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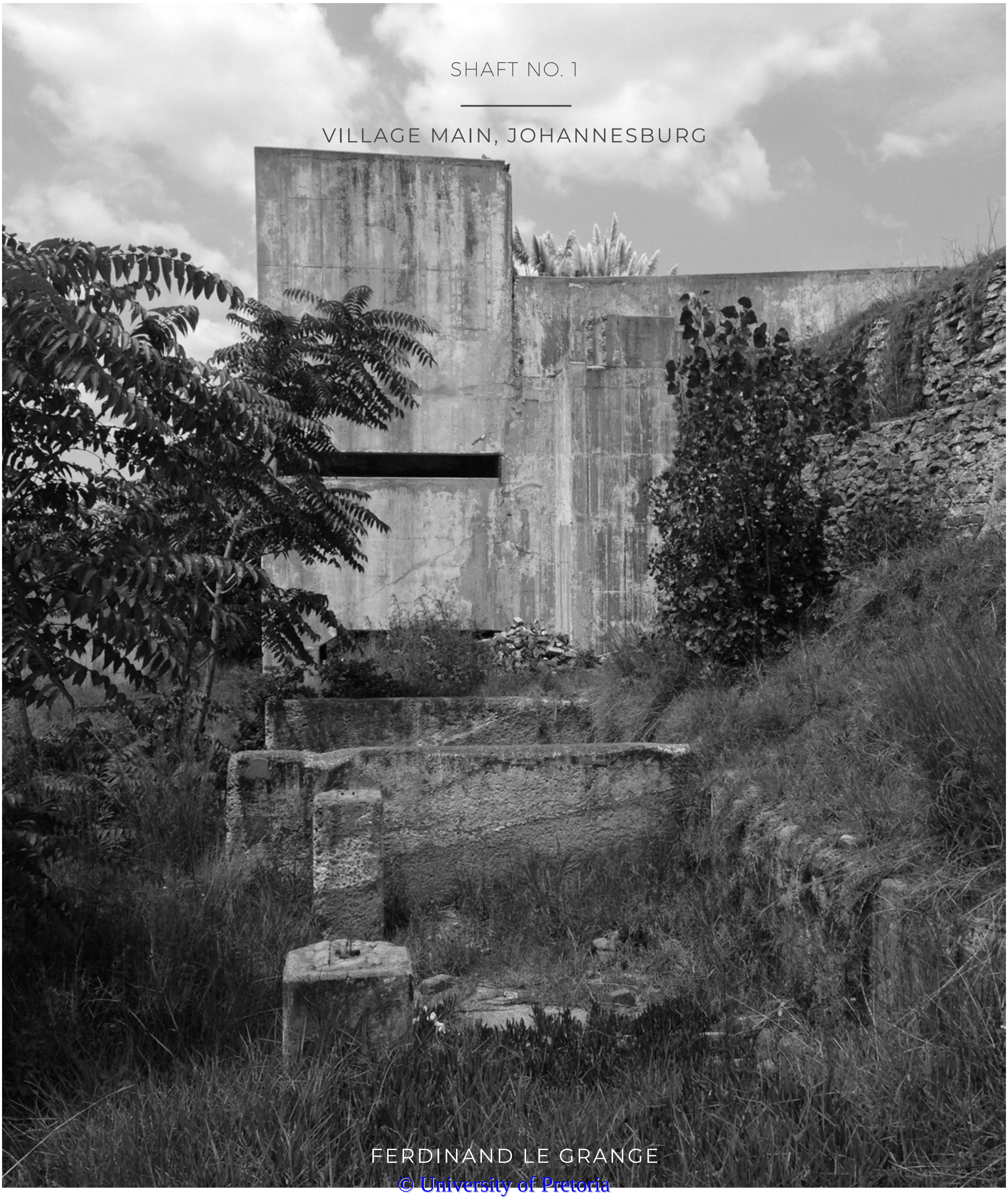
PROSPECT PORTAL

A LAYERED LANDSCAPE



SHAFT NO. 1

VILLAGE MAIN, JOHANNESBURG

FERDINAND LE GRANGE

FERDINAND LE GRANGE

STUDY LEADER: Arthur Barker

COURSE COORDINATOR: Arthur Barker

STUDY FIELD: Heritage and Cultural Landscapes

Submitted in fulfilment of part of the requirements for the degree Master in Architecture (Professional). Department of Architecture, Faculty of Engineering, Built Environment and Information Technology, University of Pretoria

Pretoria, 2018

PROJECT SUMMARY:

SITE LOCATION: Village Main Mine

ADDRESS: Sprinz Avenue, Village Main, Johannesburg South, 2001, Gauteng, South Africa

GPS CO-ORDINATES: 26°12’50.82’’S 28°03’05”E

SITE DESCRIPTION: The concrete platform and area surrounding the No. 1 Shaft and historic Village Main Mine as well as the administrative buildings off Sprinz Avenue

CLIENTS:

Maker Libraries (The British Council), The Innovation Hub (Gauteng Growth and Development Agency), Ecovative, CSIR

THEORETICAL APPROACH: Regenerative theory, idustrial heritage theory

ARCHITECTURAL APPROACH: Adaptive re-use, adaptable architecture, layering

DECLARATION

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 been previously 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 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.

FERDINAND LE GRANGE

ACKNOWLEDGEMENTS

To Stephanie, my best friend and (now) wife. Thank you for your faith in me, constant support and love over these last two years. Your grace and selflessness are a true reflection of God's heart. Thank you for being strong for me and for always fighting for us. Thank you a million times. Always, anywhere, anywhen.

To mom, dad and Mich, thank you for years of sacrifice and resources. Thank you for walking this journey with me from day one, being understanding, patient and for always caring. A better family is not possible.

To Professor Barker, thank you for years of incredible guidance and inspiration. Your passion for architecture re-ignited mine. You see the best in people and always leave them better than you found them.

To Professor Ora Joubert. Thank you for all of the lessons and for teaching me about lining things up.

To Wilan, Christian and Elzanne for being great friends and making Boukunde brighter. To Gert, Albert and Charldon for being great partners.

To Megan, Gareth, Kerry, Kallie and Matt C. Thank you for the meals, the help, the friendship and the encouragement. You are a blessing. Tian, thank you for being a great friend and room-mate. Sorry about all the mess.

To Barry, thank you for decades of friendship and for always being there even if that's far away.

To my Saviour, Redeemer and Father.

Thank you to Johannesburg Heritage, Dirk Coetser and Alexandra McKellar for information on the site.

The architecture of this scheme was inspired and influenced by: Johannesburg's lost heritage industrial architecture, Ecovative and the new materialists, Van Egeraat, Patkau, Dylan Watkins, Dirk Coetser, Walter Raubenheimer, Norbert Koch, Jankel Nieuwoudt, Claire Lubell and Mecanoo.

ABSTRACT

PROSPECT PORTAL - A LAYERED LANDSCAPE

The genesis of this dissertation is a long-standing interest in the history of Johannesburg and its lost architecture.

The combination of a gold-rush and cycles of industrialisation have led to a severe changes to Johannesburg's built environment. As the economic prospect has moved away from a gold-mining and industrial economy, the city has had to re-invent itself. In the process many of its buildings have been demolished to make way for more profitable alternatives. Village Main is one such site.

Like many instances of industrial heritage in South Africa the landscape is polluted by the devastating consequences of decades of environmental exploitation and what remains of the architecture lies unused and in danger of demolition.

This dissertation investigates architecture's role as a potential mediator between polluted natural systems and latent industrial architecture through exploring the combination of heritage and environmental theories. In so doing, it develops an archetype for a new layer of industrial architecture capable of regenerating latent industrial sites. Village Main is the case study with the intention of it becoming a precedent for industrial architecture that is capable of establishing and sustaining mutually beneficial relationships between industry and nature.

Regenerative layering is used as a means of combining the lost prospects of the site's past, the threatened prospects of its current situation and the prospects of its future.

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PROSPECT PORTAL

A LAYERED LANDSCAPE

LIST OF FIGURES

01

INTRODUCTION

BACKGROUND

The 1886 Witwatersrand gold rush marked not only the start of a century of gold mining in Johannesburg but also of immense transformations in the geological, economic, built and social landscapes of the city. Once natural grasslands, the Rand almost instantly became a region of bustling boom-towns as settlers populated the 80km long east-west mining belt.

Today Johannesburg is a truly complex global city with the marks and skyscrapers of the first world, informality to rival any developing context and suburbs to match that of any American city. However, much of the city's mining presence and *raison d'être* has been forgotten or obliterated by indiscriminate development.

Johannesburg's built environment can be characterised both by its amnesia and incessant need for reinvention (Kruger 2013:1). Much of the urban and architectural theory, too, tends to focus on the present 'Afropolis' (Nuttall & Mbembe 2008) or foreshorten the past without looking much further back (Tomlinson , et al. 2003). While it may be advantageous for current stakeholders (be it in policy, activism or design) to highlight the rapidly changing present or compress the past, this approach only perpetuates the boom and bust cycles that have characterised the city since its founding. This dissertation seeks to understand the full extent of the economic, productive and cultural layers of the city through history in order to produce a design which emerges from the *terroir* of Johannesburg and which allows for future extension without eradicating the past.

The dissertation study area, located on the south east edge of the traditional CBD and the Randjieslaagte Triangle, constitutes the last remaining portion of the original Village Main Mine. This residual mining landscape is unique in that it borders the density and culture of Jeppestown to the north and the productivity of Village Main to the west. This rare combination of urbanity, industry and the mining landscape represent a transect of Johannesburg's various layers and morphological evolutions which allow for the study, curation and extension of a cross-section of the built artefact that is Johannesburg.

Fig. 1.1 Early mines 1930 (Shango Archive)

Fig. 1.2 Market Square 1890 (Shango Archive)

1.1 CITY OF MINES, CITY OF PROSPECT

1.1.1 GENERAL CONDITION

The combination of the industrial revolutions of the past three centuries and the acceleration of globalisation have resulted in dramatic changes to the built environment (Sassen 2005:27). Nowhere is this more obvious than in Johannesburg where the city has been perpetually re-invented over the last thirteen decades.

The combination of competing political regimes, changing industry and the mechanisms of capitalist speculative development mean that previous built layers of the city do not remain leading to a general sense of urban and historical amnesia.

In the city of gold there are many parallels between the logics of the mining industry and those of the built environment. The mining mentality of extraction and removal extends to the treatment of urbanity and architecture of Johannesburg where once value has been gleaned,it is discarded or forgotten. However, in recent years as technology and attitudes have changed a process of re-mining has happened both in the case of the city's tailings as well as in the built environment, most visible in the industrial buildings of Jeppestown and Maboneng.

One of the aims dissertation is to understand lost fragments of the city as well as re-mine existing strata of the city to produce a layered city more representative of the full spectrum of Johannesburg's character and evolution.

1.1.2 INDUSTRIAL HERITAGE

One of the most pertinent consequences of changing industry is the obsolescence of infrastructure, technology, labour and built artefacts associated with industrial heritage (Kirkwood 2001).

These sites, known as manufactured landscapes, brown-fields, and post-industrial latent sites, are scattered across the city but can be found in greatest density along the mining belt (ibid.).

An additional aim of the dissertation is to understand post-industrial latent artefacts and their threatened built heritage, so that strategies for the re-use and re-integration of these important urban layers can be proposed.

1.1.2 JOHANNESBURG AS THE ARCHETYPAL PROSPECT CITY

Johannesburg as we know it was founded by prospectors and it continues to be shaped by similar tendencies centuries later.

Throughout the dissertation the lens of 'prospect' is used to engage with the context and propose an appropriate architecture.

1.2.1 GENERAL ISSUE: LOST PROSPECTS

Since the late 1880s, relentless waves of fortune seekers from across the world have scrambled to stake their claim on the richest deposits of gold ever found. Over time, access to this enormous wealth, became the basis of the world's most convoluted system of ordering physical and social space (Gotz & Seedat 2006 :1).

As a city built by prospectors, opportunists and entrepreneurs: each physical metamorphosis of Johannesburg was formed in rapid succession following booms (of varying form and intensity) with little time for physical sedimentation. This has been compounded as the city's economy has over the last century shifted extremely rapidly from mining to manufacturing to service and lately, to finance (Harrison & Zack 2012:551).

As a result of inherently extractive, exploitative and destructive tendencies as well as the frenetic urban sprawl associated with competing morphogenic CBDs and sites of production, a substantial portion of Johannesburg's early architecture lies abandoned or has been lost to new development. The aim of the dissertation is to mediate between the decaying and lost fabric and the ever changing inhabitants by exploring the architectural and historical potential of a new layer of architecture on a threatened historic site. By doing this, layers from the history of the city can be recalled and curated to manifest the invisible but important historic strata of the city.

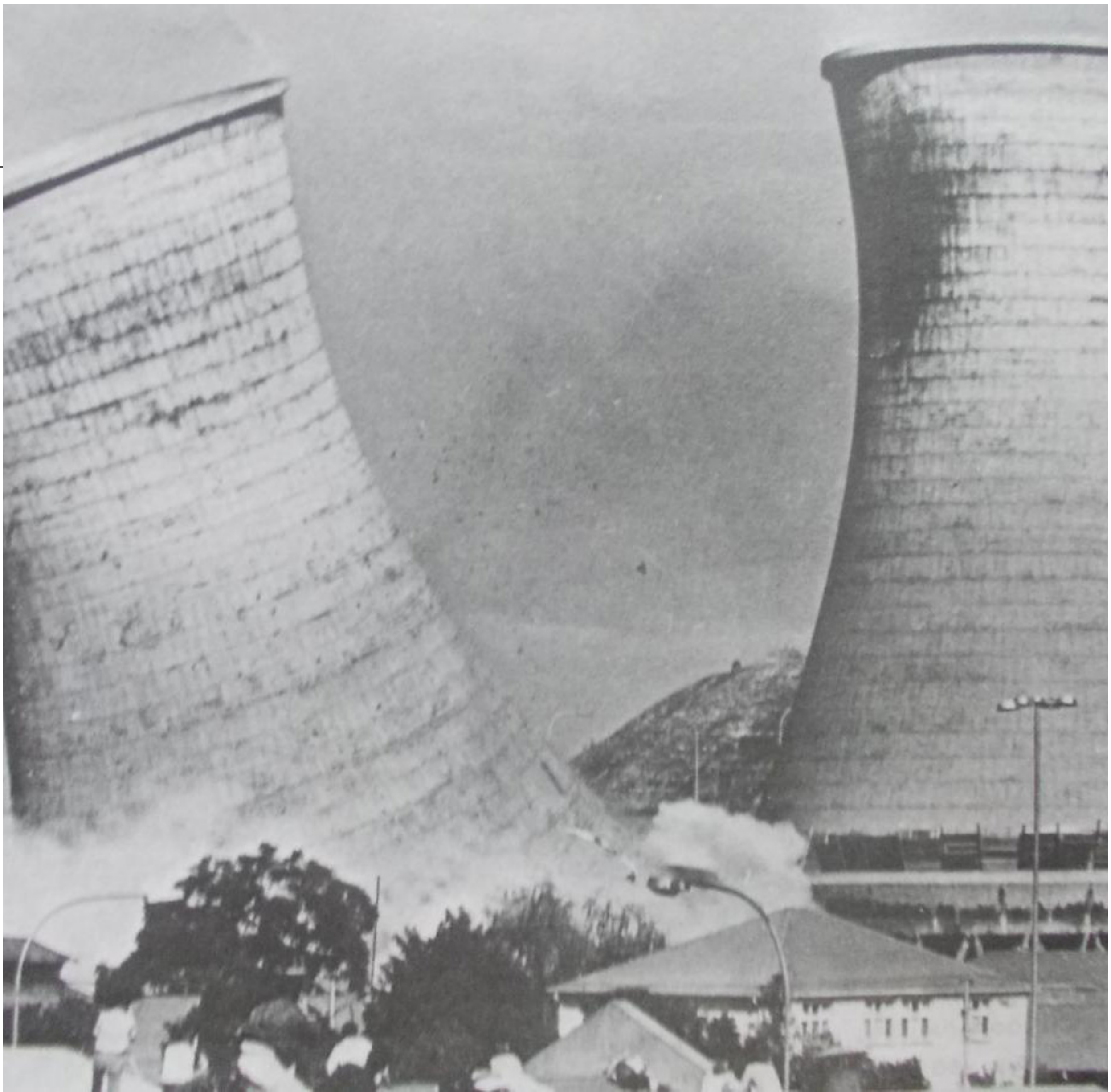

Fig. 1.3 Newtown Cooling Towers Demolition (The Heritage Portal)

Fig. 1.4 Sophiatown forced removals (SA History)

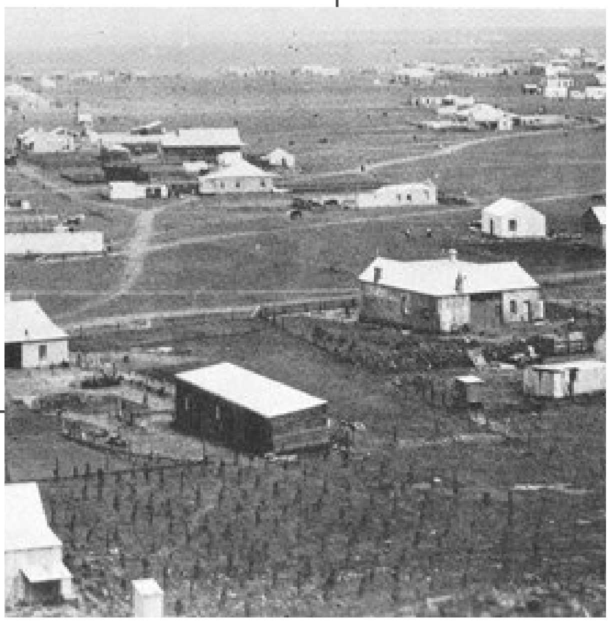

Fig. 1.5 Jeppestown 1888 (Wikimedia Commons)

1.2.2 URBAN ISSUE: THREATENED PROSPECTS

The majority of Johannesburg's gold mines ceased operations in the 1970s, leaving large portions of land in the mining belt vacant (Tang & Watkins 2011). Today, mining is virtually invisible apart from the few mine shafts and dumps which dot the landscape as many of these areas have been converted to other uses, or have and have become sites of insurgent informal activity (Bremner 2014).

These landscapes of extraction awkwardly intercept the city's natural systems and interrupt its human settlements and infrastructure. The blank zones that remain — characterised by islands of toxic mine waste and plugged shafts— present challenges for ecology, spatial integration and the future development of the region (Trangos & Bobbins 2015). If the mine dumps alone are reprocessed and rehabilitated, a further 5,500 hectares of prime land will be freed for new development (Tang & Watkins 2011).

Restoring life to the toxic and torpid territories created by mining waste is critical to achieving an inclusive and liveable future city-region as well as reconnecting the city to its subterranean past. Understanding and appreciating the complex urban ecologies as well as the forces that have guided the processes are essential for building alternative futures in these forgotten landscapes (Trangos & Bobbins 2015:1). In such a context, any new layer of the city is to suggest an alternative to the extractive economy of the mines by proposing a regenerative and productive future.

Fig. 1.6 Aerial Photograph showing site (The Heritage Portal)

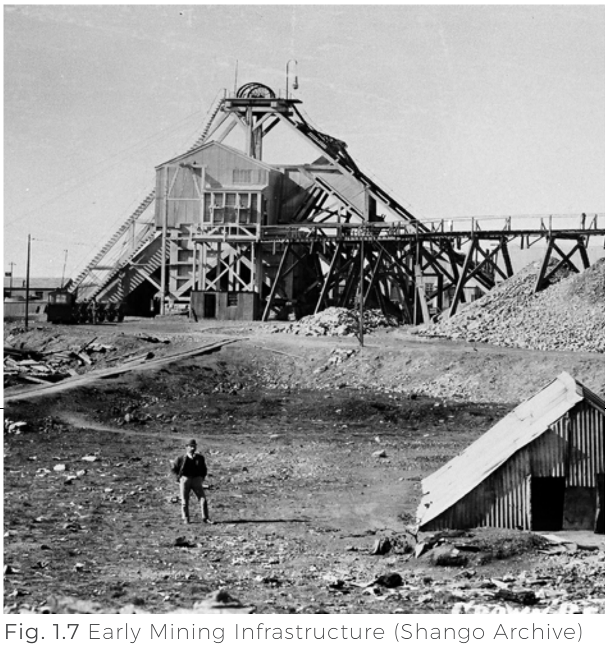

Fig. 1.7 Early Mining Infrastructure (Shango Archive)

Fig. 1.8 Early Mining Headgear (Shango Archive)

1.2.3 ARCHITECTURAL ISSUE: LAYERED PROSPECTS

Chipkin (1993) posits that the city has been entirely rebuilt four times (tent and tin town, Victorian city, Edwardian city and modernist city) and that Johannesburg is famous for its obliterated history. Fragmented and speculative additions for the most part have further reinforced this condition. Johannesburg became an instant metropolis towards the end of the 19th century, maturing from a mining camp into a city of stone and stucco and eventually one of steel and glass. Johannesburg almost immediately imported electric trams, dance halls and department stores. This trend of borrowing culture, urbanity and typology from abroad has become a recurring theme.

As a frontier city it has been one of ceaseless mimetic re-invention in which the concurrent pursuits of replication and originality, inevitable in a city where history and identity of urban form and society had to be borrowed from elsewhere. Despite the fact that without the gold-bearing seams of the Witwatersrand, Johannesburg would not have existed, the built landscape of the city is largely devoid of any reference to that history or the architectures that facilitated those processes.

New additions should act as devices to inform the metamorphosis of the existing morphology as well as creating new forms of architecture. The aim of the dissertation is to layer a new architecture onto an existing post-industrial artefact in an attempt to develop a new approach for adaptive re-use of the city's industrial heritage.

Fig. 1.9 Crusher and bunkers (Author:2018)

Fig. 1.10 Storage tank (Author:2018)

Fig. 1.11 Concrete shards (Author:2018)

THE DISSERTATION

1.3 INTENTIONS OF THE DISSERTATION

The aim of the design is to respond to the 130 year layered history of the city by proposing a new morphological, recreational and productive layer at the Village Main No 1 shaft site. The intention is to recognise and capitalise on the inherent potential in the site as a historic, natural and productive artefact.

Theories of industrial heritage and regenerative architecture will be employed to re-programme and re-invigorate a dormant site as well as manifest lost layers of the city.

1.4 RESEARCH QUESTIONS

1.4.1 How can industrial heritage architecture be expanded to form new typologies capable of changing over time?

1.4.2 How can forgotten layers of the city be recalled and incorporated into design strategies for the future?

1.4.3 How can architecture serve as a mediator and datum for layers of the past, present and future?

1.4.4 How can new layers be added to post-industrial artefacts in order to regenerate them?

1.5 DISSERTATION QUESTION

How can new regenerative programmes and built layers be introduced to both re-use and re-invigorate latent post-industrial artefacts as a way of ensuring their ongoing relevance?

1.6 RESEARCH METHODOLOGY

1.6.1 HISTORICAL OVERVIEW AND MAPPING

A series of diachronic mapping exercises will be conducted in order to understand the site change over time. Additional mappings and observations of the site and framework area will inform an urban vision, precinct and site plan as well as design approach. This method will be used to discern the value of the existing heritage fabric, the existing uses and social dynamics of the site, as well as the physical and ecological potential of the site.

1.6.2 ARCHIVE AND DESKTOP STUDIES

In addition to site visits to determine the present condition, desktop studies will be conducted in order to gather information regarding the past condition of the site. This study will gather information regarding the site's layering geologically, historically and socially as well as existing and proposed spatial frameworks of the surrounding context.

1.6.3 PRECEDENTS + CASE STUDIES

Relevant literature and case studies will be consulted in order to gain an understanding of the programme and its associated processes. This will include precedent studies to investigate design approaches that deal with both measurable and intangible aspects.

1.6.4 DESCRIPTIVE INTERPRETATION

Evaluative research and an assessment of various approaches to heritage and cultural landscapes will be conducted in order to adopt and adapt an approach to dealing with the site. Theory and literature as well as a critical reading of the site will inform a theoretical departure for the dissertation. Regenerative theory will be used as a basis for linking approaches to industrial heritage, ecological potential and architecture. This will form the basis for the urban vision and development of a design which responds to the past, present and future layers of the site .

1.6.5 APPLIED RESEARCH

A descriptive interpretation of the research will result in a design approach which responds to the dissertations aims and will give expression to an architectural form and tectonic concept. Finally, this will culminate in detailing and a technical resolution.

1.7 ASSUMPTIONS OF THE STUDY

It is assumed that the CBD of Johannesburg experiences an increase in permanent inhabitants and densifies significantly. It is also assumed that the industrial area to the west of the site becomes populated as some buildings become retrofitted for residential purposes.

It is assumed that the site is serviced by the BRT system proposed in the Turfontein Spatial Development Framework.

It is assumed that the existing buildings and soil conditions are suitable and safe and that it can accommodate new architecture.

1.8 DELIMITATIONS OF THE STUDY

Although the project is situated within a larger designed framework, the project focusses on Shaft No 1 in an attempt to best illustrate one outcome of the research question. This dissertation does not attempt to propose a solution to all instances of dormant post-industrial artefacts.

While the project is situated on the scarred mining belt to the south of Johannesburg's CBD, the design itself makes no attempt to fully solve the environmental pollution from the cyanide extraction process. It is assumed that the pollution is removed and that the site is safe for habitation.

Although the aim of the dissertation is to understand the history and layering of Johannesburg generally, the study will focus on the site and the surrounding precinct. The formal and programmatic solution are in not intended to constitute a prototype for Johannesburg or sites elsewhere.

The aim is to accommodate for community of the surrounds and the site specifically but will not tackle the issue of illegal mining or the 'Zama Zamas'.

1.9 LIMITATIONS OF THE STUDY

A regenerative approach is adopted and the aim of the dissertation is to systemically and holistically resolve a large-scale issue. The design therefore encompasses a range of disciplines and combines the urban, industrial, ecological and social responses to form an architectural solution. Expertise has been sought in these fields but the technical resolution of the programme and framework has been limited to architectural components. The non-architectural components are strictly indicative and are limited to educated guesswork.

02

CONTEXT

Fig. 2.1 Collage of urban prospectors along M31 (Author: 2018)

2018-02-13 PROSPECT RITUAL

On the morning of the 13th of February 2018, a truck lost its load on the M2 highway between Joe Slovo and Clevelend off-ramps. While this is not an uncommon occurrence, this particular truck was transporting gold-bearing rock. For two days modern-day prospectors came from far and wide to seek their fortune along a stretch of road merely a few hundred meters away from the centre of the city's disappearing mining belt.

JOHANNESBURG: PROSPECT CITY

From the start Johannesburg has been defined by processes of greedy and frenetic extraction.

From the derivatives trader in Sandton to the to the informal trader in Alexandra, all seem determined to leave as soon as possible with as much as possible. The mining belt is a constant reminder of this.

Growing at 4% per annum, and expanding to equally fast growing neighbours in an urban region of more than 10 million people, this is not a city on the edge of crisis and collapse (Gotz & Seedat 2006:1). It is a prospect city inherently on the verge of boom or bust.

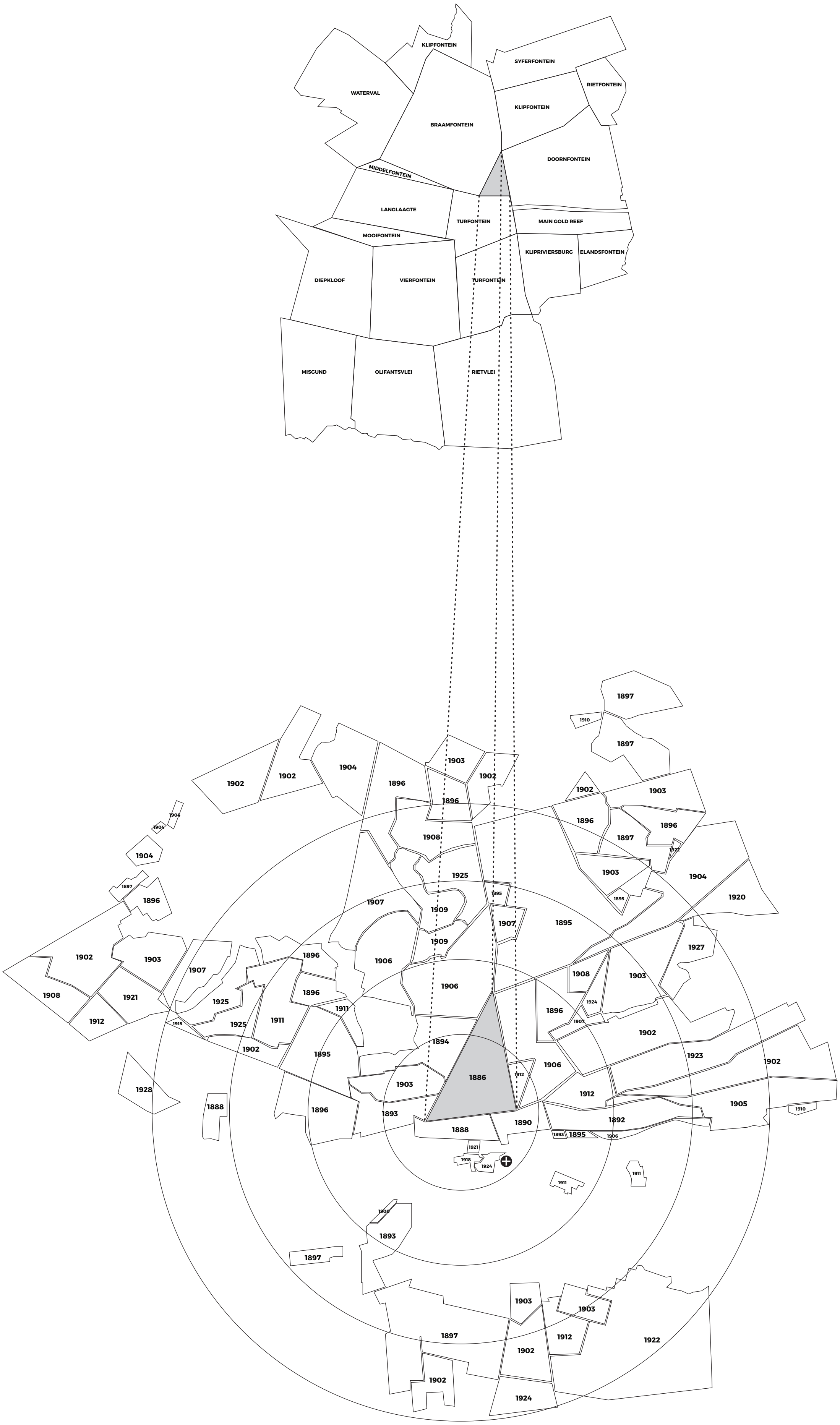

Fig. 2.2 The development of the Randjieslaagte Triangle from left-over farmland (Author:2018)

FROM *UITVALGROND* TO DIVIDED METROPOLIS

Before the discovery of gold, the Zuid-Afrikaansche Republiek (ZAR) only had legislation for surface topography as territory. Its *grontwet* made the minerals below the earth's surface the property of the owner of the land and mining was allowed without the permission of the state. By the time gold was discovered in 1886, a policy of state control over mining was established. After successful prospecting a gold-field was proclaimed (Bremner 2014: 184). Licensing provisions were then made and a title (*mynpachtbrief*) was granted to third parties to mine the land. Thus the rights of land-ownership, mineral ownership and political loyalty were all preserved. This allocation of the rights to extraction set up the relations of production which underpin the modern South African political economy (Van Onselen 1984).

The city of Johannesburg came into being in 1886 on a triangular piece of ground known as *uitvalgrond* at the centre of the eight farms which were first proclaimed as public diggings. Uitvalgrond- meaning surplus ground- was the definition given by the governing ZAR to land that was left over between portions of farms whose perimeters were determined by how far a Boer farmer could ride in a day from his farmstead (Bremner 2014: 180).

At the time it was laid out, the city was a proclaimed gold-field and was criss-crossed by lines of mining claims. Urban stands were granted by a mining commissioner in Pretoria as well as a Diggers Committee. *Voorkeurrechte*, or preferential rights for the use of its urban stands, were granted in the same way that *mynpachtbriefe* were granted to mine (ibid. 184).

