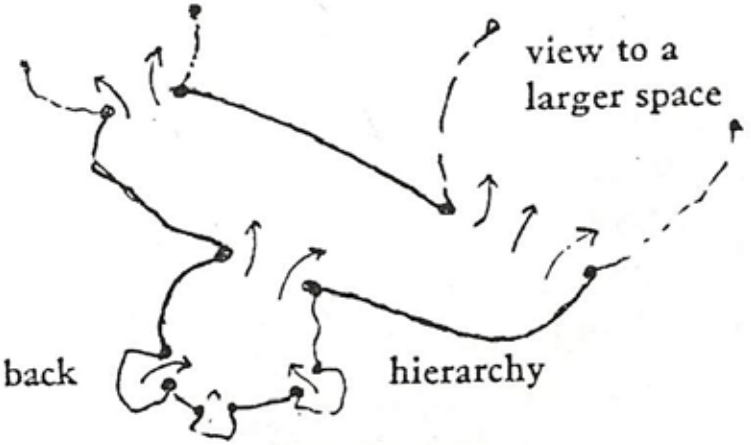


figure 68. diagrams showing hierarchy of different types of open spaces

"Outdoors, people always try to find a spot where they can have their backs protected, looking out toward some larger opening beyond the space immediately in front of them."

(Alexander, 1977, p. 558)

4.2.5 HIERARCHY OF OPEN SPACE

People do not sit facing brick walls. In short, this simply implies that a space inhabited by people should have a protective barrier behind them, and a view in front of them. This tells us that the building becomes the backing to the square,while the square opens up to a view.

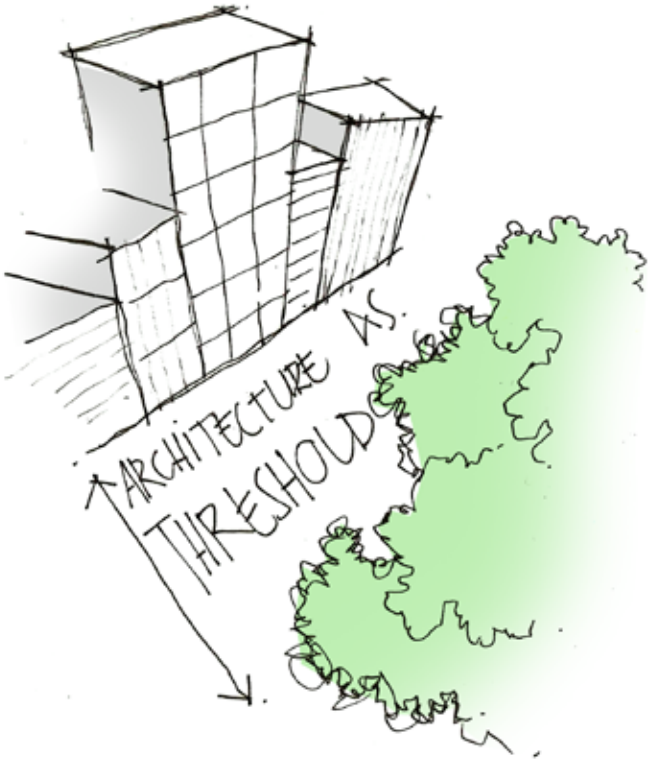
figure 69. juvet landscape hotel, Norway. Hotel set in natural surroundings

"Without the recognition that the city is of and within the environment, the wilderness of the wolf and the moose, the nature that most of us think of as natural cannot survive, and our own survival on the planet will come into question."

(Botkin, 1990, p. 167)

chapter 5 theoretical concept & strategies

figure 70. architecture as threshold between city and nature



5. THEORETICAL CONCEPT AND STRATEGIES

The following chapter documents the process of a design solution and discusses the various factors which were taken into consideration to formulate the concept.

5.1 THEORETICAL CONCEPT – NATURE vs. CITY

Urbanization in the Western world has always been coupled with the exploitation of nature by man. In Africa, especially in its Southern parts, nature plays a greater role in the development of our work and live spaces, but is still dissociated from our urban fabric.

The concept of this intervention is the play between the city and nature. Nature is signified by horizontal elements, spanning vast areas and covering the ground to promote life. The city on the other hand is represented by tall horizontal elements, spanning upwards to increase usage and floor space. The concept aims at interweaving these two elements in order to create a green urban space that is not only sympathetic to the natural world around it, but also delivers an enriching and active urban environment.

"Without the recognition that the city is of and within the environment, the wilderness of the wolf and the moose, the nature that most of us think of as natural cannot survive, and our own survival on the planet will come into question." (Botkin, 1990, p. 167)

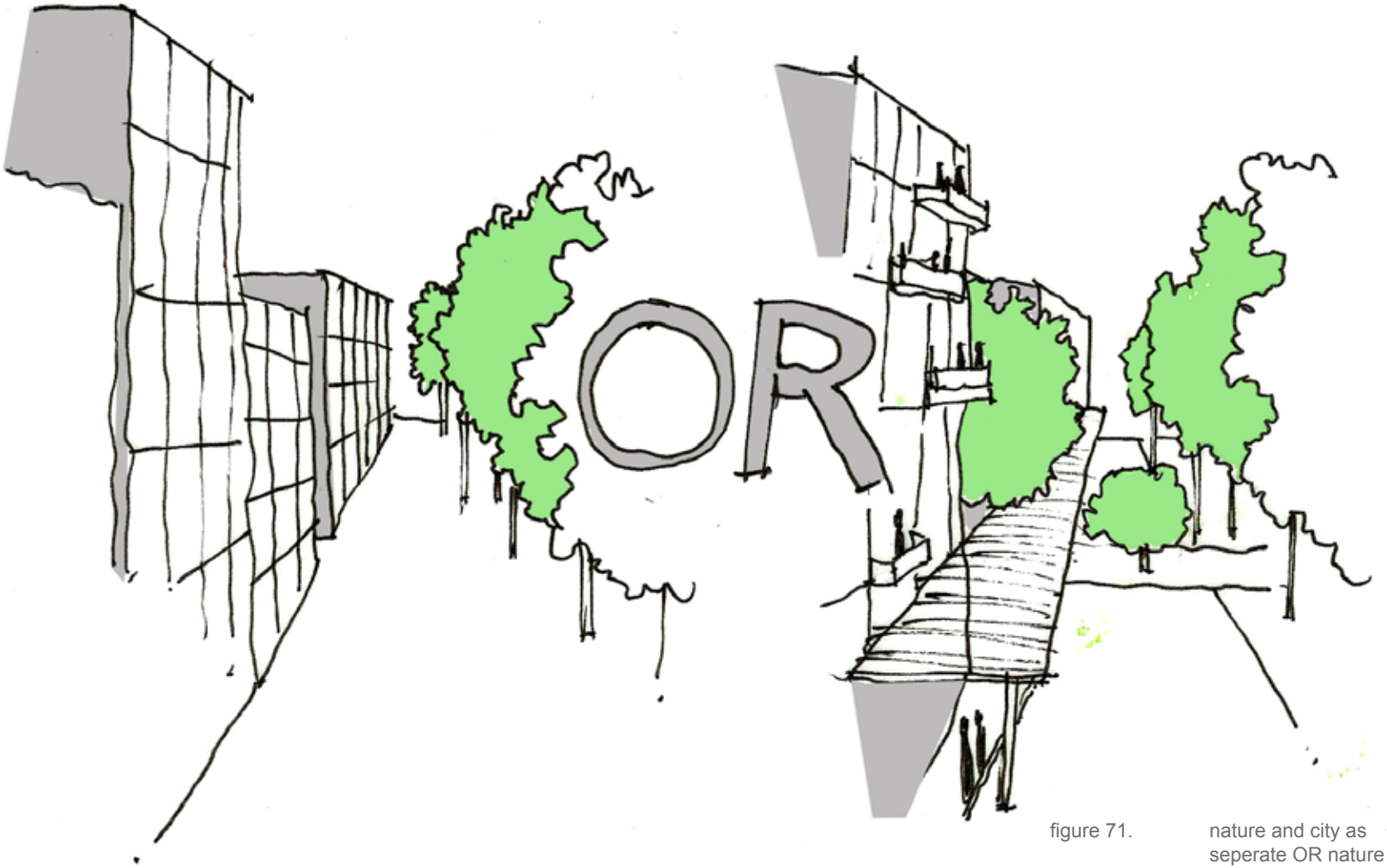


figure 71. nature and city as seperate OR nature integrated into city

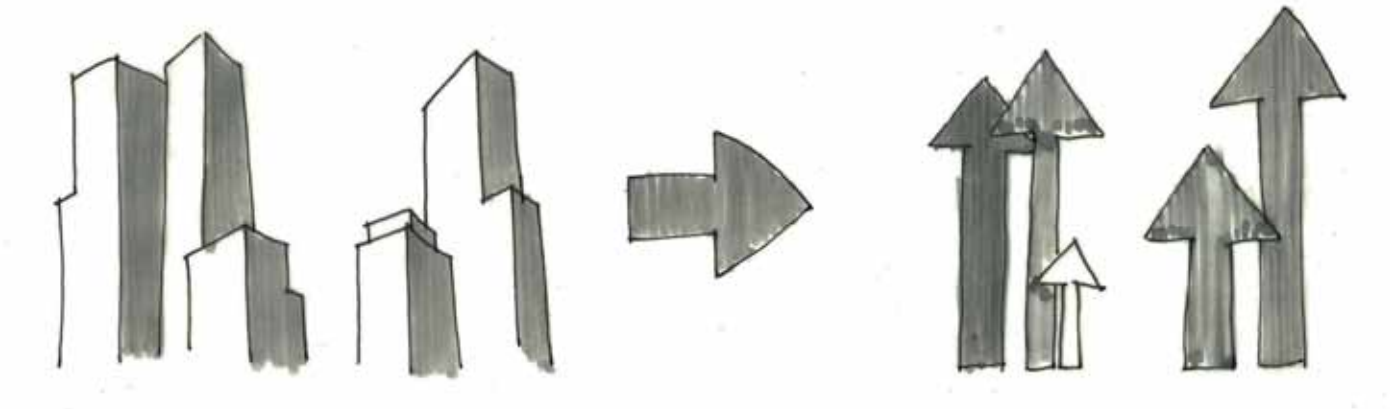


figure 72. the architecture in the city portrayed as vertical elements

5.1.1 VERTICAL=CITY

Norberg-Schultz states that a phenomenological notion of place is comprised of the landscape (natural) and the settlement (man-made). This settlement shapes man's understanding of the natural environment, forming a cultural landscape (Norberg-Schultz, C. 1980. P. 52). Through the exclamation of the vertical elements, that represent the man-made settlement, we become more aware of the nature around it. It frames the landscape and adds praise to the natural flow.

These vertical elements form viewpoints in the city fabric that act as visual points of identity while visitors and locals travel through the city. This is especially important at the Northern gateway of Pretoria, as the area is understated and lacks the legibility of an international tourist precinct in the CBD.

Vertical elements can draw people into an area and focus their attention on certain aspects of the development, but almost as important, it guides visitors through the architecture. It becomes the element of movement in the scheme, along which all activity takes place.

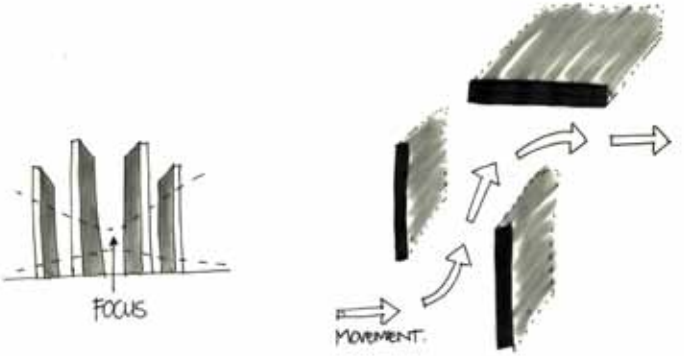


figure 73. vertical elements negate focus and movement

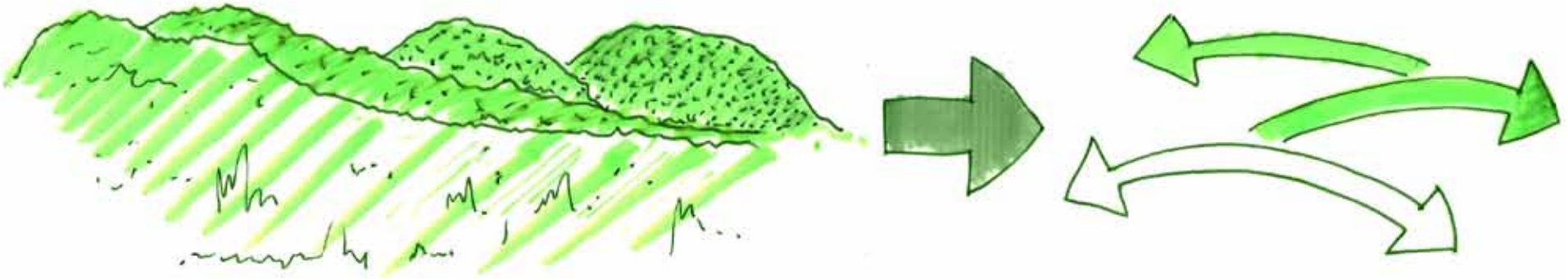


figure 74. nature portrayed as horizontal planes and elements

5.1.2 HORISONTAL=NATURE

Almost all architectural proposals include a response to the surrounding context. The Zoo proposal also has architectural context to take into consideration. On site there is however an element that overshadows all the built form around it: nature. Nature is represented by flowing horizontal elements across the city-scape and forms the heart of the proposal.

As the vertical elements negate flow, the horizontal elements link all these areas of flow together. This creates points of rest and relaxation, or admiration along the man-made natural elements.

The man-made nature introduced into the scheme will start to re-connect the grey concrete city with the natural wonder and green landscapes that the Zoo and its Northern boundary have to offer. The combination of vertical and horizontal will break down the hard edges that currently constrain views along Boom Street. It will give visitors framed views of the landscape all along in inside the proposal.

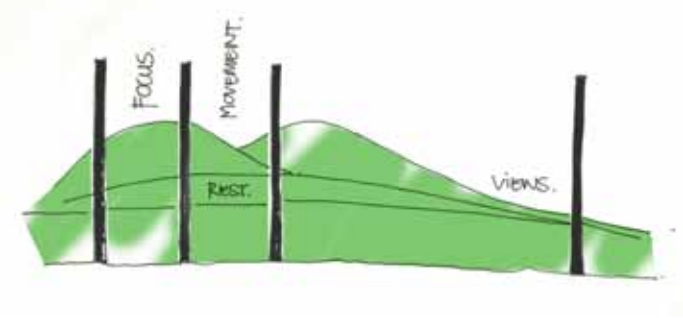


figure 75. vertical and horizontal elements

5.2 PRECEDENT STUDY

Architects: Foster and Partners

Project: Elephant House

Location: Copenhagen Zoo, Denmark

This precedent was chosen as a study in Zoo architecture

"Set within a historic royal park, adjacent to the Fredriksberg Palace, Copenhagen Zoo is the largest cultural institution in Denmark, attracting over 1.2 million visitors a year. Replacing a structure dating from 1914, this new Elephant House seeks to restore the visual relationship between the zoo and the park" (www.fosterandpartners.com).

The project consists of two enclosures that are embedded into the natural landscape; one for male and the other for female elephants. The simple geometry and rounded glass dome roofs form a direct contrast to the original 1914 Elephant House as it rises out of the earth, like a buried structure resurfacing.

The domes create a natural flow over the landscape as the structure raises above the natural ground level and disappears below ground. These structures form the elephant quarters and outside playing and exhibition areas. The level difference is ideal for viewing platforms and temperature control inside the enclosure.

The scheme is not without an element of verticality and rigidness. High massed walls, filled with earth and planted, organises movement in and out of the structure. The built mass of these walls give the Elephant House a sense of being grounded as it seems that the entrance was dug out and framed with the natural earth.

The Elephant House is a mixture of vertical and horizontal elements that seamlessly come together to create something more than architecture. It is a home, an event space, an exhibition in itself, but most importantly; it reconnects architecture and the built form to the natural environment in which it is placed.

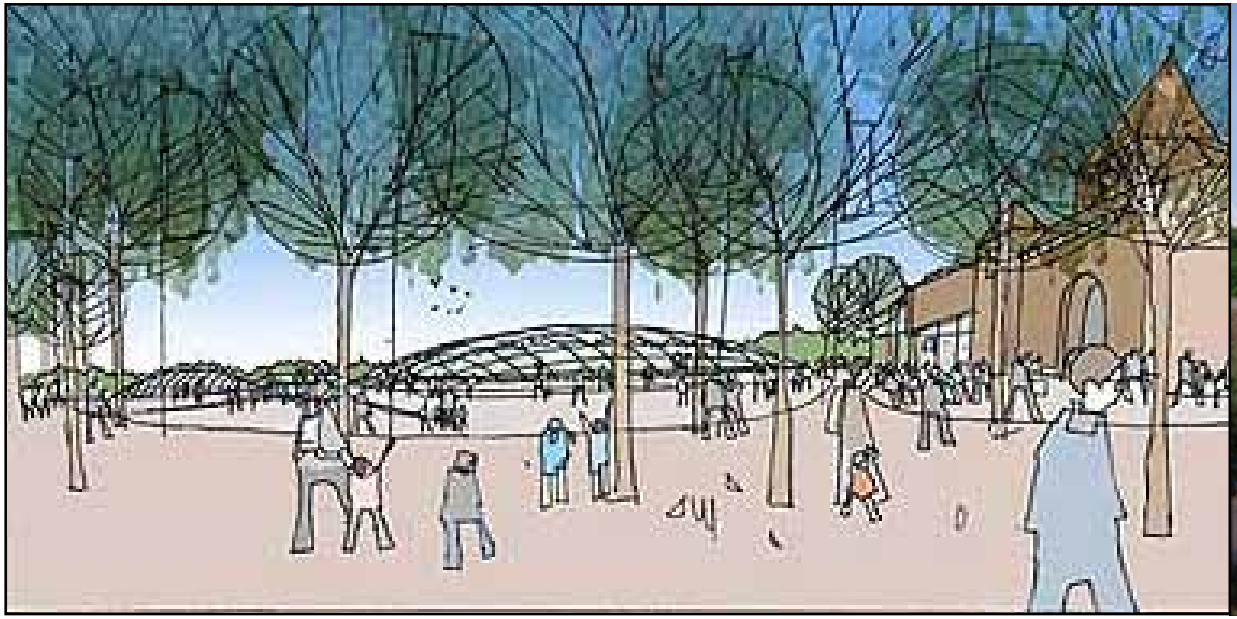


figure 76. artist impression of proposal

figure 77. photo of elephant house

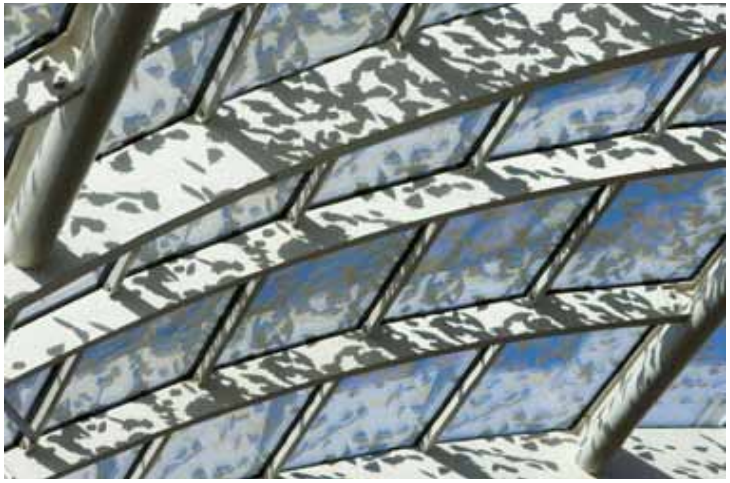


figure 78. photo of roof glass treated with leaf pattern

"Foster and Partners' design had to respond both to the needs of elephants and to those of their caretakers and visitors, and their first zoological building has led them to seek unique solutions to the needs of unusual clients – in terms of security, maintenance, stimulation and comfort. Both economic and environmental considerations were priorities: the building will be naturally ventilated and rainwater will be recycled. While the glass domes will fill the spaces with daylight, the panes will be fritted to avoid unnecessary heat gain. Trees will be planted to provide extra shade in summer". (http://www.arcspace.com/architects/foster/elephant/index.htmll)

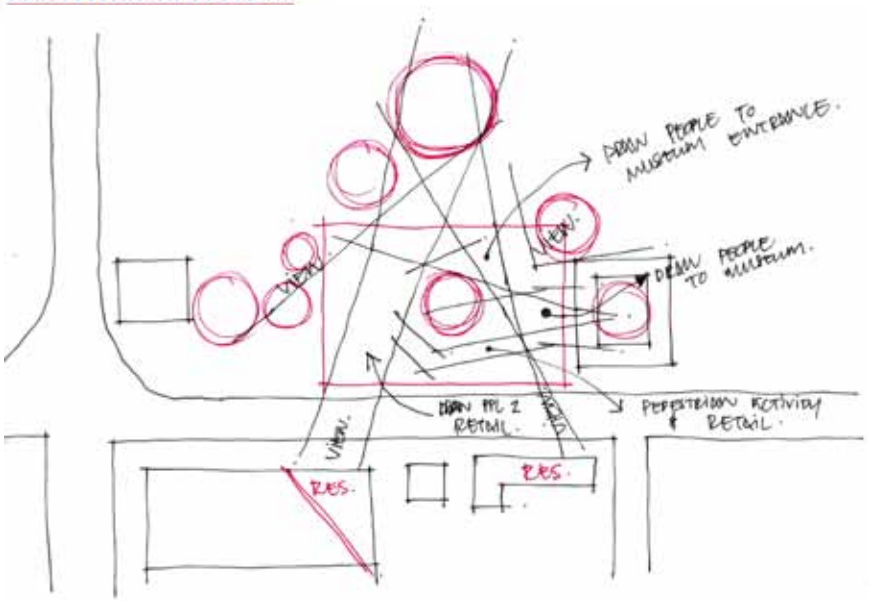


figure 80. beginnings of a resonse to context

figure 79. form development from context plan

5.3 ARCHITECTURAL STRATEGY

5.3.1 FORM DEVELOPMENT FROM CONTEXT

HERITAGE

A historical path, leading from Boom Street right through the Zoo, has been present since its inception. This path will remain and form the main route into the Zoo, linking up with the heritage houses to the South of Boom Street. The new information centre on the North-West corner of the Museum will be lower in height, and the Southern edge of the centre will slope back down to the ground to give accent to the single entrance on the Western façade of the Museum.

ZOO

The Western wing of the new development will border the existing ponds in front of the Aquarium, with balconies and view areas overlooking this area. The Northern wing is situated facing the trees in the Lemur enclosure.

BOOM STREET

The pedestrian activity and movement along Boom Street will be accentuated by the informal trade and curio stalls on the Northern sidewalk along the street. This will form a square in the middle of the development, which will house other retail opportunities.

SOUTH OF BOOM STREET

The block of apartments on the South of Boom Street has always been blessed with a great view of the Zoo. The lower information centre will still offer this to the residents, and the retail square will provide them with entertainment and leisure right on their doorsteps.

NATURE

Almost all the trees on site have been preserved, and the area to the West of the museum creates space for natural rest areas. The square also draws attention to the large trees as the building wraps around them.

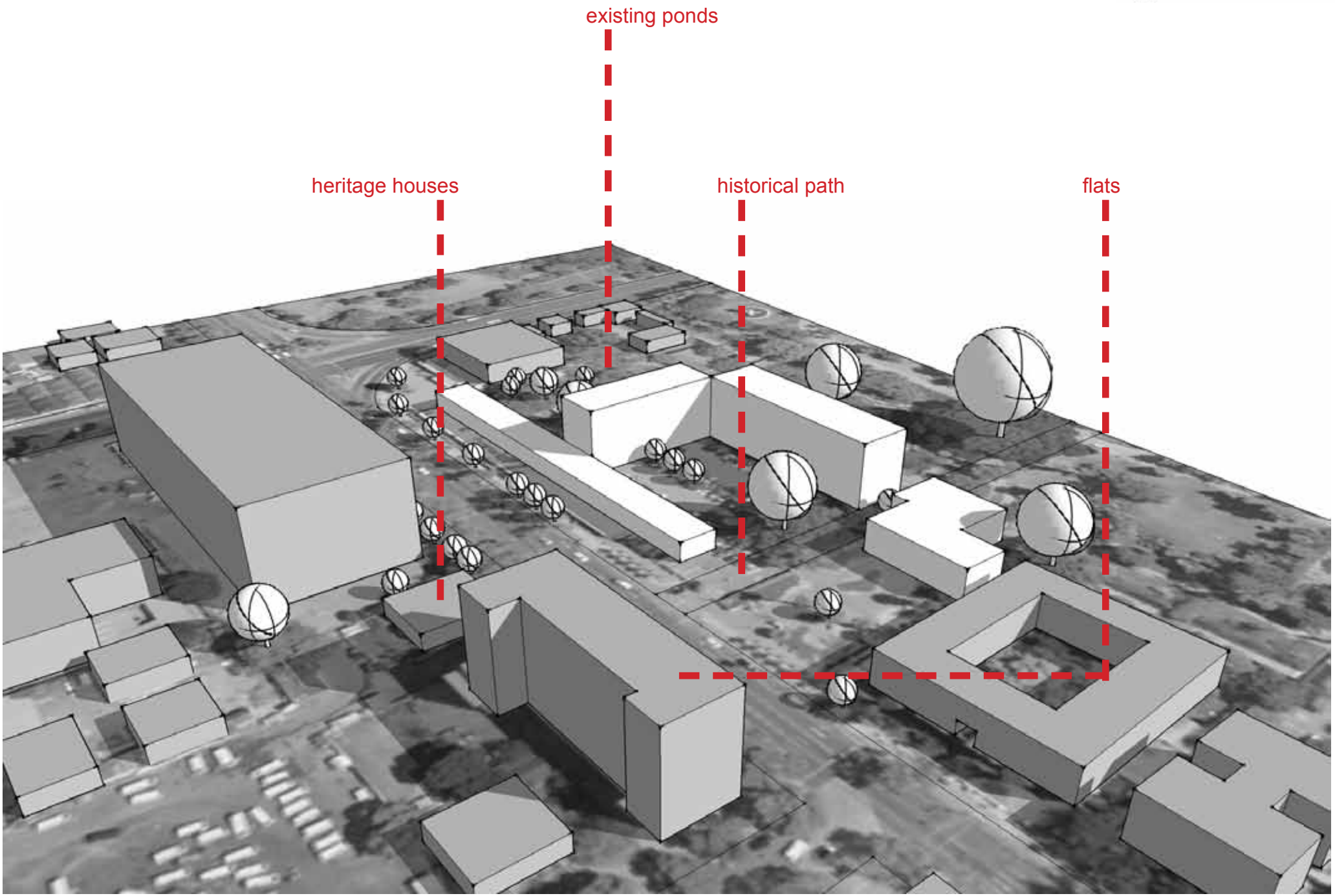


figure 81. form development from context 3d

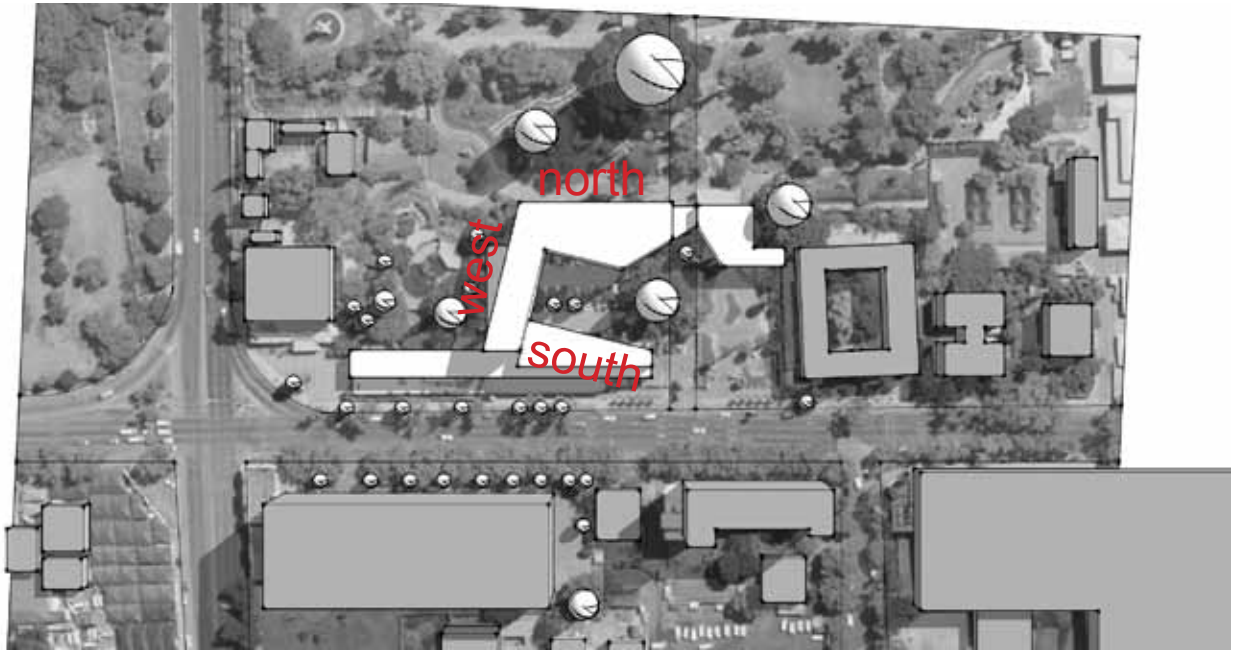


figure 82. form development from theory plan

5.3.2 FORM DEVELOPMENT FROM THEORY

NATURE

The North, South and West wing has been rotated and augmented in order for occupants to have a view of the big trees and green area in the square. Retail and offices on the North of the proposal will overlook the nature in the Zoo, while activity on the West wing will have views of the ponds and square.

GREEN STREETS

With the city as a backdrop, the green area will provide the public with a natural environment to relax in. This will add a most needed attraction in the Northern Region of Pretoria.

ENTRANCE TRANSITION

Visitors will move from the busy sidewalks, through the informal market and into the formal retail square. The transition will be easy, and is facilitated by the natural elements of the Zoo, that is seen from the street. Visitors entering through the open area next to the trade stalls will experience the information centre and entrance as the portal to the Zoo.

PUBLIC SQUARES

The Square is proportioned to accommodate enough activity, yet it does not seem too large. This will improve the quality of the space in quieter hours when there are fewer visitors.

HIERARCHY OF SPACE

The Square is orientated in such a way to provide visitors with great views, while sitting with their backs to the buildings.

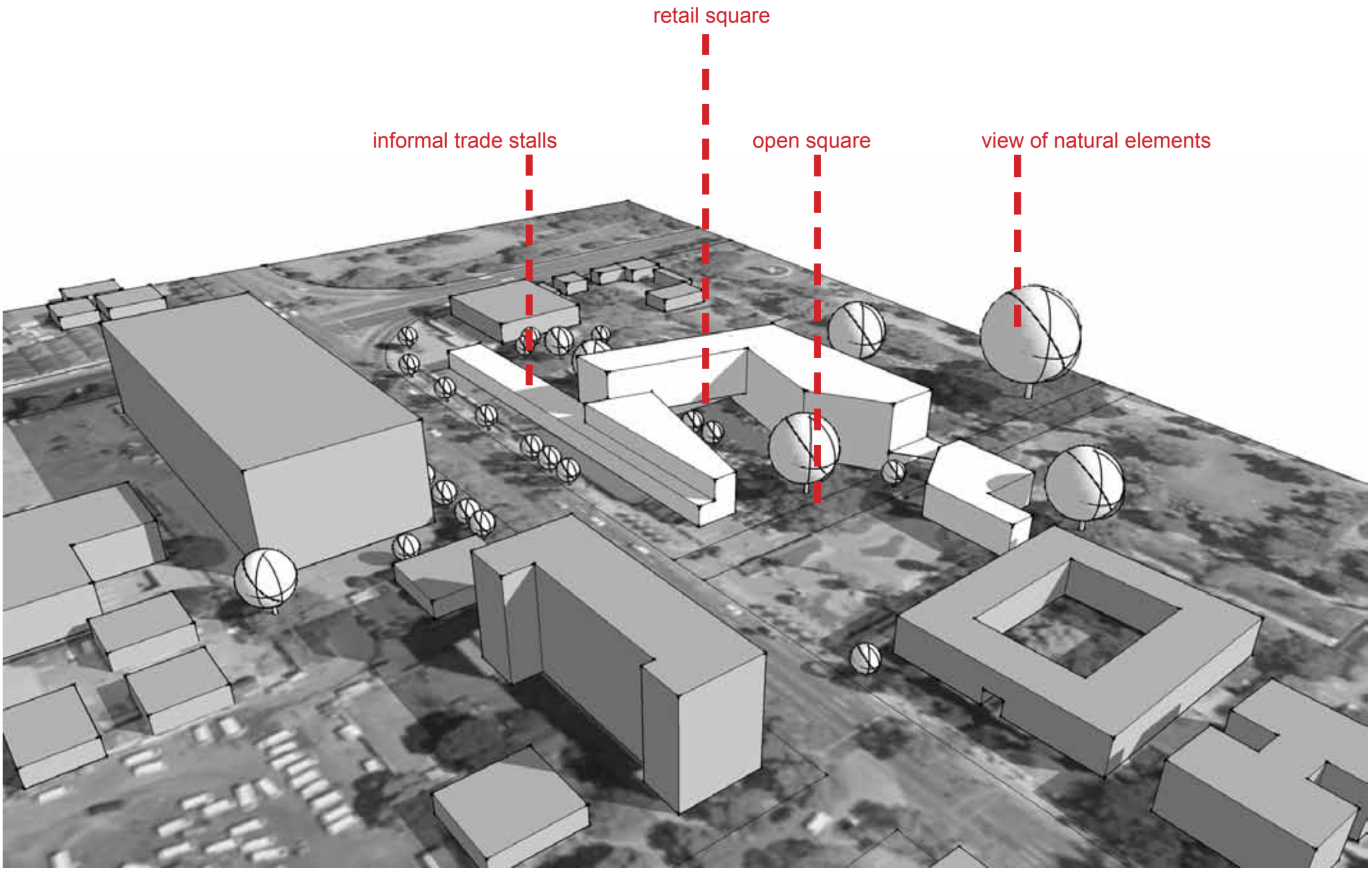


figure 83. form development from theory 3d

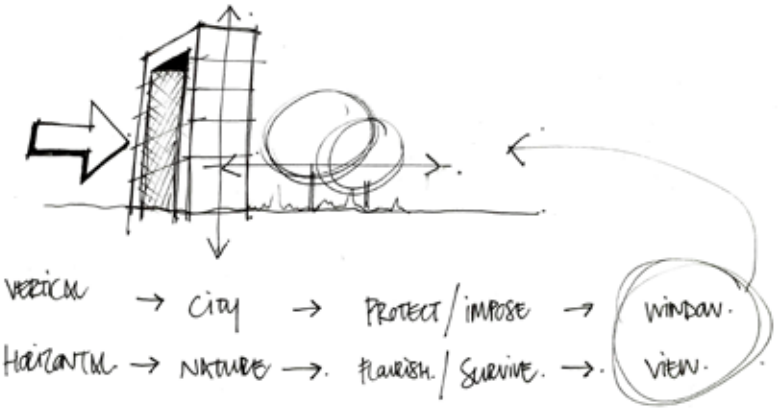


figure 85. beginnings of a theoretical concept

figure 84. form development from theoretical concept plan

5.3.3 FORM DEVELOPMENT FROM THEORETICAL CONCEPT

HORISONTAL (Nature)

Nature is represented by green horizontal planes cutting through the development on both ground and first level. This will provide visitors with open space and great views of the Zoo, while still inside the building. The planes will create areas of rest and focus along them, integrating built fabric with man made nature. It will also signify the approach to re-connect nature with the inner city, as they will originate at the Zoo, cross Boom Street and enter the parking structure proposed by Andries Haasbroek. (MProf. 2010)

VERTICAL (City)

The proposal does not ignore or forget the city back drop in which the site is situated. The city is represented by the verticality of the structure itself and these vertical elements will negate movement along them, and frame views of nature for visitors to admire. The structure is rotated at such an angle as to give the residents across the street in Andries Haasbroek's development (see nr. 1 on diagram) a view of the trees in the square and the Zoo.

