Creating Connections in the City:

From road to street, and buffer zone to landscape

Residual highway space as a tool in stitching segregated neighbourhoods into the urban fabric

By Christine de Beer

Project Information

DISSERTATION TITLE: Creating Connections in the City:
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Residual highway space as a tool in stitching segregated neighbourhoods into the urban fabric

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Abstract

The fractured form of the post-apartheid South African city, created by city planning laws based on racial segregation, sustains inequality. Under apartheid, neighbourhoods were designed to exist in isolation. This isolation was created and reinforced by infrastructure and large areas of open space. This project recognises that residual space created by the highway could be an opportunity to stitch together the urban fabric. The project aims to address these spaces by using program to create connections. It finds its program in a sports centre on the border between Bonteheuwel and Langa.

By understanding how our cities came to be fragmented globally, and its impact in South Africa, this project unpacks case studies that have created connections, extracting strategies that are useful and can be adapted in the South African context. It reviews literature that highlights new thinking about the city and the shift in the planning agenda from separation to integration. The project aims to address the separation between the two neighbourhoods of Bonteheuwel and Langa. It does this by transforming a road that divides, into a connective street; and by inhabiting the buffer zone with program in order to create an active landscape. The strategic choice of site is at an intersection of a new connection made into Langa, and presents the opportunity to address both these conditions of road and buffer zone.

By creating an active street edge the urban fabric becomes continuous between Bonteheuwel and Langa. The precinct has been designed so that the landscape offers the potential of connection by being programmed with urban agriculture, sports facilities and recreational space. These two predominant ideas prompted the conceptual understanding that the building becomes the transition between urban edge and landscape. A ramp is used as a mediating device to negotiate level changes both from inside to outside, as well as navigating the internal topography of the building.

By recognising the opportunity of these residual spaces alongside the highway, these sites can be used to stitch together the isolated neighbourhoods in our city.

Table of Contents

Figure 1 - Sketch of people crossing the N2 highway in Cape Town. This image highlights how infrastructure has created boundaries in our city.

Introduction

This dissertation addresses the legacy of modernist planning in the city. Globally, modernist planning focused on separation; the separation of pedestrians from vehicular environments and the divisions of the city by land use. In addition, apartheid planning rules and by-laws used city planning as a tool for racial segregation, and many of the effects are still present in the post-apartheid South African city. Therefore, new thinking about the city, and in particular about post-apartheid planning, has placed emphasis on integration, hence the need for proposals to give shape to these intentions.

This project accepts the heavy reliance on cars as a means of transport, citing mobility as a requirement not only of the modernist city, but of contemporary life. It therefore focuses on the condition of highways, how they have become objects that fragment the city, and the potential for them to become a tool to re-connect communities. The project aims to rethink some of the major transport routes not only as the providers of speed and mobility but as integral and essential parts of the urban system. It questions whether the road belongs to infrastructure or the city, and whether it can in fact become an urban street that links an infrastructure system to the urban fabric. It takes the road, often used as a separator and tests its ability to be transformed into a street, becoming a seam along an edge.

In addressing the separation created by infrastructure, this project also looks at investigating a new reading of landscape. Vacant land, in the form of extensive buffer zones, has become a divisor in the city and reinforces the infrastructural borders. This division was a result of apartheid planning and therefore needs to be re-programmed in order to integrate the city. By programming the buffer zones and road reserves, the land becomes a useful amenity and therefore offers the potential of connection.

Therefore, the chosen site lies in the residual space created by the highway, between the neighbourhoods of Bonteheuwel and Langa in the Cape Flats. The site, strategically situated at a new connection into Langa, offers these two conditions; the opportunity for a road to become a connecting street, and the opportunity to inhabit the buffer zones alongside a highway with program in order to transform it into an active landscape. The proposed architecture sits at the intersection of these two conditions.

This paper is structured into three sections. The first attempts to understand how our cities came to be fragmented – through unpacking the ideals of modernist planners and how these ideas were implemented in apartheid South Africa; and how this is an issue in the contemporary South African city. The second section explores strategies of connections in the city by reviewing case studies. It highlights architectural strategies that offered clues to intervening in the residual space alongside the highway in ways that presented opportunities to reconnect the fragmented parts of the city. It then introduces the site of intervention between Bonteheuwel and Langa, through mappings, photographs and briefly describing the history of how these areas came about. Section three describes the design process, explaining the project through principles which aim to achieve connections in multiple ways.

SECTION ONE: Impact of Modernist Planning Globally - Separation

The result of modernist planning was separation. This, combined with an advance in technology, has resulted in pedestrians being separated from the space utilized by vehicles; and the city divided into functions by zoning and land-use regulations.

Technological innovation and the increased dependence on the automobile have resulted in infrastructure that has created vast areas of lost space. The introduction of cars has changed the way in which the world is perceived and therefore designed. Trancik (1986) explains how the need for mobility and motion has become a tool for isolation. Cape Town is the prime example of this. The urban context is scarred with the incisions of the highway that has created isolated neighbourhoods. Davila (2013) conveys the notion that increased mobility can integrate individuals and social groups but also fragment identities as communities become segregated due to the infrastructure that is associated with mobility. McHarg (1969) reinforces this idea with his view that the highway, a clumsy concrete form, creates scars in the urban fabric by carving into communities and creating segregated neighbourhoods and uninhabited parks.

Modernism brought in 'heroic'[1] ideas of making a city. These ideas are clearly evident in the cities in which we reside today. The tendency to oversimplify; to 'predict and prepare'[2], was the downfall of the planning method that was driven by a very administrative agenda[3]. This created a focus on the building rather than the outdoor room with little consideration of time. Furthermore, designs were in accordance to the present with little acknowledgement of the past or accommodation for the future (Trancik, 1986; Todeschini, 2014). The reductionist philosophy of modernism analytically broke the city down into what it considered the four functions of living: dwelling, work, recreation and transportation. Trancik (1986) argues that the complex social relationships of the urban setting have been sterilized by the planning model of the Modern Movement. Zoning and land-use policies separated functions that had often been integrated, resulting in homogeneous districts bordered by traffic arteries. The areas between neighbourhoods often result in vast areas of lost space in the urban fabric.

This dissertation addresses the lost space that is a consequence of modernist planning in Cape Town. It focuses on using this space to reconnect neighbourhoods.

[1] The authors understanding of heroic in this context is the intention of the architects of the Modern Movement to create a new life using architecture to define the way in which people live.
[2] Designing for a society, that has predetermined needs, rather than identifying and accommodating the human needs and comforts of individuals.
[3] The mass production of housing, for example, was for pure utilitarian and functional purposes in which all people were expected to operate. People were reduced to stereotypes and buildings became dehumanized.

Modernist Planning in South Africa – Racial Segregation

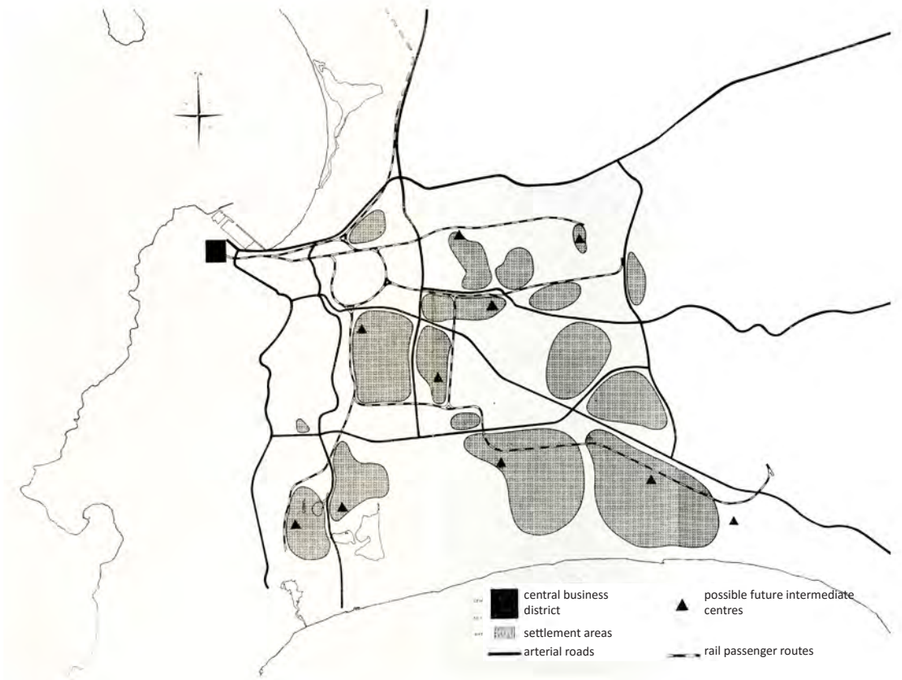


Figure 2 - Basic form of Cape Town highlighting areas being defined by highways.

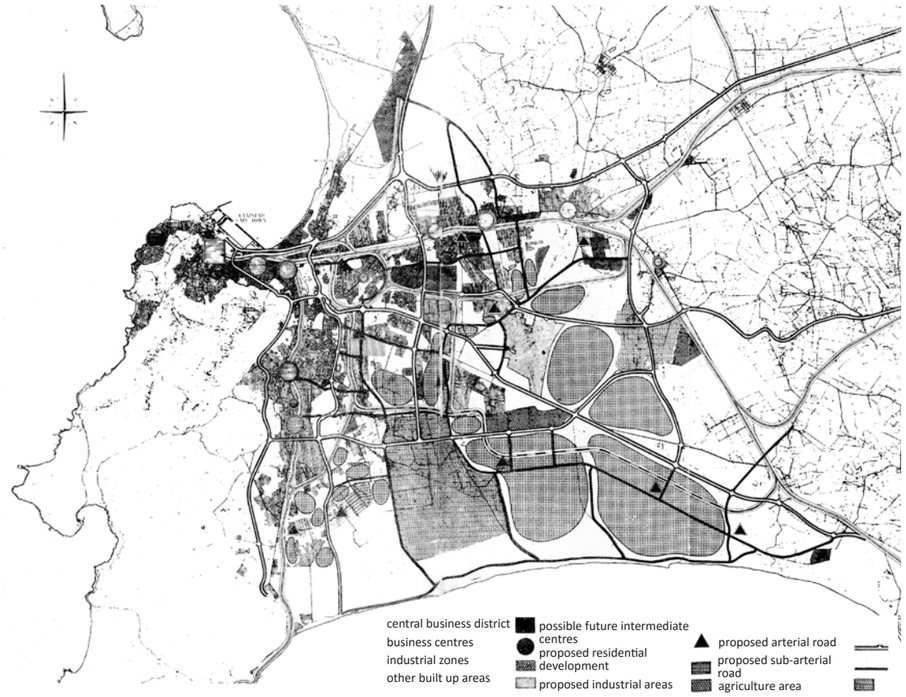


Figure 3 - Schematic Plan of Cape Town.

Modernist planning in South Africa was used as a tool for racial segregation. Its impact teaches us the power that architecture holds in society, and that the architect has a distinctive role in the shaping of the urban environment. Whilst planning and urbanisation in South Africa has followed universal progressions, the impact of apartheid has created a unique condition. The laws in which racial discrimination was institutionalised have had a direct influence on the spatial layout of our cities. Leading contributors to the South African Modern Movement, such a Norman Hanson, began to recognise the downfalls of the Modern Movements formalist ideas, and believed in the necessity for a social and political practice within architecture. Japha (1998) revealed that Mumford became an imminent source for architects unsatisfied with the ideas put forward by Le Corbusier.

Mumford's writings on regionalism appealed to South African architects as they were not framed in generalities and were therefore considered to be more realistic, democratic and locally relevant at that time (Japha, 1998). Mumford related his ideas on regionalism to the neighbourhood unit (as defined by Perry) (figure 4). This planning device idealised the new regionalist consciousness and was believed to improve living conditions and provide diversity. "Regionalism, however, is in essence response to context; and in South Africa the pairing of regionalism and the neighbourhood unit offered very specific possibilities for physically reinforcing South African patterns of urban segregation" (Japha, 1998, p. 429). The implementation of the neighbourhood unit in South Africa meant all workers could be housed under surveillance, and this could be co-ordinated with the control of influx. This planning mechanism made it possible to survey and regulate the inflow of black Africans into South Africa's urban areas.

This surveillance planning was used as a tool for isolation, with the separation of society based on race. Architects were at the forefront of this deeply racialised planning process. Neighbourhoods were defined and bound by major infrastructure of both road and rail (figures 1 and 2). They were built as an entity and consisted of inwardly orientated enclaves. Limited access into the neighbourhood enabled control and easy containment if there were any uprisings during apartheid. This government intervention was a "spatial matrix of the 'power of apartheid' creating the physical conditions for surveillance and the preconditions for the implementation of influx control and Group Areas Act" (Japha, 1998, p. 423). These scars and memories of apartheid planning are always apparent in our inherited urban fabric (figure 5) and this fractured form of the city sustains inequality. Therefore, the design project aims to address this disconnect by creating connections through various strategies.

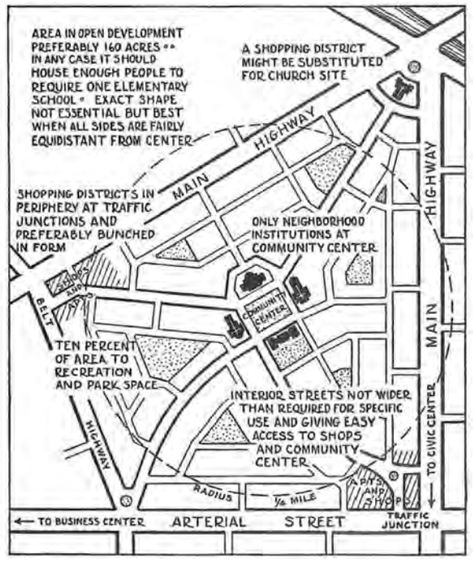


Figure 4 - A diagram of Clarence Perry's neighbourhood unit indicating the core principles of the concept

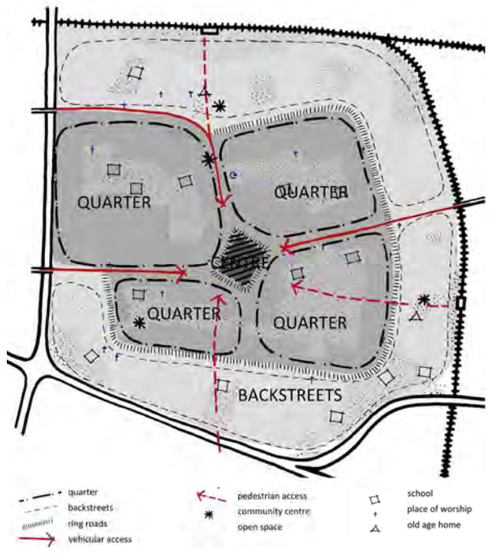


Figure 5 - Diagram on Bonteheuwel, based on the neighbourhood model, showing its overall spatial dimensions.

Mapping disconnect

A series of mappings identified disconnects that occur in the city largely as a consequence of the planning model. The design project engages with these disconnects as the site is across an infrastructural divide, which reinforces the natural (river) divide alongside it. It sits between neighbourhoods of cultural difference and it aims to address the income divide by providing for economic opportunity.

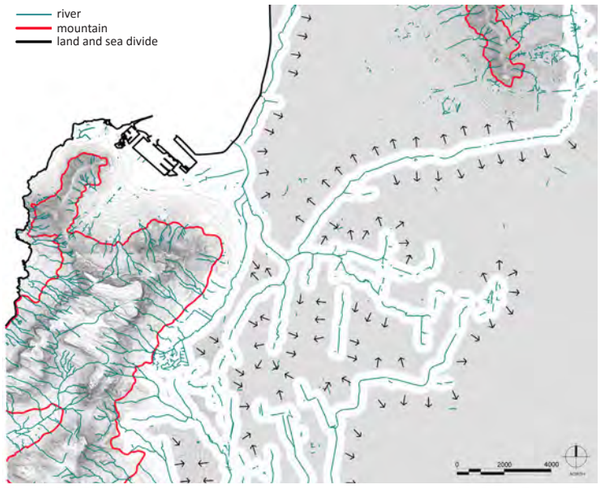


Figure 6 - The barriers as a result of the natural topography in Cape Town. The mountain creates disconnect in the urban fabric and rivers have specific points at which you can cross.

Figure 7 - The city fabric is fragmented by infrastructure. This map shows rail and road patterns of Cape Town.

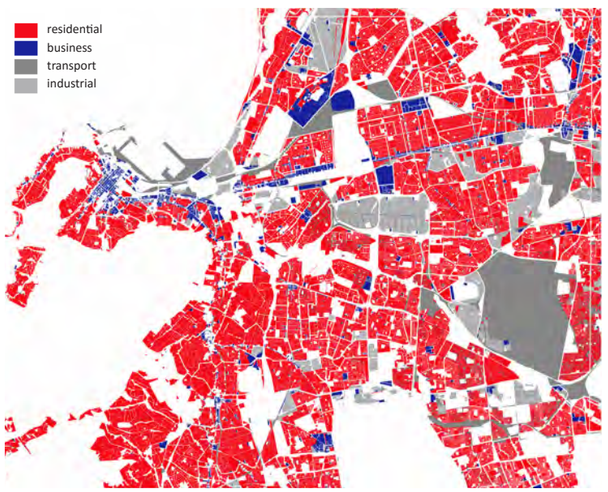


Figure 8 - Map representing the land use divide that creates pockets of functions in the city

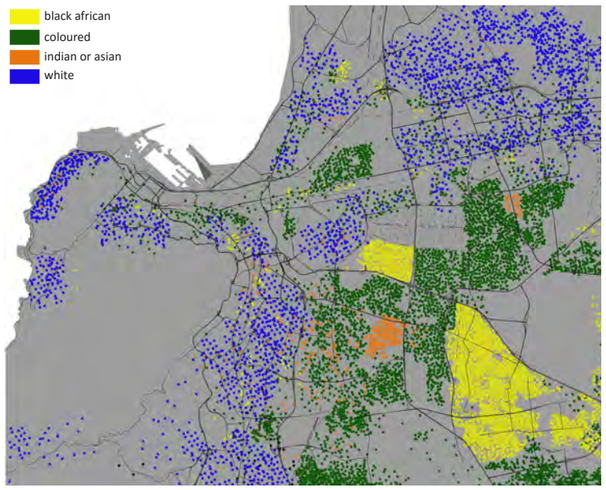


Figure 9 - The result of apartheid planning still evident today in a city which is racially segregated

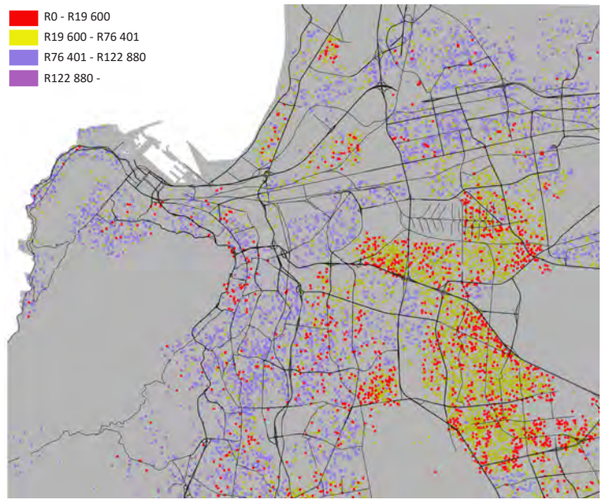


Figure 10 - Map showing the income divide in the city.