In 1897 a form of municipal government was granted which began the socio-political and cartographic separation of mine and town. This is made manifest in an early map from the period- Plan of Johannesburg and suburbs- which shows a booming town with street grids and railways with the uitvalgrond triangle still visible. Early signs of the future racialisation of the city are also visible. South of the city, mines are named as blank areas but no location of shafts and underground topography are indicated (Bremner 2014: 180). A locational map on the bottom corner omits mines altogether and a table indicating gold production is the only clue that Johannesburg is a mining town at all.

A second map- Johannesburg ZAR 1897- is a drawing of a mine in section which shows inclining gold reefs below. In this drawing, the world above the mine- apart from a headgear- is ignored. These two maps offer very distinct and prejudicial views of space on the Rand with no relation to one another. From the beginning of the city's history the world of the underground and the surface world have been physically inter-related but conceptually separate.

One of the aims of this dissertation is to explore the future underground potential of Johannesburg and reconcile its relationship to

Fig. 2.3 Plan of Johannesburg and suburbs (source: Bremner, 2014)

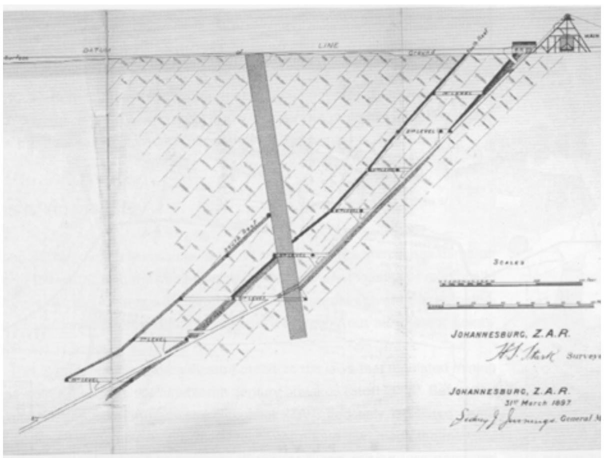

Fig. 2.4 Johannesburg ZAR 1897 (source: Bremner, 2014)

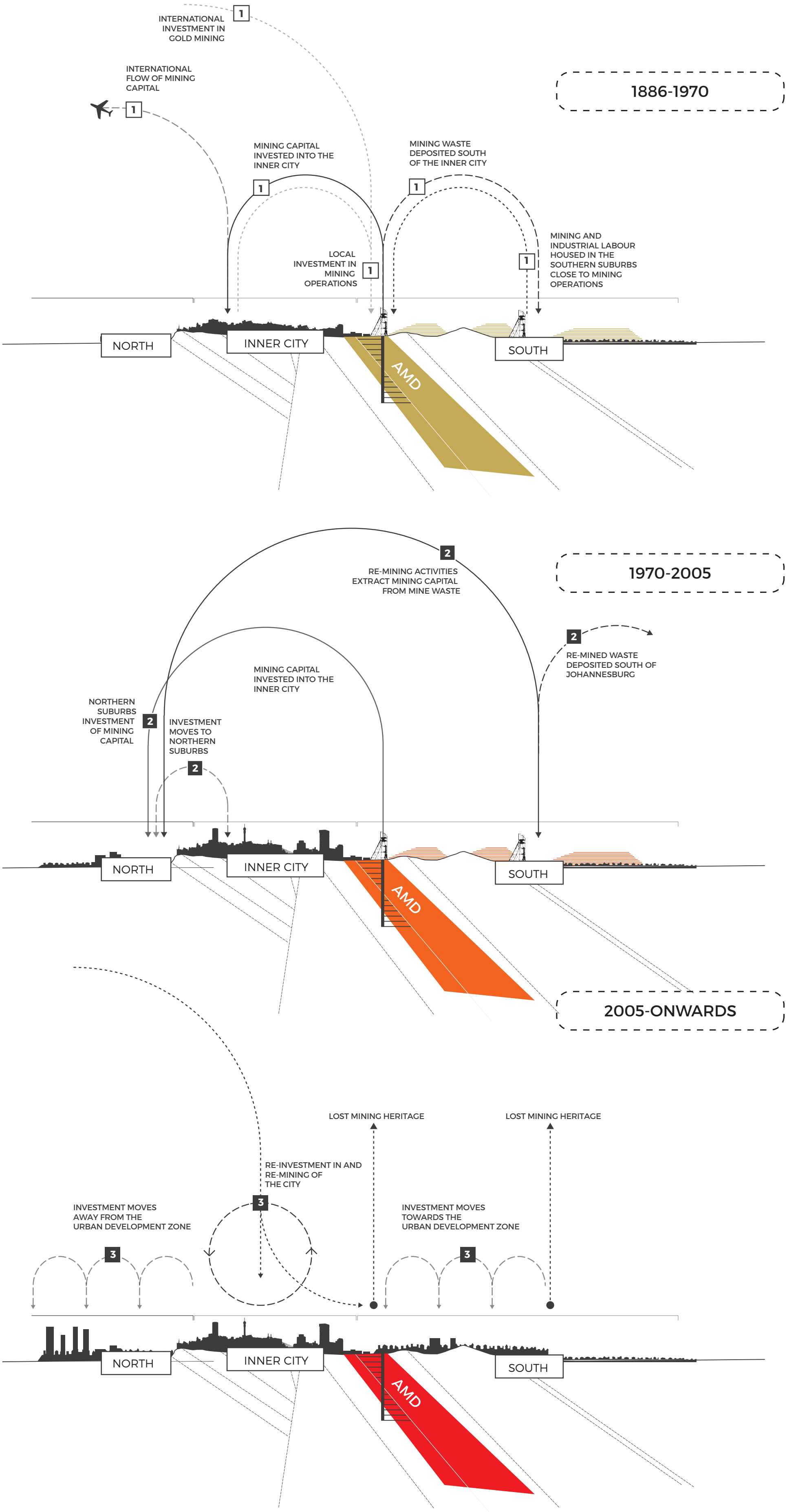

Fig. 2.5 Gold belt processes and dynamics (Author:2018)
(Adapted from Trangos & Bobbins (2015:3))

MINING BELT: LOST, THREATENED AND FUTURE PROSPECTS

Johannesburg's mining-belt is a manifestation of the incredibly valuable prospect beneath its surface. Over the last thirteen decades since he discovery of gold, those prospects have undergone a number of changes.

LOST PROSPECTS:

Johannesburg's gold deposits lie along an east-west axis and stretch almost the entire width of the Gauteng province. Johannesburg's gold reef deepens from the north to the south. The continued extraction of this gold and the associated waste products created a vast landscape of mine dumps and processing sites all along the reef. The logics of this extraction coupled with the political policy of segregation has seen a division of the city with the mining belt as its centre.

If one explores Johannesburg as a cross section, running in a north-south direction, the city gradually changes from a landscape of leafy tree-lined suburbs, once owned by Randlords, that surround decentralised business centres, to a vertical concrete inner city defined by the traditional CBD. As one moves south, the inner city abuts the remnants of mining activity and is interspersed with warehouses, manufacturing and light industry.

Generally, the area to the north is the zone of investment and beneficiaries whereas the area to the south is a region of waste and labourers.

THREATENED PROSPECTS:

The heights of Johannesburg's production came in the year 1970 where it produced 79 percent of all the world's gold (Trangos & Bobbins 2015:3). Since that time production has steadily decreased as the slanting gold reef became harder to access and returns diminished with depth.

A variety of ecosystems, both of the natural and constructed variety, adjoin the built urban form of the city, binding it to the surrounding natural network of the elements, fauna and flora (ibid.). These essential infrastructures and resources make life in Johannesburg possible but are constantly threatened by the products of urban lifestyles, industry and mining (ibid).. The same can be said of the rapidly disappearing reminders of the mining history of the city. The more recent phenomena of gentrification (specifically in the south of the CBD) poses an additional threat to the architecture of the mining belt.

FUTURE PROSPECTS:

The mining belt is representative of the city's genesis and past but has the potential to become its great future prospect too. As the north and south of the city continue to densify, the mining belt of the city is going to represent ever more appealing develop-able land.

Apart from its centrality, the future prospect of the mining belt lies in the potential of creating landscapes that support regenerating and inclusive natural landscapes supporting new forms of production and creation that go beyond mere extraction and exploitation.

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MIXED FORTUNES AND FUTURE PROSPECTS

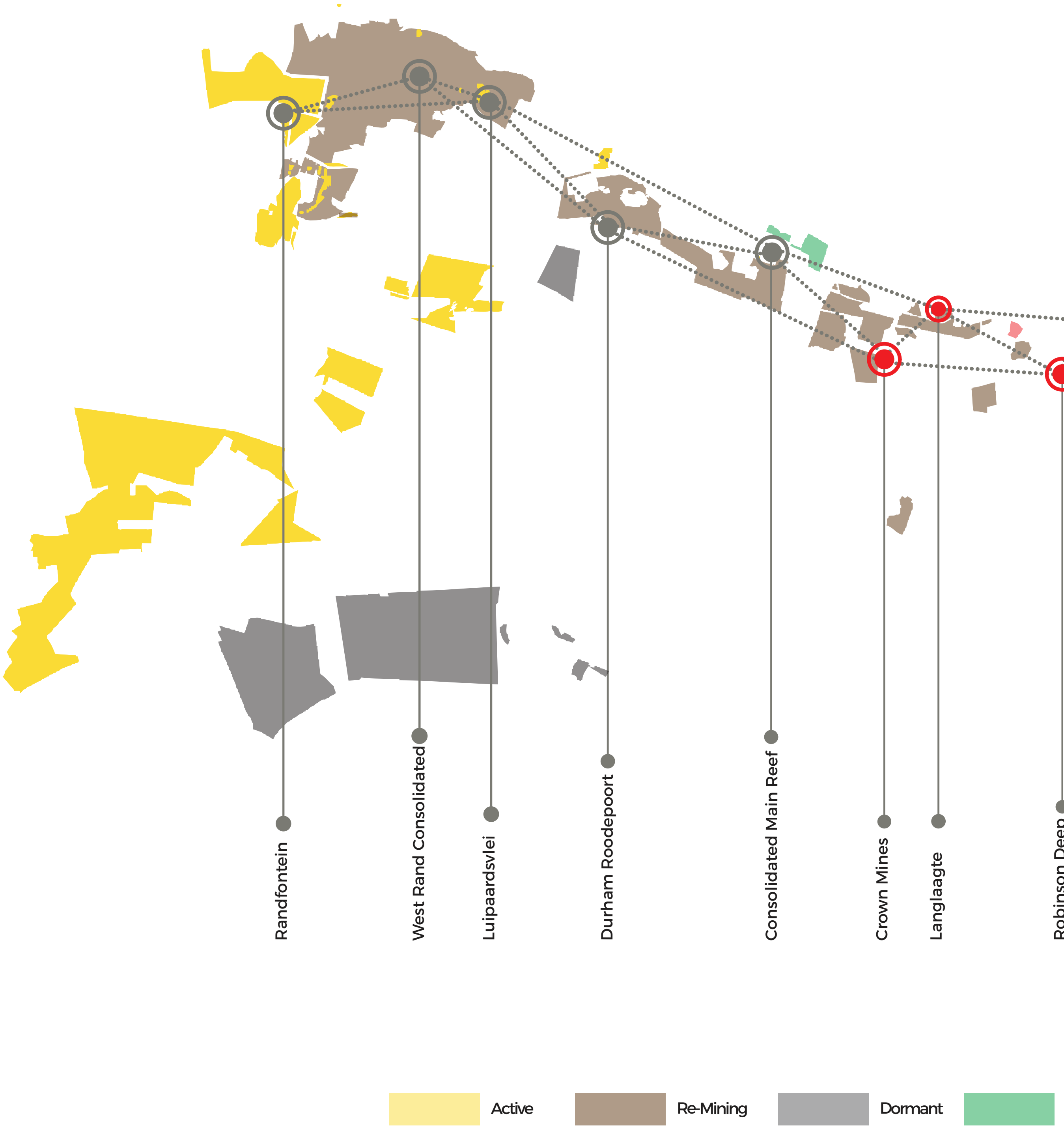


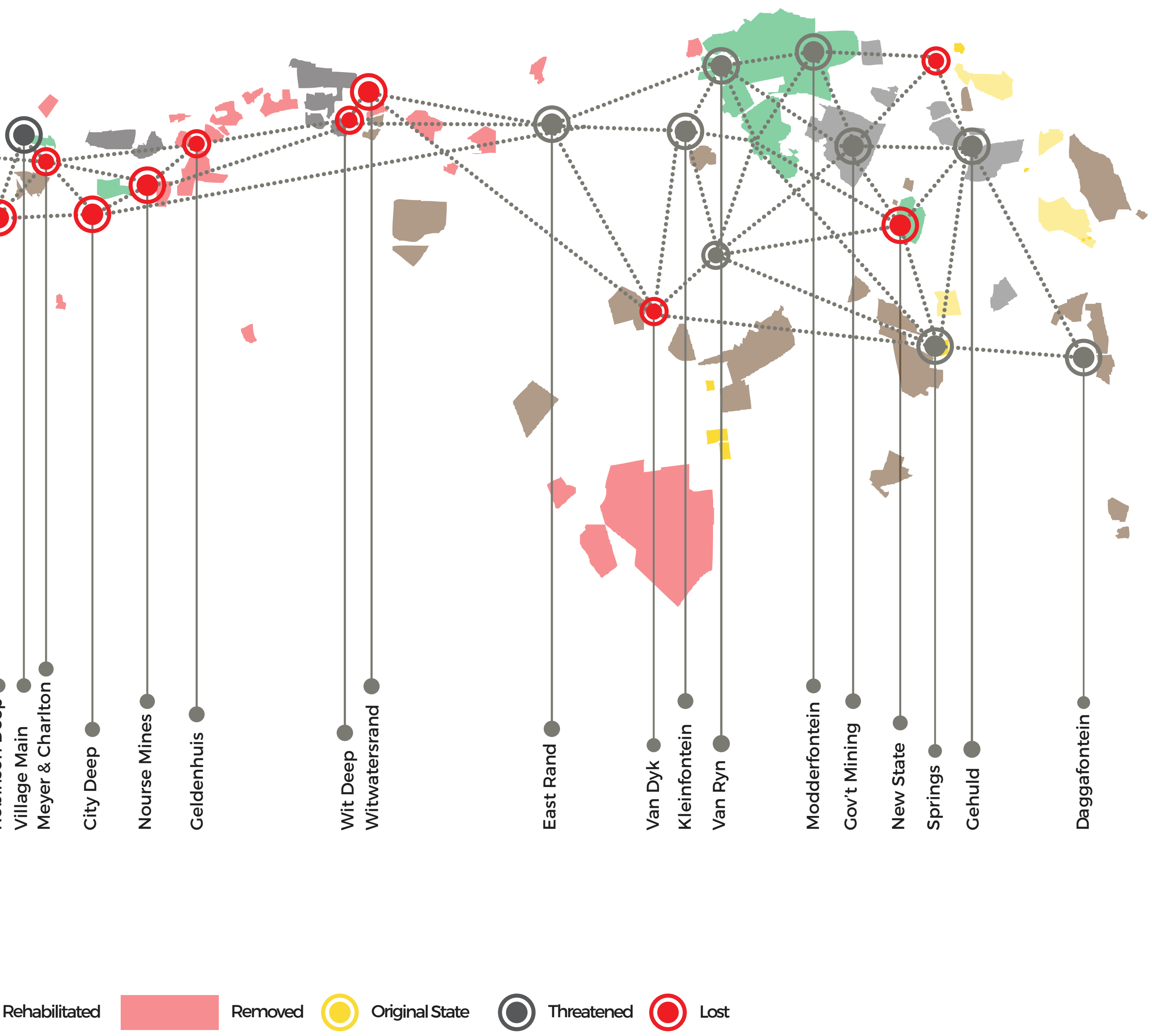
Fig. 2.6 The status of the gold mines today (Author:2018)

The process of deep-level gold mining is a deeply destructive one and its consequences continue to affect many global industrial cities. Hinged on extracting wealth and driving down costs, the direct physical and environmental consequences, as well as the indirect social impacts of the mining industry on society and the environment, create a legacy of disturbance that is extremely challenging to remedy and extend far beyond the physically altered landscape (Trangos & Bobbins 2015: 1).

Few landscapes anywhere in the world have seen mining on the scale of that of the Witwatersrand gold fields. However, from the 1970s, gold mining in the Gauteng City Region rapidly declined with a move to a service-oriented economy (ibid.). Today, most of the prospecting happens in board rooms and on trading floors but some gold mining still happens in Gauteng, with the province still home to the Mponeng and TauTona mines; the two deepest in the world.

Although they began with the same glittering promise, the sites on Johannesburg's mining belt have had vastly different fates. While only a handful of mines remain operational, the overwhelming majority have long since ceased production. The improvement in processing technology means that many have since been re-mined whilst others have simply been abandoned.

The aim of the dissertation is to explore the future prospect of one of the last gold mines.



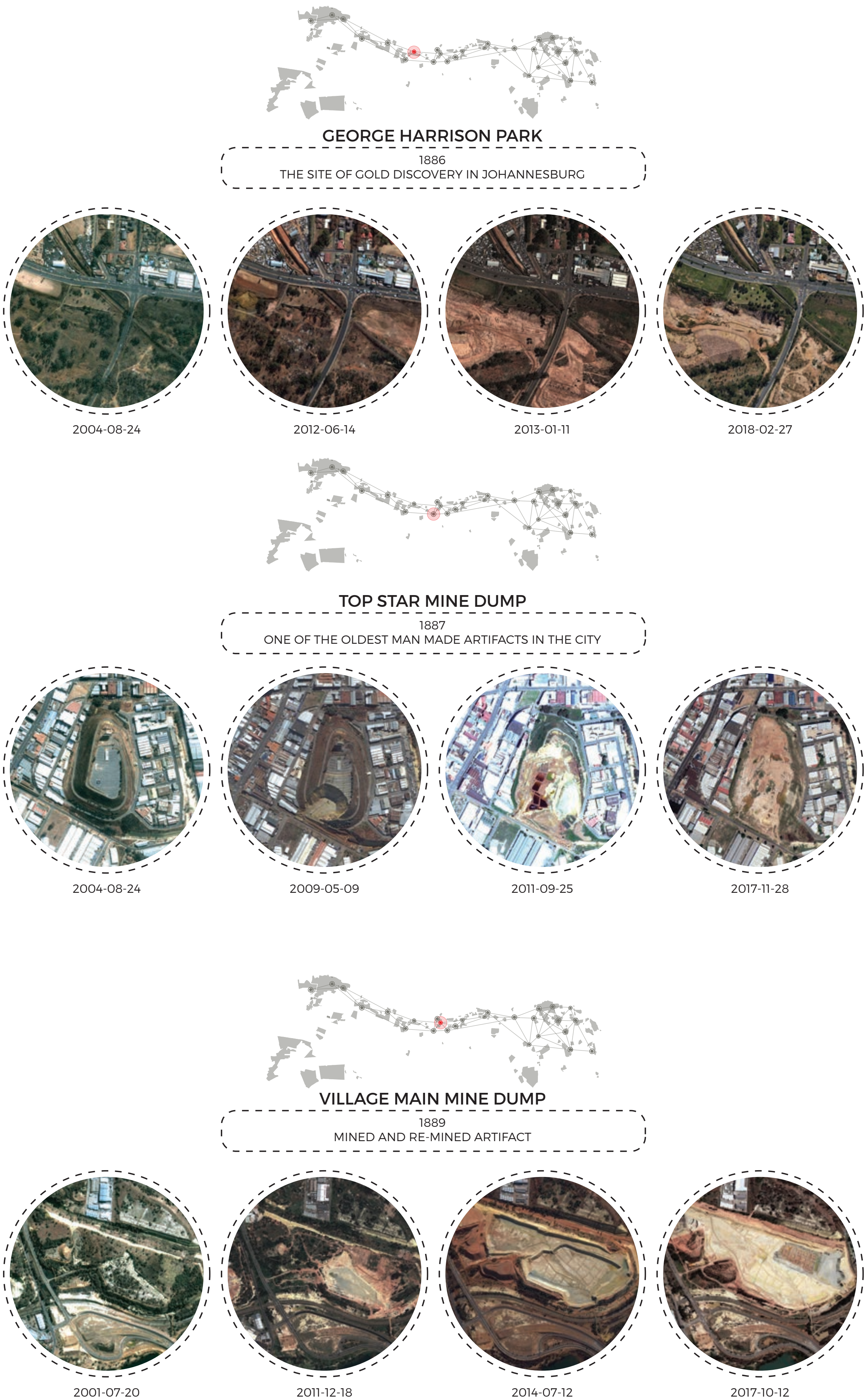
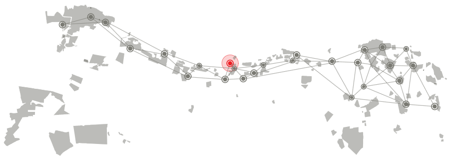


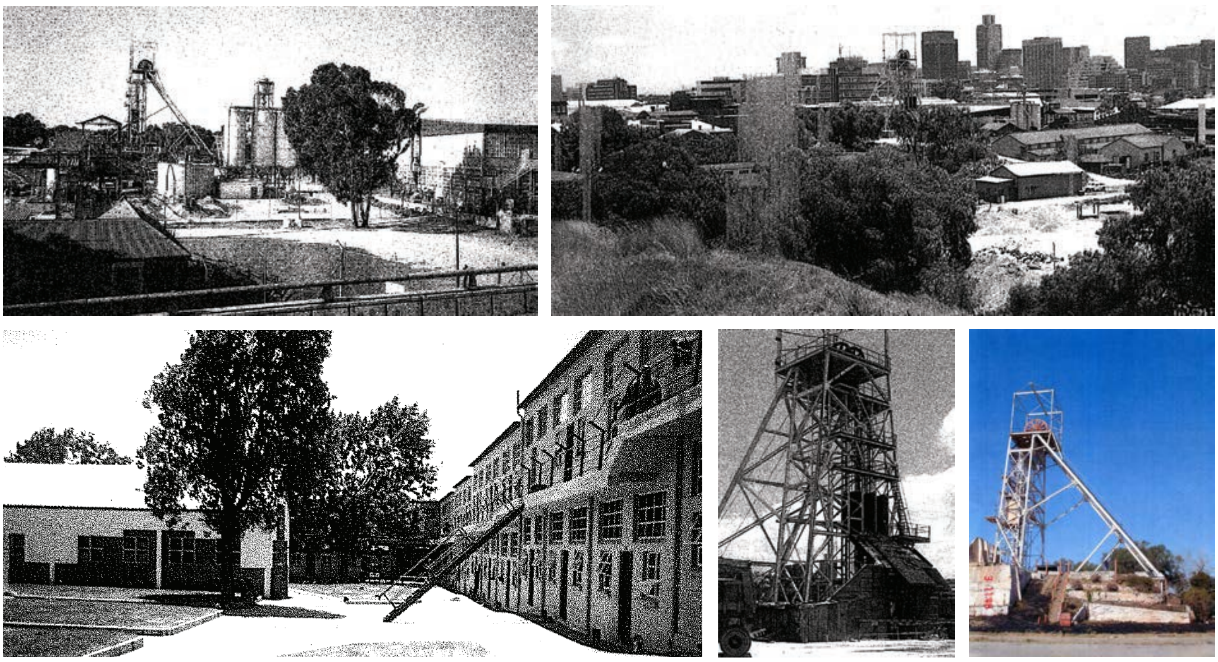
Fig. 2.7 Threatened Mining Heritage Sites at George Harrison Park (top), Top Star mine dump (middle) and Village Main mine dump (bottom) (Author:2018)



VILLAGE MAIN SHAFT 1

1889
NEAREST MINE TO THE CITY

2005-01-30 | 2010-06-20 | 2015-11-05 | 2011-11-18



LOST BUILT HERITAGE AT VILLAGE MAIN

THE SITE TODAY

Fig. 2.8 Village Main Shaft 1 as a threatened site (Author:2018)

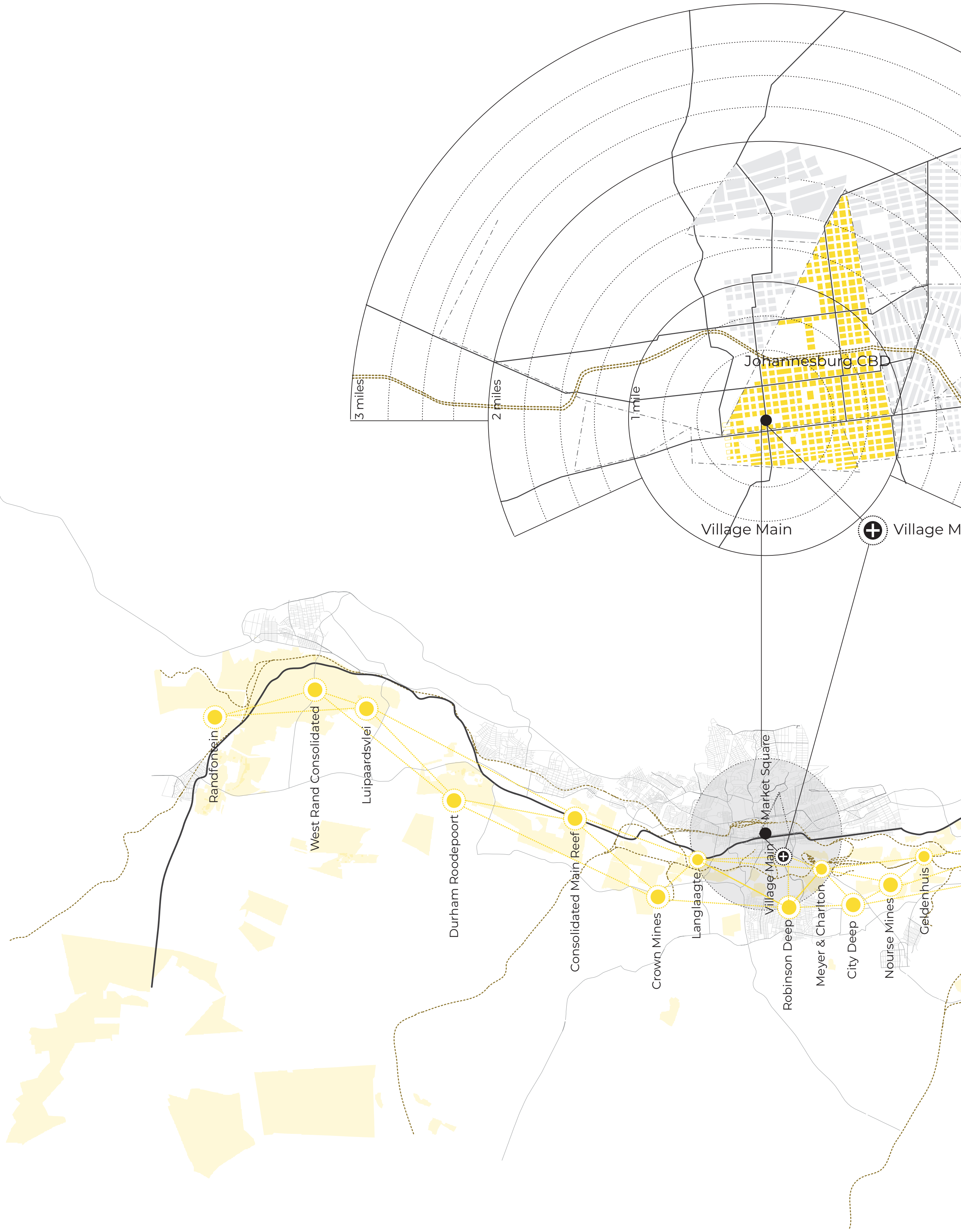
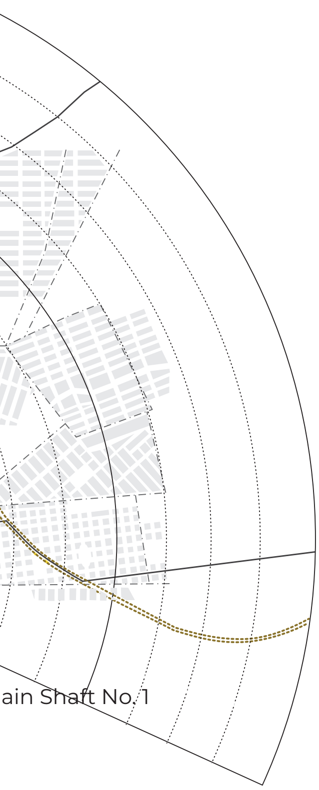


Fig. 2.9 Village Main in relation to the Randjieslaagte Triangle, Witwatersrand Mining Belt and the CBD (Author:2018 adapted from (Lubell, 2014:133))


ain Shaft No. 1


Johannesburg CBD
Jeppestown
Village Main
Village Main Shaft No. 1

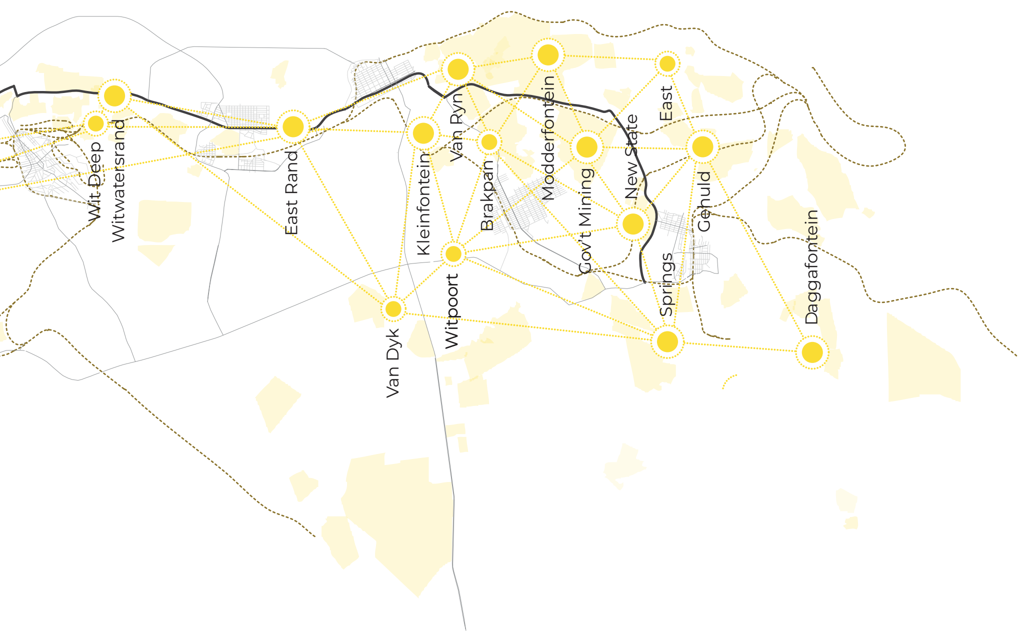

Wit Deep
Witwatersrand
East Rand
Kleinfontein
Van Ryn
Brakpan
Modderfontein
Gov't Mining
New State
East
Geduld
Springs
Daggafontein
Van Dyk
Witpoort

Fig. 2.10 Site location (Author: 2018)

Fig. 2.11 Existing concrete platform (Author: 2018)

VILLAGE MAIN

THE VILLAGE MAIN NO 1 SHAFT IS THE NEAREST MINE TO THE JOHANNESBURG CBD BUT IS A WORLD AWAY FROM THE STREETS OF THE CBD EXPERIENTIALLY. VELD HAS TAKEN OVER WHERE MINING LEFT OFF. HERE THE ANCIENT UNDERGROUND HISTORY OF THE CITY COLLIDE WITH AN UNCERTAIN FUTURE. IT IS WEDGED BETWEEN VAST MINING LANDSCAPES TO THE EAST, PRODUCTIVE INFRASTRUCTURE TO THE WEST AND THE FINANCIAL HEART OF THE CDB 1KM NORTH.