1. Andries Hasbroek's proposal
2. Heritage houses
3. Block of flats
4. State Museum
5. Public green space
6. Curio sales
7. Informal trade
8. Restaurant
9. Offices
10. Public square
11. Information Centre

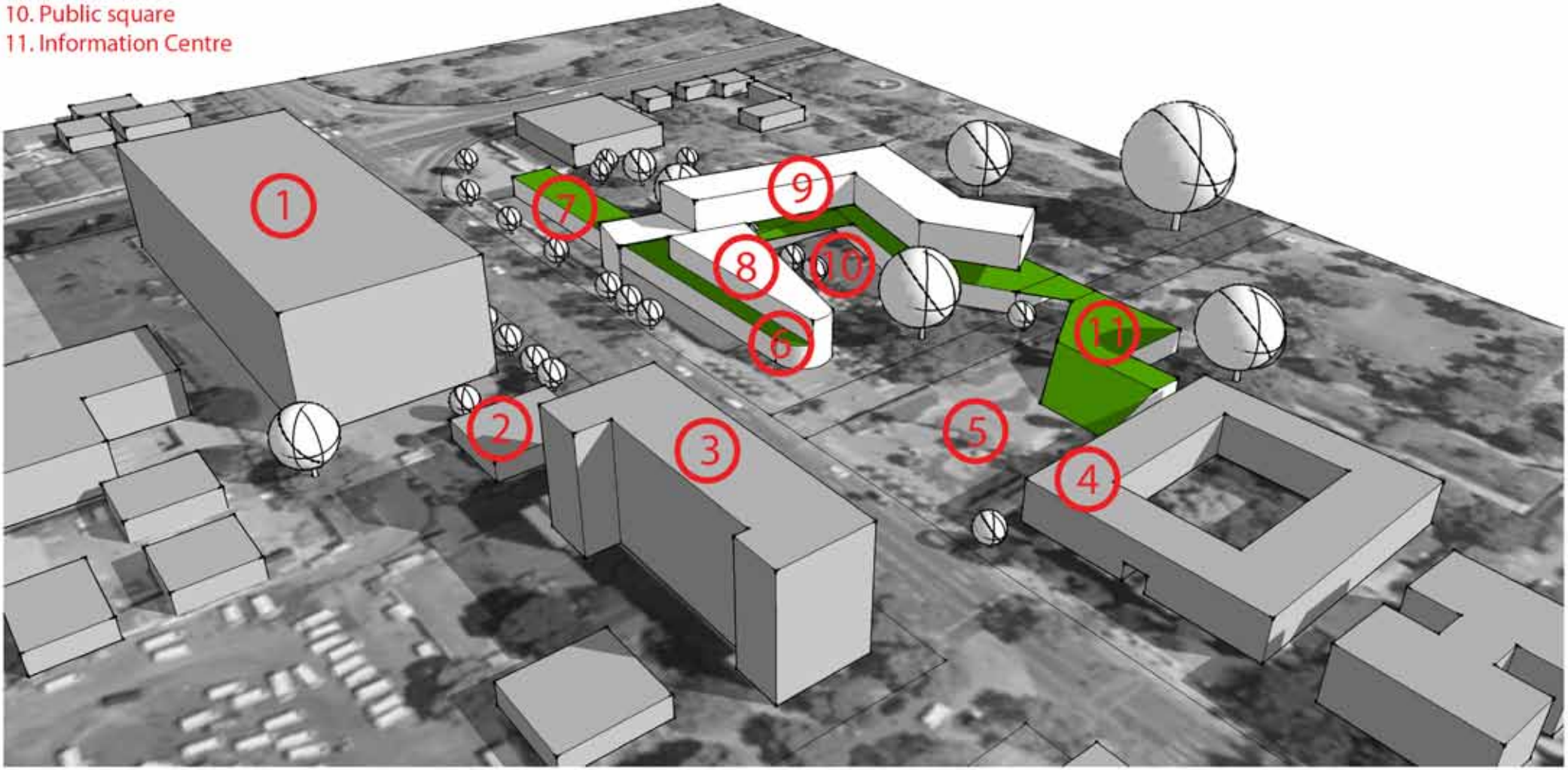
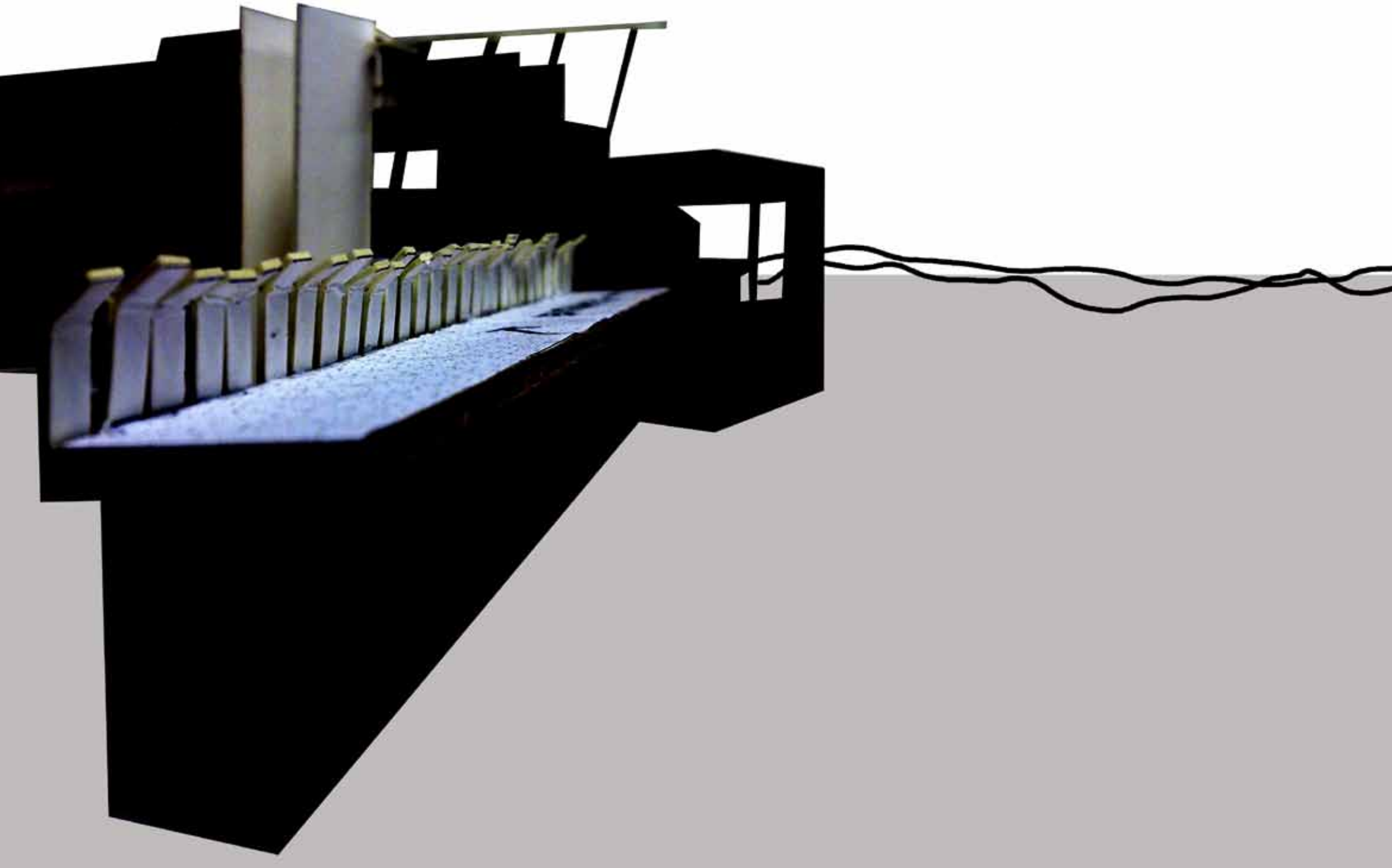


figure 86. form development from theoretical concept 3d

figure 87. edited photo of model



chapter 6architectural intervention

figure 88. early site plan development

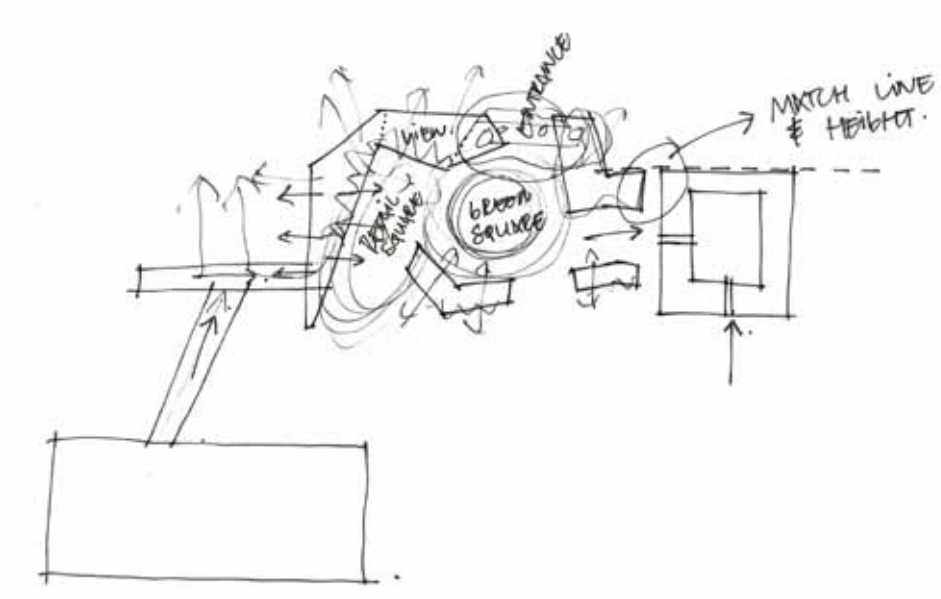
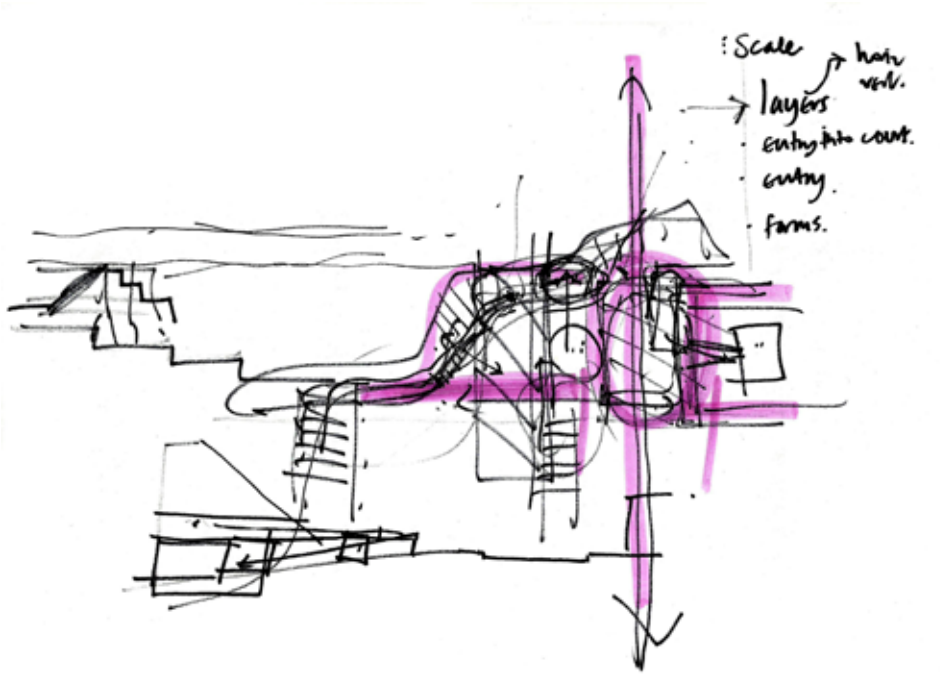


figure 89. response to early site plan development



6. ARCHITECTURAL INTERVENTION

The following chapter aims to serve as an introduction to the physical architectural intervention and how it responds to context, form, function and the beginnings of technology.

6.1 RESPONSE TO CONTEXT

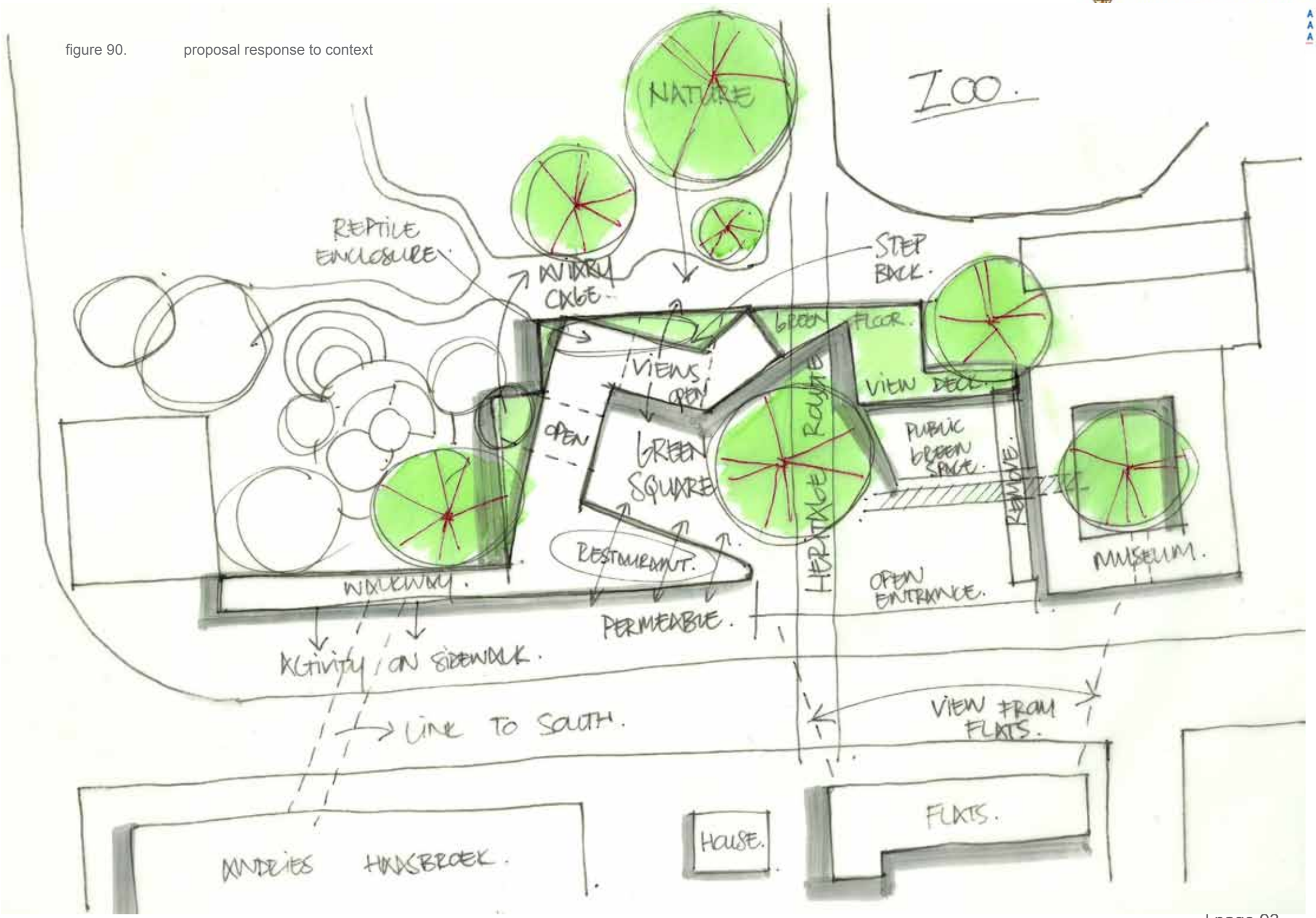
As the Zoo is the main element that the intervention has to relate to in terms of contex, the proposal aims to re-connect the built environment to the natural surroundings in the Zoo. This is done by creating public green space, not just in the square, but also inside the building. The green space inside is represented by a green belt running throughout the first floor, with planted areas creating seating and areas of rest. In the retail court, the planted area links up to a double volume aviary cage that connects the proposal to the animal component of the Zoo. The offices on the upper floor are celebrated with green verandas that overlook the natural environment of the Zoo.

Focus is drawn to the State Museum to the East of the proposal by removing the Western wall of the Museum, and highlighting the passage to its entrance with public green spaces. The information centre is set lower than the Museum as not to draw any attention away from it.

The information centre and entrance is also set lower than the rest of the proposal to ensure that it does not obscure the view that the block of apartments, South of Boom Street, has of the Zoo.

The heritage houses next to the flats link up with the heritage route that runs through the entrance and into the Zoo. The biggest link with the South is the pedestrian bridge crossing over Boom Street. This link originates in Andries Haasbroek's building and connects with the proposal on top of the informal trade stalls. The roof of the stalls act as a walkway that leads visitors into the building, but also gives them a preview of the activities and natural environment inside the Zoo.

figure 90. proposal response to context



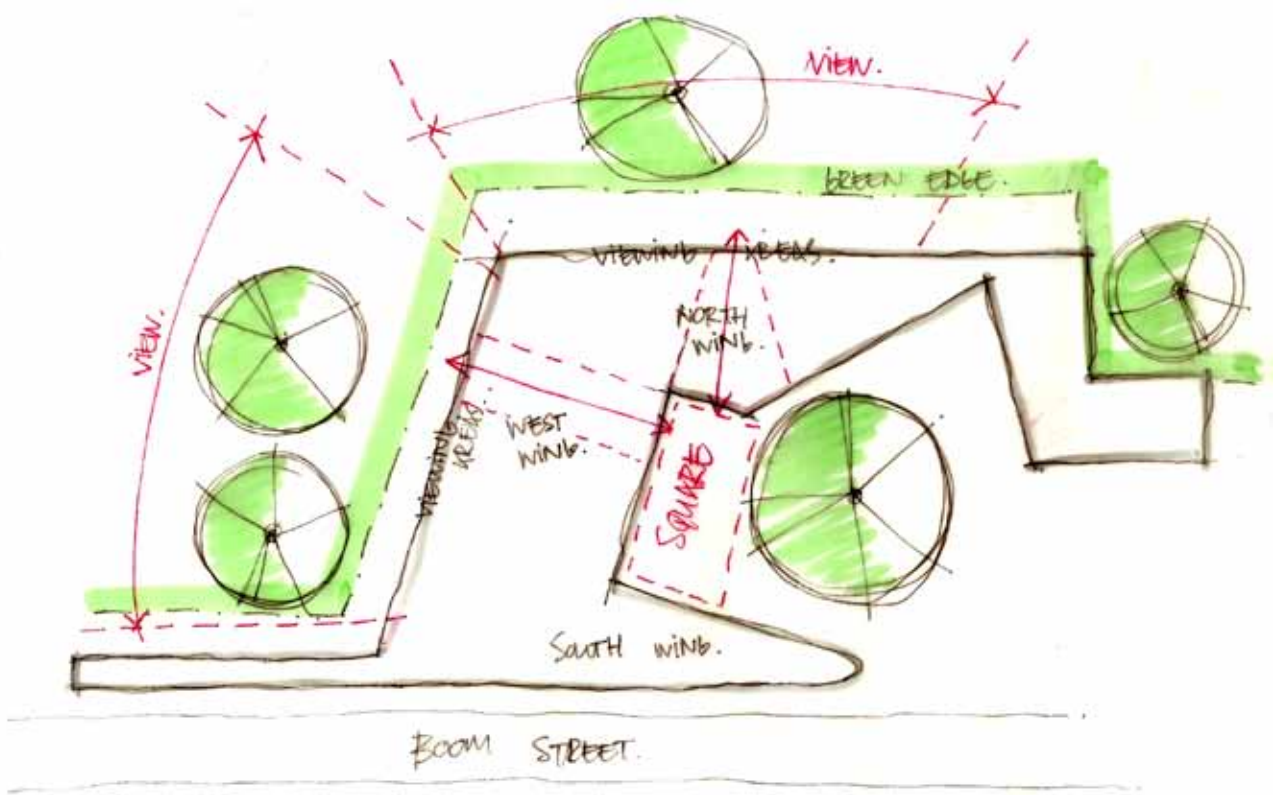


figure 91. proposal response to views and natural elements

6.2 RESPONSE TO FORM

The layout of the proposal is a direct response to the natural elements on site. The building is rotated to give visitors the best view of the Zoo while inside the building.

The North and West wing creates a public square around the trees on site; this gives the offices views over the square and the Zoo. The form of the North wing accentuates the importance of nature by stepping back on the North façade, creating open public viewing areas. The West wing also steps back from the square as the Western façade becomes a viewpoint to the gateway as visitors approach the Zoo precinct from the West.

The scale and permeability of the South wing is of a pedestrian nature, allowing easy flow of visitors on both the ground and first level, while still relating to Boom Street.

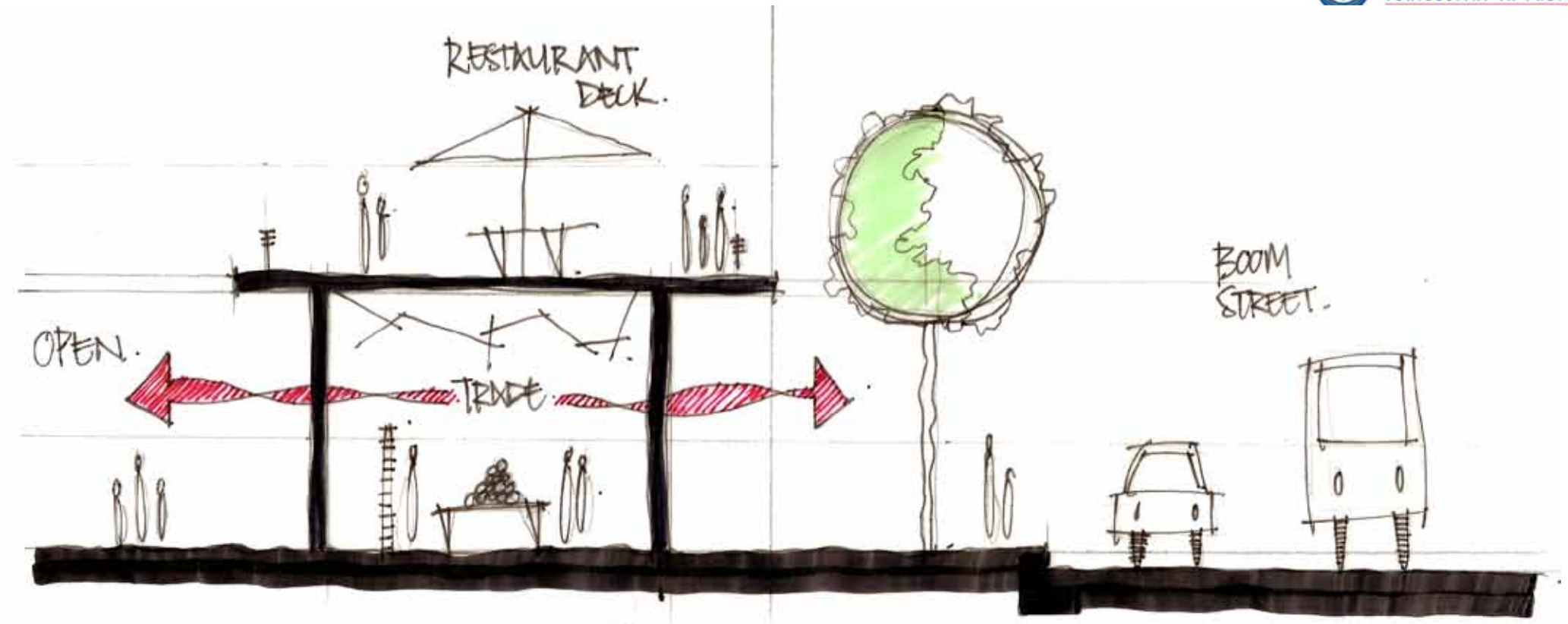


figure 92. section through trade area showing permeability and scale

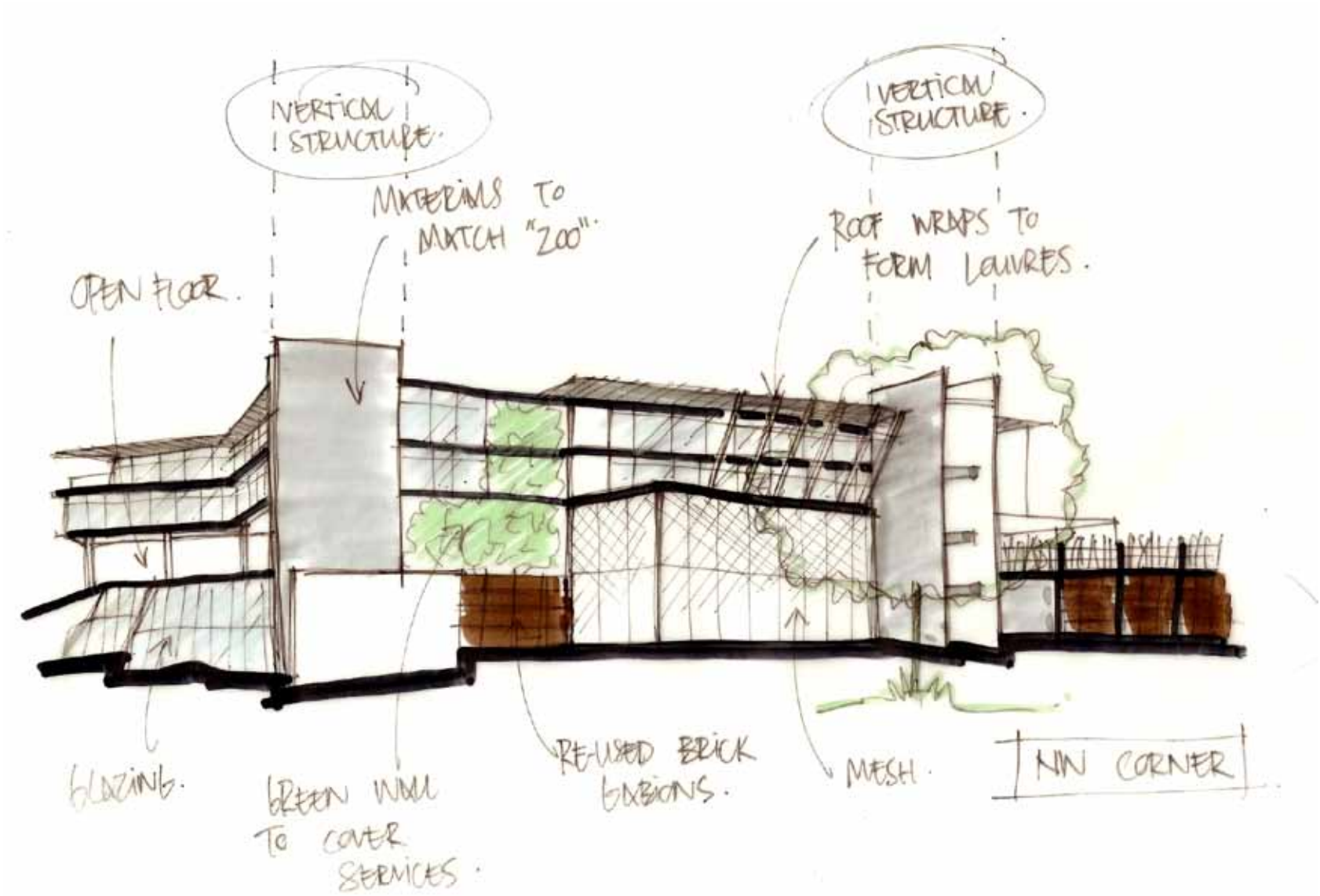


figure 93. sketch of proposal from NW corner showing materiality and vertical structures in proposal

figure 94. sketch showing visual permeability of proposal

The notion of an open design is continued throughout the first level, as visitors are able to view the Zoo through the building, breaking away from the previous hard edges that discouraged activity in the region. The sloping grass banks that form the Southern façade of the information centre are continued through the building to create a feel that the building is a part of its natural surroundings.

Various spaces, such as the Southern restaurant, retail shops, the bathrooms and the main stairwell on the North are vertically extruded. These solid forms throughout the building represent the city and the built fabric that the proposal finds itself in. These spaces also create a sharp contrast to the open flowing floors and green areas inside the building.

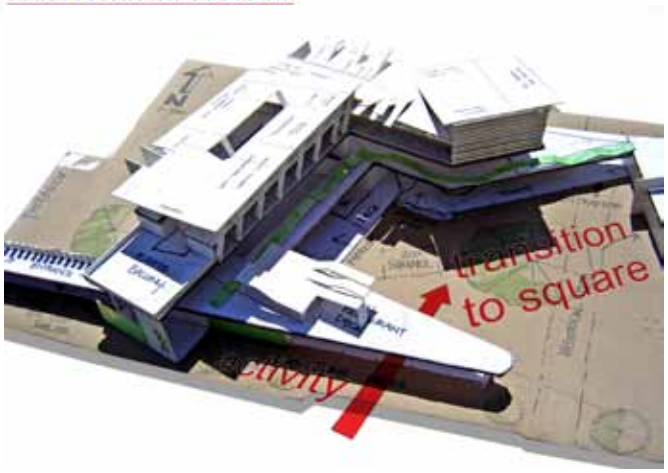


figure 95. trade & curios stalls as tranition to square

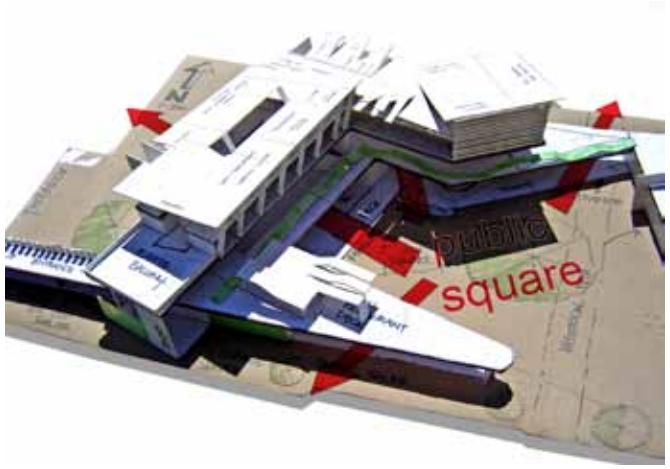


figure 96. public square forms centre of proposal

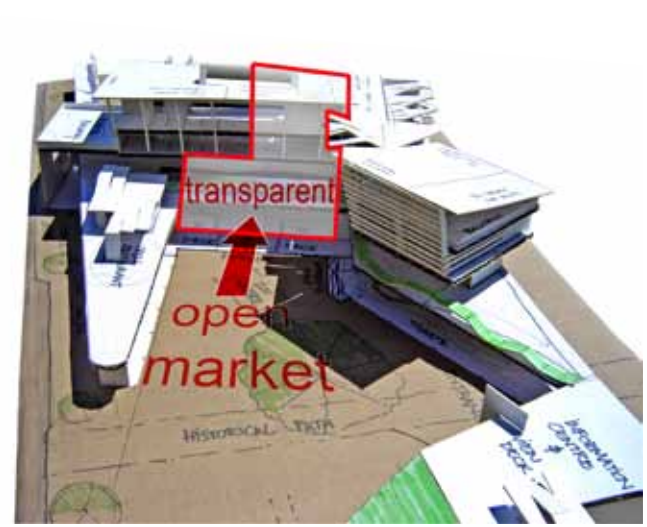


figure 97. permeability of retail square and area above

6.3 RESPONSE TO FUNCTION

INFORMAL TRADE AND CURIO STALLS

These structures are permeable to allow views of the Zoo and flow of people through them. They will give great focus to sidewalk activity, as this is where all the trading will take place, while acting as a transition to the more formal public square.

