

# MENLYN TRANSIT HUB

Integration of public transport with social/retail activity

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University of Pretoria

2013

Submitted in part fulfillment of the requirements for the degree of Magister of Architecture, M.Arch(Prof) to the Faculty of Engineering, Built Environment & Information Technology.

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Acknowledgments.

To the grace of God which gave me the strength throughout my years of studying. Thank you to my colleagues, family, friends and my wife for all the encouragement and support.

## Project Summary

**Programme:** Public Transport Interchange

**Site description:** Between Menlyn Shopping Centre & Menlyn Piazza complex

**Site location:** Lois Avenue road reserve

**Address:** *c/o Atterbury Road and Lois Avenue, Menlyn, Pretoria, Gauteng)*

**GPS Coordinates:** *29° 50' 10.7" S , 30° 54' 43.6" E*

**Research Field:** *Environment Potential*

**Client(s):** *City of Tshwane Public Transport Department, Menlyn shopping Centre, Growthpoint Menlyn Piazza*

**Keywords:** *public space, public transport, habitable bridge typology, movement*

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In accordance with Regulation 4(e) of the General Regulations (G.57) for dissertations and theses, I declare that this thesis, which I hereby submit for the degree Master of Architecture (Professional) at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

I further state that no part of my thesis has already been, or is currently being, submitted for any such degree, diploma or other qualification.

I further declare that this thesis is substantially my own work. Where reference is made to the works of others, the extent to which that work has been used is indicated and fully acknowledged in the text and list of references.

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Heinz Karl Reinhold Janz

November 2013

# Abstract

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# Abstract

This dissertation explores the potential to re-organize currently fragmented urban islands into a quality, unified civic space by means of a much needed mass transit inter-modal facility within the Menlyn precinct.

It is proposed that the mass transport node be positioned above the Lois Avenue road level, in between existing retail nodes. The transport interchange shall therefore provide an elegant solution whereby Lois Avenue may be crossed, thereby allowing access to the retail nodes located on either side, as the existing sidewalks

are not adequately designed for the multitude of commuters utilizing this area.

In theory, this dissertation explores the possibility of Menlyn Park Shopping centre and Menlyn Piazza being an infrastructure component of urbanism with the ability, as in architecture, to form a human experience within the urban environment.

This dissertation can furthermore contribute to the activity needed to make a transport interchange successful. The recently completed Gautrain and Johannesburg Bus Rapid Transport projects were investigated whereby it was identified that public transport is currently focused on getting commuters from one destination to the next as

quickly as possible, while neglecting to attend to the manner in which the commuter arrives and experiences the transport node. The Transport Interchange shall also attempt to reduce the existing traffic congestion in the area which is predicted to deteriorate within the next 10 to 15 years.

In conclusion, the aim of the transport interchange is to become a catalyst for increasing commuter density, while allowing improved access to, and providing more retail opportunities for, the Menlyn node as a whole.



Image a1 - Panoramic view from the corner of Lois - and Glen Manor avenue - by Author

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# Chapter\_1

1.1 - Introduction to the issue



## 1.1 - Introduction

Dave Chittenden stated in the south african institute of civil engineers magazine in 2001 that;

*“Transportation Acts as a catalyst to economic growth, it can significantly improve or can substantially diminish the economic potential of cities and city regions. As the city grows, there is an escalating demand for housing, employment, shops and services, which results in an increasing demand for movement and accessibility. This can lead to serious peak hour traffic on major corridors, high rates of road accidents and long commuting distances”* (Chittenden, 2001:1-34).

Before the 1990’s however, South African apartheid policies resulted in public transport being largely race based, with busses being used by Government as an indicator of class. Premium bus services catered for the white population travelling in restricted urban areas, while more utilitarian busses provided transport services for the black population commuting from demarcated rural areas to work and back. Almost two decades after the fall of apartheid, public transport is

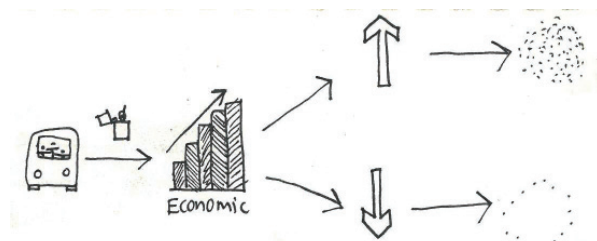


Image 1.1 - Transport as catalyst - by Author



Image 1.2 - Traffic congestion



Image 1.3 - Race based transport signage 1



Image 1.4 - Race based transport signage 2

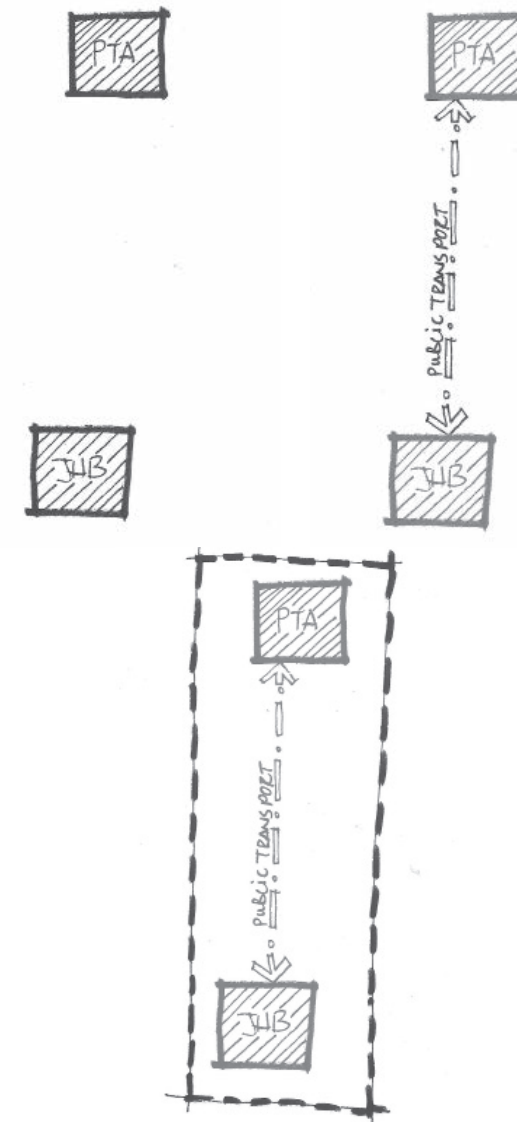


Image 1.5 - Transport as city connector - by Author.

therefore still seen as a service for the black, mainly poor population. (Transport, UITP - International Association of Public, 2008:64)

In an Article written by Ludwig Hansen and Paul Kotze from Wits University, it was stated that the main function of infrastructure in Gauteng is to make Pretoria and Johannesburg one big city (Hansen & Kotze, Septr/Oct 2012:17-21). This is seen as a positive attempt to increase connectivity between Pretoria and Johannesburg.

With the completion of three major infrastructure projects in Gauteng, namely the Gauteng highway improvement project, Johannesburg Bus Rapid Transport system and the Gautrain system, both Kotze and Hansen expressed that public transport has been exclusively about greater mobility and has excluded the consideration of equity, accessibility and place making. The normative position which they stand by is a quote by John Punter (Punter, 2010:1) from the British Government’s definition which states that;

*“Urban Design is the art of making places for people. It includes the way places work as well as how they look. It concerns the connections*



Image 1.6 - Gauteng freeway Improvement Project



Image 1.7 - Reya Veya Bus rapid transit



Image 1.8 - Gautrain system

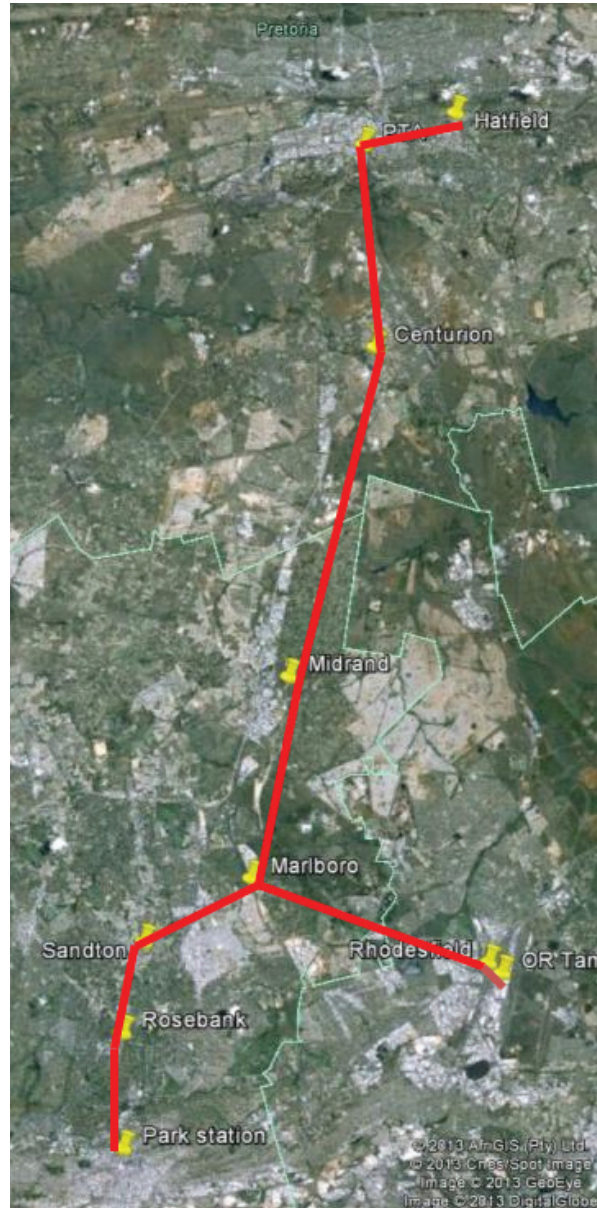


Image 1.9 - Gautrain system connecting the major nodes

between people and places, movement and urban form, nature and the built fabric, and the process for ensuring successful villages, towns and cities.”

They also go on to say that “high quality and inclusive design should be the aim of all those involved in the development process” (Hansen & Kotze, Septr/Oct 2012:17-21).

Both the authors say that public transport must have a humanist approach within the city and they also mentioned that there is not enough integration between urban designers, architects and engineers when public transport systems are being planned (Ibid, 2012:17-21).

With reference to the above mentioned article, one can look at the Gautrain system: it links all the important economic nodes in Gauteng from Johannesburg C.B.D, Sandton, Midrand, Centurion, Pretoria C.B.D. and Hatfield. But there is one node missing, and that is the Menlyn precinct in the east of Pretoria.

Menlyn is part of the core economic triangle in Gauteng (City of Tshwane, 2012:12.). It is located along a major transport route and is expected to grow significantly in the next 15 - 25 years.

Menlyn has recently been classified as the third largest area of concentrated office space and the fourth largest area of concentrated retail floor space in Gauteng (Ibid, 2012:12).

A proposal was made in the 2012 Menlyn traffic study (ITS Engineers, 2012:20) to provide the Menlyn

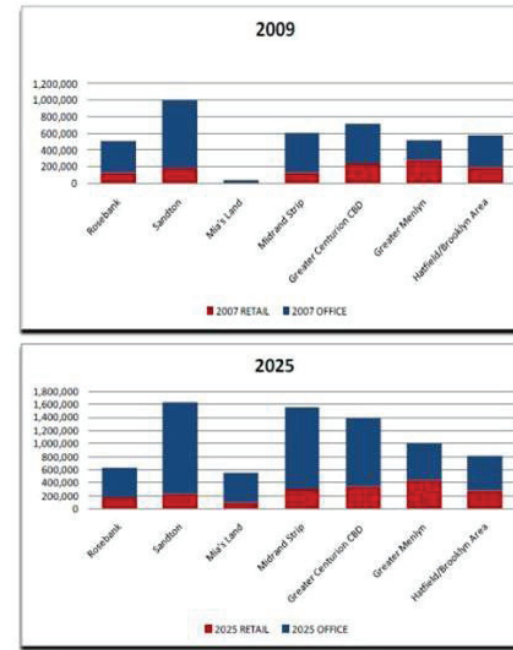


Image 1.10 - Gautengs major nodes projected growth table

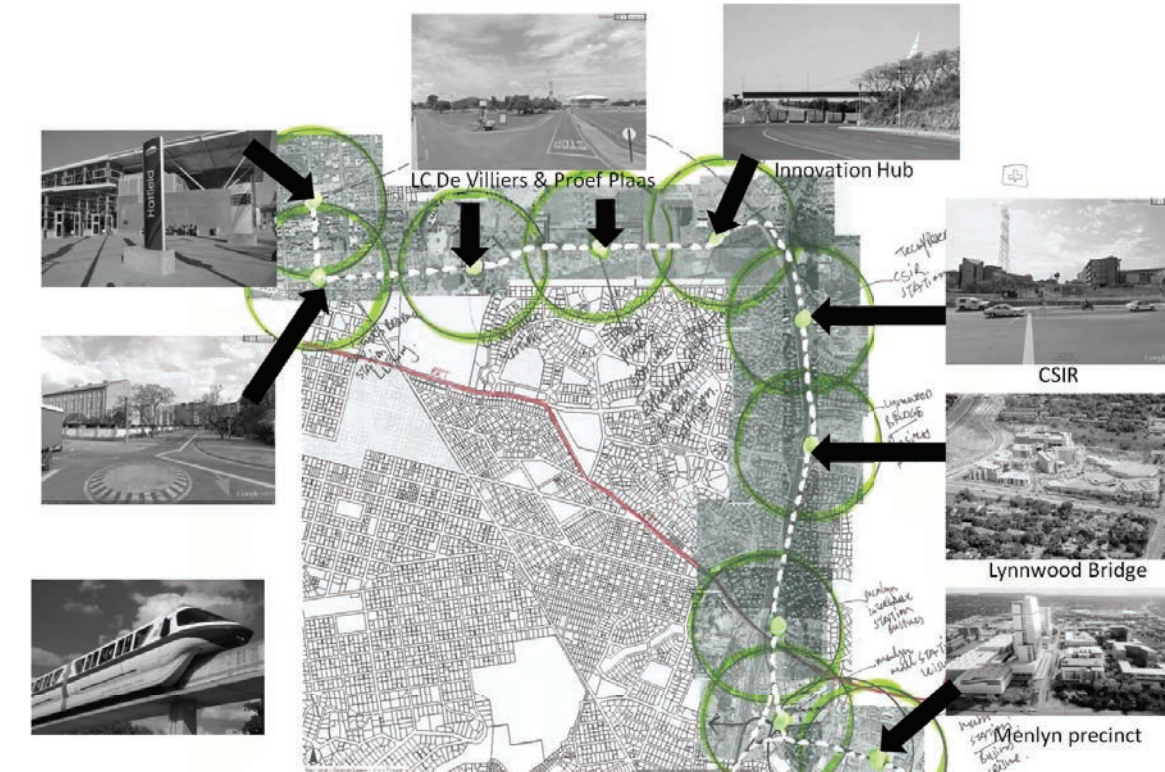


Image 1.11 - Authors interpretation of the ITS engineers mass transport proposed link from Hatfield gautrain station to Menlyn.

precinct with a mass transport system linked to the Gautain system at the Hatfield station. This will attempt to reduce the traffic problems in the area and this will also link Menlyn to the rest of Gauteng.

This system also allows for the possibility to extend the mass transport system even further

east and also link up with the Centurion Gautrain station to the south. Because of the increase in retail and office space in the Menlyn precinct, traffic becomes a major issue in Menlyn. The area also has heavy through traffic, even though the proposed Tshwane Rapid Transit system (T.R.T) will add to the traffic problems. ITS Engineers propose that the T.R.T system should work with the mass

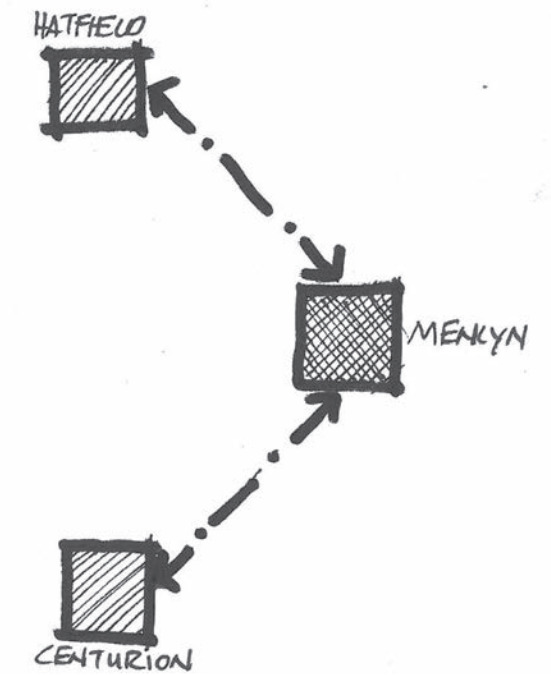


Image 1.12 - Transport as suburban connector - by Author.

transport system as a feeder system which will serve the larger areas and all the development nodes, and not the Menlyn node alone. (Ibid, 2012:35).

# Chapter\_2

- 2.1 - Context analysis
- 2.2 - Site investigations
- 2.3 - Selected site



Image 2.1 - Map indicating projects location in South Africa - by Author.



Image 2.2 - Projects location In Gauteng- by Author.



Image 2.3 - Project location in the City of Tshwane - by Author.

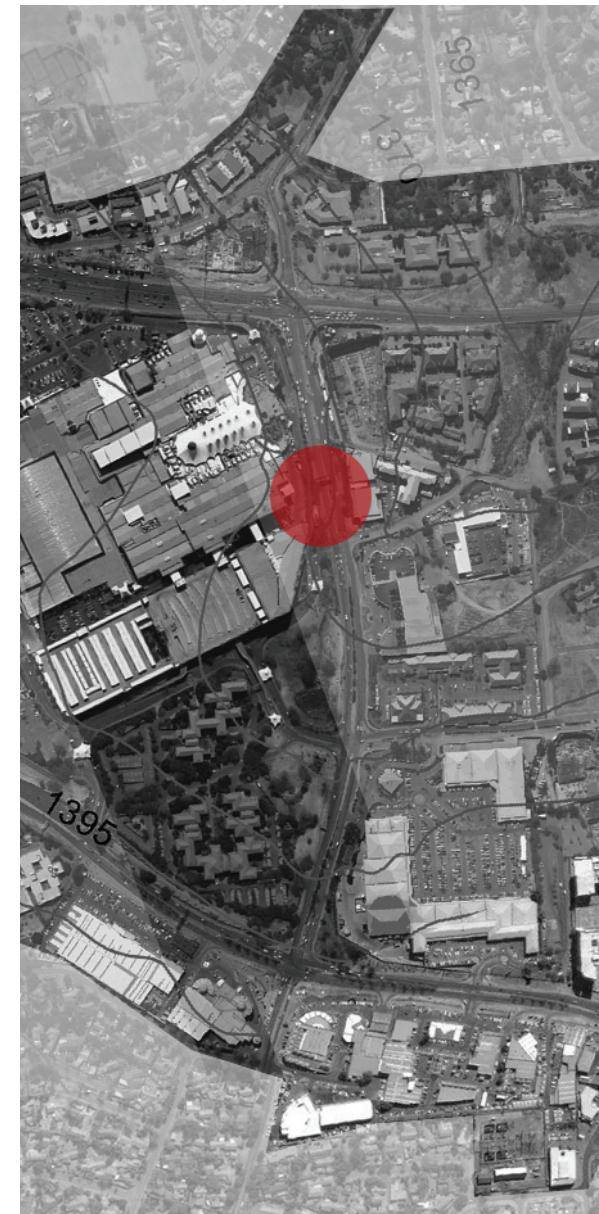


Image 2.4 - Project location in the Menlyn Precinct - by Author.



Image 2.5 - Menlyn Precinct study area - by Author.



Image 2.6 - Main access routes to Menlyn Precinct - by Author.



Image 2.7 - Menlyn Precinct zoning - by Author.

## 2.1 - Context analysis

The mapping focuses on existing formal and informal public transport facilities within the Menlyn precinct. Pedestrian movement (City of Tshwane, 2012:69) was mapped together with the proposed densities and zoning in the areas.

All the current framework proposals for the area were mapped and will be the framework which will be worked within.

The study area selected is the Menlyn precinct. It is located to the east of the N1 highway. Primary and secondary access to Menlyn is provided by Atterbury and Garsfontein road which cross the N1 highway.

The Menlyn area was recently rezoned, with the core area being allocated a 27 storey building height with business and residential zoning rights (Ibid 2012:82). Pedestrian movement is well catered for with pedestrian walkways along all the roads within the area but needs to be upgraded as some routes are very narrow and unpaved. Currently all the formal public transport stops are along pedestrian walkways, with a few informal stops

which has been formed. Because of the vast developing of the area, more public stops have been proposed for the Menlyn precinct (Ibid, 2012:61).



Image 2.8 - Glen Manor Avenue northern sidewalk - by Author.



Image 2.9 - Menlyn taxi stop and Lois Ave western sidewalk - by Author.



Image 2.10 - Lois Avenue eastern sidewalk (S-N) - by Author.



Image 2.11 - Lois Avenue bus shelter - by Author.



Image 2.12 - Lois Avenue western sidewalk (N-S) - by Author.

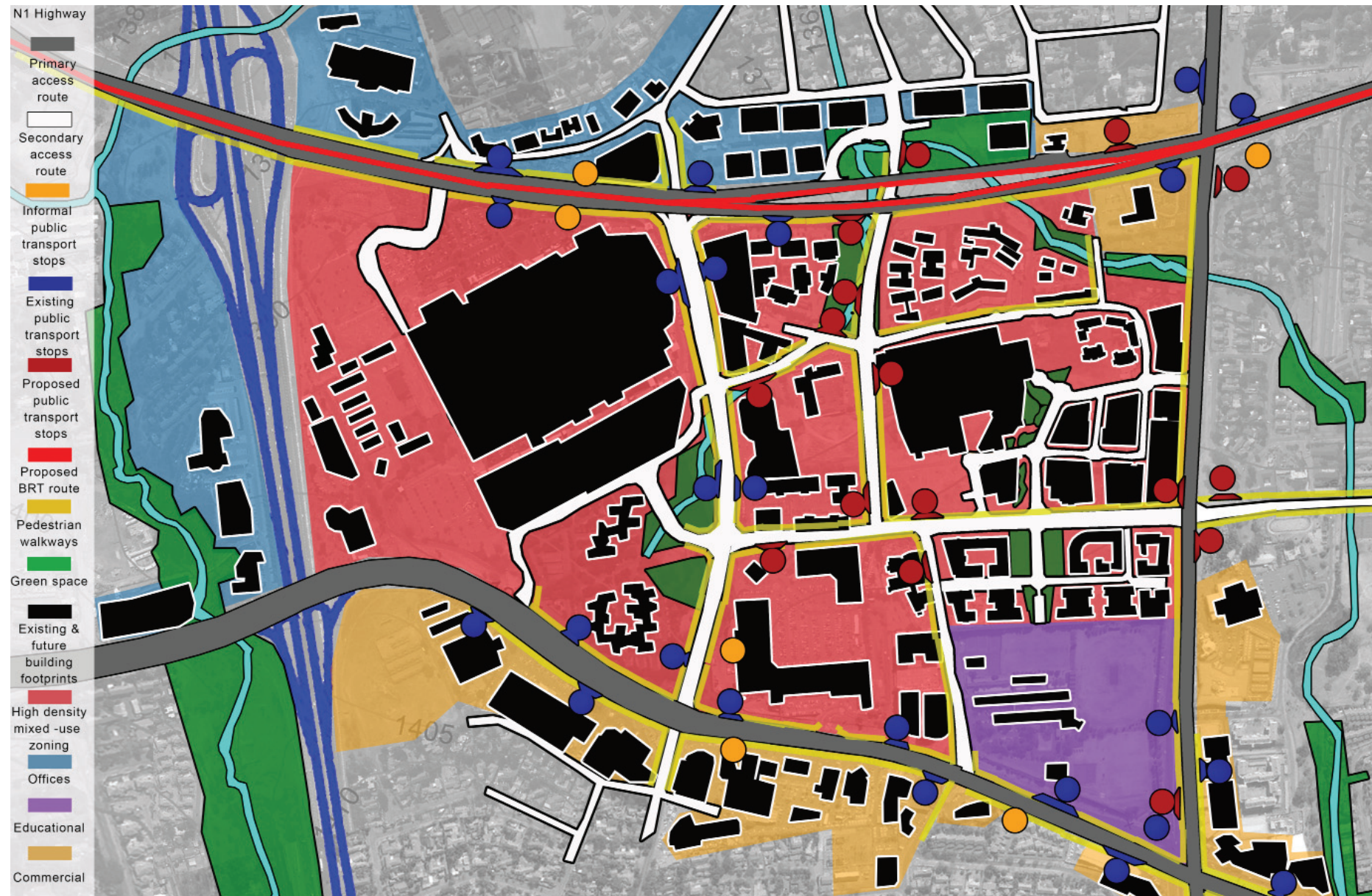


Image 2.13 - Menlyn Precinct mapping - by Author.

## 2.2 - Site investigations

From the mapping exercise several sites were investigated as a possible site for the proposed intervention.

1. The first site (image 2.14) investigated was the Menlyn Retail shopping centre. The site is fairly central within the area. Currently the shopping centre is not fully occupied and allows for the possibility to reuse a portion of the vacant northern wing for the transport interchange. This will allow the opportunity to integrate public transport with retail. This site is located to far from Atterbury Road to integrate the proposed rail and the already planned Tshwane Rapid Transit system. Unfortunately there are no current public transport facilities around the Menlyn Retail site.

2. The second possible site (image 2.15) is on the new interchange proposed on Atterbury Road to allow better access to the Menlyn Maine development. All the current public transport modes will be using this interchange and the possibility is there to use the infrastructure being provided for the new interchange to latch the

transport terminal onto.

The interchange could become a bridge type building linking the north and central Menlyn area over and under Atterbury Road. Unfortunately this site is not centrally located in the Menlyn area and there are no existing public transport facilities close by. There are also no social activities in the vicinity, which will be necessary to create activity for the public transport interchange.

3. The third possible site is situated along Atterbury road, where the proposed T.R.T station will be located (image 2.16). All the transport modes move through this area and it will be located between existing public transport facilities. This site is close to the Menlyn Park shopping centre. The proposed T.R.T terminal will occupy 14 meters of current road reserve which will create traffic congestion during peak hour traffic (ITS Engineers, 2012). This location is not centrally located within the Menlyn precinct and will exclude all the new Menlyn Maine developments being proposed within the area to the east.

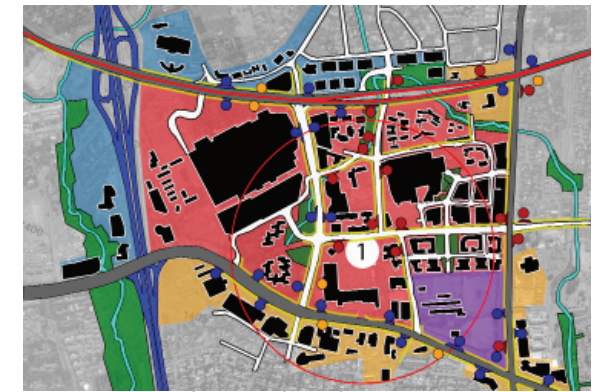


Image 2.14 - Site selection 1 - by Author.

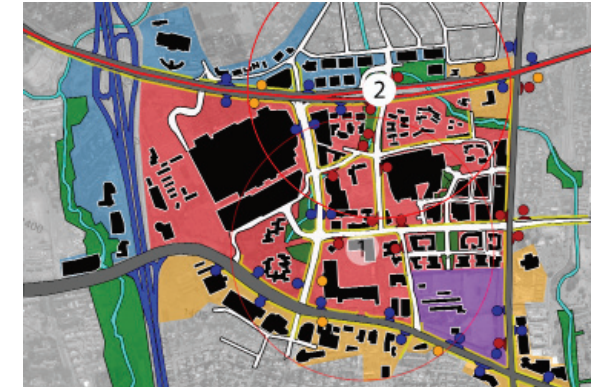


Image 2.15 - Site selection 2 - by Author.



Image 2.16 - Site selection 3 - by Author.



Image 2.17 - Site selection 4 - by Author.



Image 2.18 - 5 & 10minute walking distance - by Author.



Image 2.19 - Proposed site public transport stops and pedestrian movement - by Author.

### 2.3 - Selected site

4. The fourth and last site (image 2.17) investigated was between the Menlyn Park shopping centre and the Menlyn Piazza complex. This site is located in the middle of the Menlyn precinct and is close to current public transport facilities.

Within the the area is a mix of activity, for example restaurants, educational facilities and retail. It also allows for the opportunity to create a new pedestrian entrance into the Menlyn Park Shopping Centre from Lois avenue and the Menlyn Maine precinct.

The proposed transport interchange can link Menlyn park shopping centre and Menlyn Piazza which will be the gateway to access Menlyn Maine.

Menlyn Park shopping centre is a popular retail node within Gauteng and this can allow even more people to access it via the Gautrain system.

This site has been consequently selected and will be used for the proposed intervention. (image2.20-2.22).



Image 2.20 - Proposed BRT station in Lois Avenue - by Author.



Image 2.21 - Proposed concourse over Lois Avenue - by Author.



Image 2.22 - Proposed elevated rail terminal above concourse - by Author.



Image 2.23 - View from Menlyn Piazza towards Lois Avenue - by Author.



Image 2.24 - View from traffic light on the corner of Lois & Glen Manor Avenue - by Author.



Image 2.25 - Aerial view from Menlyn Park shopping centre upper first floor to Menlyn Piazza - by Author.

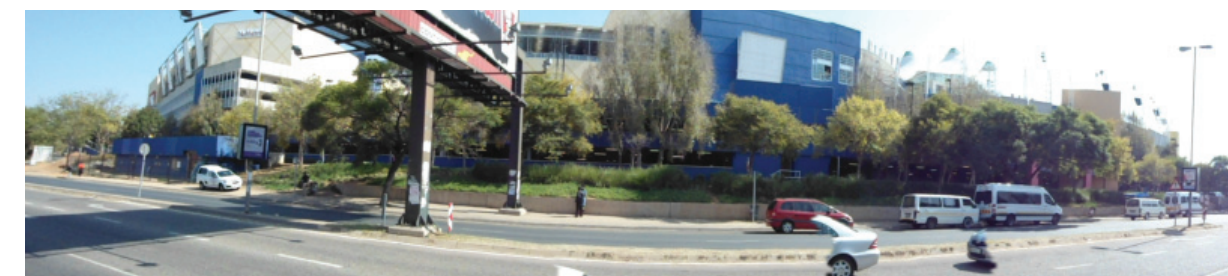


Image 2.26 - View from Lois avenue towards Menlyn Park shopping centre - by Author.



Image 2.27 - Seating at taxidrop-off on Lois Avenue - by Author.



Image 2.28 - Walkway on eastern side of Lois Avenue - by Author.

# Chapter\_3

## 3.1 Theoretical component to the urban intension

3.1.1 Infrastructure Urbanism

3.1.2 The transport interchange

3.1.3 Open transit design

## 3.2 Urban Intension

3.2.1 Opportunities

3.2.2 Informants

3.2.3 Urban Intension

3.2.4 Architectural Intension

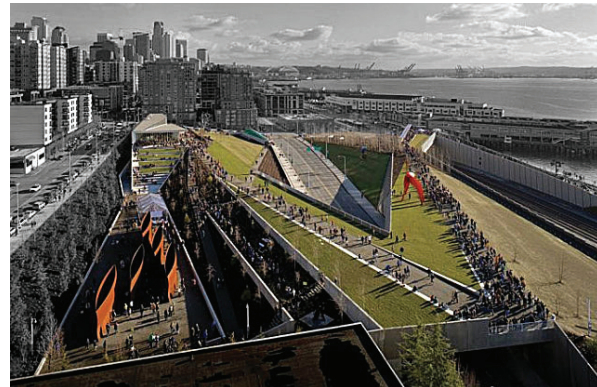


Image 3.1 - Olympic Sculpture Park in Seattle, Washington



Image 3.2 - Green Square, Bratislava



Image 3.3 - New York High Line

### 3.1.1 Infrastructure Urbanism

“Infrastructure” can be generally defined as the set of interconnected structural elements that provide framework supporting an entire structure of development” (www.merriam-webster.com).

Allen (Allen,1999:48-57) established a definition of architecture based upon a set of design frameworks. These frameworks express architecture in relation to other media forms such as painting, film, literature, the internet and performance art.

Through the expression of these relationships, Allen discusses the role of architecture in forming human experience. He then shifts his focus to infrastructure in relation to architecture and the urban environment.

Allen then presents an argument in which he describes infrastructure as a component of urbanism with the ability, like architecture, to form human experience by creating 7 propositions, which discusses a specific characteristic of infrastructure within the urban environment (Allen,1999:48-57).

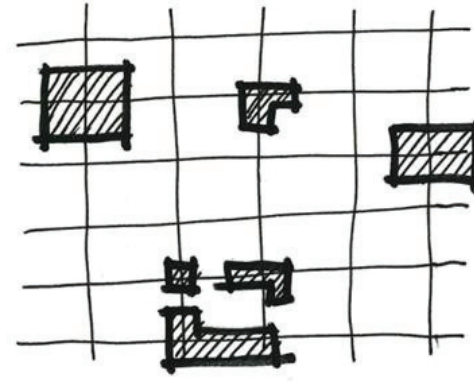


Image 3.4 - Infrastructure nodes within an identified area - by author

Proposition 1: Infrastructure does not propose a specific building. It rather constructs the site for future buildings and creates the conditions for future events. It provides services to support future programs, while establishing a network for movement, communication and exchange.

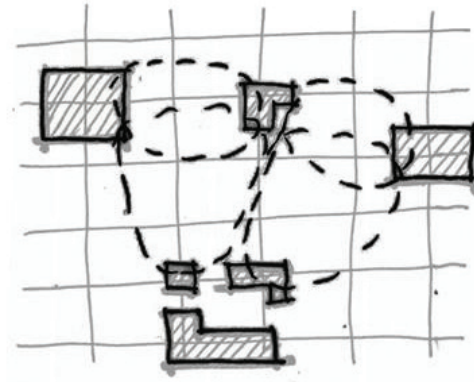


Image 3.5 - Sites created between Infrastructure nodes - by author

Proposition 2: Infrastructure is flexible. It works with time and can easily be changed, while it does not progress towards a predetermined state (master planning), but is always evolving within a loose envelope of constraints.

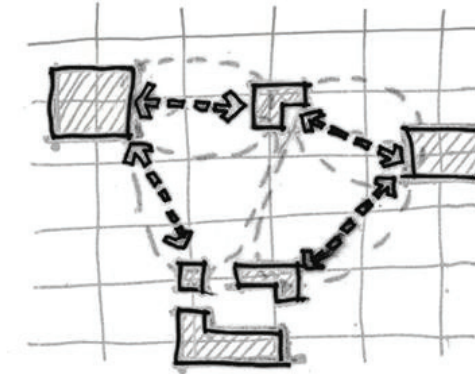


Image 3.6 - Connections created between Infrastructure nodes - by author

Proposition 3: Work on infrastructure recognizes the collective nature of the City and allows for the participation of multiple authors. It gives direction to future work in the city by providing fixed points of service, access and structure.

Proposition 4; Infrastructure can accommodate local contingencies while maintaining overall continuity. In the design of infrastructure, an extensive catalogue of strategies exists to accommodate irregularities in the terrain, which are creatively employed to accommodate existing conditions while maintaining functional continuity.

Proposition 5: Infrastructure, although static, can organize and manage complex systems of flow, movement and exchange.

Proposition 6: Infrastructure systems work like artificial ecologies. They manage the flows of energy and resources on a site, and they direct the density and distribution of habitat.

Proposition 7: Infrastructure allows detailed design of typical elements or repetitive structures, facilitating an architectural approach to urbanism. Instead of moving always down in scale from the general to the specific, infrastructure design begins with the precise delineation of a specific architectural element within specific limits.

Allan explains that within infrastructure, urbanism form matters, more for what it can do than what it looks like. He expresses the importance of an urban design process that integrates architecture and infrastructure to create a new form of urban experience (Allen, 1999:48-57).



Image 3.7 - New York High Line



Image 3.8 - New York High Line



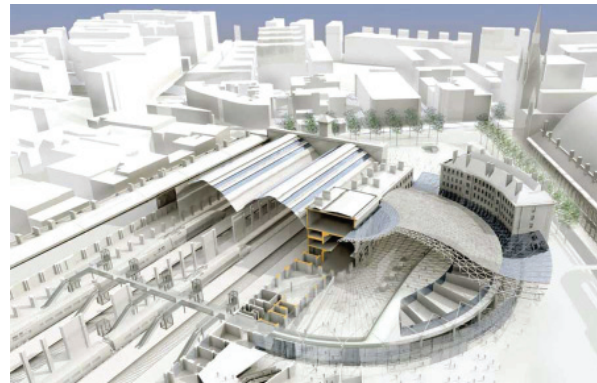


Image 3.10 - Kings cross station



Image 3.11 - Paramatta Transport interchange



Image 3.12 - Tianjin Binhai Transport Interchange

### 3.1.2 The transport interchange

“Sustainability and the Design of Transport Interchanges” by Brian Edwards, states that a transport interchange must provide spaces for interaction, transfer, integration, interconnection and intersection (Edwards, 2011:15).

Edwards proposes that transport interchanges need to be rich in social value, while it should be a venue for meeting as well as travelling. It should furthermore become a location for strengthening social and economic sustainability, so that it can become a social network and also a channel for business regeneration. He further mentions that it must be about social as well as transport space which is used by people with all levels of mobility, be they able or disabled (Ibid, 2011:73).

Edwards further expresses the opinion that modern transport interchanges should put the pedestrian first, whereby the pedestrian must have the ability to perceive other modes of transport, be able to read directional signs, and to walk through buildings with natural light which is essential to the enjoyment of traveling (Ibid, 2011:27).

Integrating public transport systems into an existing city fabric can be difficult due to transport buildings creating barriers to pedestrian movement.