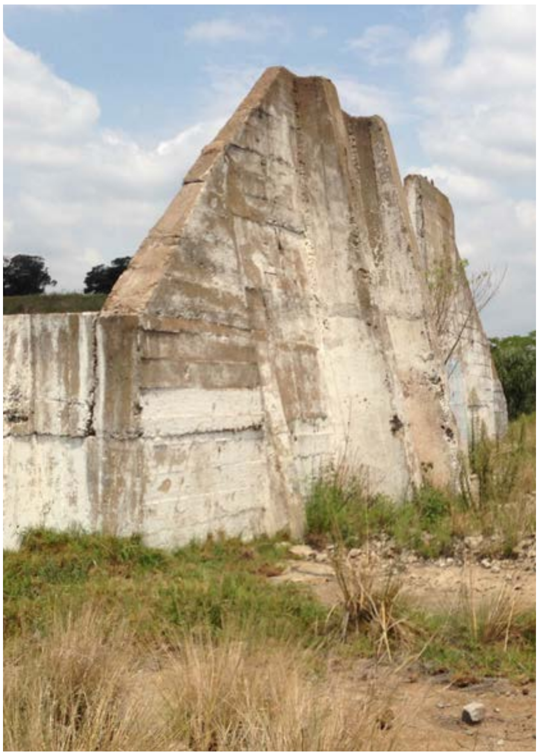


Fig. 2.12 Shaft No. 1 concrete walls (Author: 2018)

Village Main Reef Gold Mining Company (the first limited liability company in the city) was registered on 25 February 1889 (Holz 1992:19). The company was the owner of 14 claims immediately south of the Randjieslaagte triangle. To test the theory that bankets (conglomerate beds) dipped to the south, a borehole was sunk in December 1889 (Ibid.). This borehole intersected the reef at approximately 170m. Although the core assay of nine ounces of gold did not cause much excitement at the time it did prove without a doubt that the Witwatersrand was going to be a major gold-field (Ibid.).

By 1908, thanks to the introduction of new mills, the site was crushing 40,000 tons per month. This period of productivity ended rather suddenly on 21 October 1921 when an earth-tremor caused the collapse of the 15th level of the mine (Ibid.). As a result of the damages it was believed that the mine was worked out and no effort was made to re-open the mine. This represented the first instance of bust in a boom and bust cycle that would come to characterise the mine and city for the next 90 years. By the time the mine closed in 1921, it had milled 7,9 million tons of ore and had produced 3,56 million ounces of gold (Ibid.).

In 1931 South Africa abandoned the gold standard and the re-opening of derelict mines

Fig. 2.13 View north towards Johannesburg CBD (Author:2018)

Fig. 2.14 View from freeway 2005 (Ellipses:2016)

Fig. 2.15 Shembe worshippers (Ellipses:2016)

became an attractive possibility once more. In 1934 the company was re-founded. It had ore reserves of 3,293,000 tons, giving it a life expectancy of 17 years (Ibid.).

In subsequent years the company acquired the New Robinson, Meyer & Charlton and New Wolhuter mines, making it the dominant player on the southern periphery of the CBD. In 1940 Anglovaal became the administrator and technical manager of the mine (Ibid.).

Due to the inconsistent nature of the reserves, the board gave three months statutory notice of closure in 1961 but operations continued. In the mid 1960s the state introduced subsidies for mines which boosted operations, as did the acquisition of the entire Robinson Deep mining title. Underground mining continued for another ten years until in June 1976 operations below the surface halted (Ibid.).

At this point the mine started treating sand dumps and calcines- the latter for their gold content. The calcines lasted until 1980 since which time only sand has been treated.

In 1989, the chairman of the company announced a feasibility study into the possibility of re-mining. As a result, underground activity commenced in 1991, albeit, on a much more limited scale.

In the year 1960, the timber headgear of the Village Main No 1 shaft was condemned by the management of the mine and was replaced with a steel alternative. The wooden headgear was so solid that it took a full week to demolish (Ibid.). This event represents the first instance of removal of built artefacts from the site, a process which culminated in 2008 when the steel headgear was removed as the last remaining remnant of built industrial heritage on the site. The remaining equipment from the site was sold off as scrap-metal.

HERITAGE SIGNIFICANCE.

ASSESSING HERITAGE SIGNIFICANCE:

The National Heritage Resources Act (1999) sets out the framework for the assessment of the national significance of Village Main. The heritage significance is therefore assessed through the following categories:

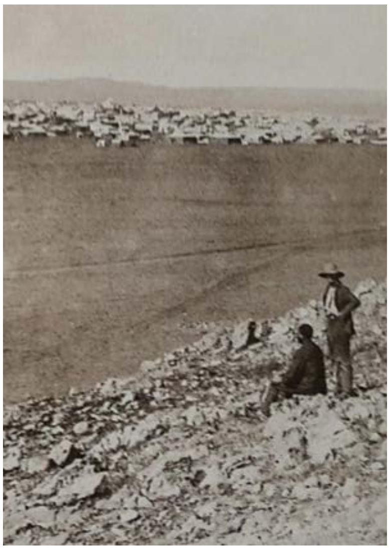


Fig. 2.16 Johannesburg 1888 (Heritage Portal:2016)

Fig. 2.17 Undergound scene (SA History)

Fig. 2.18 View from freeway 2000s (Ellipses:2016)

HISTORY AND MEANING:

The site is associated with the founding of Johannesburg and its rise as the world's foremost gold producer until 1970. It is also significant as a geological site of both scientific and cultural importance.

Village Main was a gold mining site from 1899 until 2008. During those years it not only contributed to the economy of the city but also as a site of employment and as a landmark. The site's boom and bust cycles are emblematic of Johannesburg's story over the last century and its

FUNCTION:

The artefact represents a strong and special connection to a particular organisation of importance in the history of South Africa.

Although the majority of the equipment and processing buildings have been removed from the property, the site represents an example of a deep level gold mine of the sort that made Johannesburg the world's largest gold producer until 1970. The extractive nature of the operations can be clearly seen in the surrounding mine tailings as well as the pollution on the site. This too represents an important, albeit unpleasant, facet of the site's history as it represents a period of particular industrial activity and attitude towards the environment.

CONTEXT:

The site has a strong association with a particular group for spiritual reasons.

Through the 109 years the mine was operational, it witnessed dramatic changes in the nature of gold mining as an industry as well as changes in the urban context of the surrounds. The site was originally a lone mine in the veld to the south of the Randjieslaagte triangle but is today very much a part of the CBD of the city. It's proximity to the industrial area to the west, Jeppestown to the north-east and the financial district to the north make it an instance of the mining belt with heightened presence and worth. The synthetic landscape created by the excavations and tailings are today used as important Shembe church sites due to the vantage it allows.

ARCHITECTURAL SIGNIFICANCE:

Village Main Mining Company occupied the site from 1899 until 2008. During that time many iterations of building happened but sadly so did demolitions (of the 23 original buildings only four remain). At present all that remains on the site are the administration buildings on Sprinz Street (dating from 1934) and the podium upon which the second generation headgear was mounted (dating from 1934). It is absolutely vital that the remaining built structures be protected against possible removal, vandalism or indiscriminate development. The most severe loss to the architectural heritage on the site is the second generation steel headgear which was removed in 2008. This is a loss both for the steel detailing on the artefact as well as the iconic nature of the headgear and its position as a Johannesburg landmark.

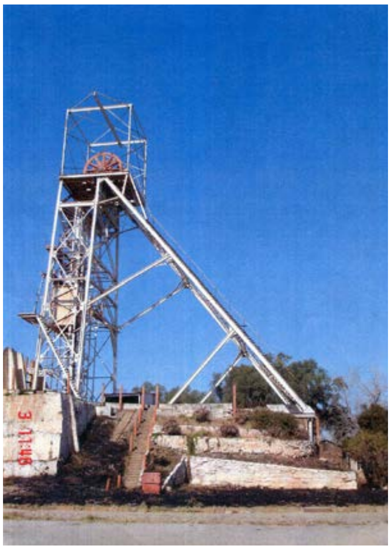


Fig. 2.19 No. 1 shaft 1990s (Heritage Portal:2016)

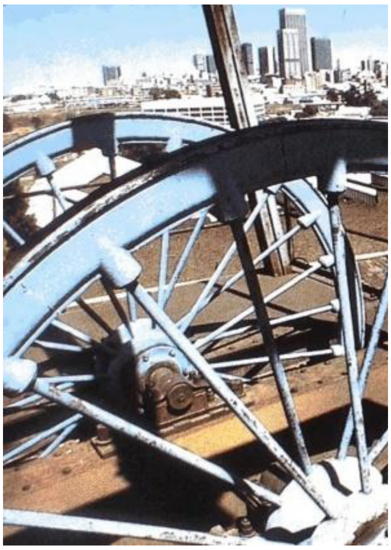


Fig. 2.20 View from freeway 2005 (City Sightseeing)

Fig. 2.21 View towards crusher (Author:2018)

FORM:

The artefact is an instance of an uncommon and endangered aspect of South Africa's cultural heritage.

The remaining concrete podium on the site is extremely unique in that it represents the only instance of that type of technology on the Witwatersrand mine belt. Whilst this instance is raised, other Witwatersrand mines have a headgear which sits on the surface.

TECHNOLOGY:

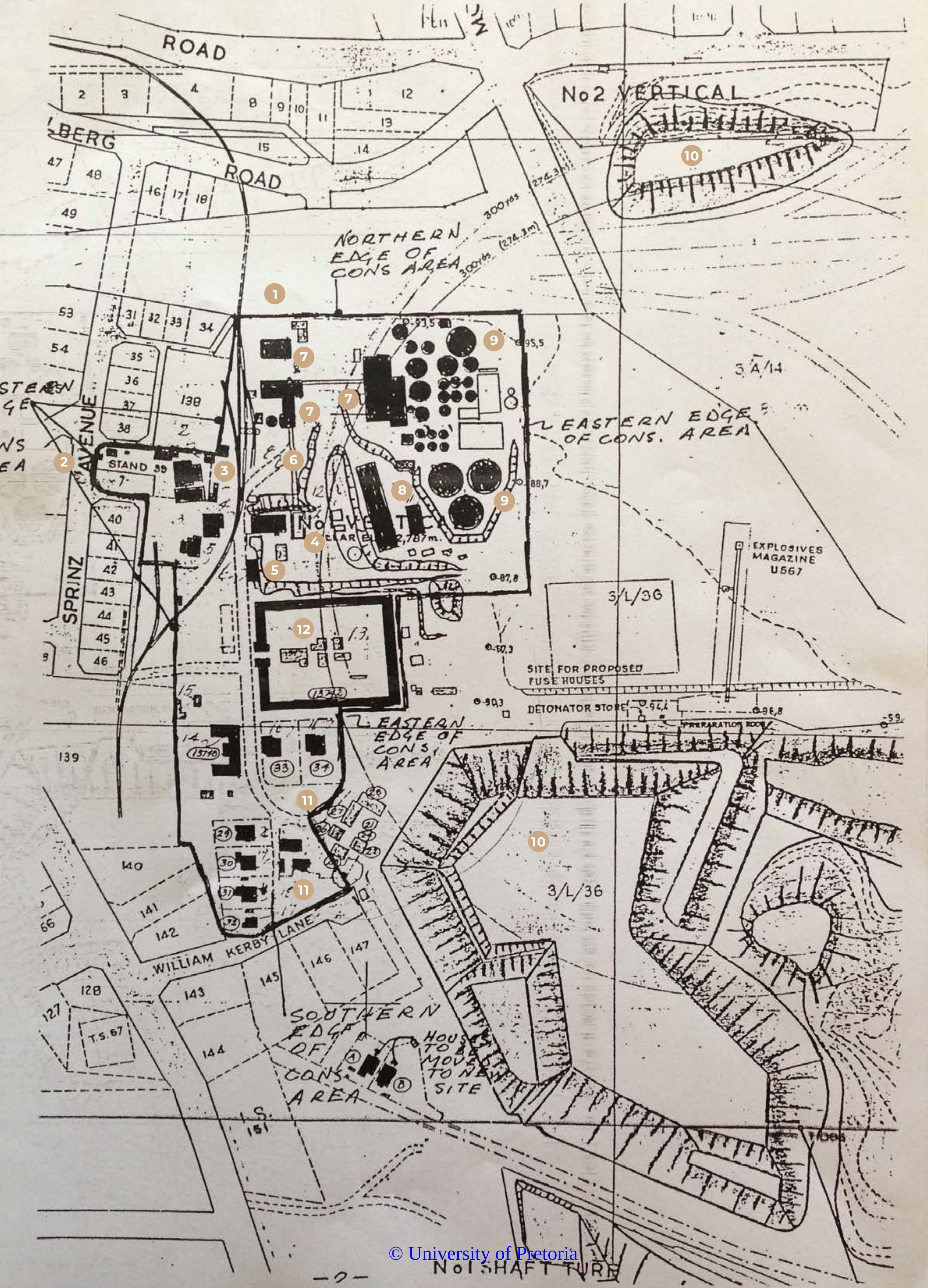
The mine represents a high degree of technological achievement in a particular time period.

Due to the nature of the geology, the Witwatersrand gold mines are the deepest in the world and required extremely sophisticated technology in order to extract gold. Village Main is a prime example of such a site. The number 1 shaft extends two kilometres vertically. Unfortunately, the mechanical equipment was removed from the site in 2008 when it was officially closed. The buildings lost to demolition are: an electrical sub-station, winder house, lamp house, headgear, conveyor structure, mine reduction plant and workshops.

MATERIALITY:

The structures and artefacts are all over 60 years of age.

The most notable instance of historic materiality on the site is the concrete podium and stone retaining wall. These were built in 1934. Their materiality and monolithic nature are functional requirements related to the fact that trucks used the podium as a base from which to collect ore. Their weathering tells the story of the centuries of mining as well as the site's eventual abandonment. The remaining administrative buildings on the site are typical mono-pitch brick buildings built in the 1930s. They were drawn by the mine engineer. Also notable is the hand-painted gate on Sprinz Street bearing the company's logo and name.


ROAD
ROAD
No2 VERTICAL
NORTHERN EDGE OF CONS AREA
300yds (274.3m)
300yds (274.3m)
EASTERN EDGE OF CONS. AREA
3/A/14
AVENUE
SPRINZ
STAND 39
No 1 VERTICAL
EXPLOSIVES MAGAZINE U567
3/L/36
SITE FOR PROPOSED FUSE HOUSES
DETONATOR STORE
PREPARATION ROOM
EASTERN EDGE OF CONS AREA
3/L/36
WILLIAM KERBY LANE
SOUTHERN EDGE OF CONS AREA
HOUSES TO BE MOVED TO NEW SITE
T.S.67
No1 SHAFT TURF

ORIGINAL SITE PLAN

To a great extent the arrangement of the Village Main No 1 site is a result of the process by which gold was extracted on the site and is a manifestation of the process of extraction, processing and transportation. Economy and the processing of materials and labour took preference over ecology and the conservation of resources.

1. Materials entrance/exit from Heidelberg Road
2. Personnel entrance from Sprinz Avenue
3. Village Main administration buildings, staff recreation room, and substation
4. Mine headgear and concrete platfrom
5. Change House
6. Conveyor structure
7. Extraction and reduction
8. Workshops
9. Tanks
10. Mine dumps
11. Engineer and supervisor accomodation
12. Labour accomodation

Fig. 2.22 Early site plan (Author:2018)

[01] EXTRACTION

The site was predominantly organised around the process of extracting gold-containing ore from the underground tunnels. These tunnels are as far as a kilometre beneath the surface. A concrete platform was constructed upon which a headgear and lift were placed to lift the material from the sub-surface.

A radial arrangement of facilities was adopted on the site with the processing facilities arranged around the vertical shaft.

[02] PROCESSING

The Macarthur-Forrest Process is a method of separating gold and silver from their ores by dissolving them in a dilute solution of sodium cyanide or potassium cyanide. The method includes three steps: contacting the finely ground ore with the cyanide solution, separating the solids from the clear solution, and recovering the precious metals from the solution by precipitation with zinc dust (Encyclopedia Britannica 2018).

This process necessitates the series of buildings on the site as well as the mine dumps which dot the surrounding landscape, The cyanide, in particular, is the reason for the pollution of Johannesburg's acid mine drainage problem.

[03] TRANSPORTATION

Village Main's productive capacity required a constant flow of material and people in and out of the site. Admin functions were located to the west with a link to Sprinz Avenue, residential functions were located to the south with a link to William Kerby Lane, and industrial processes were located to the north and east with links to Heidelberg road.

ORIGINAL PROGRAMME

In order to understand ways of intervening at Village Main and proposing an alternative future it is essential to understand the logic of the original programme and its relationship to the horizontal and vertical dimensions of the site.

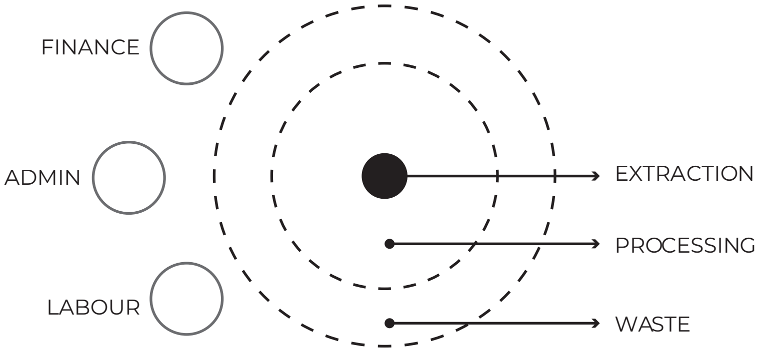


Fig. 2.23: Historic concentric programmatic diagram (Author:2018)

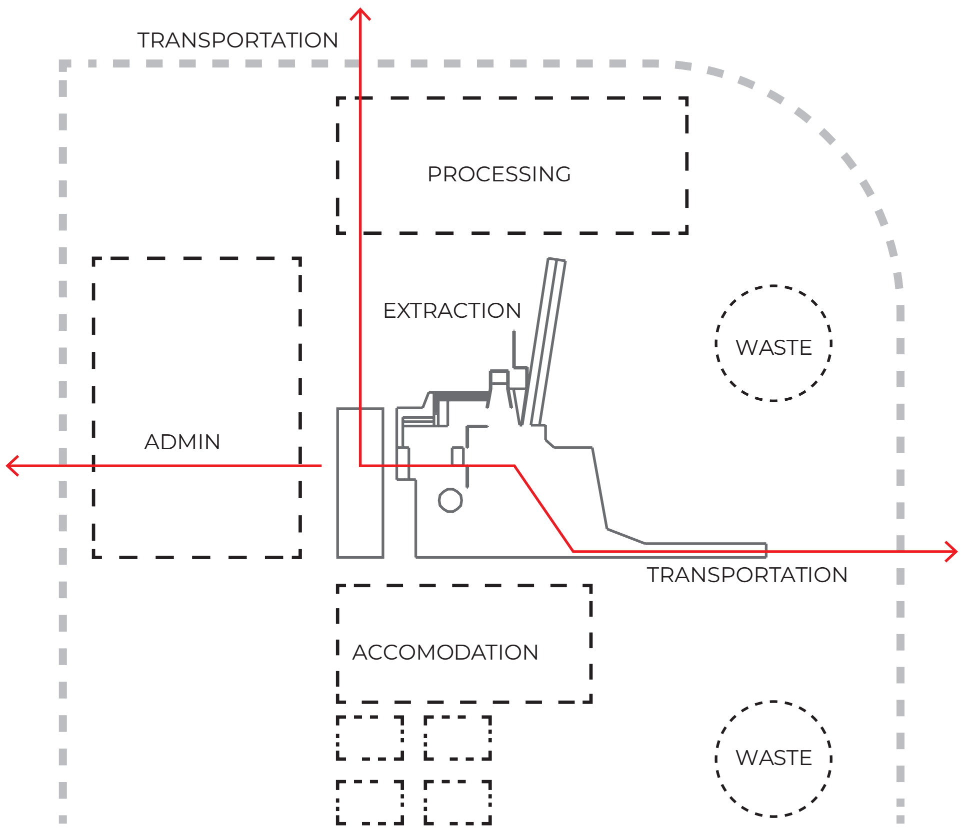


Fig. 2.24: Physical manifestation of programme on site histroically (Author:2018)

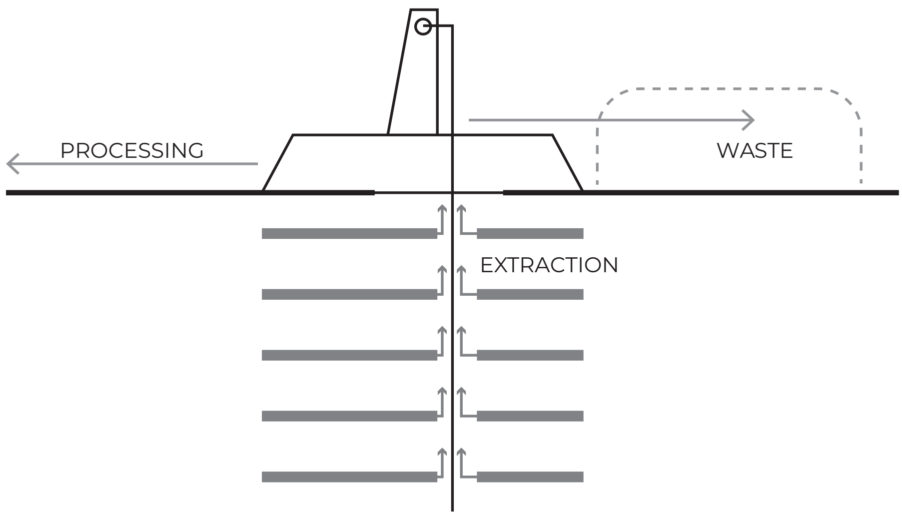


Fig. 2.25: Sectional flow of materials historically (Author:2018)

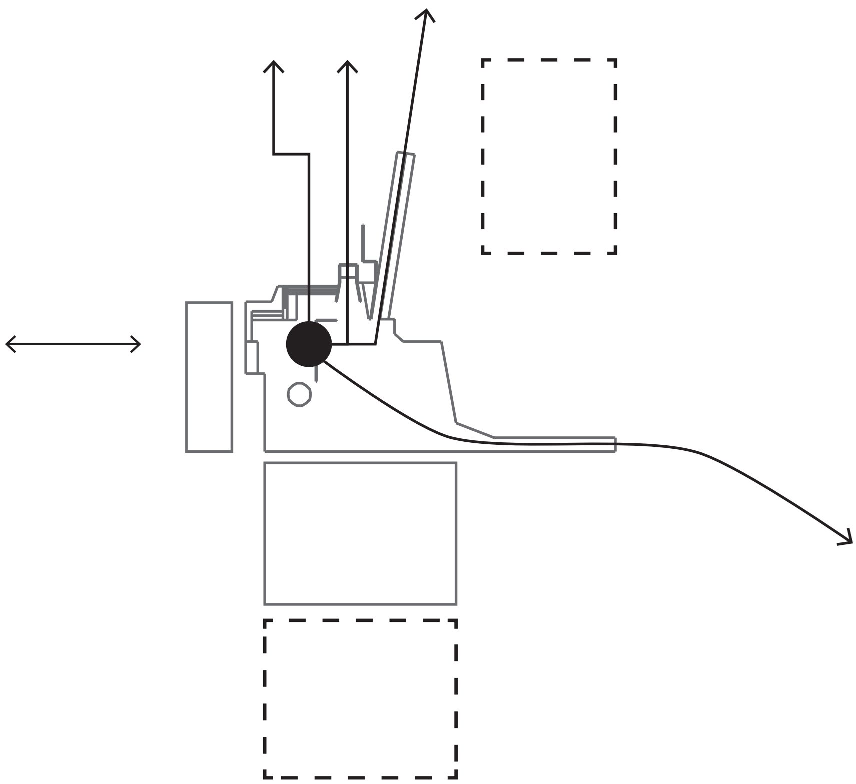
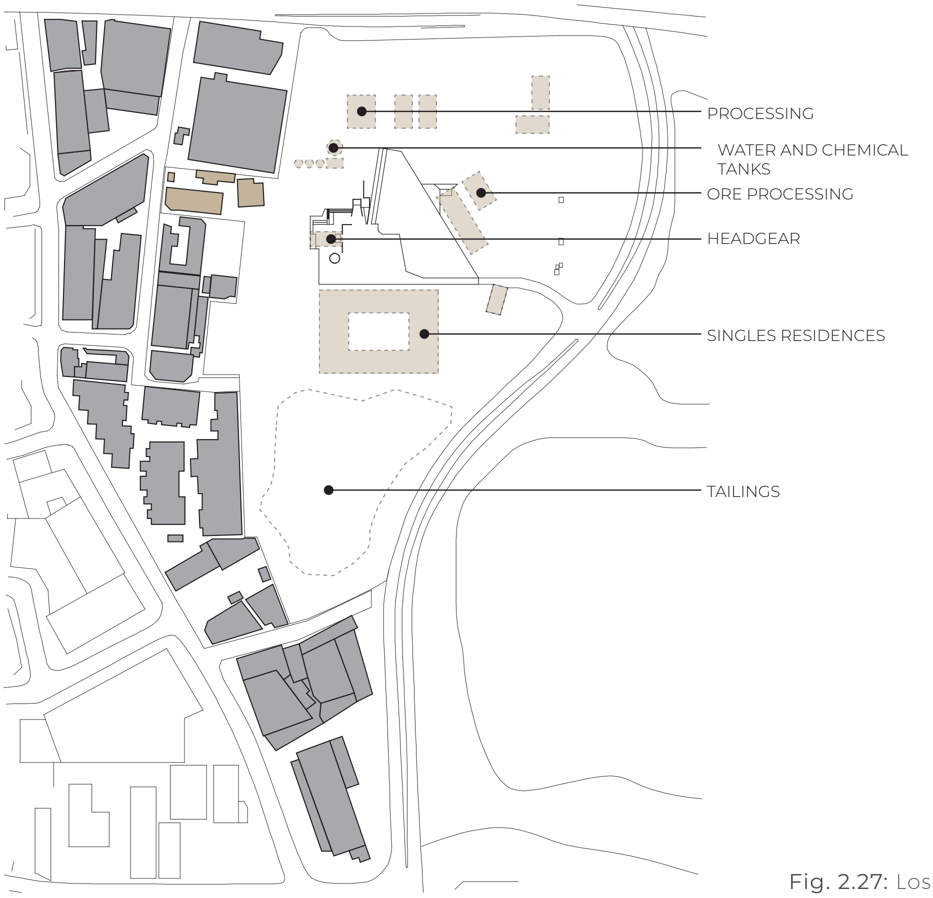
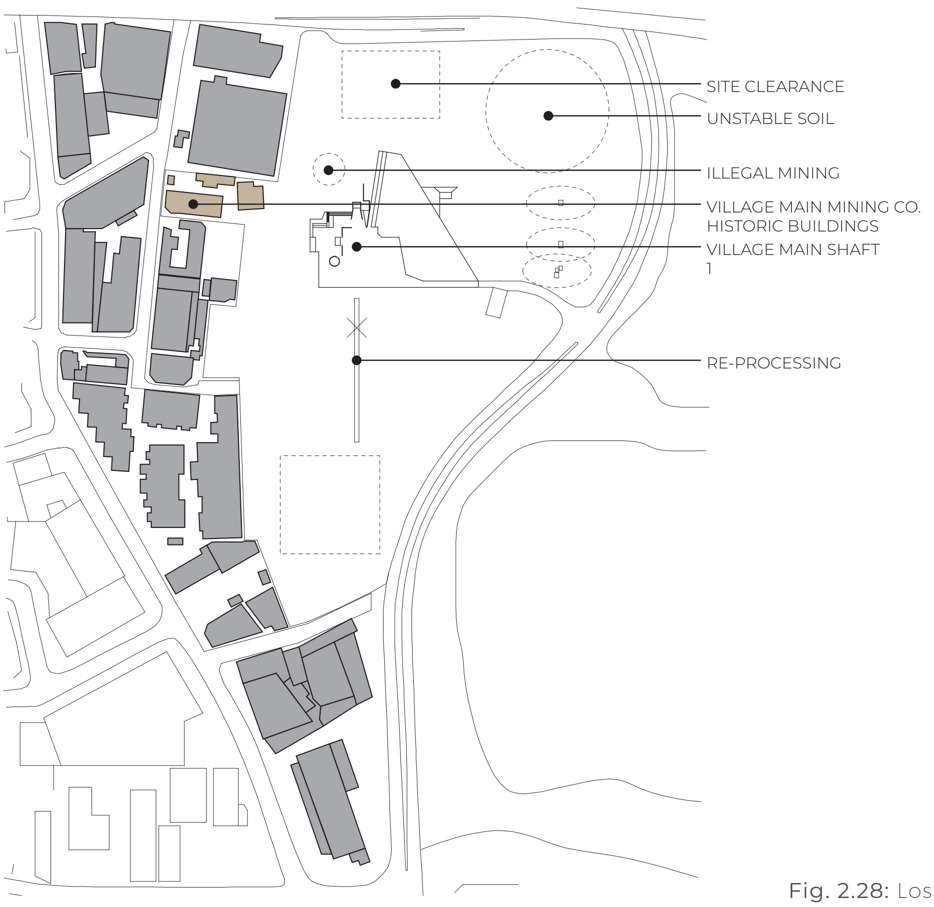


Fig. 2.26: Horizontal flow of materials historically (Author:2018)



LOST BUILT HERITAGE

Fig. 2.27: Lost built heritage (Author:2018)



THE SITE TODAY

Fig. 2.28: Lost built heritage (Author:2018)

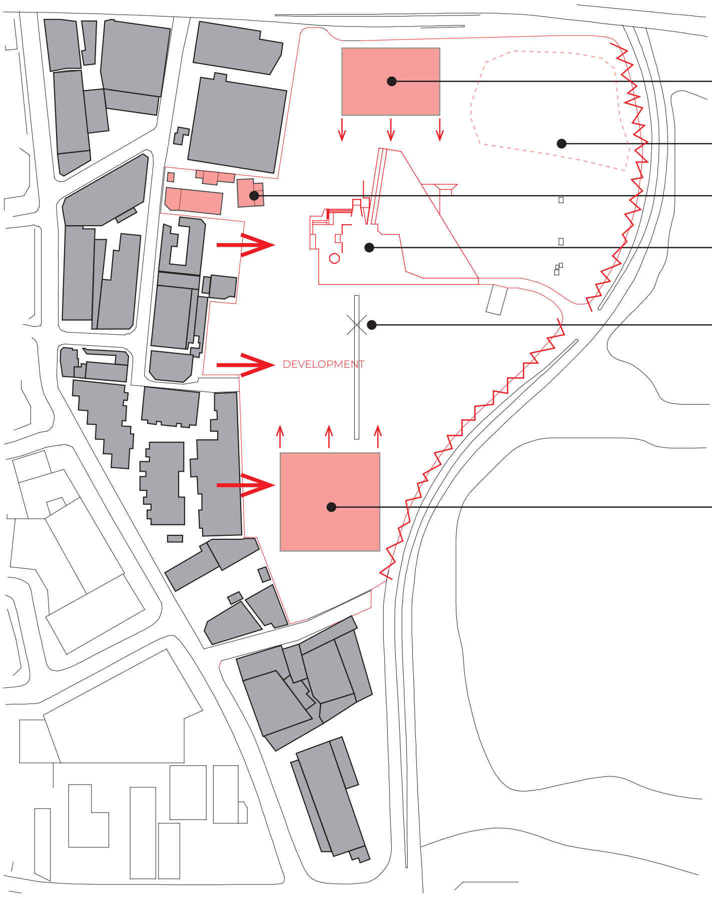


Fig. 2.29: Threats to site (Author:2018)

Fig. 2.30: Underground network (Author:2018)