PUBLIC SQUARE

The Square is the heart of the proposal and all other functions and areas are accessible from here. It binds the proposal to the natural environment and to the city. The trees on site and the pergolas over the restaurant areas create shade for people in the space, while the square provides recreational space for visitors.

RETAIL SQUARE

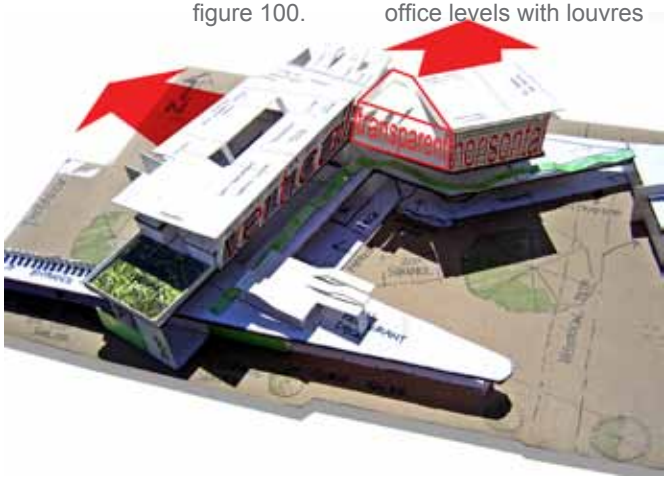
The retail square forms the biggest area on the ground floor and serves as an open market. Similar to the Red and Blue shed in the V&A Waterfront in Cape Town, shop owners can rent stalls and display goods. The concept is to keep the area as open as possible to create the opportunity to rent out the entire area as an exhibition or performing space.

The restaurants on the ground floor open out onto the square, creating an open feel to the retail development, with services hidden away behind the building on the Western façade.

figure 98. reptile enclosure

figure 99. visually open first level

figure 100. office levels with louvres



REPTILE ENCLOSURES

The reptile enclosures create another open space that the public can enjoy without entering the Zoo. The glass enclosures and open pools and planted areas unwraps the Northern façade and creates a zoological backdrop for visitors inside the square. Due to the level difference on site, this area is set lower than the retail square. The solution to this is an amphitheatre for school groups to gather for briefings, before entering the Zoo, or for the public to enjoy during lunch.

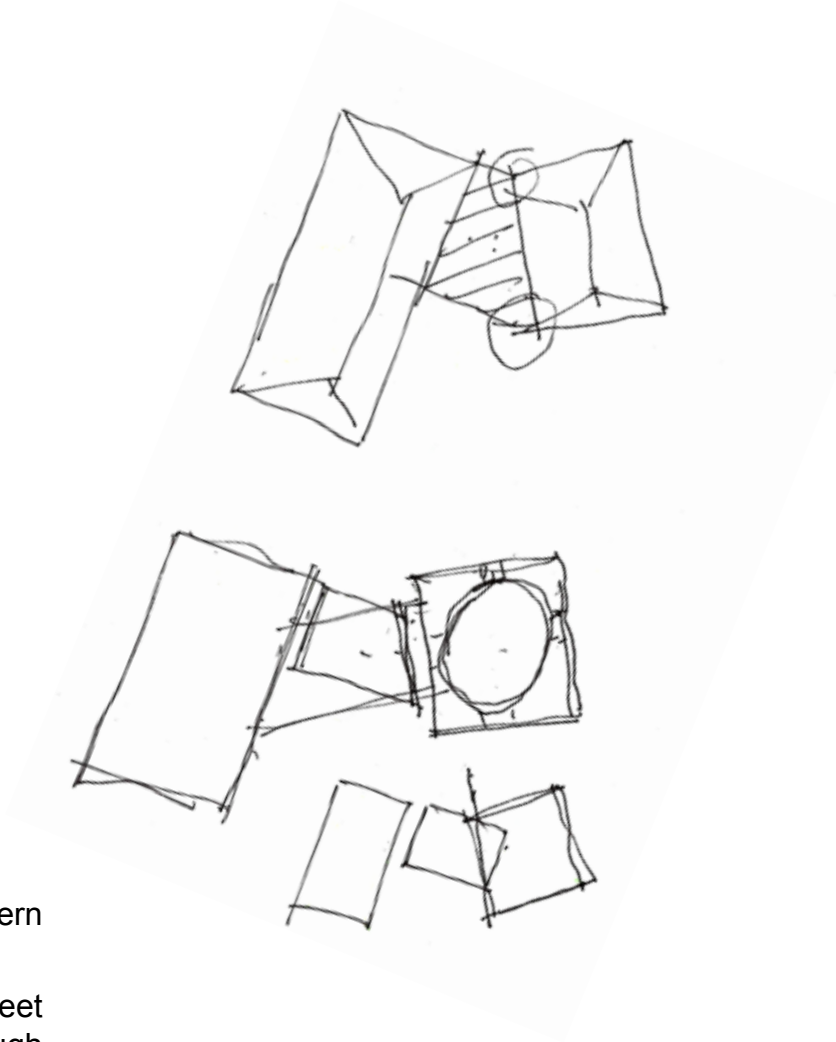
OPEN FIRST LEVEL

The first level is the barrier between the public and private sectors in the development. It creates an open area for the public to move through and enjoy views of the Zoo, the aviary cage, the reptile enclosures, interactive zoological displays and various smaller retail shops. It links the main building with the view deck on top of the information centre, while the Northern area also serves as an exhibition space for the Zoo..

OFFICES

Two floors of offices will enjoy north light, as well as natural ventilation. They enjoy views of the Zoo, and are joined by green verandas. Services for these offices are grouped together and circulation is central to the two wings.

figure 101. sketch showing connection between North wing and turned offices



6.4 THE DESIGN

6.4.1 PLANS

The following sub-chapter contains floor layouts of all the levels in the proposal.

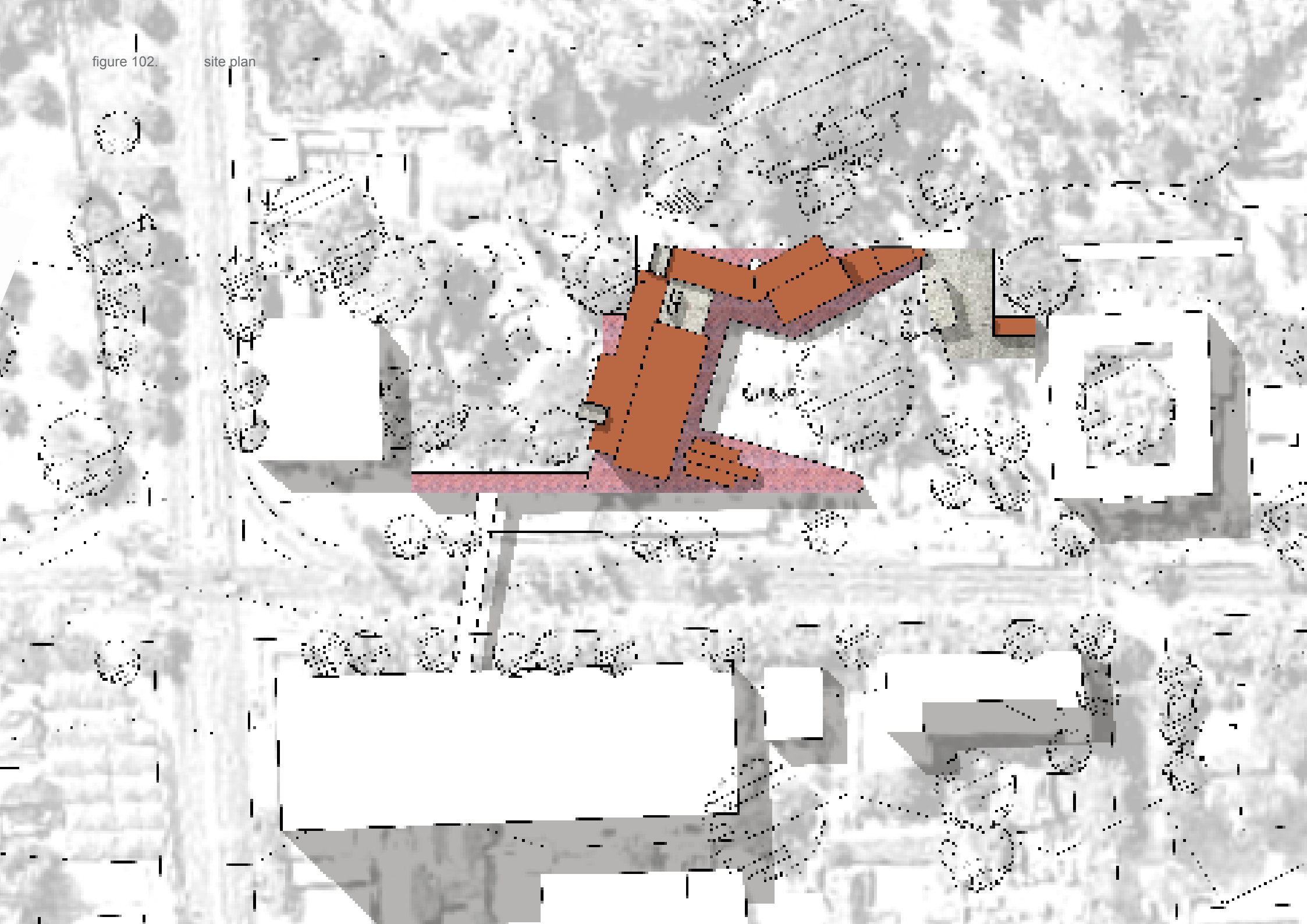
SITE PLAN

The site layout is based on relations to context around the site. Natural context is taken into consideration through the orientation of the proposal, to maximise views of the Zoo from anywhere in the proposal.

The proposal also creates views for the block of apartments across the street, and is turned off the North-South axis to maximise Northern exposure to the office levels.

Heritage houses to the South of Boom Street line up with the historical route crossing through the entrance into the Zoo. The State Museum's side entrance links up with the public square, from which the rest of the development is accessible.

figure 102. site plan



6.4.1.1 LEVEL -1 & 0

The ground level, and lower entrance level becomes the transition from public street interface to Zoo programme. Visitors move through informal trade, to a public square and open market. From here the reptile enclosures, information centre and new entrance is structured around the square, and visitors can freely move between these spaces as they please.

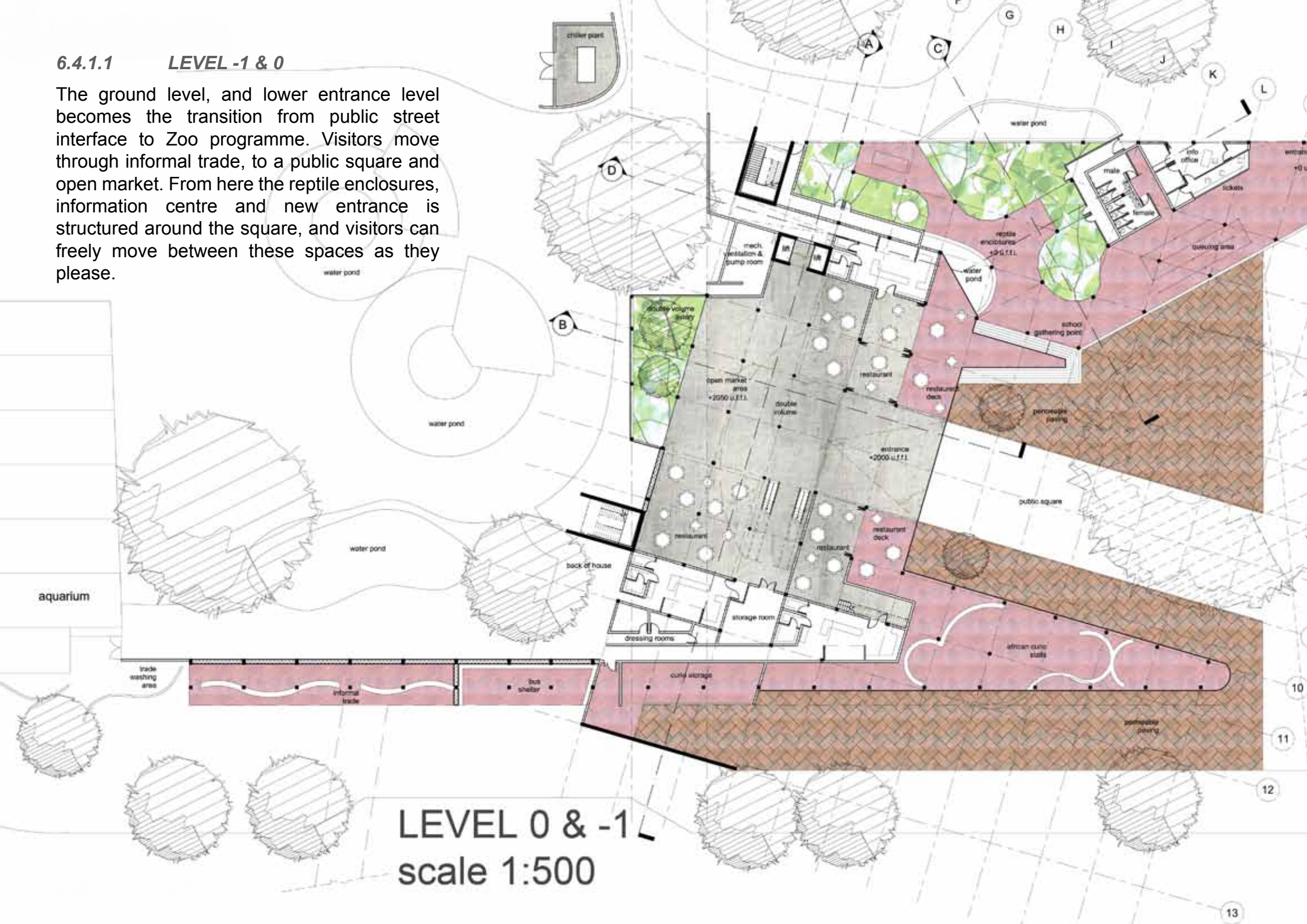


figure 104. level -1 and level 0 plan with materials

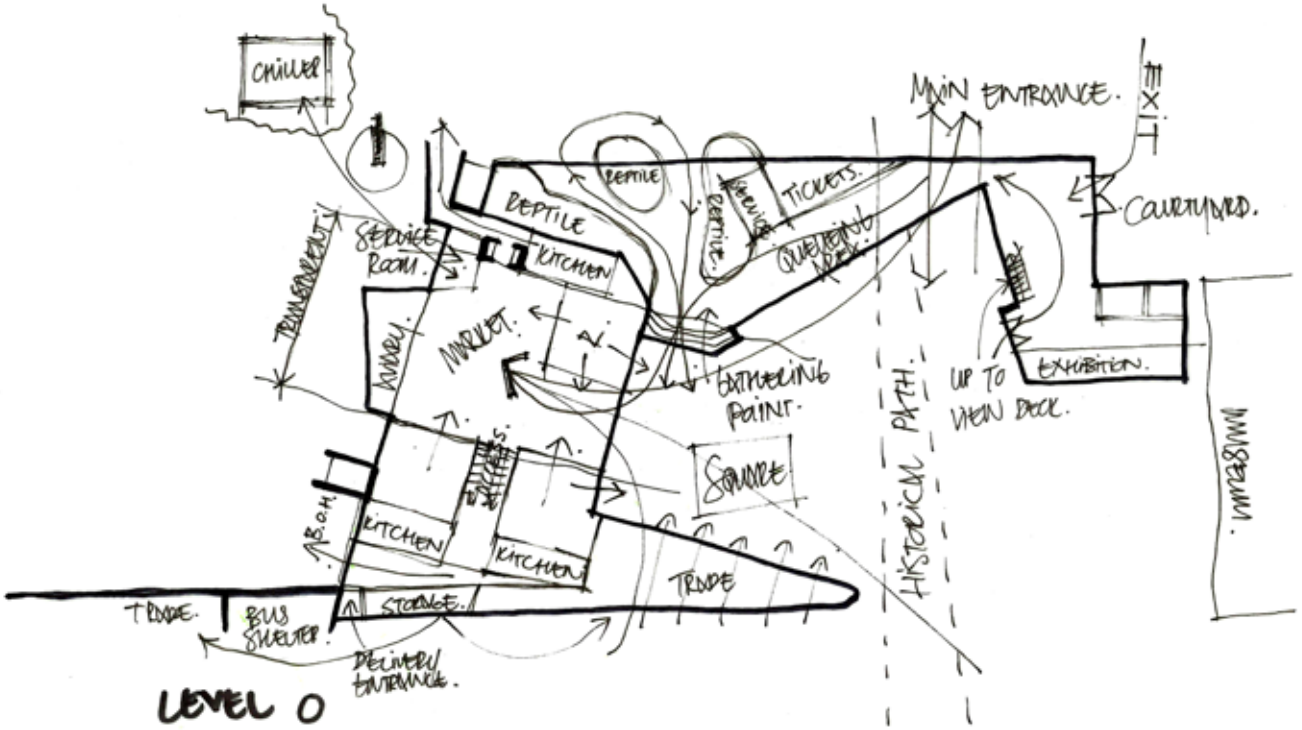


figure 103. diagrammatic layout of level 0 and -1 showing relation of spaces

LEVEL 1
scale 1:500

figure 105. level 1 plan with materials

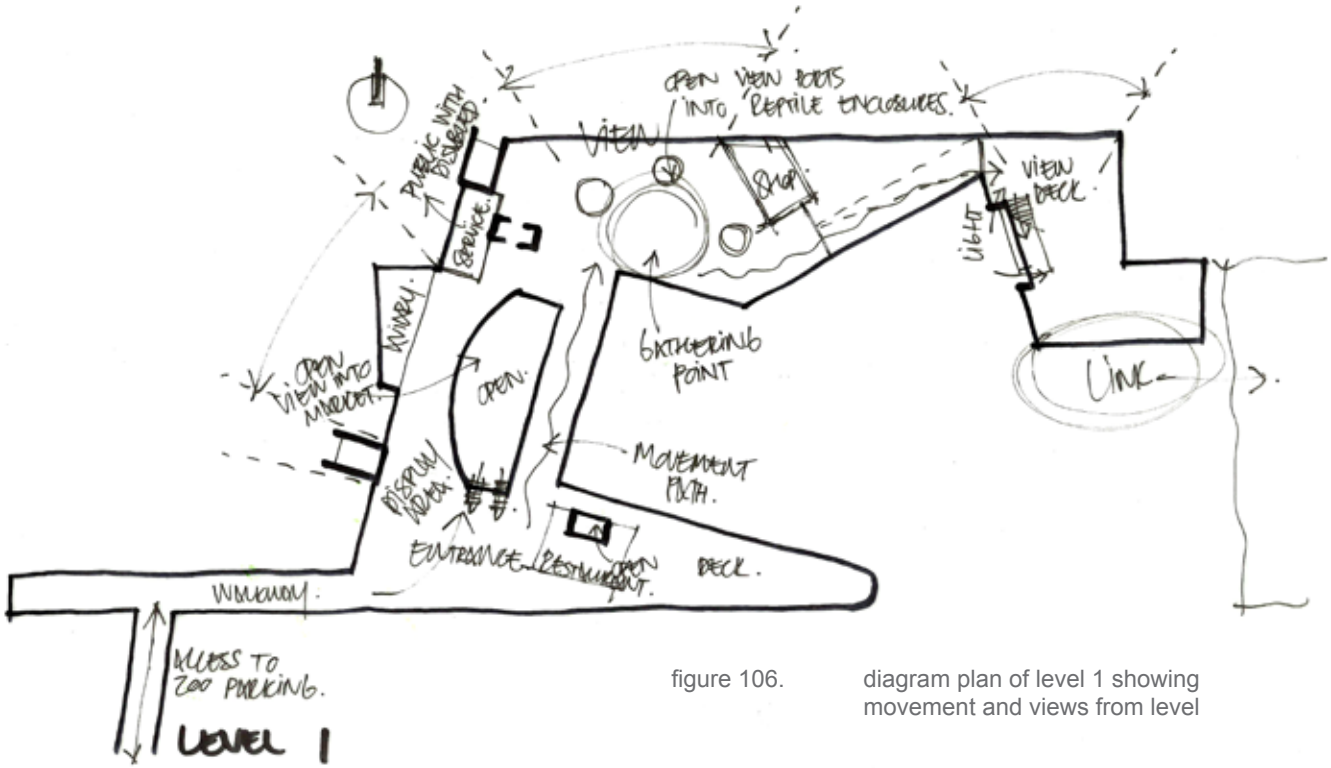


figure 106. diagram plan of level 1 showing movement and views from level

6.4.1.2 LEVEL 1

Visitors who park in the new Zoo parkade across Boom Street will enter the proposal on this level. Edge conditions have been kept open to provide users with the maximum view of the surrounding Zoo environment. Sections of the floor have been kept open where circulation is located. This creates an double volume space above the market, and the opportunity for visitors to view the activity on the floor below. The level slopes down to the view deck above the information centre.

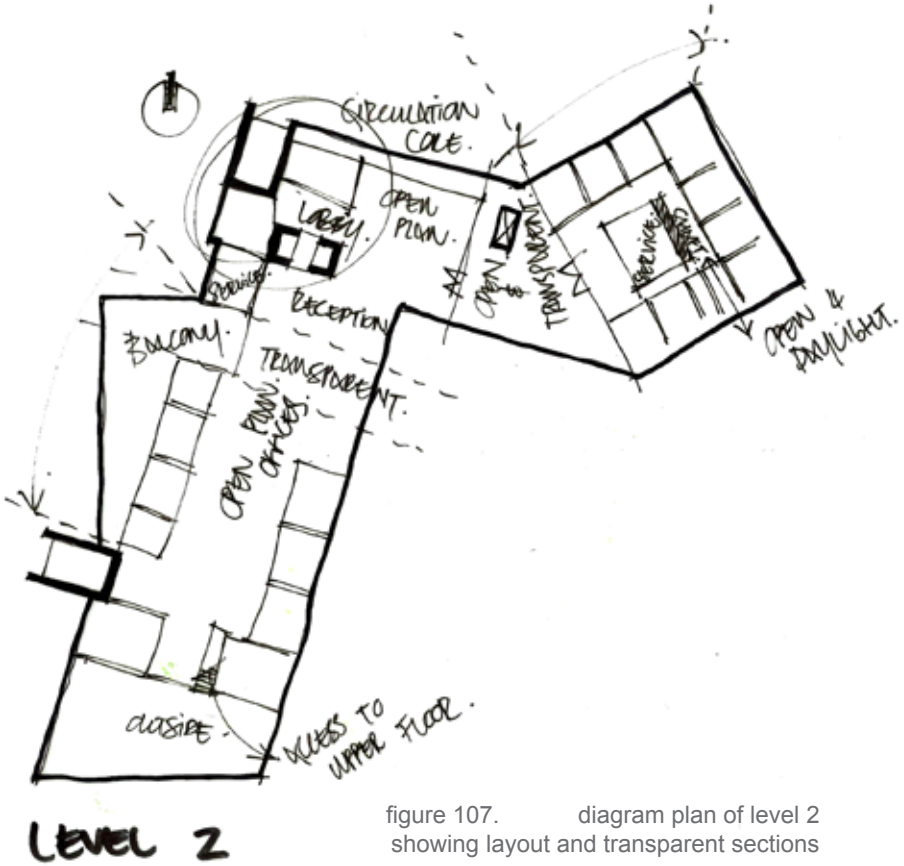


figure 107. diagram plan of level 2 showing layout and transparent sections

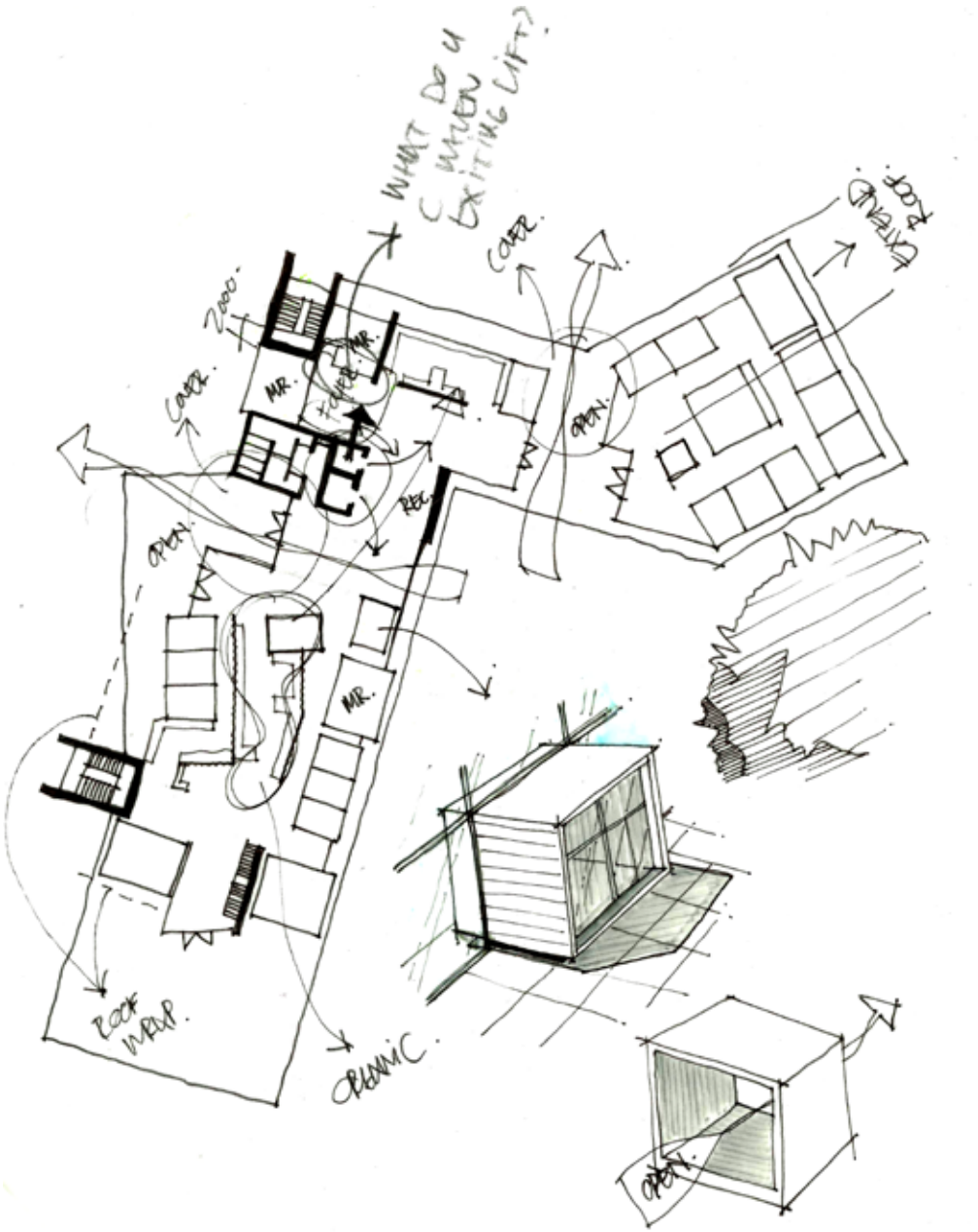


figure 108. diagram plan of level 2 showing office arrangement and cubicle design

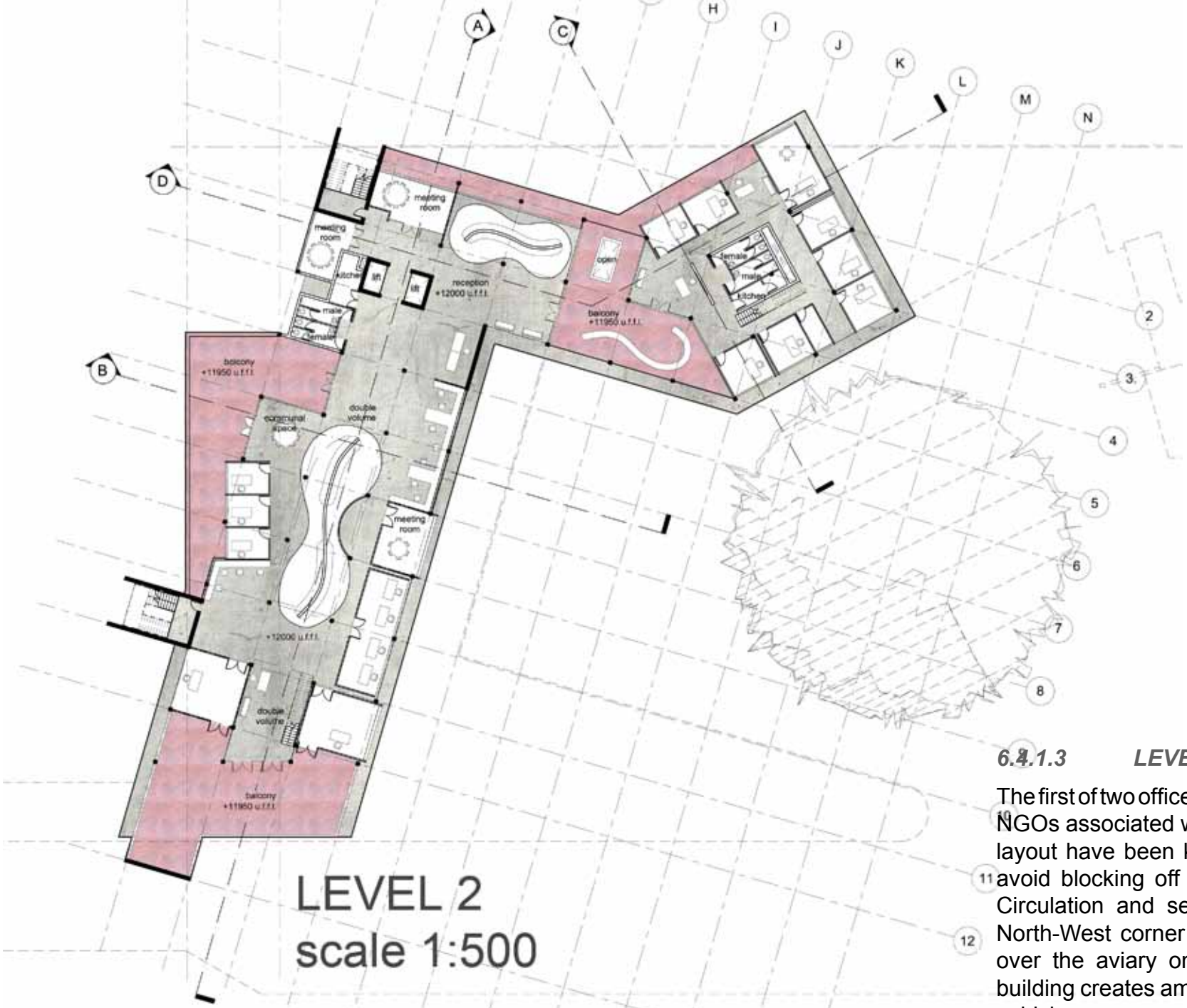


figure 109. level 2 plan

6.4.1.3 LEVEL 2

The first of two office levels are allocated towards NGOs associated with the Zoo. Sections of the layout have been kept open or transparent to avoid blocking off views of the surroundings. Circulation and services are grouped in the North-West corner of the proposal. A balcony over the aviary on the Southern end of the building creates ample recreation space. Office cubicles are grouped around open plan office arrangements.