A way of overcoming this is to design the transport building in order to aid cross-city movement by opening up the interchange to all users rather than just the travelling public (Ibid, 2011:62).

Key principles to the successful integration of an interchange and an urban area, is to provide safe and secure routes for pedestrians and cyclists alike.

Commercial space should be integrated at the interchange within the main pedestrian walkways. Civic space must be allocated around the interchange. One must also create space within the interchange for community use and ensure legible connections with other modes of transport and civic nodes within the area (Ibid, 2011:63).

### 3.1.3 Open Transit design

“Why are stations designed for non-transit users most successful?” (CAVALUZZI, 2012).

A new approach by Peter Cavaluzzi is to design transit stations which appeal more to the non-transit user. An example would be the Grand Central Terminal in midtown Manhattan where more visitors are drawn to the station for its shopping, dining and cultural events than



Image 3.13 - Grand central terminal, Manhattan.

commuters. The goal is to use transport as a way to design iconic spaces such as the great hall, the retail passages and Park Avenue which embodies the culture of the city, while creating meaningful real-estate value at the same time (CAVALUZZI, 2012).



Image 3.14 - The Interchange project

“The interchange”, is a major transit hub planned for the City of Minneapolis and surrounding Hennepin County. The project is based on a design principle called “Open Transit” (Ibid, 2012).

The principle of this design is an inclusive design point of view which incorporates a wider array of spaces and modes to create an iconic place.

Peter Cavaluzzi states that great cities across the world are defined by great places and if they were to make cities more sustainable, they need to create transit places that will also sustain and enhance urban life (Ibid, 2012).

An important issue which he referred to was that transit is an essential component to defining the difference between world-class cities with vibrant twenty-four hour occupancy and the type of

commuter city that empties after business hours.

An example Peter refers to is the Los Angeles Gateway centre, which is the largest intermodal transportation facility in America, linking busses, subway systems, and long distance; commuter and light rail services.

On the completion of the interchange in 2000, the utility on all modes of transport increased from 7000 people a month to over 80000.

Peter believes that by providing a first-class environment for those taking advantage of the city’s expanded transit system, it is possible to convert car-centric commuters to embrace public transport thereby strengthening the notion that public transit is for everyone (Ibid, 2012).

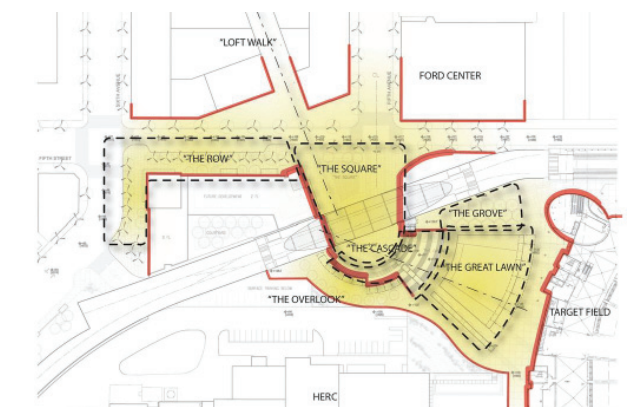


Image 3.15 - The Interchange project



Image 3.16 - The Interchange project



Image 3.17 - The Interchange project



Image 3.18 - The Interchange project

Open transit design comprises of 5 essential elements (Ibid, 2012).

Element 1: Integration of all available transit modes which include; rail, bus, cars, bicycles and walkways including the provision of a “bike bar” cafe, which provides bike repair, rental and other services.

Element 2: An orientation towards real estate development, creating cities as high density mixed use nodes. The opening of Target Field, the new home of the Minnesota Twins baseball team created a huge influx of people, which the transit hub provided opportunities and choice for. It also integrated a lawn amphitheatre and commuter oriented Retail Park which achieved the aim of the interchange, namely to connect a series of public spaces and create a destination.

Element 3: Architecture should create iconic spaces which induces a feeling of it being high-class. The visitor’s experience the same hustle and bustle however it is broken up into a series of different spaces. The idea of creating iconic spaces is to draw the tourist as much as the commuter, and by getting the non-transit rider is what adds

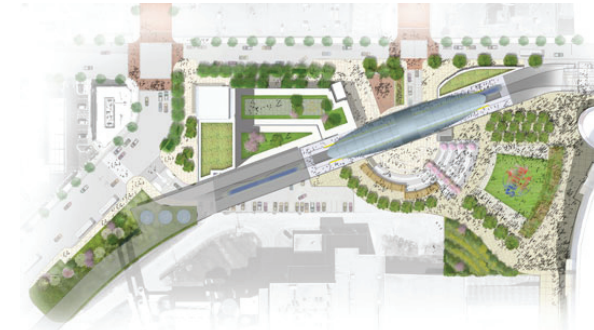


Image 3.19 - The Interchange project

that extra level of vibrancy to the interchange.

Element 4: Integration of culture along with transit design in the heart of the public space. This creates a sense of arrival and will spur development around such node. Within a public space, users can be made aware of being environmentally responsible by showing how it can be integrated into the normal everyday life of the traveler.

Element 5: Creation of appeal for the non-transit users by providing a range of activities and choice. This draws tourists, workers, shoppers, diners and casual observers to the same space.

### 3.2 Urban Intension

The image 3.20 illustrates the existing conditions currently on the proposed site for the intervention. Lois avenue is a barrier between the two retail nodes. This leads to unsafe crossing of Lois avenue by the pedestrian.

The existing access points to Menlyn and Menlyn

Piazza are not clear and has to be shared with vehicles. Some walkways are unpaved and not pedestrian friendly. Another issue is that Menlyn does not lend itself to create activity outside the building.

The activity of Menlyn Piazza is the opposite of Menlyn but can not be easily accessed due to the limited amount of entrance points.

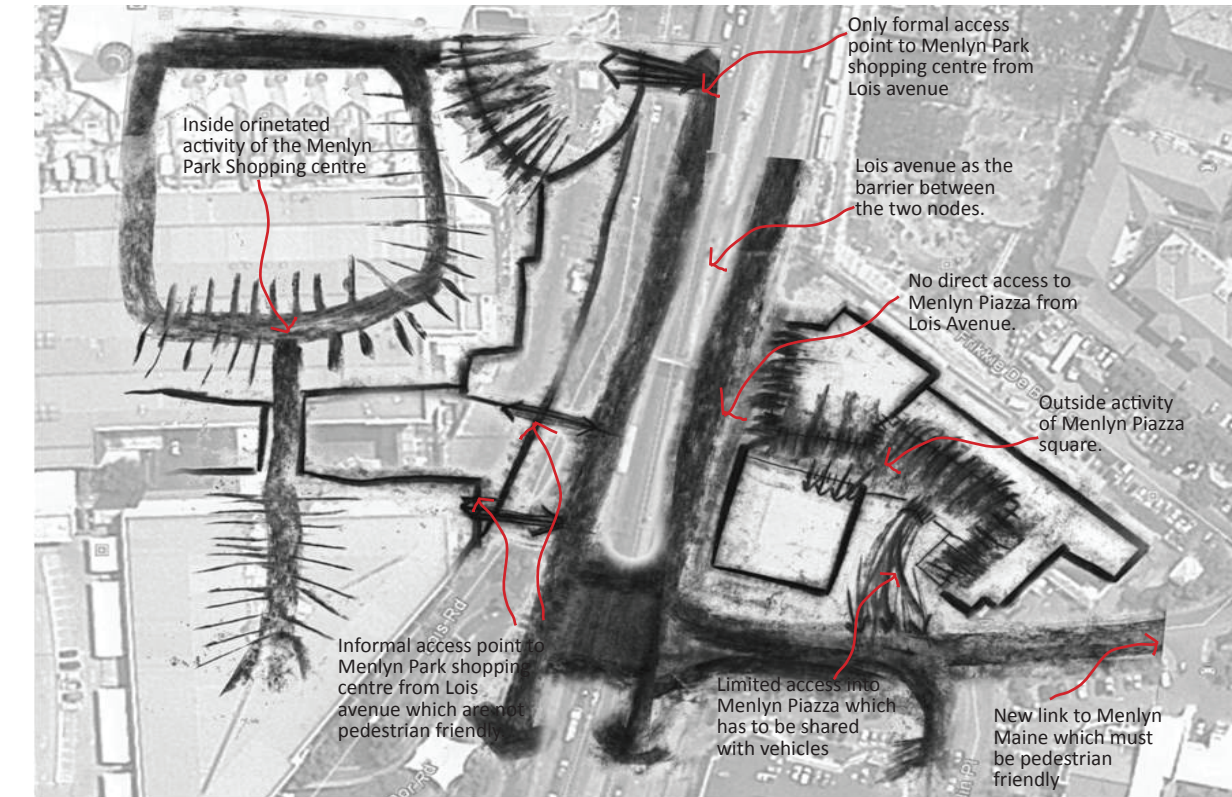


Image 3.20 - Existing issues on site - by Author



Image 3.21 - Unsafe crossing of pedestrians over Lois Ave- by Author



Image 3.22 - Unsafe access to Menlyn shopping centre - by Author



Image 3.23 - No pedestrian entrance from Glen Manor ave into Menlyn piazza, to be shared with the vehicles - by Author

### 3.2.1 Opportunities

One of the objectives mentioned in the March 2012 Spatial framework (City of Tshwane, 2012) for the Menlyn precinct is to promote residential redevelopment and densification around the Menlyn Node in order to enhance the economic viability of the node by increasing the resident component to the area.

The aim is to improve the sustainability of the node by creating a 24/7 living environment by enhancing the economic viability and sustainability of the public transport systems in the area as a result of more people residing within walking distance from these facilities and services.

Further more to create a natural buffer of high value (financial and social) residential development around the Menlyn Node in order to prevent the horizontal expansion of business activities, and to rather promote the vertical expansion of the node. (City of Tshwane, 2012:75-76).

*“Transport interchanges are central to the achievement of sustainable development, with the ability to connect different modes of transport,*

*to stitch together flows of transport infrastructure and people in an attractive and coherent fashion, in critical to creating successful communities* (Edwards, 2011:13).”

The Menlyn Park shopping centre is the main retail node in the area, with two other retail nodes; Menlyn Piazza and Menlyn retail located close by. Another retail node; Menlyn Maine Mall is being planned within the Menlyn Maine development to the east of Menlyn Park shopping centre.

With the need for a mass transport system in the Menlyn node as mentioned in the 2012 Menlyn Traffic Study (ITS Engineers, 2012:20), the existing retail facilities provided for in the area can contribute to the activity needed for a transport interchange to be successful.

It was previously mentioned that transport buildings can add to the cross-city movement within an urban area. Such an area identified within the menlyn precinct is on Lois Ave, between the eastern side of the Menlyn shopping centre and the west of the Menlyn Piazza area.

Currently Menlyn Park shopping mall and Menlyn

Piazza are cut off from one another because of Lois Avenue which is a four lane road linking Atterbury road with Garstfontein rd.

The Menlyn shopping mall can be accessed by two access point along Lois Avenue. The one entrance is from an existing taxi stop and the other over a un-paved walkway with stairs leading one up the embankment. Both the entrance ways leads one into the lower ground floor parking area.

### 3.2.2 Informants

With the main focus being; placing the needs of the pedestrian above that of the vehicle, pedestrian movement informed many factors to placement of certain functions.



Image 3.24 - Access routes in and around the Menlyn - by Author

The Menlyn precinct is accessed by several access routes from all directions (Image 3.24).

*“Infrastructure gives direction to future work in the city, by providing points of service, access and structure”*(Allen: 1999:48-57).



Image 3.25 - Existing retail Infrastructure in Menlyn - by Author

The existing and future retail nodes (image 3.25) in the Menlyn Precinct provides the points of service, access and structure needed for the Transit Hub to be successful.

*“Infrastructure does not propose specific buildings, but it constructs the site for future building and creates the conditions for future events. It provides services to support future programs, establishes a network for movement, communication and exchange.”* (Allen: 1999:48-57).

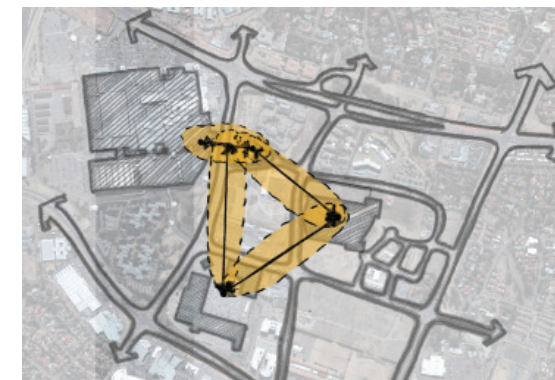


Image 3.26 - Connecting the existing retail Infrastructure - by Author

The spaces between the identified infrastructure nodes provide the sites for movement between the nodes(image 3.26), in turn creating a network for movement, communication and exchange.



Image 3.27 - Access to infrastructure from existing routes - by Author

The existing routes within the precinct have poor legibility to access the nodes (image 3.27).



Image 3.28 - Identified routes where transit oriented design will be implemented - by Author

These routes (image 3.28) have been identified and will be redesigned with transit oriented design principles as the design driver.

### 3.2.3 Intension

The transport building will attempt to link the inside orientated, solid facade Menlyn shopping Centre to the vibrant open air Menlyn Piazza complex and also allow for a new pedestrian access from the street level which can create better integration with the Menlyn precinct.

Key issues to be addressed will be to create better flowing pedestrian walkways, which are more legible to the user within the Menlyn precinct.

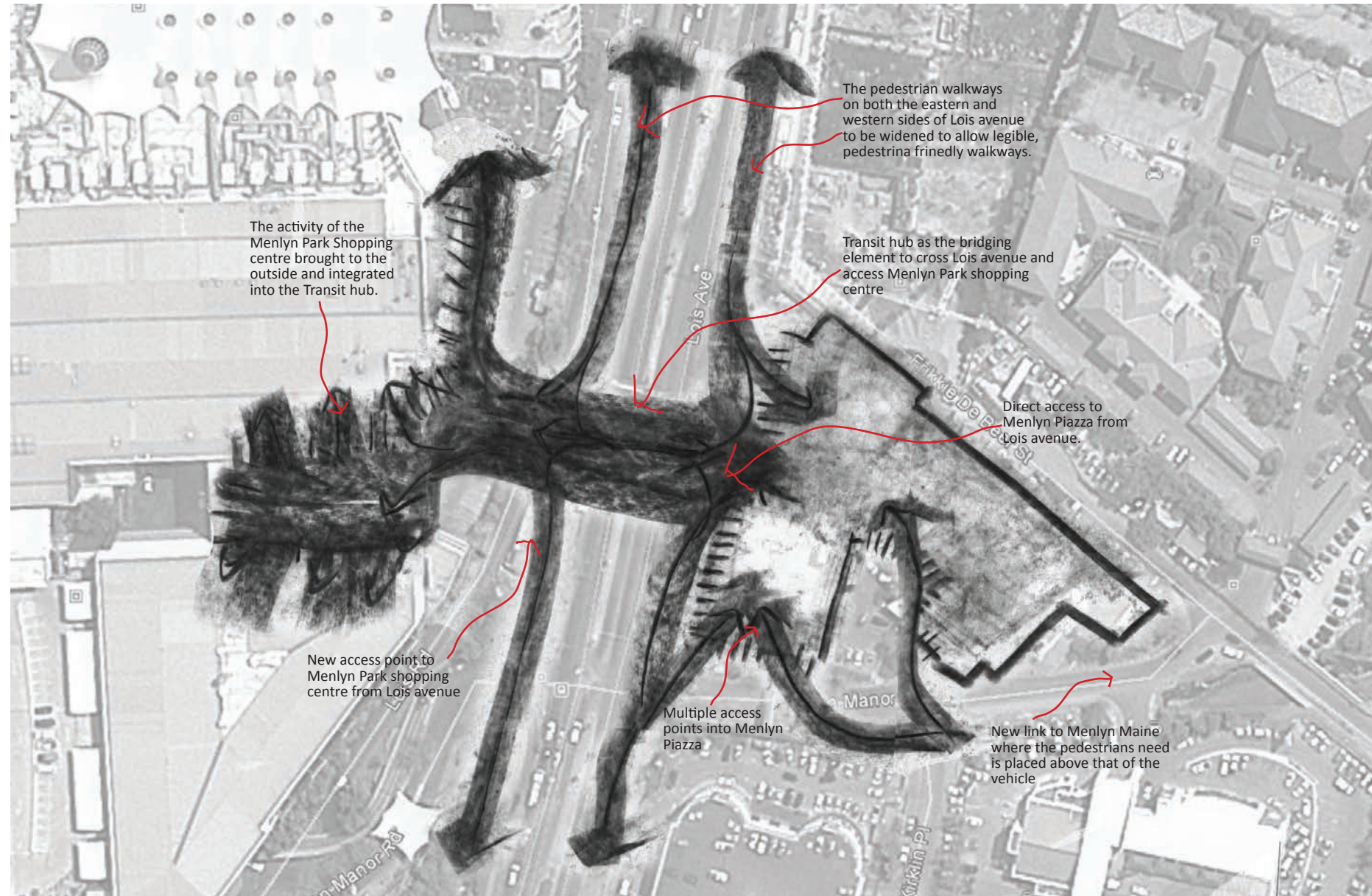
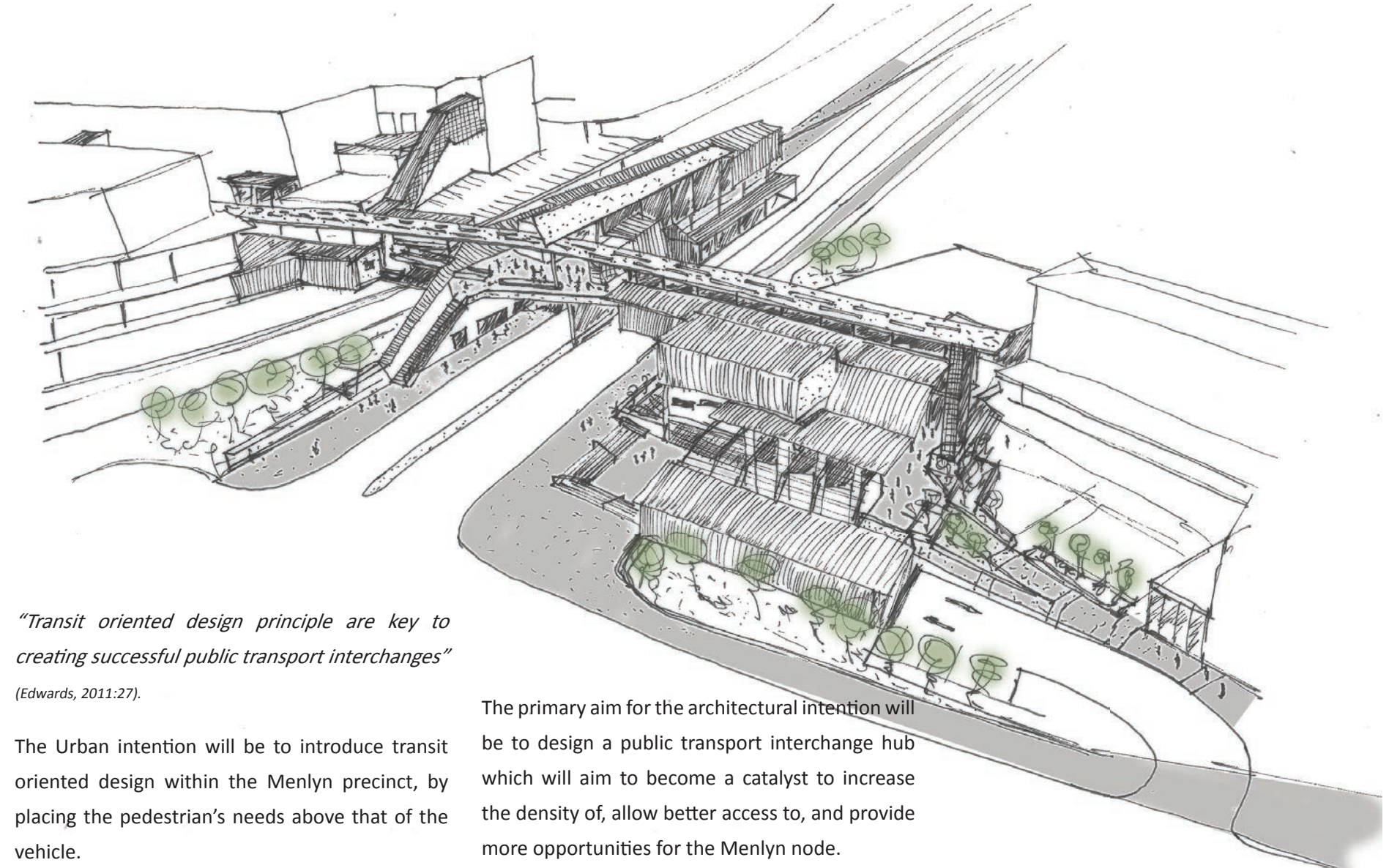


Image 3.28 - The intension of the urban vision, to create better pedestrian access into the existing retail infrastructure - by Author

Image 3.29 - The primary aim for the architectural intention will aim to become a catalyst to increase the density of, allow better access to, and provide more opportunities for the Menlyn node - by Author



*“Transit oriented design principle are key to creating successful public transport interchanges”*  
(Edwards, 2011:27).

The Urban intention will be to introduce transit oriented design within the Menlyn precinct, by placing the pedestrian’s needs above that of the vehicle.

The primary aim for the architectural intention will be to design a public transport interchange hub which will aim to become a catalyst to increase the density of, allow better access to, and provide more opportunities for the Menlyn node.

# Chapter\_4

4.1 - Client

4.2 - Programme

4.3 - Accomodation schedule



Image 4.1 - City of Tshwane Logo

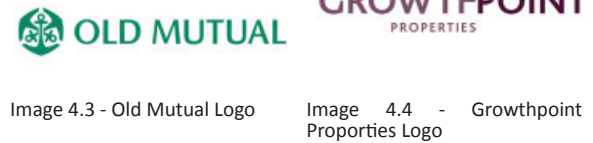


Image 4.3 - Old Mutual Logo

Image 4.4 - Growthpoint Properties Logo

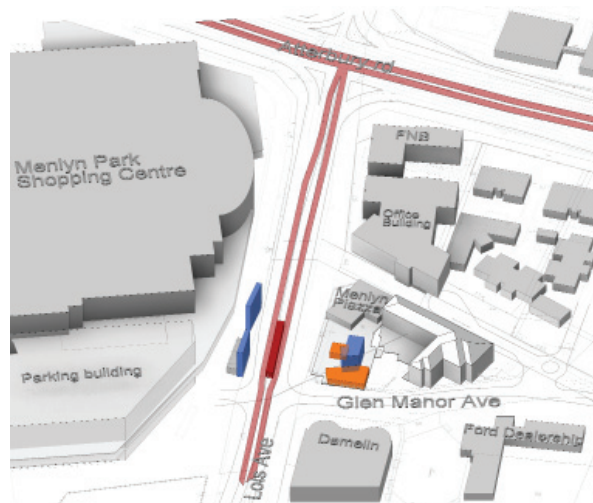


Image 4.5 - Lois Avenue and Menlyn Piazza accommodation diagram - by Author

#### 4.1 - Client

The following entities will have an important share in the execution of this project. Firstly the City of Tshwane public transport department. The author had an interview with the head of public transport for the City of Tshwane, Mr Mike Krynauw. He agreed with the proposal as stated in the 2012 Menlyn traffic study done by ITS Engineers. Next will be the owners of the two shopping/retail centres which will be linked by the transit hub. Old Mutual Properties currently owns Menlyn Park shopping Centre. Menlyn Piazza is owned by Growth Point property group.

The Menlyn Park Shopping Centre was built in the 1980's with a 60 000m<sup>2</sup> floor area, which comprised of 45000m<sup>2</sup> of retail space. In 1998 construction started on the refurbishment and the centre was enlarged by 105 000m<sup>2</sup>, to have a total retail area of 150 000m<sup>2</sup>.

Menlyn Piazza is a mixed use development, consisting of several restaurants with retail shops on the ground floor and offices on the top three floor. The building is located on the eastern side of

Lois Avenue and can be accessed only from Glen Manor Avenue. The centre provides parking on two basement levels and a few parkings on the ground floor level. The Centre has been designed in a "U" shape, creating a vibrant and busy public square in the middle.

#### 4.2 - Programme

The programme of the transit hub will consist of an integration between Bus Rapid Transit (B.R.T) and elevated rail. The B.R.T will be sharing its terminal functions with that of the rail. The accommodation schedule for the transit hub will be based on the recently completed Gautrain stations and the ongoing Tshwane B.R.T project.

The requirements for the rail station were obtained from Tom Steer (Gapp Architect and Urban Designers). He was the master architect on the Gautrain Project.

The proposed programmes for the transit hub are as follow;

On the road level there will be a single module Bus Rapid Transit station. The station is classified

as a building for public gathering. The size of the station is calculated by the amount of people the B.R.T busses can accommodate.

The station will have two loading sides which will allow the station to be occupied by a maximum of 192 people at a time. The length of each waiting area is 19 meters, with 3 access doors on each side spaced according to the door positions on the busses. The size of the station is in accordance with the current Bus Rapid Transit design manual as being used with the Tshwane Rapid Transit Project (MRA: 2012).

Located on the public concourse level will be an elevated rail platform (image 4.6). The rail and B.R.T system will share the entrance terminal area and also the modes of access, which is either by staircase, escalator or elevator.

The elevated rail platform size is dependent on the type of train. The chosen train for the proposed system is an Urbanaut train model. The length of the train is 50.9 m in length, and consists of 7 train cars with a capacity of 390 passengers, 138 seated and 242 standing.

The retail or social activity needed for the transport system will be drawn from the Menlyn Park Shopping centre and Menlyn Piazza.

A public square will be created on the corner where menlyn piazza is currently located. The existing building will be demolished to make space for the entrance square. The public square will attempt to create a civic space whereby one will enter either the menlyn piazza complex or access the public concourse interconnected with the transit hub and Menlyn Park shopping centre.

Within the Menlyn Piazza square will be a coffee shop with outside seating, a bicycle shop with rental facilities and also the stairs, escalators and a lift to access the concourse level.

Currently all the new projects underway in Menlyn Maine provide for bicycle parking outside the buildings. This will provide the opportunity for the office going traveller to rent a bicycle and ride from the transit hub to his or her office building. On the concourse level will be a retail strip leading the traveller to the outside terminal entrance of the transit hub.

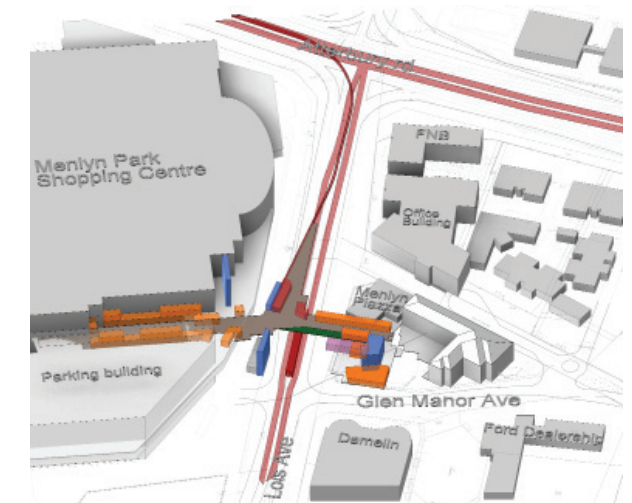


Image 4.6 - Concourse level, Terminal building and Menlyn Promenade accommodation diagram - by Author

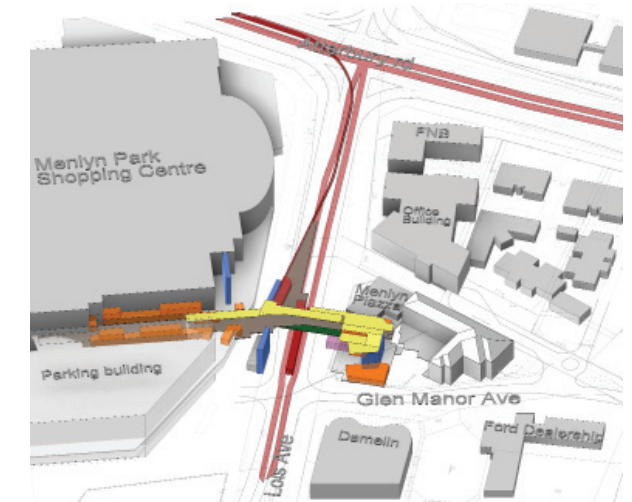


Image 4.7 - Roofing element linking the two nodes - by Author

The space provided between the southern edge of the Menlyn Park Shopping Centre and the parking area will be utilized to create an interactive shopping promenade. The promenade will extend towards the public concourse linking the two shopping/retail nodes. Items sold within the Shopping centre will be exhibited and will allow the user to experience the product at first hand.

The user will then have to move through the centre to the specific shop to buy the product. The shops will vary in sizes and are designed on a five meter grid. The integration of retail and travel will provide the traveller with the opportunity to buy a light meal, the newspaper or something to drink before they embarks on their journey or it will just become a meeting place for work colleagues.

The idea is to integrate transport into the everyday lives of the users by providing the everyday essentials on the routes used everyday. This is an aspect which has been neglected as mentioned by Ludwig Hansen and Paul Kotze (Hansen & Kotze, Sepr/Oct 2012:17-21).

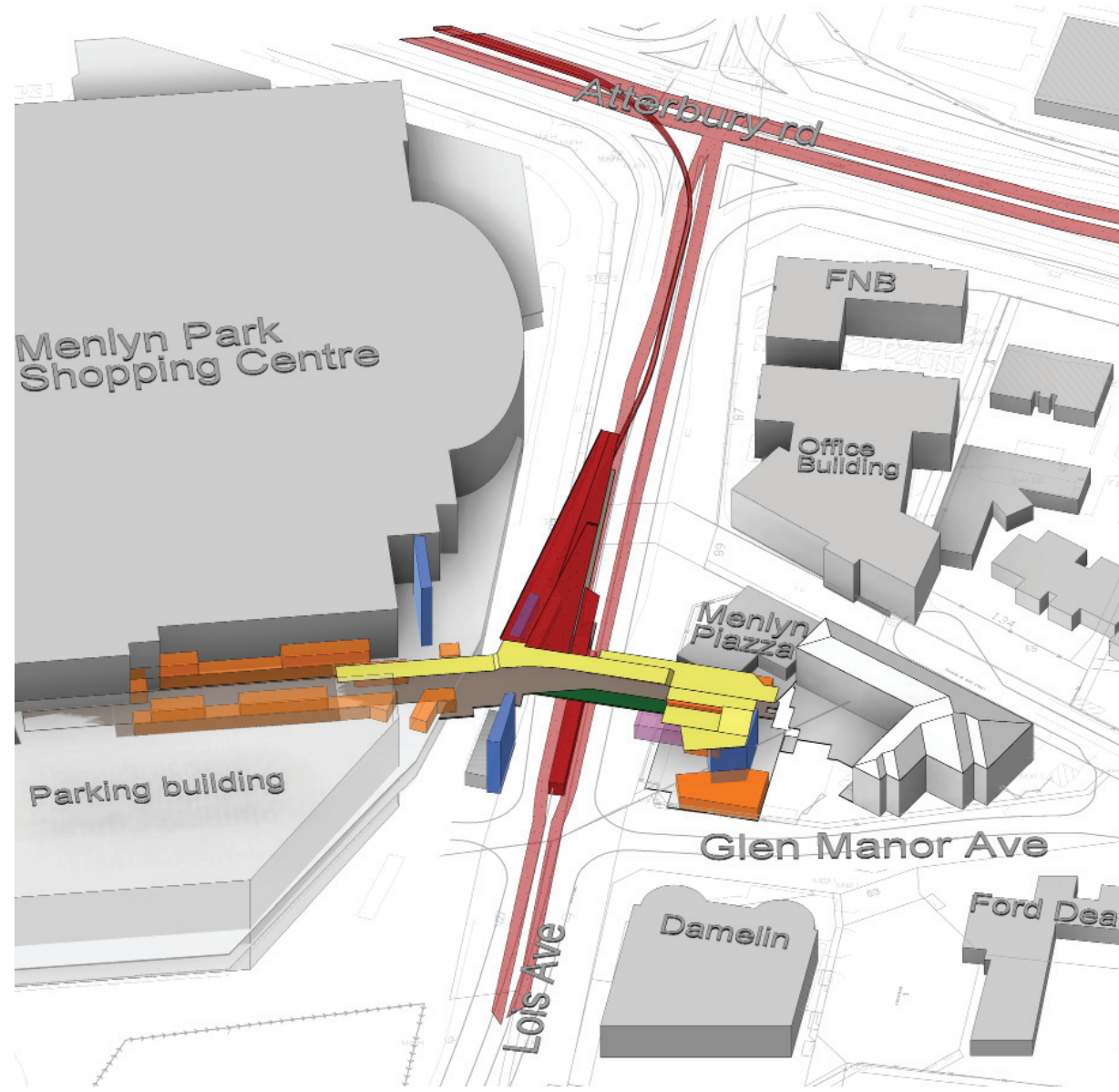


Image 4.8 - Menlyn Transit hub zoning diagram - by Author

#### 4.3 - Accommodation schedule:

##### Menlyn Piazza entrance square

Coffee shop: 250m<sup>2</sup>

Bicycle renting cafe: 125m<sup>2</sup>

Concourse level retail strip: 250m<sup>2</sup>

##### Transit Hub (Ref)

Station control room: 13.5m<sup>2</sup>

Ticket Office room: 16m<sup>2</sup>

Ticket vending machines back-store: 4m<sup>2</sup>

Receipt and safe deposit room/Ticket storage: 4m<sup>2</sup>

Security Office: 10m<sup>2</sup>

First aid room: ...m<sup>2</sup>

Male locker room: 20m<sup>2</sup>

Male staff toilets: 2.5m<sup>2</sup>

Female Locker room: 20m<sup>2</sup>

Female staff toilets: 2.5m<sup>2</sup>

Administration Office: ...m<sup>2</sup>

Rest room/ Kitchen: 10m<sup>2</sup>

Cleaning room: 4m<sup>2</sup>

Operation storage room: 15m<sup>2</sup>

Police office: 16m<sup>2</sup>

Male ablution facilities

Female ablution facilities

Route supervisor office: 12m<sup>2</sup>

Drivers and conductors dispatch office: 12m<sup>2</sup>

Drivers and Conductors rest room: 12m<sup>2</sup>

Unisex toilet and beverage dispenser for above:  
6m<sup>2</sup>

Elevated rail platform

Bus rapid transit platform

##### Menlyn Park interactive Promenade

Retail shops: 1000m<sup>2</sup>

First floor offices: 350m<sup>2</sup>



Image 4.9 - Sandton Gautrain station interior view



Image 4.10 - Starbucks coffee shop



Image 4.11 - Outdoor shopping promenade

# Chapter\_5

- 5.1 - Conceptual informants
- 5.2 - Planning informants
- 5.3 - Informant implimented on site
- 5.4 - Concept and Parti diagram



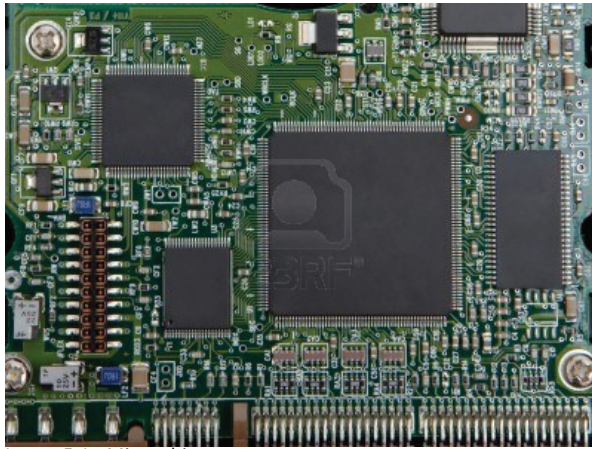


Image 5.1 - Micro chip

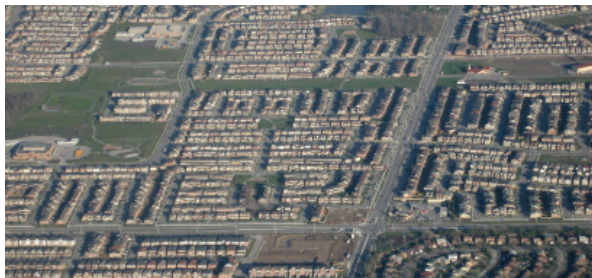


Image 5.2 - Urban sprawl



Image 5.3 - Dense city

The Menlyn transit hub will aim to become a catalyst to increase the density of, allow better access to, and provide more opportunities for the Menlyn node.

For the above intention to happen the Transit hub needs to be the starting point within Menlyn to achieve the aims which were set out in the Menlyn 2012 Spatial framework as previously mentioned.

## 5.1 - Conceptual informants

The following questions were asked.

- 5.1.1 How to increase the density of Menlyn?
- 5.1.2. How one achieve better access into and around Menlyn?
- 5.1.3. How can more opportunities be provided for Menlyn?

### 5.1.1. Increase the density of Menlyn

#### **Dense;**

The concept of density can be referred to as “crowded or closely compacted”. The density of a city can be compared to a microchip, whereby the

closer the electrical components are positioned to each other on the chip, the better it performs (PORTER:2005). This definition compares well to the layout concept for a City or Town.

#### **Compact city;**

A compact city or town positively impacts on the sustainability of the area and restricts urban sprawl. Combining work, leisure and living activities in close proximity of one another would ensure that more people within the city supports a public transport system along with local businesses.

This would further encourage people to rather walk or cycle, requiring them to be less dependent on their vehicles thereby in turn, reducing greenhouse gas emissions (PORTER:2005).

The author can therefore postulate that, should the proposed project take place, the Menlyn Precinct would become a dense, compact city which can provide the above-mentioned attributes.