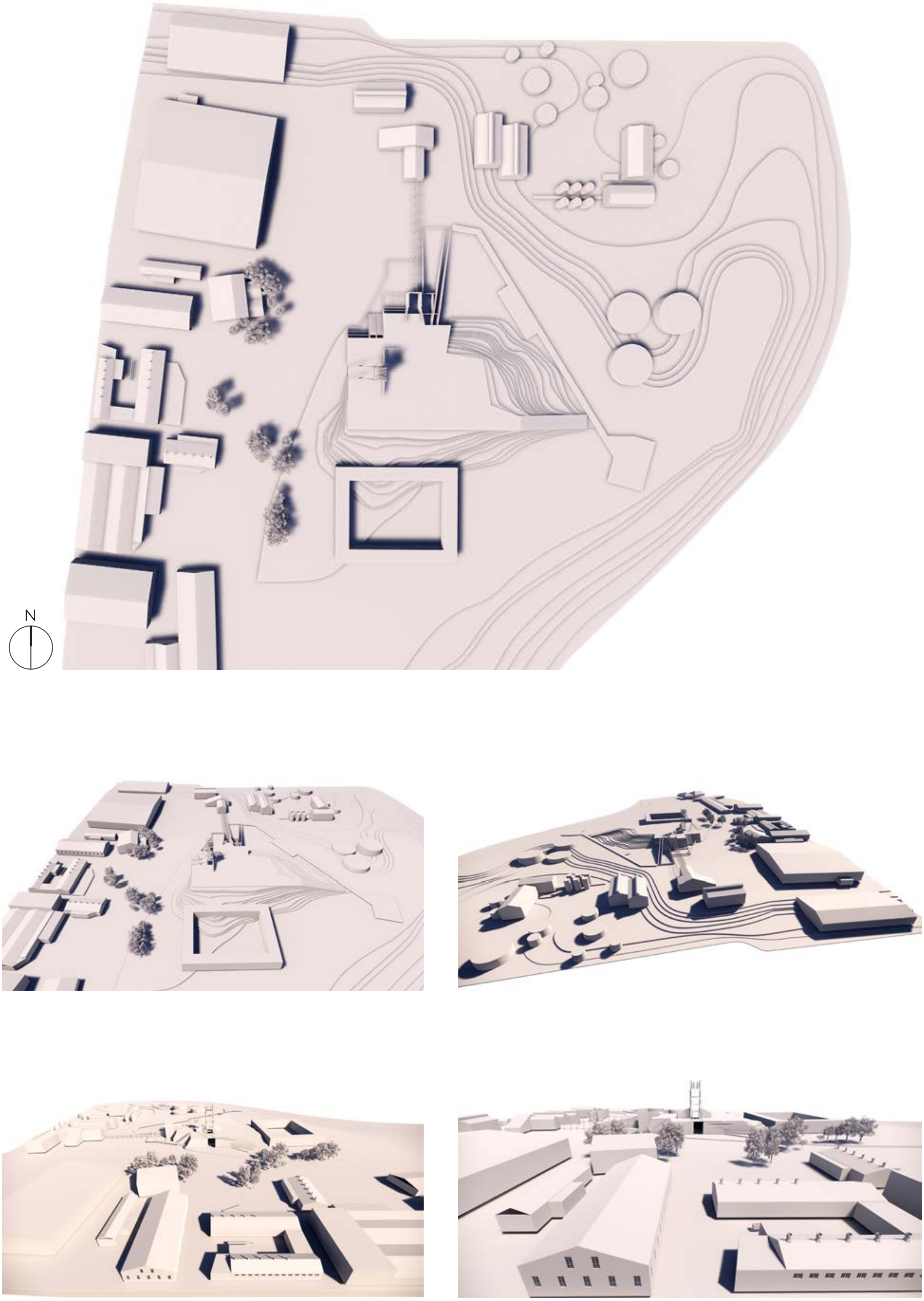


Fig. 2.31: Views of the site and building at the height of production (Author:2018)

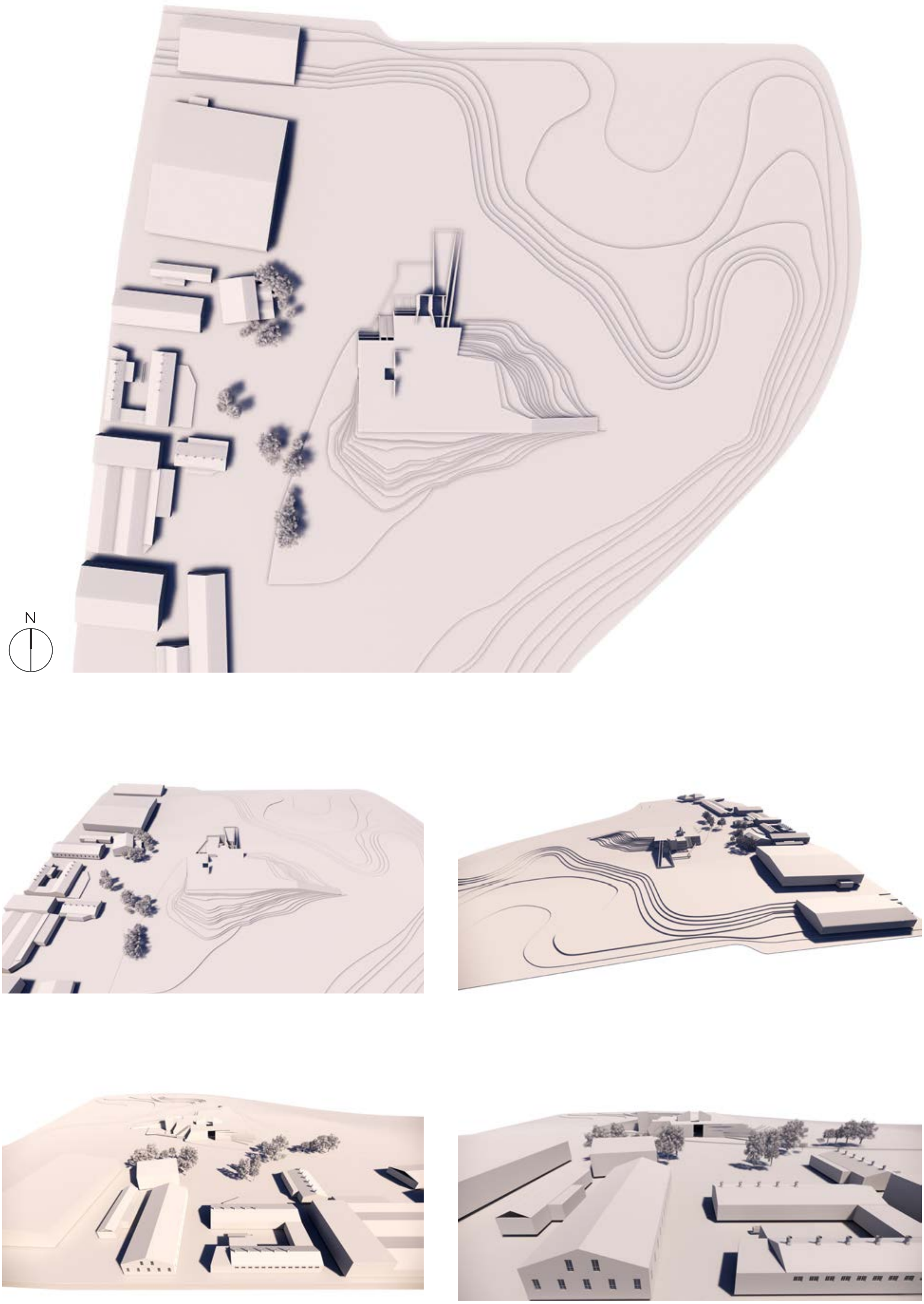


Fig. 2.32: Views of the site and built fabric today (Author:2018)

HERITAGE SUMMARY: THE WAY FORWARD

[01] **HERITAGE DESIGNATION:**

According to the information contained in the National Heritage Resources Act (1999), it is recommended that the buildings be granted national heritage resource status. This is due to the fact that it is "of cultural significance or other value for the present community and for future generations" (South Africa 1997:7). Every effort should therefore be made to ensure the future of the landscape and buildings but in a way that re-instates relevance.

[02] **RECOMMENDATION: ADAPTIVE RE-USE OF THE SITE AND BUILDINGS OF VILLAGE MAIN**

The recommendation is to intervene on the site, historic building cluster and concrete platform through a process of adaptive re-use. These buildings provide a window into how the built environment and industrial architecture was structured in the past. Adaptive re-use will ensure their survival provide a framework for how they fit into our future.

[02] **WHAT SHOULD STAY:**

The historic administration building cluster and the concrete platform represent the last remaining architecture at Village Main. For this reason. In line with the Burra Charter (Australia ICOMOS 1999:1) it is recommended that 'as little as possible but as much as necessary' is done to care for the place and ensure its future. For this reason, the administration building cluster and concrete platform are both to be retained and altered where necessary.

[02] **WHAT CAN BE ALTERED:**

According to Clause 5.IV of the Charter of Nzhny Tagil on Industrial Heritage it is appropriate to adapt a building which is no long able to function with its original purpose in order to preserve its heritage significance (TICCIH 2003:1).. This is most clear at the south-west corner of the platform and the entrance to the bunker. Their current state and dilapidation mean that unless they are re-used through an adaptive process they will collapse.

[02] **WHAT CAN GO:**

It is recommended that nothing be removed apart from the south-west portion of the platform and earth-mound. This will allow for an adaptive re-use process and the addition of new architecture which can contribute to the future of the site. Fences currently impeding movement through the site can be removed.

[02] **WHAT SHOULD BE BROUGHT BACK:**

It is recommended that the foundations of the erased buildings on the site are to be brought back as a memory of lost architecture. It is further recommended that the original movement routes and axes be restored on the site. This will restore the relationship of the administration buildings and the platform.

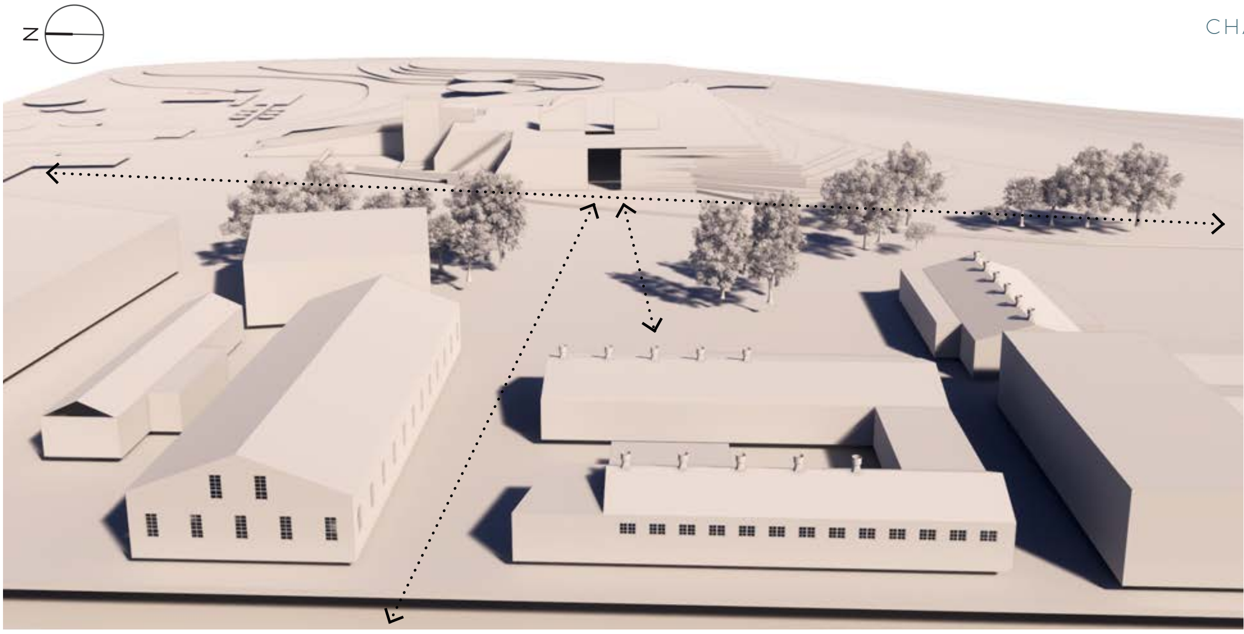


Fig. 2.33: Recommendation for adaptive re-use and re-establishment of links (Author:2018)

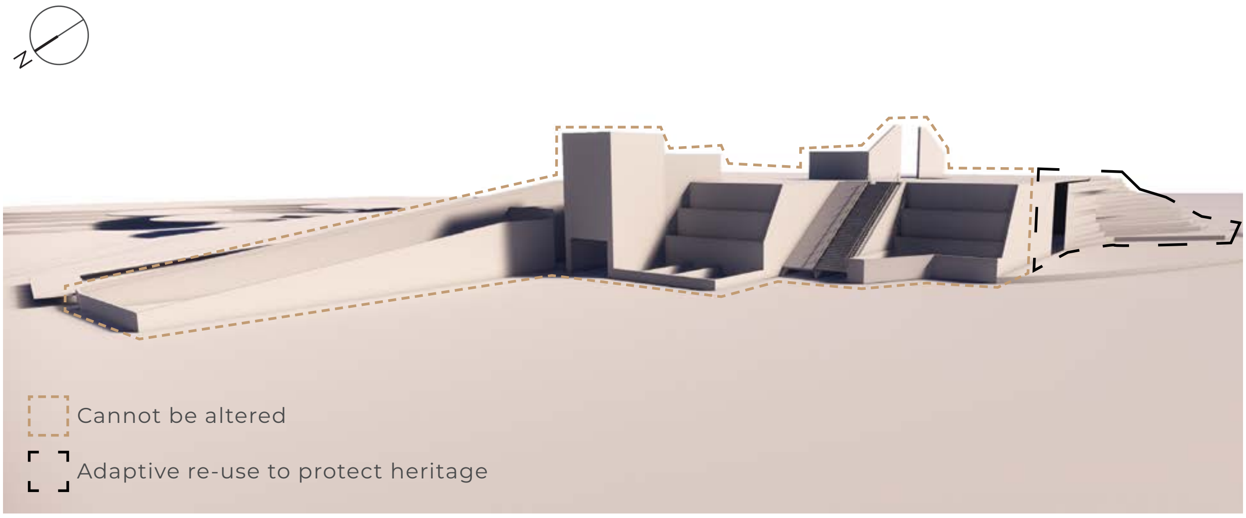


Fig. 2.34: Concrete platfrom heritage response recommendations (Author:2018)

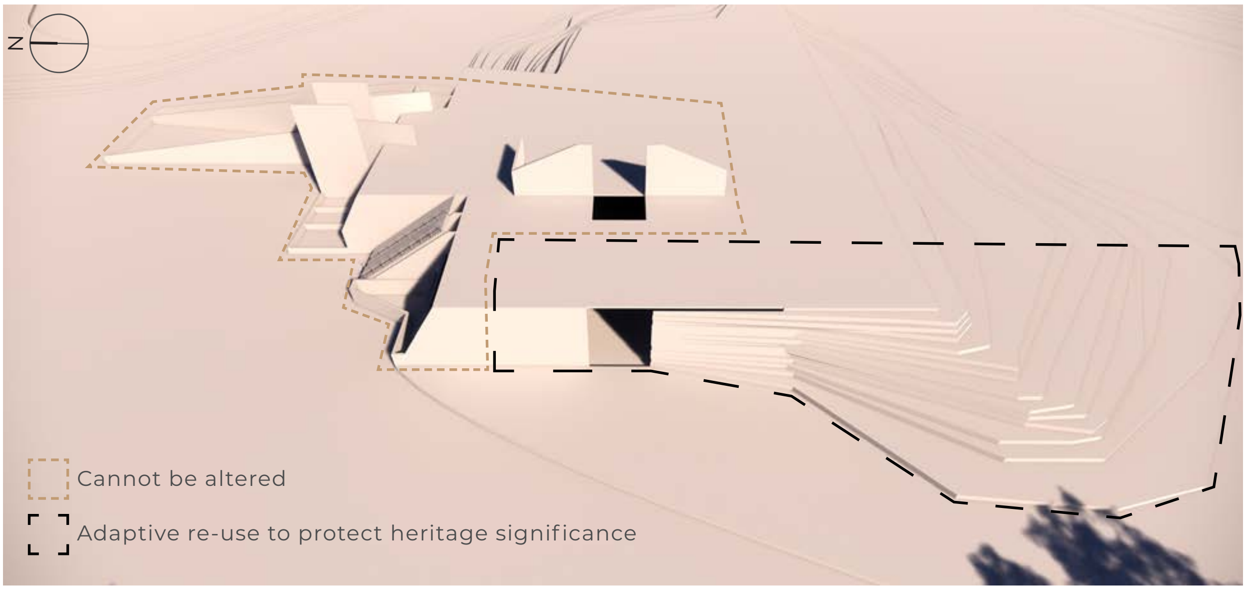


Fig. 2.35: Concrete platfrom heritage response recommendations 2 (Author:2018)

LAYERING PRECEDENT I: SITE RE-USE

Layered overview of the Acropolis:

3500 BC First humans gathered in Athens

1200 BC Mycenaean palace and wall was built

700 BC The first sanctuaries and Temple of Athena were built

480 BC The Persians largely destroyed Athens

475 BC Construction of the wall "Themistoclean" began along the Acropolis

438 BC The Parthenon was built adjacent to the former site of the old Temple of Athena. A few years later, the Temple of Nike and the Erechtheion were erected

26 Temple of Rome and Augustus was constructed along with the Acropolis staircase

267 The Heruli tribe destroys Athens. Almost a century later Emperor Julian repairs the Parthenon

1458 Parthenon is converted into a Mosque, which is an early example of forms of reuse

6th century Temples of the Acropolis are converted into Christian churches

1600 The Acropolis is occupied by Turkish garrison houses

DIMITRIS PIKIONIS

LANDSCAPE OF THE ACROPOLIS

1954-57

1687 The Venetians bombard the Parthenon

1834 Athens becomes the capital of Greece

1845 First restoration works on the Acropolis started

1874 Acropolis museum was established

1933 Nikolaos Balanos carries out major restoration works for the Acropolis site

1957 Pikionis finishes the pathway of the archaeological site

2009 Bernard Tschumi constructs the Acropolis Museum

(Verheij:2015:66)

Dimitris Pikionis was exemplary for his approach to re-using existing structures and building materials. The power and quality of his work is made clear in the example of his design for the Acropolis pathway in Athens.

The design takes both the existing, latent and lost layers into account. It is therefore described by Litho (1989:1) as a "sentimental topography". It is designed with movement in mind and takes into account the experiences of strolling, travelling, wandering and weaves narrative into them. Through the articulation of a route, the design tells the story of place.

The secret to the architect's understanding of and intervention in the context is his respect for the condition in which the site is found. This recognition and reinterpretation

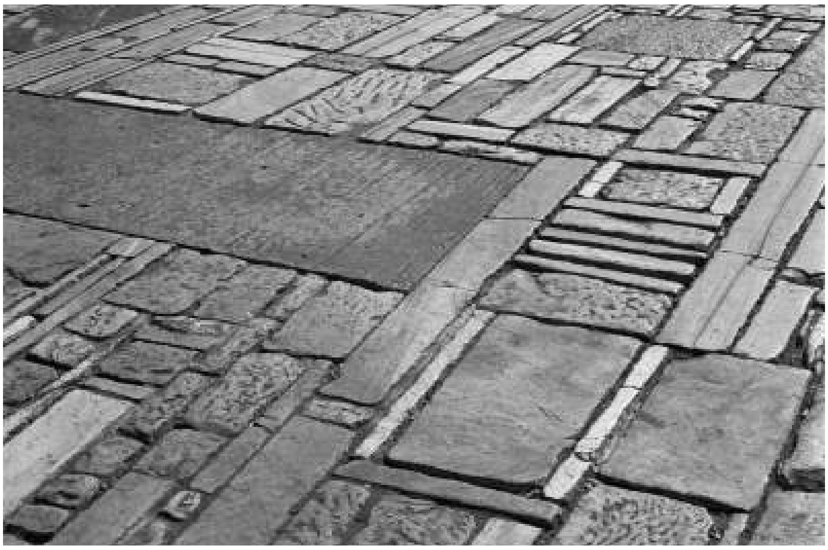


Fig. 2.36: Tapestry of stone (Verheij:2015)

Fig. 2.37: Belvedere (Verheij:2015)

Fig. 2.38: Route (Verheij:2015)

Fig. 2.40: Route plan (Verheij:2015)

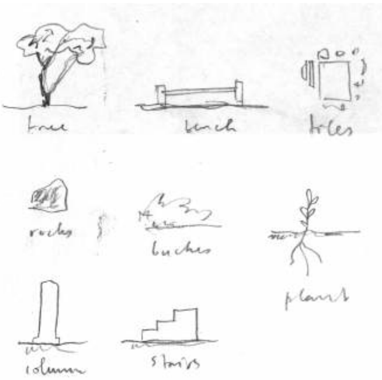


Fig. 39: Sketches of design elements (Verheij:2015)

IN THIS PROJECT PIKIONIS ACTED AS AN ARCHAEOLOGIST AND COLLECTOR. HE REUSED STONES AND MATERIALS THAT HE FOUND IN THE LANDSCAPE ON AL KIND OF SCALE LEVELS. HE AFFIRMS THE IDEA OF THE ARCHITECT AS A COLLECTOR AND ARCHITECTURE AS A REMAKING.

(VERHEIJ 2015:66)

re-organises and re-assembles the elements into new relationships. In so doing, the site is re-discovered and gains new worth. His reuse of ancient materials is "collaged rather than designed" and "it reinterprets the genius loci as a mythic narrative... a promenade to be experienced as much by the body as by the eyes" (Frampton 1995:9).

The new paths, indistinguishable from the historic site, appear as if they have always been there. Due to a level of homogeneity and the careful selection of materiality the intervention seamlessly blends into the surroundings. Rather than employing the tactic of contradiction, Pikionis adopts an approach of palimpsest and layering.

To fully appreciate this work of Pikionis it is important to expand the idea of re-use to a broader sense. Pikionis not only literally re-used - collected and assembled - old building stones but also re-used more abstract aspects such as site and topology (Verheij 2015:66).

In this project, Pikionis acted as much as an archaeologist as an architect. He uncovered material and memory layers which were eventually incorporated into a project which recalls past prospects, re-interprets them in the present and allows for future experiences to be layered.

This project is especially relevant to Village Main as route-based, experientially rich design was employed to contribute a sense of coherence and legibility to a place full of stories.

LAYERING PRECEDENT II: MEMORY

Layered overview of Mérida and the Roman Museum:

25 BC The Roman town was founded in the name of "Emerita Augusta"

6th century Mérida was the capital of Hispania

713 Mérida was conquered by the Muslims, and became the capital of the Cora. The Arabs reused most of the old Roman buildings

1230 The city was brought under Christian rule, when it was conquered by Alfonso IX of León

16th century Don Fernando de Vera y Vargas, señor Don Tello y Sierra Brava began an important epigraphical collection in their house, later this collection grew to what is now the collection of the Museum of Roman Art

1720 The city became the capital of the Intendencia of Mérida.

19th century In the course of the Napoleonic invasion, numerous monuments of Mérida were destroyed or damaged. Later the city became a railway hub and underwent massive industrialization

19th century The house of Don Fernando de Vera y Vargas, señor Don Tello y Sierra Brava was torn down

1838 Initiative started for an archaeological Museum in Mérida

1910 The first inventory of the collection gave a total of 557 objects

1936 Systematic excavations of the town's archaeological areas (theatre, amphitheatre, circus, necropolis, houses, etcetera) were initiated and carried out

1980 Start of the construction of the Museum of Roman Art by Moneo

1986 Completion of the Museum of Roman Art

(Verheij 2015:100)

RAFAEL MONEO

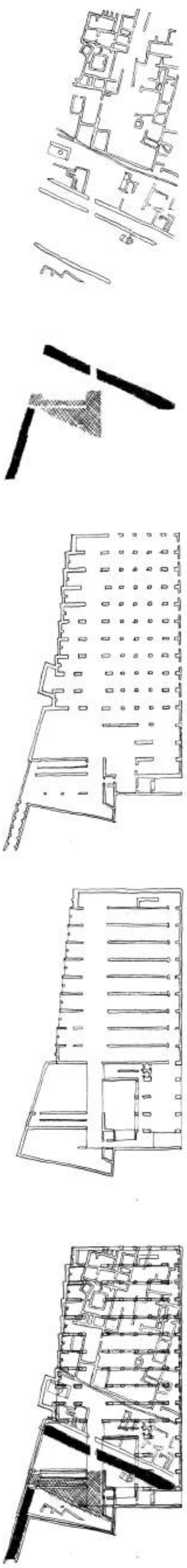
MUSEUM OF ROMAN ART, MÉRIDA, SPAIN

1980 - 86

In the case of the Museum of Roman Art, Moneo works with memory to connect to traditional Roman engineering which has a strong presence in the ancient Roman city of Mérida. Similarly to the projects in Cologne and Chur by Peter Zumthor, Moneo literally created layers of memory and rooms of memory (Verheij 2015:100). The vast emptiness of the museum refers to that; it is a space to be filled with old and new memories.

The project was designed from 1980 to 1986 and is built on top of an existing Roman archaeological site. Mérida, a city laid on the cross-section of two major Roman roads, has numerous theatres, aqueducts and bridges that are remnants of the Roman Empire. Close to the site there is the Roman theatre and the amphitheatre. To connect the museum with

Fig. 2.41: First layer of memory (Verheij:2015)



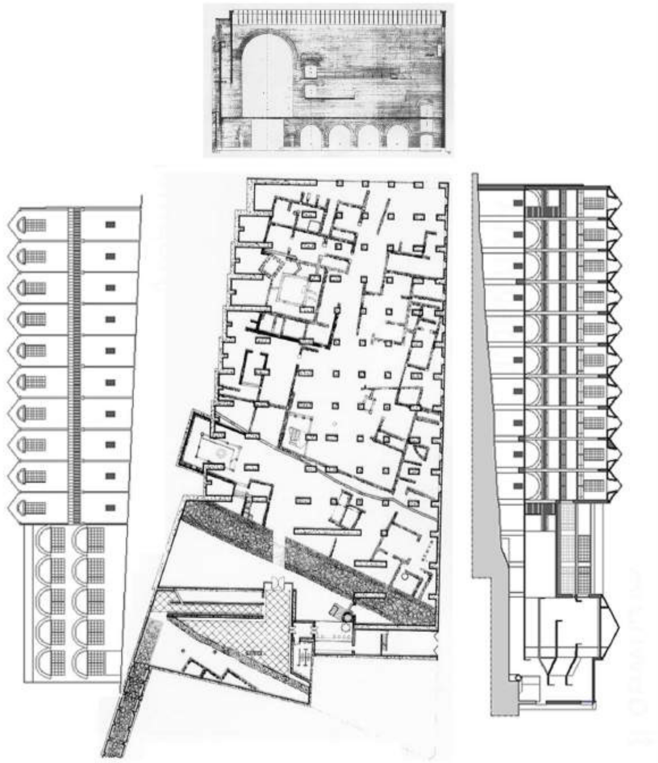


Fig. 2.43: Plan, section, elevation (Verheij:2015)

these ancient structures, Moneo created underground passages linking the museum to the Roman site.

The design is punctuated by a series of repeating parallel walls of red brick and arched openings. William Curtis (1982:629) has written that Moneo "spliced together real ruins with metaphorical ones, working its way back to the structural anatomy of ancient architecture and touching upon certain continuities in Spanish tradition".

The walls recall the Roman aqueducts as drawn by Piranesi, but also the ruin of the Proserpina aqueduct of Mérida built in the first century AD (Verheij 2015:100).

Moneo's project has a clear distinction between the old and new aspects (ibid.). Memory of the historic site is exposed in the basement and therefore emphasised. Above that, walls rise up and puncture the gallery space which spans three levels linked by bridges. The penetration of light into the space through roofs exposes antique fragments and classical columns. These are further emphasised by being placed against the red brickwork.

Moneo makes sense of the location by re-interpreting the collective memory of the site on several scale levels namely materiality, detailing, construction, organisation and the urban plan (ibid.). This project provides a model for dealing with sites containing a combination of existing and lost architectural heritage like Village Main.

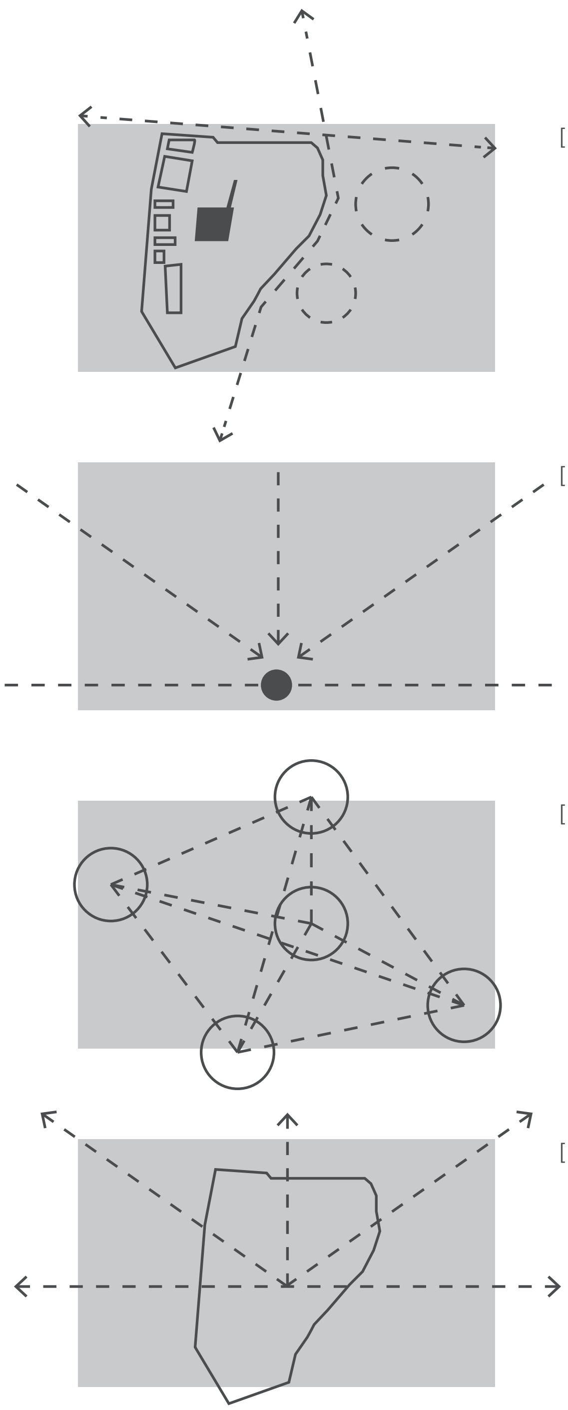
Fig. 2.42: Memory layering (Verheij:2015)

02.1

URBAN VISION

A NEW PRODUCTIVE PRECINCT

The urban framework is based on an analysis of the surrounding context and its historic strengths as well as its potential for re-interpretation.



[01] **FOCUS AREA**

The focus of the urban vision is the Village Main No. 1 site directly to the south of the M2 Highway in the Johannesburg CBD. The site is bounded by Wemmer Pan Road to the west, Sprinz Avenue to the east and William Kerby Lane to the South. The framework also incorporates the surrounding mine-dumps as well as the Village Main No 2 site across Wemmer Pan Road.

[01] **URBAN INTENT**

The urban vision aims to achieve a meaningful link between: the financial energy of the CBD, the cultural potential of Jeppestown, the untapped ecological potential of the mining-belt as well as the latent productive capacity of Village Main (the mine itself as well as the industrial area).

[01] **REGIONAL FRAMEWORK**

The framework is part of the greater regional strategy for the mining belt and the planned development of the corridor. The future densification of the area places great value on the site as a well-positioned green space within a future productive and residential zone.

[01] **CATALYTIC EFFECT ON SURROUNDS**

The aim of the framework is to re-frame productive, economic, recreational and cultural relationships to catalyse a mixed-use precinct capable of restoring life to a much forgotten part of the city.

Fig. 2.44: Urban vision goals (Author:2018)

PRECEDENTS: ADAPTIVE RE-USE OF POST-INDUSTRIAL SITES

Traditionally, buildings are designed with one particular function and use case in mind. When this function or programme is redundant, the building becomes threatened. Adaptive re-use is the process of giving such buildings (usually old or abandoned) new lives through new uses (Department of Environment and Heritage 2004:3).

CULTURAL BENEFITS OF ADAPTIVE RE-USE

Industrial buildings are a good fit for the cultural sector as the openness and scale of their space means that they can easily be re-used for exhibitions, studios and workshops. The architecture of adaptive re-use necessitates a dialogue between the past and the present which forms an inspiring and dynamic contrast. This quality, too, lends itself to the attraction of the cultural sector and the artistic community.

ECONOMIC BENEFITS OF ADAPTIVE RE-USE

Precedent has shown that the adaptive re-use of old buildings can be profitable (Hartmann et al., 2018). This is due to the value that can be added to an existing but poorly functioning investment as well as the fact that capital investment required for such a process is less than the cost of demolition and re-construction. Adaptive re-use projects, by virtue of their appeal to the cultural sector and other innovative companies can often attract new investment into areas (ibid.).