figure 111. example of office cubicles

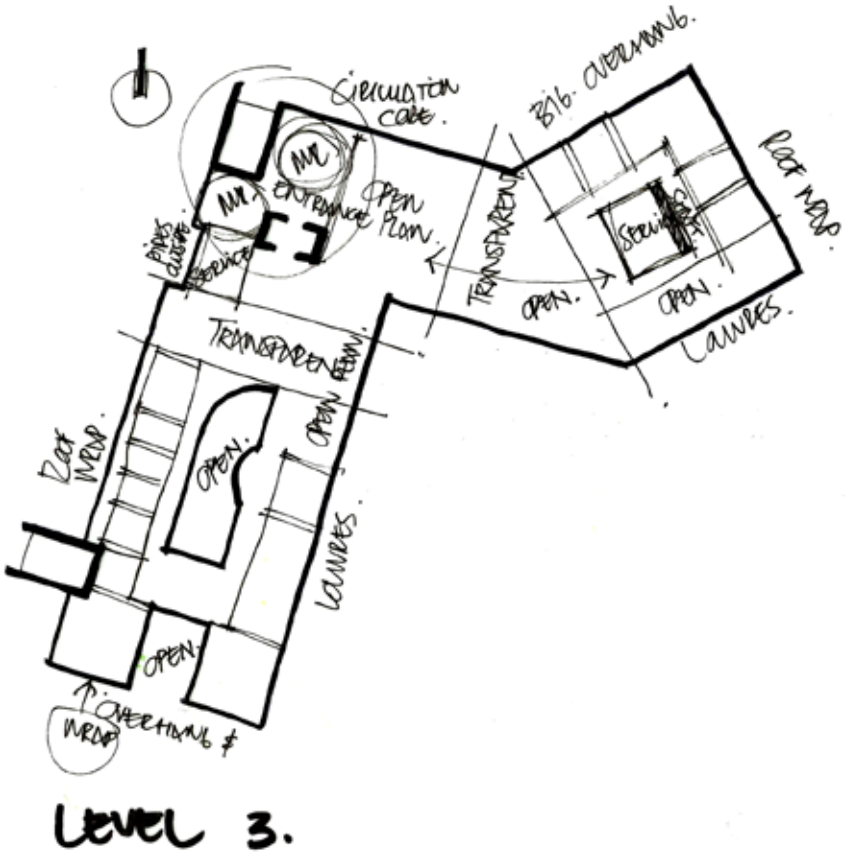


figure 110. diagram plan of level 3 showing layout and transparent sections

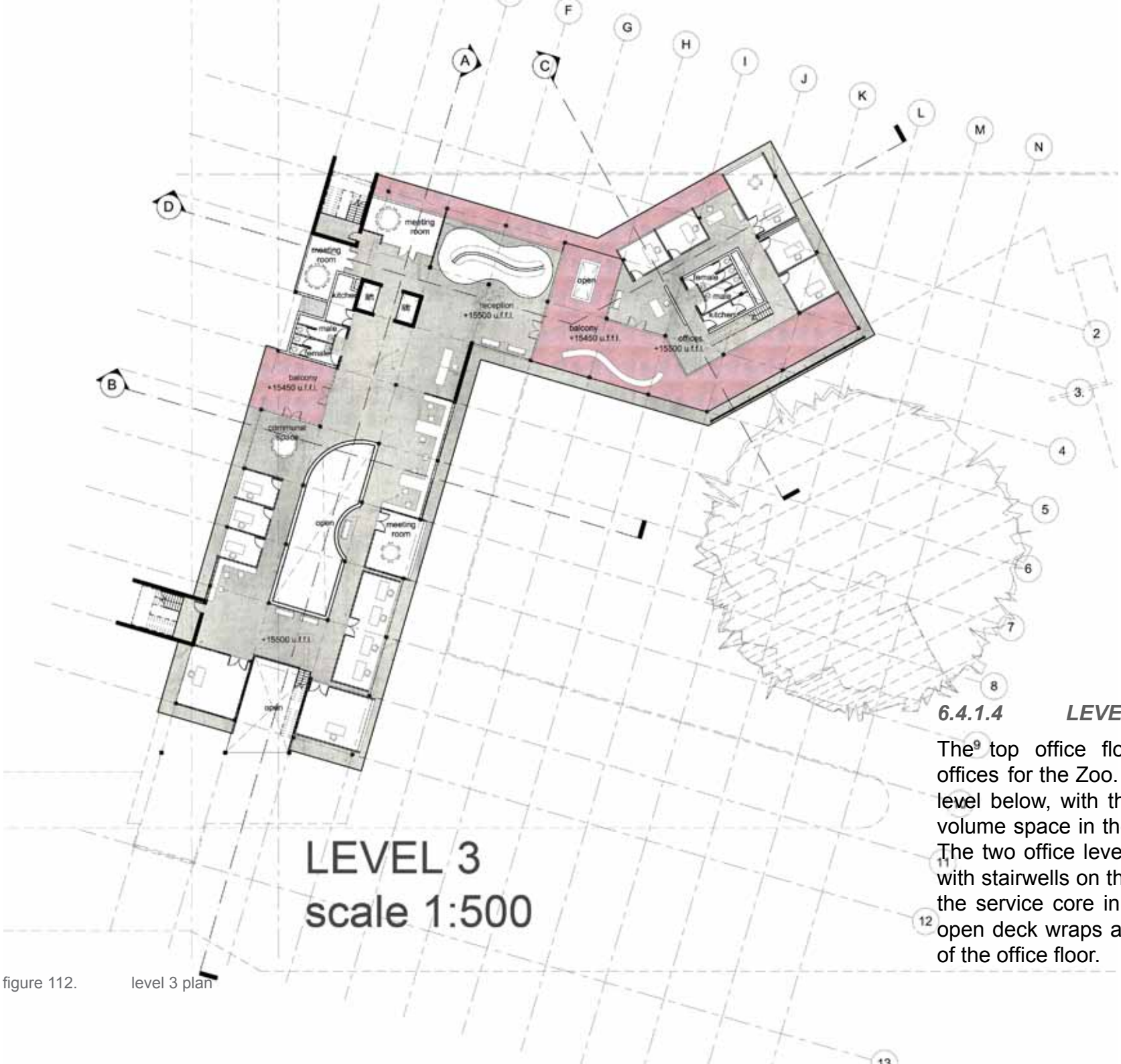


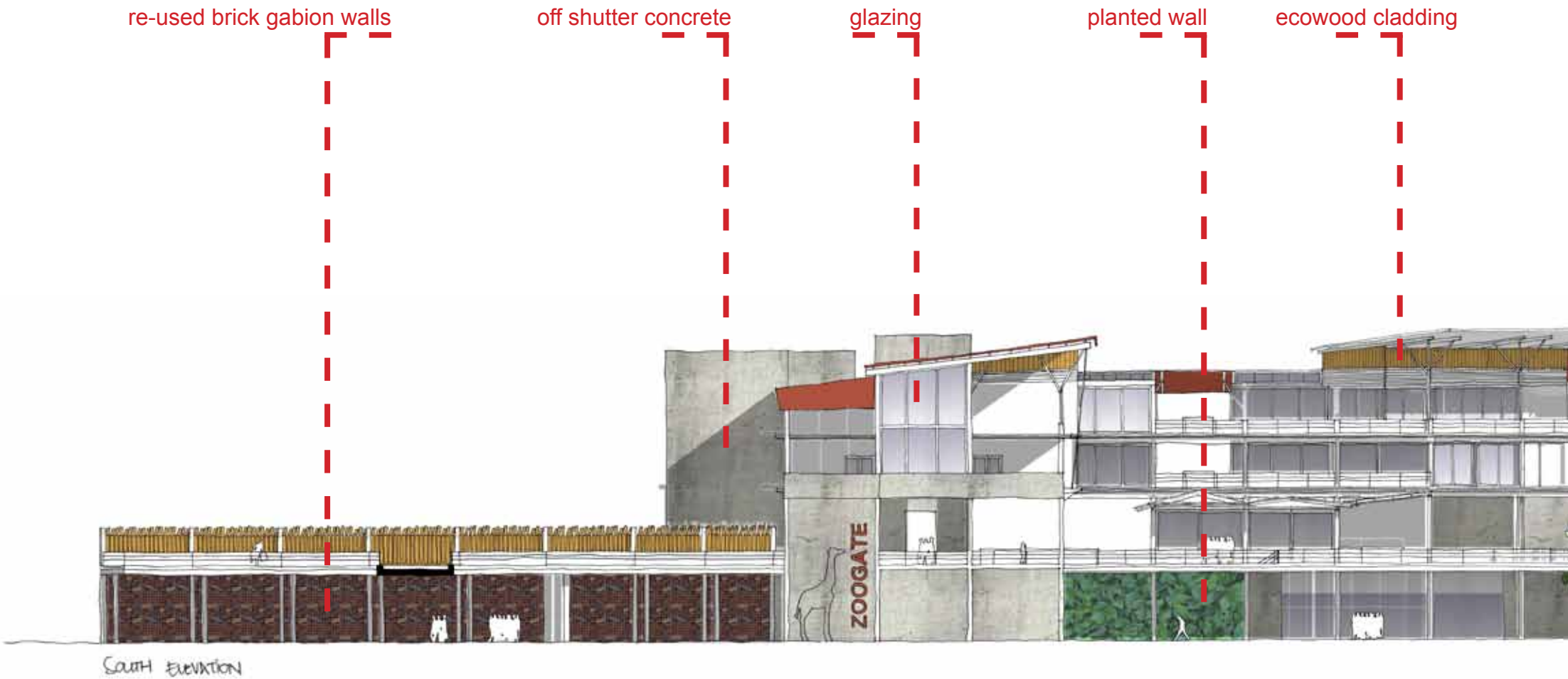
figure 112. level 3 plan

6.4.1.4 LEVEL 3

The top office floor is dedicated for new offices for the Zoo. The layout is based on the level below, with the exception of the double volume space in the middle of the West wing. The two office levels are internally connected with stairwells on the South corner and next to the service core in the North-East corner. An open deck wraps around the Northern portion of the office floor.

6.4.2 ELEVATIONS

The following sub-chapter depicts the materiality of the proposal through the documentation of the elevations.



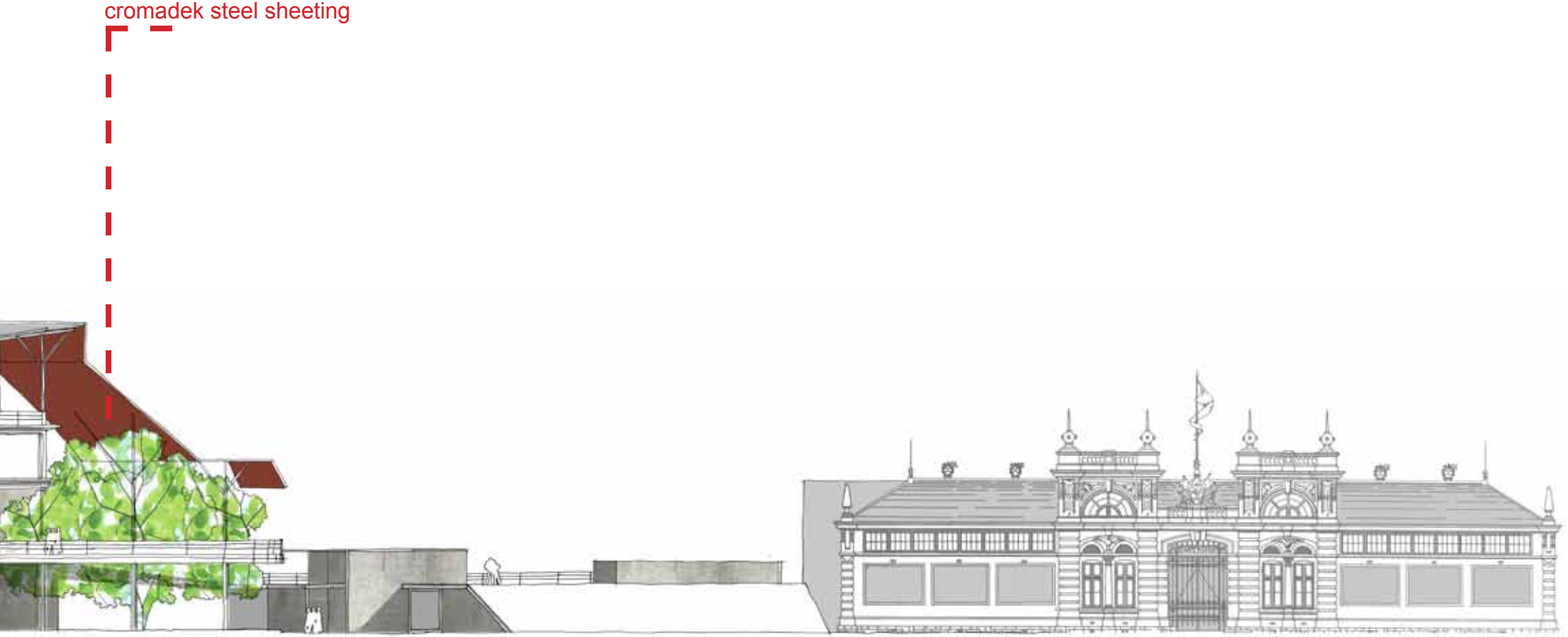


figure 113. south elevation with museum context

NORTH ELEVATION

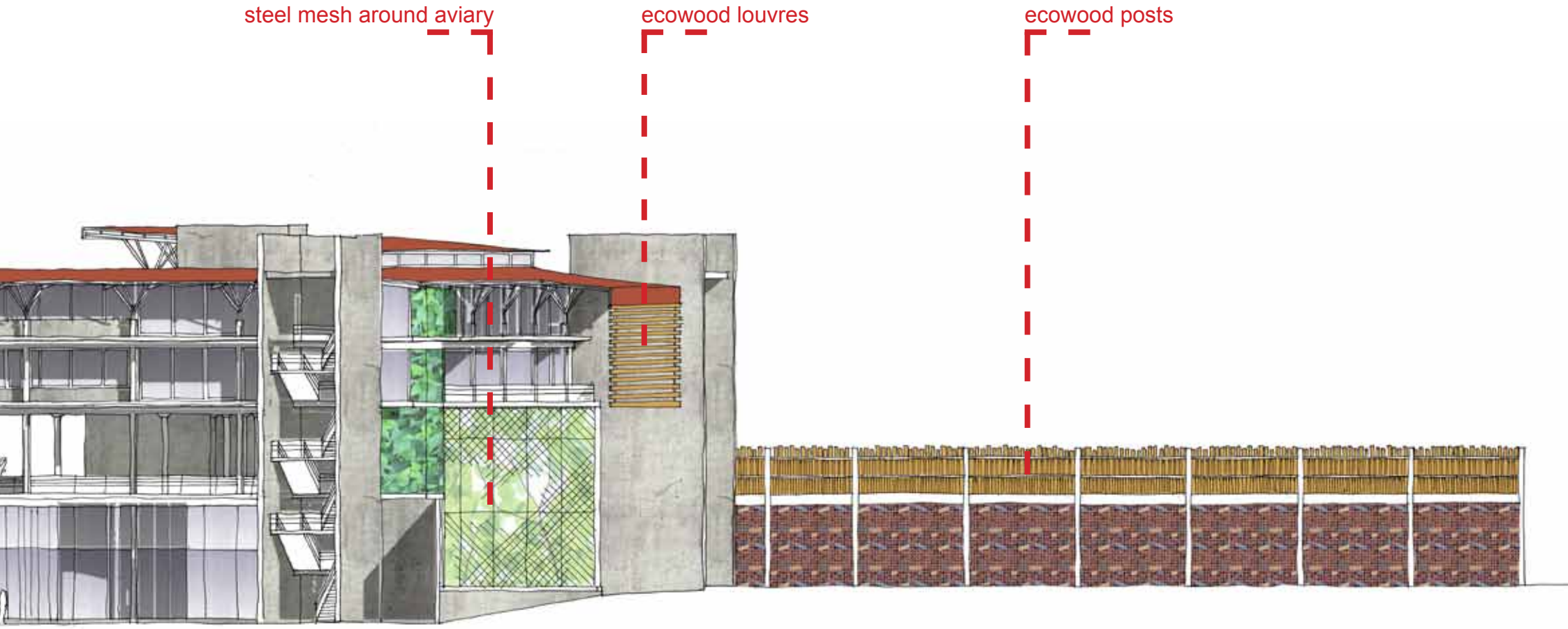


figure 114. north elevation with materials

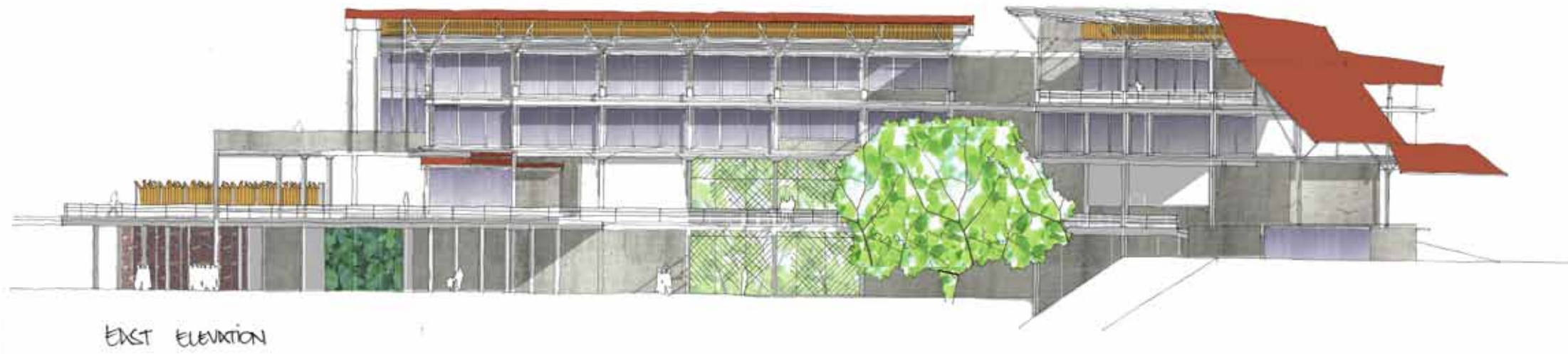


figure 115. east elevation with materials

figure 116. west elevation with materials

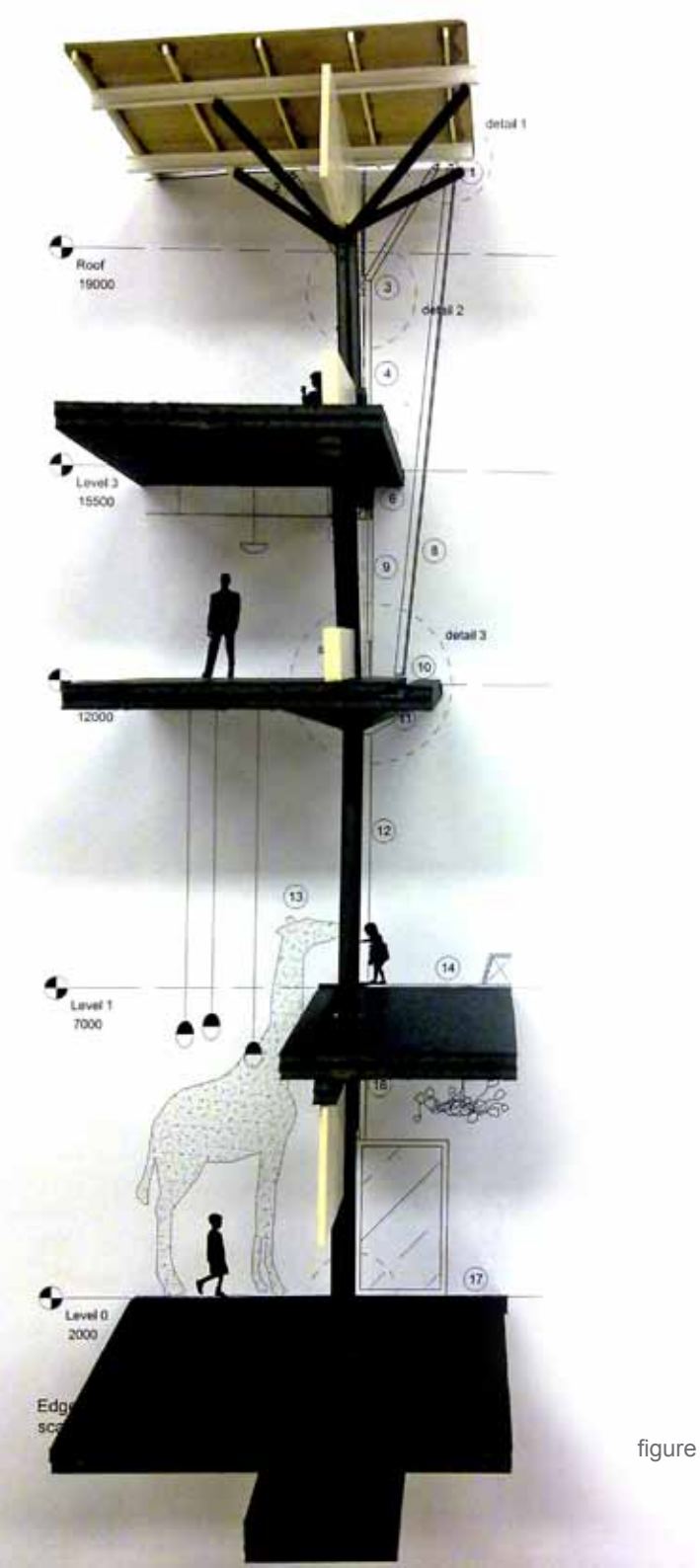


figure 117. photo of technical model

"Architecture is the art of organizing space. It is through construction that it expresses itself."

(Perret, 1952)

chapter 7 technological investigation

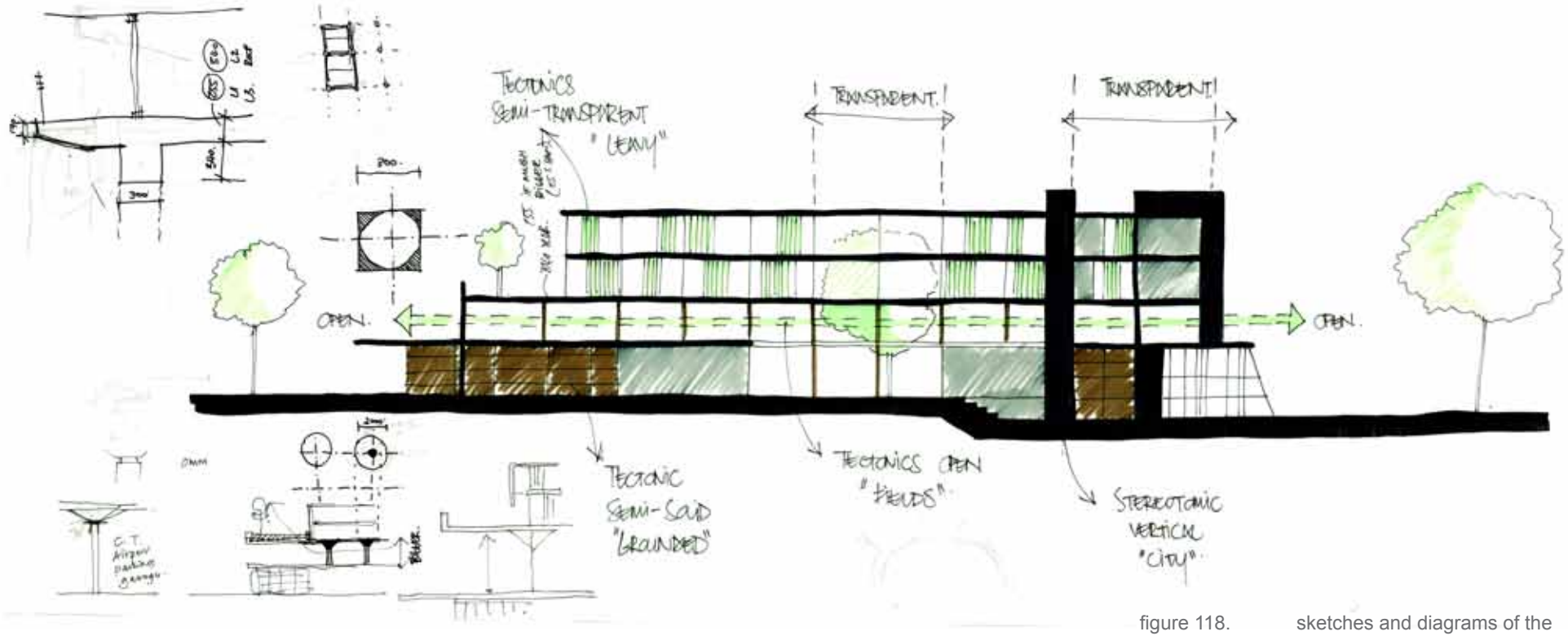


figure 118. sketches and diagrams of the beginnings of a techtonic language

7. TECHNOLOGICAL INVESTIGATION

7.1 TECHNOLOGICAL CONCEPT

The technological concept is based on the play between the vertical and horizontal elements that make up the structure. Vertical elements are accentuated by the open horisontal components. This draws back to the design concept of nature and the city.

The stereotomic elements relate to the city context, with hard vertical structures penetrating the building. It grounds the floating upper levels and the materiality relates back to the Museum and elements found in structures in the Zoo.

The tectonics in the development are based on more natural elements. The ground level speaks to the earth and is grounded by gabion walls seperating the public sidewalks and the semi-private Zoo functions. The open first level relates to an open natural environment, framing views of the Zoo as users pass through the level.

The two upper levels represent a lighter and semi-transparent tectonic, symbolising the tops of tree-like structures, letting light through while still creating a private realm for the office space.

7.2 STEREOTOMIC & TECTONIC

According to Gottfried Semper, the building crafts are divided into two distinct categories. Firstly, the “stereotomic” represents the repetitious piling up of massive elements to compose a volume, and secondly; the “tectonics” which are the lightweight components composed to define a spatial matrix.

(Frampton, K. 1996. P. 5)

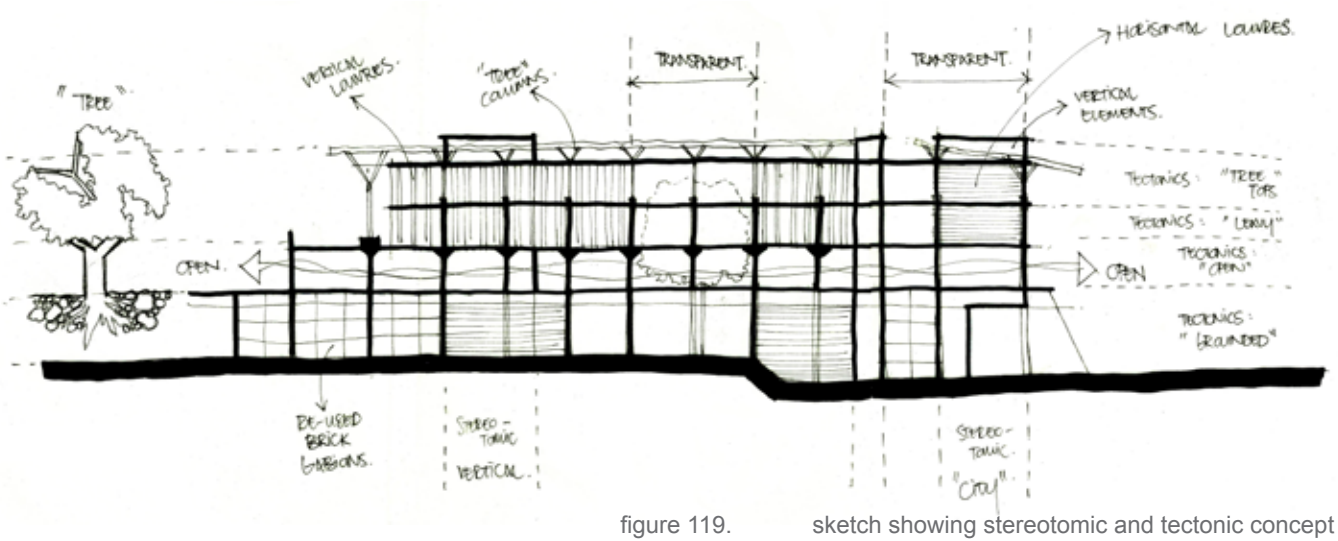


figure 119. sketch showing stereotomic and tectonic concept

The Stereotomic elements consists of a concrete column and beam structure, developed on a structural grid to simplify the construction process.

The columns range from 300x300mm concrete columns on the ground level to 300mm dia. round columns with mushroom caps on the first level. On the second and third level the columns change to round steel pipes that are cut and joined to form a tree-like structural element that will carry the roof structure.

The effect of the column designs is that the stereotomic mass becomes lighter higher up in the building. Concrete columns are cast in timber shutters, to leave a natural cast print on the concrete. Concrete floors are cast on structural beams to transfer the loads down to the columns.

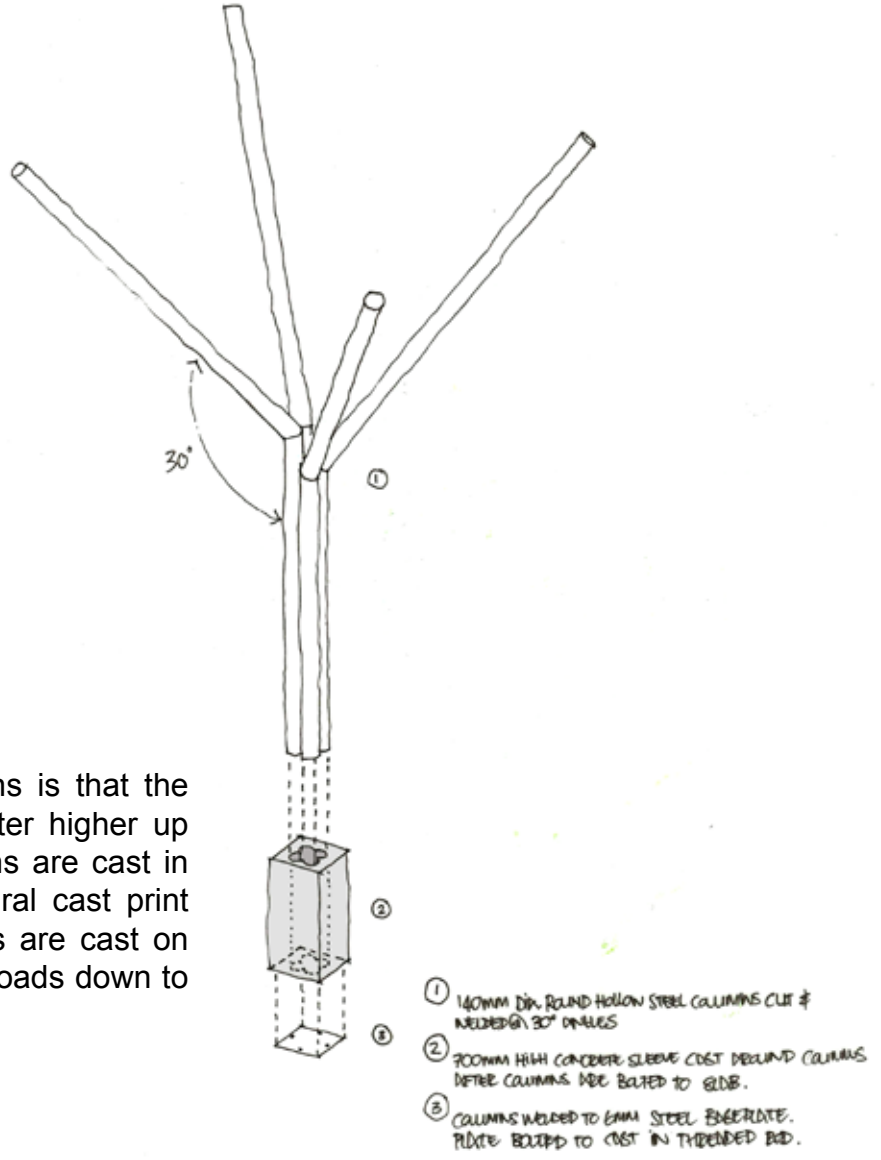


figure 120. detail of column assembly

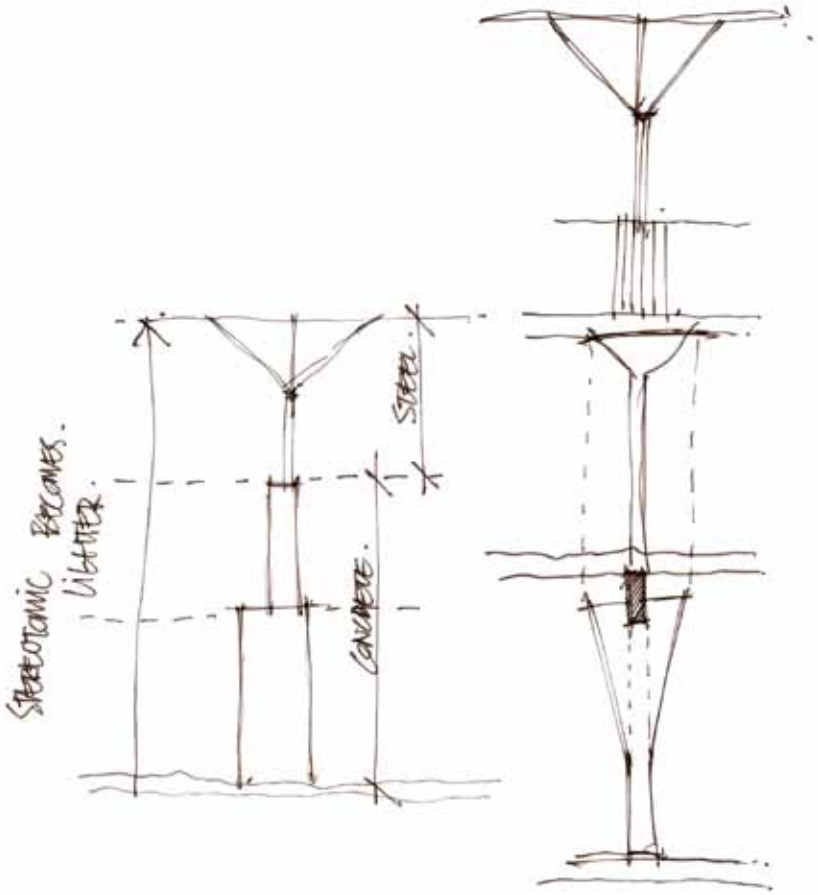
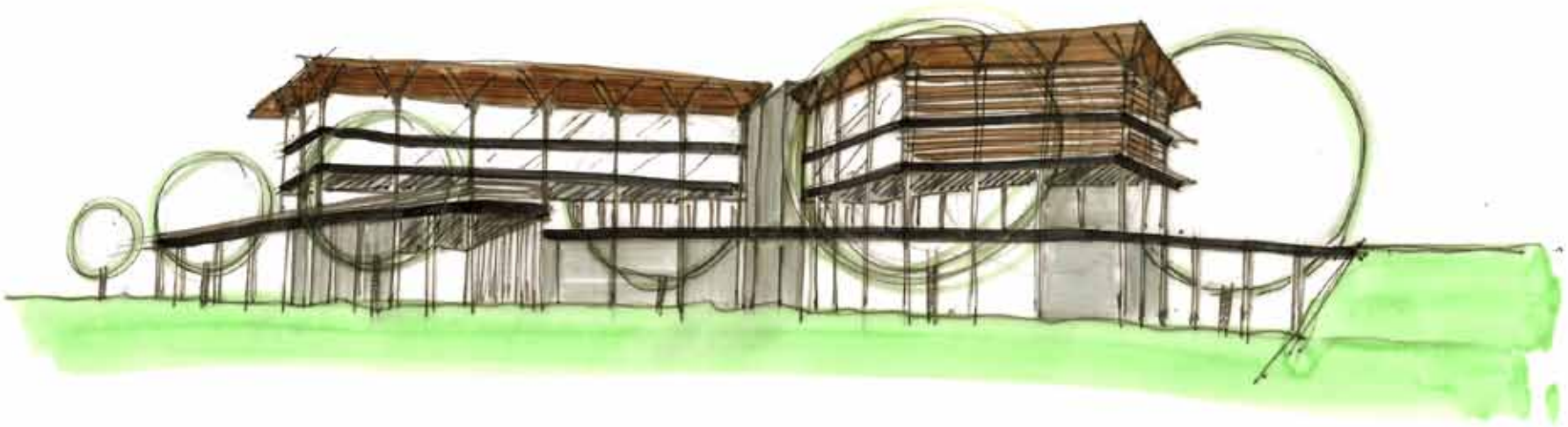


figure 121. diagram showing stereotomic investigation

figure 122. 3d showing stereotomic arrangement

figure 123. sketch showing tectonic investigation



The Tectonic is treated with various elements, depending on where in the proposal it is situated. Restaurants, offices and zoo facilities on the ground floor are fitted with timber louvered partitions that can be closed for privacy, or opened up to the public. While open, these partitions also function as shading devices.