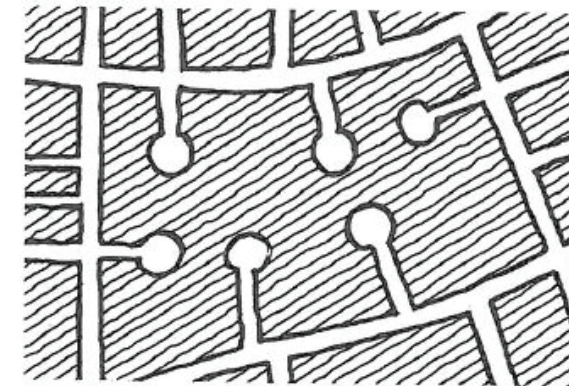
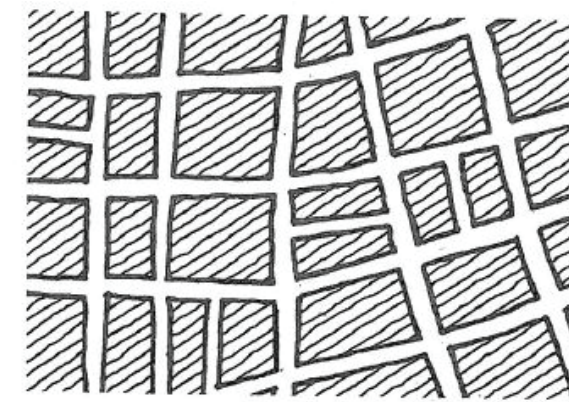


Image 5.4 - Permeability

### 5.1.2 - Creating better access into and around Menlyn.

In the book entitled Responsive Environments (1995), Kevin Lynch explains that only places which are accessible to people can offer them choice. He refers to “permeability” as the number of alternative routes through an environment.

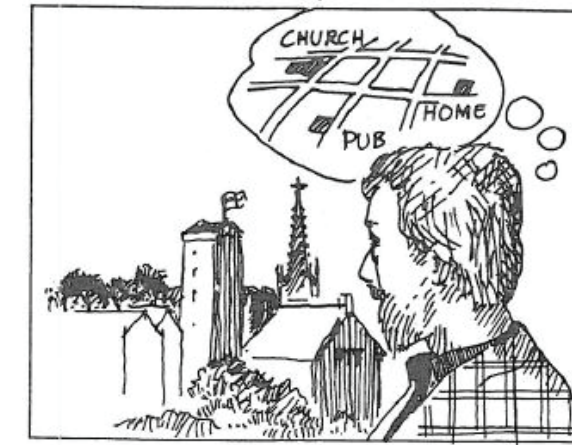


Image 5.5 - Legibility

The quality of permeability is therefore central to making responsive places. Lynch expresses the notion that permeability is of little use by itself, unless the accessible places offer a choice of experiences to a variety of users. He further presents that the degree of choice offered by a place depends on how legible and easily people can understand the layout (Lynch:1995).

The three elements of permeability, variety and legibility have therefore to be integrated into the Menlyn Node to achieve the required outcome.

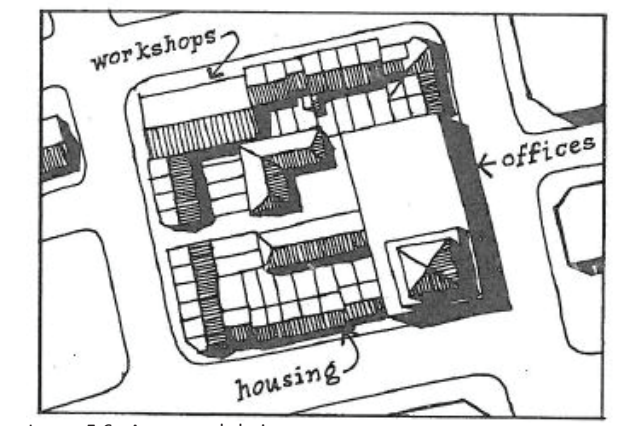


Image 5.6 - Access and choice

### 5.1.3 - Providing more opportunities for Menlyn?

Lynch explains that the provision for more opportunities for a node is a collection of the three identified element, which is a function of density and access (Lynch:1995).

Taking the author’s standpoint into account, the more opportunities created for the Menlyn node, the denser it shall become. The node would therefore have to be permeable offering a variety of choices with multiple access points, which are clearly legible to the users.



Image 5.7 - Interaction diagram - by Author



Image 5.8 - Kings cross station interior showing interaction between the commuter and pedestrian

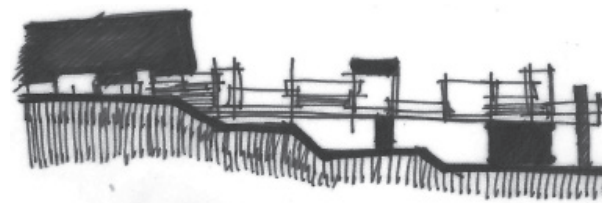


Image 5.9 - Interaction between different materials and spaces - by Author

*“A transport interchange must provide spaces for interaction, transfer, integration, interconnection, intersection.”* (Edwards, 2011:15)

Given the main purpose of a transport interchange, the author shall attempt to re-interpret these spatial qualities mentioned in the above quote thereby using them as planning informants.

## 5.2 - Planning Informants

### 5.2.1. Interaction

Archispeak defines interaction as *“a way in which people interact, either in an abstract or physical way. It is a two-way action or influence between two parties when information is exchanged”*. (Porter, 2005:89). Interaction as a concept can be found across the entire design process; from where the architect interacts with the client, to the site/context with the design idea. Form interacts with space; materials interact with the solid and the void, while different materials interact with each other (Porter, 2005:90). Interaction occurs within a transport interchange in a variety of ways. There

is interaction between the different modes of transport namely rail, bus, vehicle, bicycle and the pedestrian. Each mode has a different type of flow which can be articulated in such a way as to give a diverse meaning compared to the other (Edwards, 2011:15). In the case of the Menlyn Transit Hub, pedestrian routes are considered to be the most important of these transport modes. A concourse offers the opportunity for the traveler and non-traveler to interact within this public space, especially if the concourse is used as an element of a public square, or a linking element, bridging an urban barrier. This form of interaction could also link the interior and exterior of a station terminal, thereby making the terminal entrance an extension of the outside concourse by utilizing similar materials or overhead elements (Ibid, 2011:15).



Image 5.10 - Berlin Station Interior

### 5.2.2 Transfer

Transfer is the movement between the different modes of transport within the transit hub. It also refers to the point of access from where the transit hub is accessed from the urban fabric. Being able to seamlessly transfer between modes of transport is a key measure in the success of public transport (Edwards, 2011:83).

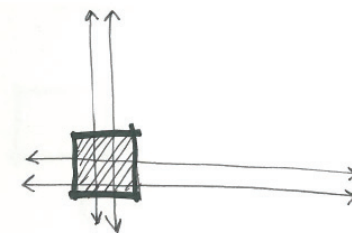


Image 5.11 - Transfer Diagram - by Author

The patterns of flow are an important force in shaping the architecture of an interchange. Seamless transfer between transport modes can be made possible by providing a single ticketing policy within the holistic system.

Within a transport interchange, the central concourse is the focal point for transfer and information activity therefore retail is an important aspect of a transport interchange, however has to be limited to certain zones. This ensures that

movement and the transfer areas maintains focal importance (Ibid, 2011:15)

### 5.2.3. Integration;

Integration within transport interchanges is not solely about bringing together different modes of transport, but also integrating transport into the urban fabric around the station, and the greater city. This furthermore allows improved integration within a provincial context, as is the case with the Gautrain, where Johannesburg and Pretoria are now perceived to be one metropolitan area, due to the integration which was created by the rail system linking the two cities.

Successful urban integration is achieved by creating safe and secure routes for pedestrians and cyclists, integrating commercial spaces within the interchange, forming civic spaces around the interchange, creating multipurpose space to be used by the wider community, and ensuring legible connections with other transport modes and civic landmarks (Edwards, 2011:63).

Integration also occurs between indoor and outdoor spaces where the functional movement

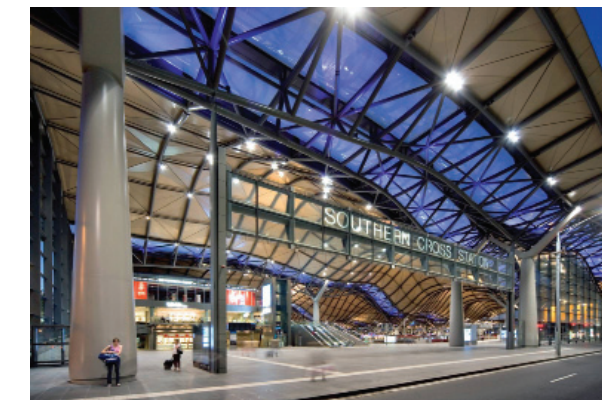


Image 5.12 - Southern cross station - Sydney



Image 5.13 - Molndal station - Gothenburg



Image 5.14 - Rotterdam Tram connection

patterns are expressed and the distinction between inside and outside are blurred. (Ibid,2011:109).

By allowing passengers and non-transit users to move through the interchange together, social and cultural integration is created, while avoiding the creation of a closed, wholly public transport user community (Ibid,2011:109).

**5.2.4. Interconnection;**

A transport interchange is a place of connection (Edwards,2011:14), which not only is a connection between the types of transport modes, which should be as seamless as possible (Ibid,2011:21), but also connections created to join other parts of a city, in addition to more widespread transport interchanges.

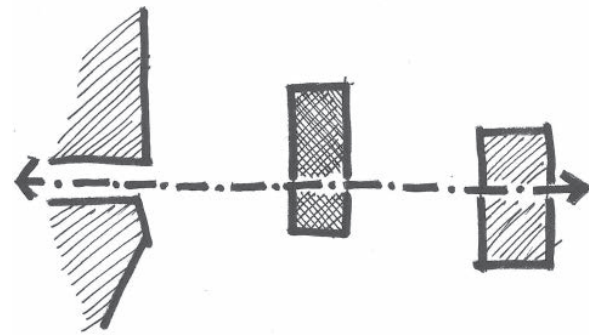


Image 5.15 - Interconnection of spaces diagram - by Author

Transport and urban interconnection is mainly achieved by foot (Ibid,2011:58), therefore the ideal placement of pedestrian routes should take preference over that of the retail zones through keeping them secondary to that of transfer and circulation considerations (Ibid,2011:169).

**5.2.5. Intersection;**

“Each of us is a kind of crossroad, where things happen.” (Claude Levi-Strauss ref)

Archispeak defines Intersection as the primary axis where horizontal and vertical lines cross. Intersecting routes are intercepting nodes which mark moments of choice, with the opportunity to change direction or to meet those travelling from other directions (Porter,2005, p.81).

“Spatial intersections of a city are where transport intersections occur, and this is where the interchange will reside.” (Edwards,2011:60)

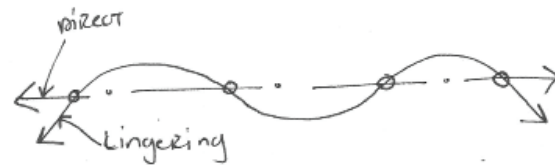


Image 5.16 - Intersection of the direct and lingering route diagram - by Author

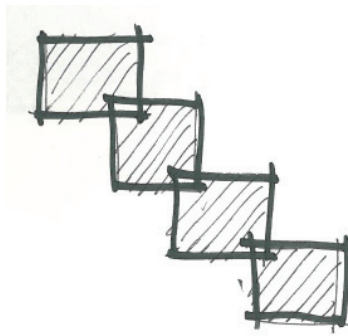


Image 5.17 - Interection of spaces - by Author

**5.3. Informants implimented on site**

The Menlyn Shopping Centre and the Menlyn Piazza complex are existing infrastructures identified on site. These nodes provide for an opportunity to add to the social activity necessary within a transport interchange, in order to help integrate public transport with retail and social activity.

Transit-oriented design principles are central to creating successful public transport interchanges (Edwards, 2011). The pedestrian’s needs should be placed above that of vehicle traffic, with the main focus being on pedestrian movement, which is currently limited in the Menlyn Shopping Centre and Menlyn Piazza areas.

There are currently two flights of stairs from Lois Avenue into the Menlyn Centre parking area, which leads to the lower ground entrance, while Menlyn Piazza has only one entrance from Glen Manor Avenue.

Although the Menlyn Piazza layout provides for the opportunity to create a secondary entrance from Menlyn Shopping Centre via Lois Avenue, there



Image 5.18 - Site plan of Lois avenue - by Author

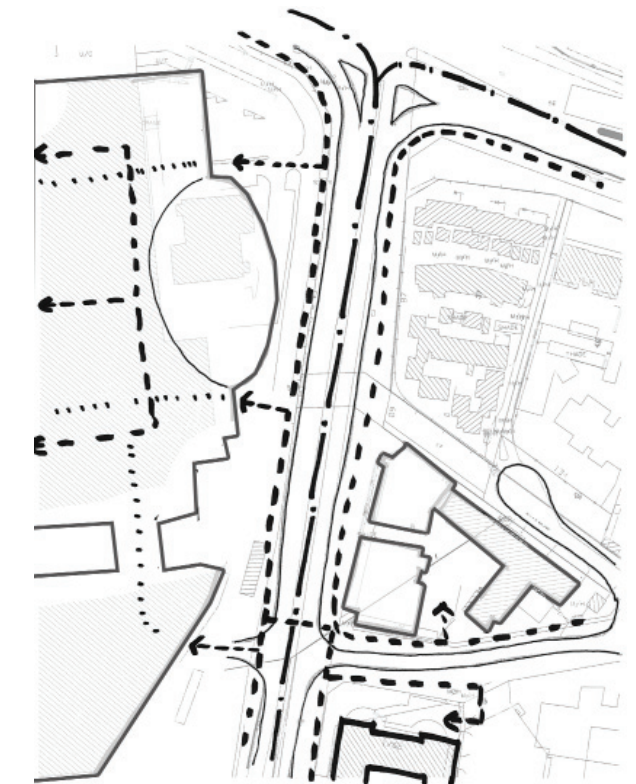


Image 5.19 - Pedestrian movement and access to Menlyn and Menlyn Piazza from Lois- and Glen Manor avenue - by Author



Image 5.20 - The connection created between Menlyn and Menlyn Piazza - by Author

is currently no direct link other than a pedestrian crossing. The suggested Transport Interchange would provide direct and safe access, linking the two buildings.



Image 5.21 - Location of the transfer spaces along existing routes where the link is accessed - by Author

Different modes of transport (pedestrian and public) cross at specific positions creating the ideal location for the necessary transfer space, to access the interchange from the road level. One would furthermore be able to move between the different transportation terminals.

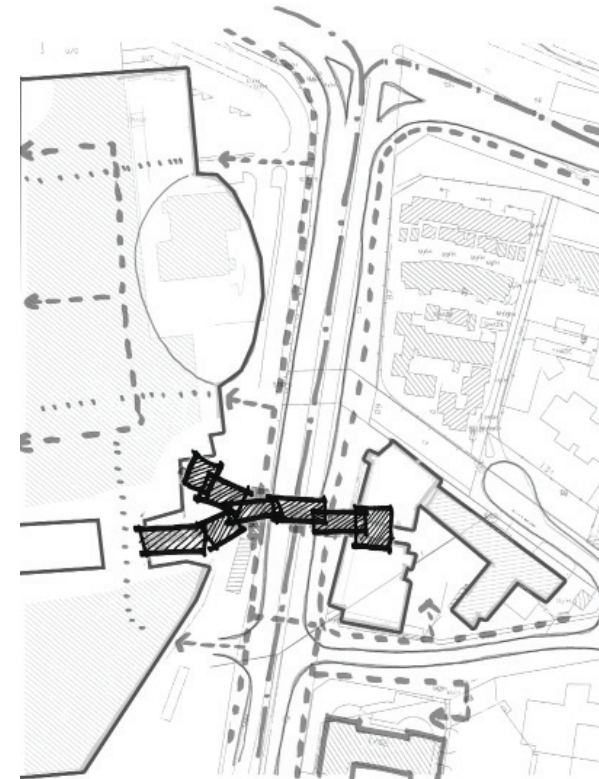
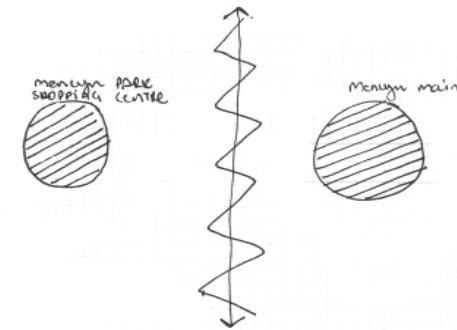


Image 5.22 - Intersection of spaces along the link created between the two nodes and the transfer space - by Author

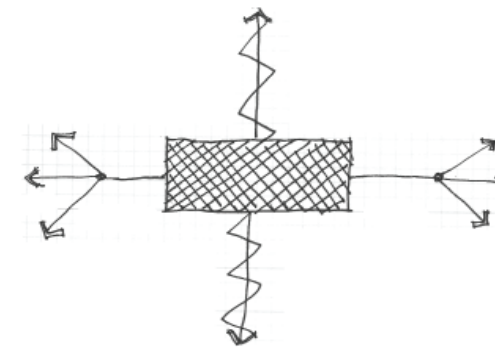
The space between the existing infrastructure and the transfer areas would allow for the necessary integration, intersection and interconnection within the context of the proposed Transport Interchange.

#### 5.4 - The Concept

The Concept was summarized in the introduction of this chapter whereby the aim of the Transit Hub is to be a catalyst whereby density is increased, improved access is created and more opportunities are provided for the Menlyn Node, thereby providing spaces for “*interaction, transfer, integration, interconnection and intersection*” (Edwards, 2011).



1. Current situation - Two nodes divided by a major movement route



2. Purpose of transport interchange - Providing cross city movement

3. The intension - Reconnecting a divided node through public transport.

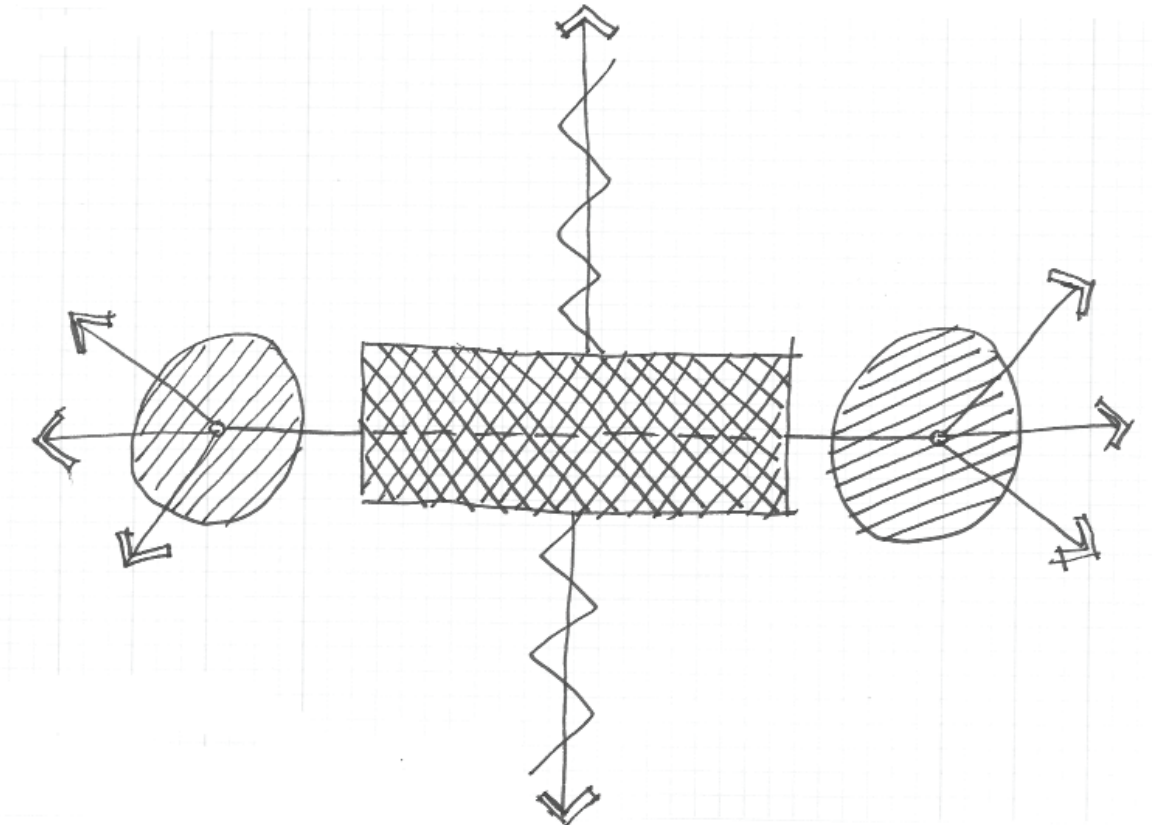


Image 5.23 - The Parti Diagram - by Author

# Chapter\_6

- 6.1. Typological precedent
  - 6.1.1 Illinois Institute of Technology, McCormick Tribune Centre,
- 6.2. Functional precedent
  - 6.2.1 Kuyasa Transport Interchange
  - 6.2.2 Metro mall, Johannesburg
- 6.3. Tectonic precedent
  - 6.3.1 Oriente Station, Lisbon

## 1. Typological precedent

The Illinois Institute of Technologies, McCormick Tribune Centre, designed by the Office for Metropolitan Architecture (OMA), 2003 refers.

The concept was to reinvigorate the urbanism inherent in the site which was a long forgotten master plan of Mies van der Rohe's in the 1953 (OFFICE FOR METROPOLITAN ARCHITECTURE. 2003).

The insertion of public transport into a mixed use facility provided the necessary activity, while the node was further linked to the greater urban area outside the campus via public transport.



Image 6.1. McCormick Tribune Centre

The objective was to re-energize a portion of the campus, housing a building which had a footprint double the size of the resident population, having halved since the 1940's.

To create a new point of density, the Tribune Centre was located in a large rectangular parking area underneath an elevated rail line, linking the campus to the rest of Chicago. The encircled track was known to the students as "the tube" and became a critical part of the Campus' image.

The Tribune Centre is a large single storey building, providing a focal point for the campus, which features a noise-absorbing steel tube wrapped around an elevated train, running directly over the building. The Tribune Centre avails of a dense array of programs including a bookstore, food court, cafe, auditorium, computer centre and meeting spaces.

The core aspect of the building was the creation of delineated lines for student foot traffic, indicating the desired routes across the campus. The intersecting diagonal paths are maintained inside the centre by linking a multitude of activities through a network of interior street, plazas,

recreation and other urban elements (OFFICE FOR METROPOLITAN ARCHITECTURE. 2003).

The roof is a concrete slab, acting as a unifying element which protects against the noise of the elevated rail overhead, while binding the various activities together. The "tube" protrudes through the roof to reminding one of what is above, while the roof has large overhangs to embrace the adjacent Commons Hall, which was the original student centre designed by Mies van der Rohe.

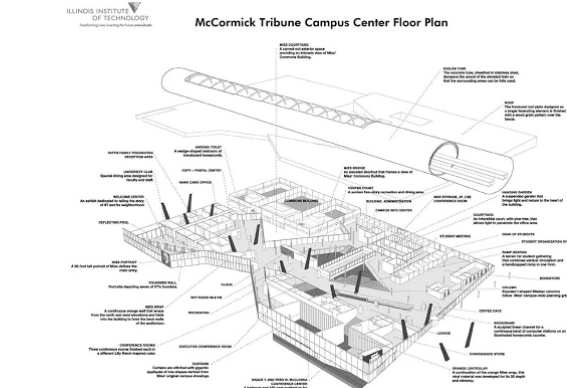


Image 6.2. McCormick Tribune Centre 3d plan view

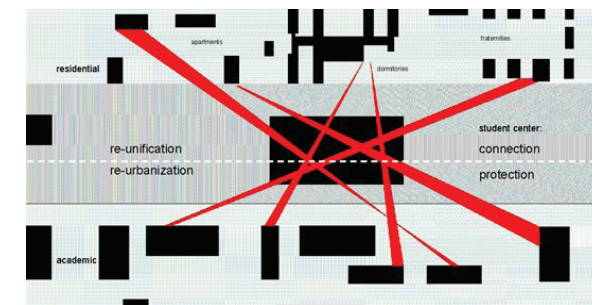


Image 6.3. McCormick Tribune Centre access diagram

## Appropriateness to the Menlyn Transit hub:

By analysing the McCormick Tribune Centre; social interaction has been created by adding the transport node in the middle of the campus, allowing the students and commuters to interact.

Access to the transport facility has been made easy as the station is placed in the middle of the centre.

The station is integrated into the campus, being situated in the middle while providing access from multiple sides of the building.

The centre is interconnected with the city of Chicago, being a node within the transport system.

Intersection occurs where the pedestrian access routes and rail facilities cross, meeting in the middle.

2. Functional precedent; integration of social and retail activities within a transport facility.

The examples below are existing transport interchange nodes within South Africa, where an attempt at place-making has occurred for the users, through integration of public transport, social and retail activity.

### 2.1 Kuyasa Square transport interchange.

Meyer + Vorster architects.

City of Cape Town.

Meyer + Vorster architects highlighted the importance of the new Kuyasa Station as part of a future urban node in Khayelitsha. The projects

aim was to act as the catalyst for future intensive urban development around the station. The project brief stated that it had to create a vibrant, integrated urban environment where the broader urban needs of public transport users, particularly pedestrians, took precedence over the necessary functional elements. (Meyer & Vorster, 2012)

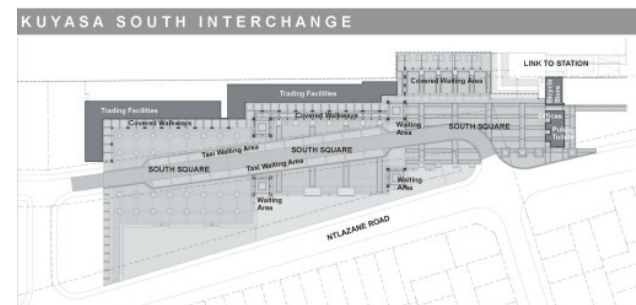
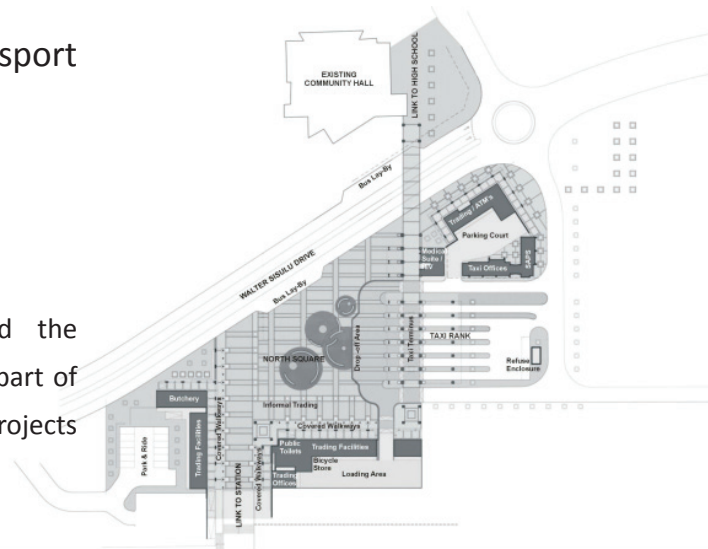


Image 6.4. Kuyasa Station Layout plan



Image 6.5. Kuyasa Station aerial view

The project is situated on either side of the train station elevated above the rail facilities, which are seen as the dividing element in the area. Each side of the interchange is emphasized by a public square which forms the backbone for the urban centre. The northern square has been integrated into the existing community centre, with a high school located in close proximity to the station.

Transport is the main function of the interchange therefore it required commercial and social facilities to act as ancillary functions. These consisted of formal and informal trading, public ablution facilities, a butcher, medical suites, a satellite police station, bicycle lock-up stores, office and banking facilities, a private taxi rank and public bus stops, while a park and ride component was also in the planning.

The structural design of the two buildings holds the potential to accommodate future housing on top of the trading facilities, while future additional institutional facilities may also be located around the public spaces. (ibid:2012)

### Appropriateness to the Menlyn Transit hub:

Interaction occurs between the daily commuter and the shop owners, who face the public square and open walkways leading to the station entrance. The suburbs on either side of the train facilities have been interconnected via the elevated train terminal, which functions both as a bridge and an access point to the train platforms.

The Kuyasa Transport Interchange integrates into the surrounding areas, becoming an extension of the urban fabric, while the public square and retail facilities have been interconnected via a multi-functional space between them. This can be used by the informal trader or as a meeting place between friends and family.

Three intersecting routes have been created.



Image 6.5. Kuyasa Station, main entrance walkway and public square

The primary route intersects with both the main entrance and elevated train station, which occurs on either side of the rail facilities. The secondary route intersects with a pedestrian route and the taxi stop area, also on either side of the rail facilities.



Image 6.6. Kuyasa Station, public square view



Image 6.7. Kuyasa Station, Public square bench

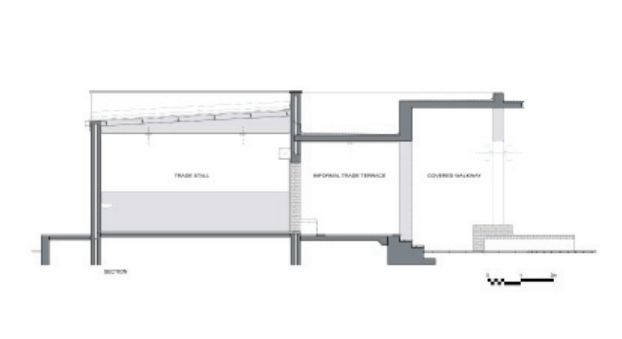


Image 6.7. Kuyasa Station, Retail shop and walkway section



Image 6.8. Kuyasa Station, retail shop with informal selling space

2.2 Metro mall

Urban Solutions Architects + Urban Designers.

Johannesburg Development Agency

Newtown, Johannesburg.



Image 6.9. Metro mall street view

The Metro Mall transport facility and traders market is an essential part of the City of Johannesburg's urban renewal strategy, which formed one of the first major infrastructural improvements of Johannesburg's Municipal dispensation. The Metro Mall is situated between Bree and Gwigwi Mrwebi Streets located north-west of Johannesburg's central business district.

The transport facility links Braamfontein to the north with the Newtown Cultural Precinct in the south (image 6.9). It further provides a permanent facility for a large number of taxis in the area, while formalizing street trading. Additional facilities provided for are storage spaces for the traders, ablutions and offices for the facility management.



Image 6.9. Metro mall Location plan

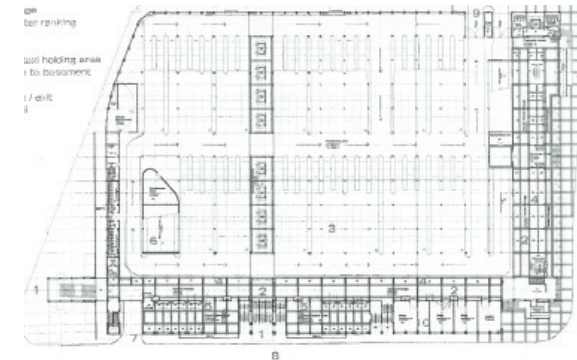


Image 6.10. Metro mall layout drawing

The facility consists of a triple-storey ranking facility for taxis and busses, with trading and pedestrian routes along the edges. Retail accommodation varies from counter trading, cubicles with roller shutter doors, and shops with glassed shop-fronts. The majority of the shops are situated on Bree Street, complementing existing retail activities across the road.

Informal trading exists along all the routes leading to and from the arrival and departure points.

Sound urban design principles were implemented, as this facility forms part of a larger urban design framework, which allows the continuation of pedestrian movement throughout the vicinity. The addition of mixed use facilities ensures constant activity and passive surveillance. Retail has been situated on the periphery of the roads to acknowledge the importance of the street



Image 6.11. Metro mall entrance structure

as a public space, while these spaces are further defined by steps and seating, distinguishing the Metro mall from often austere and internalized terminal buildings. The facility allows as much for ease of circulation as for orientation and even personalization (SILVERMAN, Melinda, 2009, pp.144-147).



Image 6.12. Metro mall retail passage

**Appropriateness to the Menlyn Transit hub:**

The Metro Mall layout allows for a building typology where the building is used as a walk-through, which is used by the commuter or pedestrian to access the different public transport modes, while also accessing the retail facilities in the facility.

The main entrances on the corners have been articulated with tower like structures, with secondary entrances being expressed by a high volume concrete entrance roof, protruding through the brick elevation. These entrance areas also form the transfer spaces to access the different floor levels.

The Metro Mall facilities have been placed in parallel to the existing retail facilities in Bree street, which in turn, creates an interactive passage whereby the commuter and shop owner interact as they travel towards the public transport platforms.

The passages are naturally lit and ventilated, forming access points to the platform areas.



### 3. Tectonic expression

The expression of the main ground floor space by stereotomic structures and everything on top is tectonic, creating this distinct difference in perceived space.

Oriente station, Santiago Calatrava.

City of Lisbon, Portugal.

The expression of the main ground floor space by stereotomic structures and everything on top is tectonic, creating this distinct difference in perceived space.

The Oriente station was commissioned by the City of Lisbon for the 1998 World Expo, with the brief being to serve the thousands of visitors expected for the event. The long term goal for the station was to become the main train terminal for the city.

Oriente station is an intermodal facility, which serves and interconnects several forms of transport types, from metropolitan, to medium and long-haul regional and international trains. The station is further connected to the underground system, busses, taxis and airport check-in facilities.

The station building consists of two levels, divided into three parts. The national train platform is on a raised level, while the lower level connects to the underground system, while acting as an entrance to the Expo ground and the bus terminal. The raised level is accessed either by ramp of circular glass elevators. The raised platform serves eight sets of railway tracks, covered by a 25 meter high white metal and glass roof structure. The supporting roof columns resemble a group of lilies or palm trees, while there are some references to British perpendicular gothic fan vaults.



Image 6.13. Oriente Station main entrance

The lower ground level is a large manmade cave, sheltering the commuters from the outside elements while linking the different modes of transport. The materials used were mainly concrete, with the bridge parapets made of glass and stone paving matching that used in the streets of Lisbon, while steel has been used in the connection to the bus terminal.

The stations efficiency has been questioned due to its ticketing offices being scattered across the facility rather than being grouped in one area. (Oriente Station, Lisbon, 1998)



Image 6.14. Oriente Station main transfer space

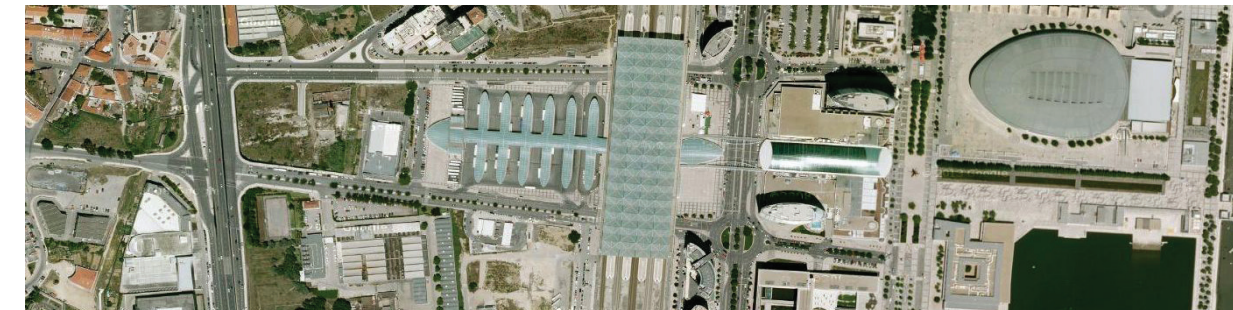


Image 6.15. Oriente Station location plan

#### Appropriateness to the Menlyn Transit hub:

This project took precedence due to the interconnection between the different tectonic and stereotomic structures.

The ground floor structure is made of heavy concrete, emphasizing the entrance to the station, while performing a functional role by bearing the weight of the trains on the upper level.

The ground floor performs multiple functions leading the commuter to the elevated rail platform, the underground train system, the bus terminals outside, or towards the entrance of the expo grounds and retail centre.

The elevated rail platform creates a light tectonic of steel and glass with an open naturally light and ventilated feel.



Image 6.16. Oriente Station ground floor concrete structure



Image 6.17. Oriente Station outside view of tectonic and stereotomic structure



Image 6.17. Oriente Station Double volume entrance area

# Chapter\_7

7.1 - Design Development

### 7.1 Concept 1 - March 2013

Pedestrian movement was the first issue which had to be addressed. The aim of the transit hub is to become the bridging element by which the commuter can cross Lois Avenue to enter Menlyn park shopping centre or Menlyn Piazza. This was done by creating a link over the road between the two nodes with street access from Lois Avenue (image 7.2).

The link would allow the pedestrians to access the upper first floor level of the Menlyn Park shopping centre or over and into the Menlyn Piazza complex. A visually strong element on the Menlyn Piazza corner had to be done to emphasize the entrance to the transit hub concourse (image 7.1).

The idea was also to extend the existing Rhapsody's restaurant to the concourse level, adding social activity to this link between the 2 retail nodes; this will also have a direct access point from the eastern side of Lois Avenue (Image 7.2).