New thinking about the city

Residual space as a result of the neighbourhood planning model becomes a waste, especially in areas where space is limited. Although these spaces have in some instances been appropriated in alternative ways, they have mostly become an area filled with discarded rubbish in addition to a contributing factor in urban sprawl. Crisman (2006) questions how to construct publicness in marginalized space alongside high speed movement. This idea is carried through in Trancik's writings.

Trancik's (1986) "Finding Lost Space" refers to the notion of 'anti-space'. He highlights what he defines as anti-space, the most interesting example of which being the left over space alongside the freeway that is neither maintained much less used. The highways obsession for speed and safety rarely considers cultural significance, time and human experience (Crisman, 2006). However, the opposite of this is the case in the apartheid planning of Cape Town. The highway (and therefore residual spaces alongside it) were used as tools to separate the population according to class, race and culture, thereby limiting human experiences.

In addition to recognising these spaces in our city, the literature begins to highlight new thinking about the city. In particular, the post-apartheid planning agenda places emphasis on integration. The challenge at hand is how these residual spaces, created by the incisions that the highway scars the landscape with, can become spaces that promote access, and connect fragmented neighbourhoods. Crisman (2006) argues that designers should be receptive to these fragmentary, undervalued spaces. Her insight offers the opportunity for the making of city, architecture and landscape to coincide (Crisman, 2006). This idea presents the opportunity to not only rethink the idea of the road in our city, but also engage with a new reading of landscape.

Streets and Roads

Mossop (2006) reinforces the need for designers to engage with landscapes dominated by vehicles. Most solutions have banished the vehicles to subterranean underworlds but there are few realised projects where the reality of private transports convenience has been integrated with the idealised inhabitable spaces. This linking and layering of both scale and discipline could potentially start to stitch together the fragmented urban fabric.

Historically, the highway has divided the city into disconnected pockets of urban fabric. The highway falls under the category of the most specialised freeway, having almost no relationship to its environment. It becomes a corridor for the transit of vehicles only (Mossop, 2006). It provides mobility but inhibits access as there are very specific points at which one can get onto and off a highway. This project aims to rethink the role of some of the major transport routes, seeing them not just as providing mobility and speed for vehicles, but as integral and essential parts of the urban system. It questions if the highway or road belongs to infrastructure, or whether it can in fact be a vital part of the city. It looks at transforming a road into an urban street in the context of the specific site chosen - the intersection between Bonteheuwel and Langa. In this environment the design for vehicles dominates the design for pedestrians and yet the majority of the population do not own cars.

Streets should be multifunctional spaces that provide an ease of access. The streets that adjoin residual space however become the terminus of generalized use. Jacobs (1916) refers to these streets as border vacuums. These borders are formed alongside spaces with mono functional use, such as the railway or highway, and in turn start to simplify the use of the adjoining territory (Jacobs, 1916). As one moves away from these borders, there is a gradual increase in economic activity and the movement of people. In order to build connections, these borders should serve to intensify the productivity of areas. Jacobs (1916) refers to Lynch's writings which suggest that an edge can become a seam rather than a barrier if there is some permeability of sight and movement. It then becomes a line of exchange rather than a line of division. This begins to suggest an approach of how to go about transforming the borders of segregation into seams that stitch disparate parts together.

New reading of landscape

This project engages in two principal ideas in order to overcome the disconnect created by the highway. The first is to integrate the road into the urban fabric, and the second is to integrate the buffer zones alongside the road into the urban fabric. It questions the way in which vacant land has become a buffer in the city and aims to programme this landscape to ensure it becoming a useful amenity and therefore offer the potential of connection.

The site chosen offers this dual condition. It offers the opportunity to test to what extent the road can be transformed into a street as a connection between the neighbourhoods of Bonteheuwel and Langa, as well as the opportunity to inhabit the buffer zone with program and transform it into an active landscape. The site of intervention sits at the intersection of these two conditions.

As a precursor to the design intervention, strategies of connection were investigated through case studies.

SECTION TWO: Strategies of Connection

The case studies to follow were selected to aid in the design project by understanding the architectural principles employed in each. They present architectural ideas that have framed the thinking towards the design intervention. The case studies pay particular attention to an interest in the ground plane, how program is utilized, the reading of topography and level change, movement across the site and the way in which connections to the city are created. The nature of the design problem between Bonteheuwel and Langa calls for a layering of scale which makes it important to understand these spaces in relation to the larger urban context, as well as what the projects provide for people in the immediate context. These case studies also highlight the need to look towards a layering of disciplines, namely, urban design, architecture, landscape and ecology.

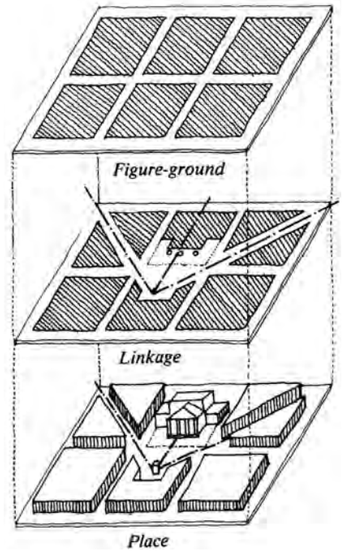


Figure 11 - Diagram depicting the urban design theories as put forward by Trancik (1986).

The case studies present varying strategies in addressing connecting fragmented parts of the city. Ponte Vecchio, and the Nyanga Shopping Centre are examples of physical bridging across infrastructure. The Olympic Sculpture Park and the Mill Street Bridge are examples of interventions over and under infrastructure, both utilizing residual space. As a precursor to these strategies, the urban design principles Trancik discusses are reviewed.

Trancik (1986) identifies approaches in Urban Design Theory to use as tools in trying to rectify bad urban form. The principles that he raises can be critically engaged with when addressing the problem of residual space. It is important to note that the context in which Trancik writes relates to formalist European ways of making space; space that is static, civic and monumental. This context is vastly different from the post-apartheid South African city. However, it is still of use to discuss the principles of the urban design strategies that Trancik puts forward to use as guiding principles in the design intervention (figure 11).

- The Figure Ground Theory engages with the patterns of relationship between solid mass and open void. This approach manipulates these relationships by adding to and subtracting from the urban form establishing a hierarchy of space.
- The Linkage Theory is derived from connecting one space to another, a system of connection or network structure is used to order the space. The emphasis is on the circulation diagram rather than the spatial diagram. Movement from one space to the next is used as the connecting tool.
- The Place Theory takes into consideration human needs, cultural, historical and natural contexts. In this approach the users control the immediate public environment.

To some extent the approach used in the design project draws on all three of these theories as shown in figure 12. The figure ground diagram highlighted the lack of relationship to the street as well as the discontinuous urban form. The urban form was added to in this case to achieve a better relationship. The linkage theory prompted looking at the site at the metropolitan scale and as a larger network rather than in isolation, and the place theory informed the program to accommodate the community's needs.

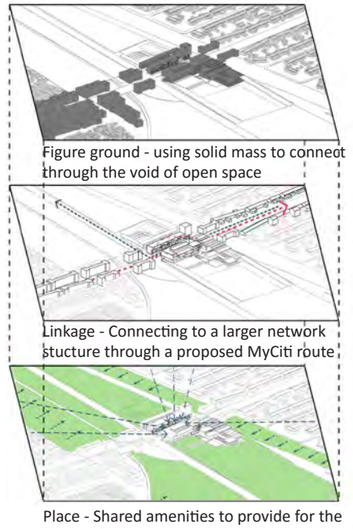


Figure ground - using solid mass to connect through the void of open space

Linkage - Connecting to a larger network stucture through a proposed MyCiti route

Place - Shared amenities to provide for the needs of the community

Figure 12 - Diagram adapting Trancik's (1986) urban design principles to the site of the design project.

Interventions across infrastructure:
Integrated Bridging: Ponte Vecchio, Florence

Figure 13 - Ponte Vecchio. The ground floor shops and living areas above are 'clipped' onto the side of the bridge, and the Vasari Corridor, inaccessible to the public runs along the upper most level.

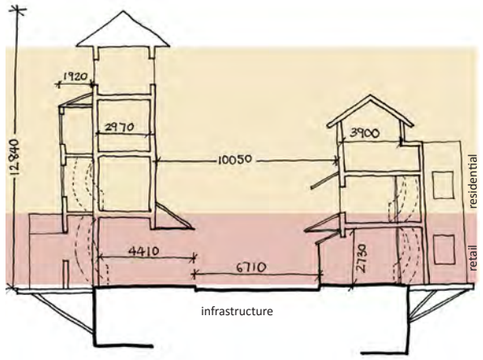


Figure 14 - Diagrammatic section through the Ponte Vecchio showing the retail activity on the ground floor and the residential component above.

Figure 15 - A view of the shops opening up onto the pedestrian activity. The bridge is a flawless continuation of the street.

The principles extracted from this case study that were useful for the design intervention were: the almost flawless continuation of the surrounding urban context, the layering of program onto what is usually a monofunctional space highlighting how infrastructure can become inhabited with the provision of density at the connection point, as long as it is a part of a series of connections in a larger system that penetrates deeply into the surrounding context. The street profile which creates the active street was also a technique appropriate for the question the design project aims to address.

Trancik (1986) discusses the design principle that he refers to as 'integrated bridging.' The Ponte Vecchio in Florence (figure 13) is a unique example of this strategy as it is a building that is a bridge and a bridge that is a building. Two functions are successfully integrated into one form. Trancik (1986) suggests that this principle can be applied when a barrier in the city fabric needs to be overcome. It is a method that can be used to create connections in order to retain spatial continuity (Trancik, 1986). Whilst the site conditions vary greatly to that of the Cape Flats, there are key principles in the Ponte Vecchio that aided the thinking about the design project intervention.

Ponte Vecchio is an extension of the street leading up to it (figure 15). This is achieved not only through its organisational space creating linear movement, but through the proportions of the bridge in section and elevation. The urban context surrounding the bridge is populated with shops, restaurants and apartments providing the density which aids in the high pedestrian movement in the area. Further density was provided in the original design of the bridge where houses, which were home to the shop owners below, hovered above the shops on the ground level (figure 14). The success of the bridge is attributed to this layering of multiple programming on to what could be considered solely as infrastructure.

The Ponte Vecchio is truly articulated as part of the city. It becomes much more than a point at which to cross the river. Trancik (1986) refers to the Ponte Vecchio as an example of an uninterrupted mesh of activities in public space where the bridge becomes part of a system of pedestrian networks which is augmented by buildings. A connection is created as the bridge is a main link between two prominent tourist attractions - the Uffizi Gallery which used to serve as the government's headquarters and Pitti Palace, the residence of the ruling family. Ponte Vecchio's upper storey forms part of the elevated passageway which enabled the ruling family to move freely between the two destinations.

Nyanga Shopping Centre, Cape Town

The Nyanga shopping centre is located at a point of divide in the city, between the neighbourhoods of Gugulethu and Manenburg in Cape Town (figure 16). The development intended to serve and empower people who were previously denied access to convenient shopping and business facilities. Of interest to the design project was the way that the Nyanga shopping centre has made connections; physically, over infrastructure that segregates the neighbourhoods, as well as through income and program, and socially in the way in which the project was approached and developed. Similarly to Ponte Vecchio, Nyanga shopping centre layers program onto what could be a monofunctional piece of infrastructure.

The building was to bridge the traditional divide that is reinforced by buffer zones of road and rail between the black communities to the east and coloured communities living west of the train station (Nuttall, 1995). The brief of the project was to provide a structure that houses major retailers, both regionally and nationally, alongside local traders of the informal sector. The site lies in left over space between the railway line and main road, and is accessible from the N2.

Community involvement was key to the success of the project. Through its process the project brought different organisational bodies together. The building provides a common social experience to the surrounding communities in a politically neutral environment (1994).

The Nyanga station is a hub of activity with its 35000 daily passenger movements (1994). There has always been commercial activity at this point of interchange and these entrepreneurs have been accommodated for in the new building. The development provides varying scales of retail, enabling the up and coming businessman to increase in stature and permanence therefore providing the opportunity to bridge income divides.

Figure 16 - Aerial view of Nyanga shopping centre.

Figure 17 - The understated interior of the shopping centre acts as a backdrop to the identities of the traders, shoppers and the resulting social interactions.

Various clues were recognised in the Nyanga Shopping Centre that were useful for the intervention between Bonteheuwel and Langa. The sites share similar physical attributes. Both are located in buffer zones that are a result of infrastructure, and that are within easy access of the N2. They are also both located between historically different cultural groups as a result of apartheid segregational planning. Nyanga is located on an existing transport interchange, whilst the intervention between Bonteheuwel and Langa proposes a new MyCiti route to enable connections through a larger network. The shopping centre strives to humanise the commuter's experience through the use of broad staircases, open spaces and large volumes. The connection being made in the design project also aims to prioritize the pedestrian through its interest in creating an edge. The form of the roof of the Nyanga Shopping Centre (in comparison to its immediate context) gives the centre a clear identity within a fairly monotonous surrounding urban fabric. This prompted the thinking towards creating a landmark in order to form an identity for the design project intervention. A program that brings people together while enhancing economic opportunity also led to an interrogation of the program needed in the design intervention.

Interventions over and under infrastructure
Landscape Urbanism: Olympic Sculpture Park, Washington

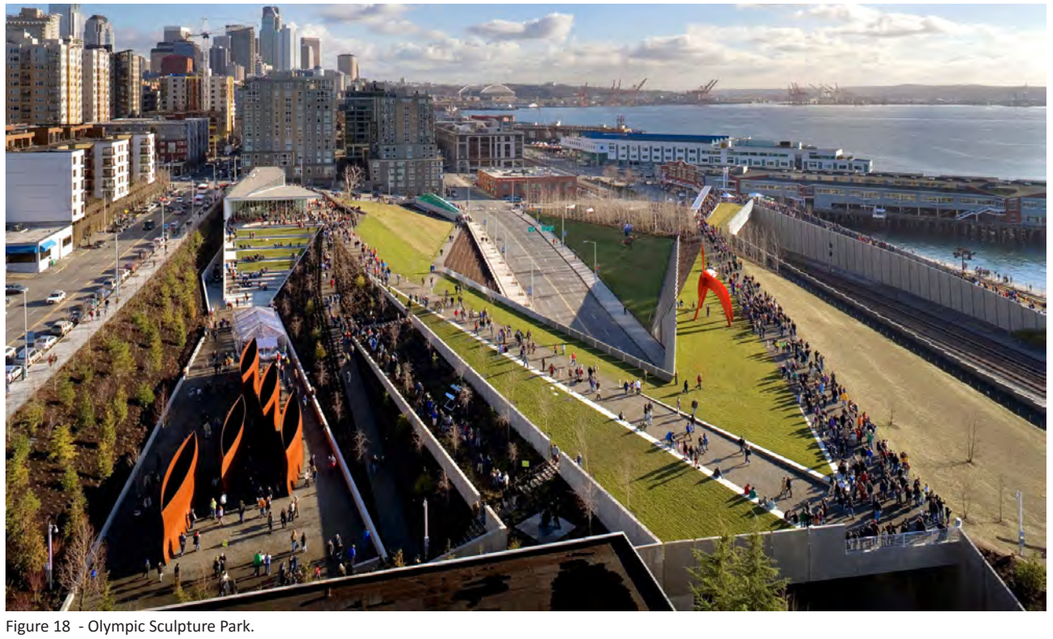


Figure 18 - Olympic Sculpture Park.

The Olympic Sculpture Park in Seattle by Weiss Manfredi Architects is an interesting example as it becomes a hybrid of two systems, both working parallel and perpendicular to existing infrastructure (figure 18). Its foundation in landscape urbanism presents this approach as an option worth considering in the South African context. Landscape urbanism suggests using landscape as a connective tissue. The relevancy of the case study lies in the fact that it intervenes alongside movement infrastructure. It uses residual space to connect three parcels of land that are a result of the road and rail, as well as reconnecting the city and the waterfront. All of these are conditions that need to be addressed in the design project. The use of a ramp as a mediating device between varying conditions was also of interest to the design project. The intervention begins to answer Crisman's (2006) question of how publicness can be constructed on the margins of high speed movement.

Landscape urbanism uses the horizontal surface to stitch the city back together. According to Waldheim (2012) landscape urbanism emerges as a useful framework in addressing sites of abandonment that cause social isolation. Landscape urbanism provides new-found relationships between the professional disciplines of architecture, landscape and urban design.

The landscape of the Olympic Sculpture Park links three indigenous Northwest ecologies: an evergreen forest, a deciduous forest, and the shoreline which includes a series of tidal terraces for salmon and salt water vegetation. Landscape urbanism layers ecological processes with the social and cultural needs of a community. The starting point is the underlying elements that influence the formation of a city, the geology, topography, rivers, and climate. Landscape urbanism suggests there should be a relationship between these underlying structures of topography and the major structuring elements of the city (Waldheim, 2012). This idea is reiterated in Mcharg's argument that development should respond to the operation of natural processes (McHarg and Mumford, 1969). The design of the Olympic Sculpture Park has understood the ecology of the site, and this has been integral in the design process.

In Pollak's essay, "Constructed Ground: Questions of scale", she speaks of architecture not as an object, but rather as a device that can transform the landscape. This idea works with the ground itself to use the landscape as a material to rethink urban spaces (Pollak, 2006). The simultaneity of scales that is present in the Olympic Sculpture Park shifts the identity to become architecture, city and landscape.