Solid partitions are created with gabion boxes filled with brick, re-used from the demolished buildings.

On the open first floor, partitions become more transparent, with glass and mesh bounding the spaces. However, on this level the tectonics are kept to a minimum to offer visitors the maximum view over the natural elements of the Zoo.

The two upper levels are designated for office space and are enclosed by glazing. Vertical and horisontal louvre shading devices cover the facades and create a more private space. Areas on these floors are kept open and uncovered in order to create transparent sections in the building so that visitors in the square can still enjoy the views to the Zoo. Planted verandas also lend some privacy to the open space on the upper levels, while connecting the building with the natural surroundings.

The lightweight steel roof falls that to the North in order to create larger overhangs over office spaces.

figure 124. sketch showing hierarchy between stereotomic and tectonics

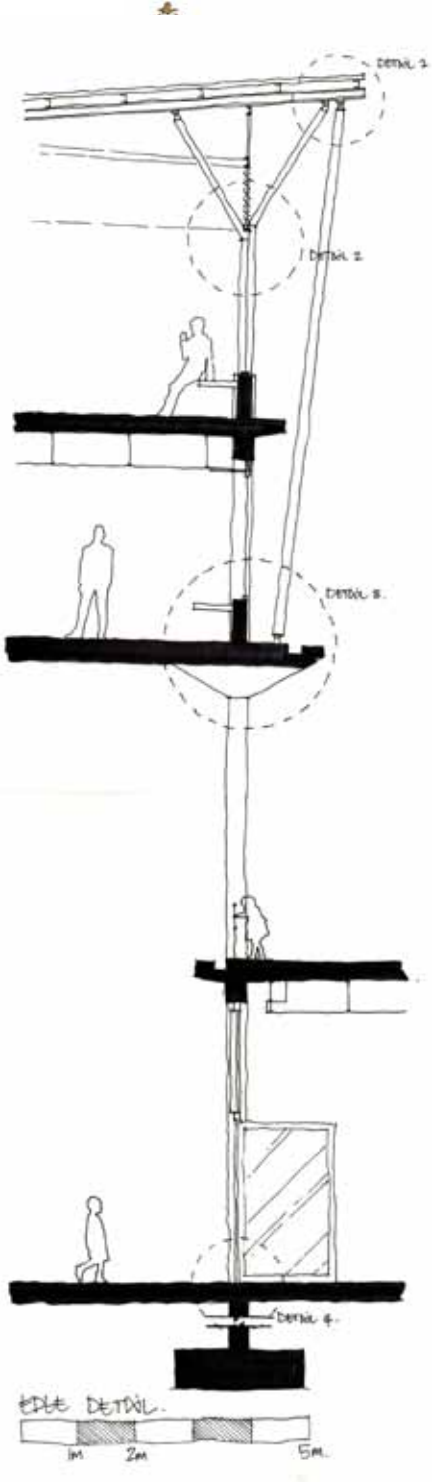


figure 126. interior rendering of double volume space in offices

7.2 SECTIONS

The following sub-chapter documents sections through the proposal. The aim of this is to examine the stereotomic together with the tectonic elements. This provides a spatial representation of what the proposal might look like. The sections also include a materiality and a programmatic investigation.

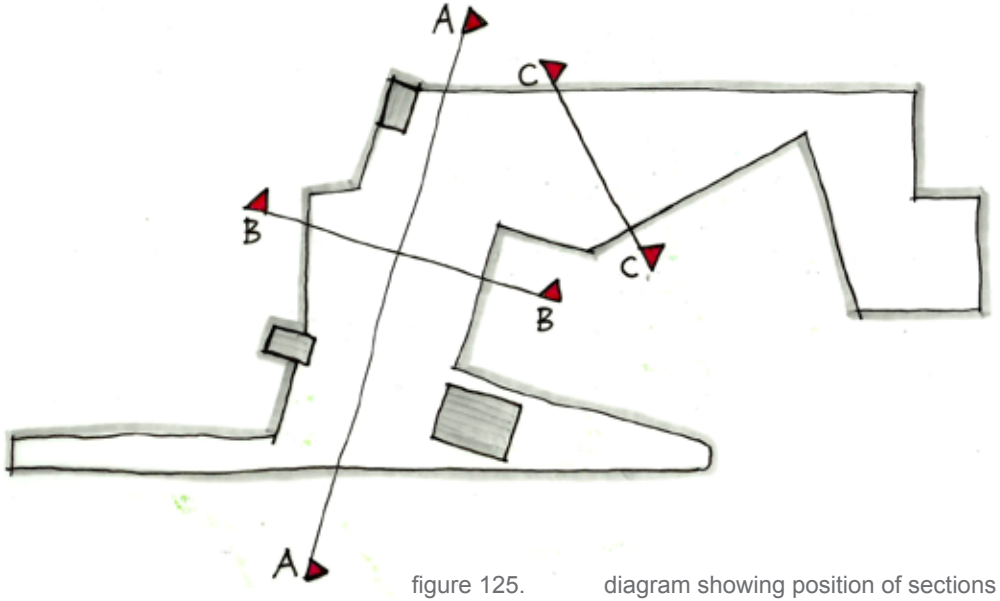


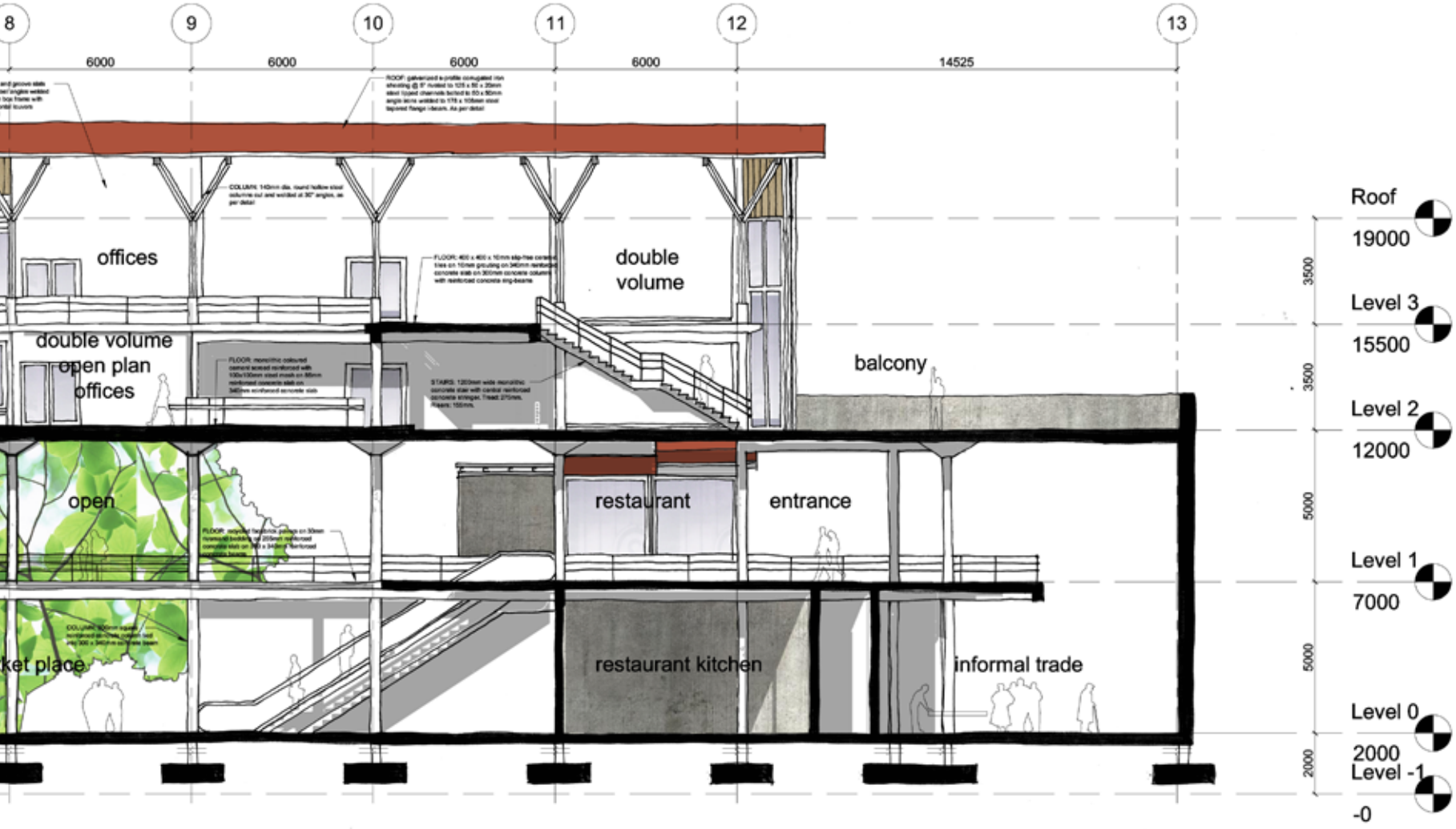
figure 125. diagram showing position of sections

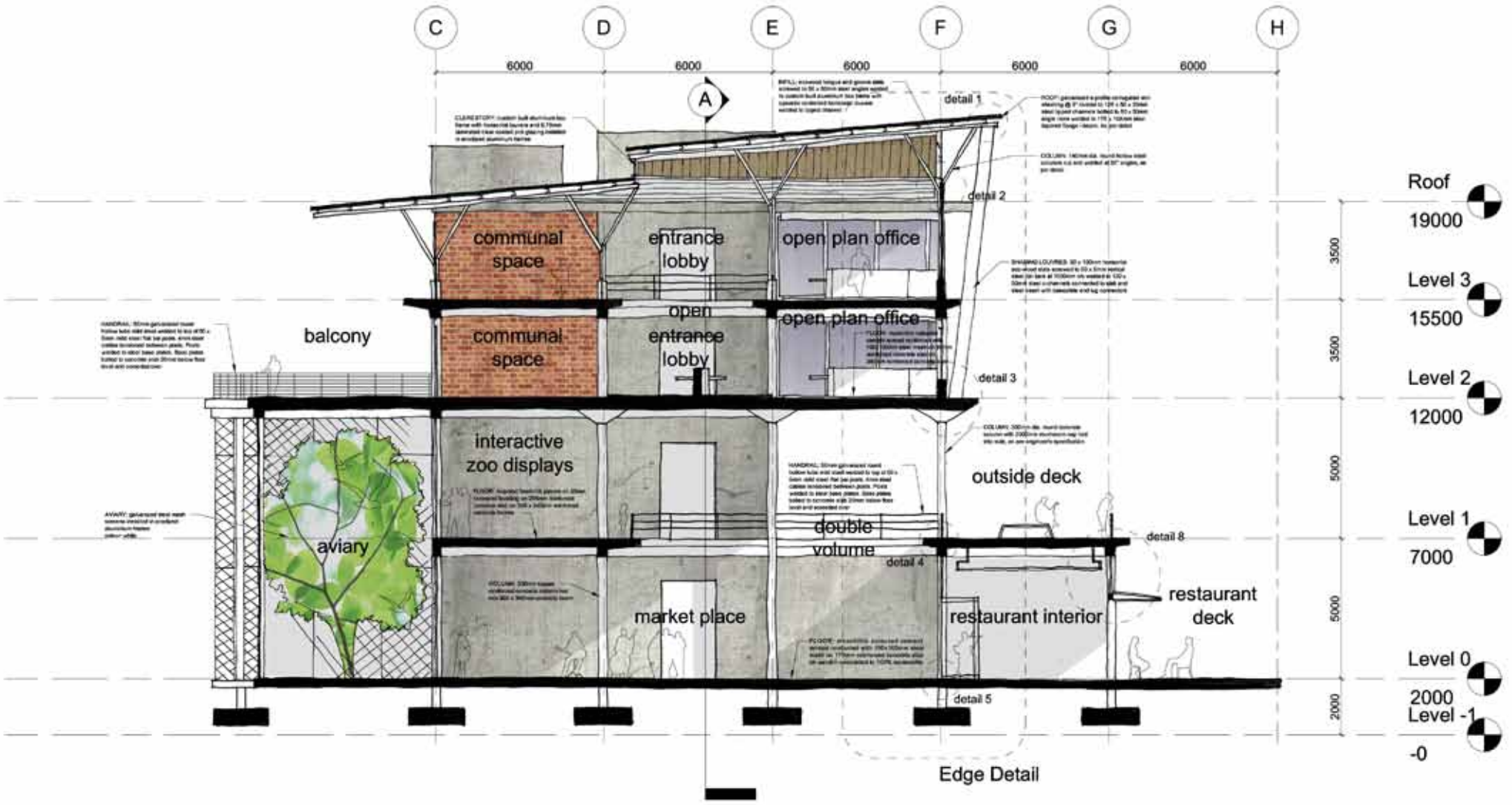
figure 127. 3d section through West wing

SECTION A-A

scale 1:200

figure 128. section a-a

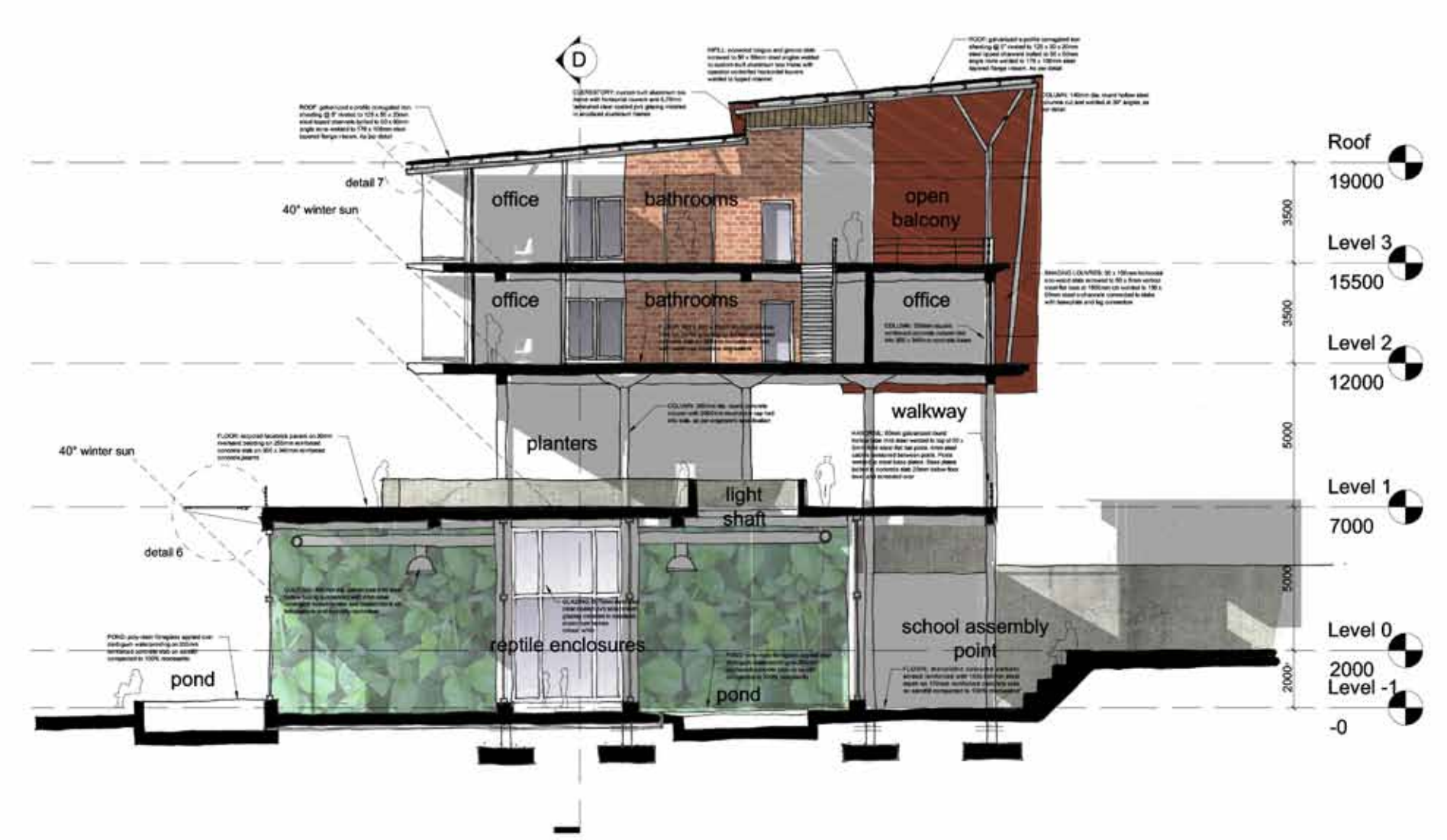




SECTION B-B

scale 1:200

figure 129. section b-b



SECTION C-C

scale 1:200

figure 130. section c-c

SECTION D-D

scale 1:200

figure 131. section d-d


C
offices
reception
office
offices
reception
office
meeting point &
view deck
shaft
resfreshment
shop
reptile enclosures
reptile and bathroom
service shaft
bathroom
corridor
information
office
Roof
19000
Level 3
15500
Level 2
12000
Level 1
7000
Level 0
2000
Level -1
-0
3500
3500
5000
5000
2000

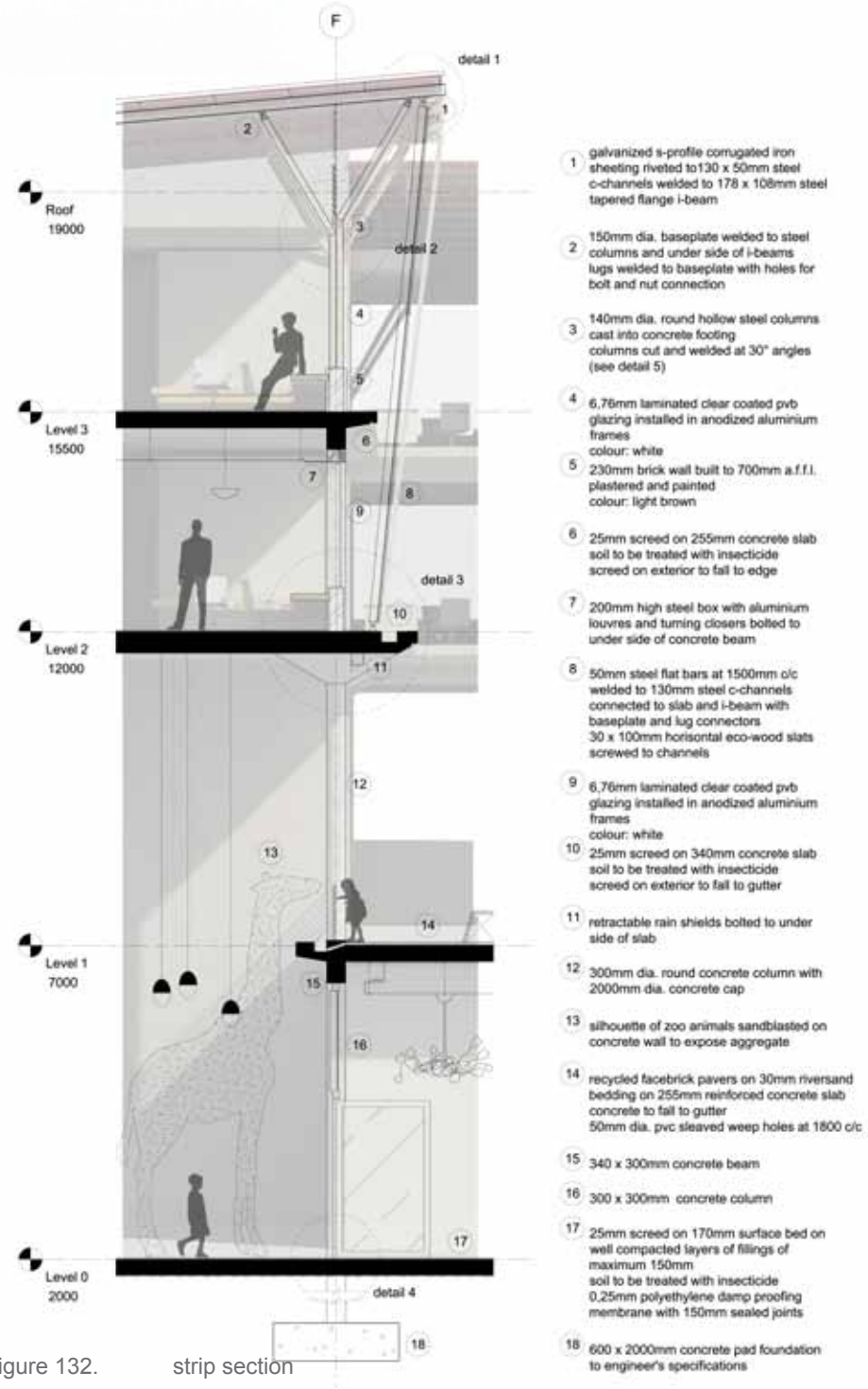


figure 132. strip section

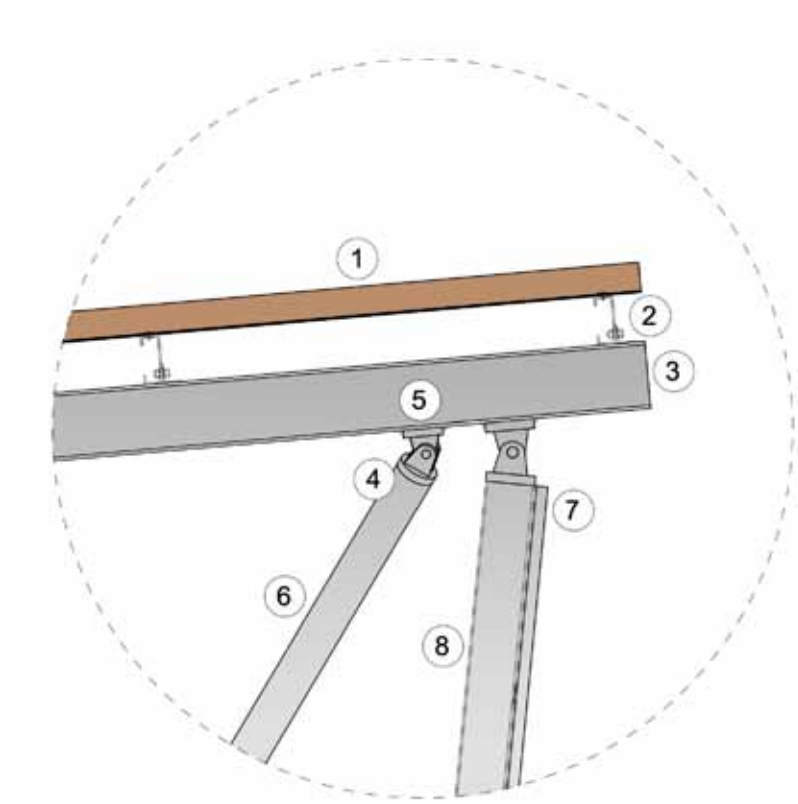


figure 133. detail 1. roof and column connection

7.3 DETAILS

The following details show technical resolution in stereotomic and tectonic scenarios found within the proposal. All details were designed keeping the technological concept in mind, and serve to add complexity and refinement to the design itself.

1. galvanized s-profile corrugated iron sheeting riveted to steel c-channels at 5°
2. 125 x 50 x 20mm steel lipped channels bolted to 50 x 50mm angle irons
   angles welded to steel i-beam
3. 178 x 108mm steel tapered flange i-beam
4. 25mm 150mm dia. baseplate welded to steel columns and under side of i-beams
5. 25mm lugs welded to baseplate with 10mm holes for bolt and nut connection
6. 140mm dia. round hollow steel columns cast into concrete footing
   columns cut and welded at 30° angles
   (see detail 5)
7. 30 x 100mm horisontal eco-wood slats screwed to 50 x 5mm steel flat bars at 1500mm c/c
8. flat bars welded to 130 x 50mm steel c-channels connected to slab and i-beam with baseplate and lug connectors

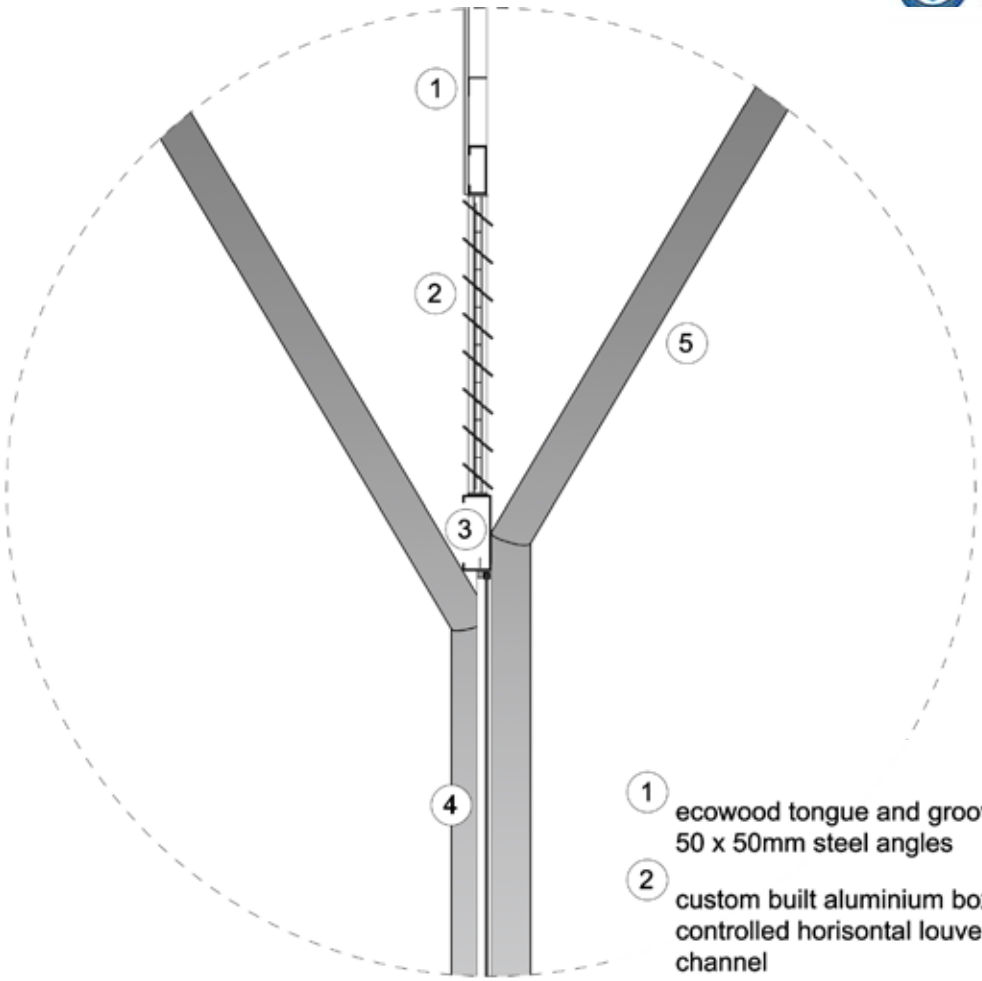


figure 134. detail 2. tectonics around columns

1. ecowood tongue and groove slats screwed to 50 x 50mm steel angles
2. custom built aluminium box frame with operator controlled horisontal louvers welded to lipped channel
3. 200 x75 x20mm steel lipped channel welded to inside of steel columns
4. 6,76mm laminated clear coated pvb glazing installed in anodized aluminium frames
   colour: white
5. 140mm dia. round hollow steel columns cast into concrete footing
   columns cut and welded at 30° angles
   (see detail 5)