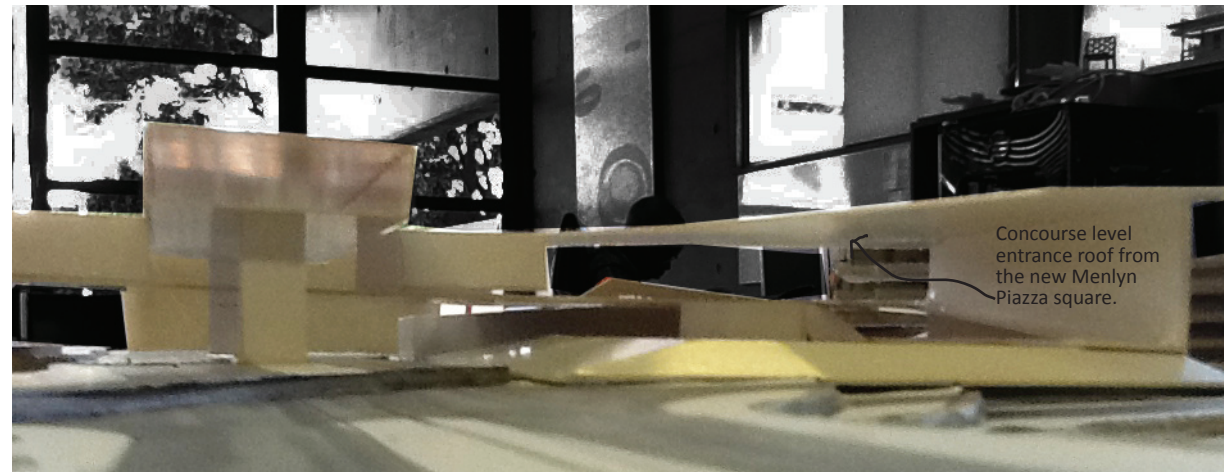


Image 7.1 - Concept 1 - Transit hub southern elevation from the corner of Lois and Glen Manor avenue - by Author

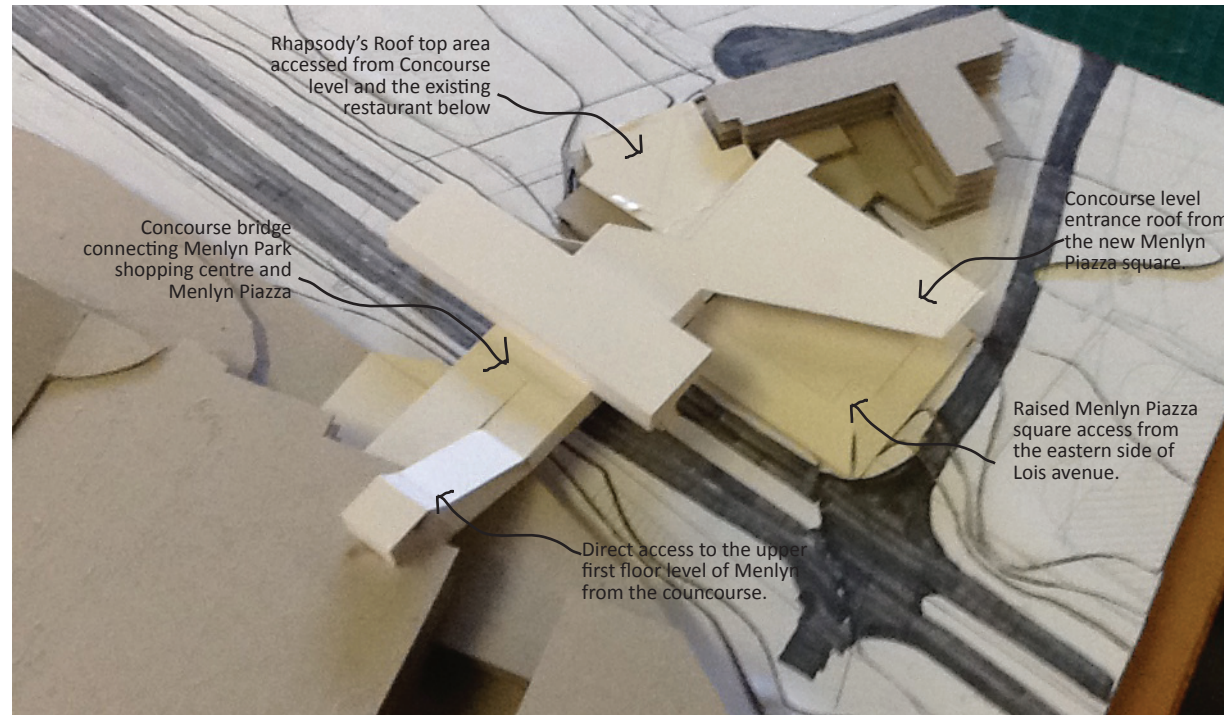


Image 7.2 - Concept 1 - Transit hub south western axonometric view - by Author

### 7.2 Concept 2 - April 2013

The second concept looked at creating a more visual and direct link from the corner of Lois and Glen manor to the Menlyn Piazza square and the concourse entrance, as the first concept was to enclosed and it gave the feeling that the concourse entrance square had turned its back to the existing Menlyn Piazza square.

The public square was seen as a walkthrough to the existing Menlyn piazza square and a waiting space, with planter boxes and a coffee shop to cater for the waiting commuters. The square is covered by a large lightweight roof.

A direct route was created from Glen Manor Avenue and taken through the existing Ty's restaurant into the Menlyn piazza square (image 7.4); this was done to create better integration with the routes around the site.

The concourse was also made wider where the retail facilities and terminal entrance were placed in the middle and the walkways on the edges of the concourse.

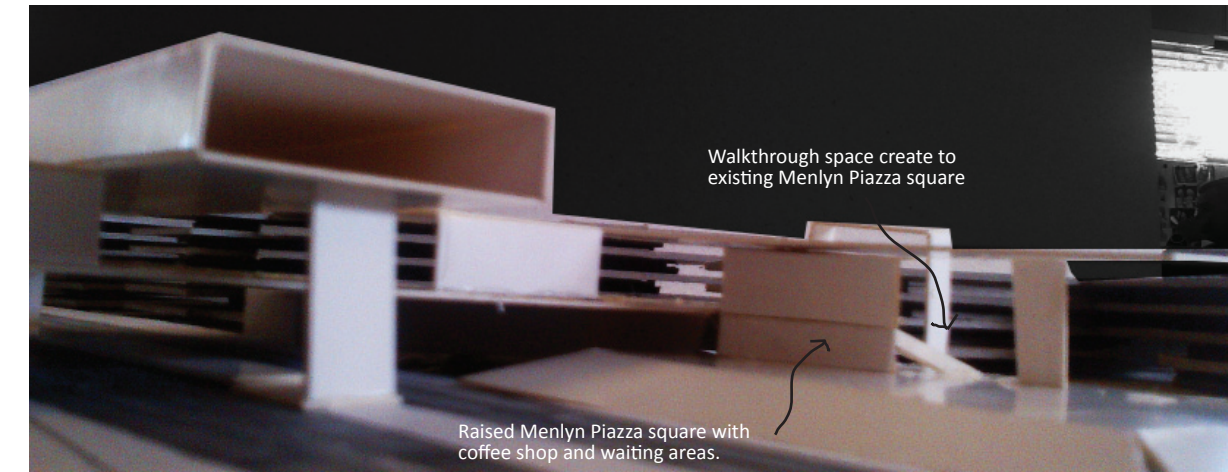


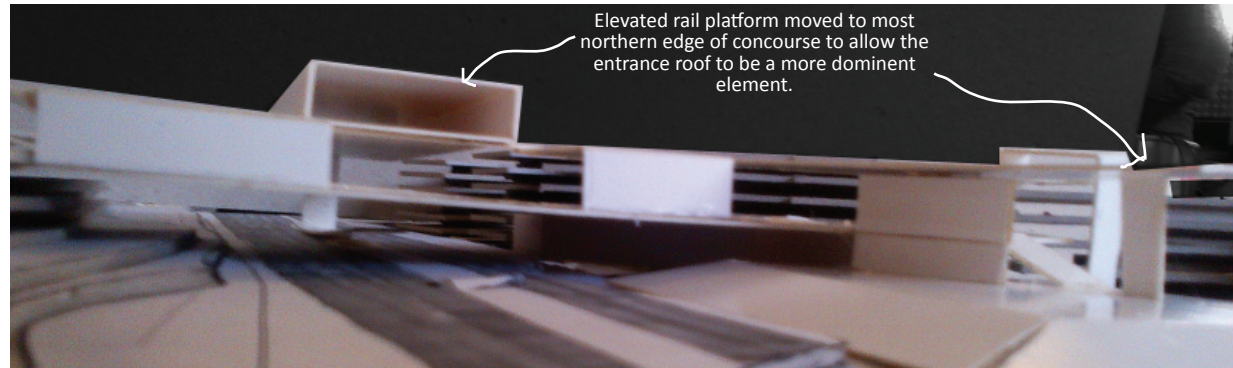
Image 7.3 - Concept 2 - New public square on the Menlyn Piazza corner - by Author



Image 7.4 - Concept 2 - Transit hub south western axonometric view - by Author

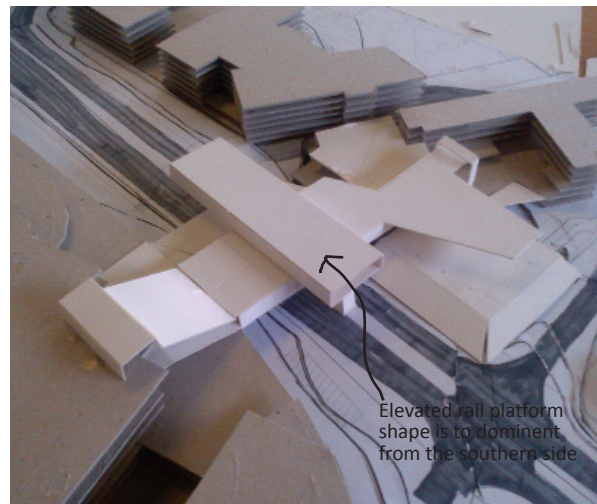
The terminal platform above the concourse was dominating the Menlyn piazza concourse entrance, and several options were explored to move the terminal platform back, completely on the northern edge (image 7.7) or either half way into the concourse (image 7.9).

The latter was chosen as this option allows the platform above the concourse to create a roofed area where the terminal building is entered.



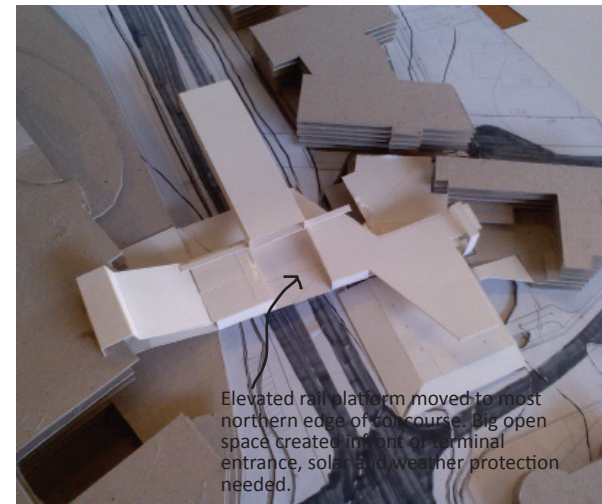
Elevated rail platform moved to most northern edge of concourse to allow the entrance roof to be a more dominant element.

Image 7.5 - Concept 2 - Transit hub southern elevation from the corner of Lois and Glen Manor avenue - by Author



Elevated rail platform shape is to dominant from the southern side

Image 7.6 - Elevated platform Roof position 1 - by Author



Elevated rail platform moved to most northern edge of concourse. Big open space created in front of terminal entrance, solar and weather protection needed.

Image 7.7 - Elevated platform Roof position 2 - by Author

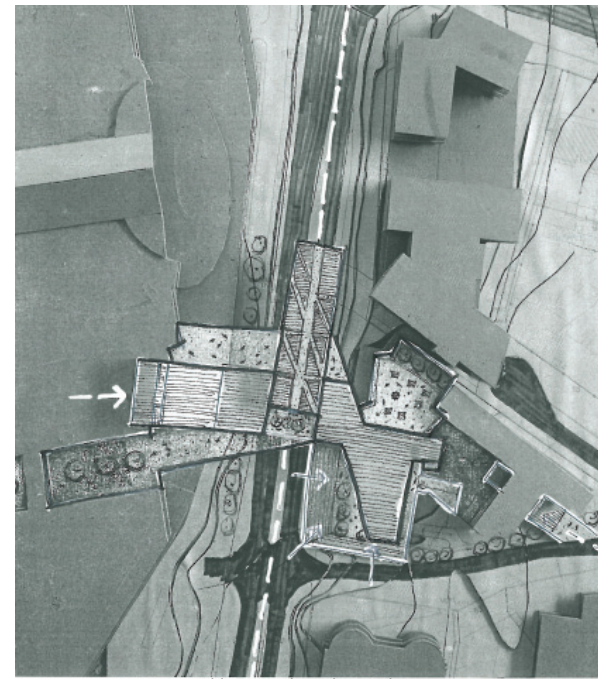
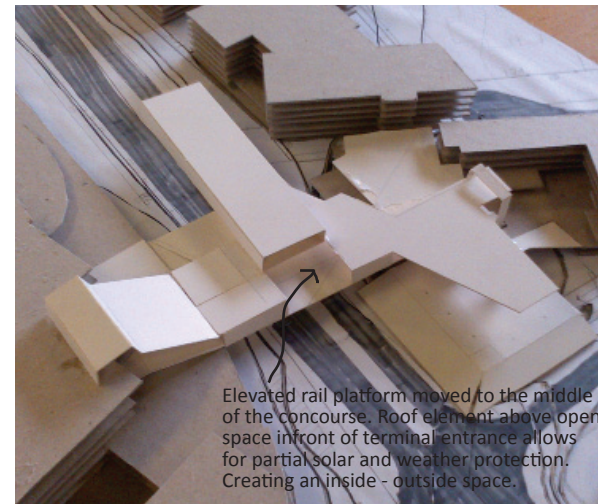
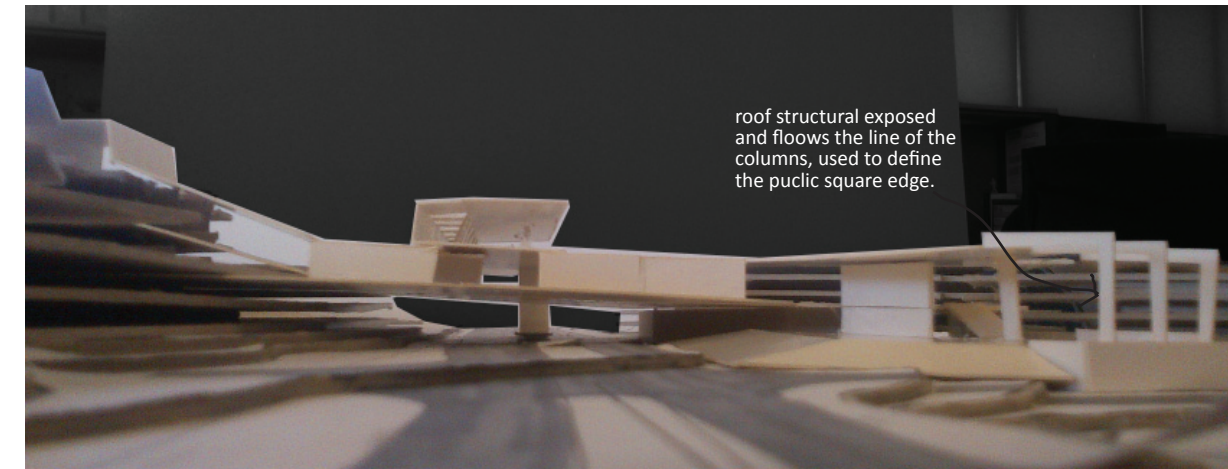


Image 7.8 - Conceptual layout plan - by Author



Elevated rail platform moved to the middle of the concourse. Roof element above open space in front of terminal entrance allows for partial solar and weather protection. Creating an inside - outside space.

Image 7.9 - Elevated platform Roof position 3 - by Author



roof structural exposed and flows the line of the columns, used to define the public square edge.

Image 7.10 - Concept 3 - Transit hub southern elevation from the corner of Lois and Glen Manor avenue - by Author



Elevated rail platform moved to the middle of the concourse. Roof element above open space in front of terminal entrance allows for partial solar and weather protection. Creating an inside - outside space.

Direct access to the existing Menlyn piazza square was changed from going through Ty's restaurant to running along the edge of the square towards Glen Manor Avenue.

Image 7.11 - Concept 3 - Transit hub south western axonometric view - by Author

### 7.3 Concept 3 - April 2013

Entrance square roof structural columns used to define the edge of the square.

Exploration of the elevated terminal platform roof was done to look at ways of allowing northern light onto the platform and keeping out the harsh western sun (images).

The access route through Ty's restaurant was changed to a route running along the edge of the Menlyn Piazza complex, linking up with the widened pedestrian route along Glen Manor Avenue leading towards Menlyn Maine (image).



Elevated rail platform western wall articulated to allow northern light onto platform area.

Image 7.12 - Alternative Elevated platform Roof design - by Author

### 7.4 Concept 4 - April 2013

The concourse link to menlyn changed from going directly to the upper first floor level of Menlyn, to utilizing the space between the Menlyn shopping centre and the parking area. The space will be used as a promenade with shops and offices along the edges and the promenade route linking with the concourse (image 7.13).

A secondary access to the upper first floor level is provided for, from the concourse link into the menlyn promenade strip (image 7.13).

The link between the two nodes is emphasized by a roofing element which intersects; the gap between Menlyn Park shopping centre and the parking building, continues along the concourse and wraps over the existing elevator at Menlyn Piazza (image 7.13).

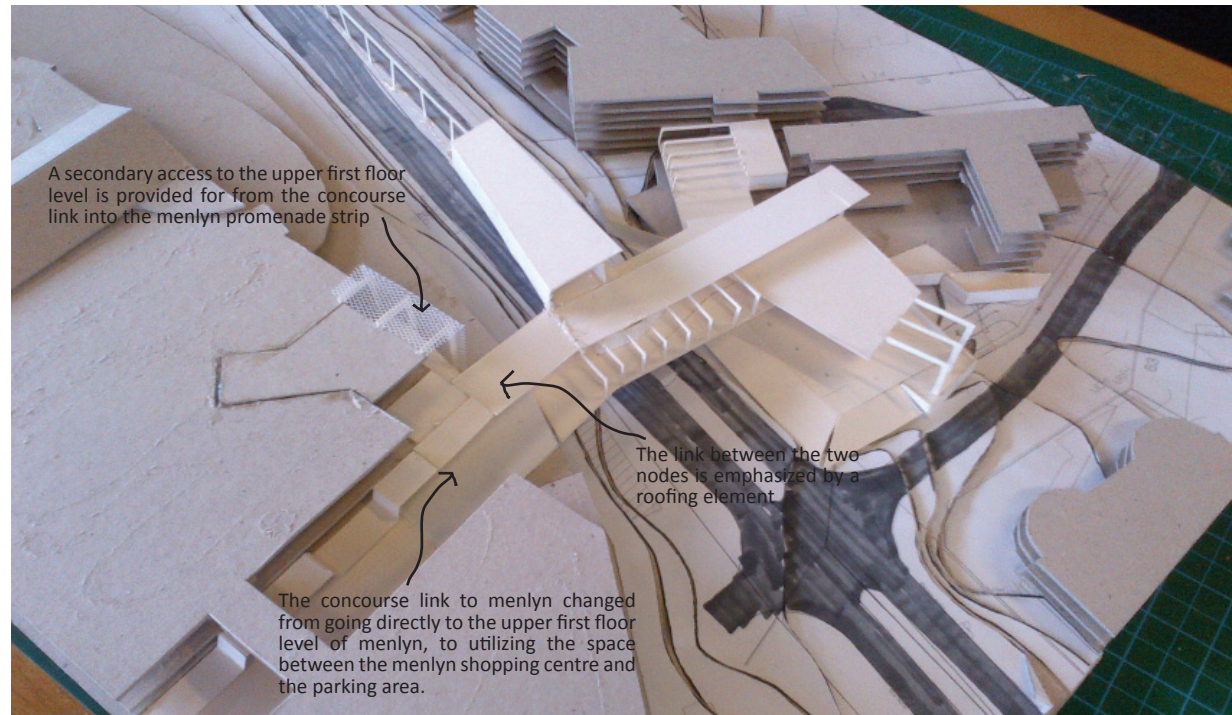


Image 7.13 - Concept 4 - Transit hub south western axonometric view - by Author

The concourse was made narrower, with the pedestrian route only along the southern side and the terminal entrance and retail facilities on the northern edge (image 7.13).

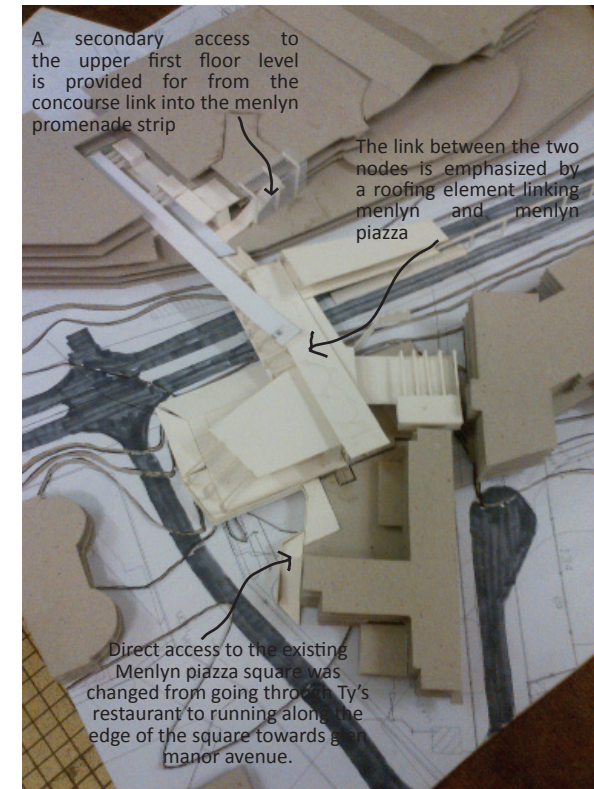


Image 7.14 - Concept 4 - Western axonometric view - by Author

### 7.5 Concept 5.1 - May 2013

From concept 4, the First floor area of Rhapsody's was removed and the elevated rail platform was moved to the same level as the concourse, this created better integration between the commuter and the passenger. The track was moved to the side of the station between the terminal building and the Menlyn Park shopping centre.

The Menlyn Transit Hub was seen as a destination station, and if the system were to be extended the split could happen at the Atterbury & Lois ave intersection.

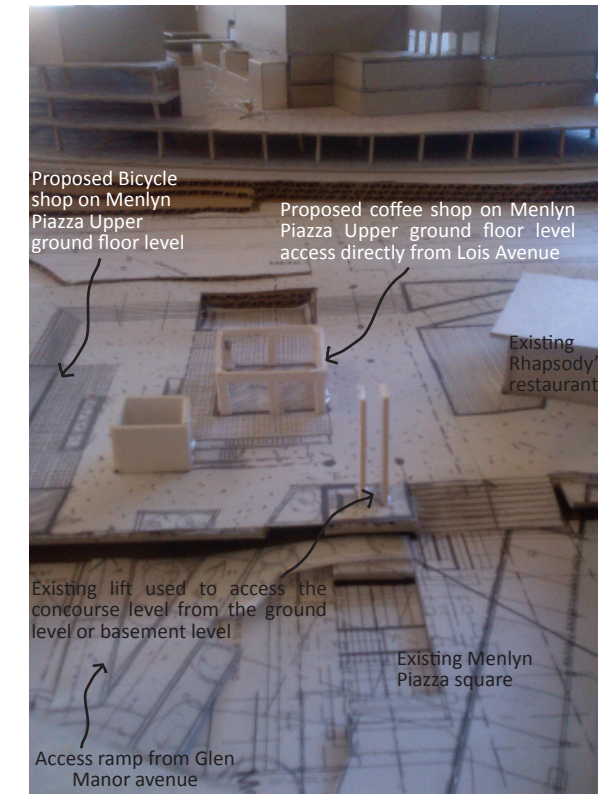


Image 7.15 - Menlyn Piazza built-up model stage 1 - by Author

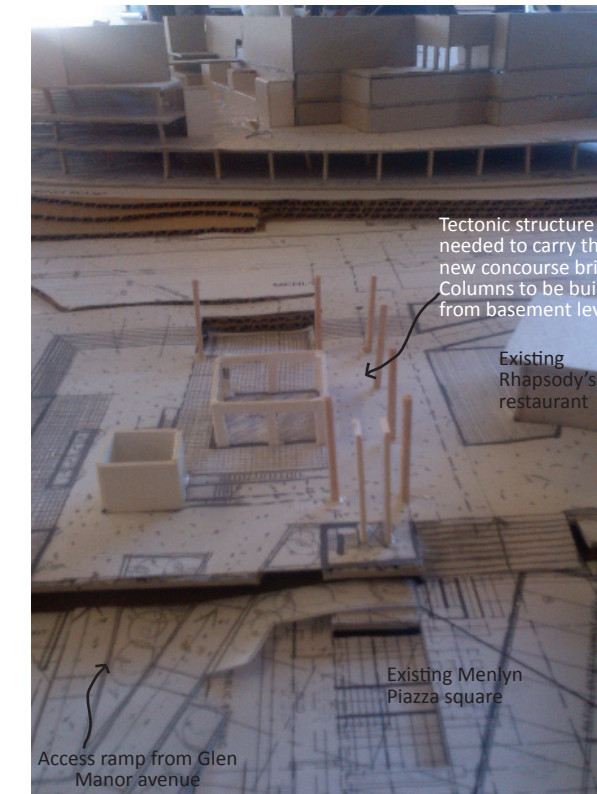


Image 7.16 - Menlyn Piazza built-up model stage 2 - by Author

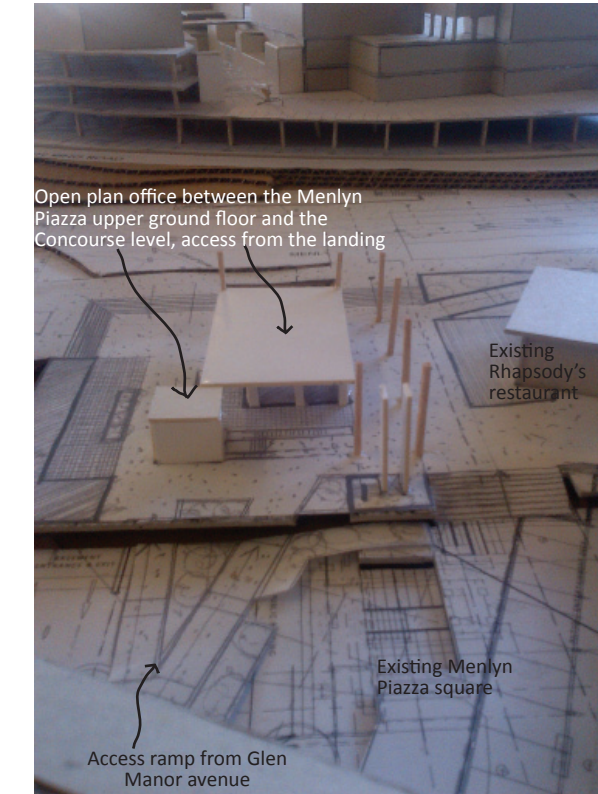


Image 7.17 - Menlyn Piazza First floor built-up model stage 3 - by Author

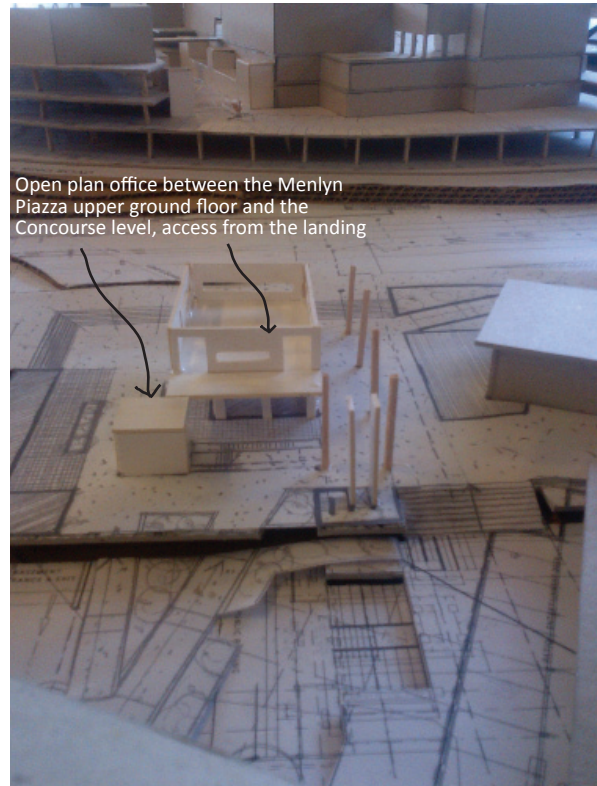


Image 7.18 - Menlyn Piazza First floor built-up model stage 4 - by Author

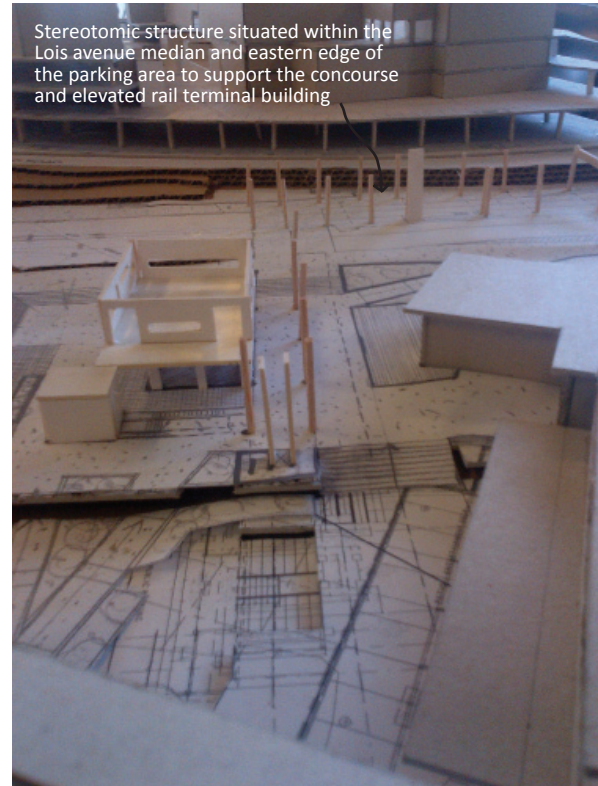


Image 7.19 - Menlyn Piazza Concourse and Terminal structure built-up model stage 5 - by Author



Image 7.20 - Menlyn Piazza Concourse and Terminal floor built-up model stage 6 - by Author

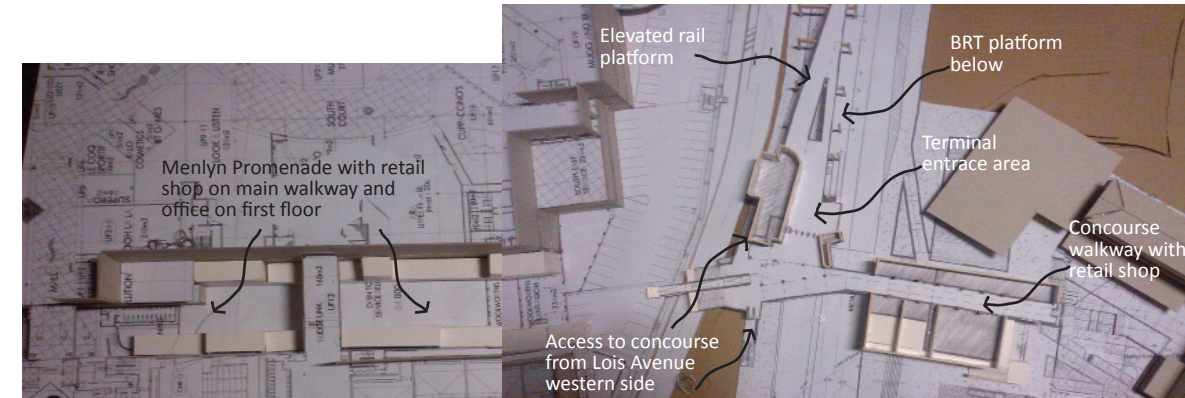


Image 7.21 - Menlyn Piazza Concourse ,Terminal building and menlyn promenade plan - by Author

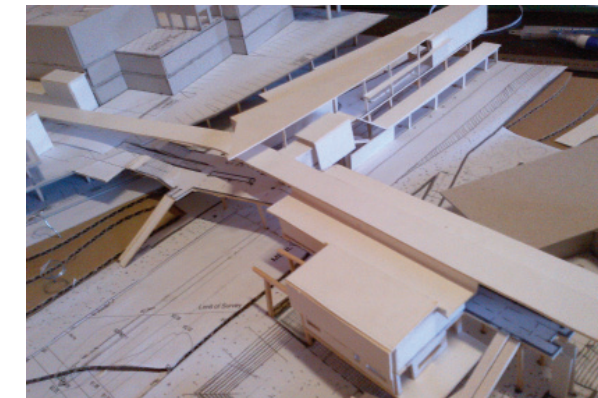


Image 7.24 - Concept 5 - western axonometric view - by Author



Image 7.22 - Menlyn Piazza Concourse and Terminal buildings built-up model stage 7 - by Author

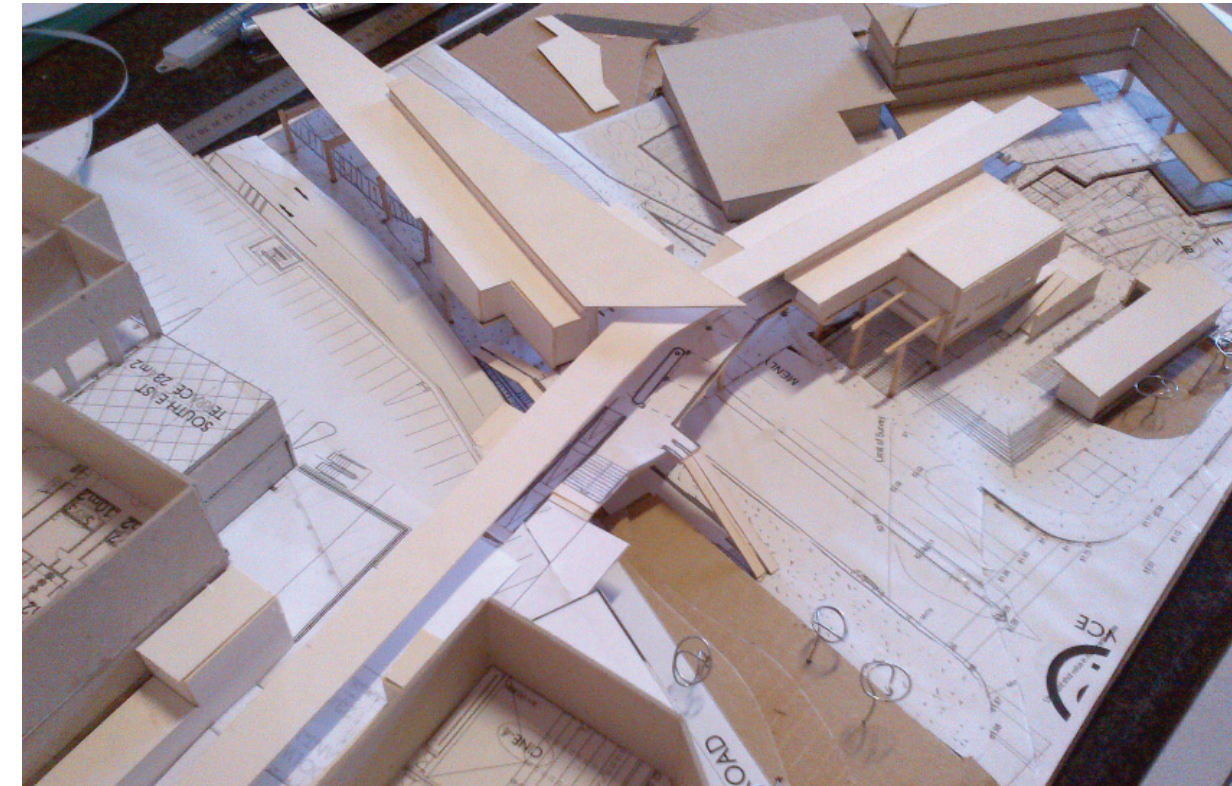


Image 7.23 - Concept 5 - Transit hub south western axonometric view - by Author

7.5 Concept 5.2 - June 2013

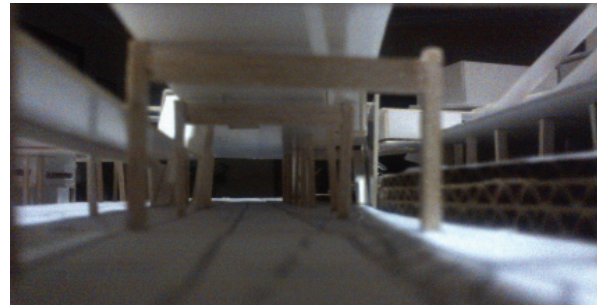


Image 7.25 - Concept 5 - Lois ave underneath rail platform - by Author



Image 7.26 - Concept 5 - Lois ave looking south - by Author

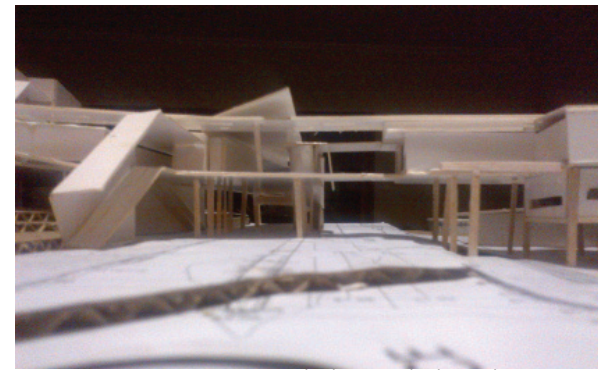


Image 7.27 - Concept 5 - Lois ave looking north - by Author

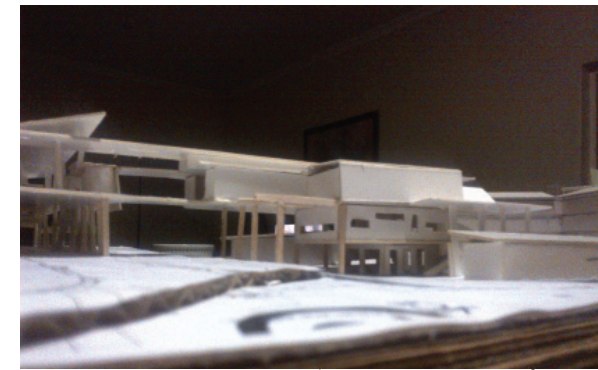


Image 7.30 - Concept 5.2 - Menlyn Piazza access view from Lois avenue - by Author