ENVIRONMENTAL BENEFITS OF ADAPTIVE RE-USE

Building demolition is one of the major sources of urban waste (Merkelson 2011). The short life-span of buildings contributes to this. Adaptive re-use bypasses the cycle of demolition and reconstruction, reducing waste and allowing for the reincorporation of old materials without wasting time, money or placing further strain on the environmental conditions (Department of Environment and Heritage 2004:2). In this way, the original building retains its embodied energy and puts it to use in a new way. Adaptive re-use is therefore an important strategy on the path to a more sustainable urban environment and increasing the building lifespan also reduce greenhouse gas emissions (ibid.).

SOCIAL BENEFITS OF ADAPTIVE RE-USE

The re-utilisation of old buildings is a way of preserving the substance of the history, which is incorporated in these structures, and orienting people in time . This quality of adaptive reuse is especially important in Johannesburg, where the rapid process of urbanization leads to the destruction of many old buildings (Hartmann et al., 2018).

Fig. 2.45: Gas Works Park, Seattle (The Cultural Landscape Foundation, 2018)

GAS WORKS PARK, SEATTLE (U.S.A)

Gas Works Park was built on the location of a former coal gasification plant in downtown Seattle (The Cultural Landscape Foundation 2018:1). It is a re-use project designed for recreational functions and community gatherings at various scales. The boiler house was converted to a picnic shelter and community cooking area while a former exhauster-compressor building was transformed into an open-air area play area for children (ibid.). This "ground-breaking project has been celebrated for its ability to shift public perceptions of post-industrial landscapes" (ibid.). It is considered revolutionary for its reclamation of polluted soils using the natural processes of bio-remediation

Fig. 2.46: Zeche Zollverein, Essen (Hartmann et al., 2018)

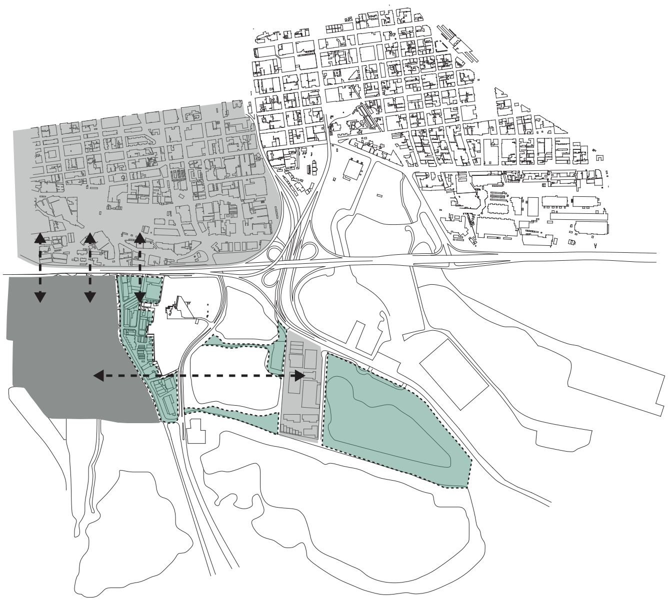
ZECHE ZOLLVEREIN, ESSEN (GERMANY)

Zeche Zollverein is an adaptive re-use project in Essen which involves the adaptive re-use of an icon of the industrial culture of a manufacturing region. The diverse mix of new functions adds a new feasibility to the site, but also contributes a new economic direction for the post-industrial region (Hartmann et al. 2018). The Ruhr area is now developing in the direction of innovation, education and culture (ibid.). It is a noteworthy example which shows that the integration of the past into the present can provide a viable future for sites of former productivity (ibid.).

Fig. 2.47: Landschaftspark Duisborg Nord Cape Town (Latz, 2011)

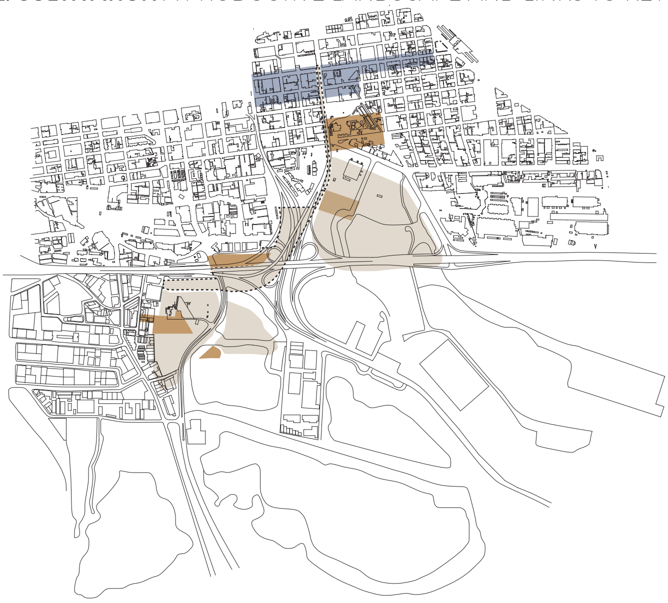
LANDSCHAFTSPARK DUISBURG NORD

The park is one of 100 sites in the Ruhr industrial region adapted for re-use. It forms a case-study for quality building and planning standards for the economic, social and environmental transformation of formerly industrialised regions. The existing elements and routes of the industrial programme formed by industrial use were re-interpreted through a with a new syntax and interlaced into a new industrial landscape (Latz 2011). The park is divided into smaller units all with unique identities but together they combine to form a recreational facility and play-park open for interpretation by visitors.



PROSPECT 1: CONNECTION THE INDUSTRIAL BELT AND INTRODUCE NEW FORMS OF PRODUCTIVITY

PROSPECT 2: CULTIVATION A PRODUCTIVE LANDSCAPE AND LINKS TO KEY MARKETS

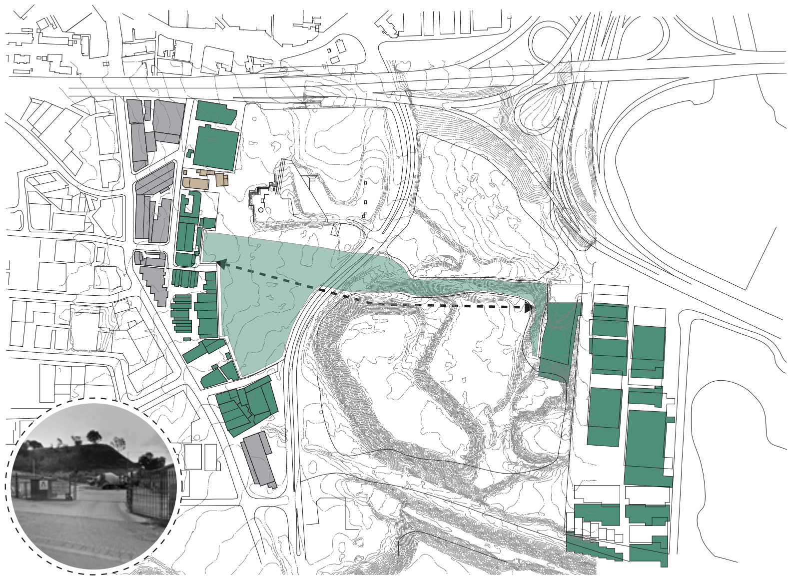


PROSPECT 3: CELEBRATION THE HISTORICAL AND CULTURAL ASSETS OF THE SURROUNDS

Fig. 2.48: Urban scale prospects (Author:2018)

OPERATION 1: RE-ESTABLISH THE LINK TO THE NORTH

OPERATION 2: JOIN THE MINING AND LANDSCAPE SITES



OPERATION 3: GROW THE PRODUCTIVE AXIS AND MEDIATE ITS RELATIONSHIP WITH THE LANDSCAPE

Fig. 2.49: Meso scale prospects (Author:2018)

Fig. 2.50: Urban proposal (Author:2018)

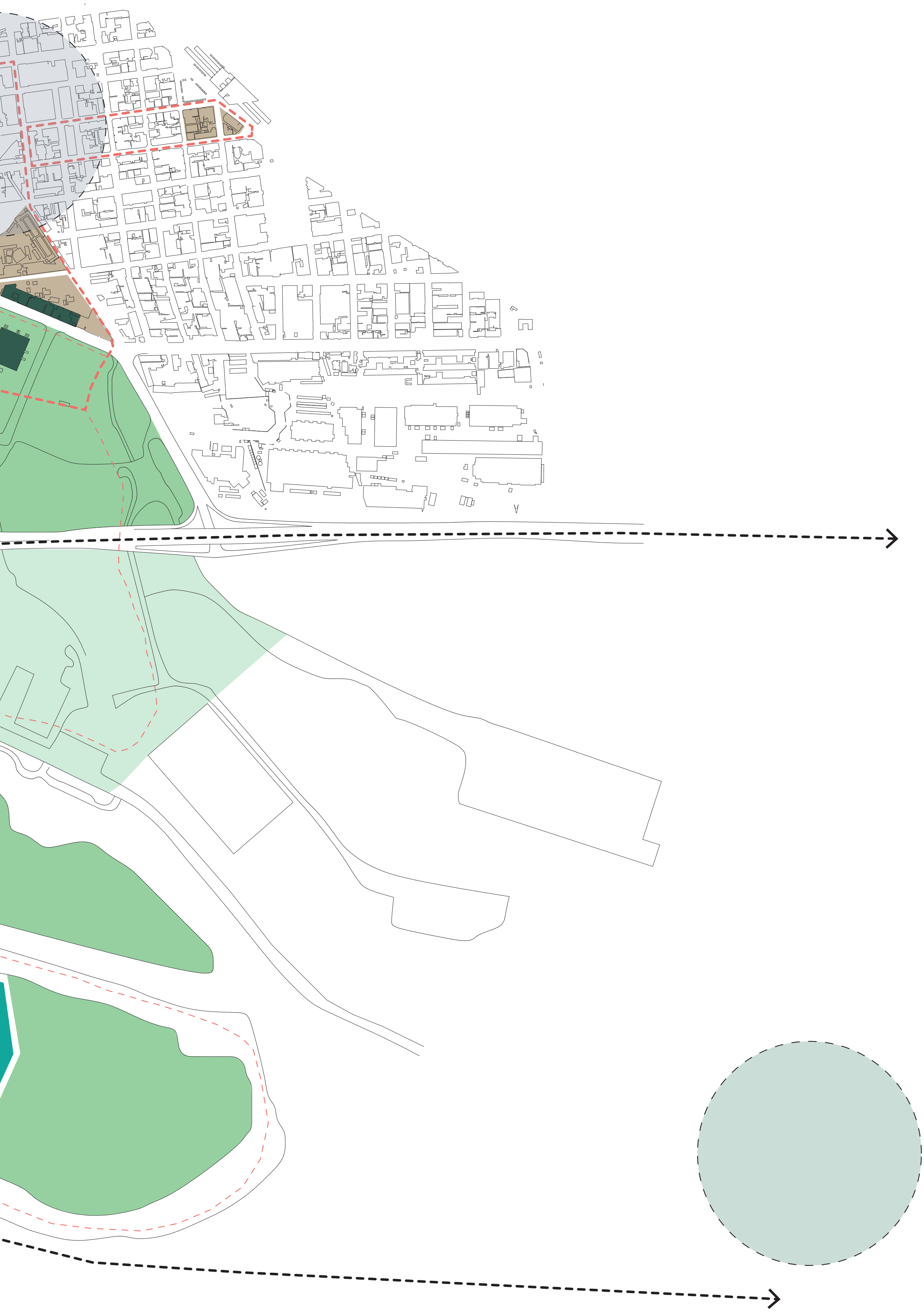


Fig. 2.51: Speculative urban vision perspective looking toward city (Author:2018)

Fig. 2.52: Speculative urban vision looking toward mine dumps (Author:2018)

REIMAGINING VILLAGE MAIN: THE PRODUCTION OF A NEW URBAN EXPERIENCE

The urban framework is designed to be a sustainable development in the historic productive heart of the city of Johannesburg. It is made up of a mixed use programme, including housing, social buildings, recreational facilities and an extensive productive landscape and bio-technology campus which aims to return the precinct to productivity but in a manner that is positive economically and socially.

At the core of the scheme is the prioritisation of open space: both for the use of productive and recreational programmes. This results from the positioning of the site in a regional framework of urban green spaces essential for the livelihood and well-being of the surrounding area and its projected future densification.

This project places great importance on well situated urban green space as a resource to balance and support the densification of urban areas.

The fundamental principles underpinning the scheme are those of the 'Smart Growth' movement described by Rowland (2006:41).

THE PRINCIPLES FOR SMART GROWTH AT VILLAGE MAIN:

1. Mix land uses.

2. Take advantage of compact building design.

3. Create housing opportunities.

4. Create walk-able communities.

5. Foster distinctive, attractive communities with a strong sense of place.

6. Preserve open space, farmland, natural beauty, and critical environmental areas.

7. Strengthen and direct development toward

existing communities.

8. Provide a variety of transportation choices.

9. Make development decisions predictable fair and cost-effective.

10. Encourage community and stakeholder collaboration in development decisions.

Rowland (2006:41)

The architecture and landscape are wherever possible orientated to maximise solar potential, vistas and historic routes. The design also acts as a barrier to further development on the site through its use of landscape as valuable productive space and utilises historic footprints as recreational facility.

03

PROGRAMME

PROGRAMME INFORMANTS: THE CHANGING NATURE OF THE CITY

The programme is derived from an analysis of the city's economy, industry, architecture and recreational aspects over time. This is done to understand the changing nature of the city over time and to understand what each aspect might become in future. In so doing, the past, present and future layers of the city are incorporated in a way that expresses the continuum of the city.

The economic development of the city is summarised as moving from an exclusive centralisation of wealth to an inclusive decentralisation in the form of enterprise development.

The industrial development of the city is summarised as moving from an extractive exploitation of labour and resources to a regenerative enabling situation in the form of a micro-development programme.

The recreation development of the city is summarised as moving from consumerist enclaves to productive precincts in the form of an operational landscape.

The architectural development of the city is summarised as moving from a situation of mono-functional stasis to a mixed-use re-use situation in the form of evolving architectural layering.

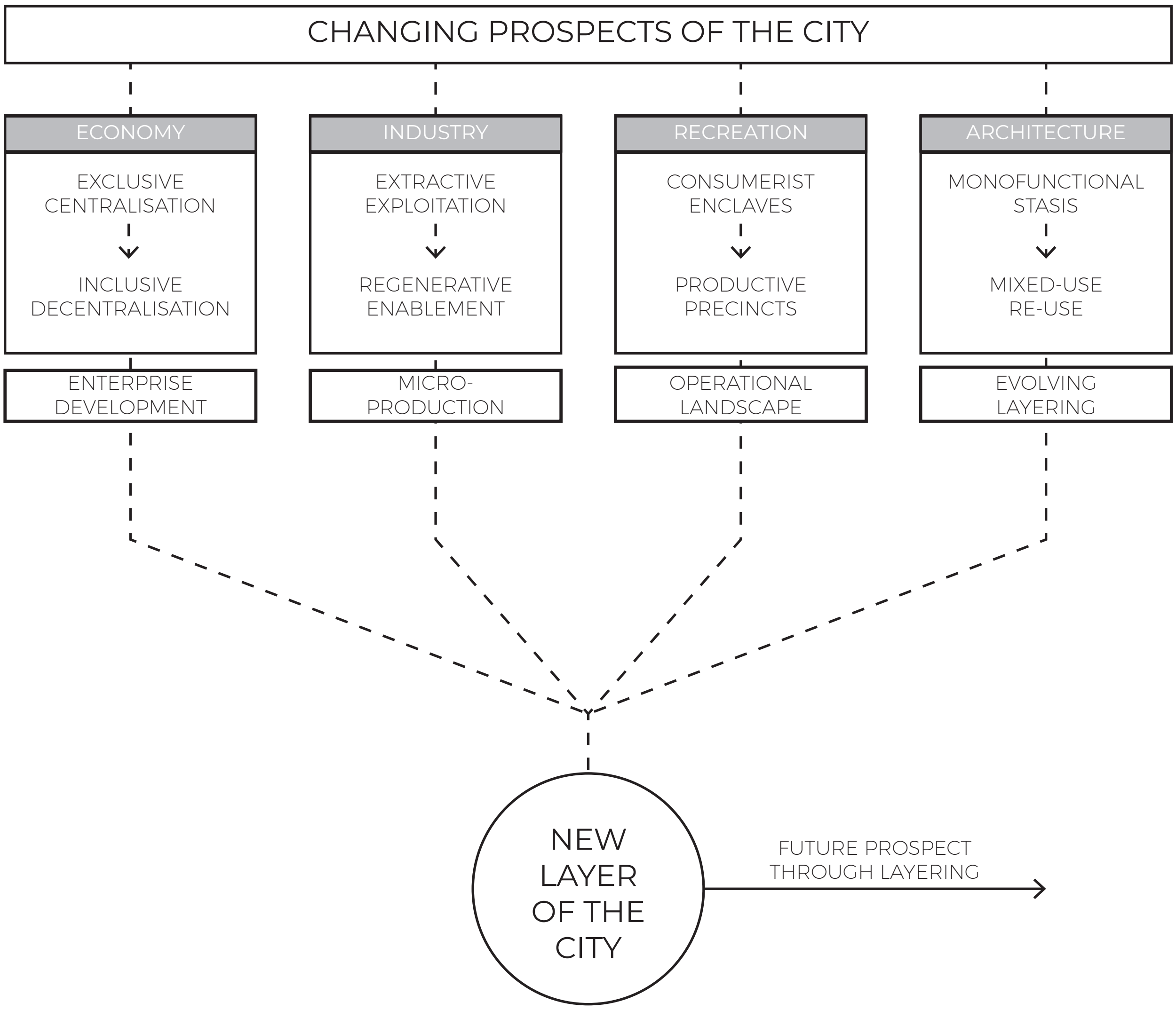


Fig. 3.1: Changing prospects and a new layer (Author:2018)

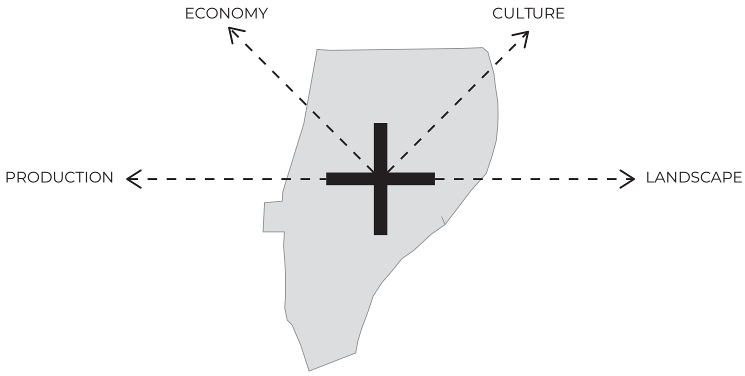


Fig. 3.2: Contextual programmatic informants (Author:2018)

The aim of the design is to combine the four aspects mentioned above as all of these are present and distinct around the site. The economic aspect is present to the north west in the CBD, the industrial component is present immediately to the west at Village Main, the architectural (cultural) aspect is present to the north east in Jeppestown, and the recreational (landscape) aspect is present immediately to the east on the mining belt.

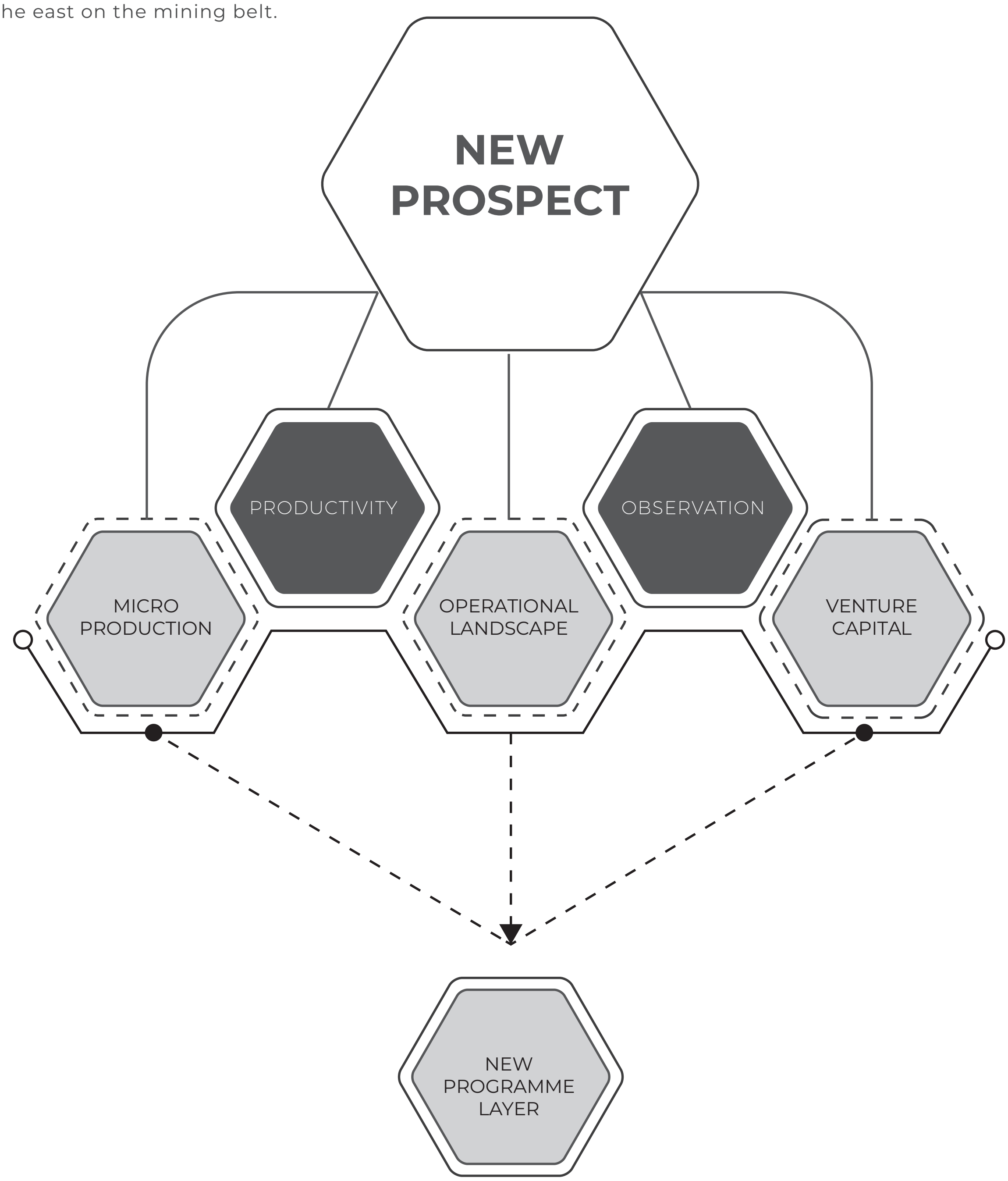


Fig. 3.3: Programme development (Author:2018)

THE SIXTH INDUSTRIAL REVOLUTION.

INNOVATION AND ITS LINK TO PROSPECTING

Innovation is directly related to the exploration of successful ideas that can generate profitable products or processes (Silva & Di Serio 2016: 121). In this sense it is very much related to the concept of prospecting. While innovation and prospecting are both concerned with the realm of the yet undiscovered, knowledge of the continuum is extremely important for plotting a future course.

THE FIRST FIVE INDUSTRIAL REVOLUTIONS

In the previous three centuries, five waves of innovation have been observed there are now signs of a sixth wave of innovation: sustainability and biotechnology (Ibid. 121).

The first wave of innovation was the Industrial Revolution which saw great strides in innovation and incorporated new technologies causing a shift from artisinal to industrial production. Its final stage was influenced by the Napoleonic War which eventually signalled its end (Ibid. 30). The second wave of innovation was the Age of Steam, which allowed for the transportation of goods and people over long distances. It contributed to the expansion and development of markets of many companies and ended as a result of the great depression (Ibid. 130). The third wave of innovation was the Age of Electricity which enabled remote communications and generally redefined the productive potential of companies. It too ended as a result of the great depression (Ibid. 130). The fourth wave of innovation was the Age of Mass Production which empowered companies to scale up production, meet new demands, and discover new business opportunities. It ended with the Oil Crisis (Ibid. 130). Finally, the fifth wave of innovation is currently based on Information and Communication Technology and Networks, and is characterized by the widespread use of computers and the reconfiguration of businesses with the development of the Internet (Ibid. 130).

THE NEXT WAVE OF INNOVATION

Sustainability has attracted increasing attention in recent years as a response to depleting natural resources, pollution, overcrowding of cities, climate change and energy and water shortages (Markard , et al. 2012). Such problems provide opportunity for action and highlight the need for sustainable innovation systems, incentive policies and support for sustainability, as well as the development of technologies that enable organizations to combine economic, environmental and social objectives (Han, et al. 2012).

However, while society is demanding that companies take on an environmental and social role, and while this is seen as an opportunity for companies to develop and innovate, many of the innovation strategies that are adopted are inadequate to accommodate these demands (Hall & Vredenburg 2012:61).

BIO-TECHNOLOGY

Bio-technology is the combination of biology with technology and involves the utilisation of biological assets and processes for industrial purposes (Naz 2015:1). While the origins of the industry lie in the science of genetics, it has now expanded to include numerous fields and is providing breakthrough technologies and sustainable industrial innovations (ibid.).

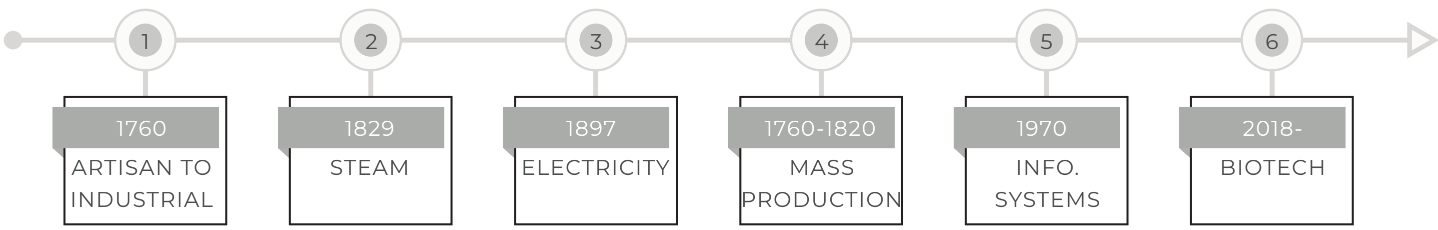


Fig. 3.4: The six industrial revolutions as programme informant (Author:2018)

PROGRAMME:
BIO-PROSPECTING AND BIO-DESIGN FACILITY

The programme of a bio-prospecting and bio-design facility is derived from the combination of a micro-production facility with an operational landscape with a venture capital component. This makes best use of the latent productive capacity and the potential of the ecological corridor.

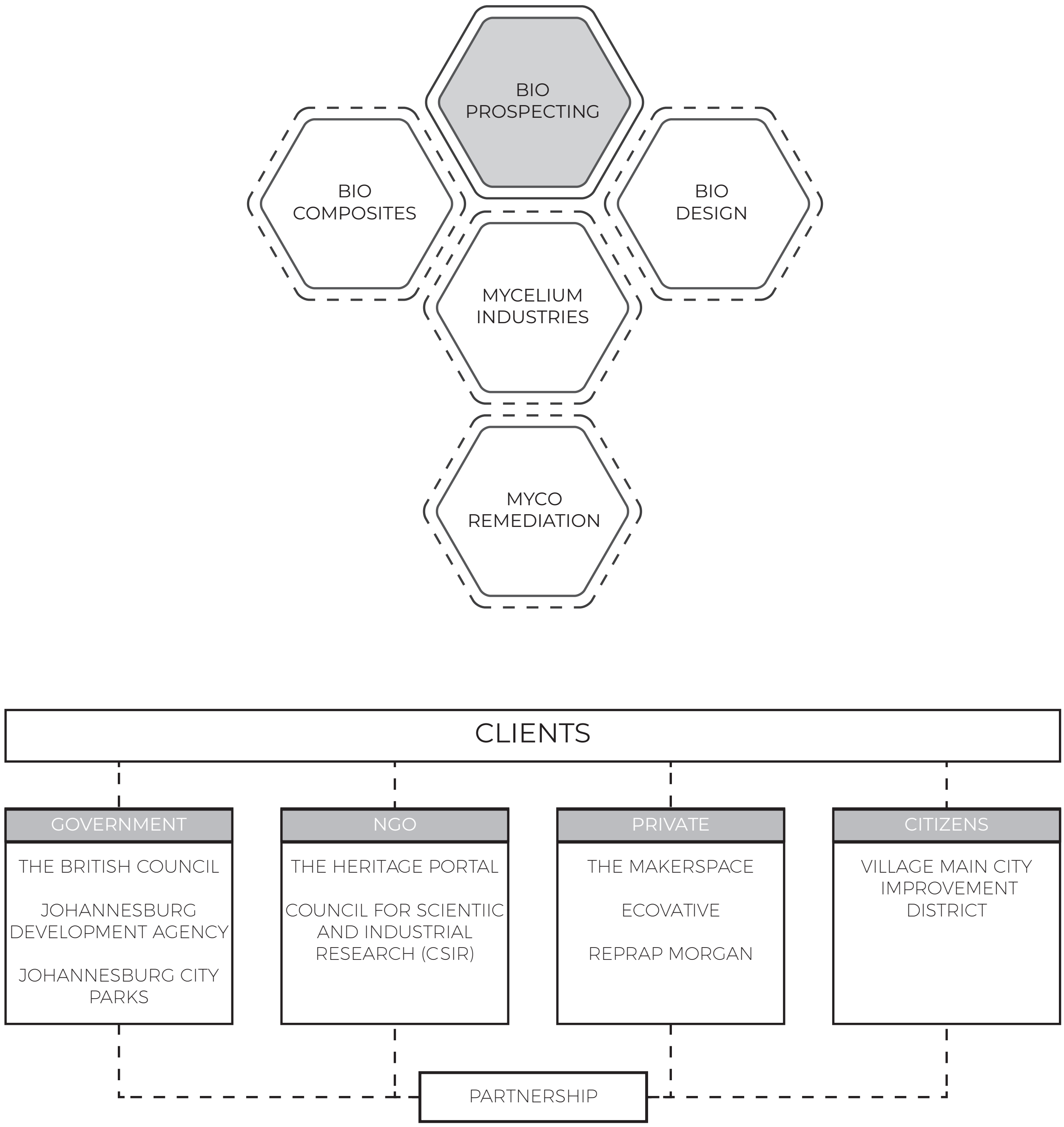


Fig. 3.5: Programme and client summary (Author:2018)

BIO-PROSPECTING AS A NEW INDUSTRIAL PROSPECT

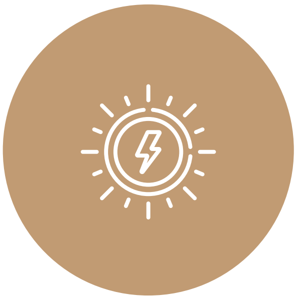
Bio-prospecting is the exploration of biological material for commercially valuable technological, genetic and biochemical properties (Harvey & Gericke 2011: 323). Bio-prospecting will undoubtedly play a key role in the sixth industrial revolution as it will allow for the discovery of new materials capable of generating new products.

BIO-DESIGN AS A NEW ECONOMIC PROSPECT

Bio-design is the combination of biology, technology and creativity (Myers 2012). The goal is to achieve more sustainable products, economies and industries. This emerging design movement incorporates the use of living materials such as fungi, algae, yeast, bacteria or other cultures either as part of low-technology crafting methods or in high-technology practices involving equipment such as 3d-printer and other digital fabrication machinery.

BIO-COMPOSITES AS A NEW MATERIAL PROSPECT

Bio-composites are compound materials formed through the combination of resins and natural fibres (Quarshie and Carruthers 2018:1). Importantly, these are natural and renewable materials which present an alternative to plastics and other pollutant materials.



MYCELIUM INDUSTRIES AS A NEW CATALYTIC PROSPECT

Mycelium is a network of fungal threads. It often grows underground and ranges in size from a unicellular to complex tree-like form (ArtisMicropia, 2018). Fruiting bodies of fungi, such as mushrooms, can also sprout from mycelia. Due to their fibrous composition, mycelium is able to form part of a highly effective and versatile bio-composite material (ibid.). Industries and products resulting from this will catalyse new possibilities for the industrial area surrounding the site.