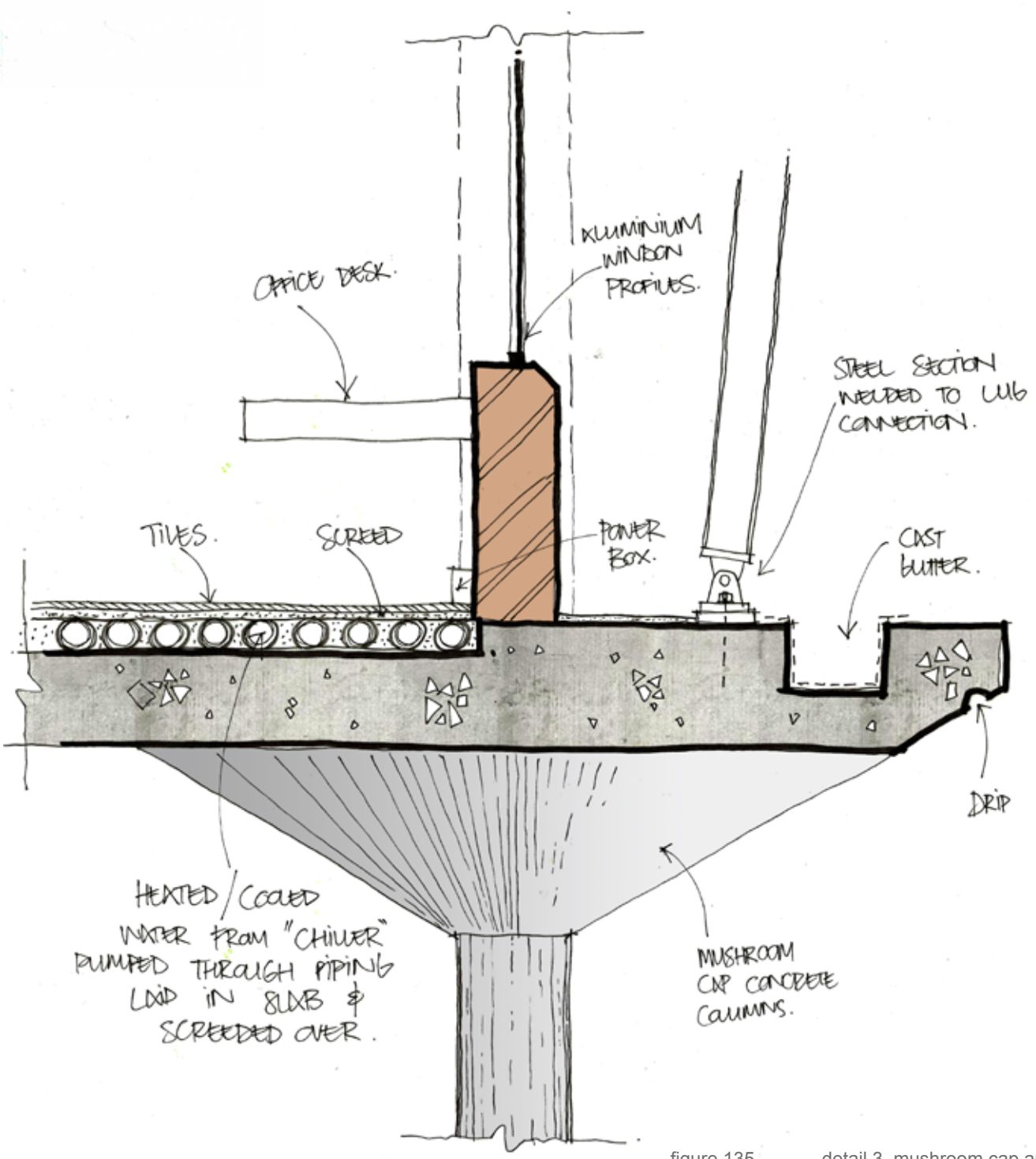
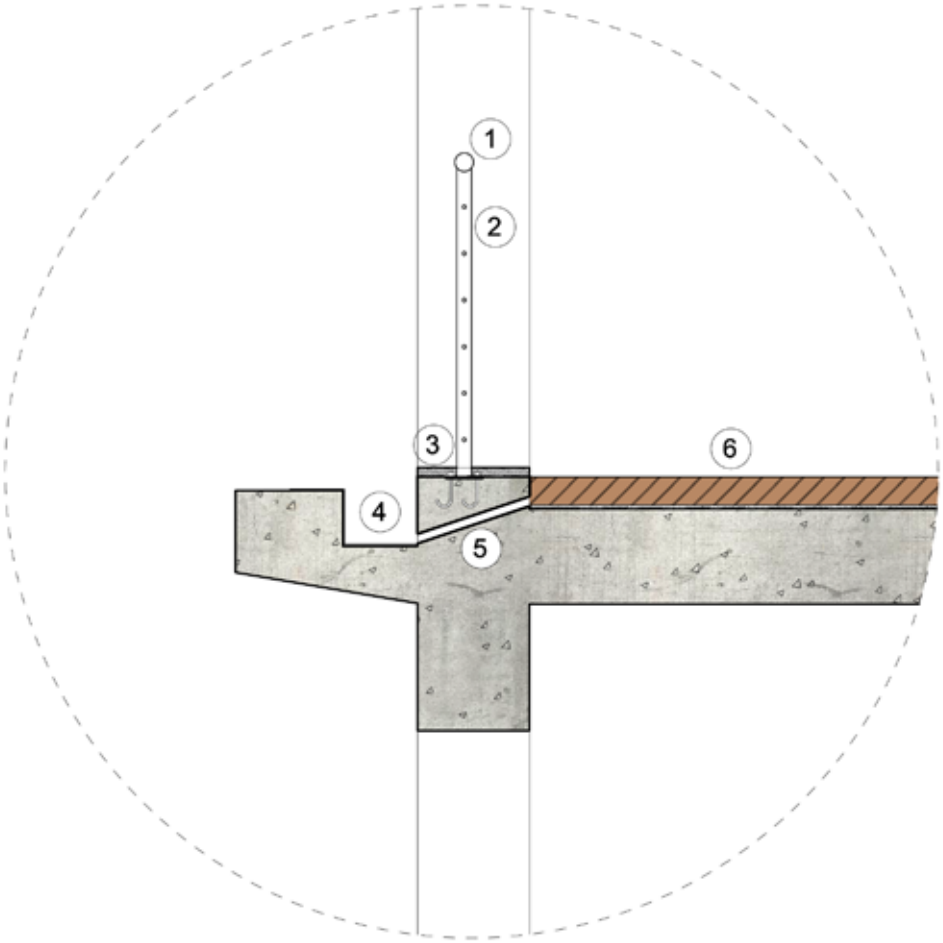
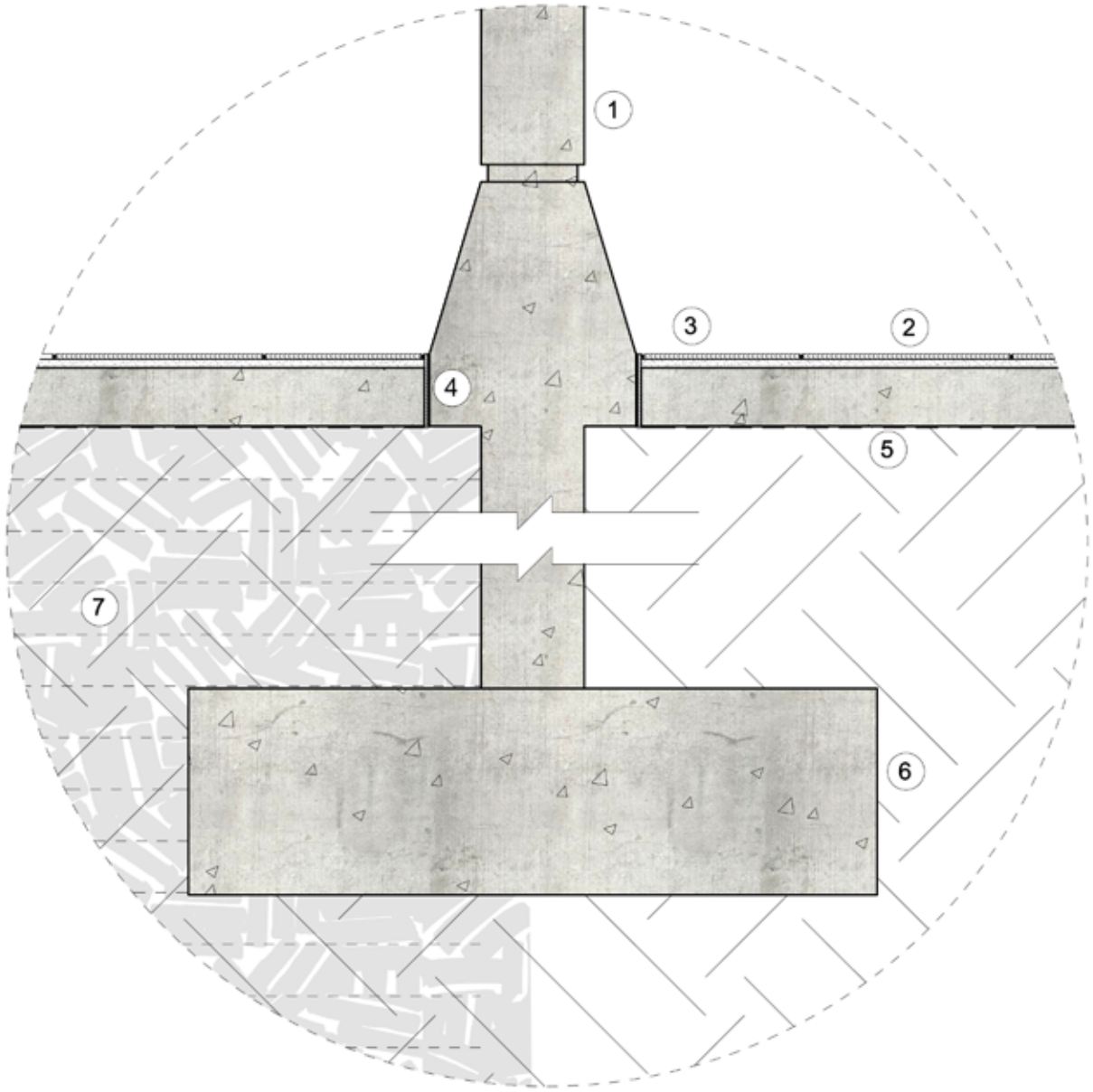


figure 135. detail 3. mushroom cap and slab detail



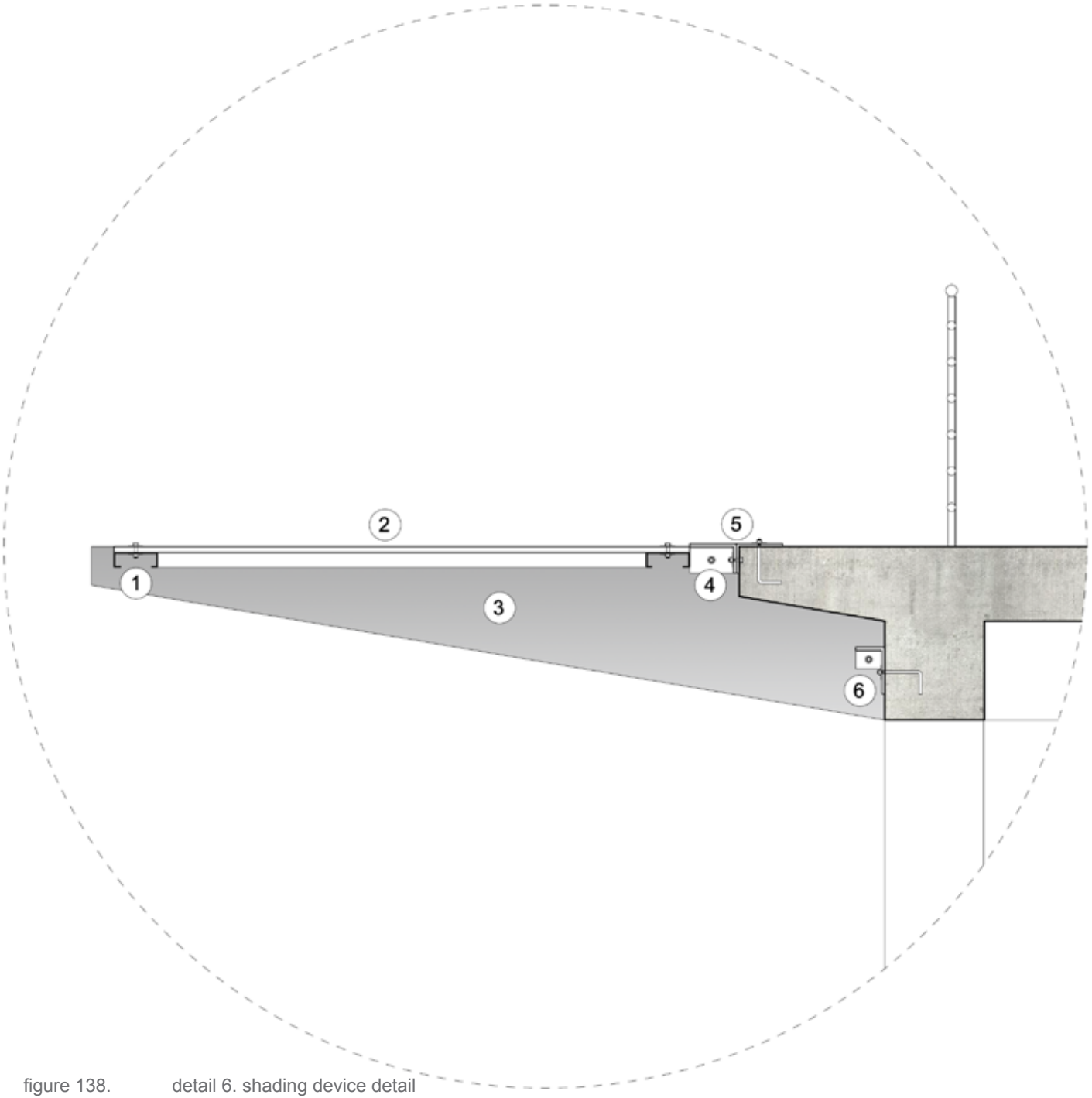
1. 50 x 2mm galvanized round hollow tube mildsteel handrail welded to flat bars
2. 50 x 5mm galvanized mild steel flat bar balusters welded to base plate. 4mm steel cables threaded through and tensioned between balusters
3. 10mm steel base plate bolted to threaded rod cast into reinforced concrete
4. derbigum waterproofing over 150 x 200mm concrete water channel
5. 20mm uPVC drainage pipe cast into concrete @ 2000mm spacing
6. recycled facebrick pavers on 30mm riversand bedding on derbigum waterproofing on 255mm reinforced concrete slab

figure 136. detail 4. slab and gutter detail



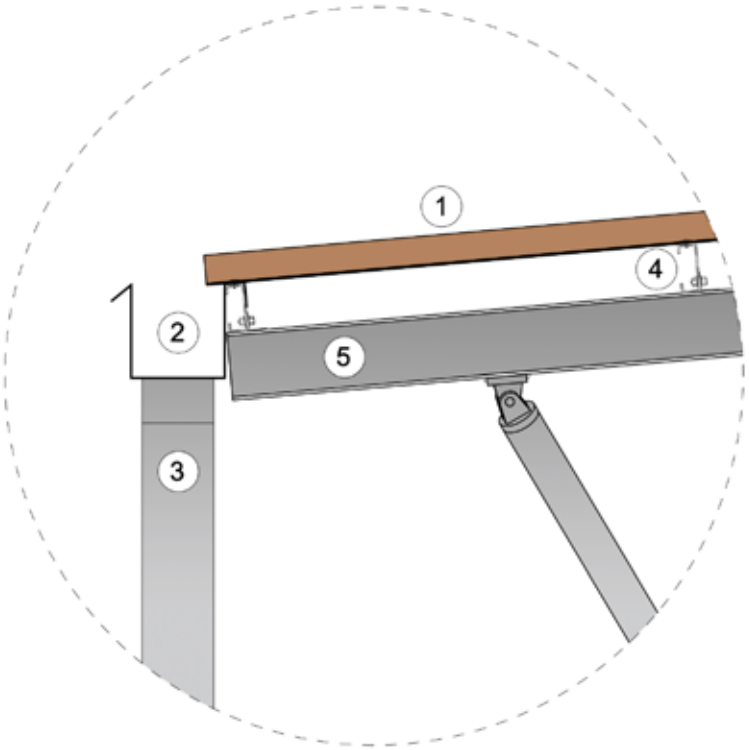
1. 300 x 300mm cast-in-situ concrete column with 600mm round base and 20mm deep shadow line
2. 600 x 600 x 10mm slip-free ceramic tiles on 10mm grouting
3. 25mm screed on 170mm surface bed on well compacted layers of fillings of maximum 150mm soil to be treated with insecticide
4. 10mm soft board infill between column and slab
5. 0,25mm polyethylene damp proofing membrane with 150mm sealed joints
6. 600 x 2000mm concrete pad foundation to engineer's specifications
7. compacted soil fillings in layers of 150mm maximum

figure 137. detail 5. floor and foundation detail



1. 150 x 50 x 20mm steel c-channel welded to mild steel profile cut plate
2. 50 x 20mm eco wood slats bolted to c-channels
3. 4mm galvanized mild steel plate water jet cut to profile and bolted to mild steel angles @ 3000mm spacing
4. 90 x 90 x 6mm mild steel angles bolted to profile cut plate and welded to 90 x 150 x 10mm mild steel angles
5. 90 x 150 x 10mm mild steel angles bolted together and to threaded rod cast in reinforced concrete slab
6. 60 x 60 x 4mm mild steel angle bolted to profile cut plate and welded to 90 x 150 x 10mm mild steel angle. angle bolted to threaded rod cast in reinforced concrete beam

figure 138. detail 6. shading device detail



1 galvanized s-profile corrugated iron sheeting riveted to steel c-channels at 5°

2 250 x 250mm galvanized mild steel box gutter bent over and riveted to steel lipped channels (140mm²/m² of roof area)

3 190 x 190mm galvanized mild steel down pipe connected to box gutter (100mm²/m² of roof area)

4 125 x 50 x 20mm steel lipped channels bolted to 50 x 50mm angle irons angles welded to steel i-beam

5 178 x 108mm steel tapered flange i-beam

figure 139. detail 7. roof and gutter detail

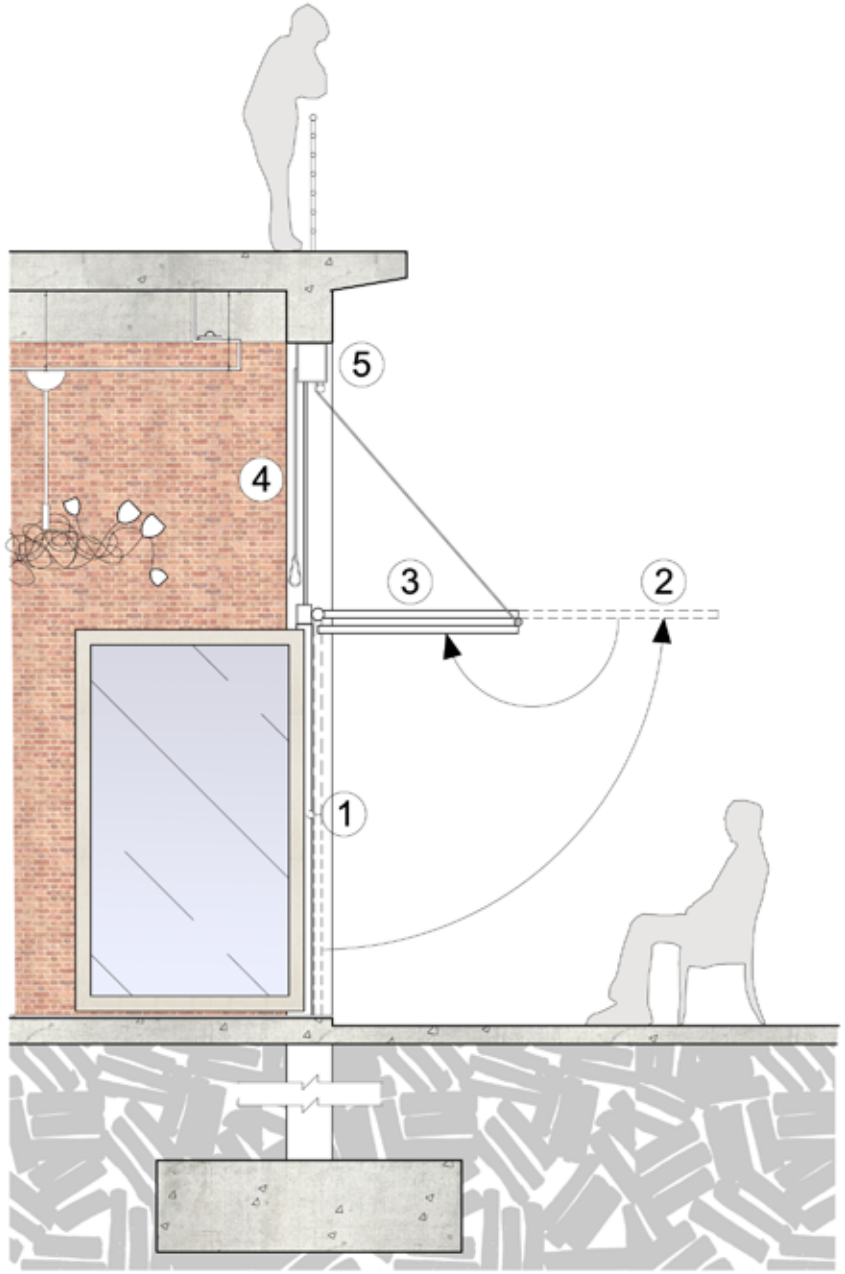


figure 140. detail 8. foldable shading detail

1. 50 x 20mm ecowood slats screwed to a folding aluminium frame hinged from bolt cast into concrete columns
2. louvre panels tilted to a horisontal position via chain link
3. bottom louvre panel folds back in and clips into position under top panel
4. panels are drawn upwards via a chain link
5. chain link operates over a series of pullies and locks chain in position when panels are drawn to a horisontal position

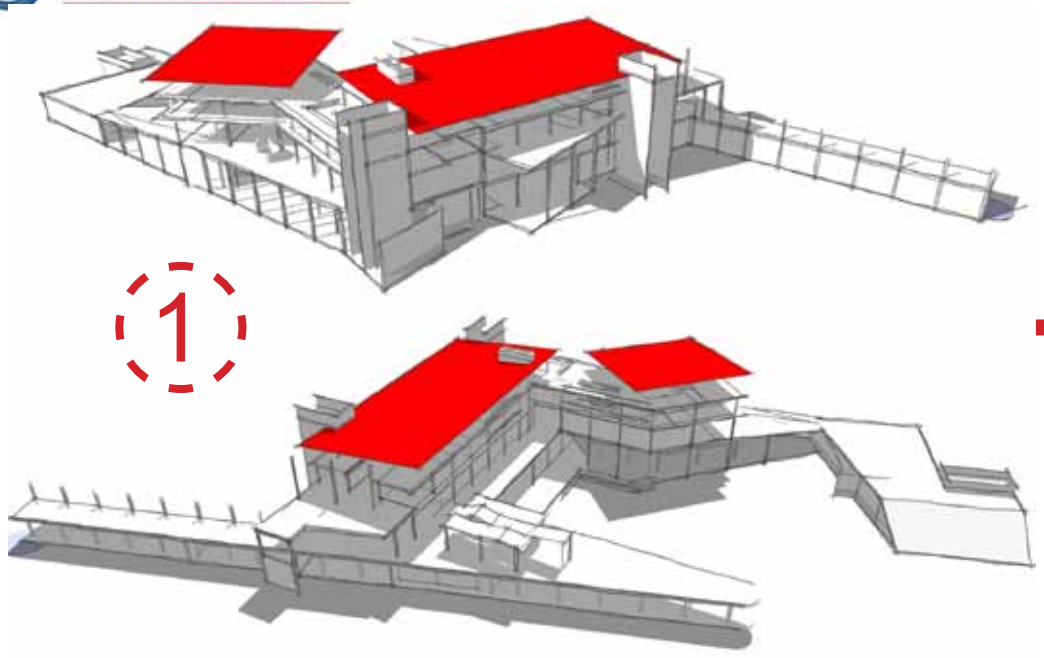


figure 141. roof development 1. single sheets

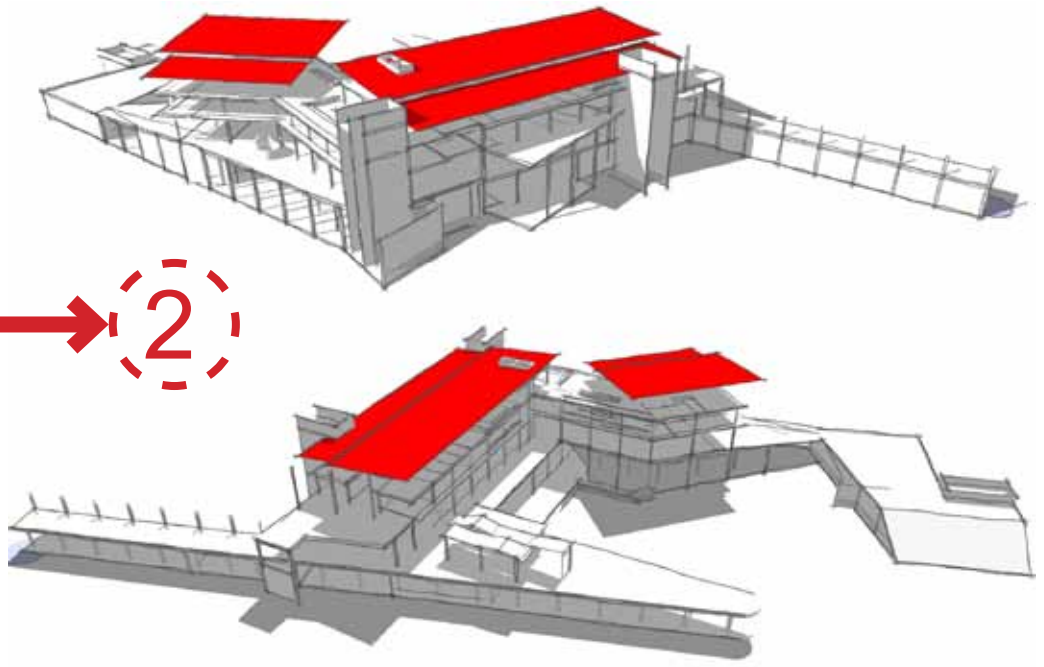


figure 142. roof development 2. roof split for clerestories

7.4 ROOF

PHASE 1

The roofing initially started off as two large monopitch roofs covering the two wings of the office levels. The uncovered section between the roofs would become an open deck and service area.

The problem existed that the roofs felt dissociated and the monopitch became too monotonous.

PHASE 2

In phase 2 the two roofs were split down their lengths to effectively create four roofs. The two facing the public square were raised in order to create a space for clerestory windows and louvres under the roof.

However, the roofs are still not connected and does not unify the two wings.

PHASE 3

The two roofs are joined by an additional monopitch roof over the North-West corner. A concrete slab is added above the circulation core for servicing the lift and hosting water tanks.

The roofs and the building itself still do not communicate as one project.

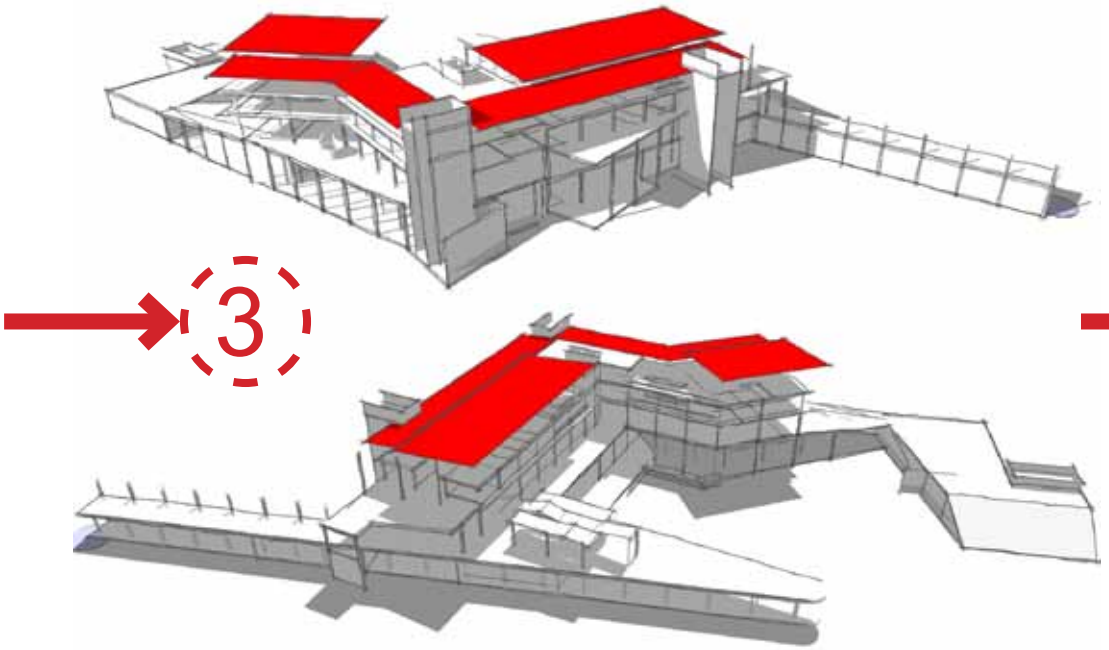


figure 143. roof development 3. two roofs connected over circulation core

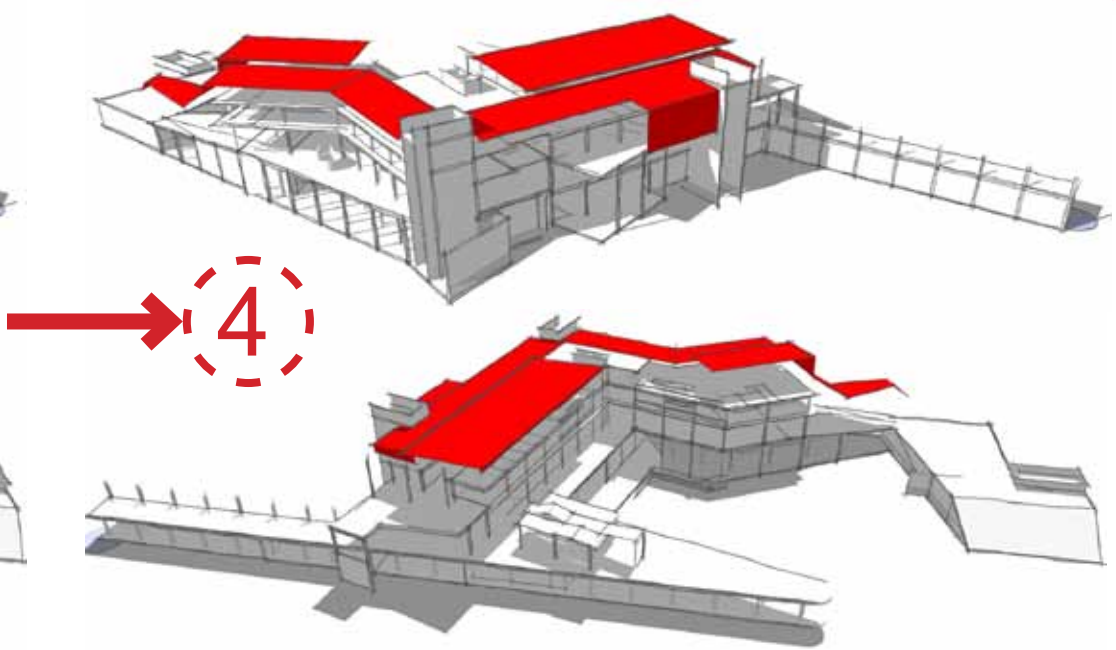


figure 144. roof development 4. roof wraps around building and extends above entrance

PHASE 4

In the final phase of the roof development the Western roof folded over the building to create shading from the afternoon sun. The Northern roof extended to create a bigger overhang. In order to accentuate the entrance of the Zoo, a portion of the roof above it is extended and folds down over the pedestrian ramp. This extension is held up by two larger tree-like columns that define the entrance portal.

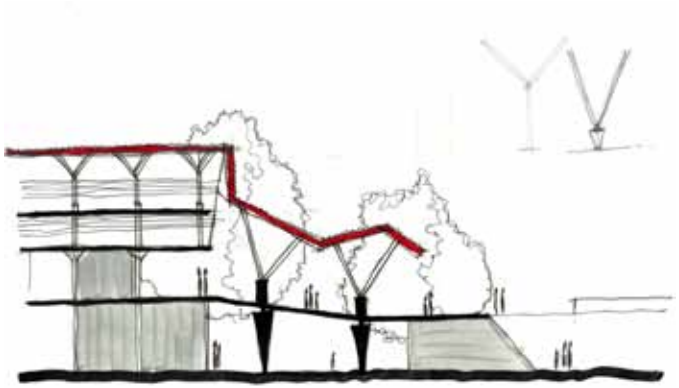


figure 145. diagrammatic elevation of roof above entrance

figure 147. example of re-used brick gabion wall

figure 146. re-used brick gabion perimiter wall

7.5 MATERIALS

Materials play a pivotal role in creating the feel of a space, but also in how that space relates to its immediate surroundings. It defines how people will interact with a building.

By specifying locally available and renewable materials, the proposal aims to create a sustainable environment that is also easily maintained and adds quality to the finished product.

7.5.1 RE-USED FACEBRICK

With the demolition of the current Zoo facilities, which are all built with facebrick, a lot of half crushed brick will be readily available on site. The brick will be sorted on site and re-used in various applications.

Gabion walls, 500mm in thickness, and reinforced with steel are built on site and filled with the facebrick. These walls form porous barriers along the informal trade and inside the open market.

In order to accentuate the outdoor feel of the open first level, the concrete floor slab will be finished with a layer of river sand and brick pavers. These pavers will also be re-used facebrick that will be cut on site to specific sizes in order to create paving patters and ensure a level surface.

figure 149. example of timber screen wall

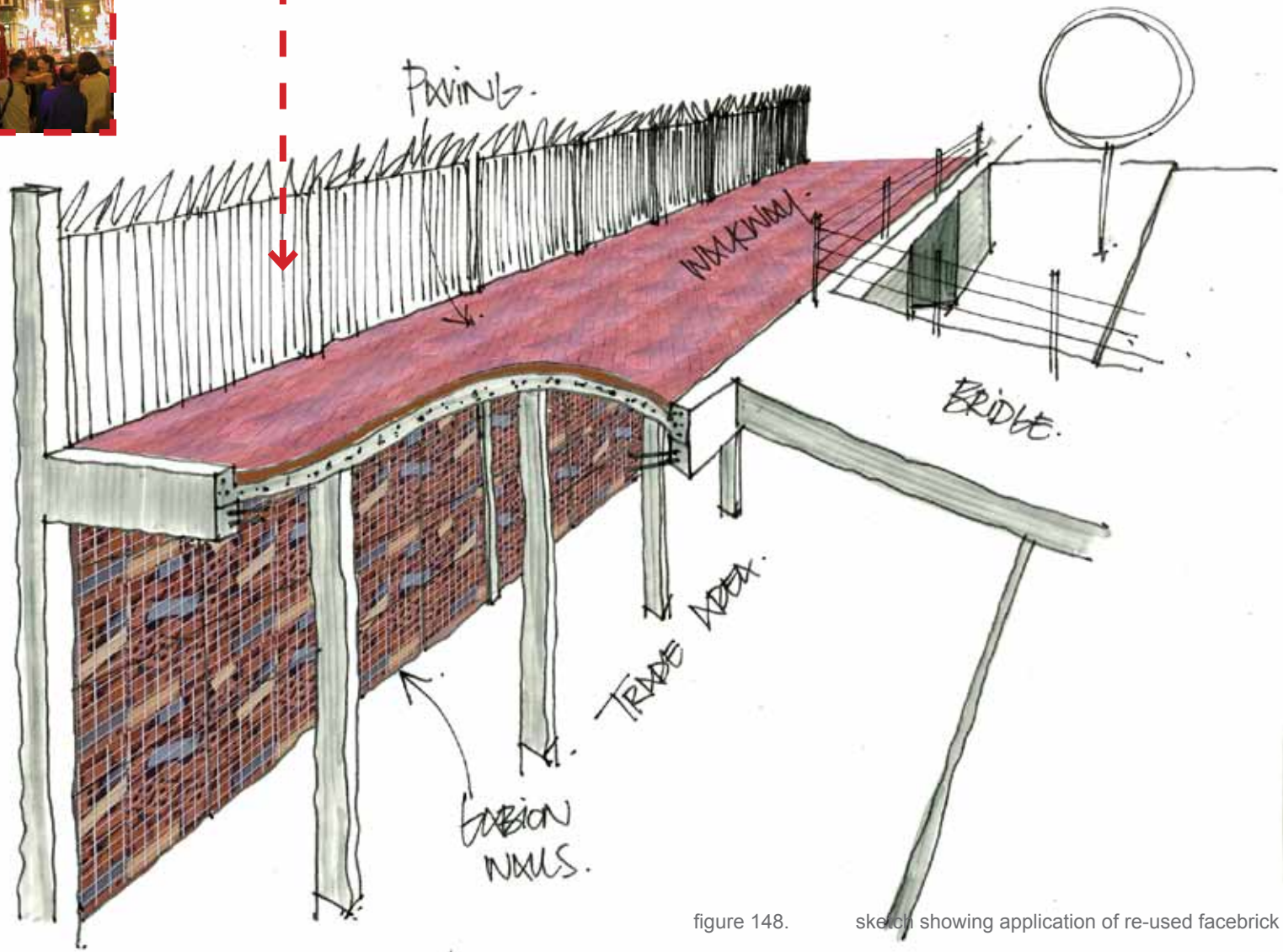


figure 148. sketch showing application of re-used facebrick

figure 150. typical ECOWOOD extrusion commonly used for decking

“the use of wood in polymers is nothing new and has been used for many years as a cheap filler. It was only during the past ten years that the use of wood as the primary ingredient in extrusion compounds started taking the stage.”