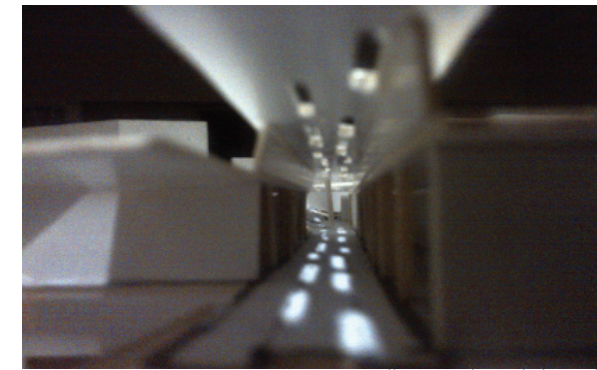


Image 7.32 - Concept 5.2 - Concourse walkway and retail shop - by Author



Image 7.34 - Concept 5.2 - Terminal entrance - by Author



Image 7.28 - Concept 5.2 - Transit hub south western axonometric view - by Author

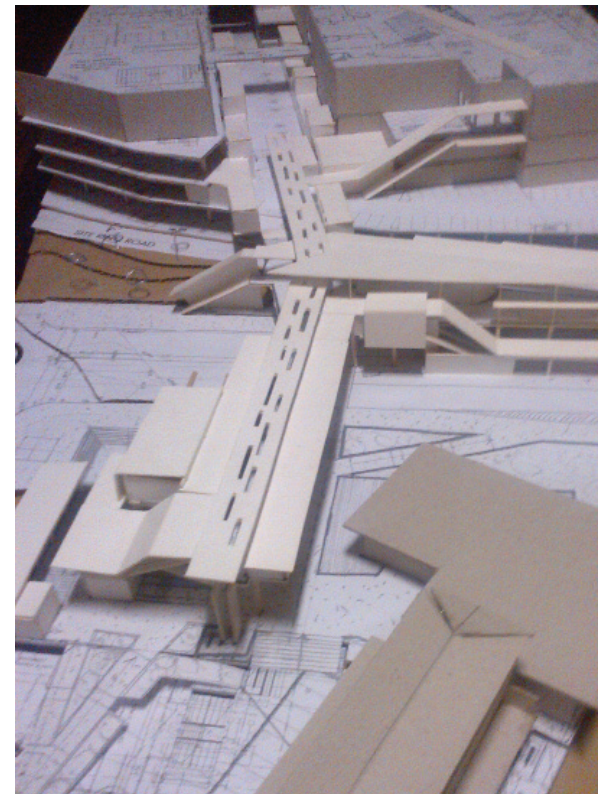


Image 7.29 - Concept 5.2 - western axonometric view - by Author

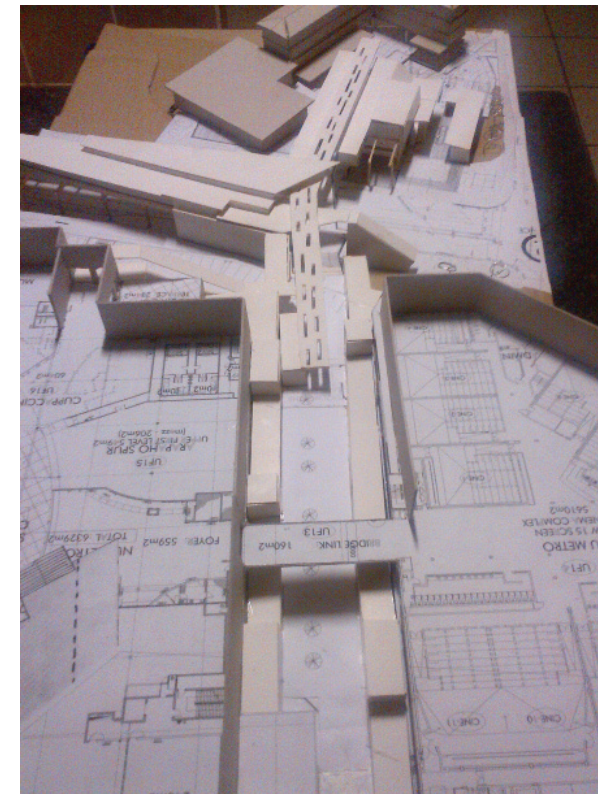


Image 7.31 - Concept 5.2 - Menlyn promenade axonometric plan view - by Author



Image 7.33 - Concept 5.2 - Menlyn Piazza ramp access from Geln Manor Avenue - by Author

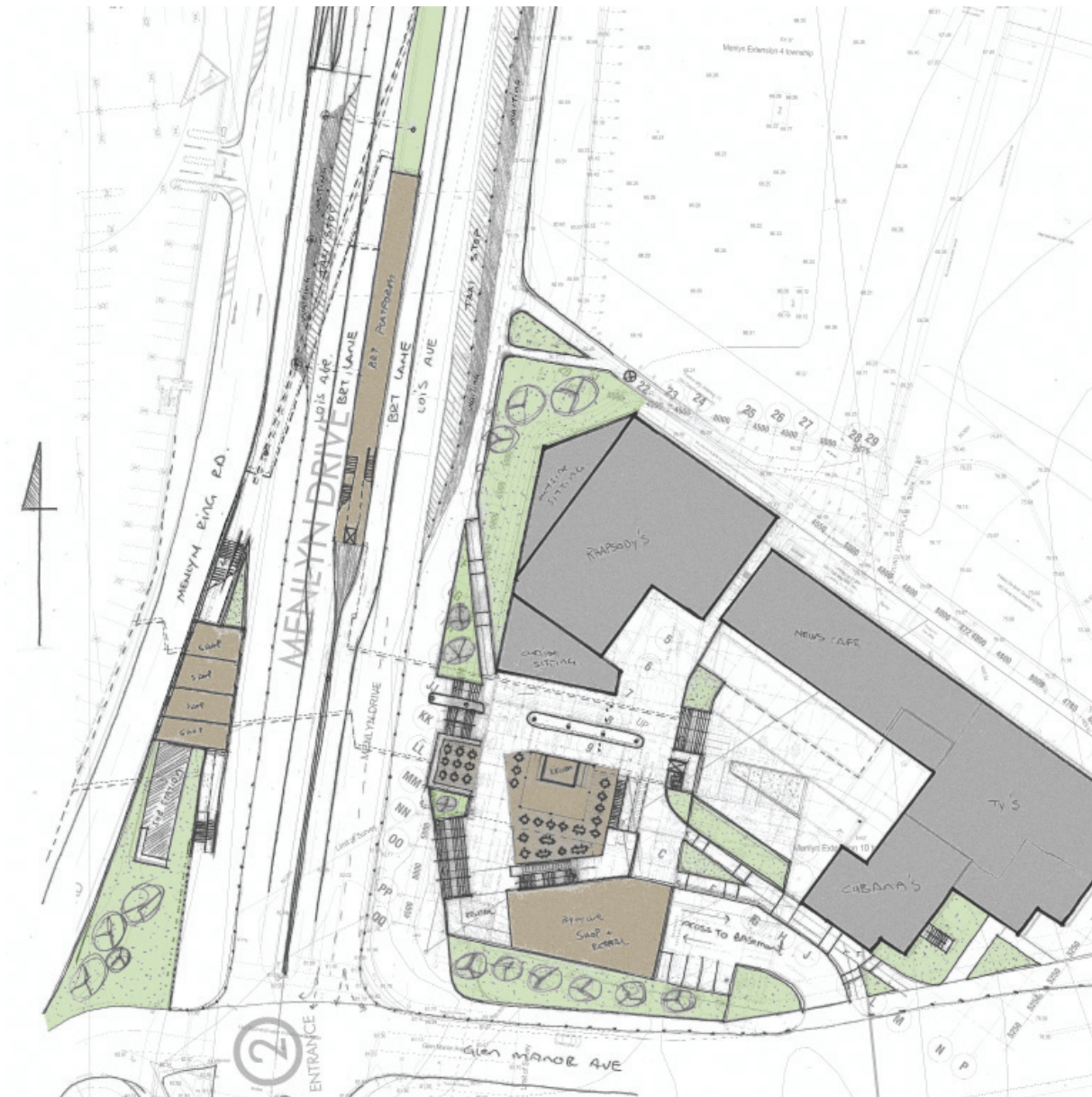


Image 7.35 - Concept 5.2 - Lois Avenue and Menlyn Piazza conceptual Ground floor plan - by Author

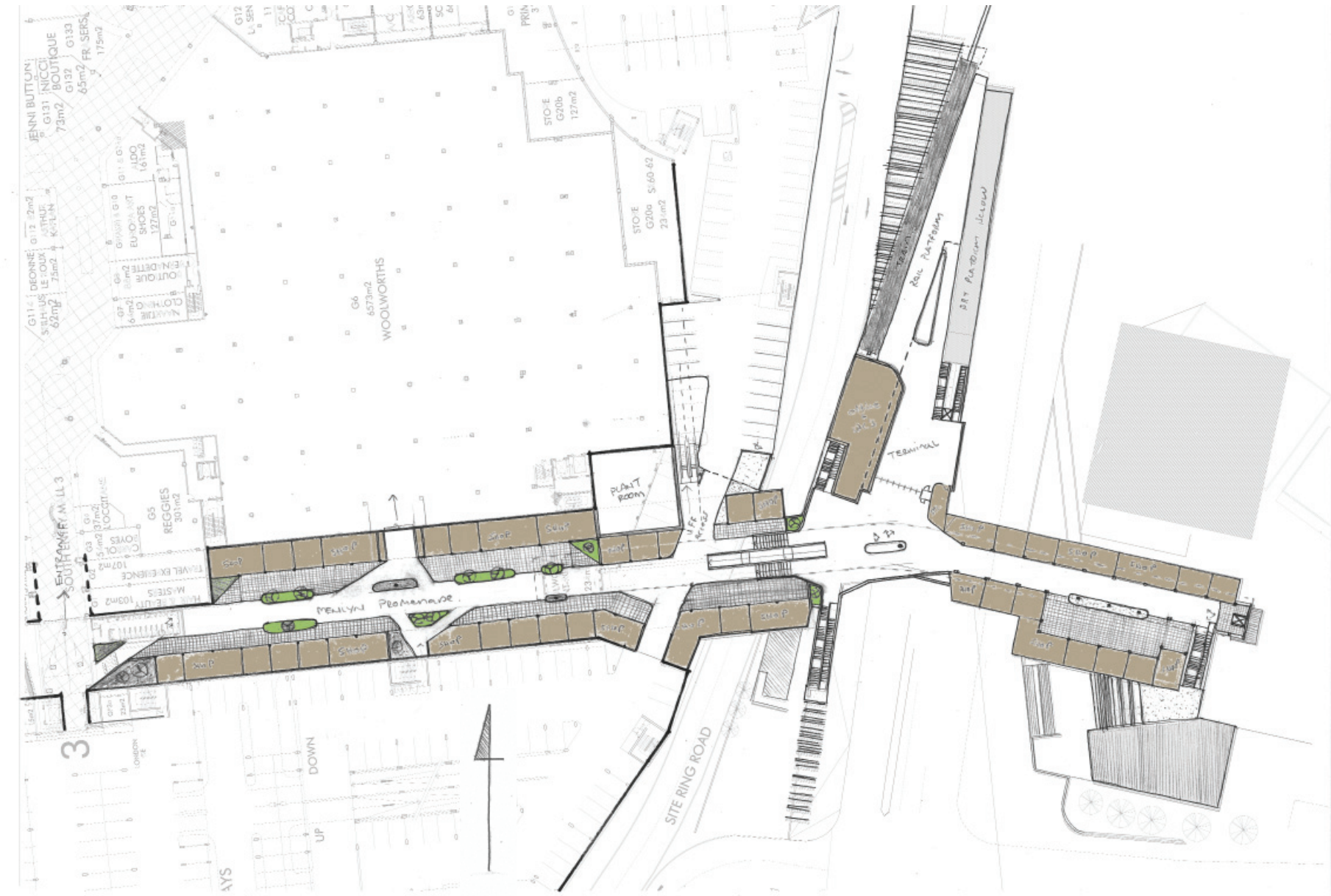


Image 7.36 - Concept 5.2 - Menlyn Transit hub Concourse, station terminal and Menlyn promenade floor plan - by Author





### 7.5 Concept 5.3 - August 2013

The final concept model had a change in the roof design. The main node is the terminal building, as this connects the Menlyn node to the rest of Gauteng. The concourse roof creates a visual link between the two nodes which is overlapped by the terminal building roof which gives it more importance.

The BRT station moved to the southern side of the transit hub. This allows better access into the station from Lois Avenue and also integrated the station into the urban fabric of the Menlyn area. The structure needed to carry the elevated terminal building was restricting the movement of the BRT commuters on the station platforms, as the structure had to be longer than anticipated.

The direct link to the upper first floor of Menlyn park shopping centre has been removed due to the fact that this will allow less people to use the Menlyn promenade. It also forces the people to walk through the mall to the main areas, as this is an essential retail mall layout principle (Ref).



Image 7.44 - Concept 5.3 - Transit hub south eastern axonometric view with changed terminal roof - by Author



Image 7.45 - Concept 5.2 - eastern axonometric view - by Author

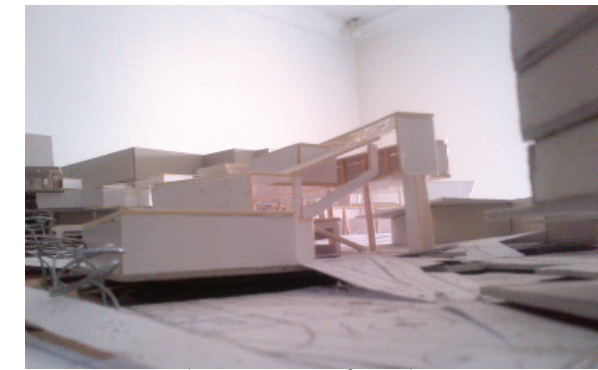


Image 7.46 - Menlyn Piazza access from Glen manor Avenue - by Author



Image 7.48 - Menlyn Transit hub view from Glen manor Avenue with BRT station accessible from the interchange - by Author



Image 7.49 - Concourse walkway and outdoor waiting area - by Author



Image 7.47 - Menlyn Transit Hub southern elevation from the corner of Lois and Glen manor avenue - by Author

# Chapter\_8

## 8.1 - Sketchplans

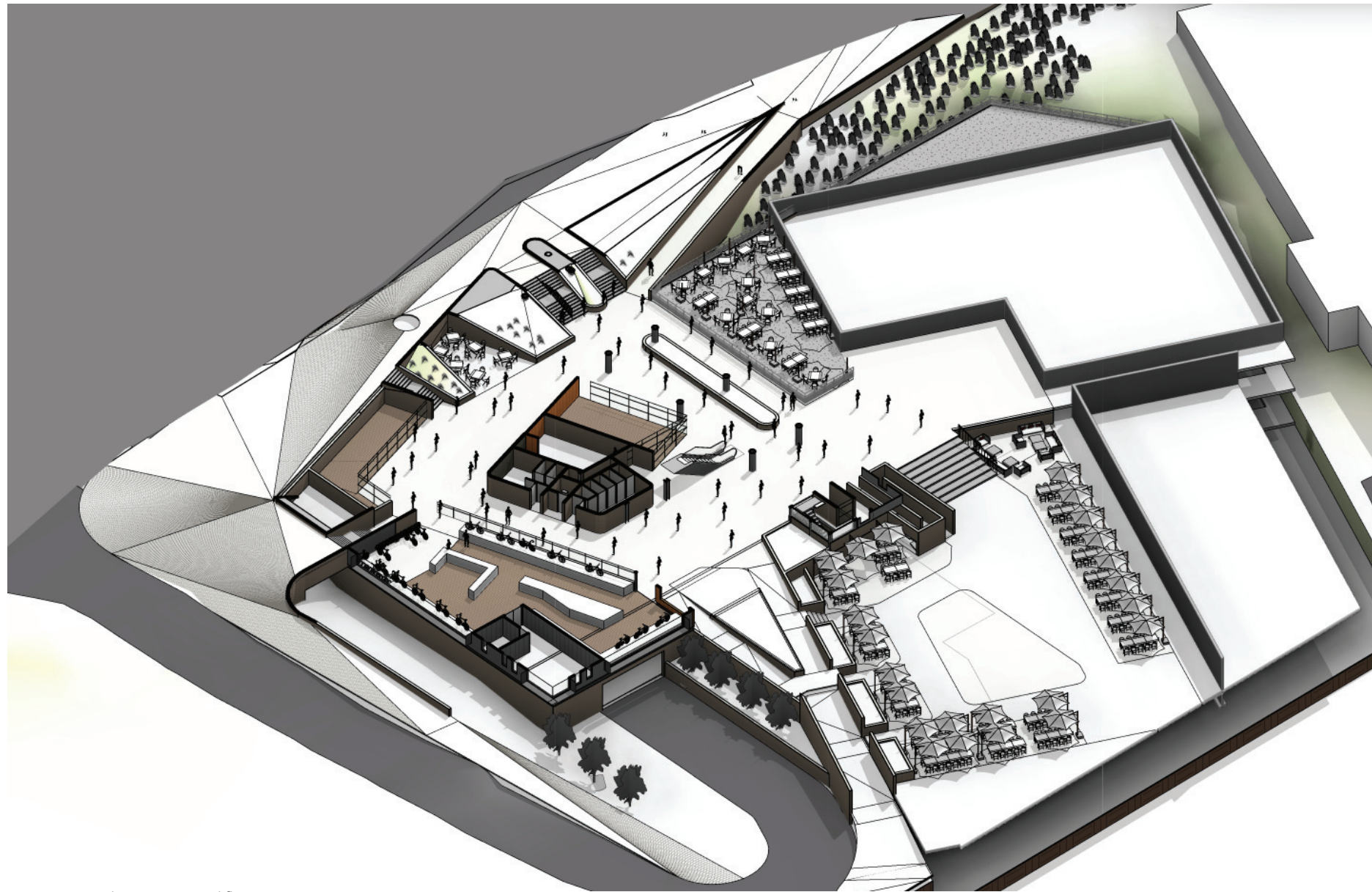


Image 8.1 - Menlyn piazza ground floor axo view

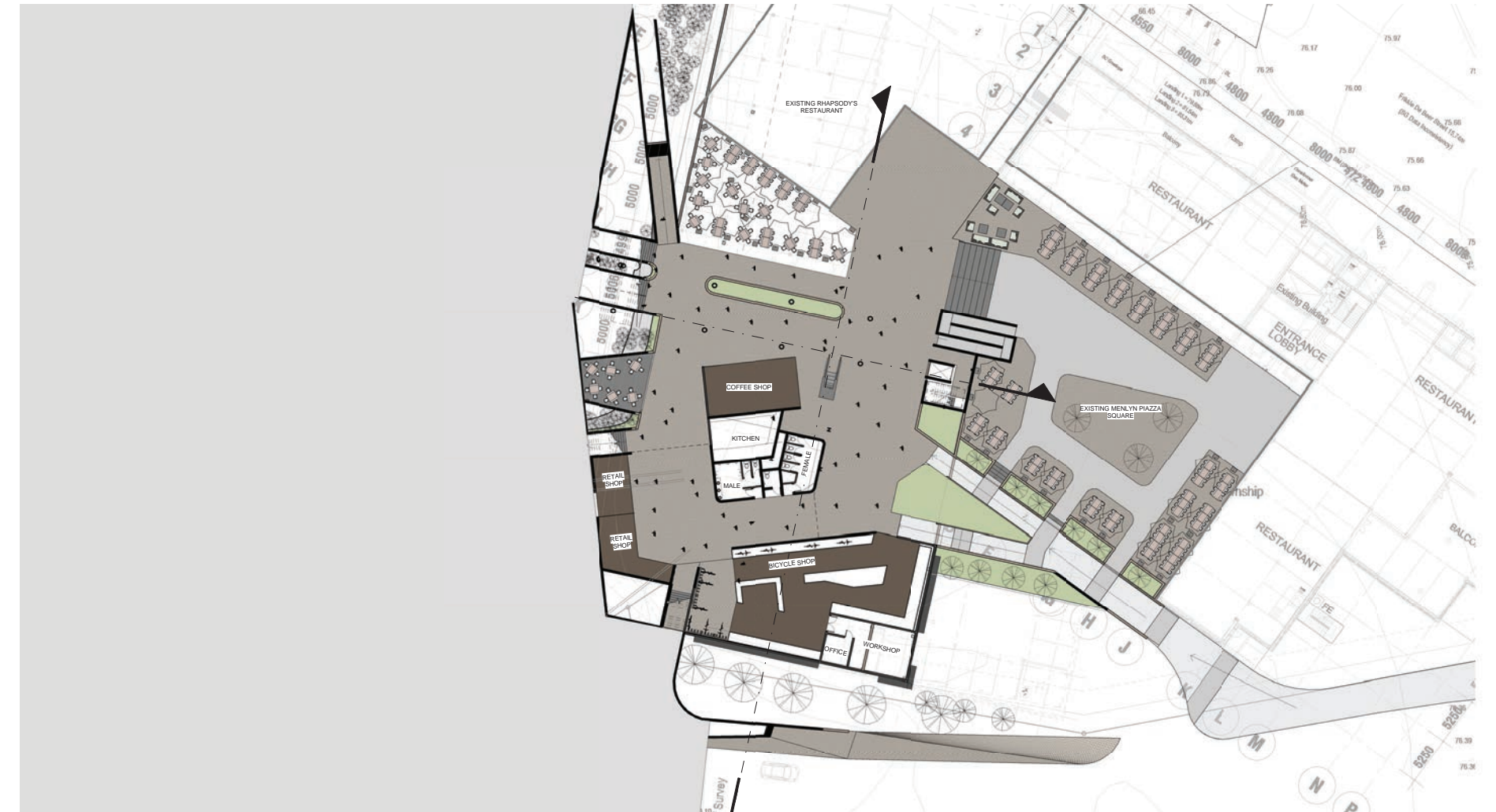


Image 8.2 - Menlyn piazza ground floor plan - not to scale

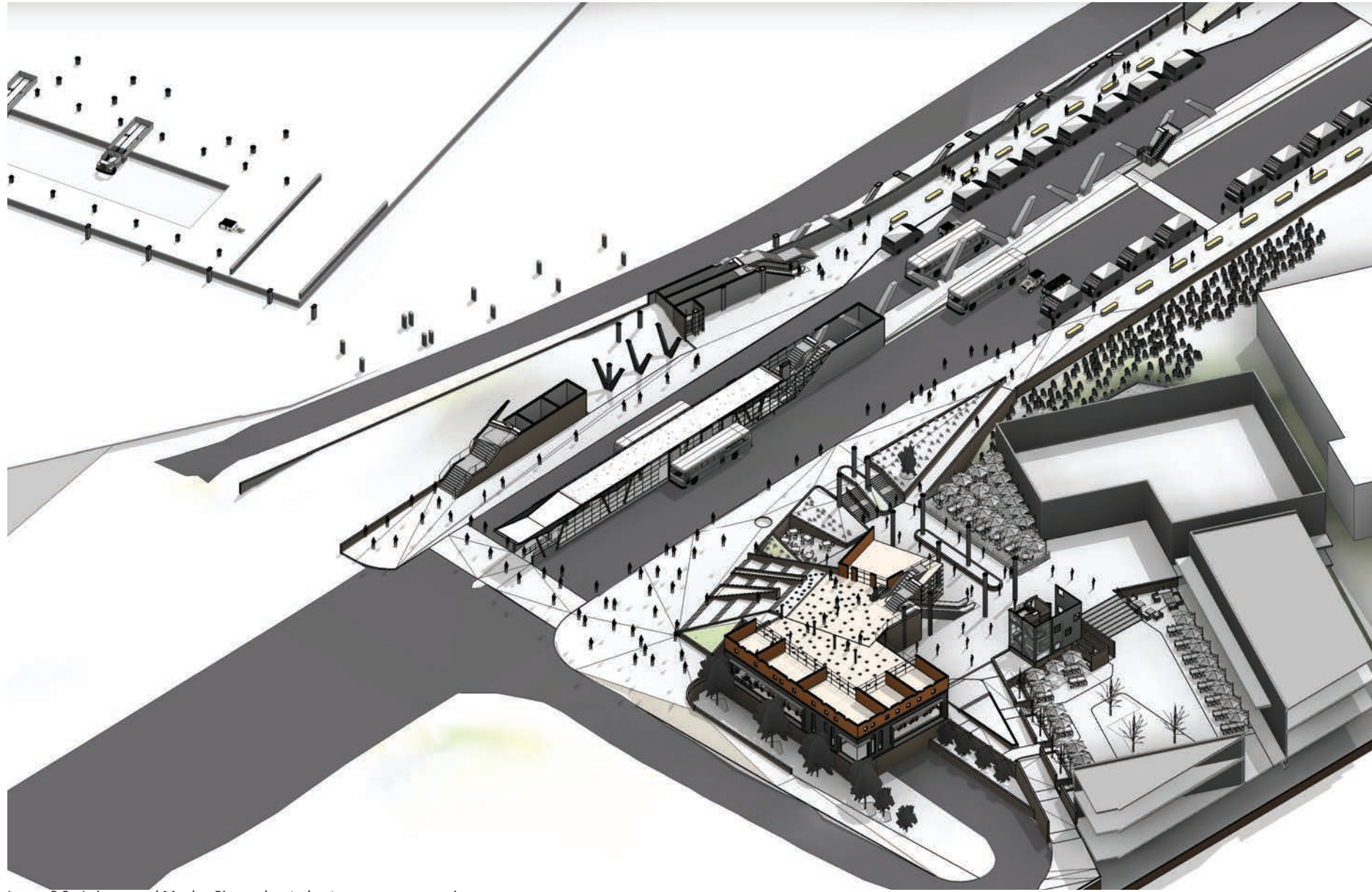


Image 8.3 - Lois ave and Menlyn Piazza elevated entrance square axo view

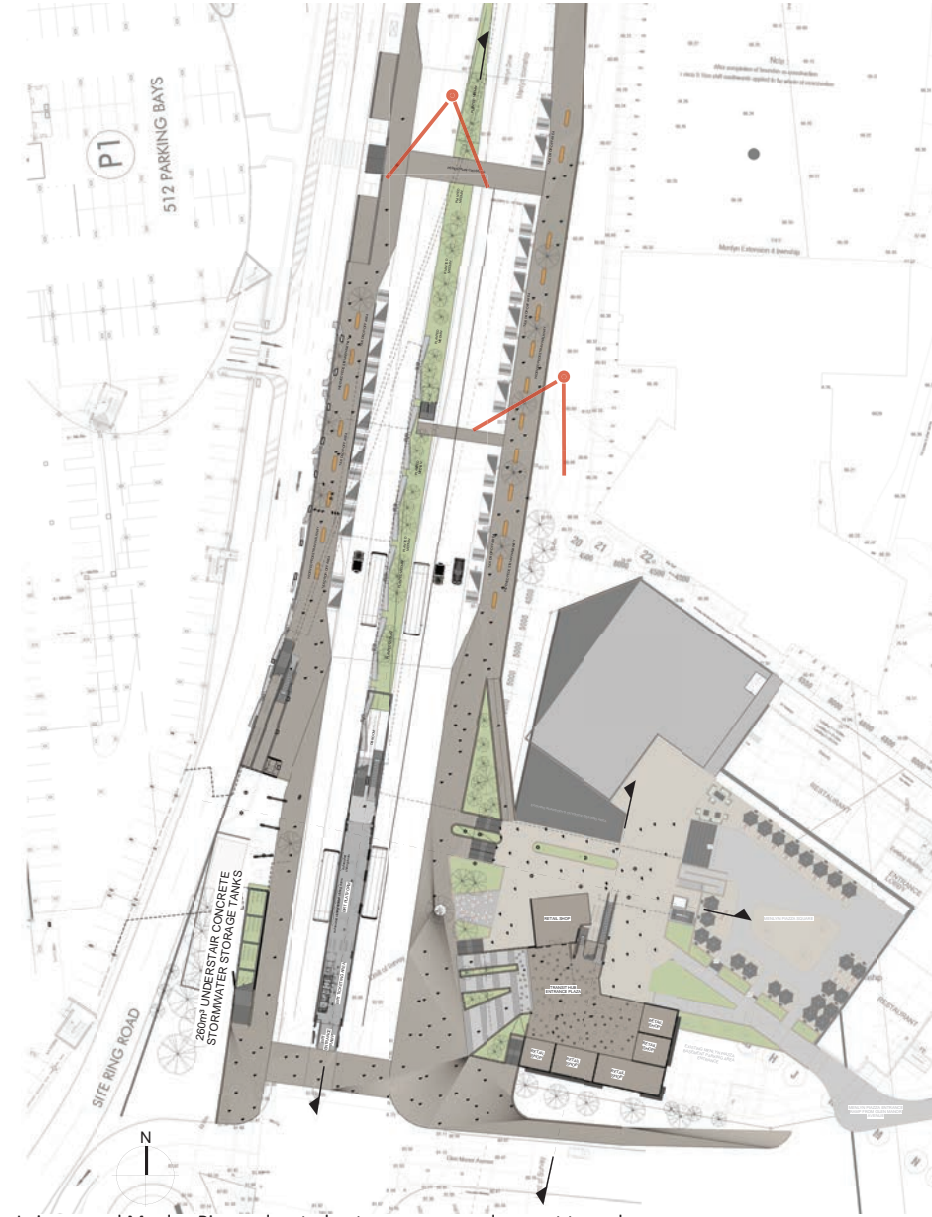


Image 8.4 - Lois ave and Menlyn Piazza elevated entrance square plan - not to scale

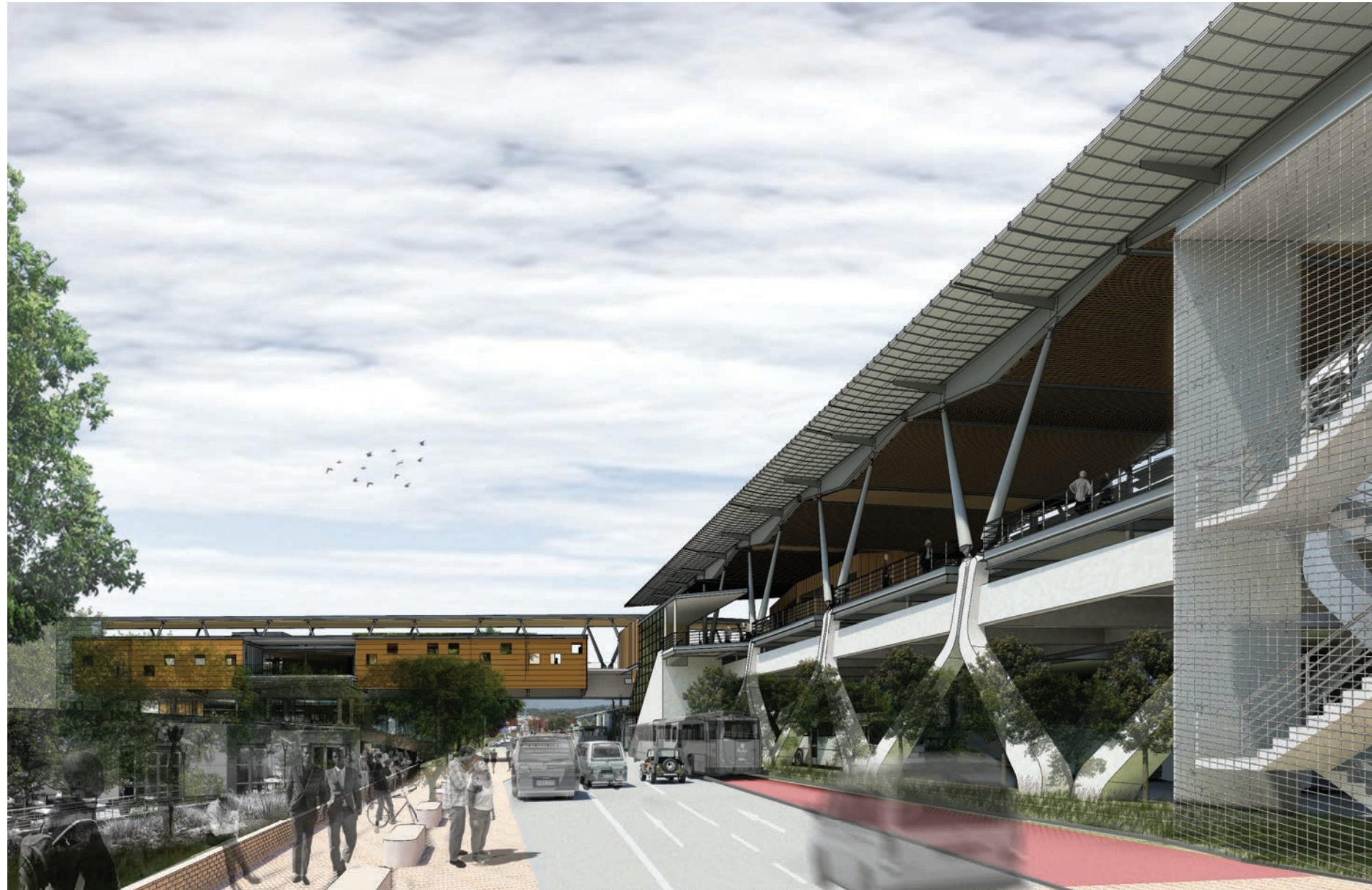


Image 8.5 - View from eastern side of Lois ave towards Menlyn Piazza access ramp



Image 8.6 - View from western side of Lois ave towards taxi drop-off and concourse access point

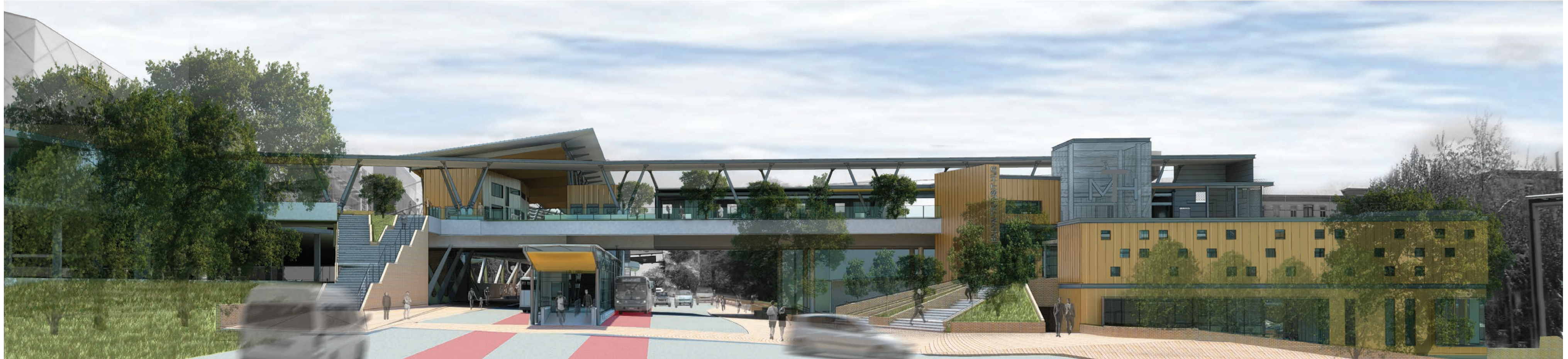


Image 8.7 - View from southern side of Lois ave and Glen Manor ave intersection. towards Menlyn Transit Hub