The reclamation of degraded urban sites, or residual space resonates with the landscape architect Corner's consideration that the reclamation of landscapes is a critical cultural practice. According to Huber (2008) conceptualizing landscapes as an artefact will aid in saving sites of neglect. Rethinking of the mono-functional realm of infrastructure, designers need to engage with the landscape of infrastructure, spaces along and underneath highways (Pollak, 2006).

The way in which the Olympic Sculpture Park touches the ground is a response to the natural topography of the site. The artificial landscape grows out of the ground using the ramps as the gradual transition between city and waterfront. The ramps negotiate the level change of the existing topography of about 12m from the top of the site to the water's edge. This results in an elongated pavilion building from which the pathway descends. Program is utilized to attract people as well as activate the space. An exhibition pavilion provides a space for art, performance and educational programming. This way the program accommodates for the everyday, and the event; the permanent as well as the temporary. The success of the project could be attributed in part to the high density of the surrounding context which provides the increased foot traffic in the area.

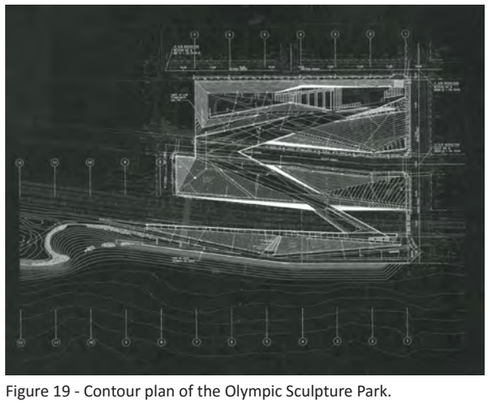


Figure 19 - Contour plan of the Olympic Sculpture Park.

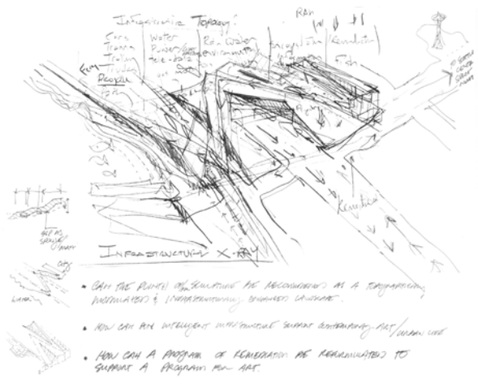


Figure 20 - Concept sketch of the Olympic Sculpture Park.

Figure 21 - Conceptual model of the Olympic Sculpture Park. The zigzag form connects the three parcels of land.

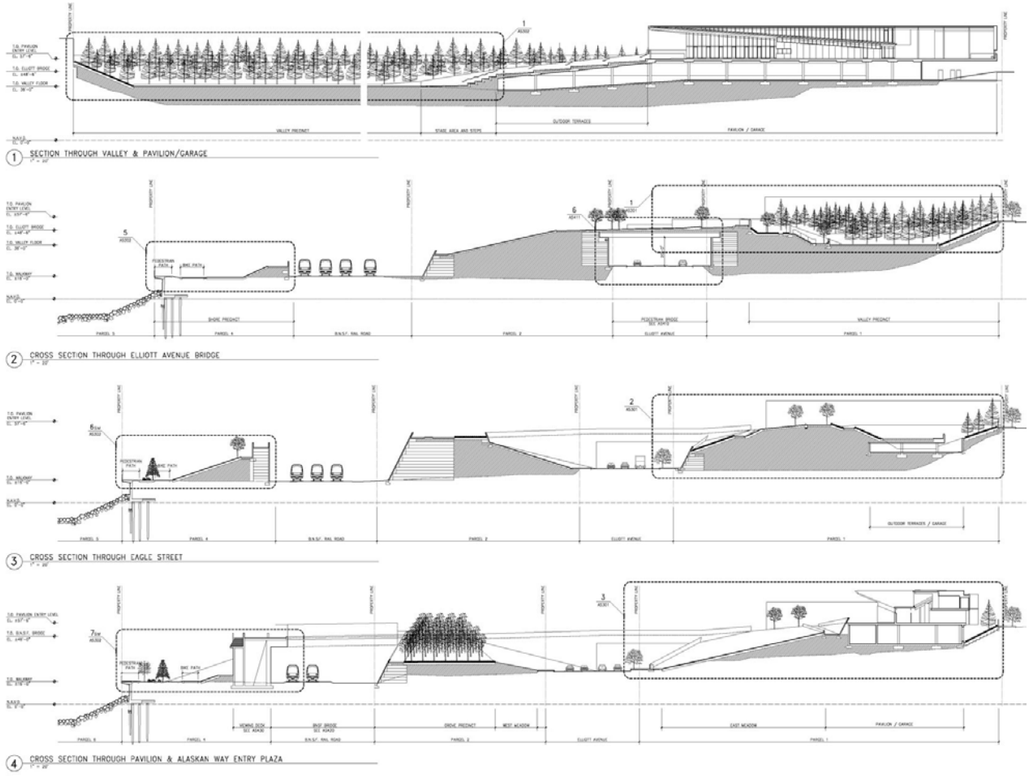


Figure 22 - Various sections through the Olympic Sculpture Park highlighting the relationship between the intervention and its topography.

The topography and level change of the site assists in the gentle transition of ramps across the site (figures 19 and 22). The point of crossing is layered with program, similar to the Ponte Vecchio, and proves to be successful in attracting people and making it a more functional space. The awareness of and interaction with the ecology of site, anchors the design in the unique site conditions.

Although the site conditions of the Olympic Sculpture Park, in particular the topography, vary greatly to the chosen site in the Cape Flats, my interest lay in the ramp as a mediating device. This gave clues on how to develop the conceptual idea of the transition between building and landscape in the design project intervention. Whilst a natural level change is not evident in the Cape Flats, the mode of subtle movement lends itself to landscaping techniques as an approach that can be adapted through the manipulation of the ground plane.

Mill Street Bridge, Cape Town

The skate park under the Mill Street Bridge in Cape Town CBD was a result of the Building Trust International PLAYscapes competition. The competition aimed to propose ideas which encouraged public interaction and turned redundant city spaces into a fun ‘playscapes’. It looked to integrate function, structure, details and the needs of those living in urban areas. The City of Cape Town submitted the Gardens Skate Park design which transforms a derelict, forgotten slice of land that is left over space as a result of infrastructure, into a positive place of play.

Similar to the Nyanga Shopping Centre, the project complements a public transport hub. The BRT station enables the skate park to be easily accessible to skaters from other areas. The architects and planners worked closely with local skaters to determine their needs and preferences. The project not only benefits the skaters, but the general public as the space is now well lit and occupied rendering it a safer space especially at night.

This project is an example of how design can make connections in the city, even on a small scale. By introducing a specific program that will be appropriated in the area, it utilizes left over space in the city, and transforms it into a productive space. It is easily accessible due to the BRT station including it in a larger network of connections.

Figure 23 - Image of the residual space underneath the highway (before).

Figure 24 - Image of what the residual space became (after).

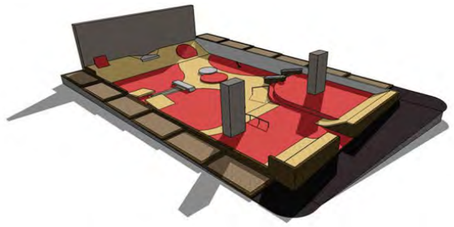


Figure 25 - 3d rendering of skate park.

Figure 26 - The proposal for the skate park.

Design Project Site

The choice of site was based on an interest in testing the two principal ideas of connection; that of transforming a road into an urban street, and the idea of transforming a buffer zone into an active landscape. The chosen site, at the intersection along a highway, offers both these conditions with the proposed architecture being at the point where the urban and landscape meet.

The site is along a main North South connector in Cape Town (figure 27). The highway, Jakes Gerwel, provides a border to the residential neighborhoods of Langa and Bonteheuwel. It is a prime example of how neighbourhoods were bound by infrastructure during apartheid planning which reinforced urban segregation.

Both Langa and Bonteheuwel have limited access points at which you can enter the neighbourhood (figure 28). This was in order to control any uprisings during apartheid. Recently, a new point of entry has been made into Langa making the new Joe Slovo housing development around its borders more accessible. This connection, from the intersection on Jakes Gerwel Drive, links up with the main arterial roads in Langa and Bonteheuwel. The intersection is a desolate environment in between vast expanses of open space. This, as well as the reduction in speed of the cars, renders it a popular smash and grab area resulting in the metro police being stationed at the intersection twenty four hours a day.

Alongside and in between the highways are vast expanses of the buffer zone and road reserve. At present these areas are utilized as short cuts and soccer fields as well as accommodating urban sprawl.

A mapping exercise assisted in understanding the geographical spread of existing public facilities in both Langa and Bonteheuwel (figure 29). These facilities were mapped with their 400m walking distance radius. This exercise highlighted the lack of public program in the immediate area of the site. Of particular interest to the design project, was the position of the sporting facilities in both areas, as well as the number of schools in close proximity to the site.

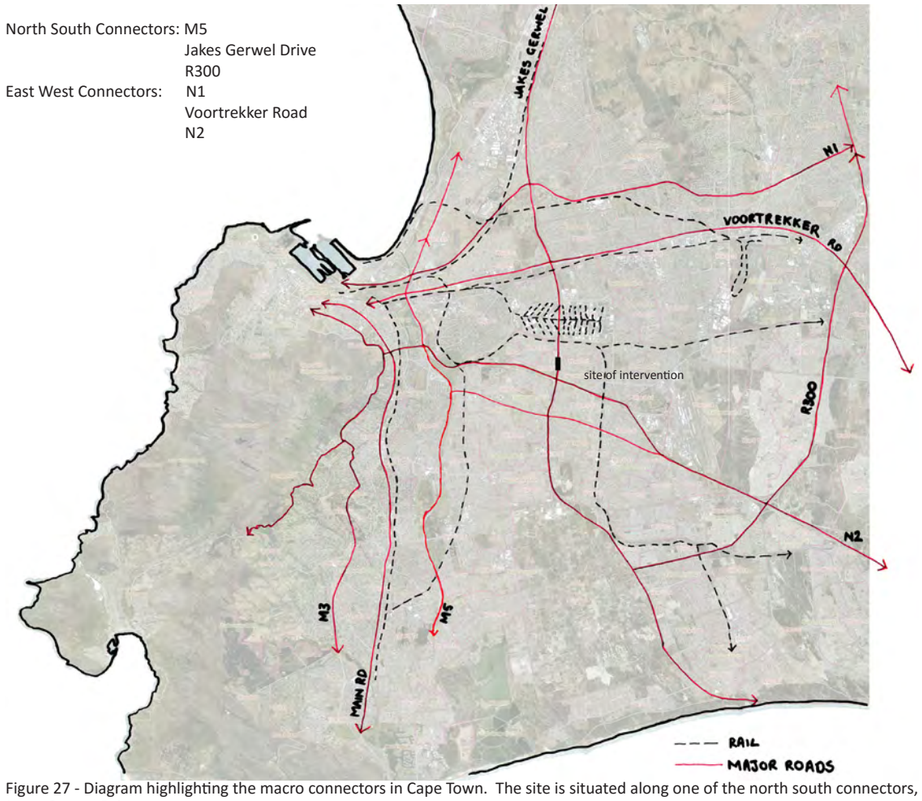


Figure 27 - Diagram highlighting the macro connectors in Cape Town. The site is situated along one of the north south connectors, Jakes Gerwel Drive.

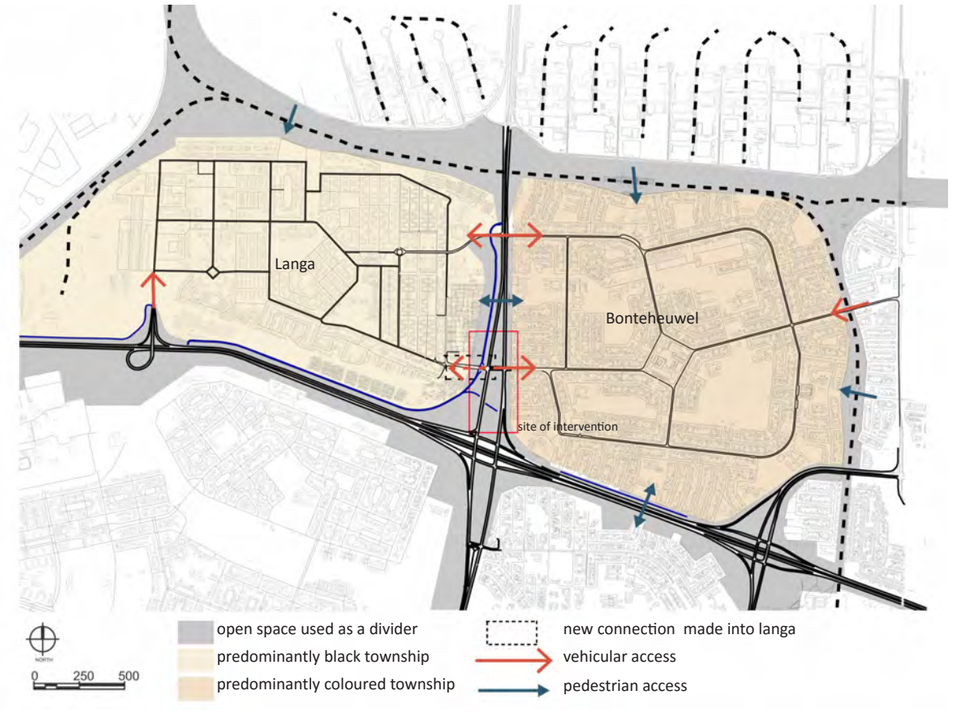


Figure 28 - Diagram of Langa and Bonteheuwel highlighting how they exist in separate entities due to infrastructure and open space borders.

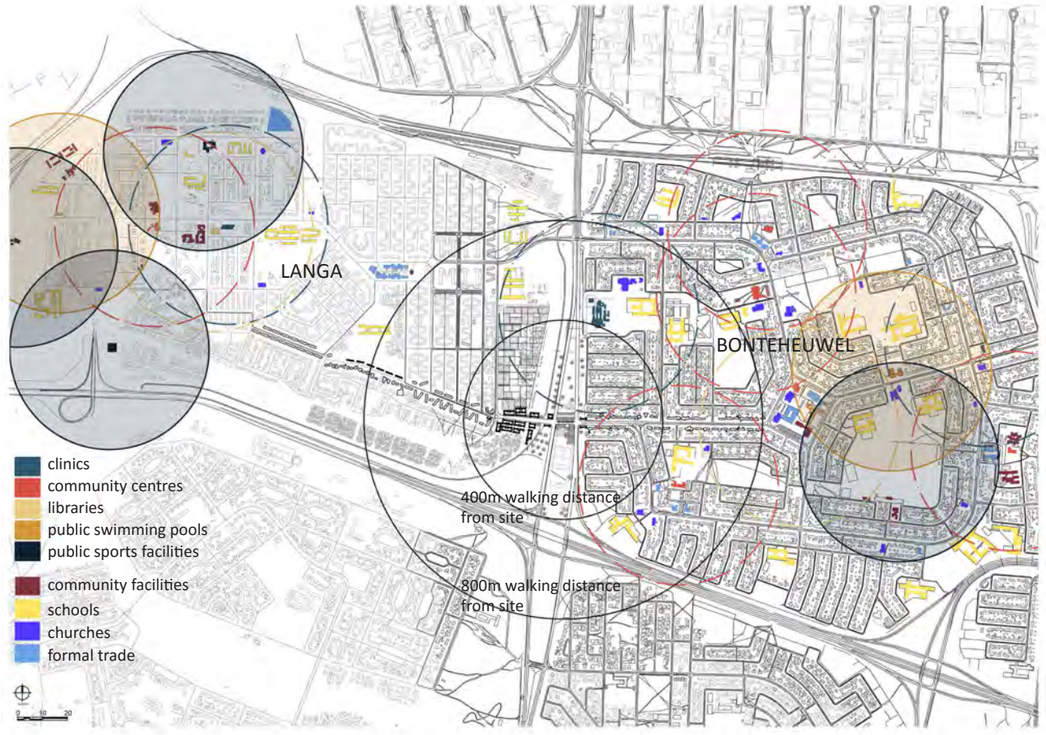


Figure 29 - Map of existing facilities in Bonteheuwel and Langa, and their 5 min walking distance radius of 400m. The shaded circles show the existing sporting facilities highlighting their absence (as well as other public facilities) along the border between the two neighbourhoods.

Figure 30 - Existing site conditions.