(www.ecowood.co.za)

7.5.2 ECOWOOD (tm)

Extruded wood is fast becoming a sustainable substitute for both traditional polymers and natural wood. The benefits include savings in labour and machine costs, and more importantly the re-use of available materials.

Ecowood can be formed through extrusion, injection-moulding or compression moulding and is available in a variety of colours. The compounds contain between 50% and 75% natural fibre, with H.D.P.E. as the polymer base.

Extruded Ecowood slats will be fixed to steel frames and applied to facades to serve as louvre shading devices. The benefit of Ecowood in this application is that is requires very little maintenance.

Specially formed Ecowood strips will also be used around the public square, where the partitions on the restaurant facades will fold up to form pergolas over the seating areas.

Ecowood decking will be specified outside restaurants as this is an effective decking material in high traffic areas. The finish can easily be repaired if it scratches, and the product is fully recyclable after use.

Sourcing the product is also efficient as the plant is situated in Limpopo, and transporting the product to site will not be a problem.

figure 151. surface texture of ECOWOOD

figure 152. 3d showing ecowood louvres on facade

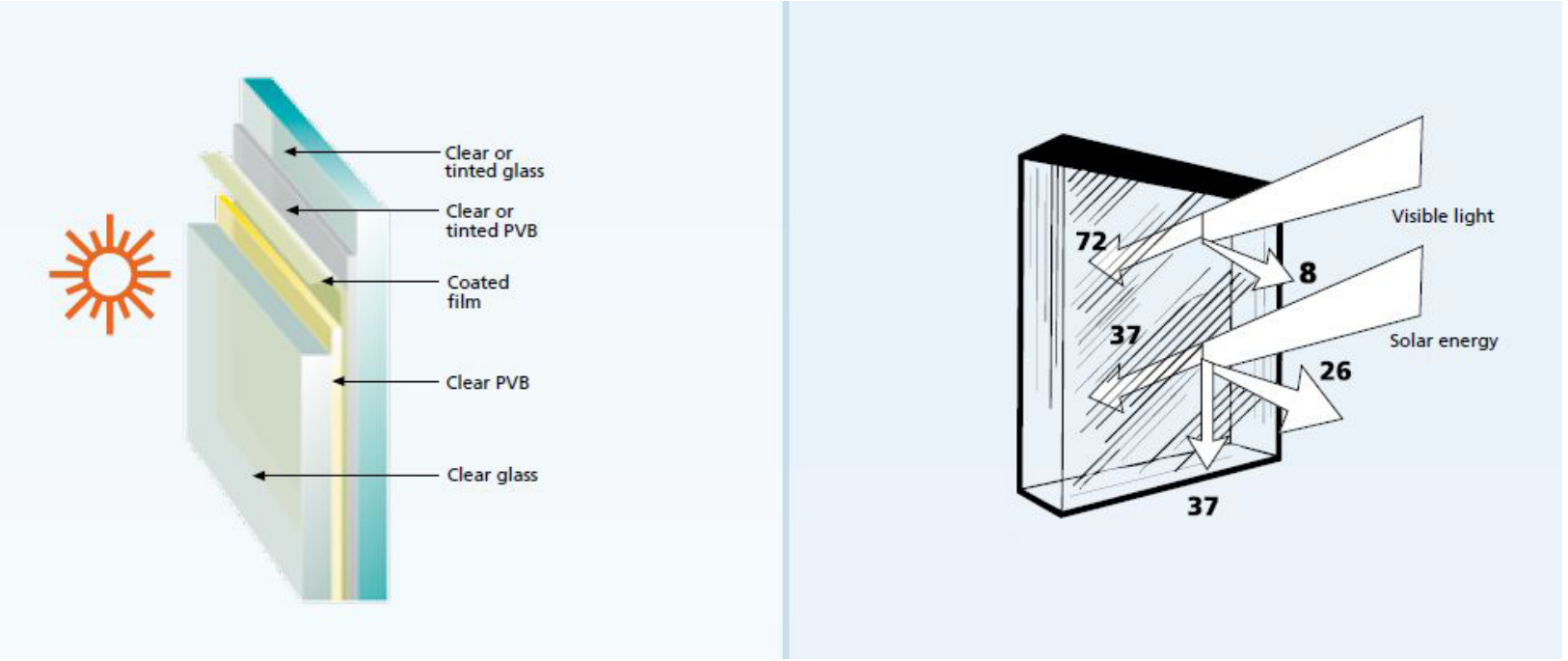


figure 153. COOLVUE composition and transmittance information

7.5.3 COOLVUE (tm)

"CoolVue glass meets the growing demand for natural day lighting and building transparency, without the heat gain associated with ordinary clear glass. CoolVue can transmit more than 70% of visible light while blocking more than 50% of solar heat." (Smartglass catalogue)

The product is a laminated clear coated safety glass that is manufactured by laminating a wavelength-selective heat rejecting coating between two layers of PVB and glass. It also reduces noise transmissions, increases safety and filters up to 99.5% of short wave UV radiation.

CoolVue will be specified for the glazing around the two upper floors housing offices. The product transmits visible light, therefore solar louvres will be added to the facades to minimize glare inside the offices.

The 6,76mm thick glazing panel are standard made in 2440x2000mm panels, and care is given to design the building facades to accommodate these sizes so that unnecessary cutting is not needed.

The glazing panels are installed in white powder coated aluminium profiles, and the profiles are fixed to the building structure.

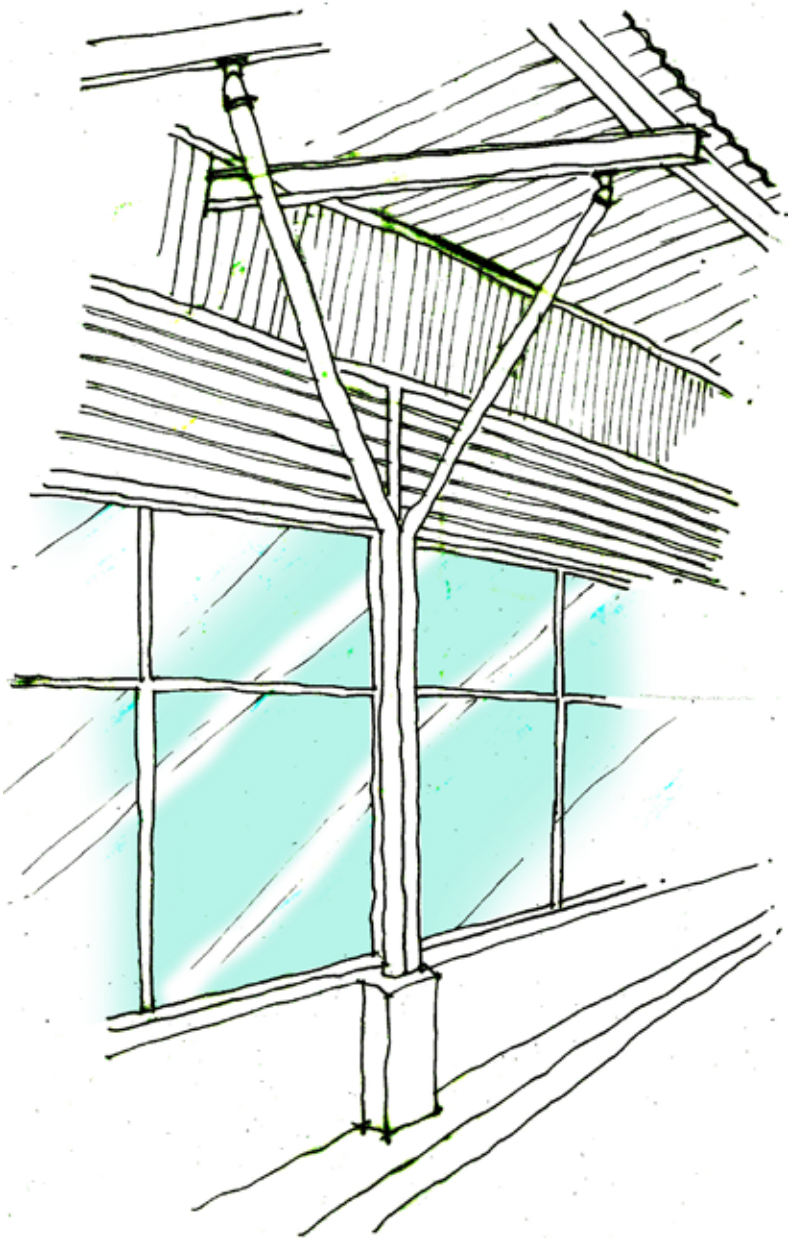


figure 154. sketch showing application of COOLVUE glazing

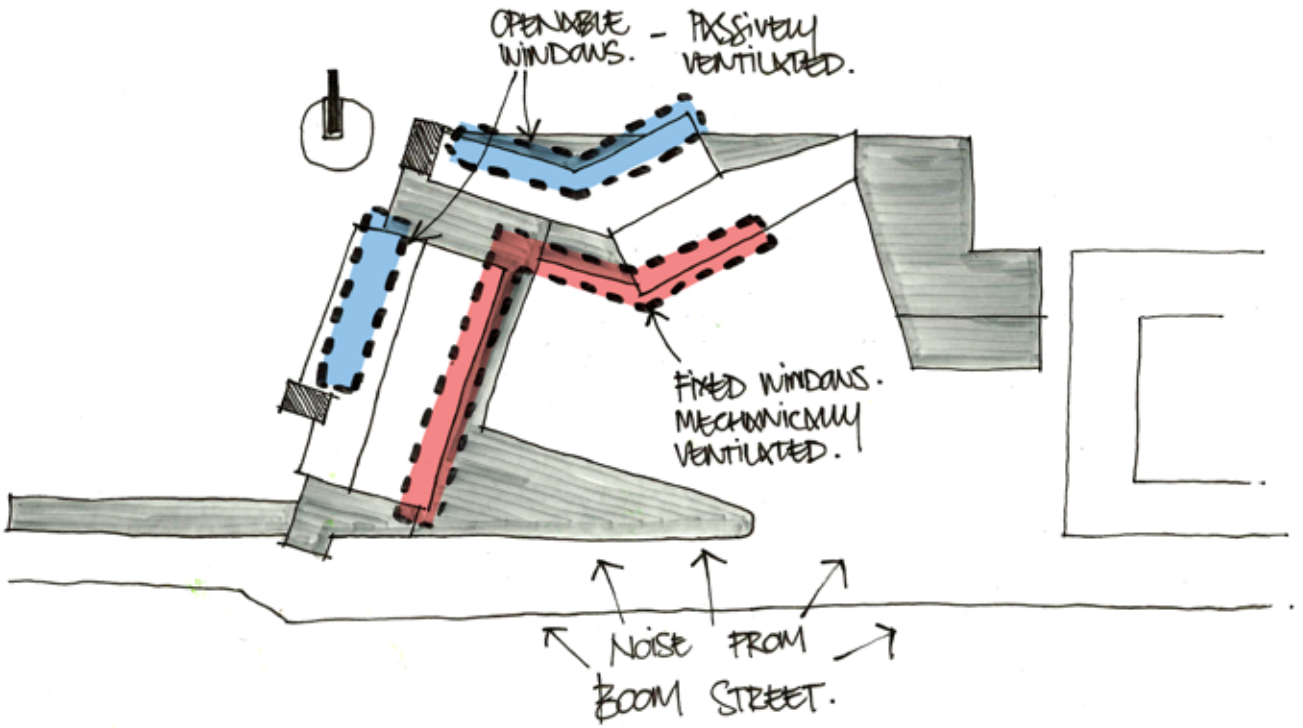


figure 155. diagram showing location of fixed and operable windows

7.6 SUSTAINABLE SYSTEMS

7.6.1 PASSIVE VENTILATION

Due to their open edges, the public ground level and open first level is passively ventilated. The ground level is open to the Public square on the East and the West is bordered by the mesh covered aviary. This, coupled with gabion walls, allows air to move freely through the open market space and restaurant seating areas.

The first level, where visitors enter the building is open to all sides to enhance views of the Zoo. This promotes air flow throughout the development and cools the micro-climate down as air passes through the natural environment of the Zoo.

The office floors are fitted with operable louvres in the facade that allows fresh air to pass through the offices, to the central open core. Louvres can be controlled to the users requirements. Air is moved mechanically (see 7.6.2) through the South and East facing offices. The central cores ventilate through louvres above the clerestory windows in the roof.

The Information centre is also passively ventilated as its North, East and Western facades opens up to allow sunlight and moving air in.

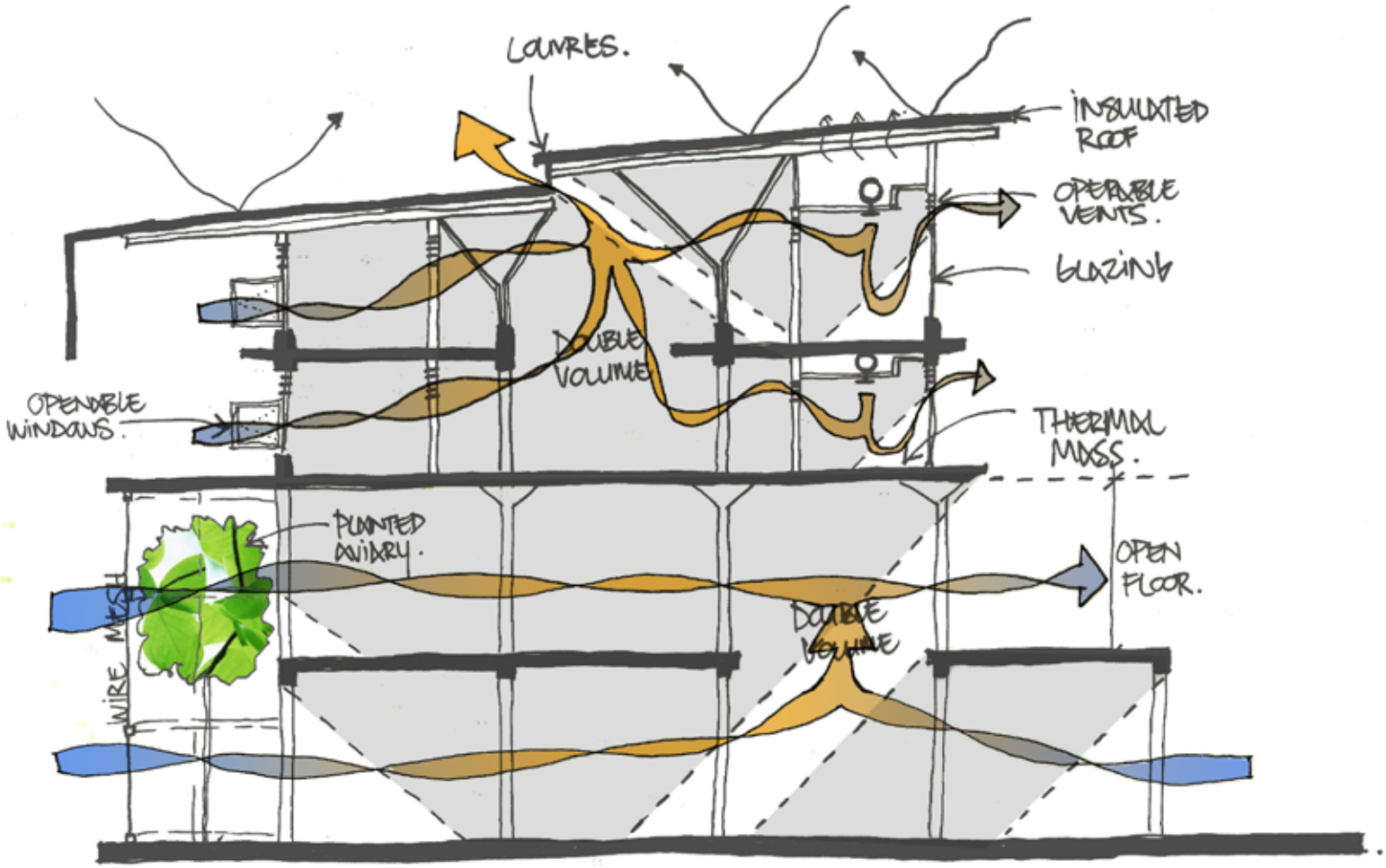


figure 156. diagrammatic section showing natural ventilation through building

7.6.2 MECHANICAL VENTILATION

The new Reptile enclosures require mechanical ventilation for cooling and heating air , as well as regulating humidity inside the enclosures. Ventilation is controlled from a mechanical room located on the North-West corner of the building.

The addition of the mechanical room provides resources to ventilate and extract the restaurant kitchens, which are located around and to the South of the ventilation room.

Mechanical ventilation will also be supplied to the office levels, but will not be conditioned. Instead, the building relies on ambient temperatures being controlled by pumping heated or cooled water through the concrete slab. (see 7.7.3)

The North and West facing offices are fitted with operable windows, which can be opened to let fresh air into the building. The South and East facing offices will be provided with mechanical ventilation, as opening widows on Boom street's side of the proposal may increase noise in the offices.

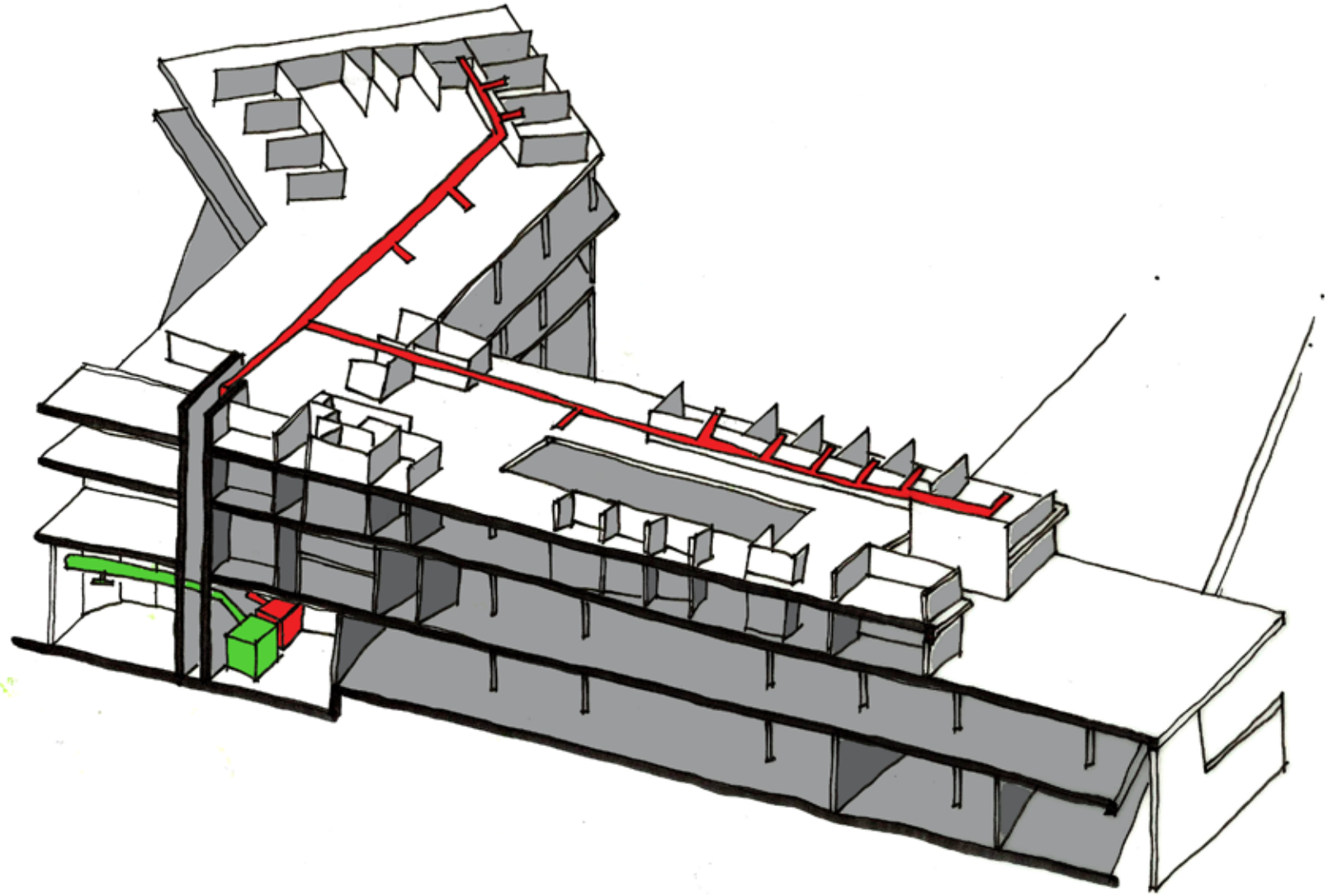


figure 157. diagrammatic section showing mechanical ventilation through building

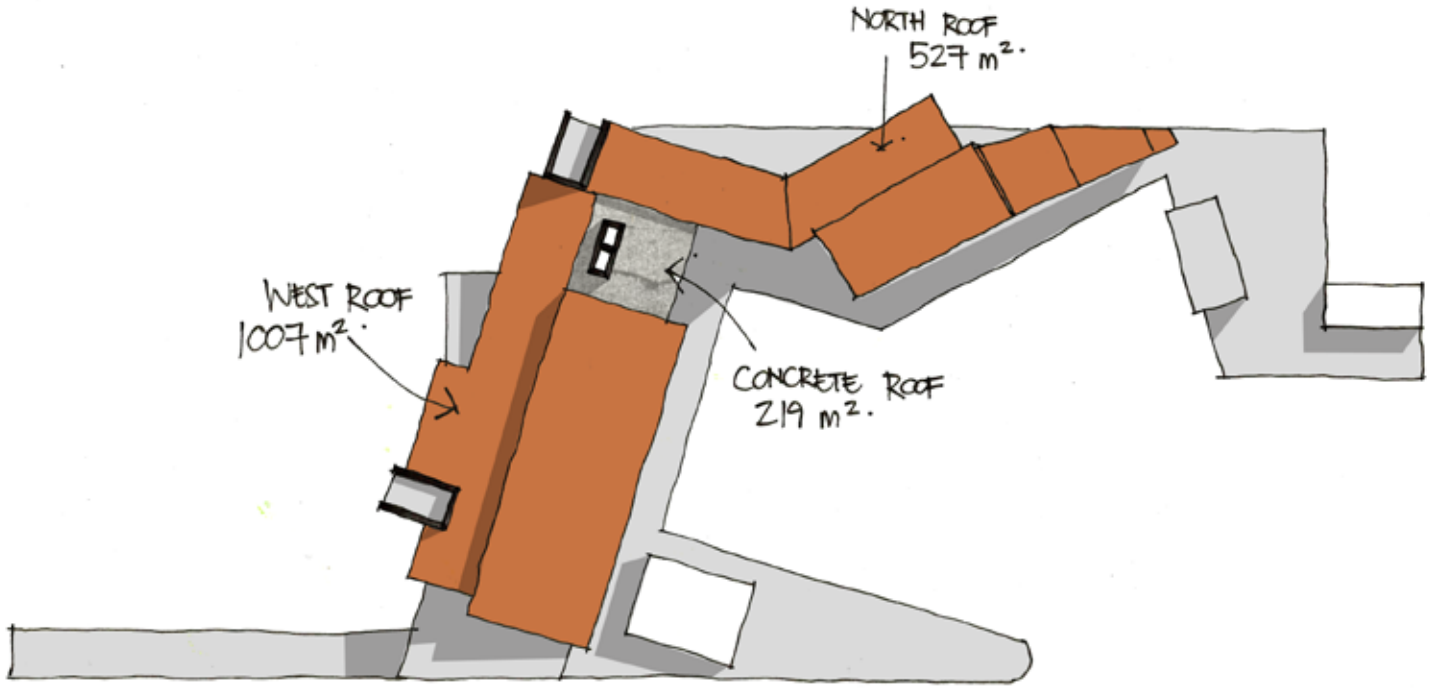


figure 158. diagram showing position and sizes of roofs used for water harvesting

7.6.3 WATER COLLECTION

Rainwater falling on the roofs covering the offices will be collected in steel gutters and directed down to collection tanks situated at various points around the proposal. The water collected in these tanks will be used in various services and activities.

Tank #1 is situated above the public ground floor bathroom and services the cisterns in this bathroom. Tank #2 is located in the mechanical ventilation room and supplies water to the reptile enclosures ponds. Overflow water from this tank will also be used in the ponds in front of the Aquarium. Tank #3 supplies water to the cisterns in the bathrooms on the office levels and located on a flat concrete slab above the bathrooms. The last tank is positioned in the back of house area and the water is used for hosing down the refuse area.

Water runoff from the restaurant decks and walkways all around the proposal will be collected, and directed to the chiller plant to the North-West of the proposal. (see 7.7.3)

The following calculations show that by harvesting the rainwater on site, the proposal can supply 80% of its annual water needs through harvested water. This amounts to a big save in water costs, and promotes the sustainability of the project.

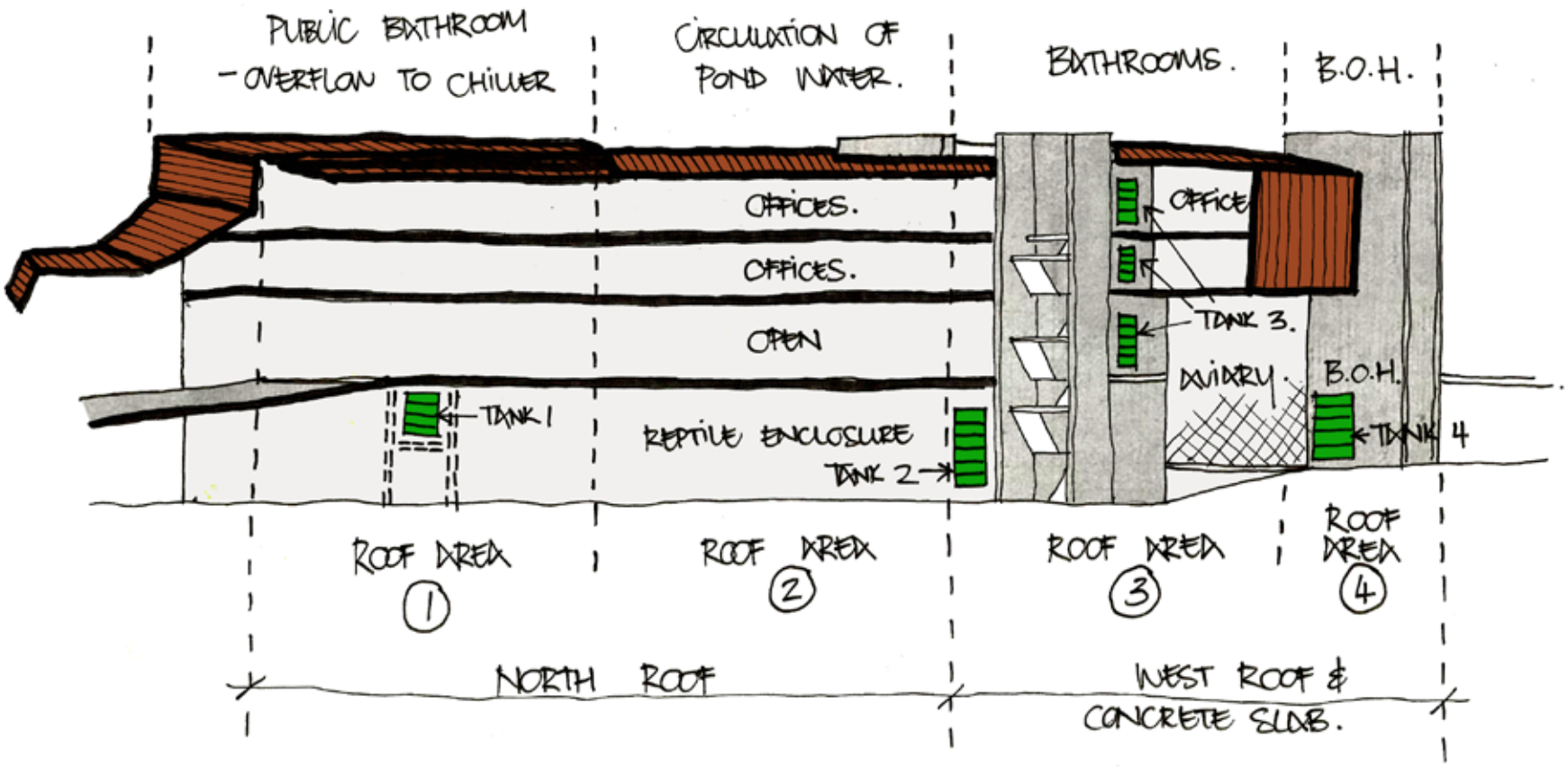


figure 159. diagram showing water tanks points and uses

Potential rainwater harvesting capacity			
area of roof(m²)	annual rainfall (mm²)	potential capacity (L)	total after 10% loss (L)
1,753	480	841,440	757,296

table 1. potential rainwater harvesting capacity

The calculations clearly show the advantages of harvesting rainwater on site. With the calculated roof area covering 480m², the projected total rainwater collected is 842,440 litres per year. After deducting a 10% evaporation factor, the total amounts to 757,296 litres.

According to Dr. Jeremy Gibberd (Green Building Handbook for South Africa), 40% of a buildings water supply must come from harvested water in order for it to be considered sustainable.

After calculating the proposal's annual water usage, and comparing it to the amount of water harvested during the year, it is clear that 80% of the buildings water can be supplied by rain water.

Overflow water can be re-directed to a number of uses, including irrigation, re-filling the ponds in the reptile enclosures and supplying water to the chiller plant.

Number of sanitary fittings		
level	toilets	basins
level 0	9	10
level 1	8	5
level 2	6	6
level 3	6	6
TOTAL	**29**	**27**

table 2. number of sanitary fittings in proposal

Water consumption				
device	#	consumption (L)	uses/day	total consumption (L)
toilets	29	7	8	1,624
basins	27	3	8	648
cleaning	4	20	3	240
				25,121/day
				77,872/month

table 3. total water consumption of proposal

Tank capacity required		
months with low rainfall	consumption/month (L)	required capacity (L)
4	77,872	311,488

table 4. water catchment tank capacities required in project

Water saved				
month	rainfall (mm²)	water harvested (L)	monthly consumption (L)	additional mains water required (L)
jan	82	129,560	78,000	-51,560
feb	60	94,800	78,000	-16,800
mar	52	82,160	78,000	-4,160
apr	33	52,140	78,000	25,860
may	11	17,380	78,000	60,620
june	5	7,900	78,000	70,100
july	3	4,740	78,000	73,260
aug	6	9,480	78,000	68,520
sep	17	26,860	78,000	51,140
oct	43	67,940	78,000	10,060
nov	85	134,300	78,000	-56,300
dec	81	127,980	78,000	-49,980
TOTAL	478	755,240	936,000	180,760

table 5. water saved on an annual basis

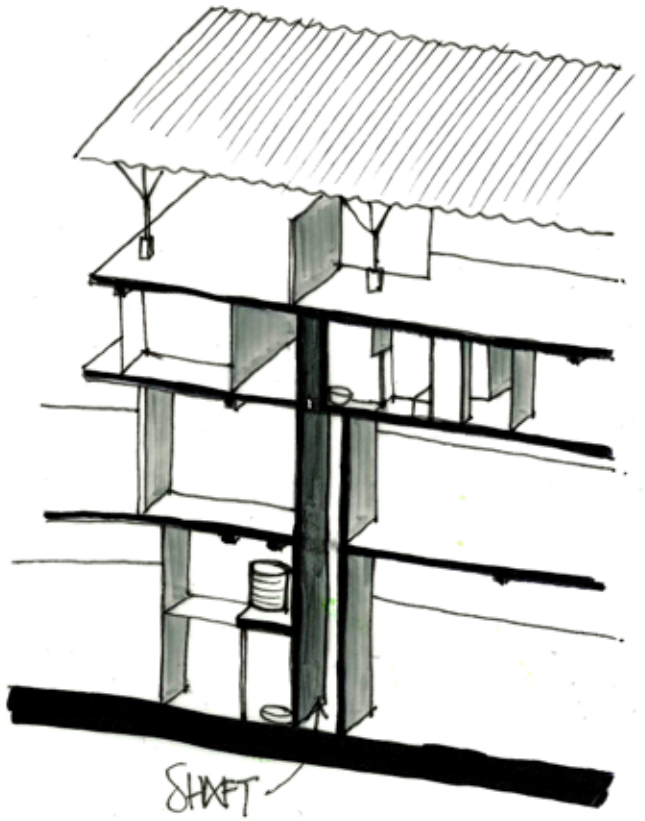


figure 160. diagrammatic section showing internal sanitary connections

7.6.4 SANITARY SERVICES

The proposal aims at grouping all sanitary services together in order to simplify installation and maintenance after completion.

Bathrooms and tea kitchens in the West wing are situated on top of each other, and join to the most Western wall. All piping is exposed on the exterior of the building, and are screened off by a cable system that attaches to the wall.

The cable system is then planted with creeper plants to completely screen off the services. These plants are watered by a drip system that receives its water supply from the same collection tank that services these bathrooms.

In the North wing, a central service shaft runs from the ground up to the top floor. This shaft houses the piping for bathroom and tea kitchens located around it. Due to the 7000mm slab to soffit height on the ground floor, another concrete slab is added 4000mm above the original floor level that hosts an additional water tank. This tank provides water for cisterns in the public bathroom on the ground floor.

All sanitary waste connects to the main line which is situated 5000m to the North of the proposal.