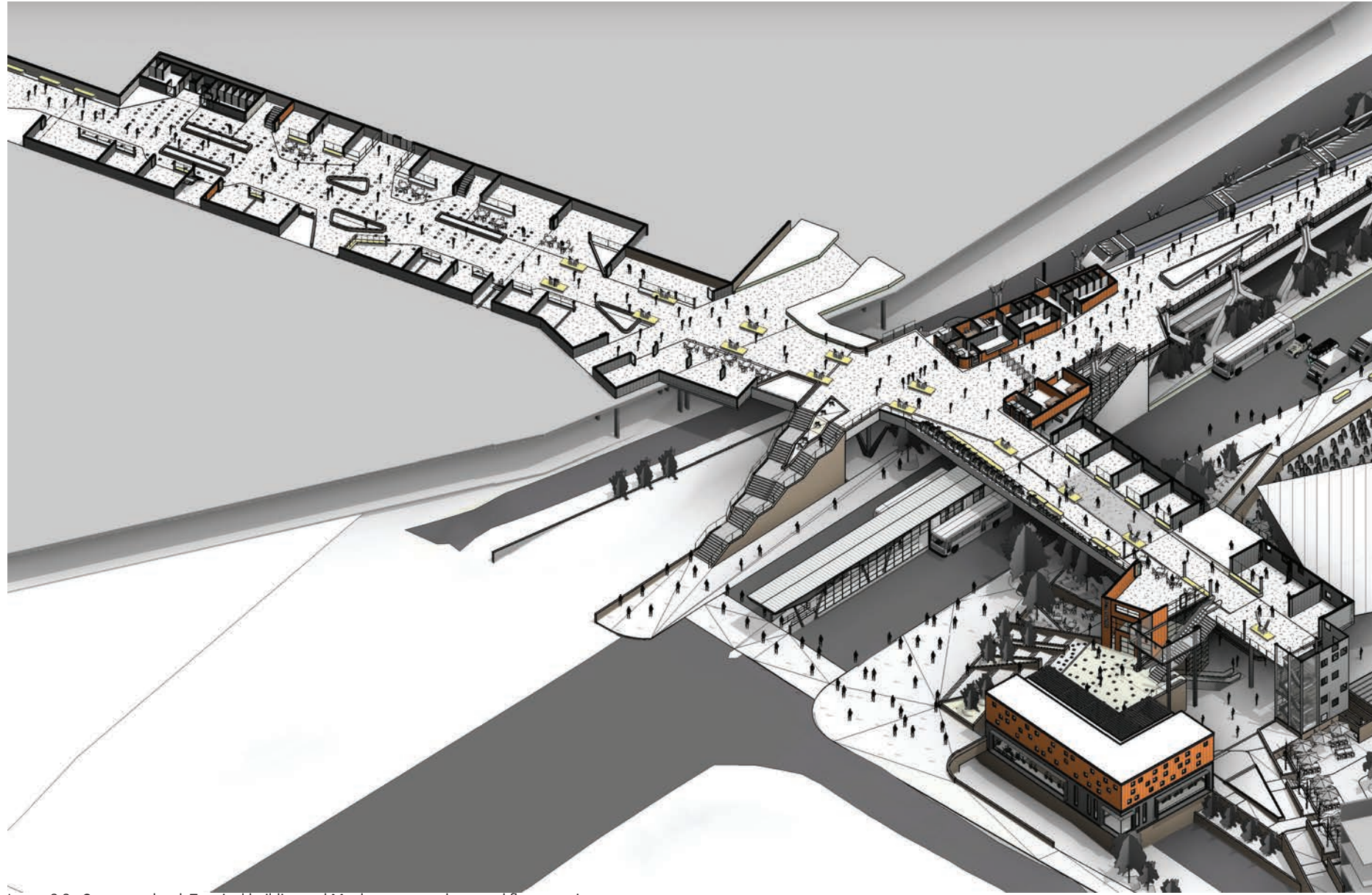
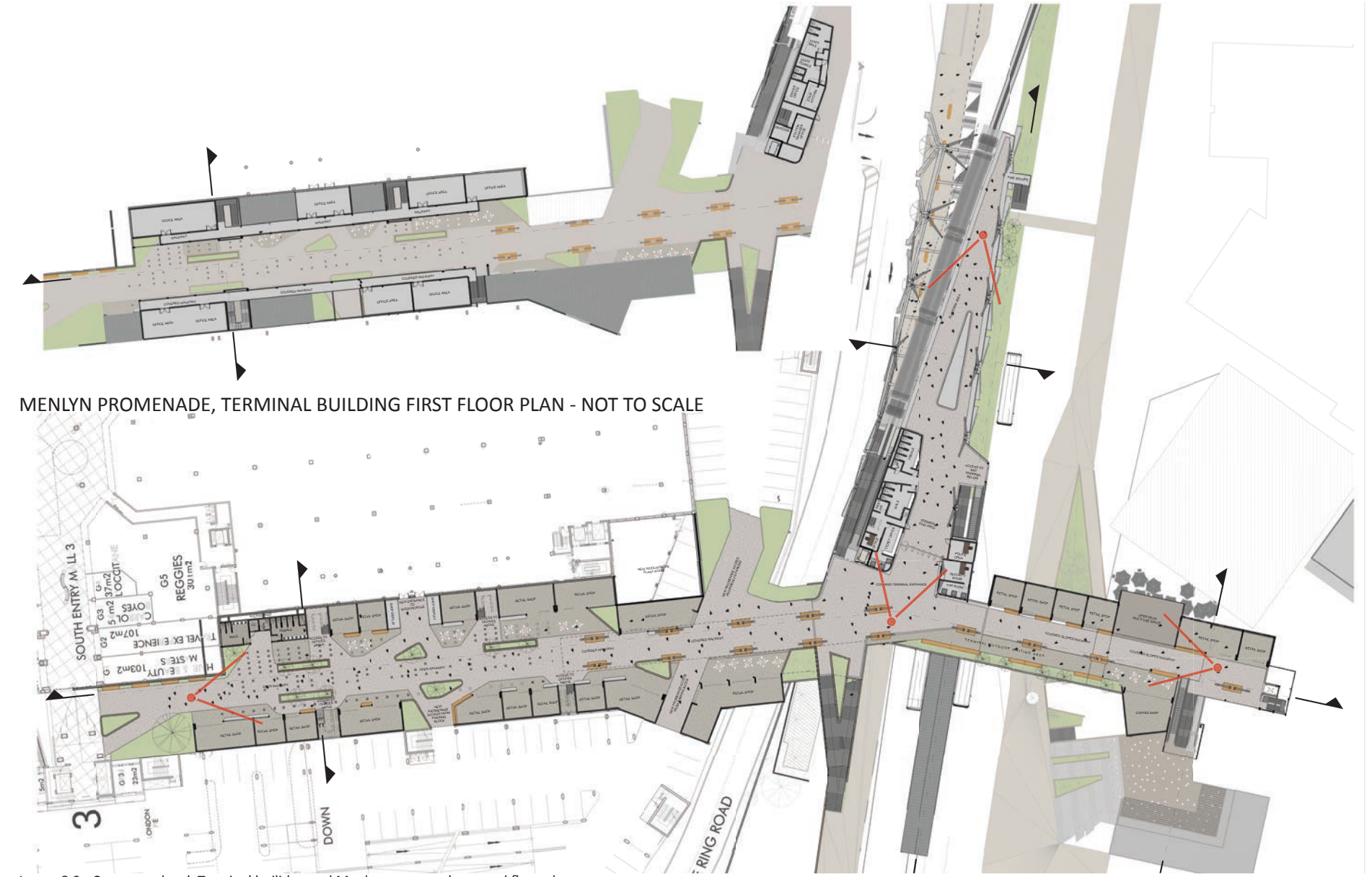


Image 8.8 - Concourse level, Terminal building and Menlyn promenade ground floor axo view



MENLYN PROMENADE, TERMINAL BUILDING FIRST FLOOR PLAN - NOT TO SCALE

Image 8.9 - Concourse level, Terminal building and Menlyn promenade ground floor plan





Image 8.10 - Section through - Concourse level, Menlyn promenade and Menlyn Piazza



Image 8.11 - View down Menlyn Promenade towards Terminal building



Image 8.12 - Concourse view from elevated Menlyn Piazza square entrance access



Image 8.13 - View to Terminal building entrance

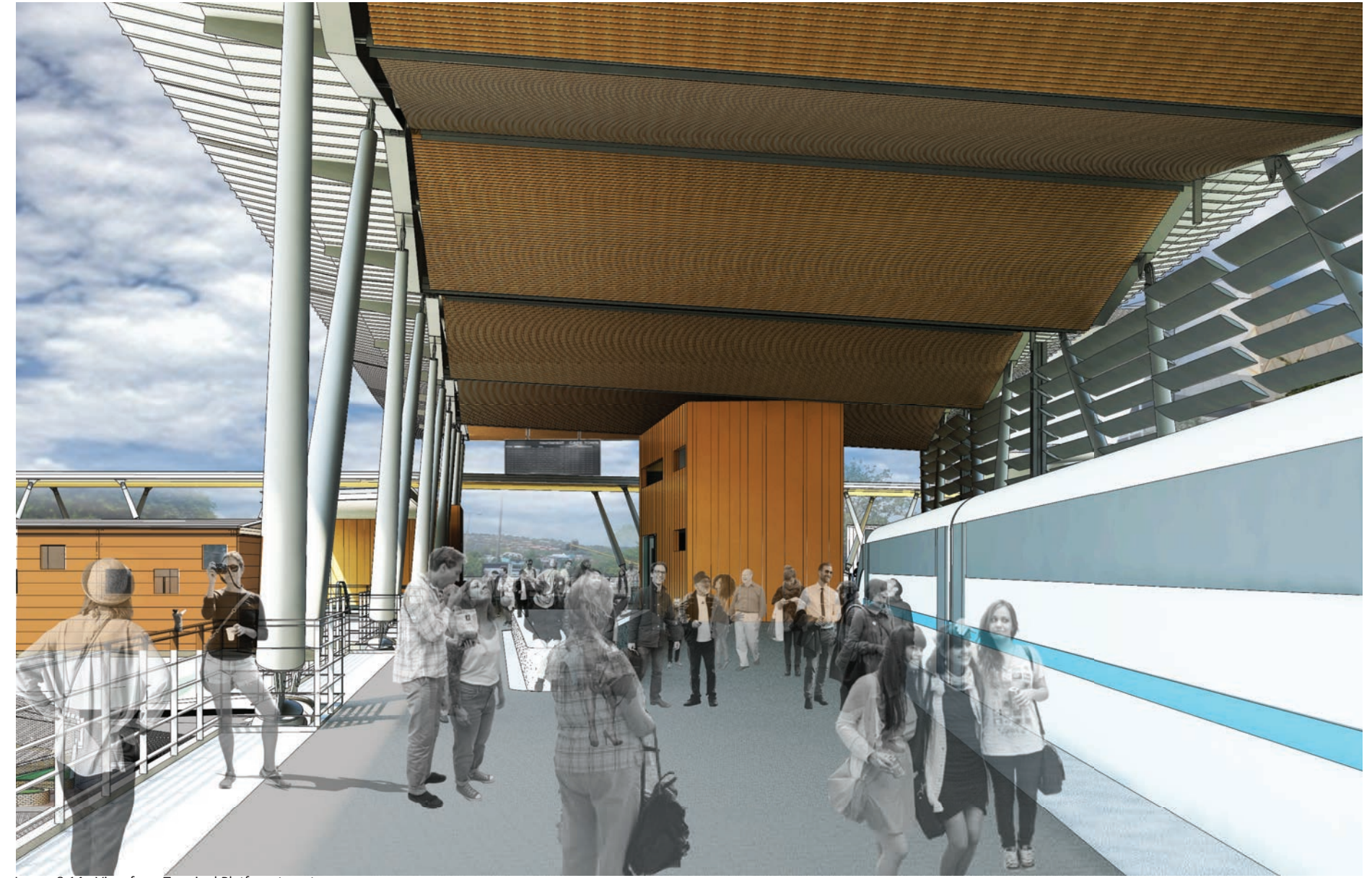


Image 8.14 - View from Terminal Platform to entrance

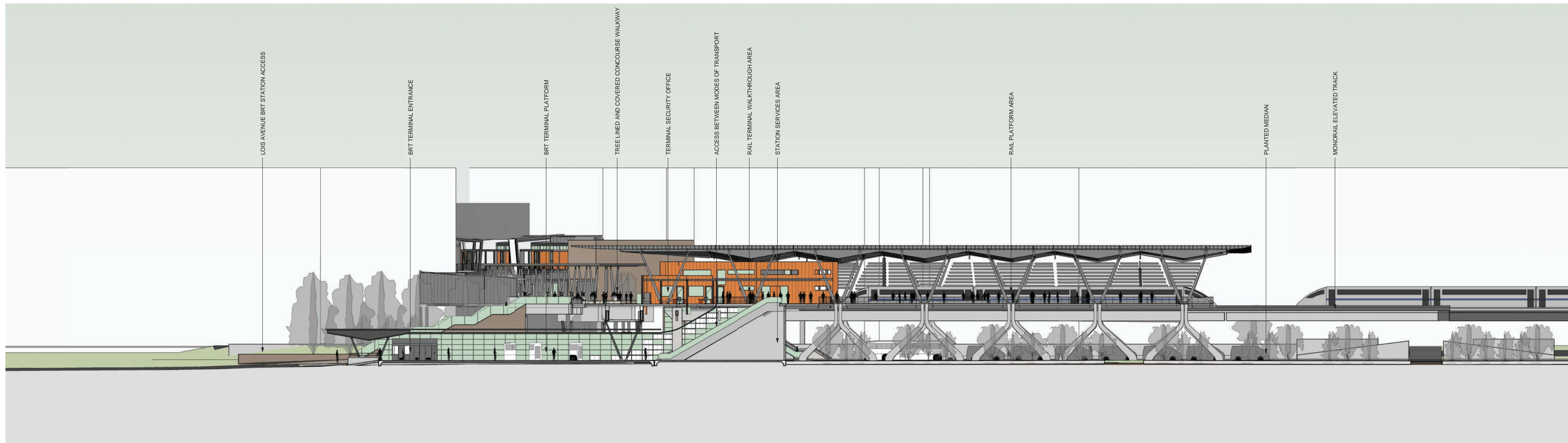


Image 8.15 - Terminal building section

# Chapter\_9

- 9.1 - Technical concept
- 9.2 - Technical resolution
- 9.3 - Materials used
- 9.4 - Environmental systems
- 9.5 - SBAT Rating

## 9.1 Technical concept

The technical design is generated out of the concept of “connections”. The connection between the existing infrastructure; Menlyn Park Shopping Centre and Menlyn Plaza, created by the insertion of the Transit hub between them.

The connections created are between existing stereotomic and the new tectonic structures.

- Three Different connection conditions within the project.

9.2.1 Linking ontop of the existing Menlyn Plaza structure

9.2.2 Linking in between the existing Menlyn Park shopping centre and Parking building.

9.2.3 Bridging Lois Avenue and going in-between the 2 infrastructure nodes.

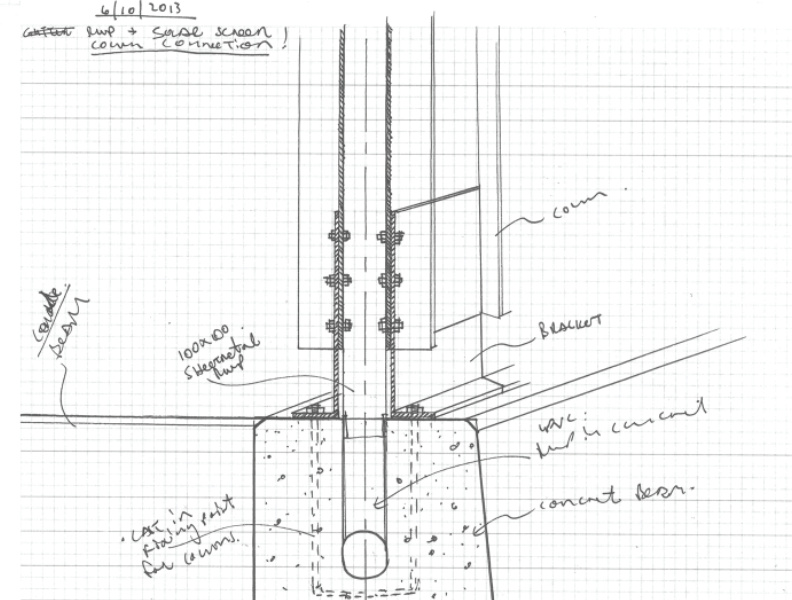
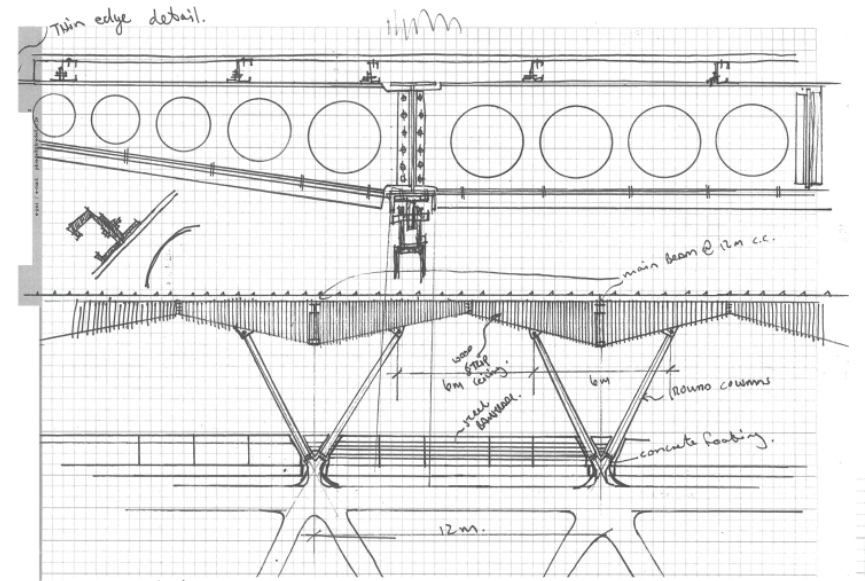


Image 9.1 - Technical development sketches

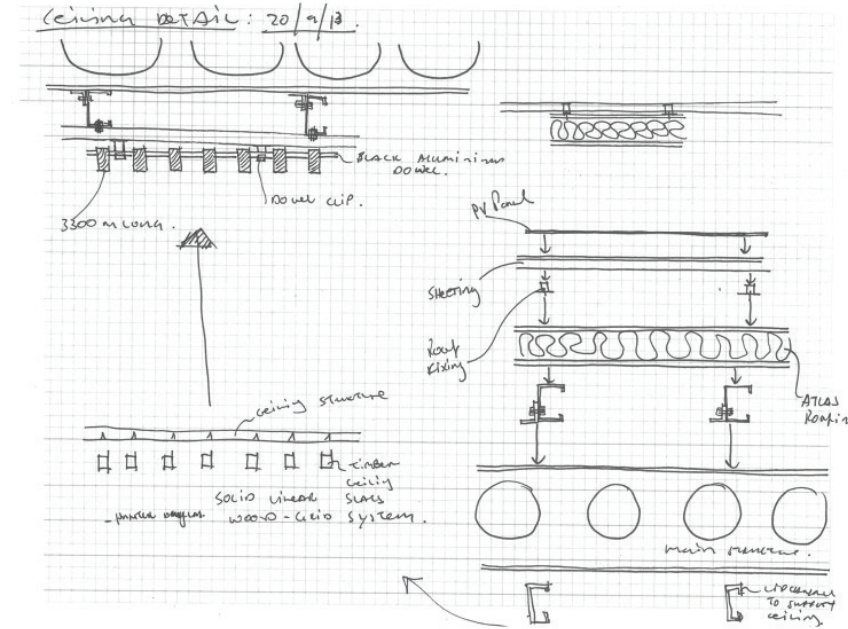
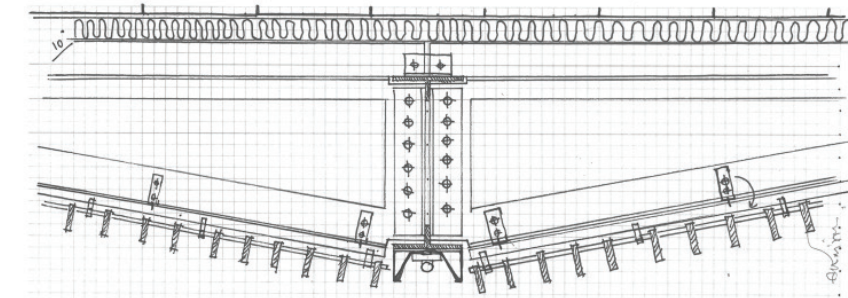
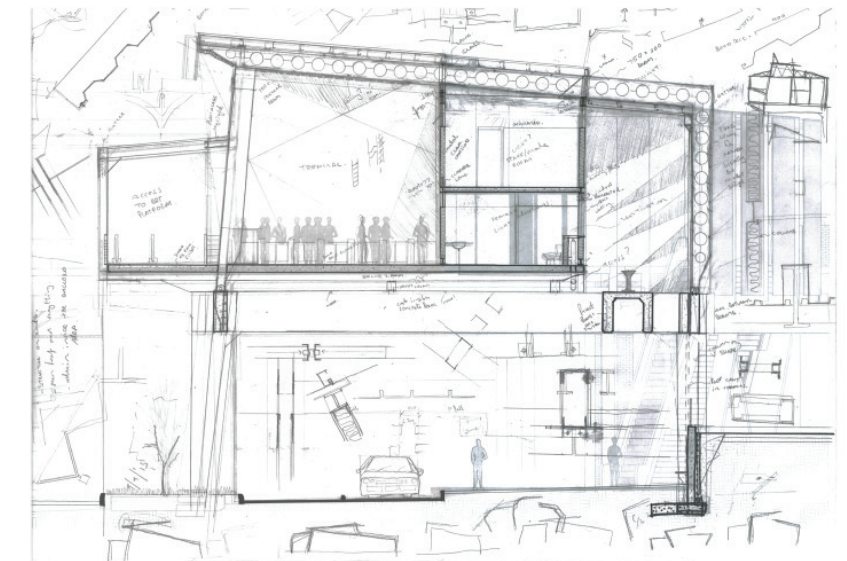
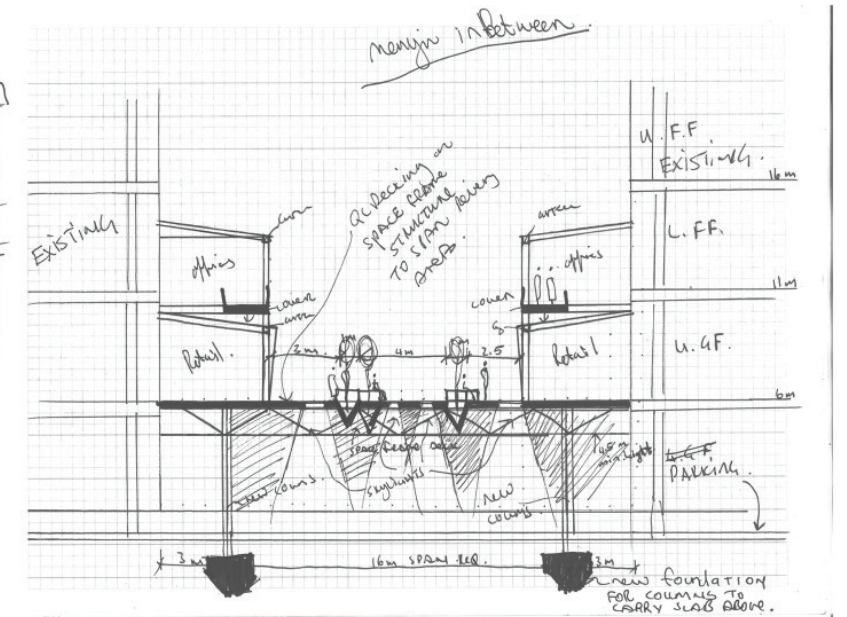