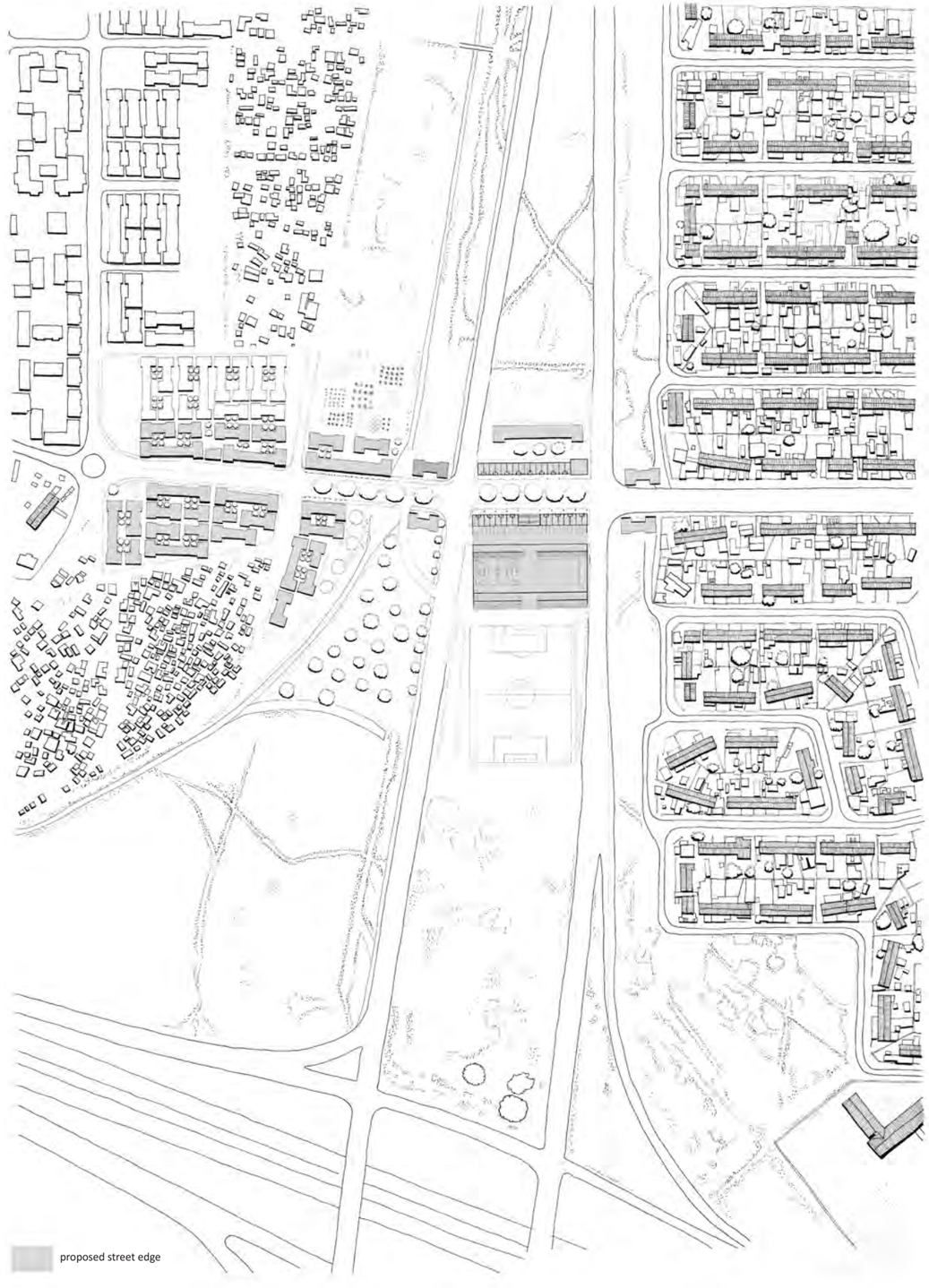


Figure 31 - Context drawing of site highlighting the street being made. (Design superceded)

Brief Background of Context

Langa is the oldest black African township in Cape Town, with its construction in 1923. It was designed to house migrant workers largely from the Eastern Cape where the predominant cultural group are the amaXhosa. Langa's design was based on key elements of the Garden City Movement, having a civic commercial centre, a central avenue extending from a central square, and the development of cul-de-sacs (Coetzer, 2009).

Figure 32 is a collage of the activity that happens on the main avenue, Washington Street in Langa. Washington Street connects the two entry points into Langa from east/west. The opportunity that this well connected street offers is evident in the way it has been populated. This, in addition to its close proximity to the taxi rank creates an active street. The pavements come alive with the selling of clothes and fruit, as well as the temporary structures erected to shelter the chesanyama traders. The number of spaza shops around this precinct and along the central avenue capitalize on the opportunity of increased pedestrian movement.

Similarly, Bonteheuwel is geographically the centre of Cape Town despite its hard infrastructural boundaries. It was one of the first coloured townships under the apartheid regime, with people being relocated from other areas of Cape Town such as District 6, Bo Kaap and Woodstock to Bonteheuwel. Housing construction begun in the 1960s, and its design was based on the neighbourhood model. It consists of four major clusters with a central business district. Whilst the neighbourhood model advocates walkable distances, Bonteheuwel favours the vehicle, creating a place not primarily for the pedestrian. It borders the industrial area of Epping, with the original (apartheid planning) intention that people live in Bonteheuwel and work in Epping. The influence of modernist planning is evident in the fragmented urban fabric due to the separation of the functions of the city. The majority of the urban fabric consists of single storey row houses, with double storey maisonettes added later by the government in the pan handles between the row houses. The backyards are populated with informal dwellings.

Figure 32 - Collage of the activity in Washington Street.

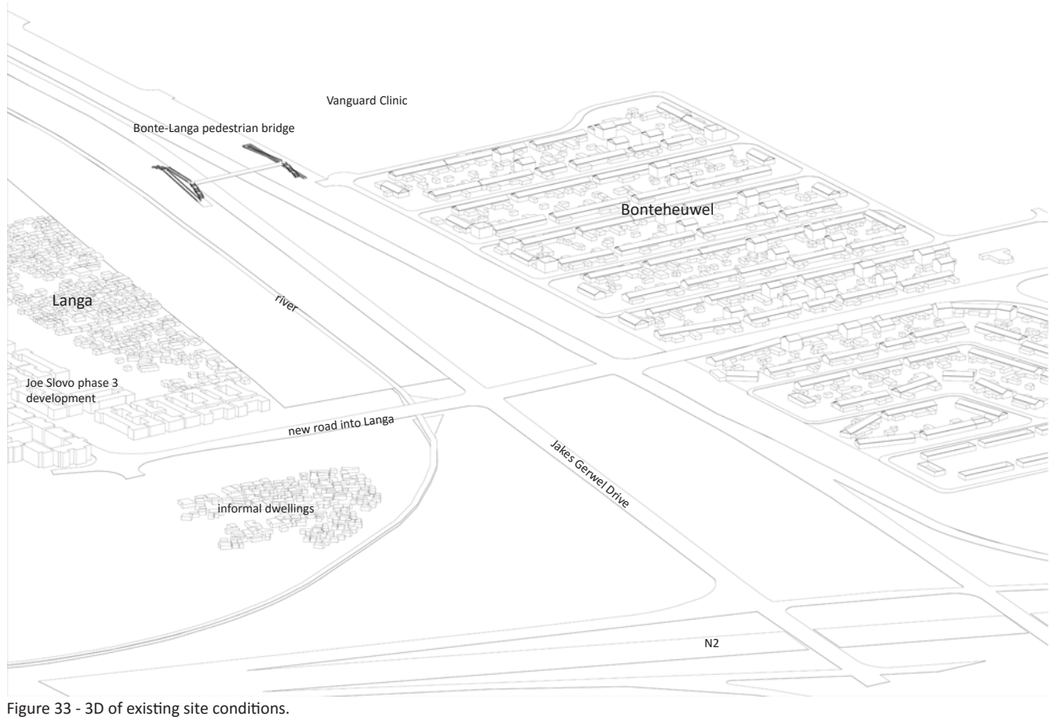


Figure 33 - 3D of existing site conditions.

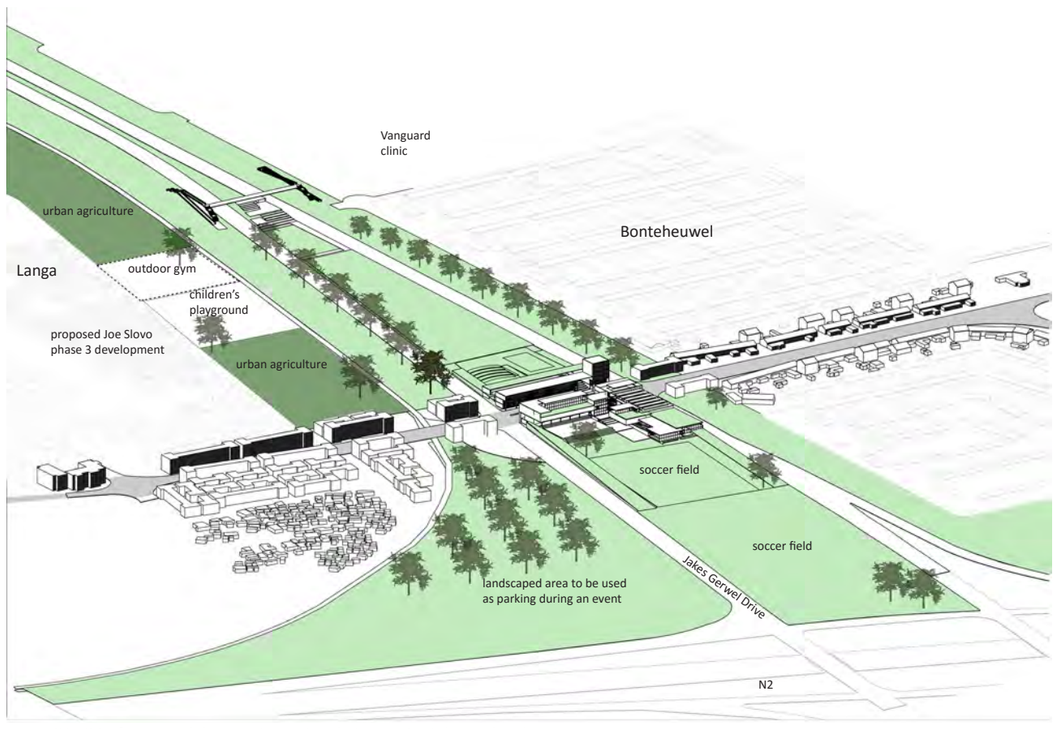


Figure 34 - 3D of proposed design intervention between Bonteheuwel and Langa.

SECTION THREE - The Design Process

Project Principles

This section is divided into two sub sections. The first unpacks the strategies of connections and the second describes the prominent design ideas in the building such as blurring the boundary between building and landscape, mitigating sound, exploring how the building meets the ground and programming the roofscapes.

The design project adopts nine principles that have assisted in framing the intervention between Bonteheuwel and Langa. It investigates creating a connection through the following approaches;

- Programming the land: A new reading of landscape suggests that the vacant land created by buffer zones alongside the highway is programmed in order to create a productive landscape.

- Activating the street: By creating a pedestrian friendly environment potential economic connections arise.

- A larger network: Re-routing the MyCiti enables economic opportunities to increase along the length of the proposed route.

- Integrating land use: Currently zoned as open space and transport, these buffer zones have the potential to accommodate civic program.

- Densification: In order to continue the 'everyday' residential fabric is used to bridge the gap, it also provides the density needed to support the civic program.

- Cross-programming: The choice of program seeks to accommodate the wider public. A variety of programs create diversity of use.

- Shared amenities: The building is located in close proximity to eight local schools, offering the opportunity to share resources that the schools may not be necessarily be able to provide on their own.

- Supporting livelihoods: The residential model, new street related retail and agricultural farming offer economic opportunities.

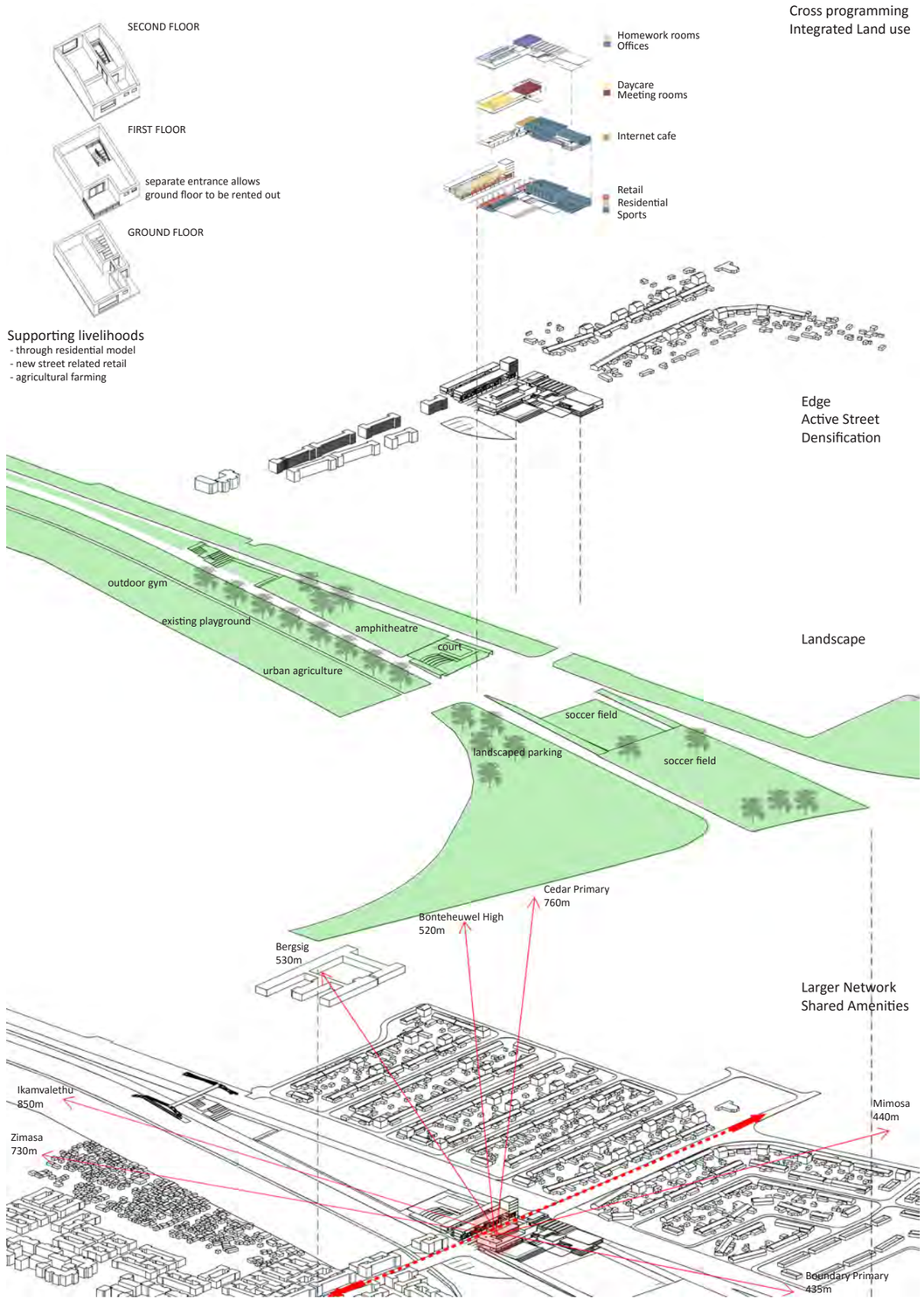


Figure 35 - Diagram highlighting the strategies of connection.

Programming the Land

A new reading of landscape suggests using the land as a connective tissue. By retaining this green lung, the buffer zones have the potential to be transformed into productive landscapes; becoming relevant green space. Instead of being a divider, this landscape offers the potential of connection and is programmed through urban agriculture, sports facilities and recreational space (figure 36).

The electrical servitude renders the land alongside the river unviable for further expansion, but appropriate for urban agriculture. The high density Joe Slovo phase 3 development overlooks this stretch of land providing surveillance and security. The vast expanses of road reserves lends itself to, and is presently being used for sports. Informal soccer games occur alongside the highway and the provision of facilities; change rooms, toilets and landscaped seating for this, was an initial program idea. The idea of including sport seemed an appropriate program to bring communities together. Next to the existing children's playground is an open space that is used for exercise. An outdoor gym has been proposed and is intended for adults to use while supervising the children in the playground. An amphitheatre, small skate park, and basketball court are in close proximity to the residences and are available for use by the general public.

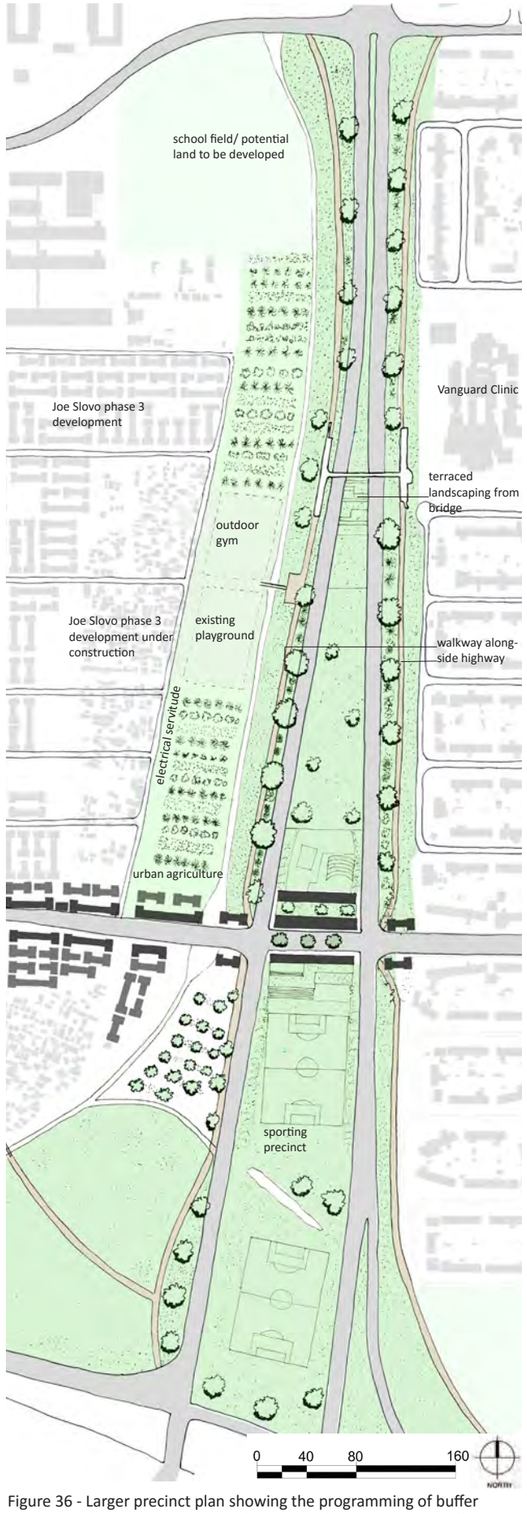


Figure 36 - Larger precinct plan showing the programming of buffer zones in order to create an active landscape. (Design superceded).

Activating the Street

By creating an active street between Bonteheuwel and Langa, the 'road' becomes a more pedestrian friendly environment allowing for potential economic activity. Creating an edge in an area consisting largely of vast open space, was an initial design consideration.

The Joe Slovo Phase 3 housing development on the border of Langa, is a housing typology based on backyard courtyards and internal streets. It is proposed that this successful typology be extended to the road in order to create a street edge. The housing typology would be adapted slightly as the units closest to the road have different economic opportunity to those situated elsewhere in the development. The sections shown in figure 37 present the different edge conditions at various points along the new street. Where the street is narrowest the units are denser. As the street progresses to the civic space, where the road is at its widest and the scale announces the change in function, the edge starts to accommodate varying activities. The edge at this point creates a street profile that is made up of seats in the shop fronts and residential units that overlook the street. Figure 42 begins to unpack the threshold between the street and the building's edge. An additional parking lane is added in order to further reduce the speed of the traffic. The large

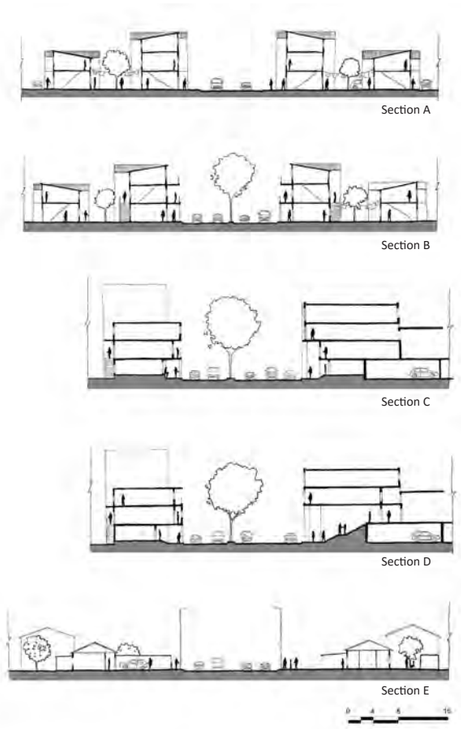


Figure 37 - A series of sections through the varying street edge conditions.