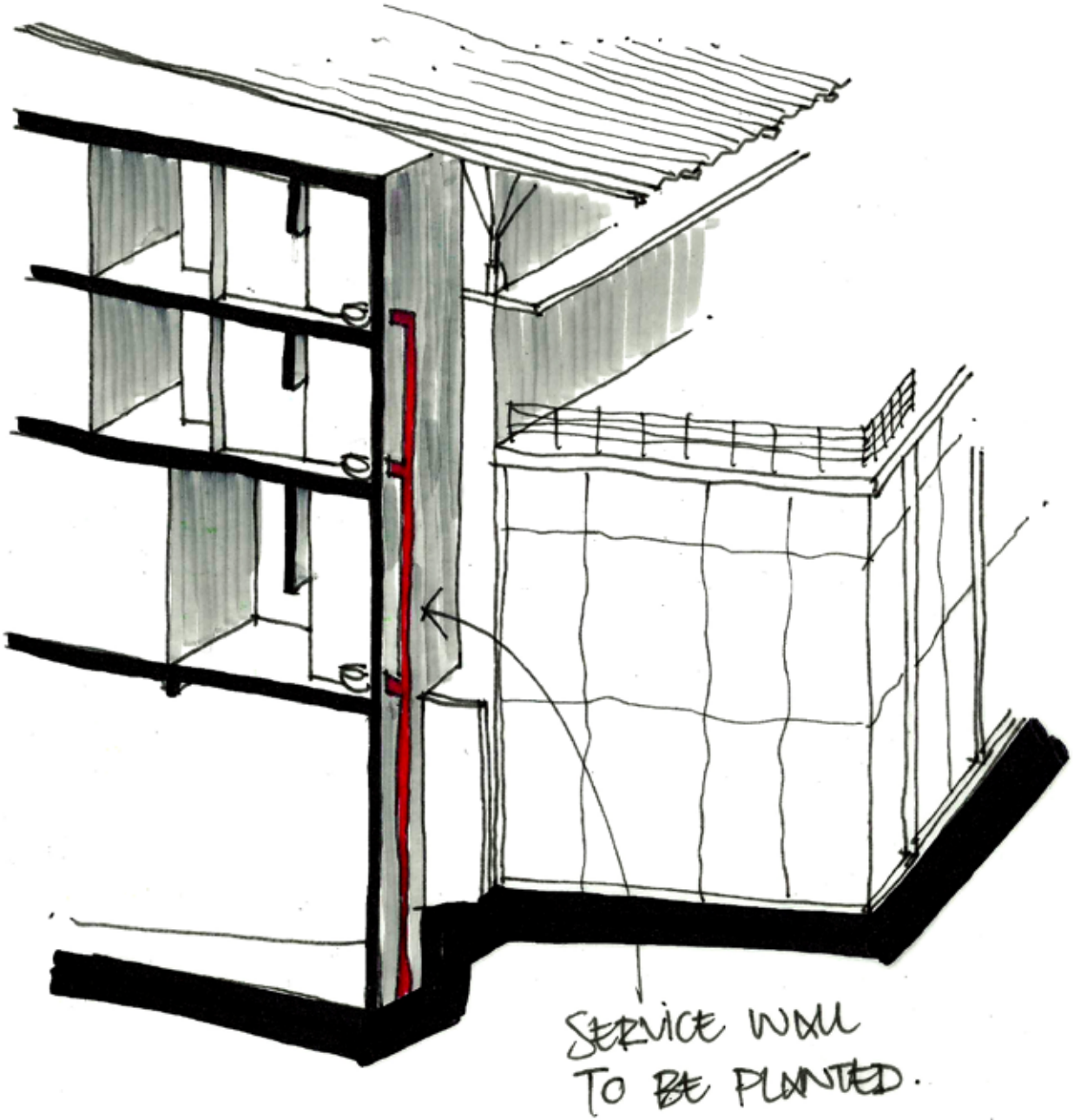


figure 161. diagrammatic section showing external sanitary connections

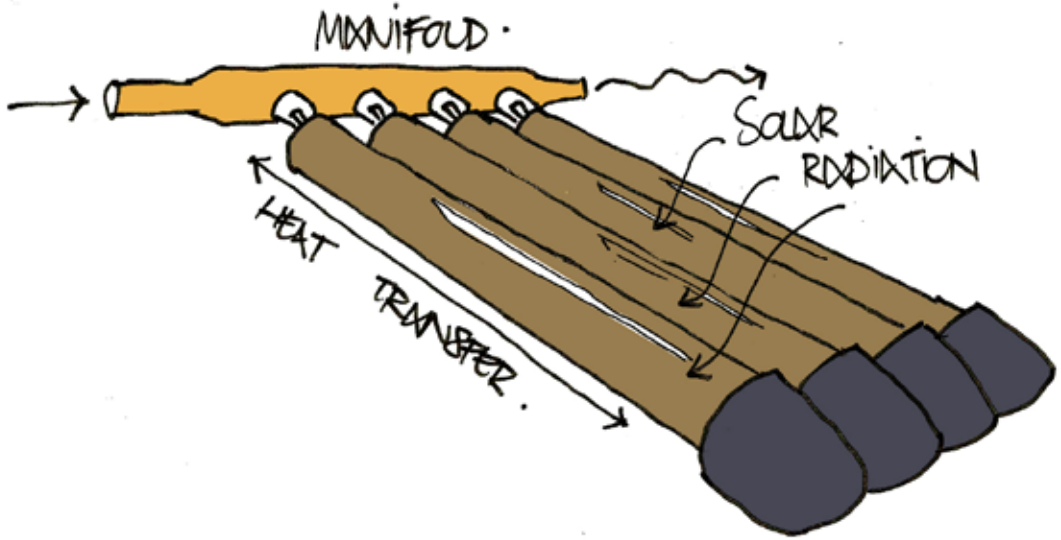


figure 162. 3d diagram of evacuated tube system

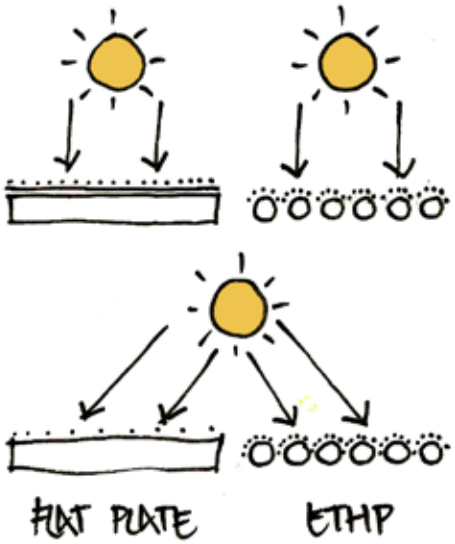


figure 163. direct vs. angled sunlight on ETHP

7.6.5 SOLAR HEATING

Heating in the proposal is based on an ETHP solar collector, that is pumped through a 20mm PVC pipe laid on top of the concrete slab before the screed is applied.

Evacuated glass tubes form the basis for an ETHP (evacuated tube heat pipe) solar collector. Each evacuated tube consists of two glass tubes, one within the other. The outer tube is made of transparent borosilicate glass, which is very strong. The inner tube is made of the same material, but is coated with a material which gives the tube excellent heat absorption qualities.The air between the tubes is withdrawn. This forms a vacuum which eliminates conductive and convective heat loss.

A copper heat pipe is installed inside the inner tube. As the tubes are heated by solar radiation, the heat is transmitted to the copper pipe. Heat is then transfered to the tip of the pipe which is connected to the collector's heat transfer manifold. Water is then heated by the tips as it is passed through the manifold.

An advantage of an ETHP system is that it is still effective on cloudy days. The tubes are able to absorb infrared rays that pass through clouds. The tubes are aligned in parallel, and the angle of mounting depends on the location's latitude.

The shape of the tubes provides superior absorption when it is compared to flat panel absorbers. The reason for this being that the round shape is able to receive direct sunlight, no matter what time of day it is.

The ETHP solar collector will be situated on the concrete slab above the circulation core. This results in the collectors receiving sun all

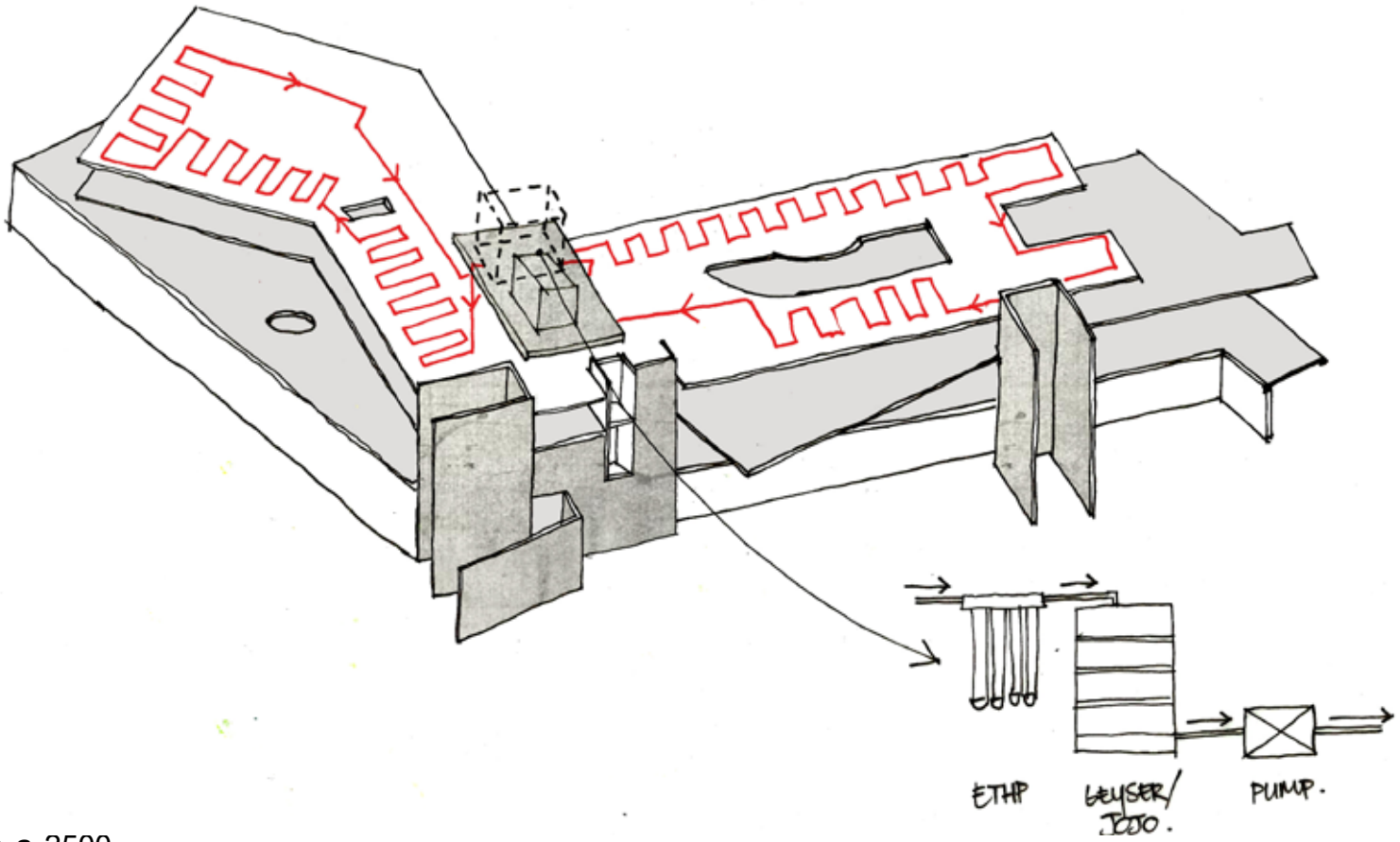


figure 164. 3d diagram of heating system in the proposal

day. The system will be connected to a 2500 litre collection tank, and a small pump, which will move the water through the system of PVC pipes hidden in the floor. This system will only be provided on the office levels, where user satisfaction is vital. The ambient temperature of the levels will be augmented as the water in the pipes heat up the stereotomic elements in the building.

figure 165. image of an air cooled chiller

7.6.6 MECHANICAL COOLING

Cooling the proposal consists of an air cooled chiller that is used to cool down water that is pumped through a 20mm PVC pipe laid on top of the concrete slab before the screed is applied.

Air cooled chillers offer good performance, considering they do not require large cooling towers or condensing pumps. This can save costs on installation and maintenance. Another cost saving factor is that air cooled chillers do not need large mechanical rooms. It is a free standing unit that can be erected anywhere and simply screened off.

Water is pumper through a radiator inside the chiller. At the same time cool air is ducted through the radiator to cool the water down. the cooled water is then pumped from the chiller through the PVC piping.

This cools down the mass of the building, bringing down the ambient temperatures. The water, which is pumped in a closed loop, is then returned to the chiller to be cooled down again.

The cooled water is pumped through the same set of pipes as used for the heating. In summer months, when chilling is required, the water flow is re-directed and bypasses the solar heater.

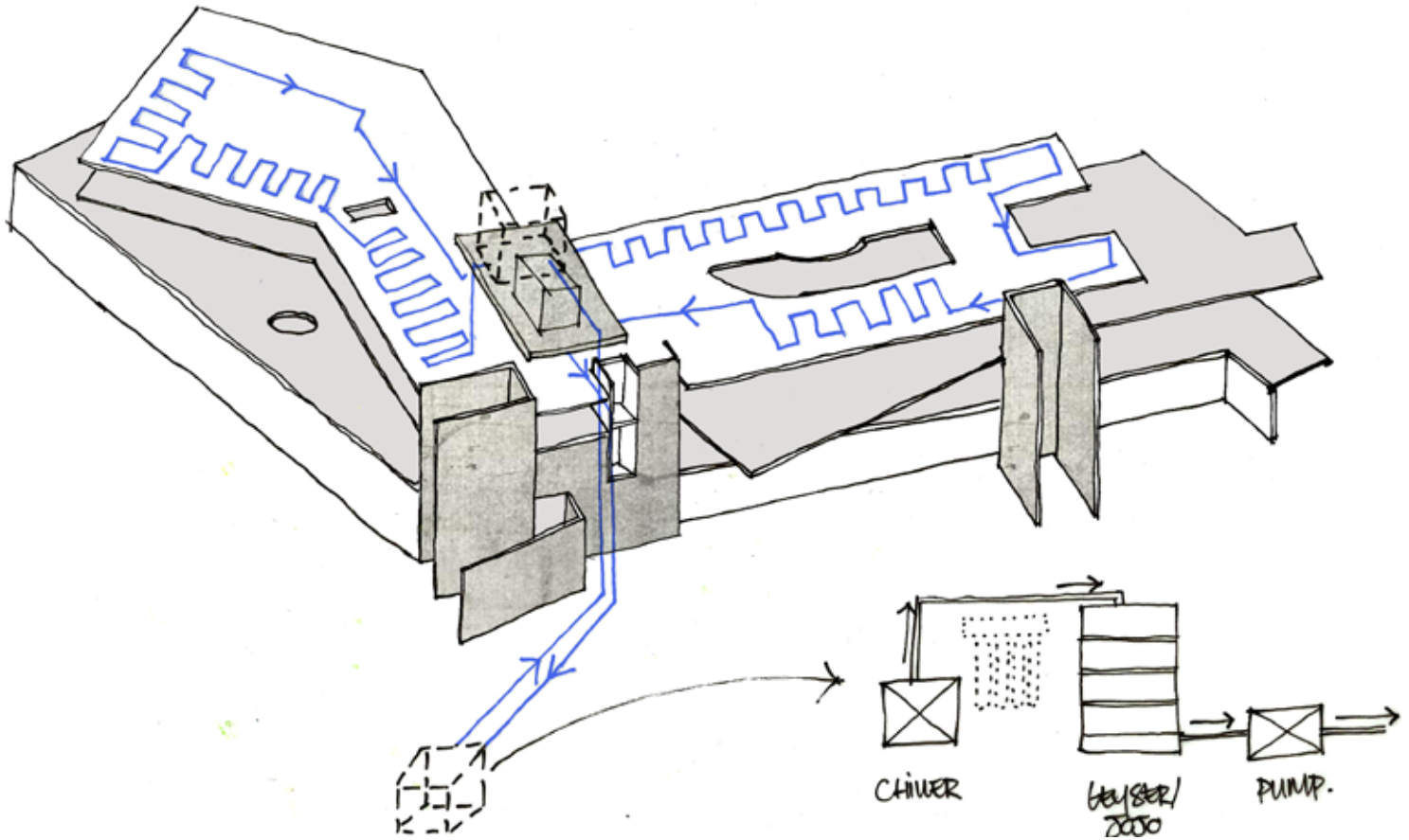


figure 166. 3d diagram of cooling system in the proposal

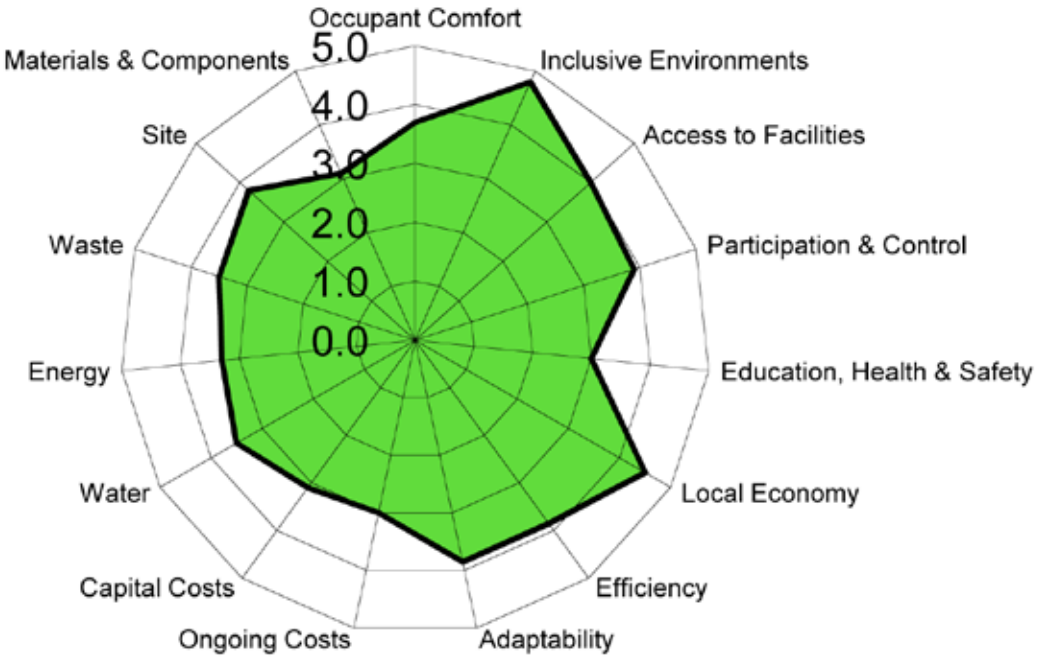


figure 167. sbat results chart

7.6.7 SBAT RESULTS

After completion of the SBAT analysis, it showed that the project scored as follows:

Social: 3.9/5

Economic: 3.7/5

Environmental: 3.4/5

with an average score of 3.5.

This is a good measure of where the project is currently in terms of social and environmental issues. It also provides a clear indication of areas that still need attention, that will be dealt with before the end of the programme.

figure 168. 3d of proposal from north west corner

figure 169. 3d view of entrance

chapter 8 model and 3ds

figure 170. 3d view of pedestrian entrance on first level

figure 171. photo of model from West

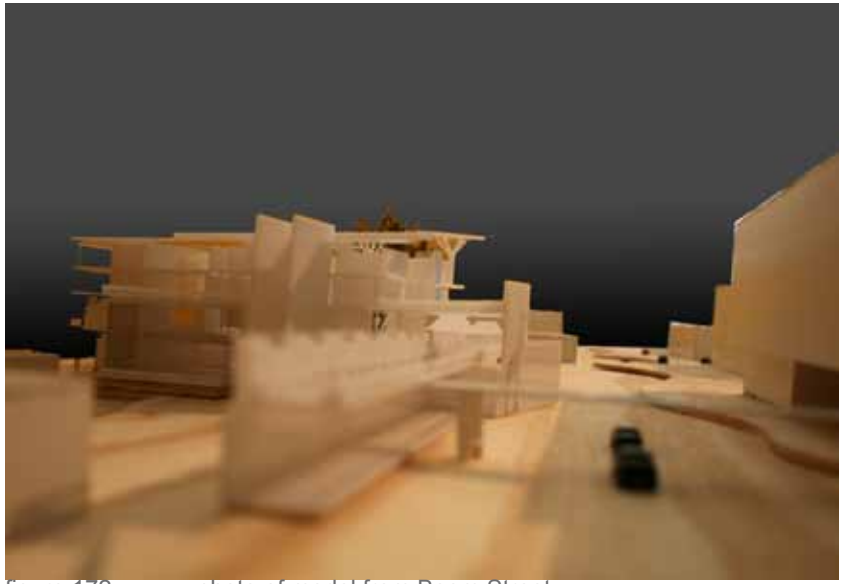


figure 172. photo of model from Boom Street

figure 173. photo of model from East

figure 174. 3d view of reptile enclosures

figure 175. 3d view of public square

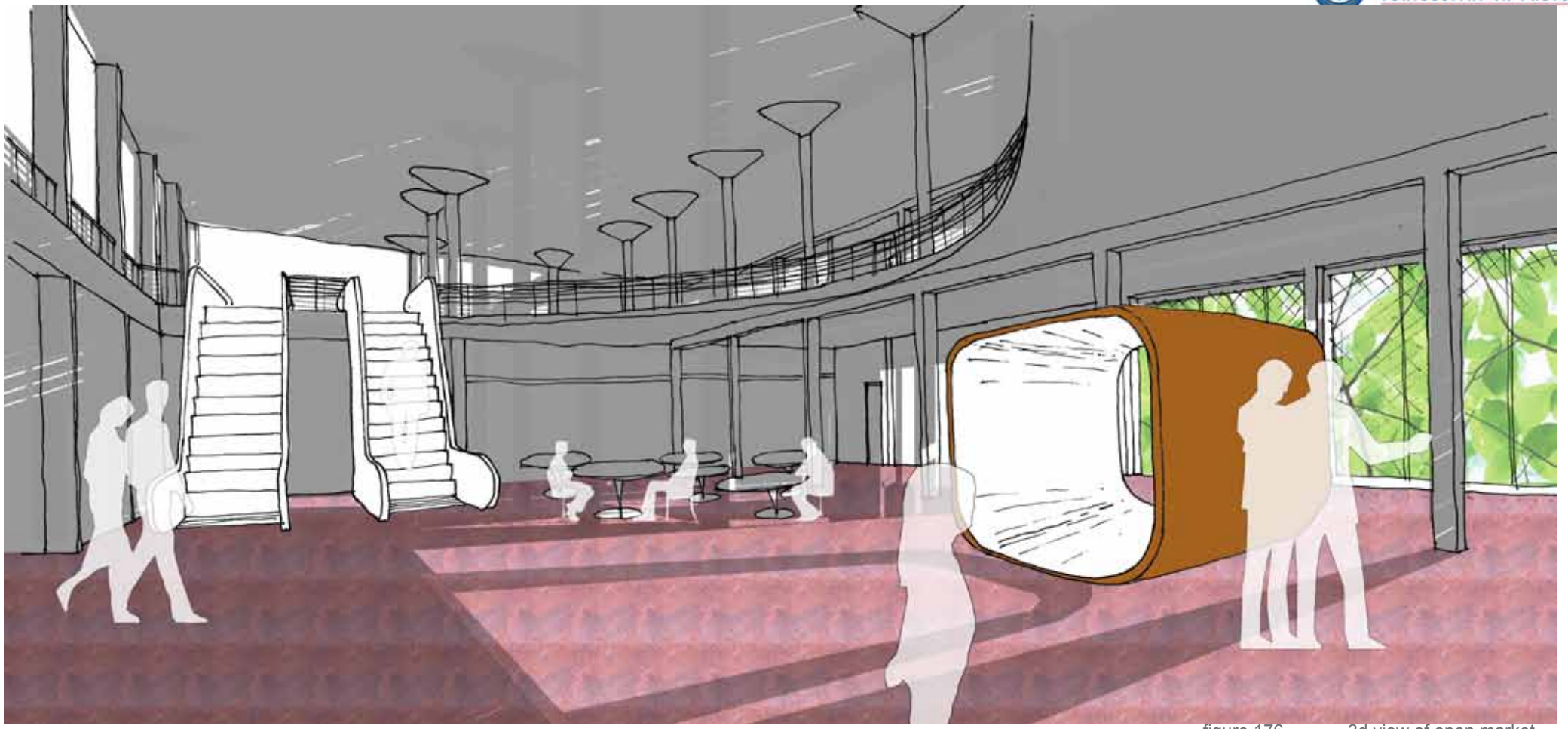


figure 176. 3d view of open market

figure 177. photo of model from South

figure 178. photo of model above entrance

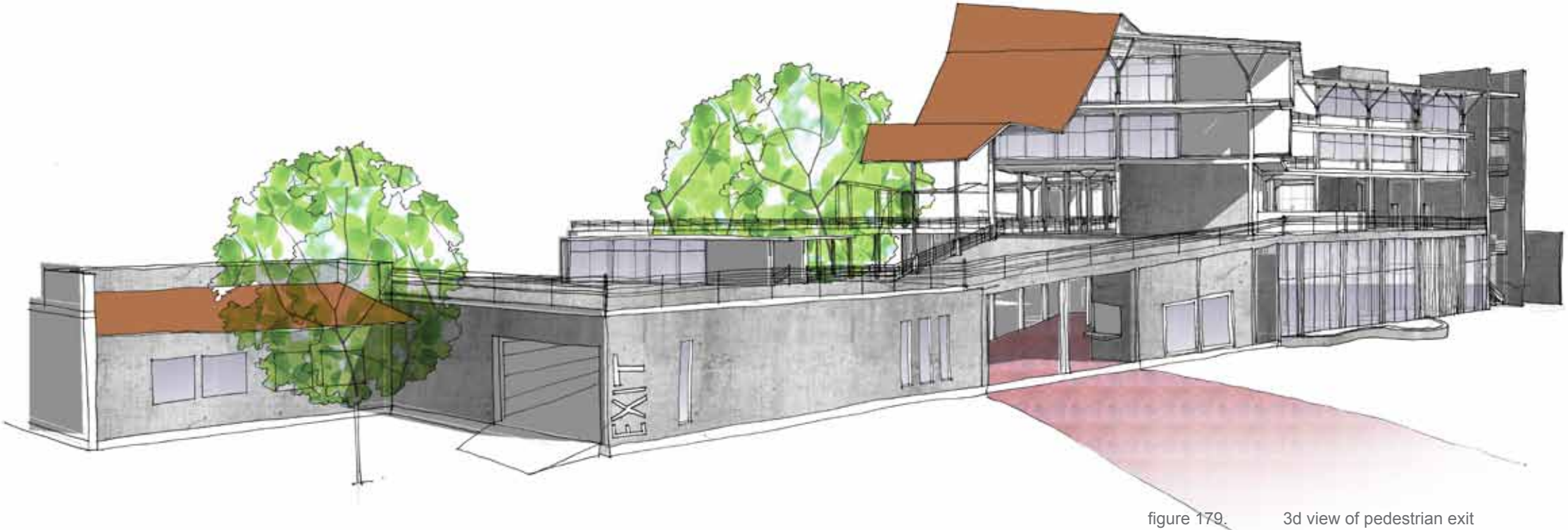


figure 179. 3d view of pedestrian exit

figure 180. 3d view of office circulation

figure 181. 3d view of open plan office

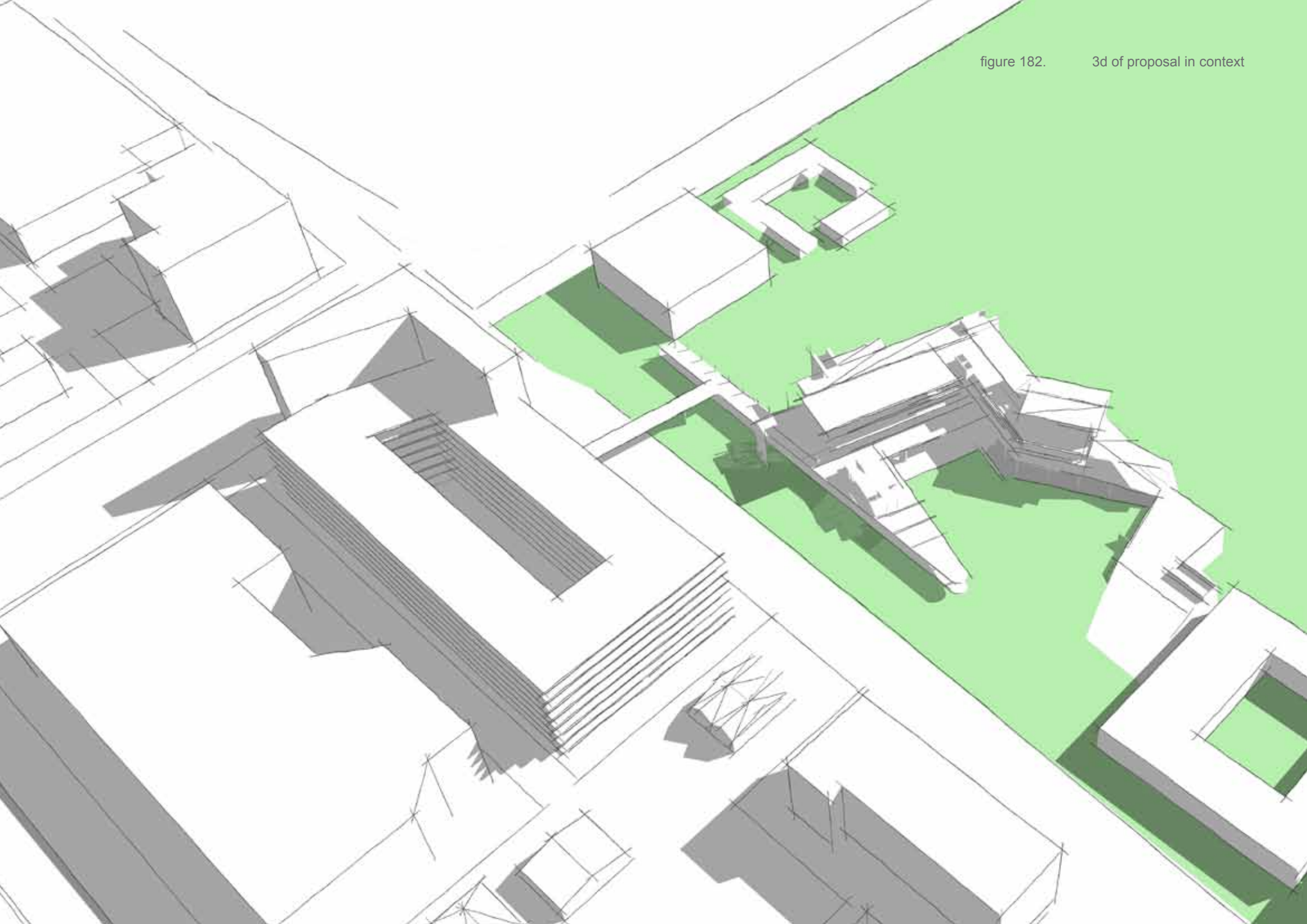
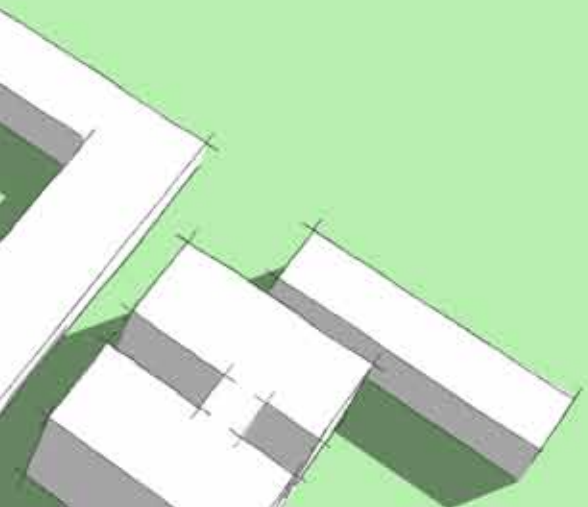


figure 182. 3d of proposal in context



chapter 9 conclusion

figure 183. zoogate logo

THE CONCLUSION

In the 111 years of the National Zoological Gardens' existence, it has grown from strength to strength. Unfortunately, the area surrounding the Zoo has taken a turn for the worse. Deteriorating public facilities and tourism activity does an injustice to the Zoo in its quest to reach its full potential.

The CONNECTIVITY THROUGH ACTIVITY framework is tailor made to start a rejuvenation process in the area. It not only strives to create an active tourism hub around the Zoo, but also re-link the Northern precinct to the CBD.

The proposal aims at breaking down barriers that dissociates the Zoo from its surroundings, as well as reconnecting the natural environments with the city fabric. The reprogramming of the transition space between Boom Street and the Zoo proves vital in creating a more public approach to the tourism destination, as it is currently limiting on both a regional and intervention scale.

By integrating nature and the city, the intervention becomes the centre of activity, while providing an array of public services and learning opportunities. It also maximises retail and commercial opportunities for the Zoo itself, and creates creative spaces for the Zoo and NGOs to work closer together.

ZOOGATE responds to both natural and man-made context in its environment, with the purpose of blurring the boundaries between the two. Visitors are always aware of their surroundings due to the transparent nature of the proposal. It responds to nature in the way that the stereotomic and tectonic is designed and applied, but always stays rooted in its city context.

The ZOOGATE proposal is not only the new forecourt to the National Zoological Gardens, but the starting point to the regeneration and re-activation of a derelict district.

Welcome to the National Zoological Gardens of South Africa.

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