Image 9.2 - Technical development sketches 2





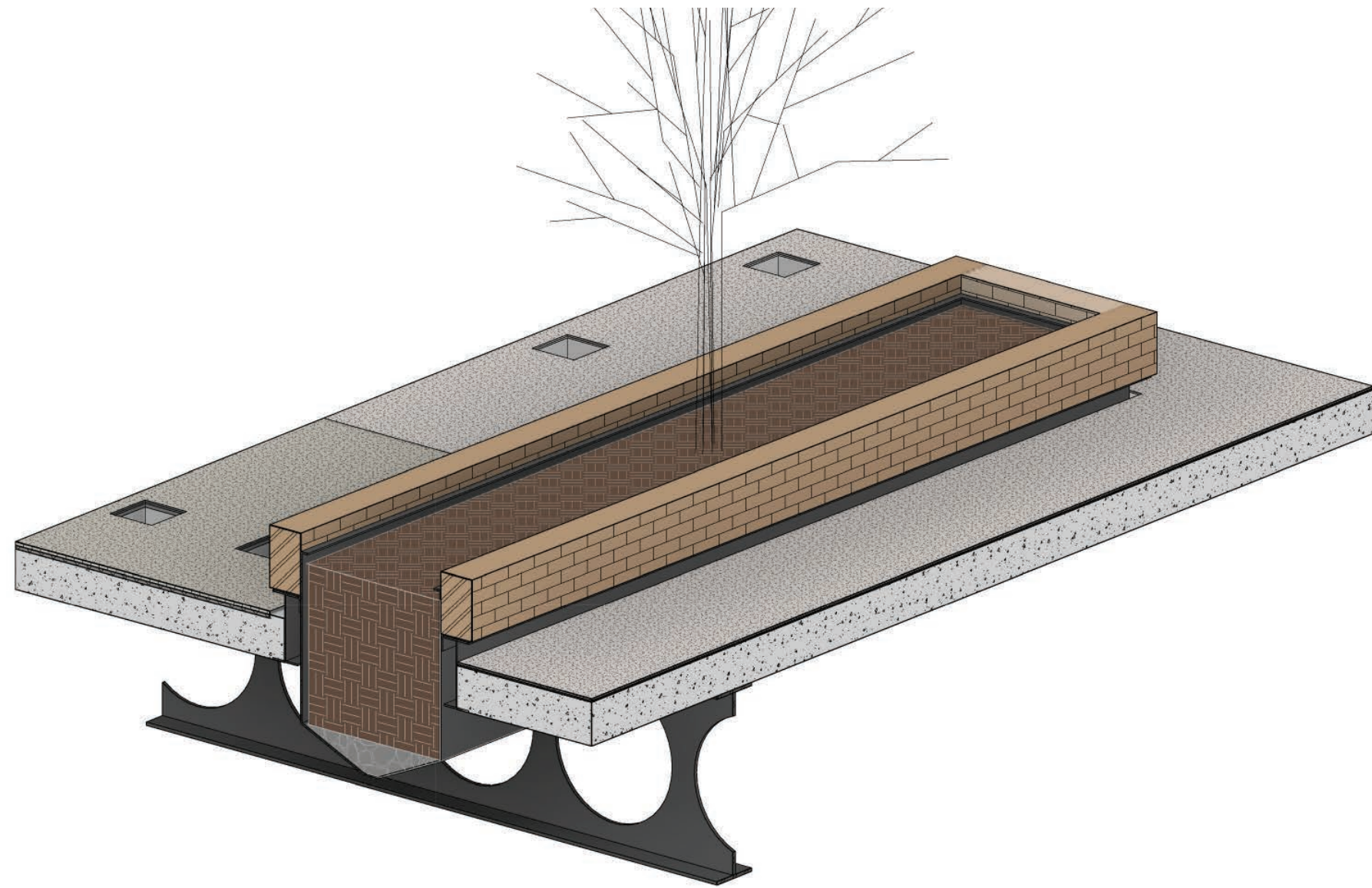


Image 9.6 - Menlyn Promenade plater box 3d view

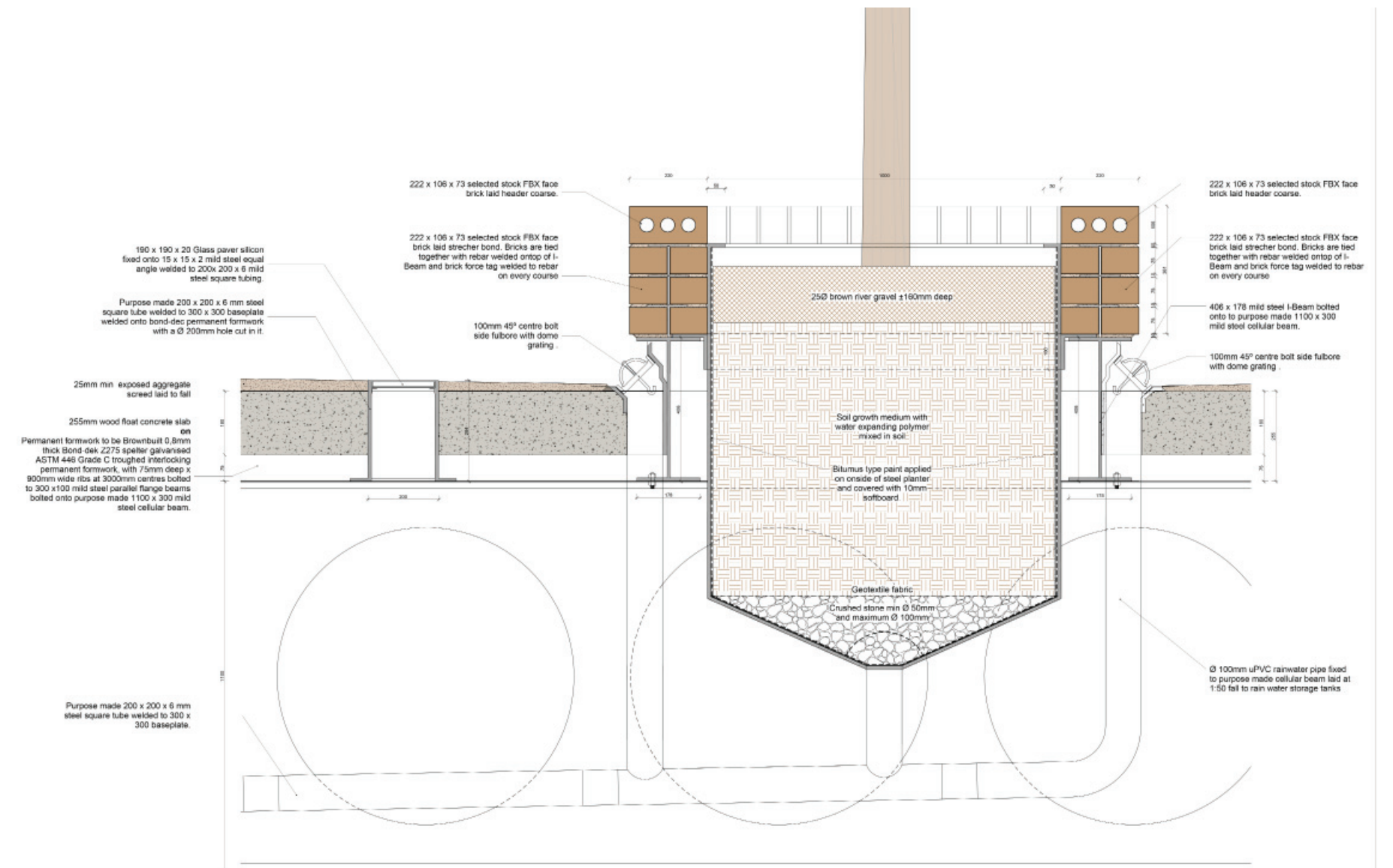


Image 9.7 - Menlyn Promenade planter detail - not to scale



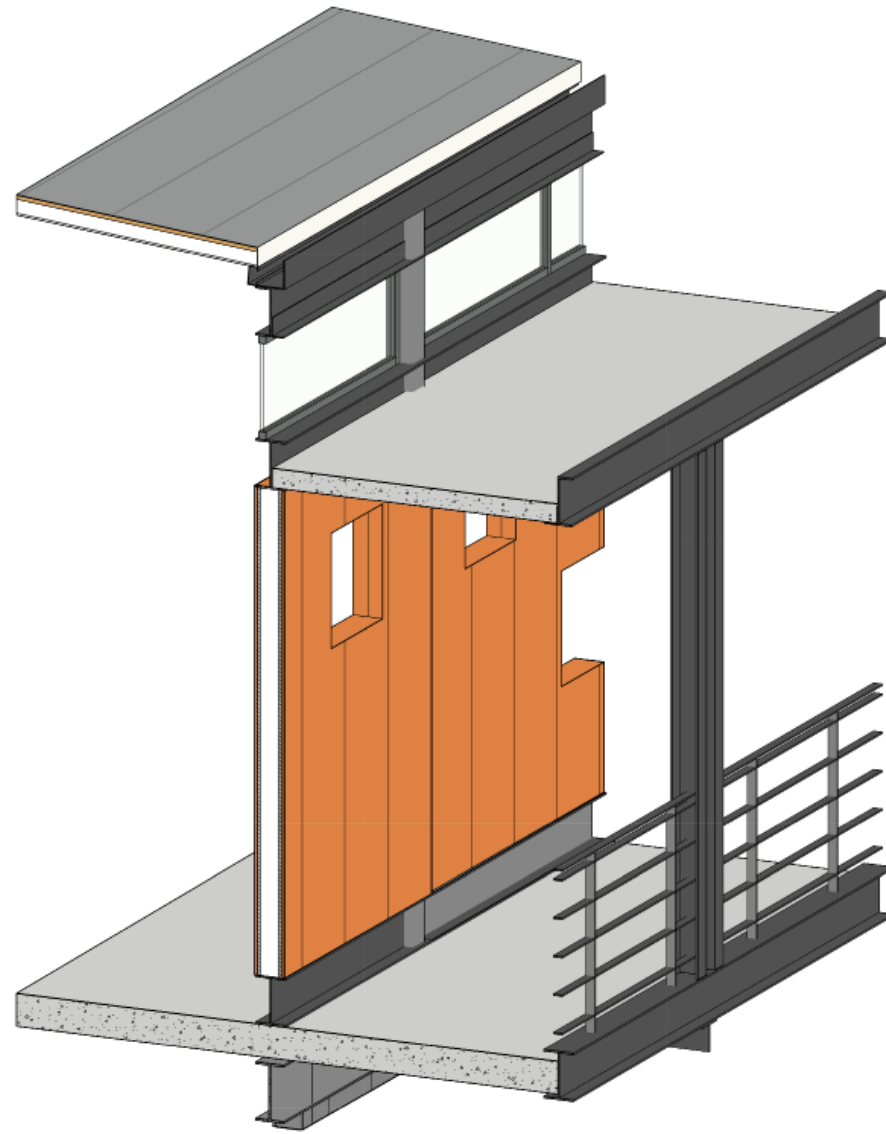


Image 9.8 - Menlyn Promenade roof edge 3d

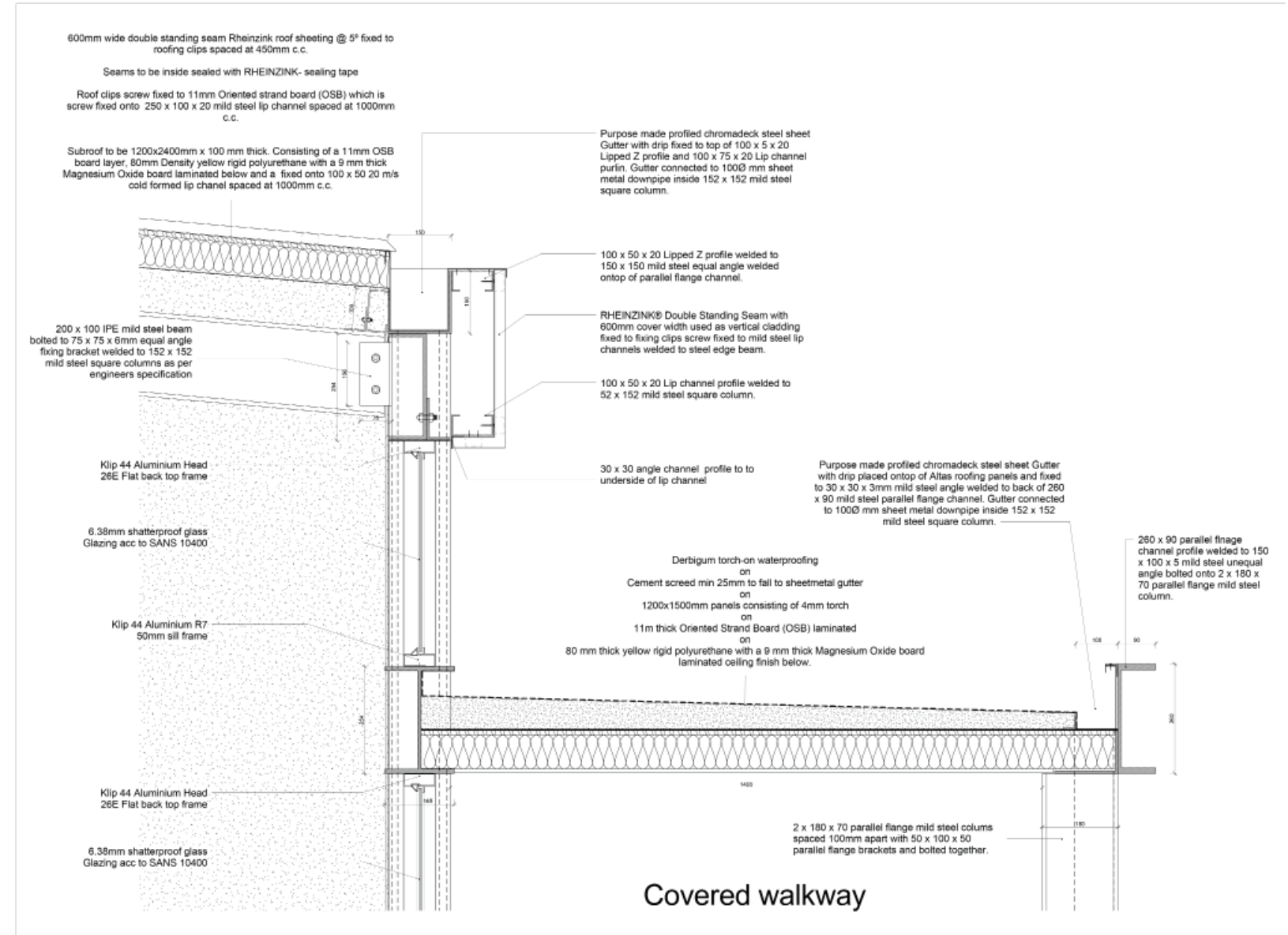


Image 9.9 - Menlyn Promenade Roof edge detail - not to scale



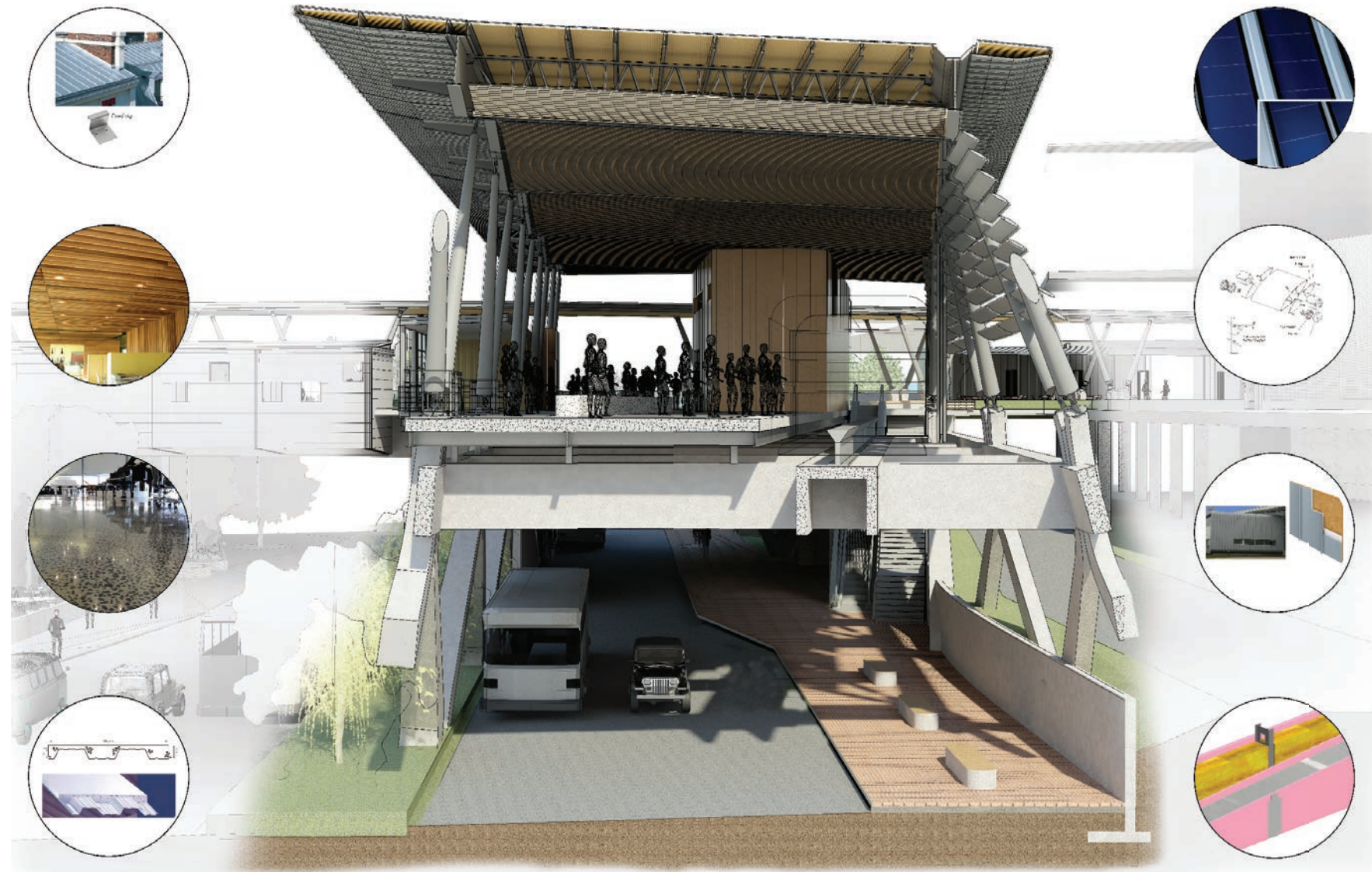


Image 9.12 - Menlyn Transit hub Terminal Building 3D section

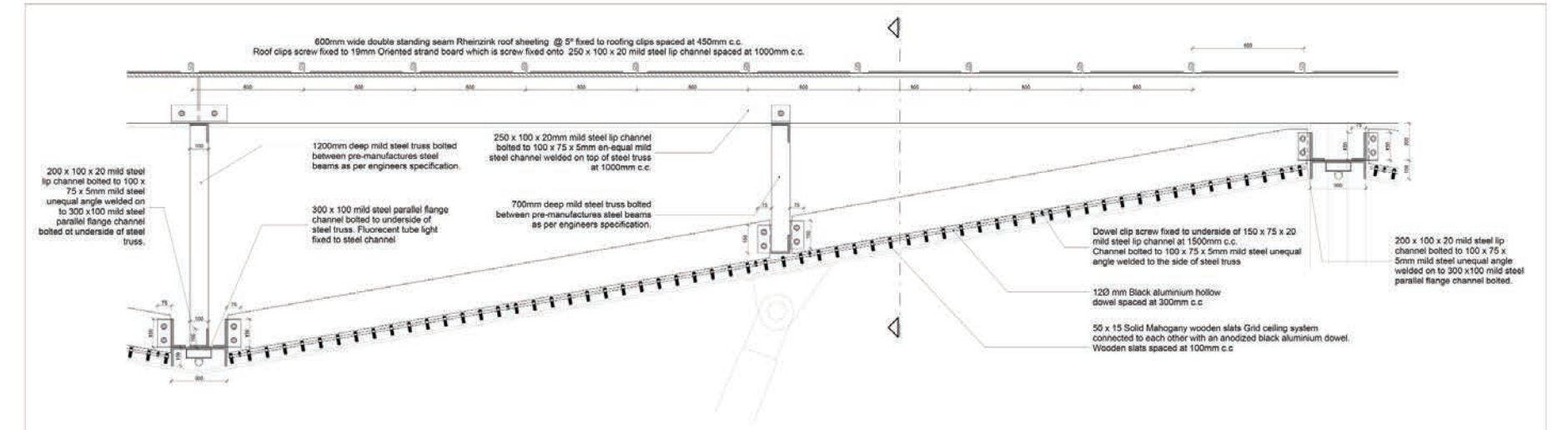


Image 9.13 - Terminal Building ceiling detail - not to scale

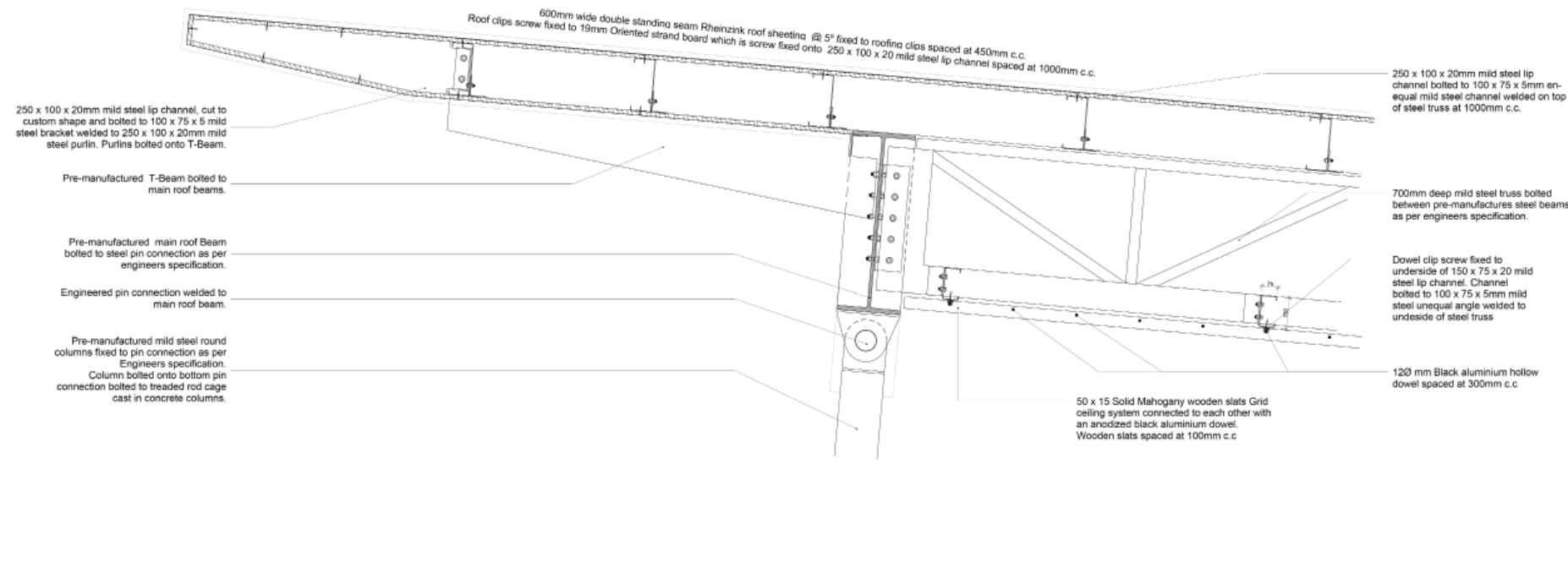


Image 9.14 - Terminal Building roof edge detail - not to scale

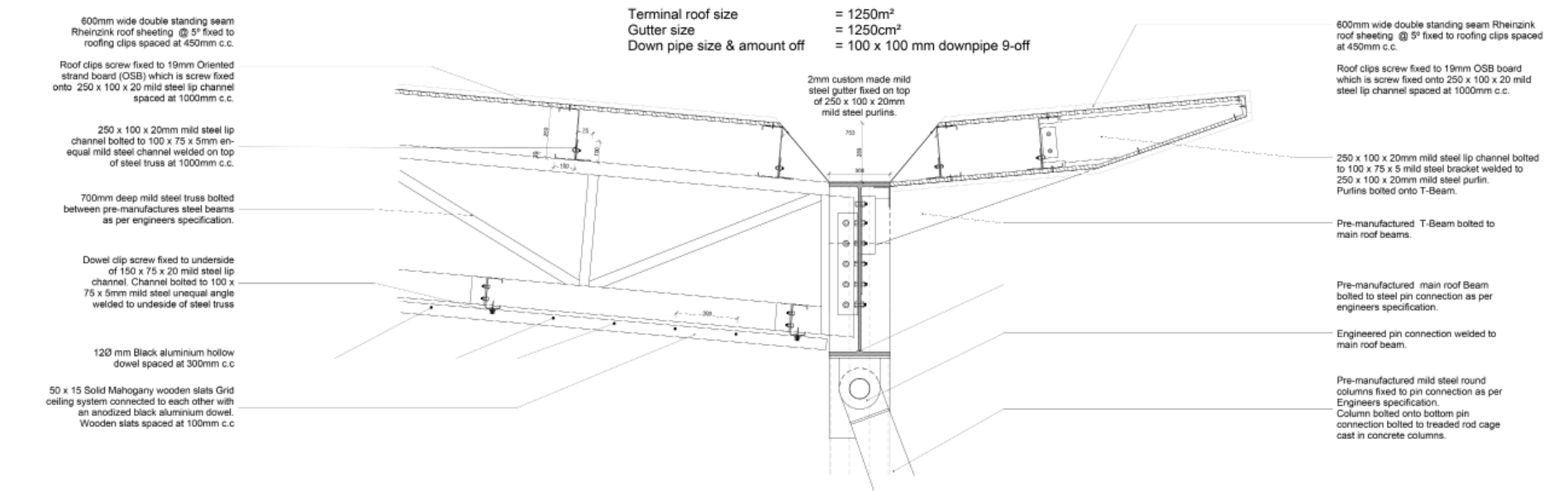


Image 9.15 - Terminal Building gutter and roof edge detail - not to scale

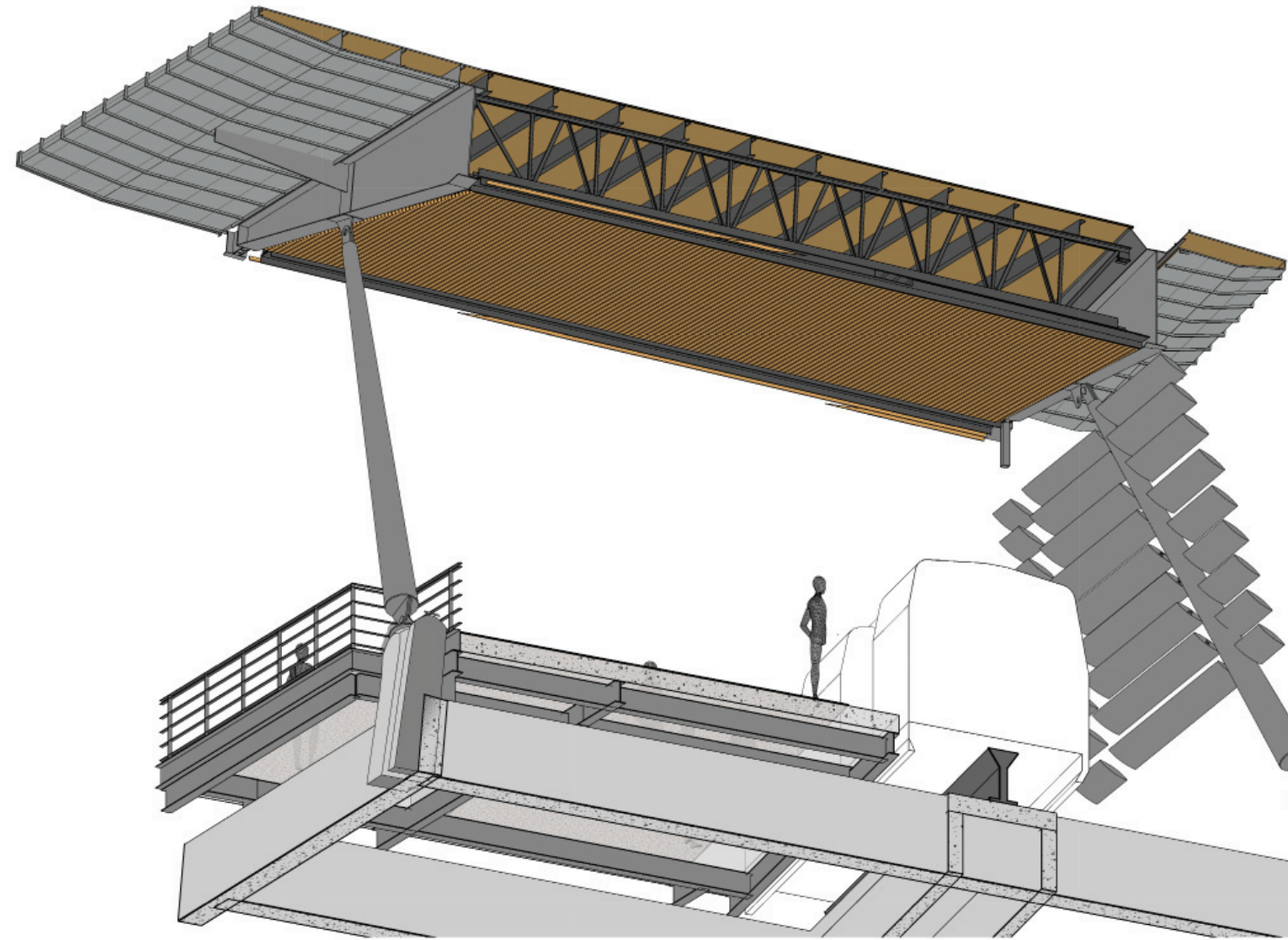


Image 9.16 - Terminal Building floor structure 3D view

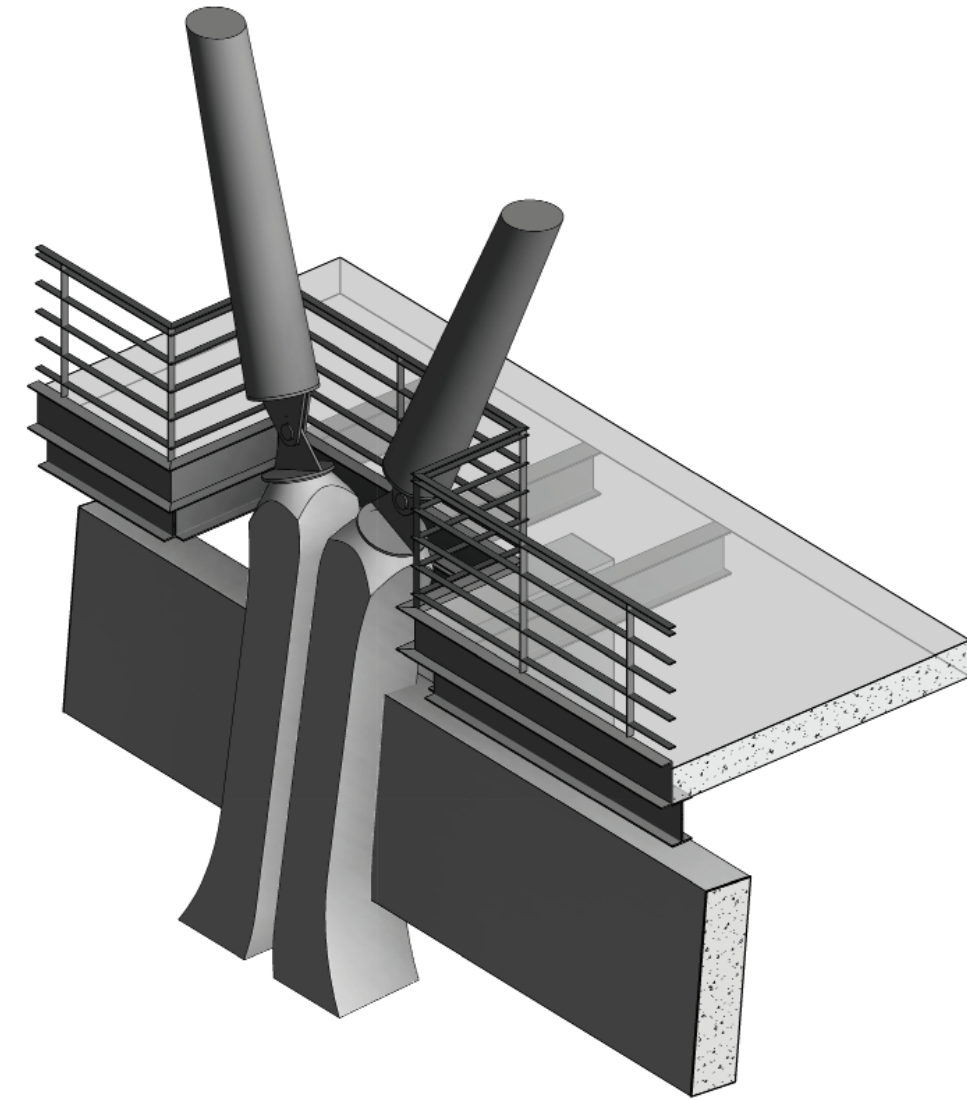


Image 9.17 - Terminal Building column and floor structure 3D view

9.2.3 Linking onto the existing Menlyn Piazza structure.

Existing concrete slab and column structure, new intervention to break out the existing concrete columns, and replace them with new steel columns grounded solidly on its own foundations to help carry the concourse structure. Express the connection of the stereotomic and tectonic.

Tectonic to consist of steel column and beam structure fixed to existing stereotomic structures.

Ground floor infill to be clay bricks, flat roofs.

Concourse structure consists of steel column and beams, with bondeck slabs as floor structure, light in weight, as needed for a bridge structure.

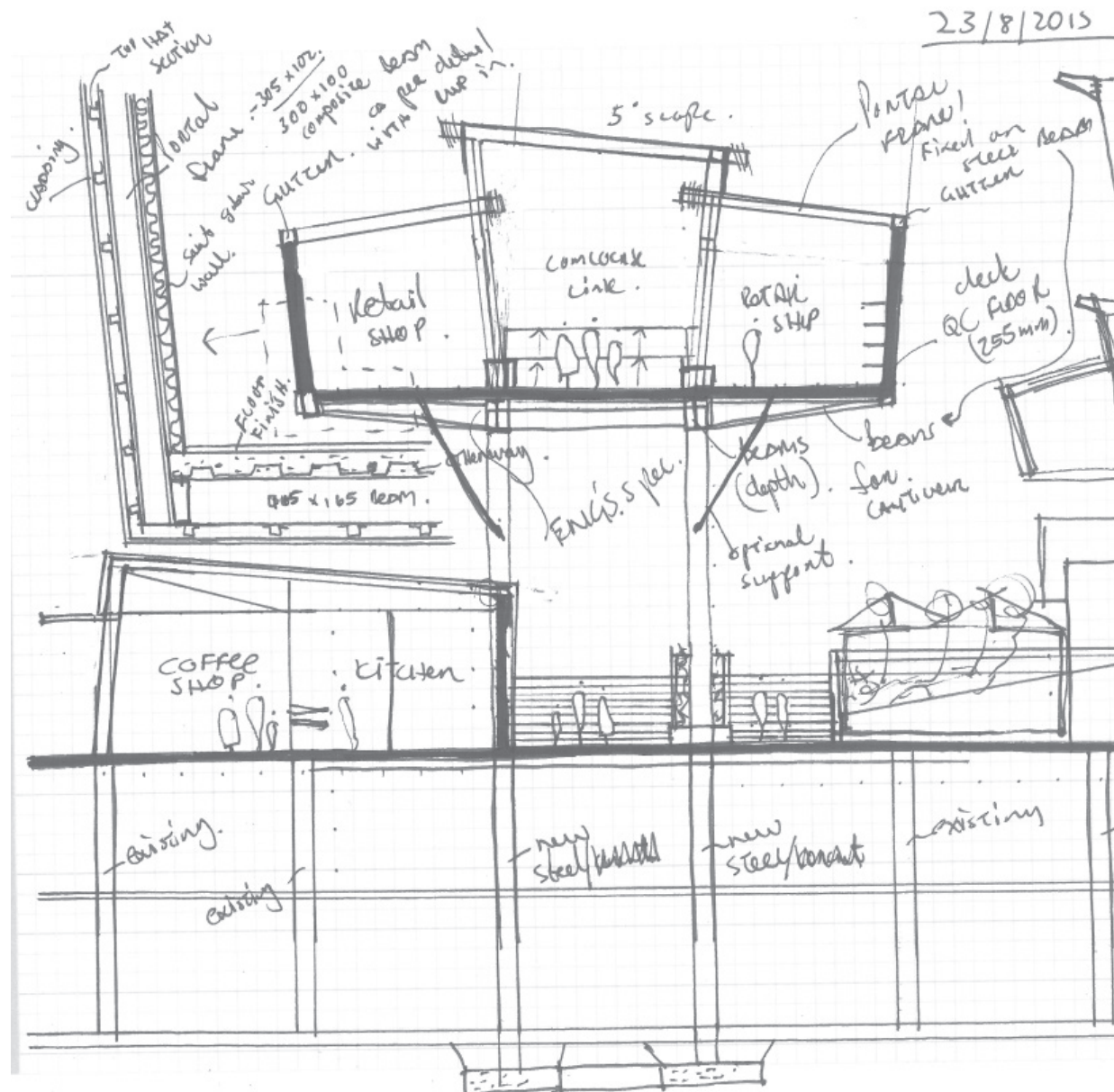


Image 9.18 - Menlyn Piazza section development sketches

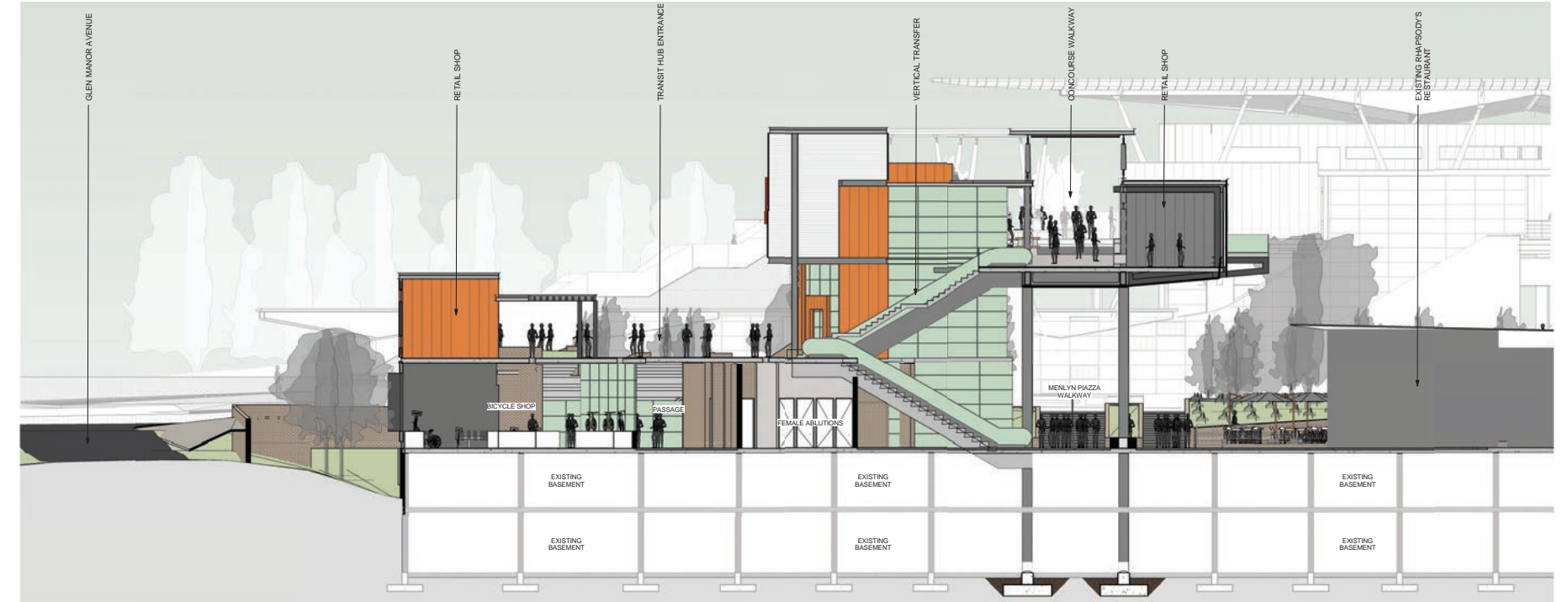
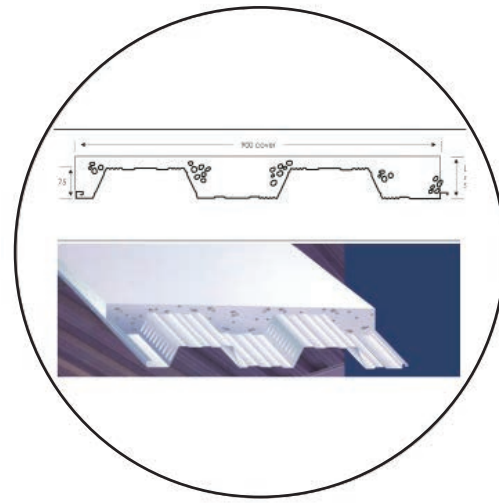


Image 9.19 - Menlyn Piazza section



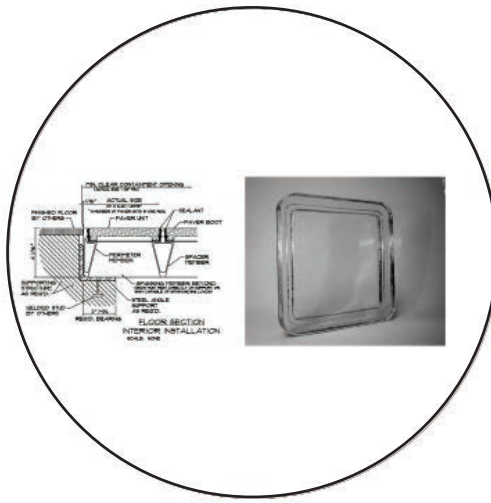
RHEINZINK Double Standing Seam with 500mm cover width, 0,8mm thick and single panel length of 5,00m used as vertical cladding fixed to steel sub frame.

Image 9.20 - Rheinzink double standing seam vertical cladding



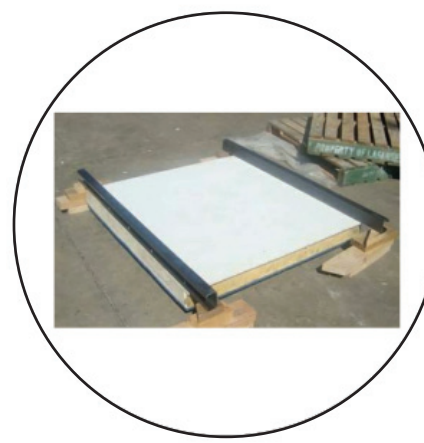
Permanent formwork to be Brownbuilt 0,8mm thick Bond-dek Z275 spelter galvanised ASTM 446 Grade C troughed interlocking permanent formwork, with 75mm deep x 900mm wide ribs at 3000mm centres.

Image 9.21 - Bond-deck flooring



190 x 190 x 20 Glass paver silicon fixed onto 15 x 15 x 2 mild steel equal angle welded to 200x 200 x 6 mild steel square tubing.

Image 9.22 - Glass paver



2400x1200mm x 80 mm thick layer of 35 Density yellow rigid polyurethane with a 9 mm thick Magnesium Oxide board laminated below and a 11 mm thick Oriented Strand Board (OSB) laminated to the top.

Image 9.26 - Atlaslas roofing panel



Image 9.27 - Polished concrete floor finish

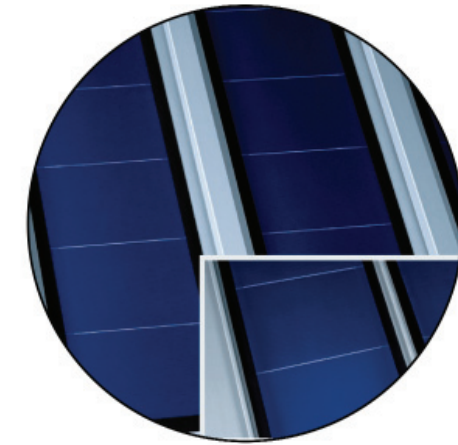
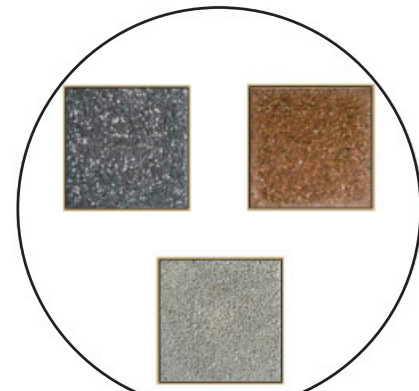
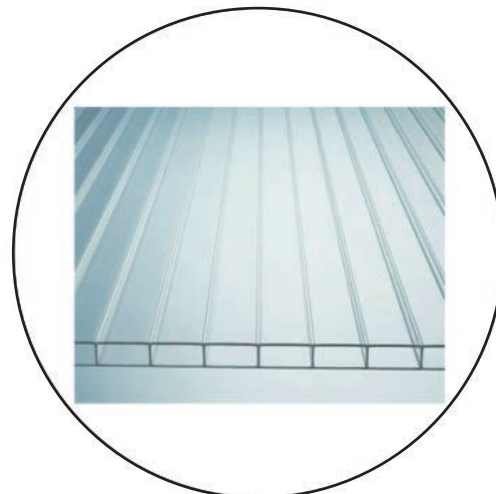


Image 9.28 - Flexible solar panel fixed on wide rib roof sheeting.



25mm min. exposed aggregate screed  
Exposed Aggregate Screed for external use. Screedcrete is an In Situ Coloured Terrazzo Screed System, ideal for external floors. Product in several exciting colours, for application to fabricate beautiful, hard wearing, non-slip, low maintenance outdoor floors. W/posed aggregate mix designs are offered in a diverse colour range, and natural aggregate size of either 6mm or 10mm size, encompassing 12 standard types. The thickness of application as a screed, ranges from a minimum of 19mm up to 30mm in thickness.

Image 9.23 - Africoate - Exposed aggregate flooring



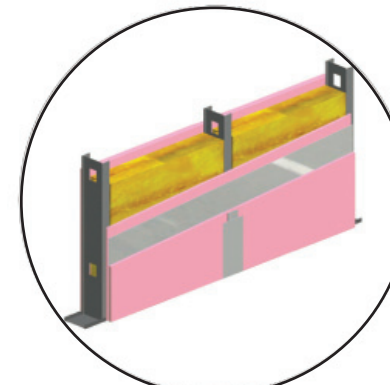
25mm triple layer plexiglass

Image 9.24 - Triple layer plexiglass



RHEINZINK Double Standing Seam with 500mm cover width, 0,8mm thick and single panel length of 5,00m with a roof pitch of 5° fixed to subroof with concealed RHEINZINK clips.  
Seams to be inside sealed with RHEINZINK sealing tape.  
Subroof to be 2400x1200mm x 80 mm thick layer of 35 Density yellow rigid polyurethane with a 9 mm thick Magnesium Oxide board laminated below and a 11 mm thick Oriented Strand Board (OSB) laminated on top.  
Sub roof fixed onto 100 x 50 20 m/s cold formed lip channel.

Image 9.25 - Rheinzink double standing seam roofing



Gyproc GypWall Secure (Rw 58dB - 120 minutes fire rating) UltraSteel Stud Drywall, consisting of stud and track system with 102 x 35mm Drywall UltraSteel studs at 600mm centres friction fitted into head track and floor track with 100mm "Cavitybatt" insulation inserted into cavity of partitioning and cast on both sides with 0,5mm galvanised steel sheet sandwiched between a double layer 15mm thick FireStop board fixed at 220mm centres using 25mm RhinoBoard Sharp Point Screws on the base layer and 42mm RhinoBoard Sharp Point Screws on the face layer with all external angles to have Drywall cornerbeads attached and all joints to be covered with RhinoTape. Wall surface to be finished with minimum 3mm thick RhinoLite Multipurpose, all in accordance with the manufacturer's recommendations.

Image 9.29 - Gyproc Gypwall



Image 9.30 - Hunter-Douglas Grid type timber ceiling system

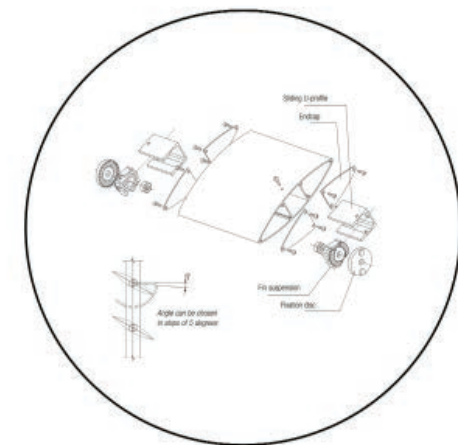


Image 9.31 - Hunter-Douglas Aerofin 450

9.4 Environmental systems

9.4.1 Rain water harvesting and reuse for ablution facilities and gardens.

9.4.1 Rain water harvesting

Pretoria rain fall per year is estimated at 517mm per year. (<http://www.pretoria.climateemps.com/>)

1000lt of water can be collected on a 100m<sup>2</sup> sheet metal roof for every 11mm less the loss factor of 0.9.

100 x 11 x 0.9 = 1000lt

Transit hub roof;

3853 (total roof area m<sup>2</sup>) x 517(mm of rain p/y) x 0.9 (water loss factor) = 1 792 800 liters of rain water which can be collected.

The transit hub consists of 3 buildings; the menlyn promenade, the terminal building and menlyn piazza part which is spread over a 150m distance. The length of the building promotes 3 storage areas, one for each building.

- Menlyn promenade roof area and partial

covered concourse roof area - 1123m<sup>2</sup>.

1123 x 517 x 0.9 = 522 531 liters of rainwater can be collected from the roofs. 520m<sup>3</sup> of storage needed.

- Terminal building roof area – 1507m<sup>2</sup>

1507 x 517 x 0.9 = 701 207 liters of rainwater can be collected from the roof. 700m<sup>3</sup> of storage needed.

- Menlyn piazza and partial covered concourse roof area – 1223m<sup>2</sup>

1223 x 517 x 0.9 = 569 061 liters of rainwater can be collected from the roofs. 570m<sup>3</sup> of storage needed.

Show piping and extra equipment (pumps) needed to reuse the water and get is back to the facilities which need it.

2.1.2 Ablution facilities water usage per year.

Menlyn Promenade sanitary requirements

9 waste closets, uses 5lt per flush.

5lt per flush. 1 flush per 10 minutes, 6 per hour, 72

flushes in a 12 hour day, 72 x 5 = 360lt per day per wc. X 9 = 3240 liters per day to flush wc's. x 365 days = 1.1 million litres needed.

5 urinals, waterless option to reduce water usage and reduce water storage.