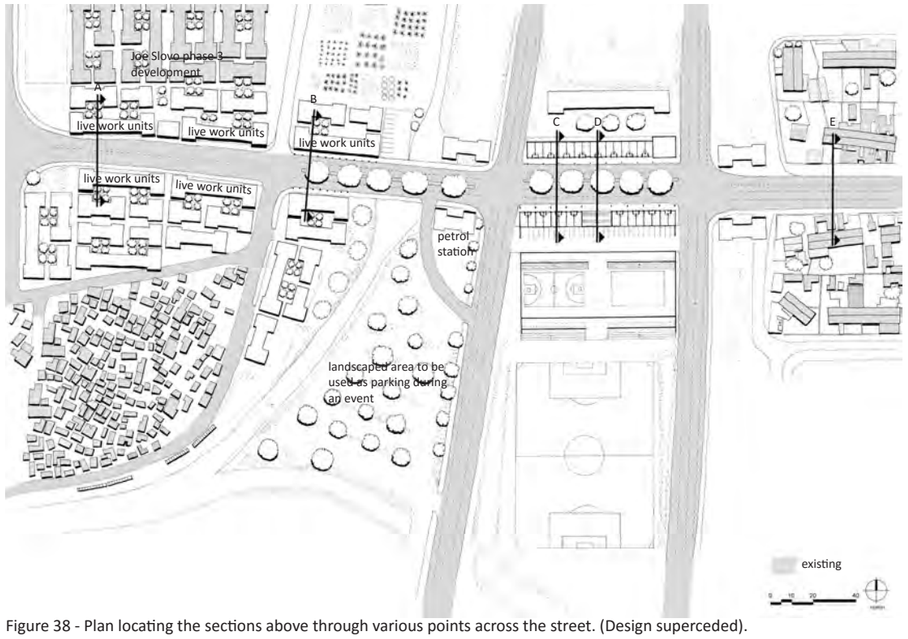


Figure 38 - Plan locating the sections above through various points across the street. (Design superceded).

columns provide the necessary civic scale as well as a transitional space that also becomes an opportunity for informal trade. The edge then continues into Bonteheuwel with the extension of the residential fabric at a higher density than the current single storey row houses that are interrupted with double storey maisonettes.

In order to enhance this primarily pedestrian environment, the intersection of the road is to be slightly raised to the same height as the side walk, and paved in order to slowdown vehicles. Further along the street the sidewalk continues across the road giving priority to the pedestrian (figure 39). Planting in the centre of the street and along the sidewalks adds to the pedestrian character.

On the corner of the highway and the street, a petrol station is proposed (figure 39). This decision was based on the lack of the petrol stations in both Bonteheuwel and Langa, as well as the economic value its presence would add to the project. Above the petrol station would be residential units in line with the intention of providing edge and density. The petrol station is ideally situated for vehicular traffic en route to the industrial area of Epping. Adjacent to the petrol station is a landscaped area that provides parking in the case of an event for the sports facilities.

Included in the larger proposed scheme, however not directly focused on in the design project, is the inclusion of a vertical element (figure 40). This 'tower' sits proud of its surroundings and is intended to read as a landmark, giving the precinct identity in the horizontal landscape. This building would also be programmed with civic use and ideally a 24 hour program in order for the tower to be a beacon at night providing additional surveillance to the residential building alongside it.

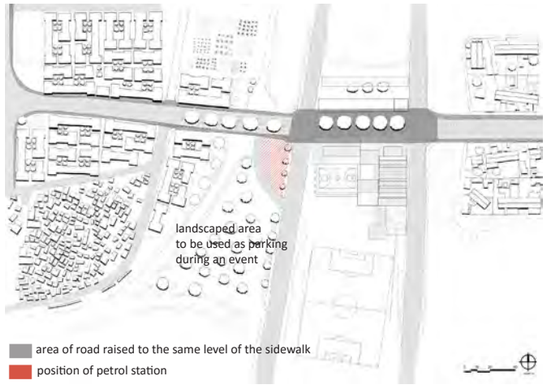


Figure 39 - Diagram highlighting the surface treatment of the road in order to achieve a more pedestrian friendly environment.

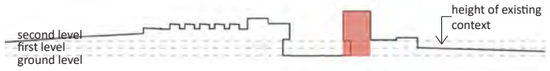


Figure 40 - Diagram highlighting the tower as a vertical element in the low density surrounding context.

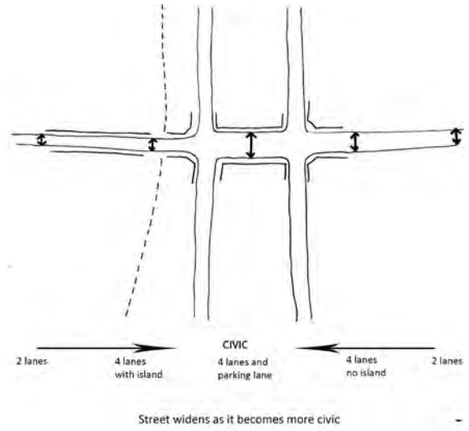


Figure 41 - Diagram explaining the widening of the street. This is unpacked further in figure 42.

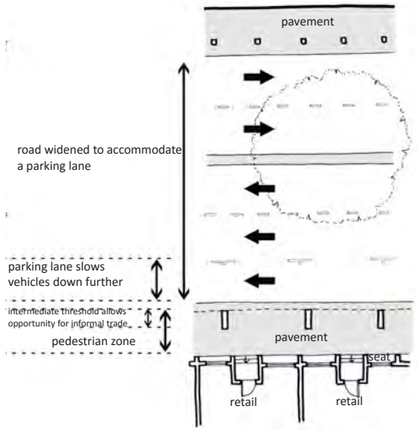


Figure 42 - Diagram explaining the threshold of the street edge. The widening of the street allows for a lane of parking which further reduces the speed of the vehicles enhancing the pedestrian environment.

Figure 43 - View of the active street. The creation of street edge is through the consideration of the pedestrian. The edge that holds the street opens up to the entrance of the sports centre (as seen on the left). (Drawing superceded).

Figure 44 - Diagram explaining the proposed route of the MyCiti bus.

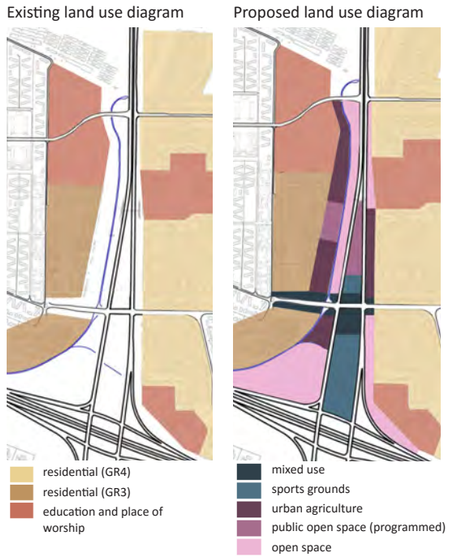


Figure 45 - Diagram explaining the proposed land use.

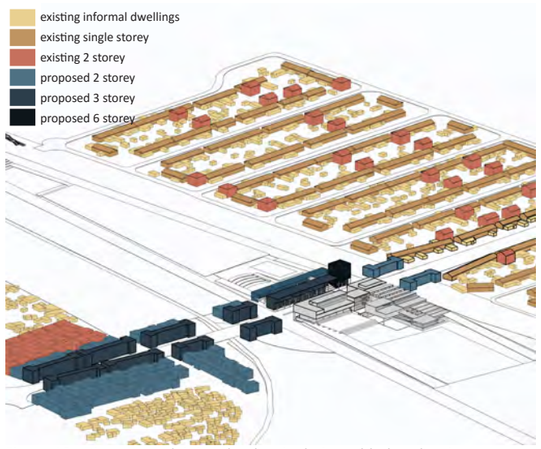


Figure 46 - Diagram explaining the density being added to the site.

Larger Network

At the metropolitan scale, in order to break the enclaves created by apartheid planning, a MyCiti route is proposed (figure 44). This route would facilitate not only the two communities of Bonteheuwel and Langa, but would increase accessibility along its length. The architecture responds to this proposal by incorporating a bus stop at the intersection of intervention.

Integrating Land Use

In the buffer areas, which are zoned transport or open space, are large areas of left over vacant land. By integrating civic program beneficial to both communities, as well as a residential component and facilities that enable a transport route, the variety of use has the potential of creating a vibrant space instead of a mono-functional piece of infrastructure (figure 45).

Densification

From the case studies reviewed, density was clearly needed to support the connection. Both the Ponte Vecchio and the Olympic Sculpture Park were situated in dense urban fabric; the high pedestrian movement attributing to their success. The highway has caused a barrier to the continuation of the urban fabric; the everyday, resulting in a break in density. In order to continue the 'everyday', residential fabric is used to bridge the gap (figure 46). The proposed housing typology increases the density that enables a high pedestrian movement and its presence allows for there to be twenty four hour surveillance over the street preventing it from become inactive at night.

Jacobs (1916) reiterates the fact that the population concentration ought to be made deliberately high and diverse near borders. She suggests that programmes intended for public use be placed at strategic points on their perimeter in order to make a border more like a seam than a barrier. The opportunities for these left over spaces created by infrastructure lie in the fact that while they are borders and barriers, they also provide transitions and intersections between enclaves of the city (Shukla, 2013).

Cross Programming

The primary program of the building is a sports centre providing facilities for the soccer activities that presently happen in the buffer zones. The benefit of cross programming is that the facilities will also appeal to the wider public. The café at the entrance accommodates the passerby, as well as contributing to the making of street, the retail provides economic opportunity on an active street, and homework rooms provide a shared amenity for the nine schools in close proximity. The internet café is a resource useful to both school children as well as the general public and the housing component provides eyes on the street. The daycare offers a service for the community and meeting rooms are available to the community for use (figure 47).

Shared Amenities

In close proximity to the intervention are nine local schools (figure 48). Whilst the schools have their own fields, a general trend is that the school has been fenced off from the field. The reason for this is that they do not have the resources to maintain these fields and the open space has become dangerous. The courtyard of the school is utilized for any outdoor activity limiting the types of sport that can be played. In light of this, the sports centre is intended to become a resource shared between the schools, and provides afternoon activities that are generally lacking in the schools in both areas. During earlier design projects in the area, it became apparent that the time period from when school closes until the parents return from work was 'troublesome' as the students are unattended. The sports centre, homework rooms and internet facilities could potentially bridge this gap. The large hall that accommodates several indoor sports can also be hired by the community for events.

Supporting Livelihoods

The residential model is designed in way to accommodate the conversion of the ground level into a spaza shop as well as being used as a garage. The dual entrance also allows for the ground floor to be rented out separately (figure 49). The new street related retail as well as the agricultural farming offer economic opportunities.

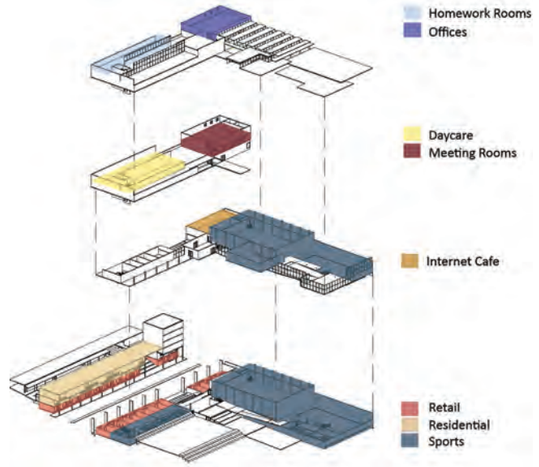


Figure 47 - Exploded axonometric highlighting the program of each level of the building.

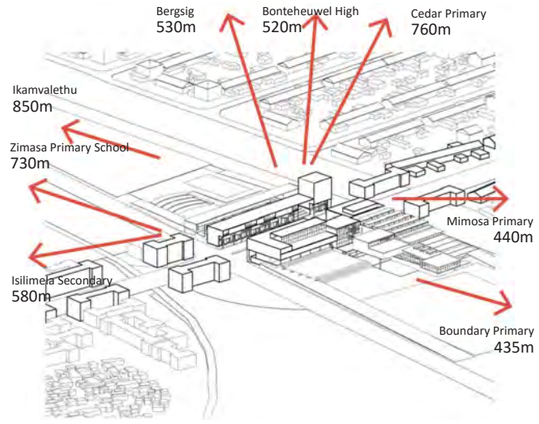


Figure 48 - The sports centre in relation to the surrounding local schools.

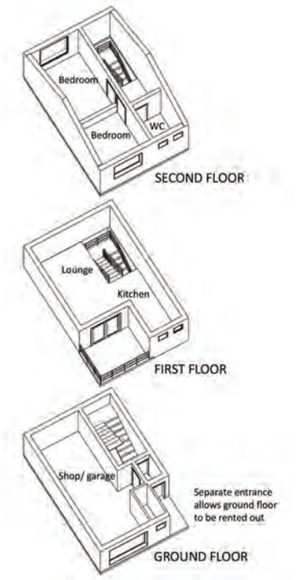


Figure 49 - The housing typology of the live work units highlighting its adaptability through the entrance threshold.

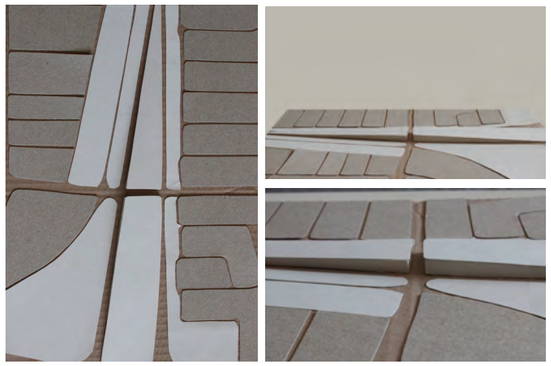


Figure 50 - Conceptual model highlighting that from above the project is read as a part of the landscape but that in section it is creating a street edge.

Figure 51 - An initial conceptual model that created raised walkways above the street. The idea of a vertical element and the stepping down of the building from street edge to landscape is still prevalent.

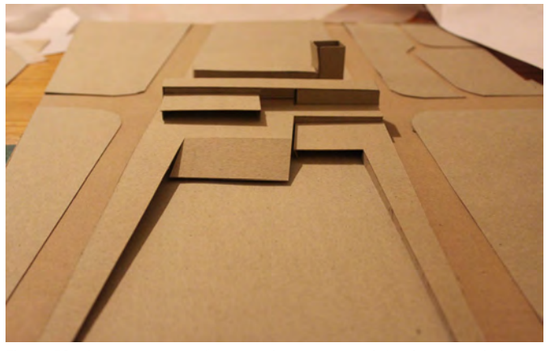


Figure 52 - A development of the previous model, reinforcing the building growing out of the landscape.

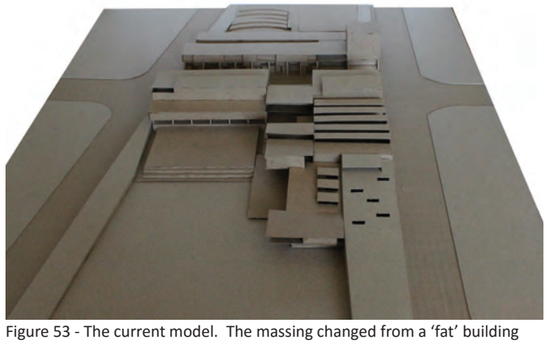


Figure 53 - The current model. The massing changed from a 'fat' building to a long narrow building in order to create 'outside rooms', for the ramps to gain enough length, and for the span of the indoor court roof to be in the correct direction to let in south light.

Design Ideas

Blurring the boundary between building and landscape

As the building sits where the urban edge, and the landscape meet, it was important to design the building as a transition to the landscape. Taking cues from the Olympic Sculpture Park, where a ramp navigated the artificial topography, a ramp becomes the mediator between inside and outside, and between the internal topography of the building's varying levels. The conceptual idea developed so that the landscape continues from the field through the buildings on either side of the street. It is expressed in varying forms in the project; planted roofs, outdoor areas, terraced seating, shading on the facade and planting in the streets.

Figures 50, 51, 52 and 53 show a series of conceptual models developing the idea of the transition from the building to the landscape.