MYCO-REMEDIATION AS A REGENERATIVE PROSPECT

In addition to the creation of new materials, mycelia can be used in the remediation of polluted soil. This process is known as myco-remediation (Mathur, 2018). This is especially useful for the polluted site at Village Main.

Fig. 3.6: Programme prospects (Author:2018)

PROGRAMME INFORMANT: MYCELIUM [NEW GOLD]

The program is derived from a mapping of the previous layers of the city as well as a regenerative approach to the existing architecture and landscape. These layers manifest as a centre for bio-prospecting, partly a postulation of the sixth-industrial revolution in Johannesburg (Harvey & Gericke 2011:323). In this case, the potential of fungal materials (more specifically mycelium) is harnessed through cultivation in the underground portion of the site. A process which also aids in myco-remediation of the contaminated soil.

By harnessing the natural potential of the site and the productive capacity thereof, a new layer of regenerative architecture mediates between the cycles of fixity and flux in order to guard against Johannesburg's tendency for erasure but also prevents a condition of stasis and redundancy. The productive and historical industrial value of the site is celebrated and re-interpreted so as to allow for future prospect and change.

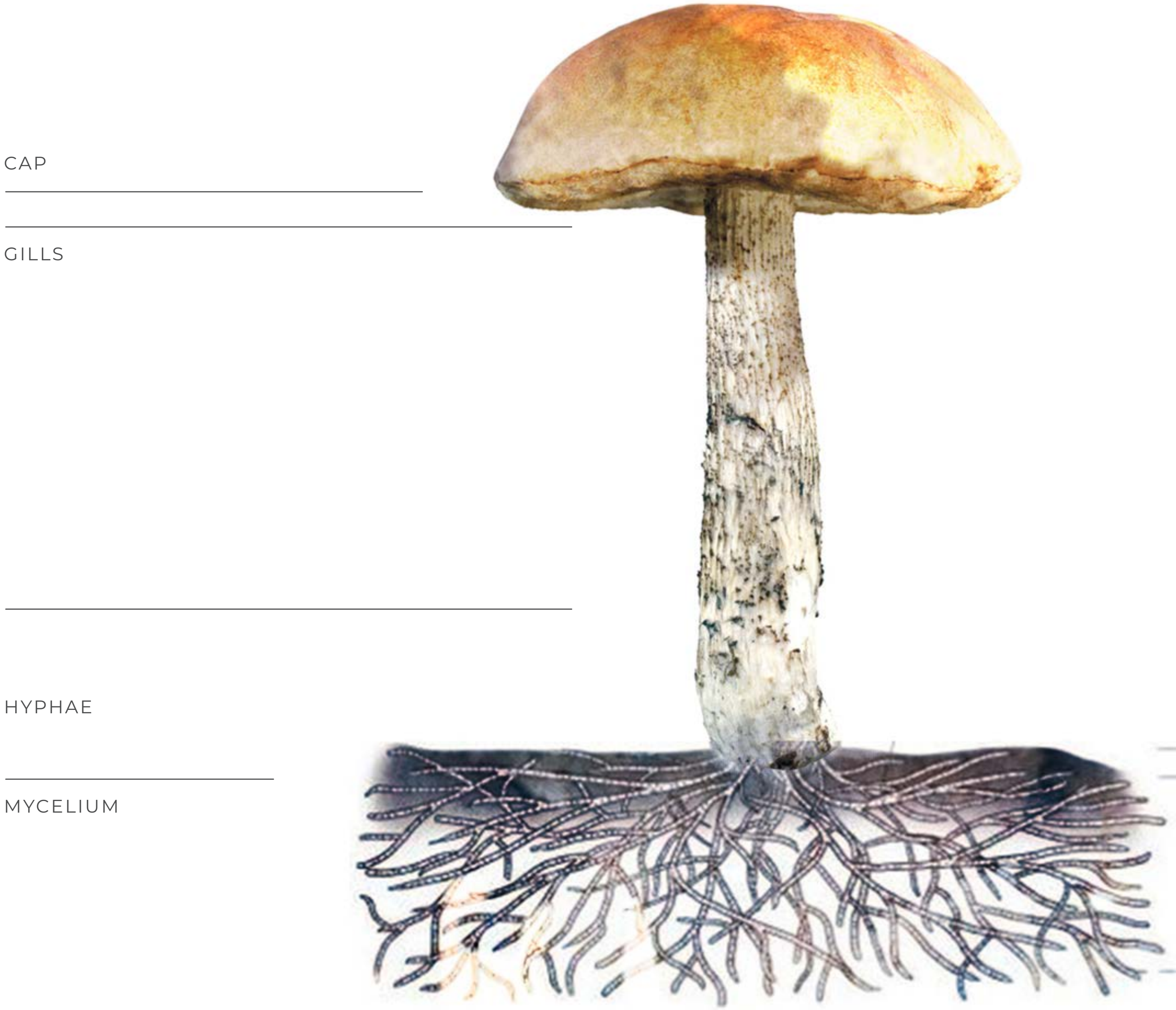


Fig. 3.7: Fungi structure (Adapted from Pngtree:2018)

Mycelia are the root-like fibres of fungi which grow underground. They appear as a frost-like growth beneath leaves and bark and grow outwards into dense networks. Mycelium holds together large amounts of the planet's topsoil and is being touted as the material of the future, already having been used in medicines, the culinary arts, the remediation of polluted environments and the world of fashion (Nalewiki 2017).

Mycelia are an important part of the ecosystem, since it breaks down organic material along with toxic substances, such as pesticides, and is also involved in the filtration of water. It is this property which allows for the process of myco-remediation: the treatment of polluted landscapes through the decontamination of soil as a result of the introduction of fungi (Flores 2015).

For the last decade, the design and architecture world has been experimenting with the use of mycelium as an alternative material as a means of considering sustainable design as best practice (Ibid. 2015).

In 2012 MoMA, New York's Museum of Modern Art, published *BioDesign: Nature + Science + Creativity*. This represents the first time the term bio-design was used. BioDesign refers not just to design that is biology-inspired but to design that incorporates living organisms as essential components that underpin and enhance the function of the finished work (Ibid. 2015:2).

Design firm Livin Studios, created design concept *Fungi Mutarium: Growing Food On Toxic Waste*. In collaboration with Utrecht University they worked with two fungi organisms (Schizophyllum Commune and Pleurotus Ostreatus) to biodegrade plastic and produce edible byproducts (Ibid. 2015:2).

Experiments conducted in both bioremediation and mycelium as a medium to replace traditional plastics, are examples of new ways of acting in the world of the sixth industrial revolution. Biodesign could represent a revolutionary way of operating in the world that transcends the arcane, industrial processes of the 20th century that has caused unquantifiable damage to our planet. This new discipline, much in the same vein as bioprospecting, envisions biology as the new building material for all aspects of life. Bio design does not simply involve mimicking organic structures and mechanisms. Rather, it relies on harnessing the logics of the natural world to perform the processes of nature: storing and converting energy, producing oxygen, neutralizing poisons and disposing of waste in life-sustaining ways (ibid.). The sustainable future of our world largely depends on our ability to realize prospects like those described above.

Fig. 3.8: Fungi structure (Pngtree:2018)

Fig. 3.9: Mycelium pavilion (Dezeen:2014)

Fig. 3.10: Mycelium fashion (Dezeen:2016)

MAKING MYCELIUM:
PROCESS + LOOPS

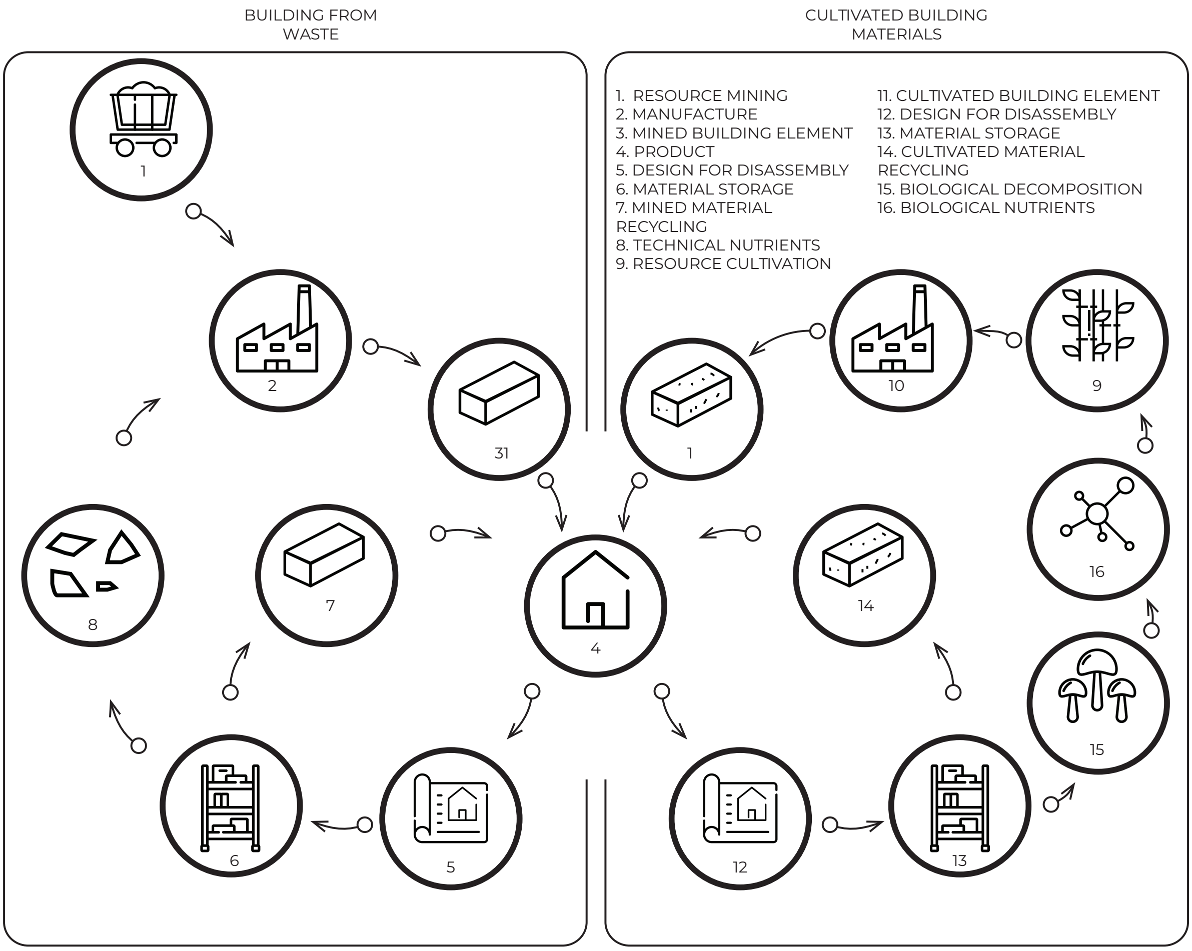


Fig. 3.11: Building materials from waste and cultivated building materials (Author:2018)

CREATE MOULD

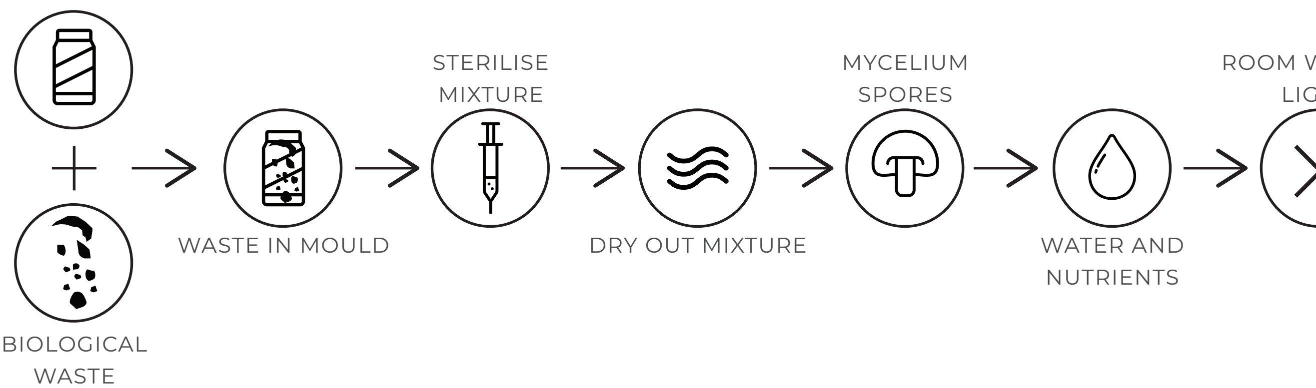


Fig. 3.12: Mycelium production process (Author:2018)

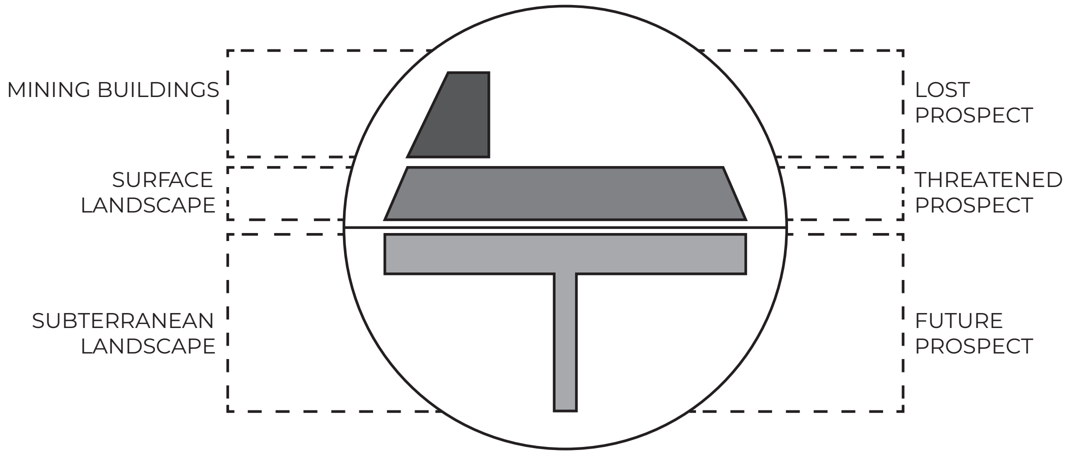


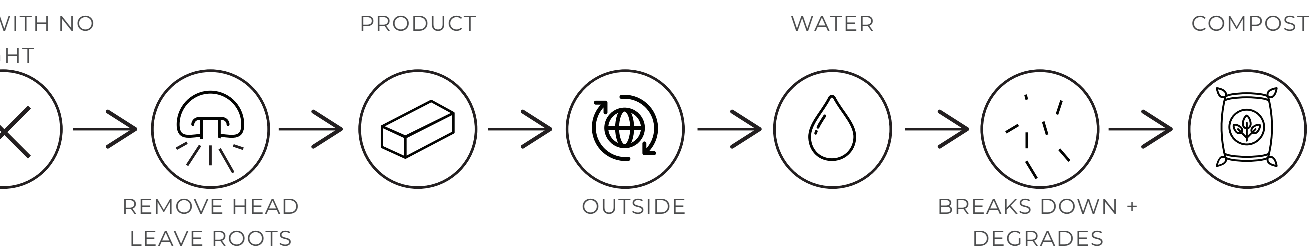
Fig. 3.13: Programme allocation above, below and beneath site (Author:2018)

CULTIVATED BUILDING MATERIALS AS AN ALTERNATIVE TO EXTRACTED BUILDING MATERIALS

Much of Johannesburg is the result of the value placed on materials as well as the processes associated with mining them. Its future could be driven by a similar material culture but with entirely different means of production. While the period of the first industrial revolution (18th and 19th centuries) resulted in a shift from regenerative (agrarian) to non-regenerative (mined) material sources the future should re-focus on sustainable resources (Hebel & Heisel 2017, p. 8). This project explores that possibility. While the conception and construction of architecture adopted in the first Industrial Revolution results in an inert object with the consequence of a one-way transfer of energy and materials from the environment to building waste, this project places the architecture in constant contact and conversation with its surroundings. It utilises materials unconventionally utilised for design including fungi for the growth of structures that demonstrate common biological characteristics of plants in buildings that absorb nutrients, grow, produce and self-repair.

THE PROCESS OF MAKING MYCELIUM

The growth of mycelium requires a substrate in the form of biological waste (either sawdust or coffee) as well as mushroom spores. The fungus consumes the substrate and nutrients and takes on the form of the mould in which it is placed. Two mycelium growths placed next to one another will fuse to form an unbreakable bond within a matter of hours. The growth of mycelium in or on the mould will continue until it is dried or heated. This results in a durable and rigid material. Once dried, this mycelium-based form can be sanded, painted or sealed in order to become a stable and commercially viable material. The result is a resilient material able to withstand extreme temperatures for a period of up to four months.



PRECEDENT
ECOVATIVE:
THE NEW MATERIALISTS

Ecovative is a bio-materials design company which provides sustainable alternatives to plastics and polystyrenes (SBIR, 2015:1). Its genesis is in the new wave of companies seeking alternatives to plastic and styrofoam. The company's products are utilised for packaging, fashion and building materials. All of their technologies are underpinned by mushrooms and mycelium more specifically.

Ecovative has patented a process whereby biomaterial is grown from fungal material.

The process utilises agricultural waste products as a substrate. The material is then cleaned, heated, inoculated before mycelium grows. This growth happens for five days after which it is heated for the purpose of stabilisation and making the fungus inert (ibid.). During the growth phase, the material's shape can be moulded into various products including protective packaging, building products, apparel, car bumpers, or surfboards. The use of agricultural waste , the reliance on natural environments and compost-ables means that the environmental footprint is minimised.

The long-term goal of the company is to become the world's first net-positive industrial company (ibid.). Importantly, its technology isdesigned to be scaled for local, regional and global economies making it suitable anywhere in the world.

Fig. 3.14: Mycelium strength test (Bizjournals: 2013)

Fig. 3.15: Mycelium chair (Inhabitat:2016)

PROGRAMME INFORMANT: THE MAKER REVOLUTION

Maker-spaces are changing the landscape of industry as well as education (Litts 2015:i). Typically, they are collaborative work spaces inside public buildings designated for learning, experimenting with materials as well as sharing ideas. They are equipped with a variety of tools, either of the low or high-tech variety. 'Making' in these settings is a communal process of innovating, designing and building with new materials and open-source technology with the aim of producing shared artefacts (ibid.).

The maker movement is a global culture promoting openness-oriented innovation typically utilising open-source hardware. Tools normally found in maker-spaces focus on rapid-prototyping and include a combination of laser-cutters, 3D printers, and circuit boards.

Maker-spaces are social in nature and provide the platform for people to gather with others to build projects and products, learn about new technologies as well as participate in entrepreneurial opportunities. They are places where people gather to build projects, learn new technologies, and develop entrepreneurial opportunities. They typically take the form of adaptable and open spaces capable of taking the form required to resource and train people of varying skill sets.

These spaces, because of their advanced technologies, provide smaller scale and more ecologically viable alternatives to traditional manufacturing spaces.

THE MAKER REVOLUTION IN SOUTH AFRICA

Most importantly for Africa, maker-spaces foster inclusion in technological and productive development.

Although there are some differences to be found between the international maker movement and that of Africa in terms of socio-economic factors, the two do share important characteristics in the way they deal frugally with resources, maximise networked possibilities, minimise waste and their reliance on improvisation and innovation,.

Maker-spaces are viable re-use alternatives to sites of de-industrialisation like Village Main and the underutilised industrial belt of Johannesburg's inner-city.

Fig. 3.16: Maker Mile, London (Armstrong: 2018)

MAKER MILE, LONDON

The Maker Mile is a creative cluster of factories, workshops, and maker-spaces in London. It is an adaptive re-use project in Regent's Canal which was historically an industrial transportation hub (Armstrong 2018).

The district combines old and new making with historic print-houses and metalworking shops standing next to new maker-spaces.

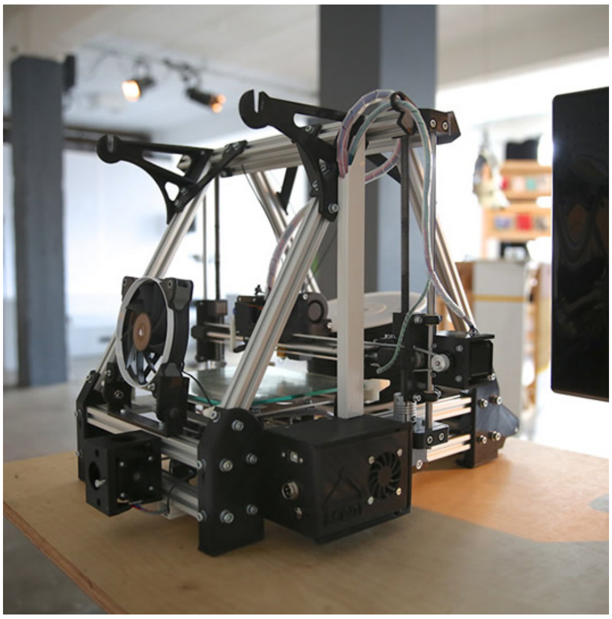


Fig. 3.17: Machine Room, London (Grace-Flood:2017)

MACHINE ROOM, LONDON

Machine Room is a 'tech-for-good' initiative on the Maker Mile in London (Grace-Flood 2017). The group aims to support industrial activities focussed on creating positive economic and social impact. The space is equipped with CNC mills, laser-cutters and 3D printers as well as traditional analog tools.

The facility also has a 'maker-in-residence' living space.

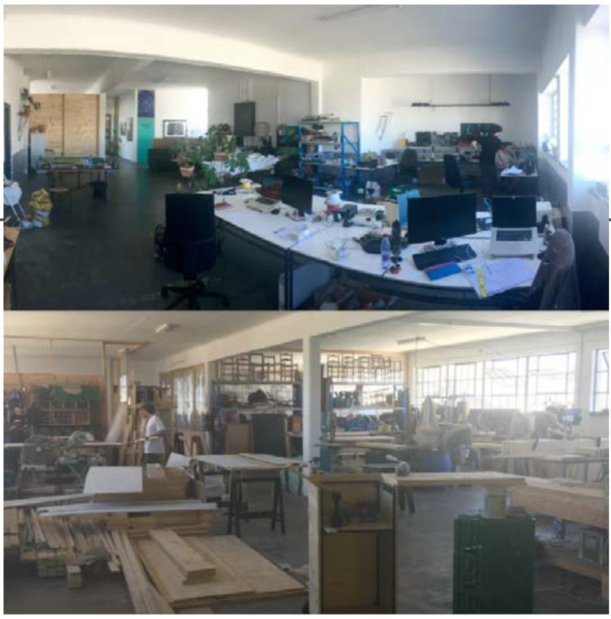


Fig. 3.18: Thingking makerspace in Woodstock, Cape Town (Grace-Flood:2018)

THINGKING, WOODSTOCK

Thingking is a maker-space in Woodstock, Cape Town. It combines an open-access workshop with a private design studio. Apart from its own product-design endeavours, it provides resources and tools to the local community (Grace-Flood 2018).

Thingking is part of the British Council's Maker Library Network.

PROGRAMME REQUIREMENTS: FUNCTIONAL, SPATIAL, HAPTIC

MYCELIUM AND BIO-COMPOSITE PRODUCTION + PROCESSING SPACE

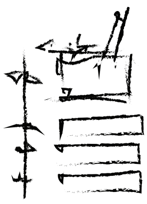
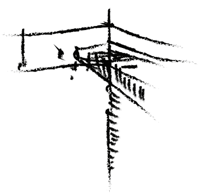
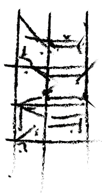
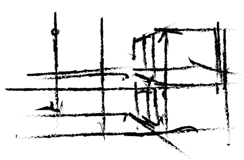
SPACE:	DESCRIPTION:	FUNCTIONAL REQUIREMENTS:
	**PRODUCTIVE LANDSCAPE**	Wet services and compost. Walkways. Storage for equipment. Link to public harvesting space and test kitchen. Link to service road and compost storage area. Workshop spaces, storage and waste collection.
	**UNDERGROUND (PLATFORM) GROWTH SPACE**	Underground landscape for the growth of fungi and mycelium . Link to vertical greenhouse and productive landscape. Wet services and the ability to control moisture levels and light quality. Floor drainage.
	**VERTICAL (GREENHOUSE +AQUAPONICS)GROWTH SPACE**	Water and heat storage with ability to circulate between crops and fish. Link to underground growth space and material processing space.
	**MATERIAL PROCESSING SPACE**	Link to vertical and underground growing spaces as well as commercial production space and staff rooms.
	**COMMERCIAL PRODUCTION SPACE**	Link to material processing spaces and commercial design and maker-spaces. Services and drainage in columns and floor.
	**ADMINISTRATION + SERVICES**	Link to commercial design and production spaces as well as to entrances and transport routes.

Fig. 3.19: Programme requirements 1 (Author:2018)

SPATIAL REQUIREMENTS:	SENSORY AND HAPTIC EXPERIENCE:	SIZE:
Outdoor space with allotment gardens for the growth of various crops. Maximised light. Direct connection to underground growth space and material processing functions. Natural ventilation.		Outdoor growth space: 4500m²
Underground, dark, humid spaces. Sufficient floor-to-ceiling height to stack early-stage mycelia and hang late-stage mycelia and fungal growth. Controlled natural ventilation.		Underground growth space: 750m²
Varying levels of light to accommodate the growth of a range of crops. Light from west to be blocked but light from north, south and east to be maximised. Natural ventilation.		Vertical greenhouse: 600m²
Single volume space with double volume circulation cores. Indirect natural south light. Natural ventilation.		Material processing spaces: 600m²
Single volume space with double volume circulation cores. Controlled natural ventilation. Indirect natural south light. Natural ventilation.		Production spaces: 600m²
Single volume space. Exterior balcony. Natural ventilation.		Administration: 500m² Services: 250m²

PROGRAMME REQUIREMENTS: FUNCTIONAL, SPATIAL, HAPTIC

BIO-DESIGN, GALLERY AND RELATED PUBLIC INTERFACES

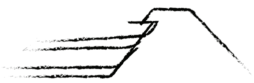
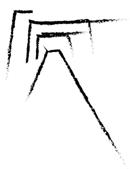
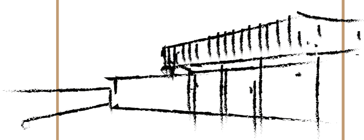
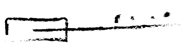
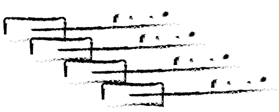
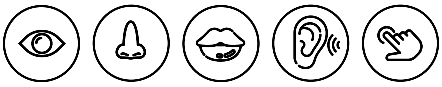
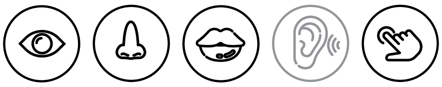
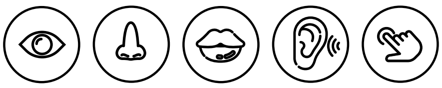
SPACE:	DESCRIPTION:	FUNCTIONAL REQUIREMENTS:
	**PUBLIC COURTYARD + PUBLIC LANDSCAPE**	Planters, seating, walkways. Link to public reception and orientation space as well as access routes and parking.
	**PUBLIC RECEPTION + ORIENTATION SPACE**	Link to public reception and orientation space. Display boards and exhibition furniture.
	**PUBLIC HARVEST SPACE, TEST KITCHEN + RESTAURANT**	Wet services, sorting and service equipment. Links to productive landscape. Links to public reception and orientation space. Indoor seating and tables for visitors.
	**GALLERY + RETAIL SPACE**	Links to public design space and maker-space. Adaptable partitions. Storage space and security for products.
	**PUBLIC DESIGN SPACE + MAKERSPACE**	Links to gallery and retail space as well as public courtyard and public landscape. Services and drainage in columns and floor. Desks and comfortable seating for design. Auditorium for presentations. Prototyping and workshop equipment.
	**COMMERCIAL DESIGN SPACE + MAKERSPACE**	Links to material processing space as well as administration and staff service spaces. Services and drainage in columns and floor. Desks and comfortable seating for design. Auditorium for presentations. Prototyping and workshop equipment.

Fig. 3.20: Programme requirements 2 (Author:2018)

SPATIAL REQUIREMENTS:	SENSORY AND HAPTIC EXPERIENCE:	SIZE:
Open space. Recreational equipment and exhibition gardens. Direct natural light. Outdoor space with shading from vegetation. Natural ventilation.		Courtyard: 12500m^2 Landscape: 12500m^2
Double volume space and glass walkway. Exhibition space. Natural ventilation.		Reception: 200m^2 Orientation space: 200m^2
Double volume. Public viewing of harvest space. Tasting and sensory space. Natural ventilation.		Harvest space: 360m^2 Test kitchen and restaurant: 500m^2
Double volume space. Public viewing space. Inside/outside space. Indirect natural south light. Natural ventilation.		Gallery and retail space: 300m^2
Double volume space. Indirect natural south light. Natural ventilation.		Design space: 200m^2 Makerspace: 200m^2
Double volume space. Hoists. Indirect natural south light. Mezzanine levels. Natural ventilation.		Design space: 200m^2 Makerspace: 200m^2

PRECEDENT-MICROBIAL HOME: [CLOSED-LOOP DESIGN]

Fig. 3.21: Microbial Home water system (Dezeen:2011)

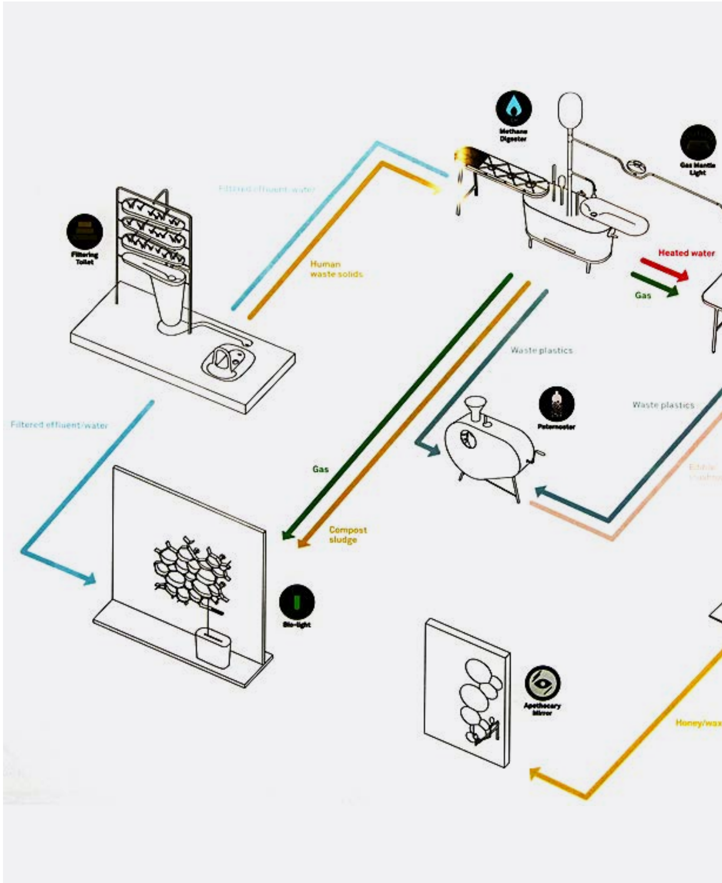


Fig. 3.22: Microbial Home closed-loop (Dezeen:2011)

BIODESIGN AND CLOSED-LOOP THINKING

Bio-design is the combination and integration of traditional design fields with biological systems to achieve superior performance and economic use of resources (Van Der Leest 2017). This fast-growing industry incorporates living systems into designs as components, material sources, building blocks, energy generators or air purifiers for example.

Bio-design is simultaneously logical and opportunistic, as it seeks latent solutions and innovations from scientific and natural ecosystems.

Fig. 3.23: Microbial Home kitchen (Dezeen:2011)

APPLICATION

Microbial Home by Philips Design imagines a future home where nature and machinery work together synergetically as an ecosystem (Dezeen 2011). The kitchen combines appliances into a cyclical flow of inputs and outputs that minimizes waste (Filippetti 2011).