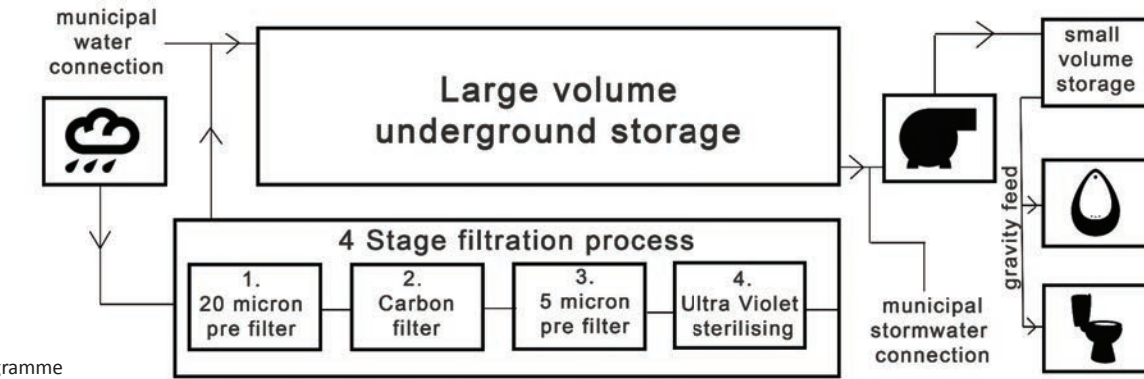


Image 9.32 - Rainwater harvesting diagramme

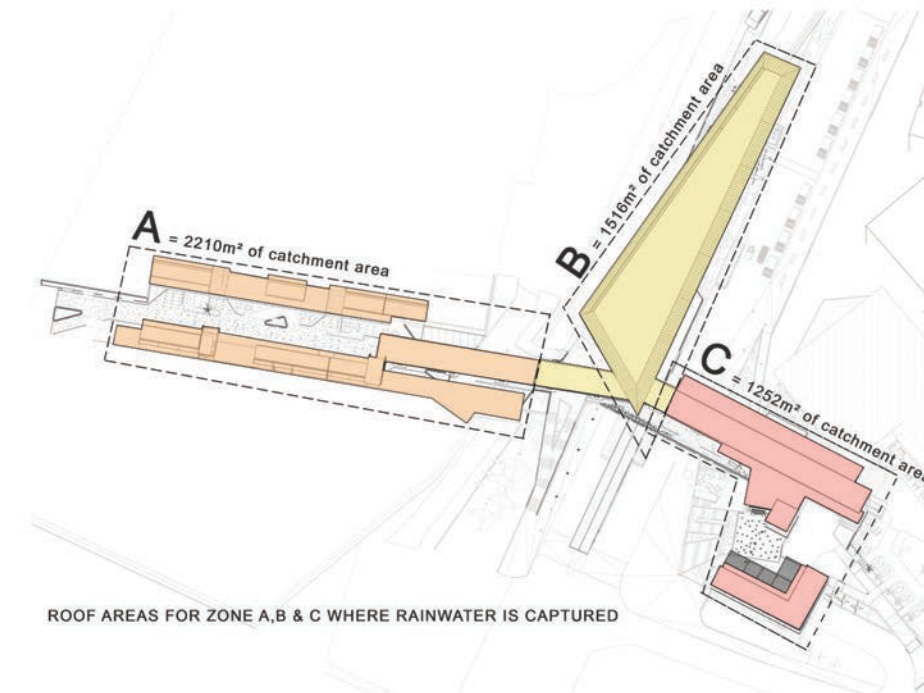


Image 9.33 - Roof catchment total areas and layout

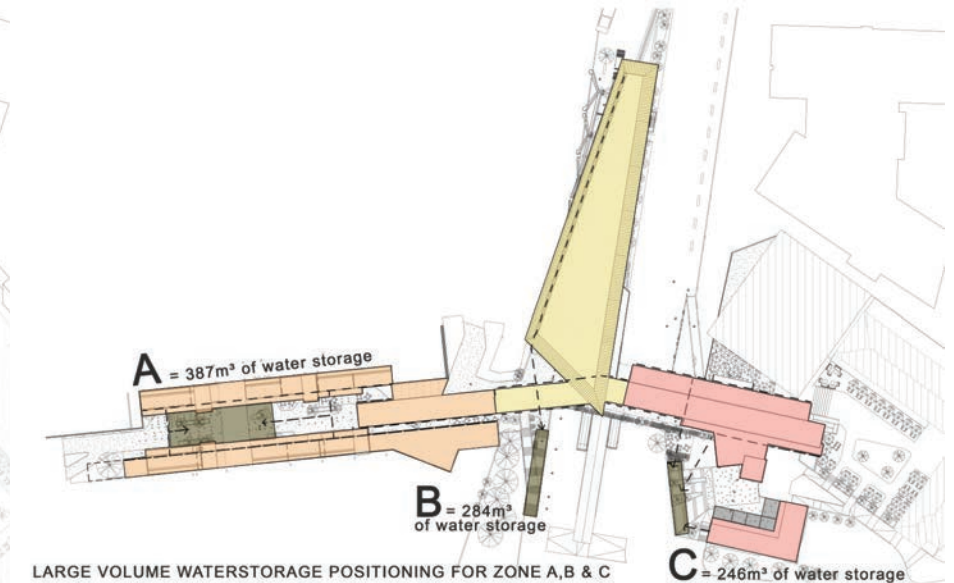


Image 9.34 - Rainwater storage capacities and storage location



MENLYN PROMENADE

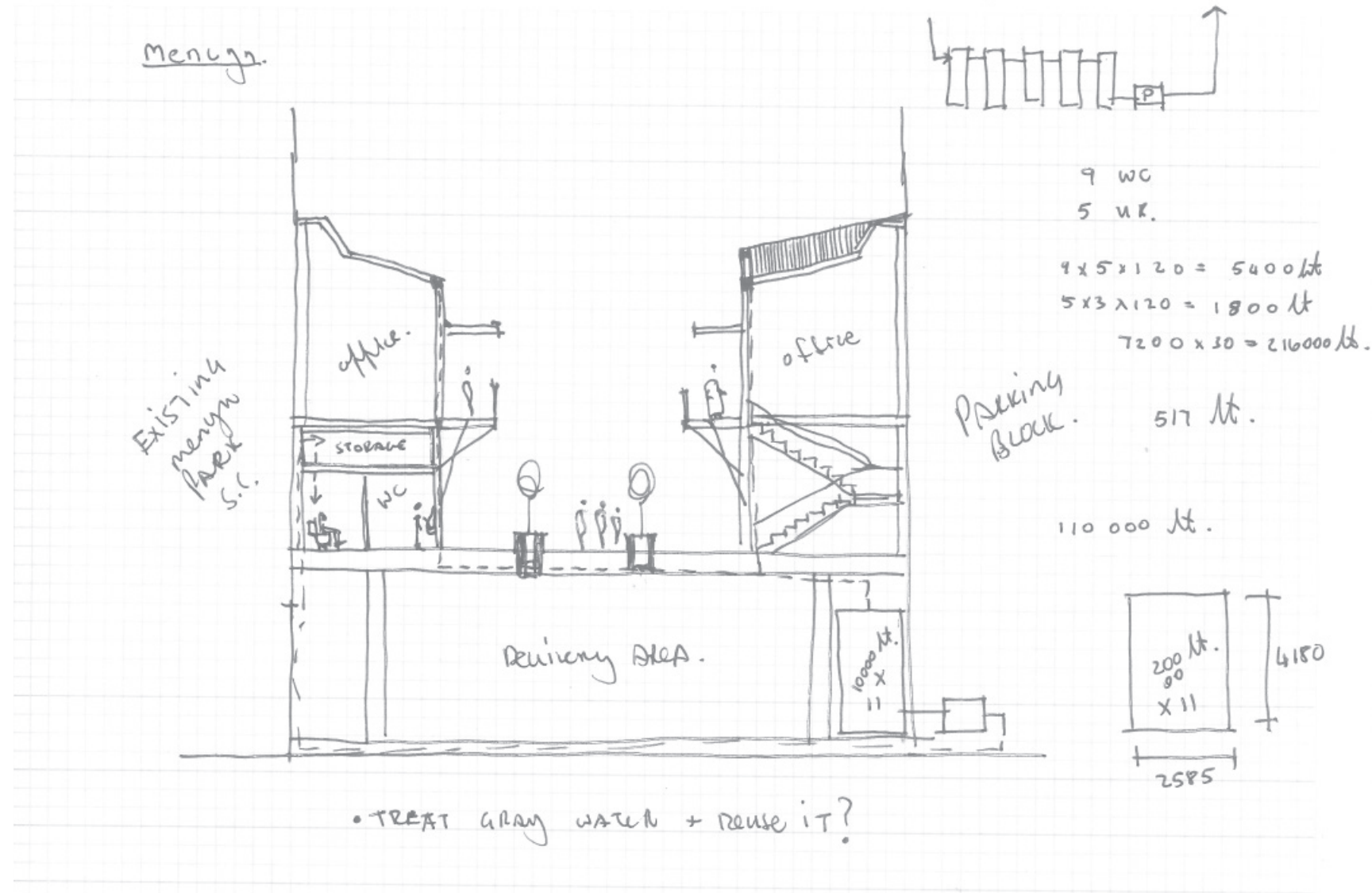


Image 9.34 - Menlyn Promenade rainwater harvesting sketch

SIZING WATER STORAGE TANKS

ASSUMPTIONS

Catchment area = 2010  
 Coefficient = 0.9  
 Eff catchment = 1809  
 Summer month irrigation requirement = 0.16m/month, say translates to 102m<sup>3</sup>/month if 638m<sup>2</sup> is irrigated  
 Winter months irrigation requirements = 0.125m/month, say translates to 80m<sup>3</sup>/month if 638m<sup>2</sup> is irrigated  
 Rainfall figures are fictional

Year 1 starting with no top-up

	RAINFALL m	IN m <sup>3</sup>	Ablutions OUT m <sup>3</sup> p/m	REMAINING IN TANK m <sup>3</sup>
J	0.122	220.698	94.77	125.928
F	0.106	191.754	94.77	222.912
M	0.091	164.619	94.77	292.761
A	0.033	59.697	94.77	257.688
M	0.022	39.798	94.77	202.716
J	0.006	10.854	94.77	118.8
J	0.01	18.09	94.77	42.12
A	0.01	18.09	94.77	-34.56
S	0.021	37.989	94.77	-91.341
O	0.06	108.54	94.77	-77.571
N	0.117	211.653	94.77	39.312
D	0.117	211.653	94.77	156.195

0.715

equals maximum tank size required

# of wc's	lt/flush	flush/p.h	hours p/d	water usage per day	lt usage per month	lt usage per year
9	0.0045	6	13	3.159	94.77	1137.24

Image 9.36 - Menlyn Promenade rainwater harvesting storage tank sizing spreadsheet

STATION TERMINAL

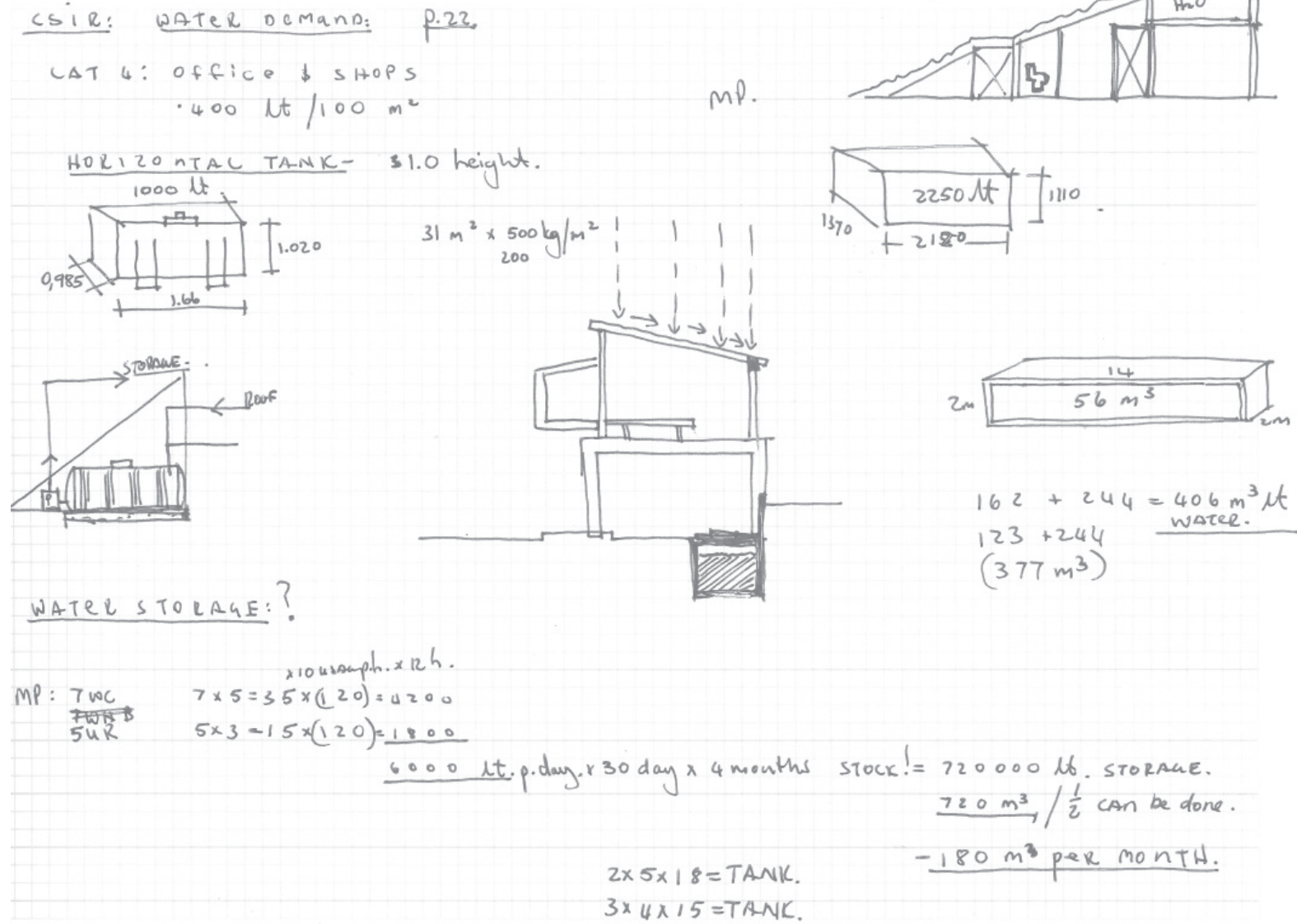


Image 9.37 - Menlyn Terminal building rainwater harvesting sketch

SIZING WATER STORAGE TANKS

ASSUMPTIONS

Catchment area = 1516  
Coefficient = 0.9  
Eff catchment = 1364.4  
Summer month irrigation requirement = 0.16m/month, say translates to 102m<sup>3</sup>/month if 638m<sup>2</sup> is irrigated  
Winter months irrigation requirements = 0.125m/month, say translates to 80m<sup>3</sup>/month if 638m<sup>2</sup> is irrigated  
Rainfall figures are fictional

Year 1 starting with no top-up

	RAINFALL m	IN m <sup>3</sup>	Ablutions OUT m <sup>3</sup> p/m	REMAINING IN TANK m <sup>3</sup>
J	0.122	166.4568 0	75.33	91.1268
F	0.106	144.6264 235.7532	75.33	160.4232
M	0.091	124.1604 284.5836	75.33	209.2536
A	0.033	45.0252 254.2788	75.33	178.9488
M	0.022	30.0168 208.9656	75.33	133.6356
J	0.006	8.1864 141.822	75.33	66.492
J	0.01	13.644 80.136	75.33	4.806
A	0.01	13.644 18.45	75.33	-56.88
S	0.021	28.6524 -28.2276	75.33	-103.5576
O	0.06	81.864 -21.6936	75.33	-97.0236
N	0.117	159.6348 62.6112	75.33	-12.7188
D	0.117	159.6348 146.916	75.33	71.586
	0.715			

equals maximum tank size required

	# of wc's	lt/flush	flush/p.h	hours p/d	water usage per day	lt usage per month	lt usage per year
public	9	0.0045	6	9	2.187	65.61	787.32
private	4	0.0045	2	9	0.324	9.72	116.64
					2.511	75.33	903.96

Image 9.38 - Menlyn Terminal building rainwater harvesting storage tank sizing spreadsheet

MENLYN PIAZZA

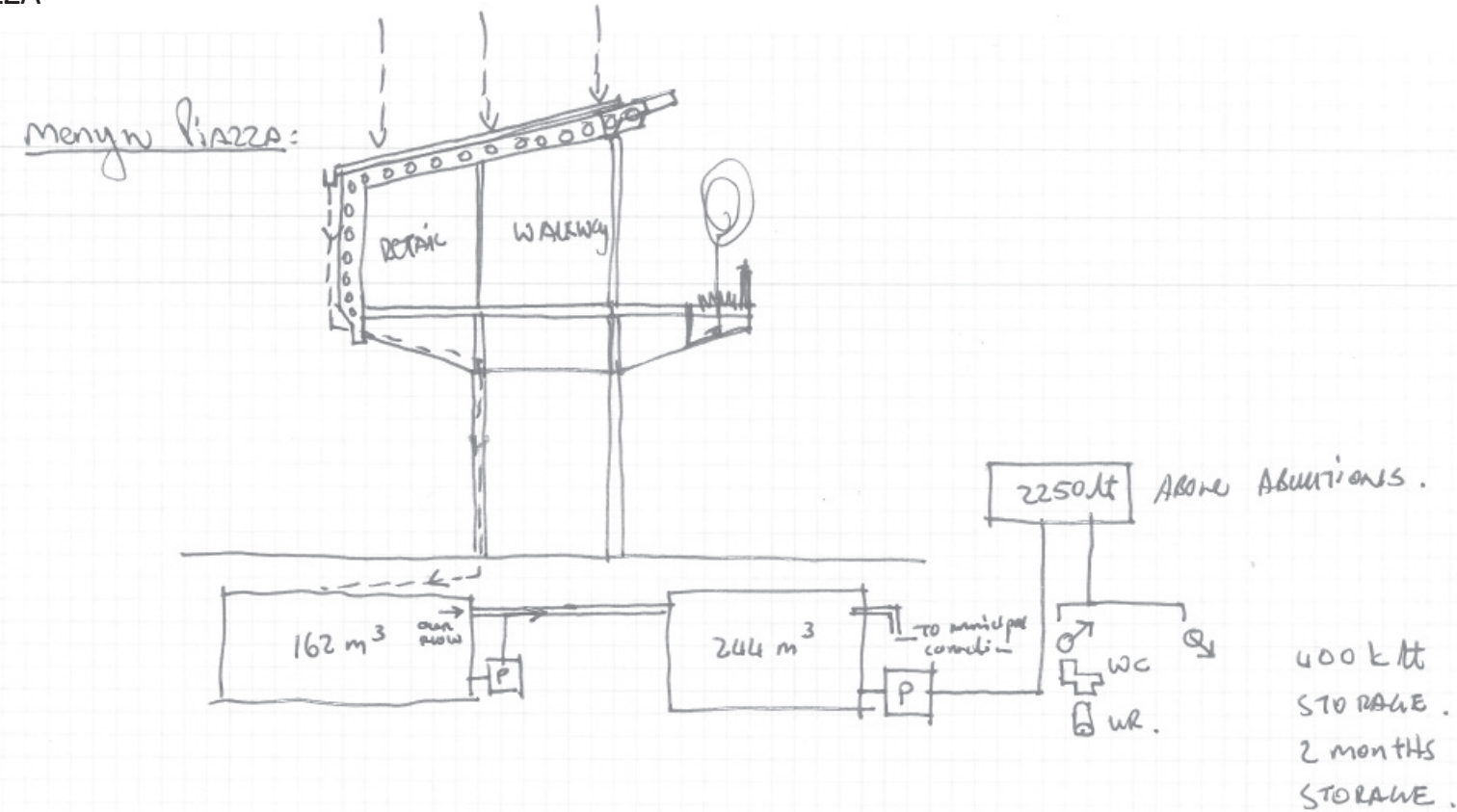


Image 9.39 - Menlyn Piazza rainwater harvesting sketch

SIZING WATER STORAGE TANKS

ASSUMPTIONS

Catchment area = 1252  
 Coefficient = 0.9  
 Eff catchment = 1126.8  
 Summer month irrigation requirement = 0.16m/month, say translates to 102m<sup>3</sup>/month if 638m<sup>2</sup> is irrigated  
 Winter months irrigation requirements = 0.125m/month, say translates to 80m<sup>3</sup>/month if 638m<sup>2</sup> is irrigated  
 Rainfall figures are fictional

Year 1 starting with no top-up

	RAINFALL m	IN m <sup>3</sup>	Ablutions OUT m <sup>3</sup> p/m	REMAINING IN TANK m <sup>3</sup>
J	0.122	137.4696 0	56.7	80.7696
F	0.106	119.4408 200.2104	56.7	143.5104
M	0.091	102.5388 246.0492	56.7	189.3492
A	0.033	37.1844 226.5336	56.7	169.8336
M	0.022	24.7896 194.6232	56.7	137.9232
J	0.006	6.7608 144.684	56.7	87.984
J	0.01	11.268 99.252	56.7	42.552
A	0.01	11.268 53.82	56.7	-2.88
S	0.021	23.6628 20.7828	56.7	-35.9172
O	0.06	67.608 31.6908	56.7	-25.0092
N	0.117	131.8356 106.8264	56.7	50.1264
D	0.117	131.8356 181.962	56.7	125.262

0.715

equals maximum tank size required

# of wc's	lt/flush	flush/p.h	hours p/d	water usage per day	lt usage per month	lt usage per year
7	0.0045	6	10	1.89	56.7	680.4

Image 9.40 - Menlyn Piazza rainwater harvesting storage tank sizing spreadsheet

9.4.2 Solar power for station and retail facilities.

Pretoria has a large amount of solar exposure during the year, on average 8.5 hours a day. This allows for the opportunity to utilize the sun to provide power for the transit hub, especially if the roof area of the transit hub is so vast. With the help from Martin Zuhlsdorff from (Royal HaskoningDHV), the allowed power usage and demand as per SANS10400-XA, and the average power demand could be calculated and a solar system could be designed. The dilemma was that this type of building classification was not listed in table 2 and 3 of SANS 10400-XA. To overcome this, the best and worst case scenarios was based on a maximum energy consumption of 120kWh/m<sup>2</sup> due to the fact that the specific accommodation was not listed in the SANS10400-XA document.

Two types of solar systems can be used; either on-grid or off-grid. The on-grid option was selected due to the fact that no battery storage is needed, only photo voltaic panels and inverters. This reduces the amount of space required for the system and also has an effect on the cost. Daytime power will be provided by the sun, and Eskom

power will be used during the night or on overcast days to supplement the power needed.

On-grid system: 100% load offset with eskom backup

1. Monthly kWh used for the building/area.

SANS benchmark of 120kWh/m<sup>2</sup> per monthly kWh of the building/area.

ZONE A - MENLYN PROMENADE - 120kWh/m<sup>2</sup> /12 x 1057m<sup>2</sup>= 10.6 MW (10 570 kWh)

ZONE B - TERMINAL BUILDING - 120kWh/m<sup>2</sup> /12 x 519m<sup>2</sup> = 5.2 MW (5 190 kWh)

ZONE C - MENLYN PIAZZA - 120kWh/m<sup>2</sup> /12 x 931m<sup>2</sup> = 9.3 MW (9 310 kWh)

2. The amount of sun hours available for Pretoria this is about 6 hours.

3. The total wattage of solar panels capacity.

ZONE A = 10 570 / 30 = 352kWh per day

352 kWh per day / 6 hours of sun = 58.6 kW capacity

ZONE B = 5190 / 30 = 173 kWh per day

173 kWh per day / 6 hours of sun = 28.8kW capacity

ZONE C = 9310 / 30 = 310 kWh per day

310kWh per day / 6 hours of sun = 51.6kW capacity

4. Number of panels required

ZONE A - 58.6 kW / 128W Panel = 457 panels needed

ZONE B - 28.8 kW / 128W Panel = 225 panels needed

ZONE C - 51.6 kW / 128W Panel = 403 panel needed

5. Invertors needed

ZONE A - 60 kW inverter

ZONE B - 30 kW inverter

ZONE C - 60 kW inverter

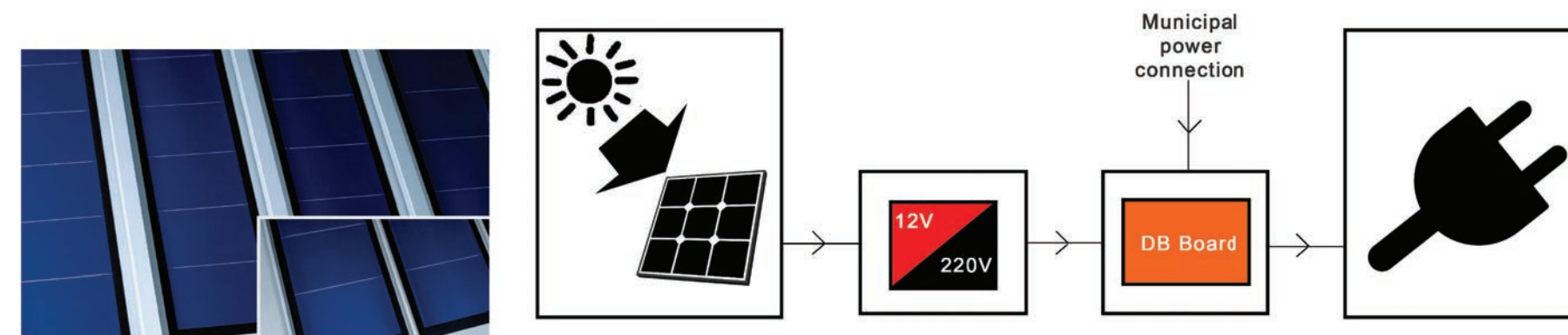


Image 9.41 - Monocrystalline solar panel

Image 9.42 - Solar harvesting diagramme

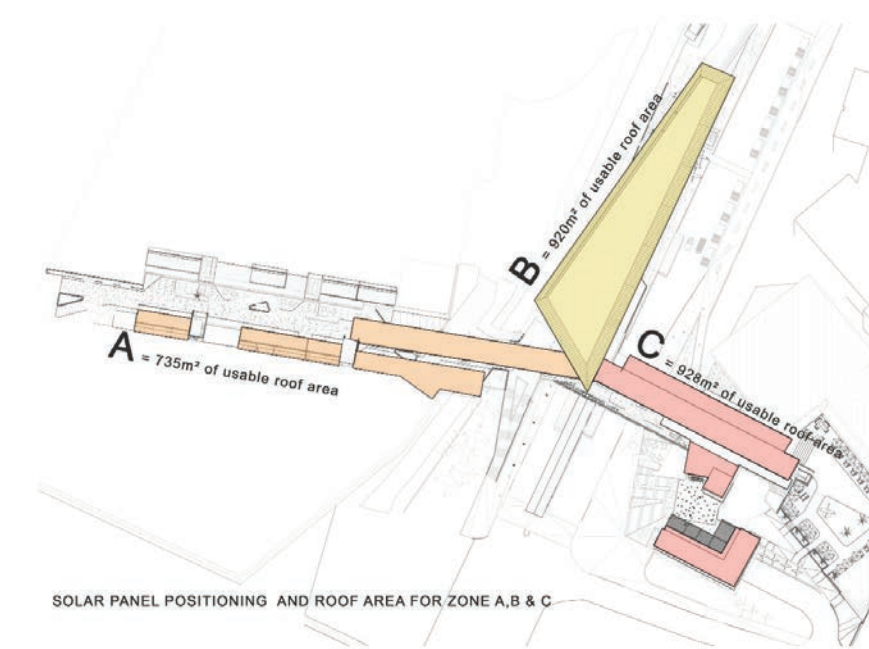


Image 9.43 - Roof areas and solar panel layout

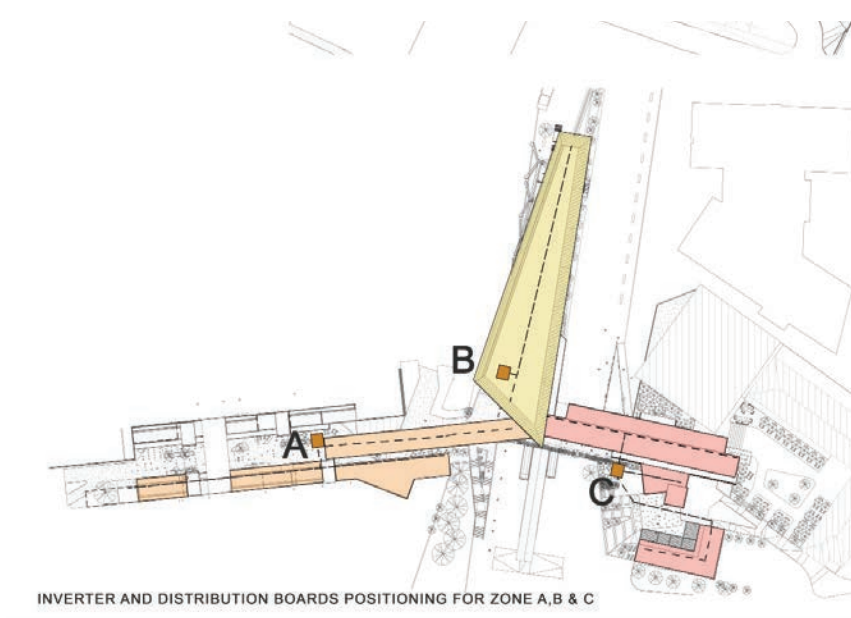


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# Conclusion

This dissertation has allowed the author the opportunity to study and become familiar with an environment in which he has been working in during his studies within the office he is currently employed at.

The investigation and knowledge gained regarding public transport planning and integration into an existing urban fabric rendered the author more sympathetic towards place making and creating accessible and legible public spaces.

With the increasing rate of growth expected for the Menlyn node, the provision of a mass transport link to this area is of utmost importance if the Menlyn node is set to become this sustainable, 24/7 living city.

The author identified an aspect which will have to be further investigated. This will be on how to better integrate all the different modes of transport and how to combine them without creating this divide as we have seen happen since the apartheid days. Even though the Menlyn node is business driven, public transport should be designed for everybody and not just for the office going business man or woman.

# Final Presentation



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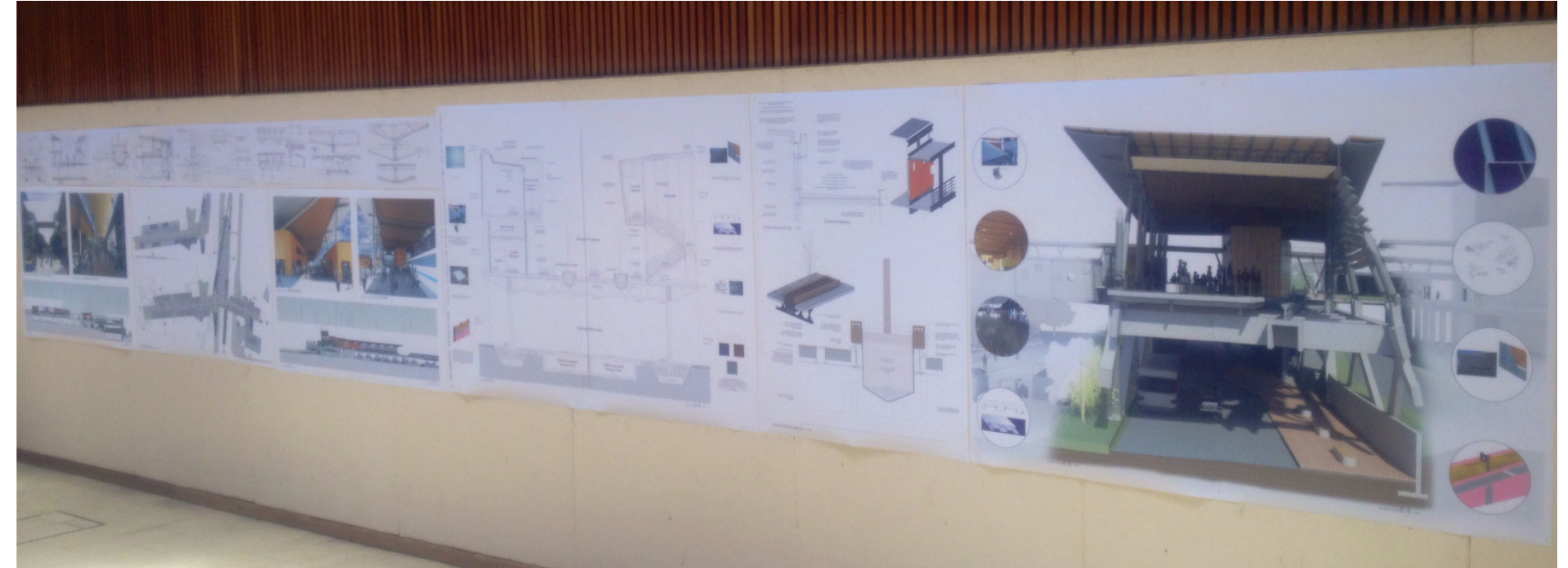


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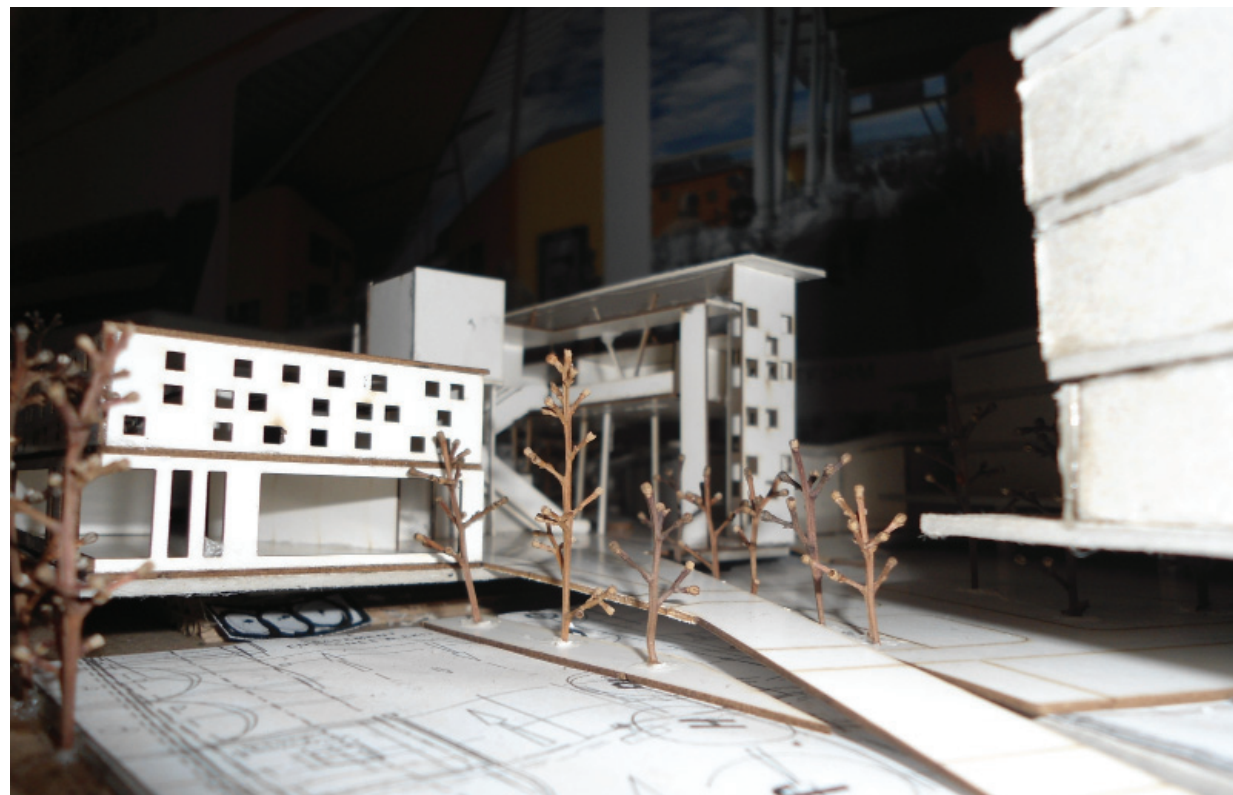
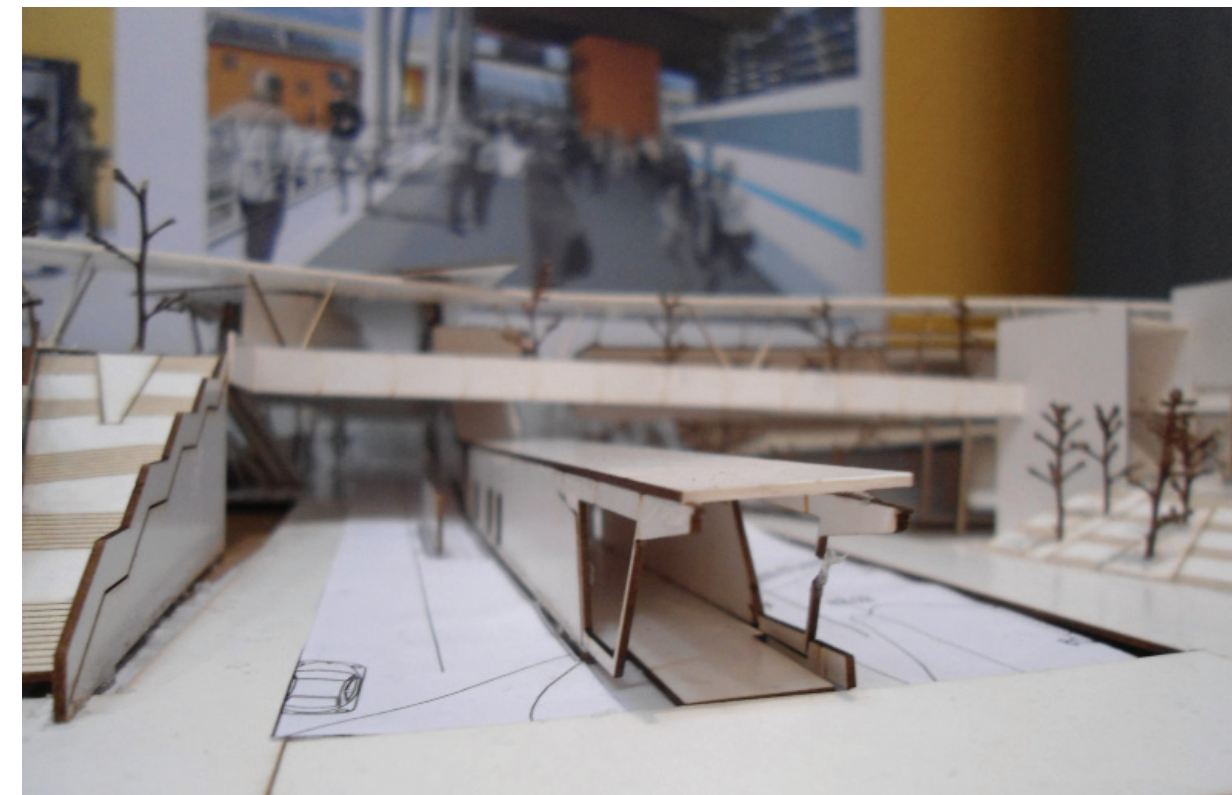


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Image 9.34 - Rainwater storage capacities and storage location - by

Author

Image 9.34 - Menlyn Promenade rainwater harvesting sketch - by

Author

Image 9.36 - Menlyn Promenade rainwater harvesting storage tank

sizing spreadsheet - by Author

Image 9.37 - Menlyn Terminal building rainwater harvesting sketch -

by Author

Image 9.38 - Menlyn Terminal building rainwater harvesting storage

tank sizing spreadsheet - by Author

Image 9.39 - Menlyn Piazza rainwater harvesting sketch - by Author

Image 9.40 - Menlyn Piazza rainwater harvesting storage tank sizing

spreadsheet - by Author

Image 9.41 - Monocrystalline solar panel, [http://www.pvdatabase.org/images\\_prod/SolarPVStandingSeamandClickRollCapSystem\\_1.jpg](http://www.pvdatabase.org/images_prod/SolarPVStandingSeamandClickRollCapSystem_1.jpg)

Image 9.43 - Roof areas and solar panel layout - by Author

Image 9.42 - Solar harvesting diagramme - by Author

Image 9.44 - 12v to 220v Invertor positioning - by Author

Image 10.1 - Final presentation 1 - by Author

Image 10.2 - Final presentation 2 - by Author

Image 10.3 - Final model photos 1 - by Author

Image 10.4 - Final model photos 2 - by Author