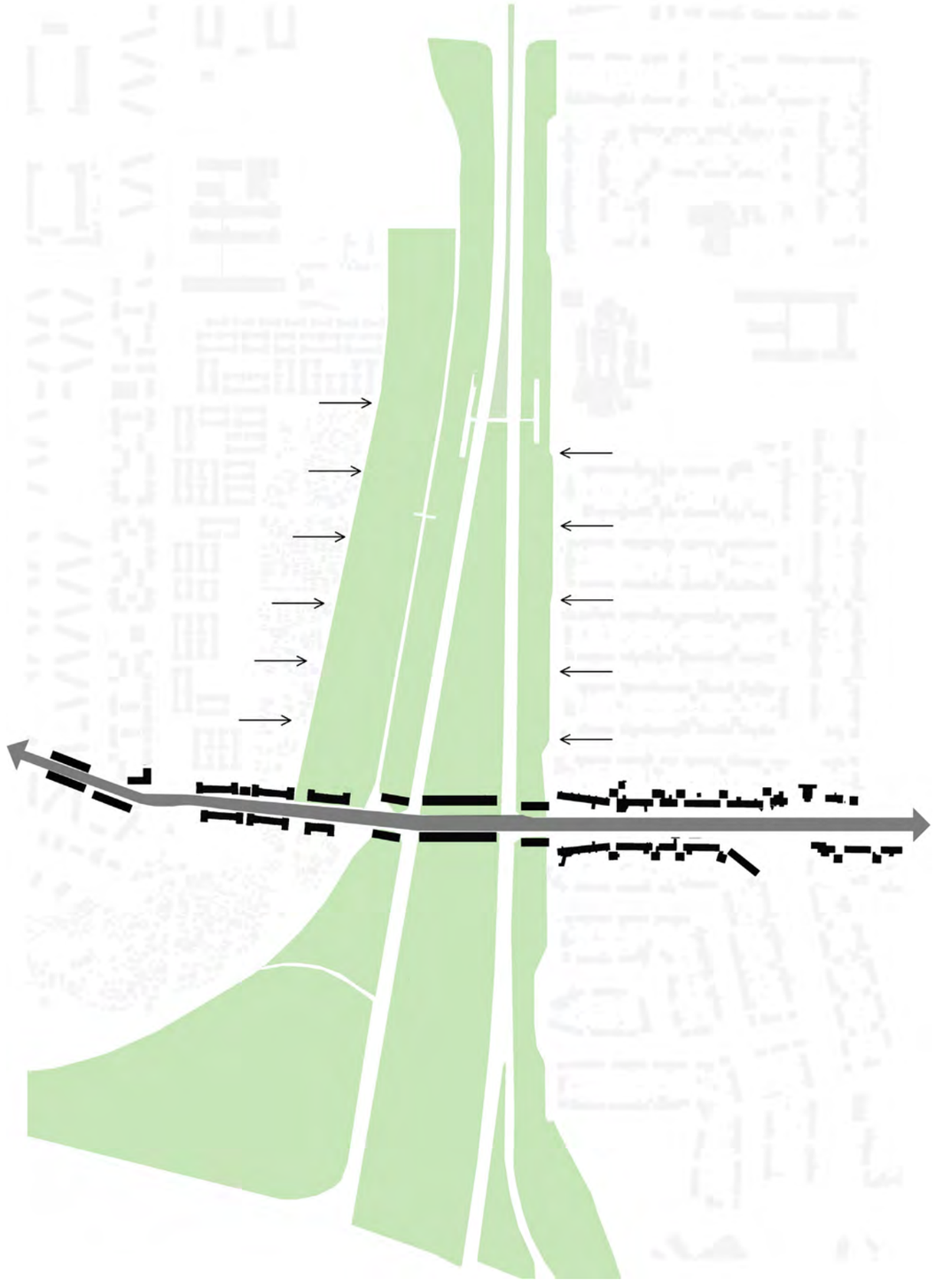


Figure 54 - A diagram highlighting the two main ideas; that of creating a street and a landscape that becomes a connective tissue.

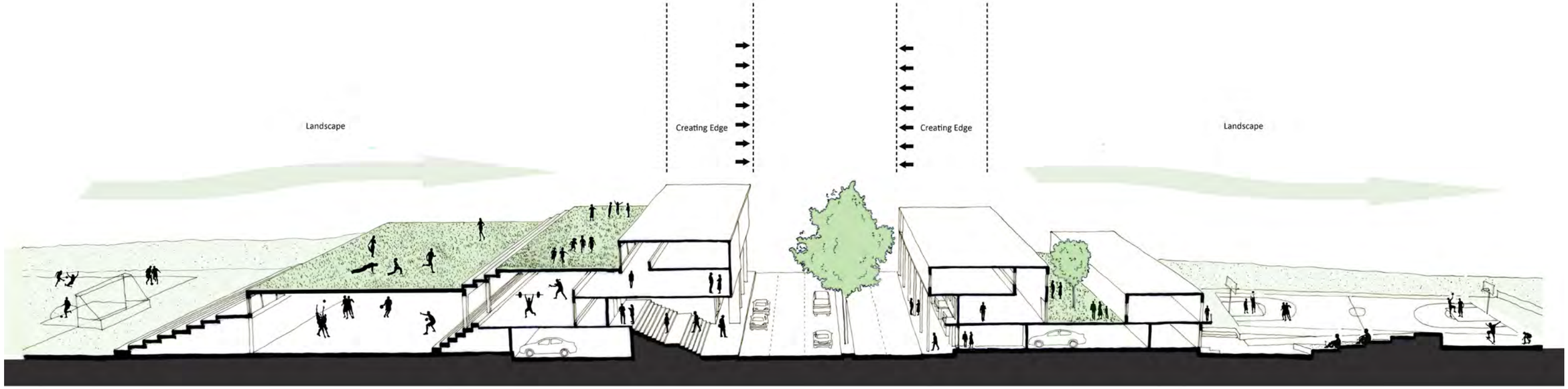


Figure 55 - A sectional perspective showing the development of the main ideas. Landscape is pulled over the building creating activated roofscapes, and the buildings create a street edge. (Drawing superceded).

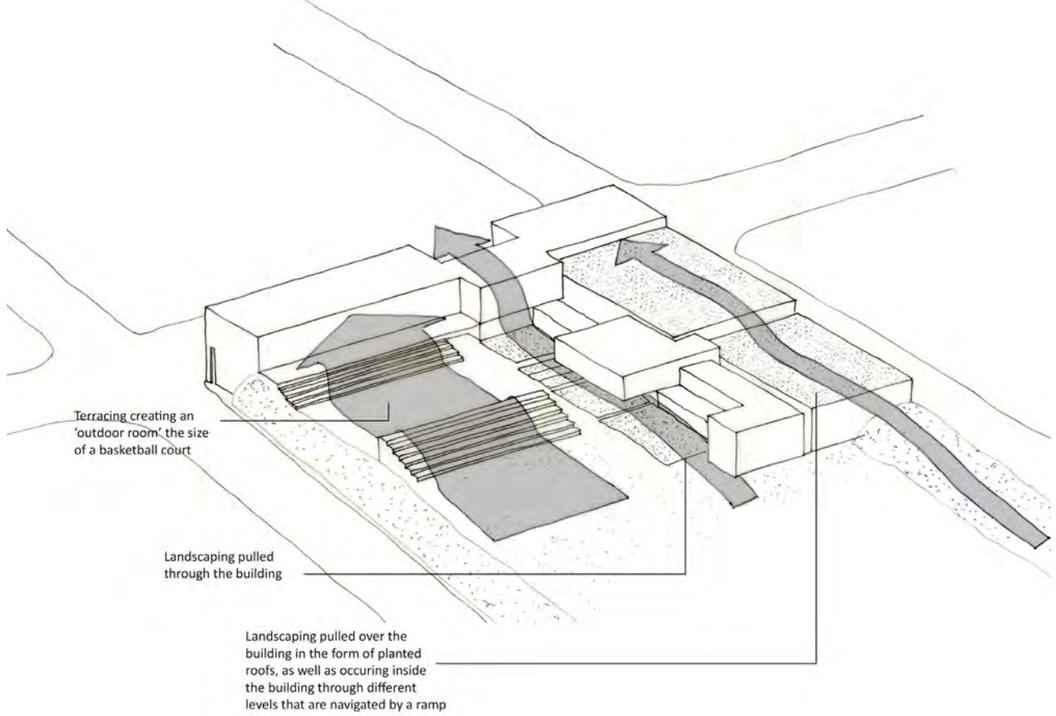


Figure 56 - Diagram highlighting the development of the previous drawing (figure 55). The terracing of the building creates an outdoor room for the basketball court, that continues to become seating for the soccer field. The landscape is pulled through the building, and the third arrow highlights the landscape growing into the building. Ramps navigate the internal topography of the building.

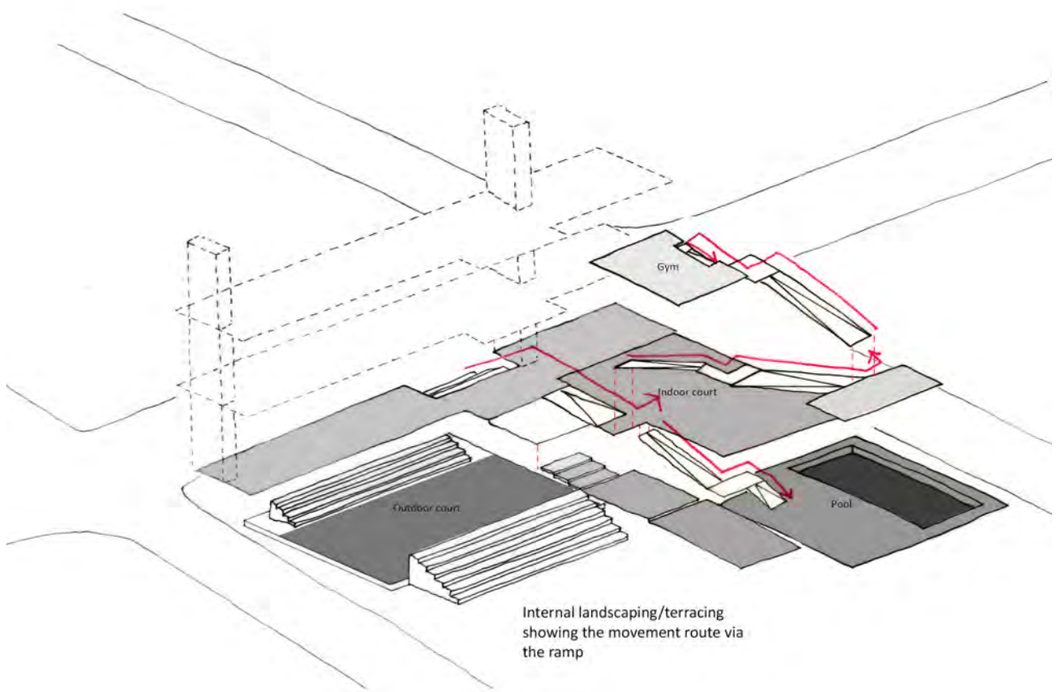


Figure 57 - Diagram highlighting the movement sequence of the ramps. Level changes are used to 'terrace' the inside of the building, and the ramp becomes the ordering device navigating this internal topography.

Figure 58 - The greater the distance 'd' the more effective the sound barrier.

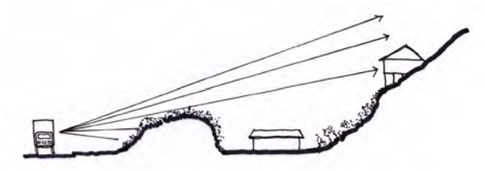


Figure 59 - The concept of an acoustic shadow.

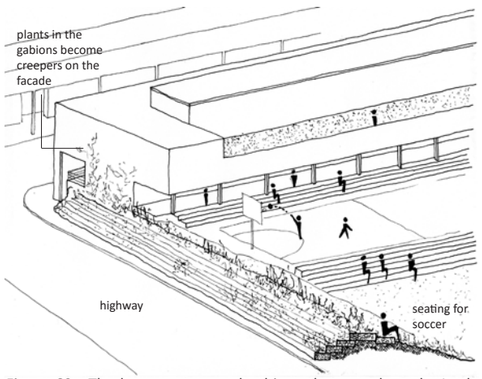


Figure 60 - The berm as terraced gabions that are planted. As the berm becomes the building these planters become creepers on the facade of the building. The berm becomes seating to the soccer fields and again breaks down from stepped seating to grass embankment, resembling the idea of transition between built form and landscape.

Mitigating Sound

Landscaping techniques aim to not only reduce the noise generated by the highway, but a planted berm also creates an edge to the open space. This proposed landscaped berm creates a barrier between the soccer field and the highway as well as providing the opportunity for landscaped seating. A sound barrier is most effective when the difference between the shortest path over the barrier and the direct line of sight between the source and receiver is greatest as shown in figure 58 (De Salis et al., 2002). The noise barrier functions in that it forms an acoustic 'shadow' (figure 59). Barriers are also more effective with high frequency sounds of short wavelength than low frequency sounds of longer wavelength (De Salis et al., 2002).

Noise barriers or embankments could be regarded as a structure with two façades, as it will always be experienced by both those travelling on the highway, as well as those living in the nearby areas. If not carefully designed, a noise barrier can visually and physically divide parts of a city, reinforcing the divide already created by the highway. However, if thoughtfully planned, "noise barriers and embankments can create visually attractive and functional urban spaces" (Bendtsen, 2009, p. 5). The design takes this into account as the berm adds an aesthetic quality to the highway as well as through creating enclosure for the field provides landscaped seating. This barrier to the highway is absolutely necessary for the safety of the children.

How building meets ground

The buildings interest in a continuous ground plane, and how to manipulate it in order to create an indoor landscape, renders the point at which the ground plane touches the earth an important detail. Retaining walls need to be carefully waterproofed in this area where the water table is very high. The drainage of the planted surfaces also needs to be carefully considered.

Because of the high water table, and the proximity of the building to the river, the building and soccer field is slightly raised above the ground. This, with sufficient drainage prevents the field from becoming water logged.

The conceptual idea of creating continuity from the street through the building to the field, is expressed with the use of a singular ground surface material. Brick paving is used in this high traffic-able area, and continues across the street forming a designated pedestrian crossing area. This surface continues through the edge building to the court and amphitheatre on the other side. It is interrupted by pockets of soft landscaping and this 'carpet' is broken down until it becomes landscape (figure 62).

The initial ideas of transition from building to landscape are expressed in the section (figure 63). As the building moves toward the landscape, its formal elements are broken down. The slab

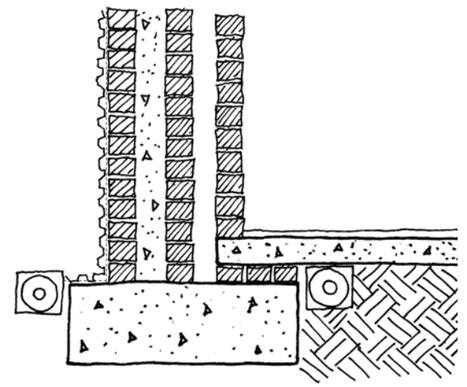


Figure 61 - Retaining wall detail.

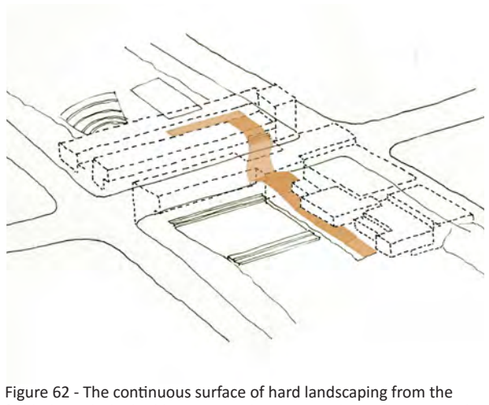


Figure 62 - The continuous surface of hard landscaping from the field, through the building, across the street and into the area to the north of the residential buildings.

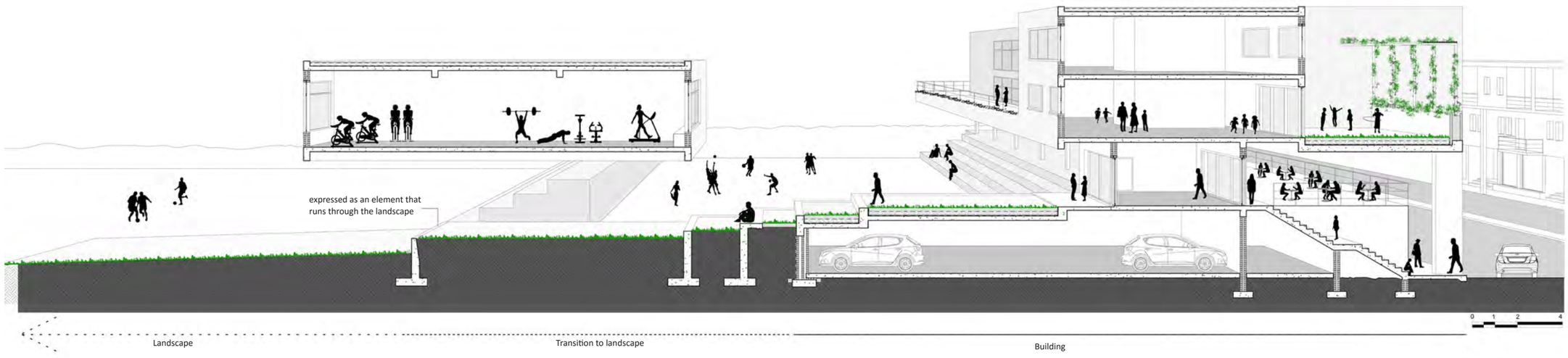


Figure 63 - Sectional perspective highlighting the transition from street edge to landscape. The building breaks down to become a seat, then a horizontal element in the landscape and finally landscape. (Drawing superceded).

becomes a seat, which then becomes a horizontal element in the landscape. As the retaining wall approaches the field, its width becomes less until it disappears completely into landscape.

Programming the Roofscapes

The projects interest in the ground plane and connection to the earth expresses a certain heaviness, which becomes lighter and more refined as it reaches the roof. Four different roofing systems are used (figure 64).

The primary space of the sports centre is large and needs to be well lit. This project therefore, also investigates large span roofs that let in adequate light. The steel constructed roof, oriented to allow south light, and reflected north light provides ambient natural light into the space below (figure 65). The roof over the gym (figure 66) is planted providing outdoor space for the gym. The form of the gym roof allows south light to penetrate the space below, relieving the space below of monotony. The swimming pool roof (figure 67) grows out of the landscape and is read as a continuation of the berm. Punctures in the planted roof allow light to penetrate but also resemble the disintegration of building to landscape. Over the offices and atrium of the daycare and homework rooms, the roof pops up to allow north light in. The roofs are cohesive in their geometries as well as portraying the conceptual idea of transition from building to landscape.

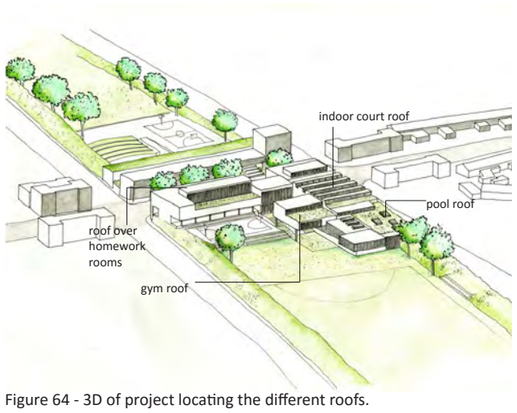


Figure 64 - 3D of project locating the different roofs.