The design takes the form of a systemic re-interpretation of domestic activities. As a prototypical artefact designed to educate and inspire, it makes processes as clear and visible as possible. The design is modular and adaptable in its construction and involves components for filtration, processing and recycling.

04

THEORY

INTRODUCTION: REGENERATIVE PROSPECTS

This chapter provides a theoretical framework for the dissertation. **Regenerative theory** forms the over-arching theoretical driver with theories related to industry, ecology, heritage, and tectonics as supportive.

The combination of these theories through **layering** will give effect to the aim of developing a design capable of reflecting the past prospect of the site, defending the current threatened prospect as well as ensuring an ongoing future prospect.

Regenerative theory will be used as an umbrella theory to understand the past of the site and its threatened present state due to its mono-functional character. It will then be combined with industrial ecology theory to develop an approach for a new creative and productive industry which will ensure a sustainable future for the site.

Theory related to drosscapes and *terrain vagues* will form a basis for regenerating the **post-industrial landscape**. An approach to deal with the past and present of the site itself will then be adopted by investigating theories related to **industrial heritage** as well as the Nizhny Taghil Charter and National Heritage Resources Act.

Theory relevant to **adaptability and succession** will then be investigated to develop a design approach capable of ensuring the future relevance and thriving of the site.

Finally, theory related to **layering** will form the conclusion and vehicle for the physical combination of the above mentioned theories. This theoretical position, expressed in design, supports the dissertation aim of expressing the past and present prospects of the site through the integration with a future prospect.

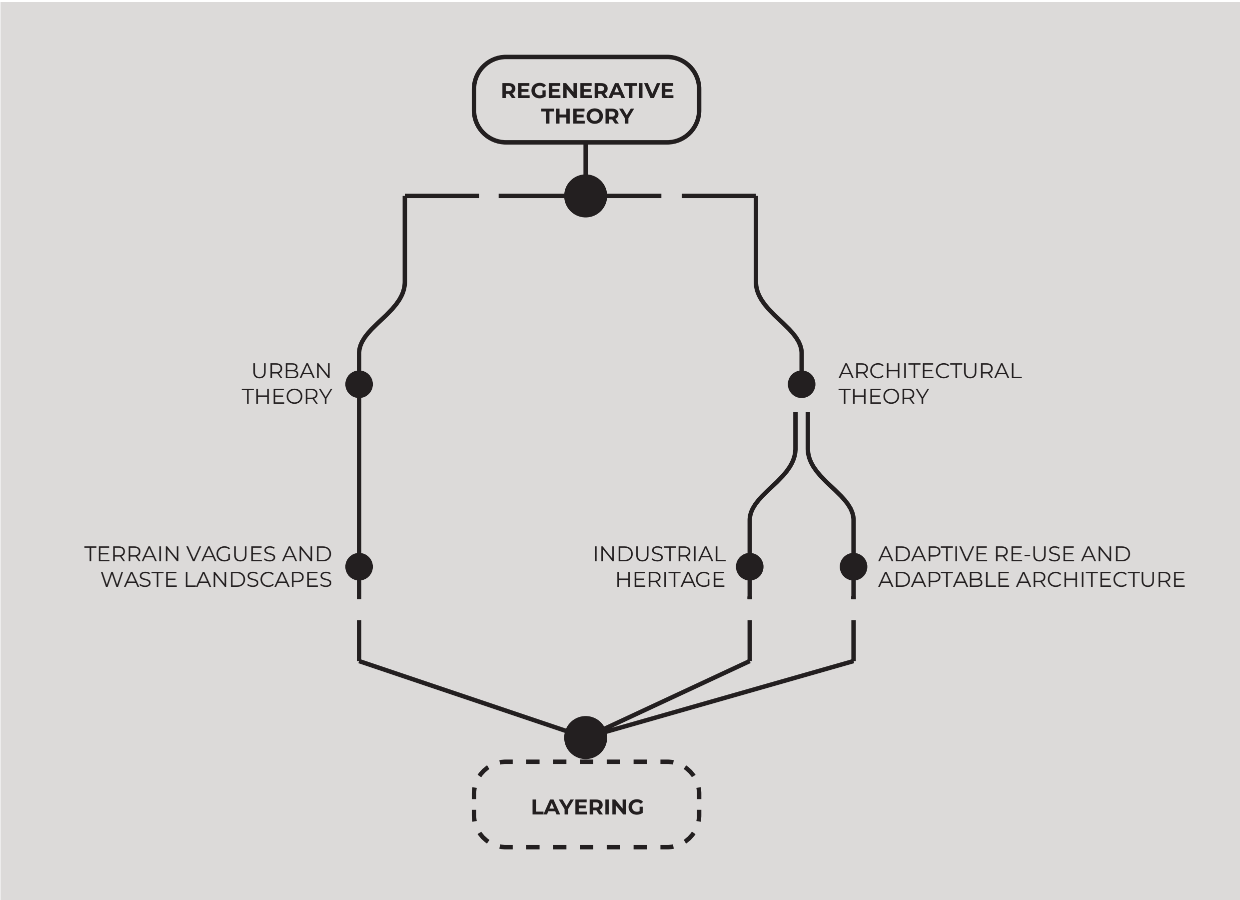


Fig. 4.1: Summary of theoretical framework (Author:2018)

REGENERATIVE THEORY AS DRIVER

MECHANISTIC TO ECOLOGICAL WORLDVIEW

The mine at Village Main is a typical example of a mono-functional industry which was created with the sole aim of extracting resources from the earth through the exploitation of the environment for financial gain. The result is a scarred landscape created from a total disregard for the long-term effects of its industrial processes on the environment. Du Plesssis (2011:1) describes this Modernist world-view as "reductionist and mechanistic", with man being seen as separate from and superior to nature.

Regenerative design theory, in opposition, is based on the notion that there is no division between humans and nature. It contends that if we are to design a world fit for ongoing human habitation and flourishing, there needs to be a shift from a 'mechanistic' to 'ecological' way of thinking (Mang & Reed 2012:23). In order for this to happen, those involved in the built environment must to develop, apply and evolve new methodologies intrinsically shaped and founded in the paradigm of 'regenerative' sustainability (ibid.). This shift requires not only the adoption of new technologies but also new philosophies which are capable of governing action (Du Plessis 2012:11).

The shift to an ecological worldview demands thought capable of comprehending a world comprised of dynamic systems versus one of static building blocks (Mang & Reed 2012:30). The shift begins by attempting to identify the core of a system as well as the associated systems around which it is organised and ordered. It necessarily views all things within a web of larger contexts of reciprocal relationships within which it is embedded as well as smaller systems which comprise it. This allows the premise for revealing the potential inherent in all living systems. The need to be more 'whole' and to improve is the basis for regenerative thinking.

The regenerative worldview can be best understood within the conceptual framework of 'Four Levels of Work' (Mang & Reed 2012:27) in which every living system must engage within a "nested, dynamic, complex, interdependent and evolving" world (ibid.). The levels are arranged within a hierarchy, the bottom two (operate and maintain) are engaged with the maintenance of the existing ('below the line work') and the top two (improve and regenerate) are focussed on the potential of the system ('above the line work') (ibid.). The aim of regeneration is the highest operation of the orders. This framework reveals how to continuously evolve the ability of the system to generate value in relation to larger systems.

REGENERATIVE THINKING

Regeneration means to "give new life and energy" to something (Reed 2007:2). By definition sustained energy and life can only happen within the context and interdependency of a whole system (ibid.). This goes beyond nicety — what is required for sustainable and ongoing life is the development of relationships between living organisms and systems.

While the shift from a focus on sustainability to regenerative thinking is both profound and necessary, the two must coexist. It is necessary to be working both with the minimisation of impact in mind as well as a living systems understanding focussed on the mutually beneficial interdependence with nature as a partner (Reed 2007:2)

The premise of the regenerative methodology is fourfold: firstly it assumes a new role for humans, secondly it demands the adoption of a new mindset, thirdly the articulation of new role, and finally demands working developmentally.

Regenerative theory places huge significance on the consequences of human presence on the planet. While 'green', 'sustainable' or 'eco-efficient' design aims to mitigate that impact, it misses the opportunity to organise human activity in such a way as to feed into and off living systems within which they are involved and embedded (Mang & Reed 2012:26). It is simply insufficient to merely mitigate the role humans have on nature, humans have to re-assume their role in nature and do so in a positive manner. From this point, regenerative design and development reconnects the activities and aspirations of humans with evolving natural

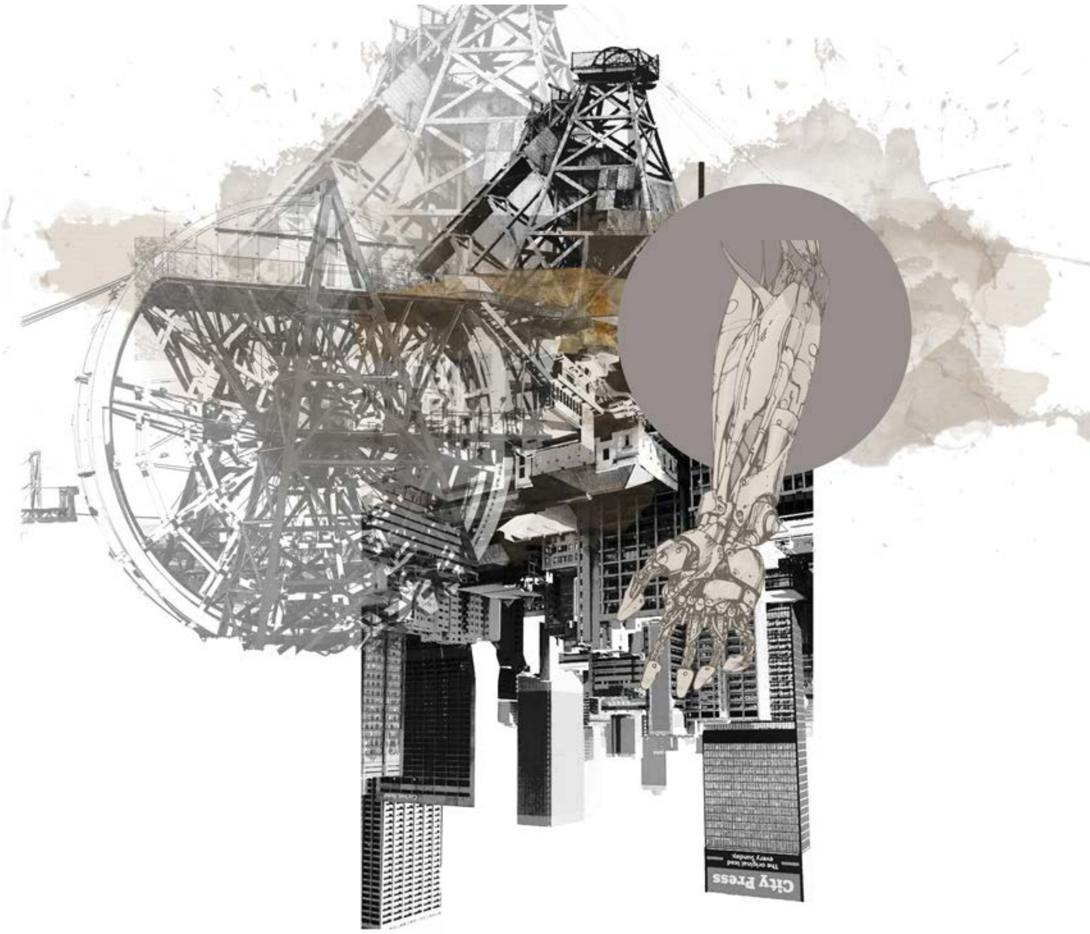


Fig. 4.2: Mechanistic worldview and its consequences (Author:2018)

systems and aims for a co-evolving of both through interconnection. Rather than simply aiming at the preservation or restoration of an ecosystem, this is the continual and mutually beneficial intertwining of culture and nature.

The most crucial, and first, step to any regenerative work is the change of mindset (ibid.). This involves the adoption of new ways of thinking about the way buildings are conceived, constructed and inhabited. For this to occur, the definition of building and site need to shift. Rather than being viewed as discrete and independent entities, they should be viewed as energy systems — webs of interconnected processes.

Likewise, the definition of the designer needs to shift. The analogy of the gardener is particularly fruitful in that it implies the continuous design of, and involvement in, an ecosystem nested within other ecosystems (ibid.). The goal is always the healthy growth and flourishing of the system through changing conditions and environmental cycles. A successful designer in the regenerative paradigm values and designs the integration of living natural and human ecosystems in order to create flourishing for both. Tied to this is the ability to weave other narratives and voices into the process to ensure the participation of community in order to tap its latent potential.

Underlying all of the above is the assumption that those involved in regeneration, work towards a developmental process underpinned by the desire to take the system to the next level.

A LIVING SYSTEMS APPROACH TO DESIGN

Sustainability should not be thought of as a deliverable or a 'thing'. It should also not be thought of as about technologies or techniques but rather as about life — a process by which living entities ensure their flourishing over the long term (Reed 2007:1). With this in mind, pieces of architecture only become meaningful when conceptualised and contextualised as part of the "living fabric of place".

Buildings within this framework are involved in reciprocal relationships where they are supported by and support a larger whole. Consequently, a building cannot simply be of a high-performance technically to be considered sustainable. A high-performance building which isn't holistically

Fig. 4.3: Regenerative prospects for the site (Author:2018)

integrated is much like a high-performance liver outside the context of a body (Reed 2007:1). In the same way the liver is useless outside of the context of the body, architecture only finds true purpose in context.

By viewing architecture as part of living systems we must acknowledge that it is caught up in processes of change and that it necessarily evolves as life is not static. By implication, all architecture (new or existing) must be designed with succession and progression in mind. This is particularly fruitful conceptually when applied to heritage architecture.

Restoration naturally refers to a system's ability to ongoingly evolve and self-organise. Regeneration according to Reed (2007:2) is about "framing restoration as a whole — engaging the earth systems, the biotic systems and the people of each place in a unique and continuous dialogue of restoration and evolutionary development — a healing or 'wholeing'".

Any design process serious about the sustained flourishing of life in a place needs to begin with an understanding of the unique processes already present on a site (Reed 2007:5). All design engages with living systems — whether consciously or unconsciously. It is through the expansion of our conceptualisation of design to include these interactions that we exploit the potential to not only script sustainable interactions but regenerative ones capable of contributing to the wealth and health of place (ibid.).

Current definitions of architecture divorce buildings and place by dividing the operational aspects of the structure from the biosphere and landscape (Littman 2009:2). What this results in is the synthesis of building systems and the continual input of resources and energy from elsewhere which inevitably results in waste. Regenerative architecture embraces and incorporates the place, site, flora, fauna, building and systems in a manner that co –evolves as a holistic entity (Ibid.). The result is that the entire ecosystem improves through the architecture itself producing more than it consumes, resulting in an upward spiral both for humans and the environment. This conception acknowledges that through the inclusion of regenerative processes, the environment contains and provides solutions to problems faced.

THE BASIS OF A REGENERATIVE ARCHITECTURAL APPROACH

For regenerative theory to find full and meaningful expression in design it needs to deal with three necessary aspects.

Firstly, it is essential that the whole system be experienced and understood (Reed 2007:4). By situating design and thinking within this, it is possible to understand and act on the potential in order to foster diverse and resilient relationships. This moves beyond the 'facts' of the place and becomes about understanding the relationships already in place and how interactions occur. In order to do this there needs to be a move beyond performance metrics and towards the holistic understanding of performance patterns. In short, data patterns are insufficient descriptions of life.

Secondly, the story of place needs to be understood so that experiences can be related to stakeholders with the aim that the place be appreciated as an embedded and living system (Reed 2007:6). Narrative becomes an extremely powerful means of communicating these complex relationships as well as engaging people with an understanding of the working of a place and the subsystems participating.

Thirdly, a continual process of dialogue needs to take place in order to align aspirations of stakeholders with the nature and spirit of the place (Reed 2007:7). The regenerative design process is one of continually enriching dialogue amongst designers, communities and the systems in which the design is contextualised. Stakeholder dialogue is a necessary component of sustainability as this ensures the growth and deepening of economic, cultural and natural synergies.

INDUSTRIAL ECOLOGY AS AN APPLICATION OF REGENERATIVE DESIGN TO INDUSTRY

The aim of the field of industrial ecology is to apply the knowledge of natural systems to the conceptualisation and operation of industrial systems with the goal of achieving sustainable and integrated relationships with the natural and industrial world (Brent , et al. 2008:9). It forms a relevant application of the theories of regenerative design to an industrial site.

The theory is a systems-based, multidisciplinary field which endeavours to understand the emergent behaviour of integrated and complex systems with an emphasis on the interface between natural and human systems (Allenby 2006:33). Its premise is that industrial and natural systems are inter-related and should be designed to compliment one another.

Its basis is in the natural sciences and has the following core principles:

- Societies, economies and nature co-evolve (Brent , et al. 2008:9).

- Economies and societies are embedded in a larger natural system, which needs to function within its own carrying capacity (ibid.).

- Material and energy flows of industry interact with those of nature (the consequences of which are determined by the properties common to all matter) (ibid.).

- Waste and pollution are minimised in nature, a principle which should also apply to industry (ibid.).

- Conceptualising industries as organisms and economies as ecosystems can mimic the diversity of nature and interconnectedness of organisms (ibid.).

- Information and feedback are important underpinnings of the success of systems (ibid.).

- Systems should minimise their dependence on external resources, focussing instead on local interconnectedness (ibid.).

If production, processing and consumption patterns in industrial systems are designed to emulate those of the natural world, a far greater sense of sustainability would result. To this end, innovative techniques for utilising the raw materials of the world need to be sought out and developed. The field of industrial ecology draws on ecological networks of interconnected actors which exchange matter and energy flows (Brent , et al., 2008:11). This vision needs to find application in the design and establishment of industrial ecosystems employing the principles of nature in their functioning.

These frameworks need to take into account the nature and complexity of the surroundings. In the case of Village Main, it is necessary to investigate theory related to drosscapes and *terrain vagues* to fully appreciate the context.

TERRAIN VAGUES + WASTE LANDSCAPES AS SITES OF REGENERATION

Gold mining landscapes are inextricably bound with waste in two ways: as a by-product of their operations as well as the fact that sites of mining become waste landscapes (Barnett 2008:29). The 'terrain vague' is condition that exists in almost all cultural and geographical contexts and comes as a result of the fragmentation of physical and intellectual territories (Girot 2016:283). Our age and the industrial processes mean that landscapes are treated with incredible violence, leading to the obliteration and removal of traces (both physically but also in terms of memory).

Terrain vague is a condition that exists in almost all cultural and geographical contexts and is the result of the fragmentation of physical and intellectual territories (Girot 2016:283).

Our age and the industrial processes result in landscapes that are treated with incredible violence, leading to the obliteration and removal of traces (both physically but also in terms of memory).

The term, coined by Ignasi de Sola-Morales (2008:118), refers to a ground condition that has been subjected to dilapidation as a result of uncontrolled aggression. It is the complete antithesis, and enemy of, conscious and sustainable design.

The terrain vague is not the romantic landscape interspersed with ruins, but rather a total 'ground zero' of absolute environmental and cultural annihilation in the age of the 'Anthropocene', typified by contaminated and eroded land (Girot 2016:283).

The terrain vague straddles the aftermath of a series of depredations but also has an unlikely future promise. This past plundering and future uncertainty are both evident in the site at Village Main 1 Shaft. While the terrain vague has a ubiquitous nature, there is also specificity in the way that it can about and the forces that have contributed over time.

Terrain vague as a term combines two words that suggest an uncomfortable wave of uncertainty on what ought to be terra firma (Girot 2016:285). While these two terms suggest an end, they also signal a turning point: an end because of the annihilation of landscape, but a turning point because of the paradigm shift in aesthetic appreciation that these places endorse, pushing the potential to act further.

Berger (2007) describes 'drosscapes' as the vast, leftover tracts of land with no apparent purpose as a by-product of our post-industrial reality. While differing in their nature and formation, they occur across the world. One of the great legacies of the Apartheid city is the buffer-zones designed to keep population groups and functional zonings apart which in many ways resemble the drosscapes described above.

Leftover spaces and drosscapes like Village Main are especially interesting as they are spaces of contestation and becoming. Various stakeholders vie for space and position in a context where land and the ability to forge a livelihood through interventions is essential. Drosscape discourse becomes especially useful for understanding these sites with regards to their re-programming through human intention. The focus prioritizes the margins rather than the centre, both physically and socially. It urges designers to consider alternate forms of operation and shift the customary definitions of urban design and architecture. In these cases, architects have to think strategically about the undervalued and overlooked potential of sites.

CULTURAL STRATEGIES FOR THE RECLAMATION OF POST-INDUSTRIAL LANDSCAPES

Degraded landscapes are one of the most severe consequences of industrial processes. The effects of gold mining have been particularly detrimental.

The lens through which we view environmental problems needs to be through culture as environmental problems are created first and foremost by culture and then facilitated through science (Comp 2008;63). For the most part, the cultural dynamic has been absent from the debate.

Such environments have been viewed primarily as technical hazards and their reclamation has tended to be viewed purely as a function of engineering and mechanistic ways of thinking. This is both ironic and problematic as the solution should not be derived from the same mindset that gave rise to the problem in the first place. When dealing with environmental degradation we are to pursue creative, synthetic, holistic solutions capable of solving economic, environmental and cultural issues simultaneously (Comp 2008:65).

Culture and education need to be a driver of change as much as the science of reclamation as it both raises awareness and improves response to the intervention through community interest and buy-in while ensuring the long-term sustainability. In this way, environment potential offers the possibility to not only solve environmental problems but also connect the arts and sciences.

Degraded environments are as much cultural artefacts as they are issues for science and their restoration needs to be tackled with the combined knowledge of the arts and sciences (ibid.).

In order to ensure the timeous and sustainable redevelopment planning and the reclamation of mining land should happen concurrently (Ketellapper 2008:86).

Sound historical readings of the environmental problem opens up opportunities for the proper understanding of the origins of the contamination we seek to re-mediate, as well as for greater reflection on the values and achievements of our predecessors. Furthermore, this illuminates the contemporary role in that continuum of history and environmental commitment (Comp 2008:63).

RECREATION FRAMEWORKS AS A STRATEGY FOR REGENERATION

Realistic and sustainable strategies of reclamation should aim for places of recreation, historical reflection, ecological education and landscape re-mediation (Comp 2008:66). A truly multidisciplinary approach to this should jointly involve the arts and sciences which together have the potential to re-mediate landscape and involve community in a healing and productive process.

There are three principles for designing a reclamation framework: remove and re-mediate what no longer works, remember the history, respect who created this place and what is currently happening on the site (Comp 2008, p. 74)

Berger & Lounsbury (2008:129) posit that the harmful consequences of mining and prospecting can be utilised for recreational purposes. For such a framework to function, proper trail system planning and environmental management are necessary to ensure ecological and experiential diversity (ibid.).

Critical to this endeavour is understanding how the connection to nature and what was lost through extraction and how it can be re-established (Barnett 2008:34). Principles for trail management: view-corridor enhancement, species diversity, trail consolidation and memory-enhancing programmes are key.

In order to appreciate the context for the application of this urban theory it is necessary to industrial heritage and how it relates to the site specifically.

INDUSTRIAL HERITAGE AS REGENERATIVE STRATEGY

FRAMING INDUSTRIAL HERITAGE

The Industrial Revolution represents one of the most significant changes in history due to the ground-breaking technological changes that happened in that time (Andrei 2010). Industrialisation led to widespread changes to the built and natural landscape: greater built densities in urban areas as well as the urbanisation of natural and rural environments. This new industrial order and face of the city was defined by the concentration of industries as well as the prioritisation of productive concerns and by the growing needs and demands of a burgeoning working class (Loures 2009:295).

Borsi (1975) defines the industrial landscape as "the landscape resultant from a thoughtful and systematic activity of man in the natural or agricultural landscape with the aim of developing industrial activities". This definition enables the holistic treatment of the entire landscape as opposed to a single element or building of an industrial site. It allows for the expansion and conception to include broader patterns of activity over time situated in place as industrial heritage (Loures 2009:295). In this sense, the material and conceptual remnants of the industrial landscape can both be recognised and attributed new meaning with the objective of determining a theoretical basis and practical methodology for the study and intervention into these landscapes allowing for the adaptation and transformation of the landscapes in order to imbue them with new relevance and layer new productive and cultural uses (ibid.).

Recently, the evaluation, documentation and development of the remnants of 19th and 20th century industrial sites have grown along with the need to consider industrial heritage sites in the planning of the city because of their contribution to collective identity, inherent physical potential as built resources as well as their cultural and historic meaning (ibid.).

The term "industrial heritage" has evolved and arrived through "industrial archaeology) which was

Fig. 4.4: Succession and adaptation as an approach to industrial heritage (Author:2018)

prevalent in the 1950s (Hudson 2005). The study of industrial heritage began as a survey of the industrial artefacts created during the Industrial Revolution in Britain. Today the term generally encompasses physical remains from old, as well as unused, industrial and technological history. Industrial heritage is part of a regions cultural history and includes built infrastructures such as water power, canals, harbours, mills, gasworks, warehouses, railways and stations as well as mines (Sutestad & Mosler 2016:323).

OBSOLESCENT INFRASTRUCTURES

The history of the contemporary city has been influenced by many different urban visions but most significantly by changes in consumption and production patterns (Siverts 2003). The end of the last century brought with it major innovations and the consequent obsolescence of many industrial landscapes. The industrialised world is experiencing these effects as a result of the restructuring of the global economy, the automation of processes as well as the relocation of industries to areas with lower production costs (Jameson 1991).

This process of the globalisation of industry has profoundly effected industrial areas the world over and has partly led to the dereliction and underutilisation of these sites. The fact that these post-industrial landscapes are often environmentally degraded and have economically disadvantaged and socially distressed populations highlights the need to redefine these places through the processes of community-based, interdisciplinary action which has the ability of integrating mixed-use long-term solutions based on ecological, economic and social objectives (Loures 2009:294).

Post-industrial sites, largely due to their environmental damage, often suffer the fate of demolition to make way for more fruitful forms of development. Such *tabula rasa* approaches not only demolish the physical remnants of the past but also the invaluable historical traces and connections to collective identity. Therefore, the distinctive and unique characters of place give way to generic forms of development so prevalent in the 21st century global city. This approach is all too prevalent and powerful counterarguments need to be developed in order to safeguard and celebrate these portals into our past.

THE VALUE OF INDUSTRIAL HERITAGE

Industrial sites have traditionally been viewed as sites of ecological degradation (Conesa, et al. 2008). The resultant need to protect the environment has in the last decades catalysed the renaissance and redevelopment of industrial sites. The reclamation, conservation and transformation of these sites constitutes an important cultural goal which is intrinsically sustainable as it is premised on the positive reuse of redundant industrial buildings (Loures 2009).

There are mounting calls for these environmentally impaired assets to be returned to productive and positive uses capable of contributing to the surrounding communities and natural infrastructures. (Loures 2009:293).

Industrial heritage is a great functional and cultural resource. These resources are potentially extremely valuable in their ability to meet the increasing demand for urban and architectural spaces capable of meeting cultural and social needs (Romeo, et al. 2015:1305).

Industrial heritage is an integral constituent of the cultural heritage underlying the birth and development of the city over time. Its features should be traced and revealed in order to retain and exemplify implicit values in a culture. This gives us an understanding of a sense of place as well as our relationship to that place over time as they embody aspects of our origins and development through their forms, histories of use and features (Loures 2009:296).

HOLISTIC APPROACHES TO INDUSTRIAL HERITAGE TRANSFORMATION

In the past, changes and adaptations to industrial heritage have been limited in scope to functional and economic concerns. It is becoming more apparent that holistic responses to industrial heritage take cognisance of ecological, cultural and social factors (Romeo, et al. 2015:1306).

By taking advantage of the latent cultural and social potential of industrial heritage sites, preservation and ongoing reuse can find a sustainable driver.

THE CHARTER OF NIZHNY TAGIL ON INDUSTRIAL HERITAGE (2003)

The charter is the most widely adopted standard for the documentation, conservation and interpretation of industrial heritage. The premise of the charter is the fact that the process of industrialisation as a phenomena has reached and affected all forms of life on the planet and states that "the material evidence of these profound changes is of universal human value" in order to make the case for the study and conservation of such artefacts (TICCIH 2003:1).

This charter credits post-industrial sites as entire landscapes worthy of attention and declares that all facilities related to the industry along with their adjacent landscapes and communities are worthy of study and conservation (ibid.). It also acknowledges both tangible and intangible dimensions.

This charter aims to specify the value of industrial heritage as well as govern the operations of conservation and maintenance (ibid.). It also suggests particular interventions to meet the requirements of energy efficiency and sustainability broadly.

Of specific relevance to Village Main is clause 5.IV of the charter which states that the adaptation of an industrial site to a new use to ensure its conservation is usually acceptable" (ibid.). It goes on to argue that design which "interprets the former use is recommended" (ibid.).

INDUSTRIAL HERITAGE IN JOHANNESBURG

While discourse on industrial heritage is increasing, the term is very seldom used in reference to Johannesburg. This is extremely problematic as the industrial heritage of South Africa is both rich and important (Läuferts & Mavunganidze 2009:533). Unfortunately, South Africa (along with many developing countries) has fallen behind in protecting its heritage assets, particularly those of an industrial nature (ibid.).

Johannesburg, largely due to the mining industry and the associated industries, has a rich heritage of productive architecture. Rather disappointingly, this aspect of Johannesburg is not pointed out or celebrated in tourist strategies for the city as is often the case overseas. To a large extent the heritage of Johannesburg has been sanitised and what is written about and punted is limited to residential and public architecture.

With the dawn of democracy in 1994 and the new heritage legislation published in 1999, focus (understandably) shifted to sites of struggle history and places that exhibited the resistance of people during the Apartheid era. Industrial heritage, for the most part, was not prioritised.

It is noteworthy that much of the preservation of industrial heritage in Johannesburg has been accomplished by partnerships with the private industry. The most obvious, and perhaps most successful case, is that of the Newtown cultural precinct where much work has been done to preserve and re-invigorate industrial buildings.

Rapid and unsympathetic cycles of redevelopment has seen much of Johannesburg's industrial heritage destroyed. This is partly due to the hastiness of developers but also the overzealousness of politicians eager to clean up industrial sites in decaying areas. One of the most painful examples of this was the demolition of the Richmond Laundries in 2008 despite numerous stop-orders to the razing of the site. Were the site handled with vision and delicacy, it could have been transformed to reflect the village character of 44 Stanley Avenues 1930s industrial buildings.

It is of the utmost importance that industrial heritage in Johannesburg is not treated in isolation but rather as sites forming part of complexes and networks of productivity but also as contributors in larger narratives of industry (Läuferts & Mavunganidze, 2009:538). An example of one such complex is the Johannesburg Gas Works precinct which forms part of the broader inner-city infrastructure network as well as a key informant in the narrative arc of 20th century industry in the city. Rather than viewing these places and processes in isolation and thereby obliterating their meaning and character, they should be linked through intelligent frameworks.

THE NATIONAL HERITAGE RESOURCES ACT (1999)

The South African National Heritage Resources Act governs the local legal context for the identification and protection of heritage resources. According to this act the No. 1 Shaft site at Village Main constitutes a national heritage resource by virtue of its been of the "resources of South Africa… of cultural significance or other value for the present community and for future generations" (South Africa 1997:7). The site has been identified as part of the national estate due to the fact that the place, landscape and structures all bear significance for the development of the surrounding community as well as for the historical industrial and physical development of Johannesburg. The site also has physical remains of an industrial process which has since become obsolete from which we can gain insight into the past.

Apart from the buildings and structures of the site, the act also recognises the landscapes and natural features as having significance. Thus the cultural landscape within which the site is situated must be recognised incorporated into any intervention.

INDUSTRIAL HERITAGE AS LAYERED PROSPECT

Industrial heritage is represented by stratified and layered architectural complexes characterized by differing formal and technical solutions which over time have been added to one another. These layers happen as a result of demand due to the evolution of technology as well as innovations in production processes (Romeo, et al. 2015:1305). It is this layering (additions, use changes, abandonment, reuse and adjustment) which gives the industrial complex its unique value (ibid).