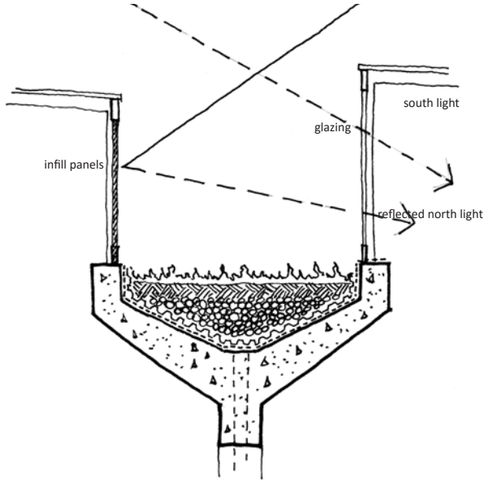


Figure 65 - Detail A through hall roof.

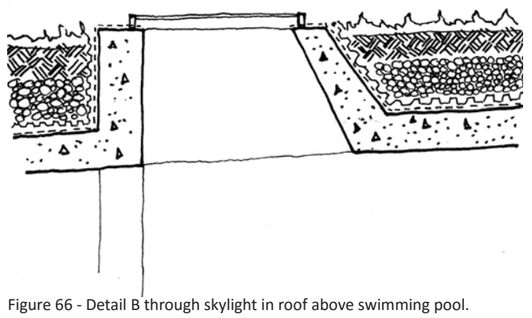


Figure 66 - Detail B through skylight in roof above swimming pool.

The idea of landscaping in the building is expressed both through hard and soft landscaping. Planted roofs and balconies are concerned with drainage, and the point at which the inside becomes the outside. These are ongoing technical investigations.

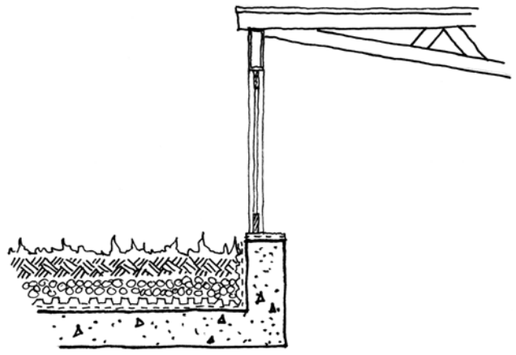
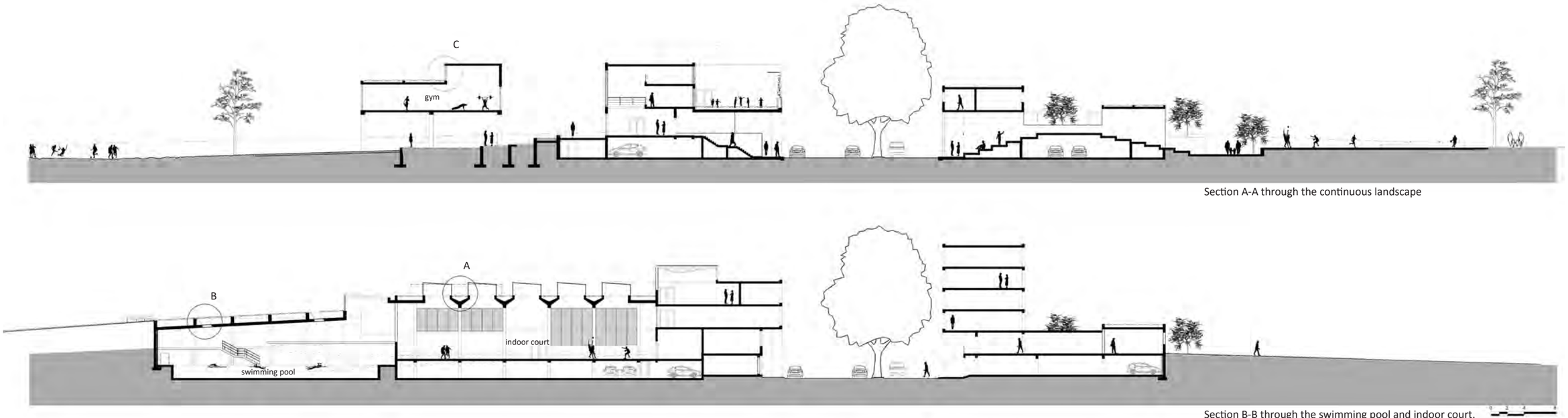


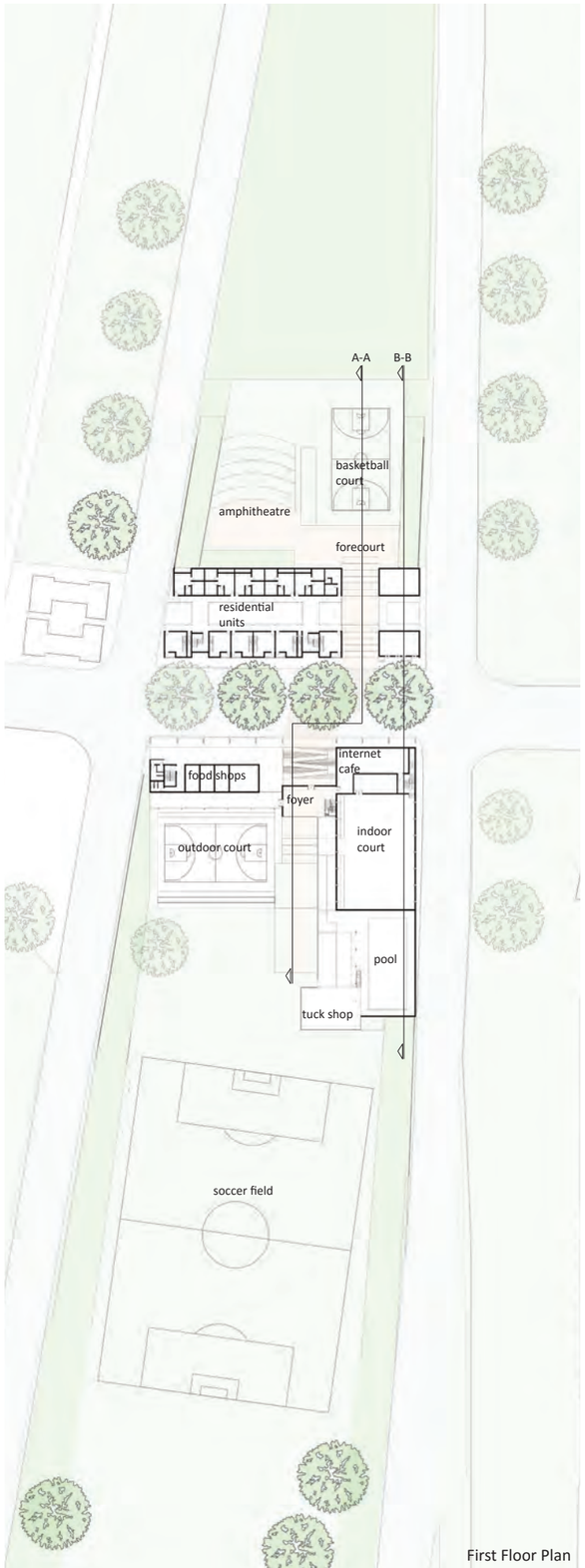
Figure 67 - Detail C through opening in gym roof.

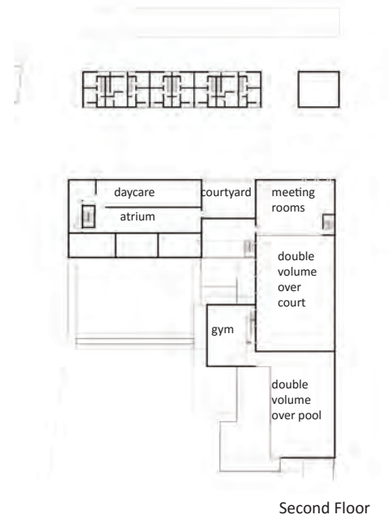


Section A-A through the continuous landscape

Section B-B through the swimming pool and indoor court.
The swimming pool roof is a continuation of the berm.

Figure 68 - Sections through the building.





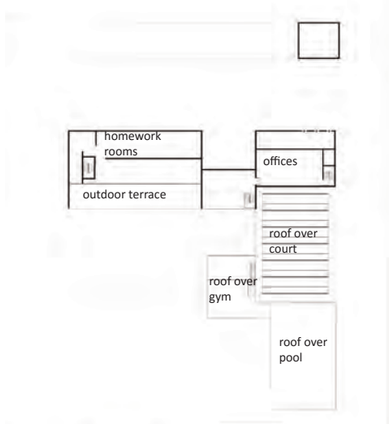


Figure 69 - Plans (in progress) of the project.

Conclusion

The fractured form of the post-apartheid South African city created by city planning laws based on racial segregation continues to perpetuate inequality. This is due to the way in which infrastructure such as roads and railways were used to create boundaries, rather than connections. This project has attempted to address this disconnect in the city by utilizing the residual space alongside the highway to create connections through a series of strategies, namely; programming the land with urban agriculture, sports facilities and recreation, and activating the street by creating an edge and providing a pedestrian friendly environment allowing for the potential of economic activity. Furthermore, it is incorporated within a larger network with the proposal of a MyCiti bus route. By integrating land-use, densifying, cross programming and providing shared amenities, it aims to create a diverse space accommodating the needs of the surrounding communities. This project, through the particular use of a site between two historically different neighbourhoods, Bonteheuwel and Langa, has attempted to show that these residual spaces along the highway should be seen as areas of opportunity that could help stitch isolated neighbourhoods back into the city fabric.

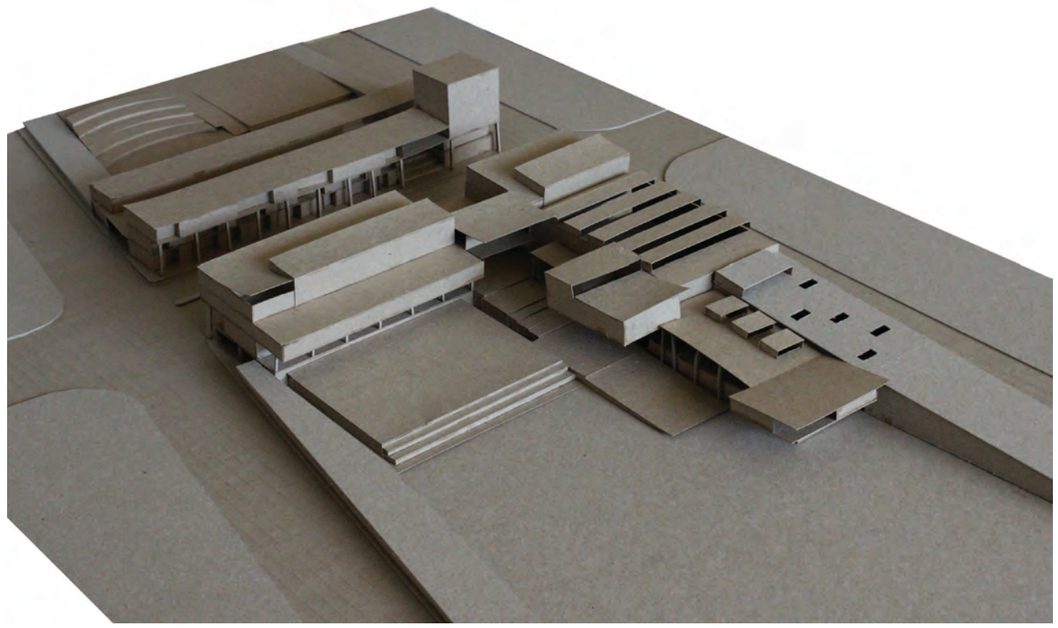


Figure 70 - Working model of design project.

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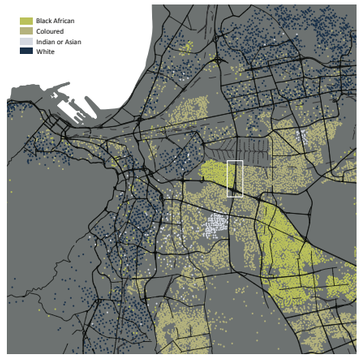
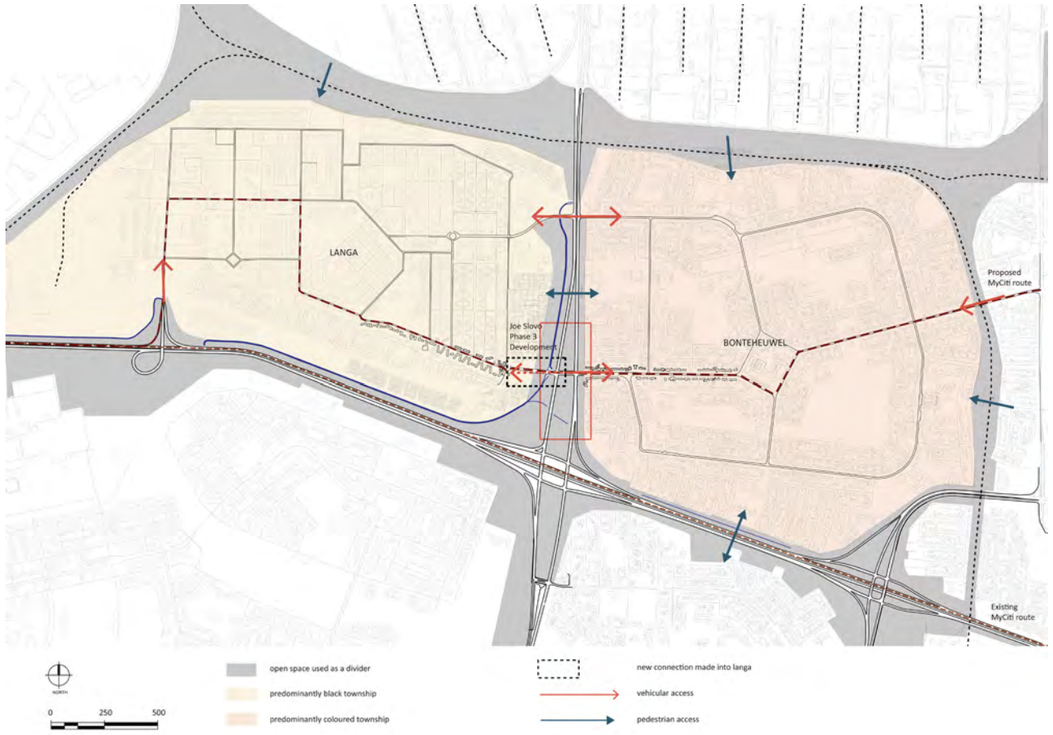
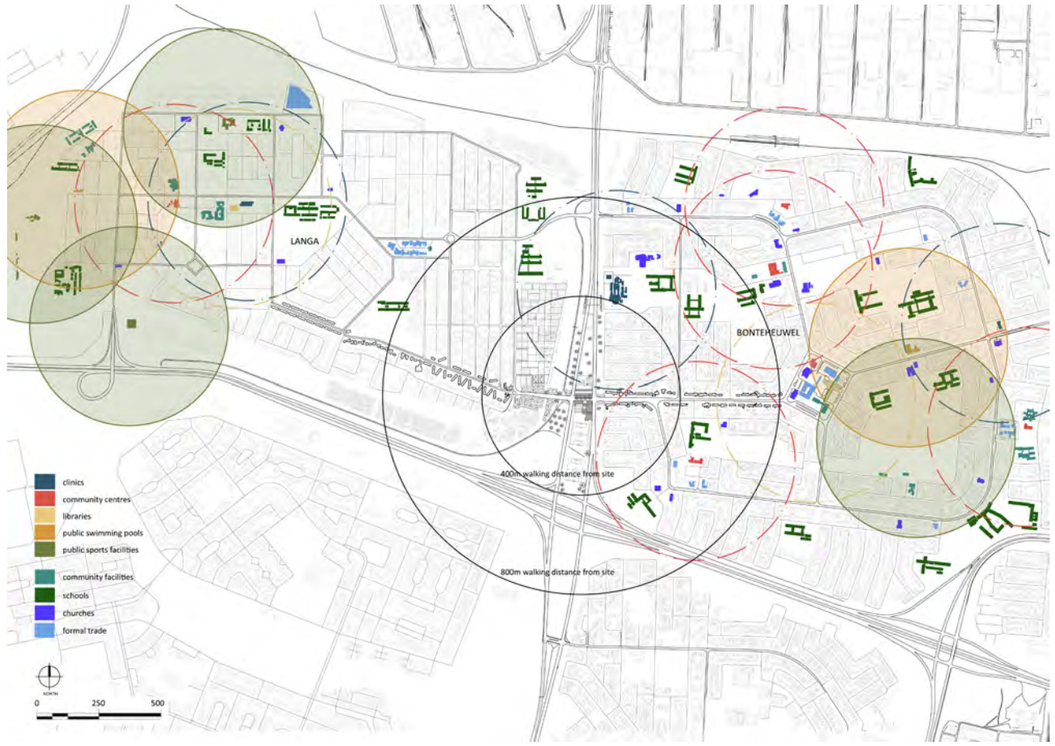
List of Figures

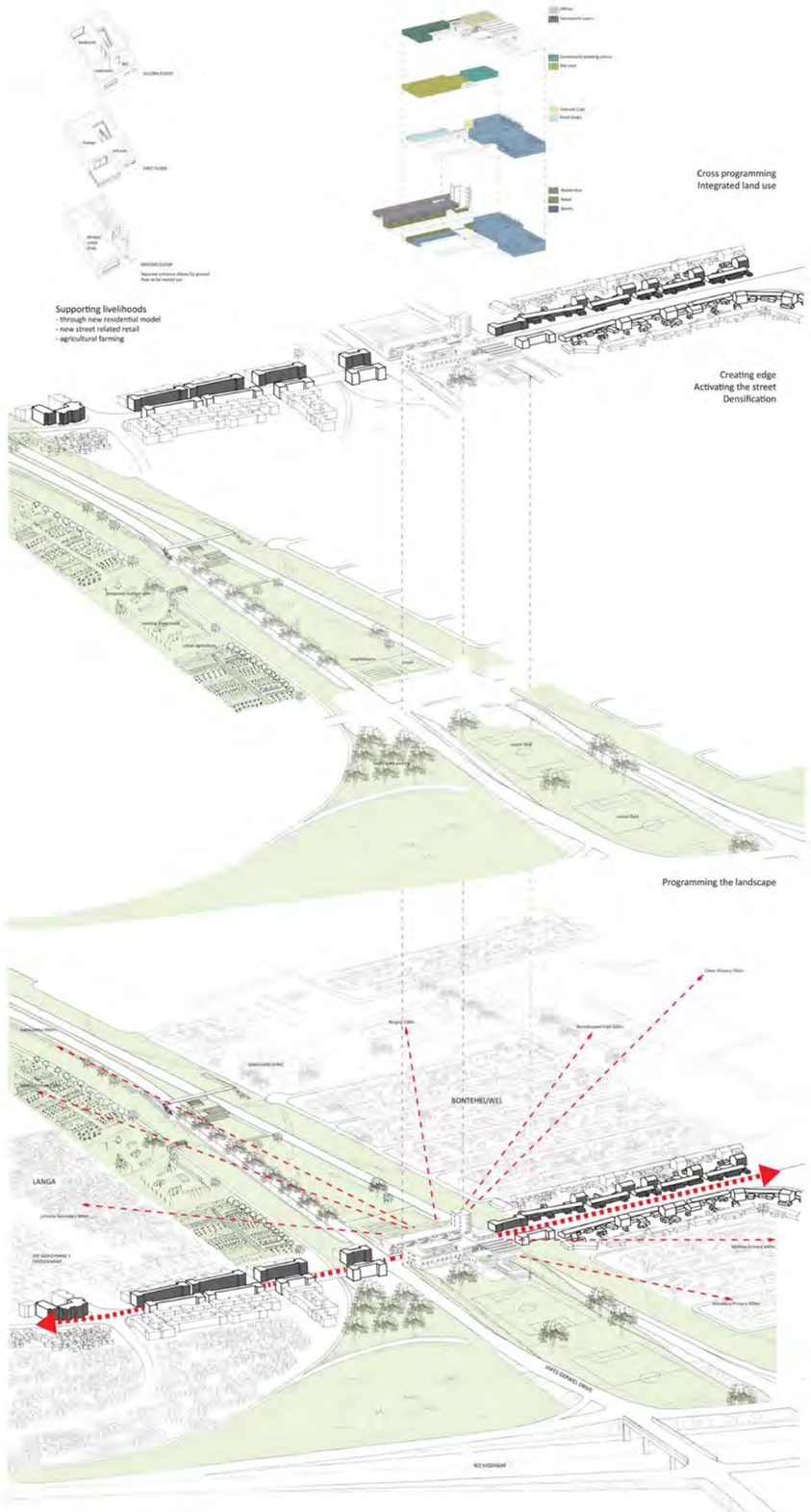
FINAL DRAWINGS

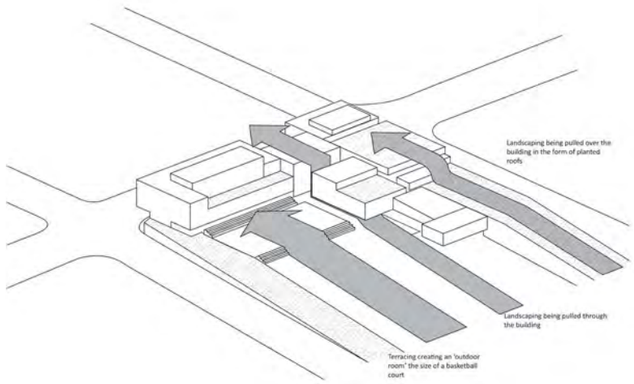

Black African
Coloured
Indian or Asian
White


R0 - R19 600
R19 600 - R76 401
R76 401 - R122 880
R122 880


LANGA
Joe Slovo Phase 3 Development
BONTEHEUWEL
Proposed MyCiti route
Existing MyCiti route
open space used as a divider
predominantly black township
predominantly coloured township
new connection made into langa
vehicular access
pedestrian access
0
250
500


LANGA
BONTEHEUWEL
400m walking distance from site
800m walking distance from site
clinics
community centres
libraries
public swimming pools
public sports facilities
community facilities
schools
churches
formal trade
0
250
500





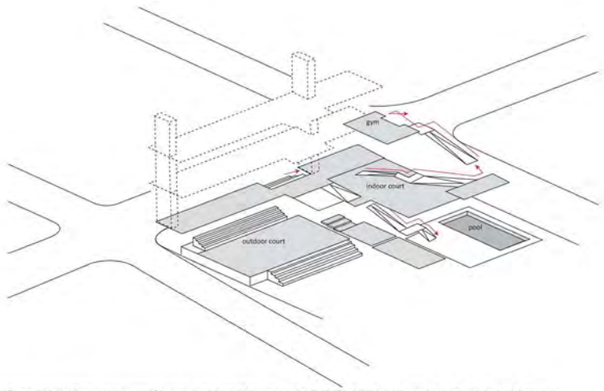


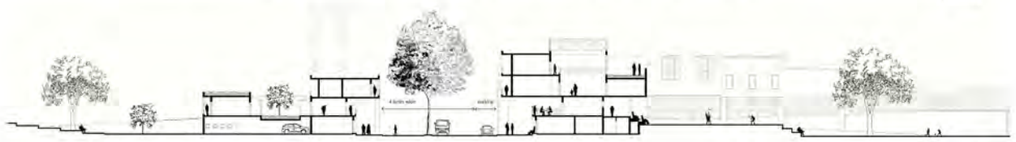
Diagram highlighting the movement sequence of the ramps. Level changes are used to 'terrace' the inside of the building , and the ramp becomes the ordering device that navigates this internal topography.

Blurring the boundary between building and landscape

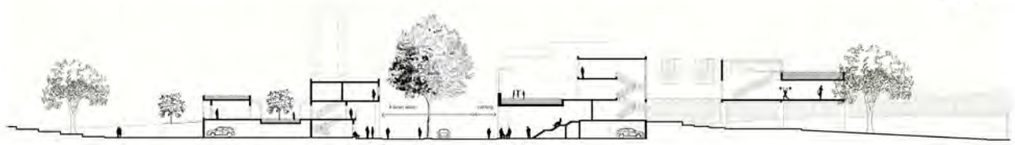
Context plan
Scale 1:500

Section 01

Section 02



Section 03



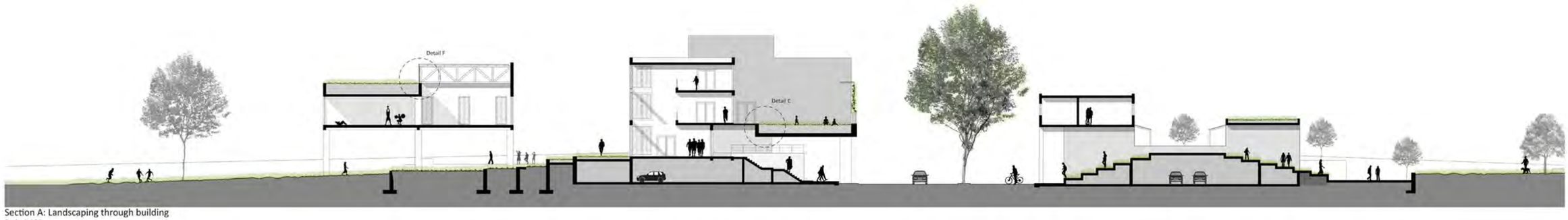
Section 04

Section 05

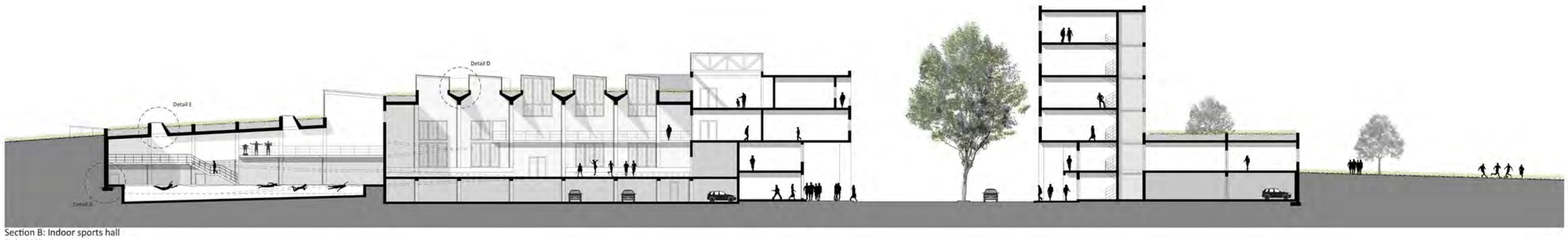
Sections through the varying street edge condition
Scale 1:200

Existing street edge condition

Proposed active street

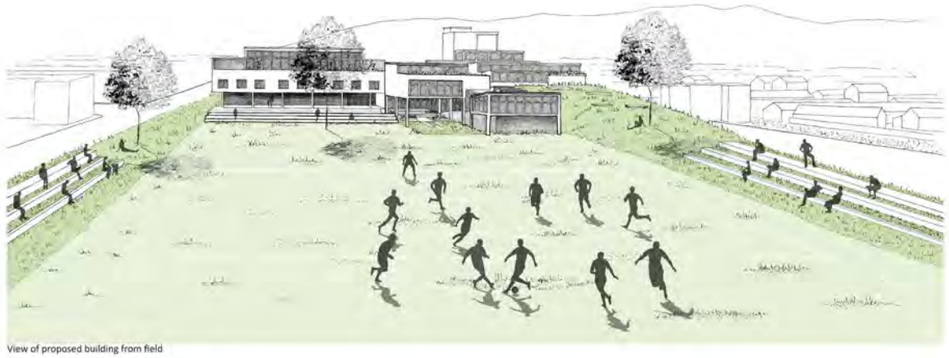


Section A: Landscaping through building
Scale 1:100

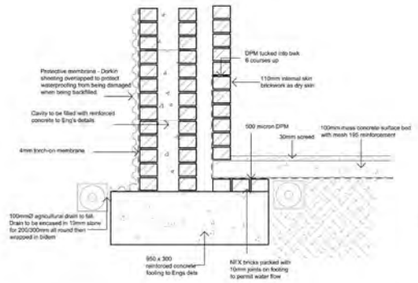


Section B: Indoor sports hall
Scale 1:100

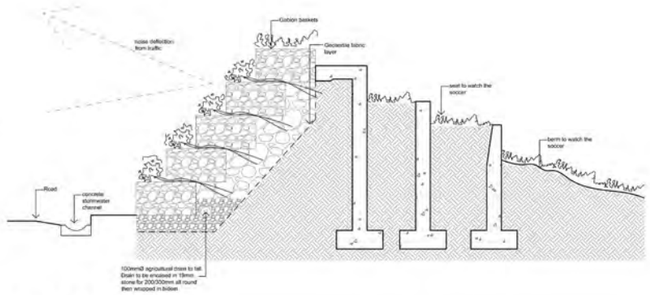
Existing view



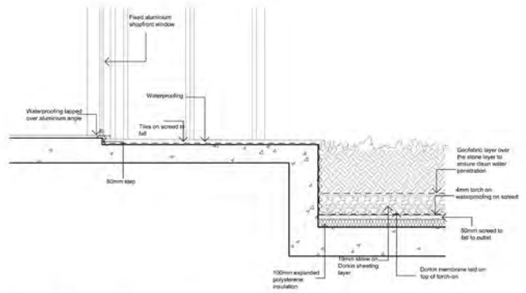
View of proposed building from field



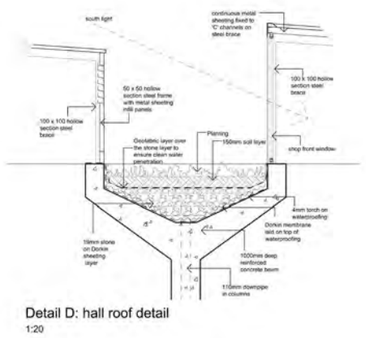
Detail A: retaining wall
1:10



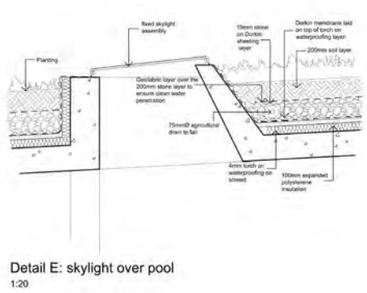
Detail B: berm
1:25



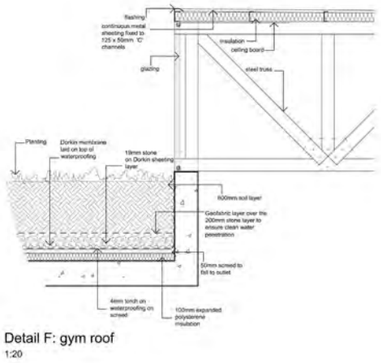
Detail C: daycare courtyard
1:20



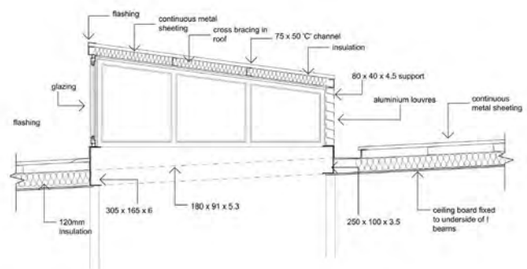
Detail D: hall roof detail
1:20



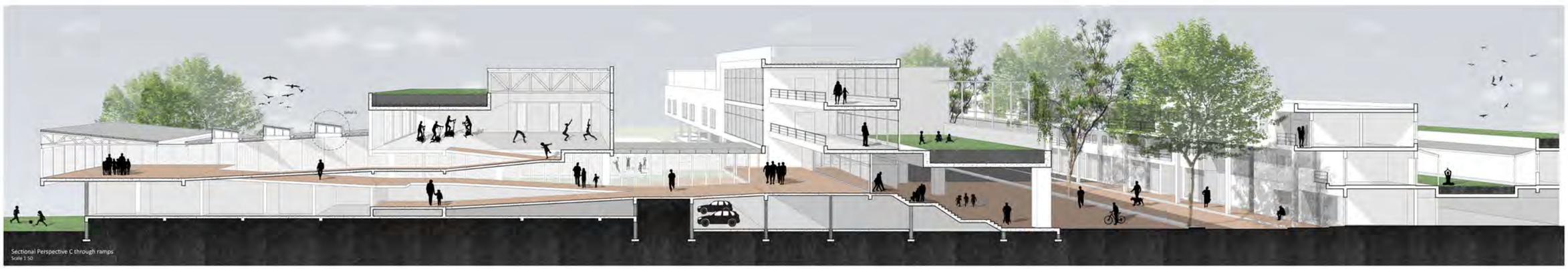
Detail E: skylight over pool
1:20

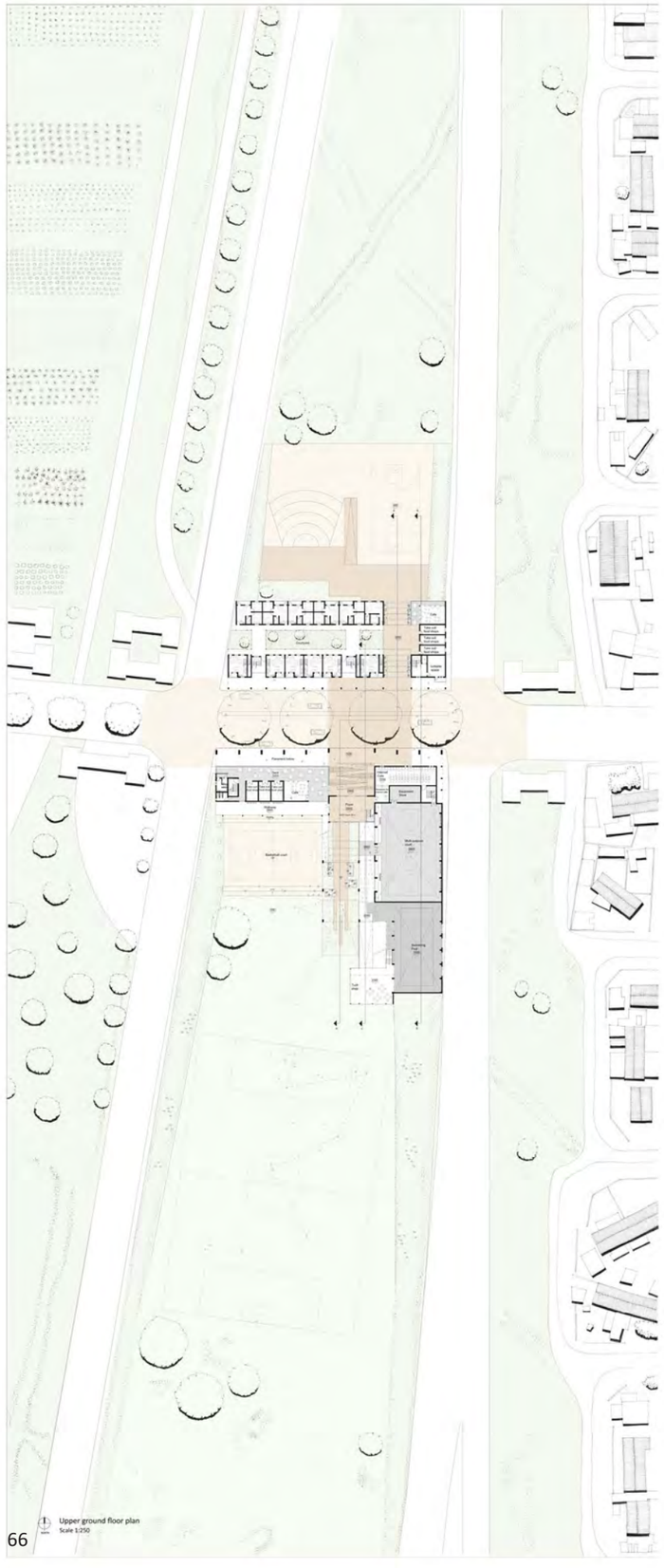


Detail F: gym roof
1:20

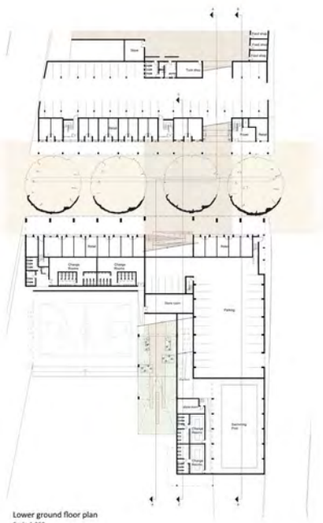


Detail G: roof over walkway
1:15





1 Upper ground floor plan
Scale 1:250



Lower ground floor plan
Scale 1:250

First floor plan
Scale 1:250

1 Second floor plan
Scale 1:250