This continuous evolution constitutes the essence of the industrial architectural typology. From the earliest industrial buildings to the present day, industrial architectures have had the capacity to adapt their form as well as their technological logics to meet changing needs of production. This quality has enabled the reading of the history of industrial sites through material and technological superimpositions. For example one can chart phases related to the testing and use of reinforced concrete, of iron, of cast iron, steel, the use of shed roofs and large glass surfaces ; or the use of artificial and natural energy sources (Romeo, et al. 2015:1306).

Cultural heritage embodied in industrial heritage sites reveal past actions and societal behavioural patterns as layered landscapes. Here, history is a dynamic element embedded in a series and succession of places capable of teaching us of past mistakes and success stories. Present and future generations are participants in the ongoing constitution of identity and meaning grounded in place. The emphasis on everyday activity and participative practices prevents the site from being monumentalised or caught in a cycle of irrelevance down the line. Flux, temporality and adaptation become important foundations to such an approach (Sutestad & Mosler 2016:333).

Kirovová and Sigmundová (2014:433) argue that industrial sites hold great potential to mitigate and resolve environmental and social issues inherited from the past. In order for these former industrial sites to be re-integrated into the adjacent urban and socio-economic context, it is necessary to identify and adopt appropriate principles of sustainable adaptive re-use (ibid.). In so doing, the likelihood of new regenerative outcomes increases.

Fig. 4.5: Industrial heritage as layered prospect (Author:2018)

ADAPTIVE RE-USE AS REGENERATIVE PROSPECT

ADAPTATION AS REGENERATIVE FUTURE PROSPECT

There is a spectrum of attitude to intervention when dealing with existing post-industrial artefacts and landscapes. On the one end lies erasure, and on the other end lies adaptation (with preservation between the two).

The process of adaptation over time manifests as re-use in architectural terms, reclamation in landscape terms and regeneration in resource terms.

This stance acknowledges the maturation, development and growth of built and natural ecosystems (Schneider 2008:42). It is an attitude to deal with the dynamic and ever-changing systems of nature as well as architecture.

ADAPTIVE RE-USE IN ARCHITECTURE

Existing buildings embody meaning and memory. The discriminate re-reading of these artefacts can lead to both dynamic and appropriate results (Stone 2005:125). The embodied and inherent qualities of place, combined with the anticipated future uses can create a multi-layered richness and complexity impossible to recreate in new buildings (ibid.: 126). The re-use of buildings emphasises continuity (ibid.: 126).

The term of adaptive reuse is defined as the reuse of old buildings for new purposes (Sahraiyan and Tümer, 2017:50). Key to adaptive re-use is the fact that it deals with re-use of the building or site which was once suitable for its previous use but is no longer suited to the specific building location or type (ibid.:52). Consequently, the value of the building will be retained or increased through the adaptation of the building.

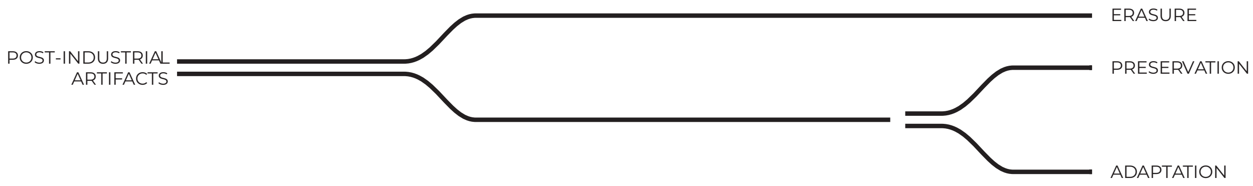


Fig. 4.6: Potential attitudes towards post-industrial artifacts (Author:2018)

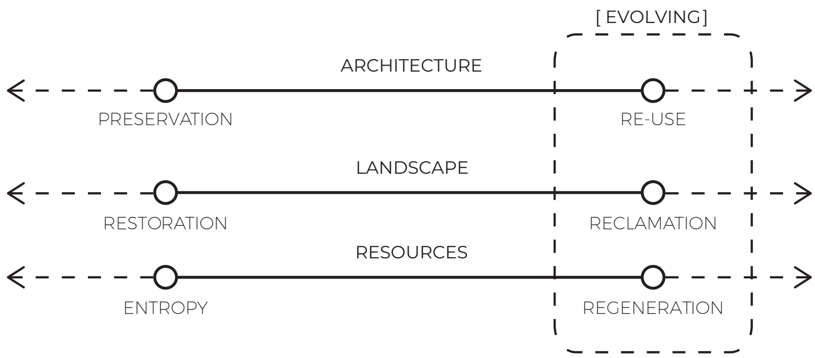


Fig. 4.7: Intended attitude to architecture, landscape and resources through adaptation (Author:2018)

According to Loures & Panagopolos (2007) successful adaptive re-use projects should broadly attempt to achieve the following:

- Perform the functions well for which they are re-designed (ibid.).

- Be lasting and adaptable to new uses (ibid.).

- Respond to their surroundings and be an asset to their context (ibid.).

- Be architecturally coherent relative to existing structures (ibid.).

-Further the aims of sustainability and have minimal environmental impact (ibid.).

Industrial buildings, in particular, lend themselves to adaptive re-use as they were built to house large scale processing systems, machinery and their often vast interiors lend themselves to the addition of new programmes (Smith 2010:2).

APPROACH TO REMODELLING EXISTING BUILDINGS

The re-modelling of any existing building is a response to the structural, environmental, aesthetic, contextual and programmatic dimensions of the project and needs a coherent strategy in order to dictate the intentions and operations (Stone 2005: 125). This process consists of three stages:

Firstly, the analysis which involves the revealing of the existing. Secondly, a strategy which is to inform intervention through an overall plan. Thirdly, the tactics which are the devices used to arrive at a detailed design.

ANALYSIS OF EXISTING BUILDINGS

It is only through the analysis of the existing and previous layers that the remodelled building can be imbued with a greater and improved meaning.

Analysis should form the basis of the argument for the remodelling strategy and should involve: context, structures, spaces, function, history and site (ibid.:125). Structural analysis should involve a study of mass, size, rhythm and form as well as physical historical significance.

In the analysis of existing buildings, narrative can be an extremely important device in the uncovering, clarification, revelation and ultimate activation of the artefact.

STRATEGIES FOR RE-USING EXISTING BUILDINGS

The intervention strategy informs the logic and order of the intervention and is to be underpinned by analysis. Three strategies can be identified in relation to their intimacy between the old and the new: intervention, insertion and installation (ibid.: 129).

Intervention: which is a complete interdependence between the old and the new which activates potential or repressed meaning (ibid.: 130).

Insertion: involves an intense relationship between the old and the new yet allows the character of both to the strong and independent. New elements are inserted which can be an interpretation of the existing or past. This strategy can use tension, juxtaposition and contrast (ibid.: 131).

Installation: involves the placement of a series of related elements within the context of the existing. This approach heightens the awareness of the existing without compromising or interfering. This strategy can be used to clarify, delineate and order (ibid.: 132).

LAYERING AND PALMIPSEST AS A TACTIC FOR ADAPTIVE RE-USE INTERVENTION

Henri Bergson argued that “which does not change does not endure” (Bergson 1911, cited in Martín-Hernández 2014:43). Martín-Hernández (2014:43) echoes this view argues for a situation involving “the continuous unfolding of the past into the present and future” rather than the replacement of one artefact with another. In such a case the retention of identity demands that the building continuously adapt both for its endurance but also for its legibility in the present moment (ibid.).

Machado provides a possible method to achieve this and positions remodelling as a way of balancing the past and the future and uses the device of palimpsest as a metaphor to describe the process of building re-use (Machado 1976: 46). A strategy which finds its manifestation in the early process of Peter Eisenman (Karaman 2012).

Apart from its expression of time through accumulated architecture, layering through the device of the palimpsest is particularly well suited to the built and natural landscape because of the inherent overlay of systems and materials either through ecological or constructed systems (Layne 2004:64).

Layne (2004:1) states that "the consideration of time, both elapsed and anticipated, is essential in achieving a full and nuanced understanding of the present". The palimpsest, a metaphorical device combining the abstractions of past and present, offers a useful tool to nuance and enhance re-use of architecture.

The concept transcends the literal into a discursive tool used to hold multiple separate ideas in parallel, echoing the multiple layers of writing (ibid.:64). The palimpsest is most useful in allowing past concepts to be held in consideration with current ones. Specifically, and most advantageous for architecture, the palimpsest unifies time and space, allowing the consideration of both aspects without forcing them to become homogeneous and indistinguishable.

Eisenman's layering and archaeology are a useful example of the application of the theory and demonstrates how the process allows for the spatialisation of layered time.

THE NECESSITY FOR ADAPTATION, FLUX AND LAYERING IN THE AFRICAN CITY

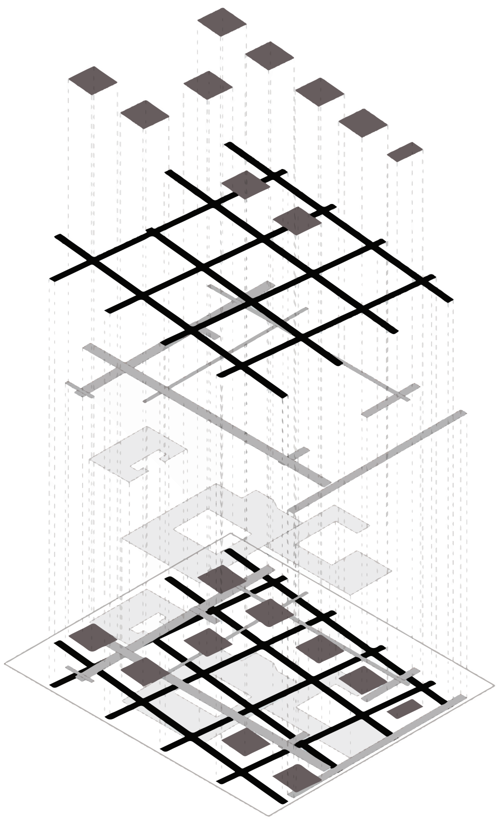


Fig. 4.8: Eisenman's layering strategies (Author:2018)

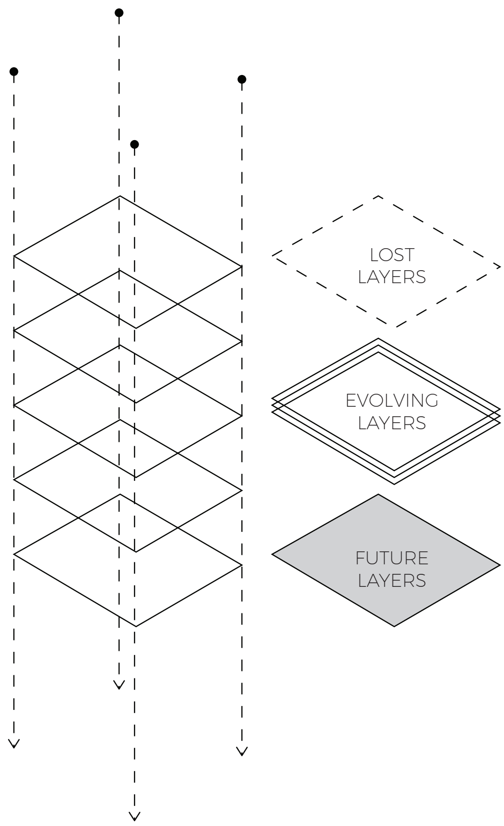


Fig. 4.9: Evolving layering (Author:2018)

South African cities are complex and ever-changing (AbdouMaliq Simone 2010: 6). No city ever stands still but this is especially true of African cities which are characterised by change and seemingly incessant movement. Residents constantly jostle for positions and compete for resources in the frenzied attempts to stay alive and prosper. Nowhere is this more apparent than in Johannesburg. The architect in such a context should adopt a way of working that allows for the simultaneous and complimentary existence of both stability and emergence. This way of working acknowledges the reality of unforeseen but inevitable future changes.

The role of design is to facilitate emergence so that it provides the support for emergent phenomena to take root and for those phenomena to become sophisticated over time. Stacey (2001) explains that most self-organising organisms and social groupings operate at the edge of emergence where stability and instability are hard to separate. At this point, there is a fine balance between the level of infrastructure provided and the amount of control exerted which can stifle further emergence and cause the organism to become unresponsive to its environment.

Implied in this way of working, is the assumption that the finite buildings of the architect are inadequate to deal with the unknown requirements of the future and should make provision for the unforeseen. Tied to these concerns are issues of ownership, technology and time. Buildings, through appropriate use of adaptable technology should accommodate changing needs over time by leveraging the efforts of people as they exercise ownership over their environments. This also opens the architecture up to notions of layering over time, thereby contributing to heritage and legacy.

Stewart Brand (1994) argues that 'buildings learn' and adapt over time. In order to express the manner and rate at which they do so he

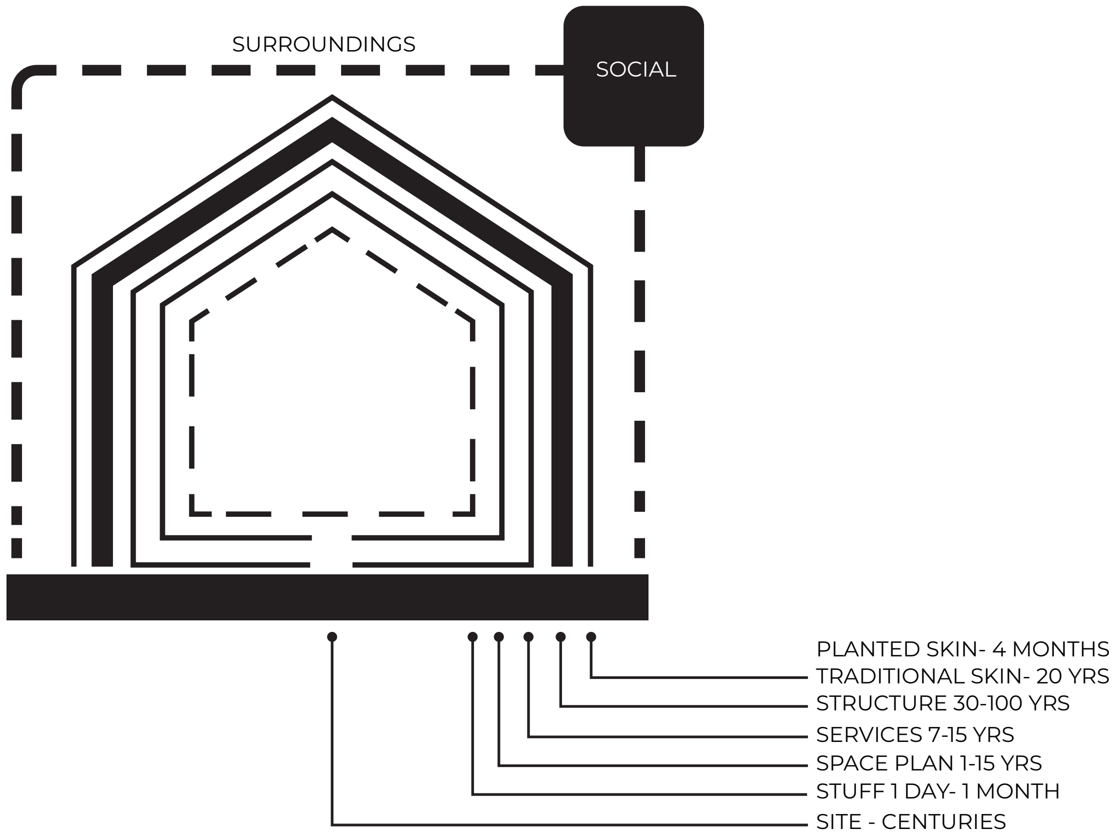


Fig. 4.10: Layering of building elements as adaptable prospect (Author:2018) (Adapted from Brand (1994)

developed a layered conception of architecture based on the timelines associated with the adaptation of particular elements. These elements are site, stuff, space plan, services, structure and skin.

Buildings designed in this way make room for re-use and appropriation as well as new ownership and occupation possibilities. In these cases the interfaces of interaction and adaptation between the building and the user become incredibly important and construction legibility comes to the fore.

Architecture in industrial contexts can be designed as environments for everyday productive rituals. Design should employ the logic of support and infill so as to tactically provide enabling environments for places of public exchange and ongoing redefinition. The aim should be to support and celebrate the everyday activities and urbanism on the site, as well as elevate everyday processes which have the potential to mutate over time. The traces of productive ritual and social interactions should be retained through the design of the building as an amplifier of immediate conditions. In this sense, meaningful architecture can act as social and historical condenser as well as a datum for a particular time. The building in this case should position itself as a bridge between the physical and the social concerns of the present and those of the future, thereby celebrating the creativity of emergence but utilising the stability of design.

Buildings in these settings should be designed to be incrementally completed and occupied rather than being viewed as complete and fixed artefacts. This will allow for the organic and sustainable occupation of the building gradually over time, thereby ensuing ongoing and sustainable prospect. The provision of infrastructure for production and trade, will provide the necessary stability for the emergence of new livelihoods bolstered by architectural support.

An appropriate intervention for the site needs to mediate between the cycles of fixity and flux. This balance needs to guard against Johannesburg's tendency for of the site to be erased regularly but also needs to prevent a condition of stasis and redundancy. The productive and historical value of the site needs to be both celebrated and retained but done in such a way so as to allow for future potential and change.

CONCLUSION: ADAPTABLE LAYERING AS VEHICLE FOR REGENERATIVE PROSPECTS

This chapter investigated a theoretical basis for architecture's role as a potential mediator between polluted natural systems and latent industrial architecture through exploring the combination of heritage and environmental theories. In so doing it develops an archetype for a new layer of industrial architecture capable of regenerating latent industrial sites. Layering through adaptive re-use in industrial buldings has the potential to transfer the culture of the society from past to present and ensure its endurance for the future. The notion of layering as a regenerative design prospect will be further developed in the following chapter.

05

CONCEPT

LAYERING: AS A GENERATIVE + REGENERATIVE PROSPECT

DEFINING LAYERING

Layering is defined as an intellectual process leading to the construction of three-dimensional space through the overlap of spatial layers (Karaman 2012:1). It also includes the overlapping and palimpsest of historical, environmental and social layers.

LAYERING AS A GENERATIVE PROCESS

The concept of layering is treated as central to this dissertation and it is utilised as a generative conceptual and architectural process. Its usefulness lies in its application as an analytic, design and representational tool (Karaman 2012:iv).

Buildings are treated as phenomena comprised of elements. Through the creation of an architectural system these varied architectural elements are inter-related.

Importantly, the process of layering shifts architecture from an object-focussed concern and re-orients it to a focus on the design process itself. This conceptualisation also redirects the focus from the 'finished' architectural object to the ongoing dialogue between layers.

This operation allows for the "assembling of complex relations into an ordered series generating from a given plane or point of reference, either actual or conceptual" (Gandelsonas 1972:85). This reference can be thought of as a 'datum' from which all layers are generated and positioned in relation to.

The architect in this case becomes the curator of existing layers and creator of new layers (both mental and material).

LAYERING AS A TECTONIC PROCESS

'Shearing layers' is an important architectural concept. Coined by Duffy (1990), it argues that buildings are not singular elements but rather comprised of a series of layers.

Stewart Brand (1994) extended this notion in his conception of buildings as being, physically and conceptually, comprised of layers based on their rates of change. These changes are a response to concerns of fashion, technology and money but most importantly, climate.

Brand's conception of building layers includes site, structure, skin, services, space plan and stuff. Site is seen as the most permanent with stuff the least permanent and least costly to adapt.

LAYERING AS A HERITAGE RESPONSE

Landscapes, buildings and objects are embedded in and transformed by time. Rossi (1984:22) writes extensively about the "primordial and eternal fabric of life" in the medieval city which undergoes a process of "multiple and endless restructuring".

LAYERING AS AN ECOLOGICAL RESPONSE

Nature and geology provide us with powerful examples of the processes of layering and the accumulaion of strata.

Layering by necessity acknowledges the inter-connected and inter-dependent nature of things. Through the fruitful linking of systems in closed-loop cycles, regenerative layering becomes possible.

LAYERING AS AN INDUSTRIAL RESPONSE

Industrial heritage is represented by stratified and layered architectural complexes characterized by a variety of formal and technical solutions which over time have been added to one another. These layers happen as a result of demand due to the evolution of technology as well as innovations in production processes (Romeo, et al. 2015:1305). It is this layering (additions, use changes, abandonment, reuse and adjustment) which gives the industrial complex its unique value (ibid).

PRECEDENT: EISENMAN'S LAYERED ARCHITECTURE

AN ANALYSIS OF THE LAYERED ARCHITECTURE OF PETER EISENMAN INCLUDING: CANNAREGGIO, BERLIN IBA HOUSING, AND THE SANTIAGO CITY OF CULTURE.

ARCHAEOLOGY + SUPERIMPOSITION

Archaeology is representative of Eisenman's move away from the pursuit of 'deep structure' to the discovery and exploration of context as a driver (Corbo, 2014:6). While his 'Houses' series employs geometric models to describe inner logic, the focus here shifted to a preoccupation with the figure/ground principle (ibid.). In the same vein as an archaeologist Eisenman brings to light the layers that constitute the city and overlays them with narratives (sometimes artificial and sometimes historical). The operative process of these projects becomes that of 'superposition' and manifests in projects such as Cannaregio, Berlin IBA, and the City of Culture in Santiago de Compostela. Fundamentally this phase of Eisenman's practice represents a shift from the focus on interiority to the focus on exteriority)ibid.). The result is that architecture becomes a text with multiple readings often ambiguous and indeterminate in nature.

CANNAREGGIO

Cannareggio becomes the first project where site becomes relevant to Eisenman (Corbo, 2014:42). In developing the design, the point grid scheme of Le Corbusier's unrealised 'hospital project' is adopted but appropriated to the topographic features of the site. The result was that the applied geometric abstraction faced the irregular fabric of the city, setting up a critical dialogue. This forms the

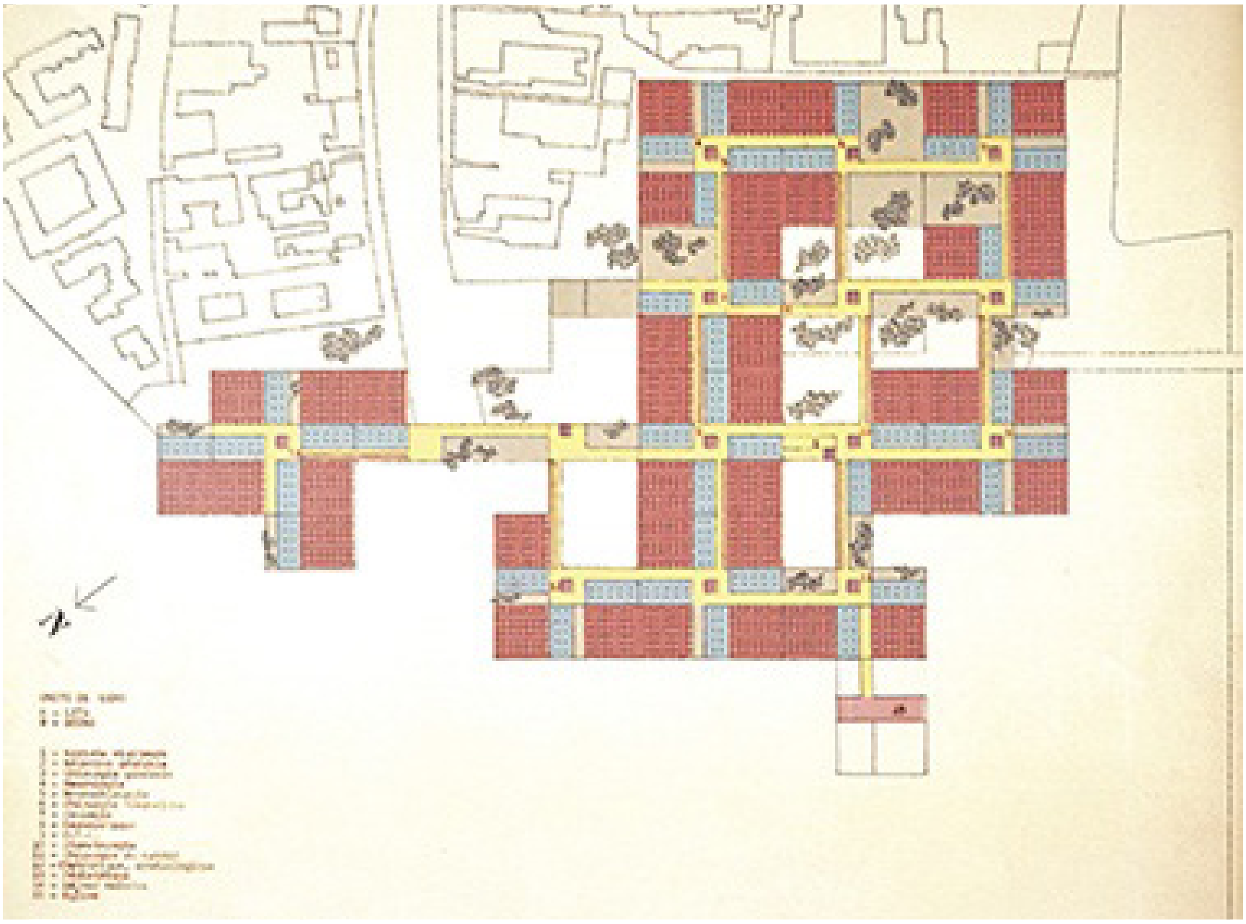


Fig. 5.1: Le Corbusier's unrealised Venice Hospital grid (Ansari:2013)

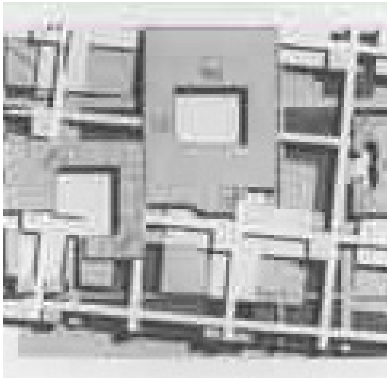


Fig. 5.2: Cannareggio layering (Ansari:2013)

"IN THE CANNAREGIO PROJECT, WE WITNESS A SHIFT THAT BEGINS THE CITIES OF ARTIFICIAL EXCAVATION AND ESTABLISHES THE THEME THAT HENCEFORTH CHARACTERISES EISENMAN'S WORK: THE MOVEMENT FROM STRUCTURE TO SITE TO TEXT, OR, BETTER, FROM THE STRUCTURALISATION OF THE OBJECT, TO THE TEXTUALISATION OF SITE" (HAYS, 2009:59)

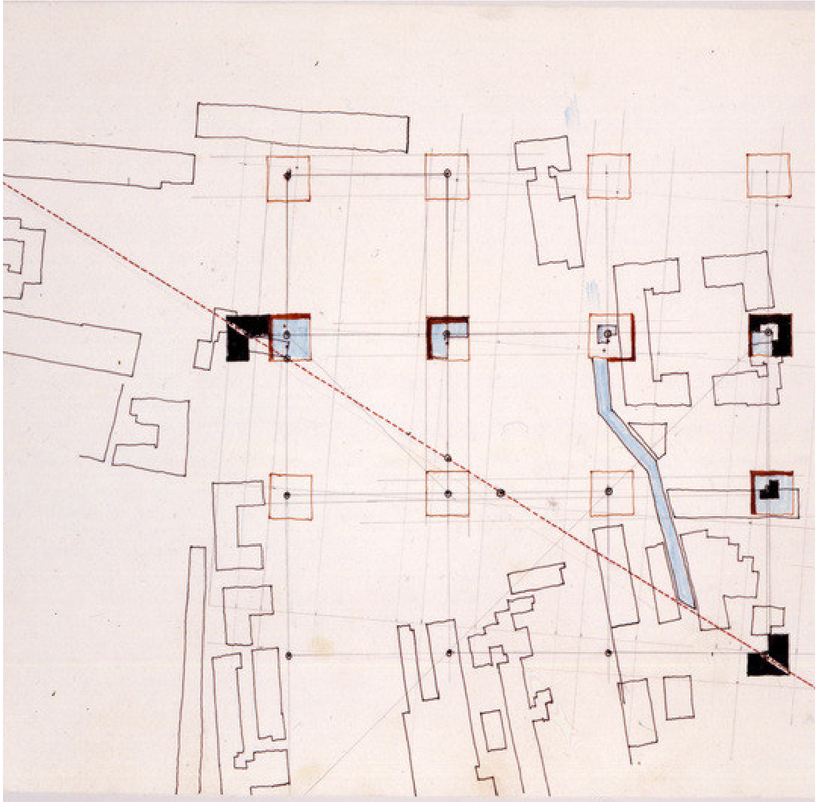


Fig. 5.3: Cannareggio plan (Ansari:2013)

first 'textual layer' of the design.

The second text is defined by Eisenman as representing the emptiness of the present and is represented by a series of hollow structures (based on House XI).

The third text represents the emptiness of the past and is constituted through a diagonal cut that works simultaneously as a surface and topological axis. Importantly, this laceration reveals the layering of informants beneath.

By re-utilising the Le Corbusian grid and inserting his House XI into a new field of forces, Eisenman celebrates an impossible future constantly being re-scripted and re-invented (Ibid: 43). In this way context is not seen as fixed or contained but rather as the generative starting point of a dialogue.

In the Cannaregio project, Eisenman utilises a technique that treats the context as an agent and driver for change. Similarly to the case of historic medieval maps, which involved an erasure and over-writing, Eisenman seeks lost meanings and geometrical informants to structure new design. Here context is seen as a palimpsest which bares a series of narrative and metaphorical layers. Architecture becomes a story-teller combining past and future, geological and urban, abstract and narrative dimensions.

BERLIN IBA HOUSING

The project engages a dynamic and critical relationship with the site and its interaction with a number of external influences: the presence of the Berlin Wall as well as several urban grids.

As in Cannaregio, the juxtaposition of layers is made possible through a process of

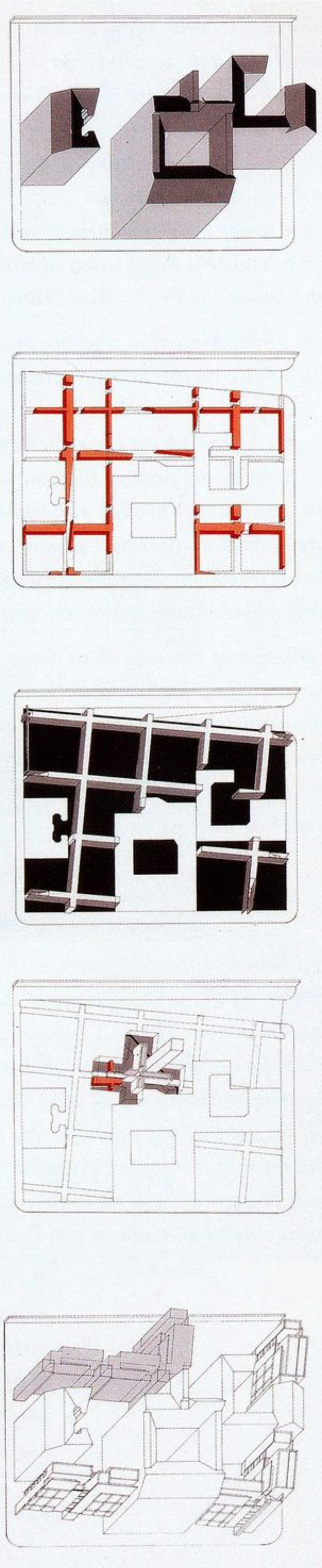


Fig. 5.4: Berlin IBA layering (Ansari:2013)

excavation which is both literal and figurative (Corbo, 2014:46).

The ruins of buildings bombed during World War II as well as the presence of the Wall are elements which Eisenman doesn't repair, restore or reuse. Rather, he avoids nostalgia by creating a new palimpsest based on the operations of excavation, substitution, and superposition. Like in Cannareggio, the architect invents an artificial context based on archaeological excavation of the past and the superimposition of grids onto the real site.

This process allows for the taking into account the history of the city while at the same time offering an interpretation of its present.

Thanks to this operation of excavation, all of the grids are allowed to translate into physical elements: either as hallways, corridors or gallery spaces.

"IN FRIEDRICHSTRASSE, THEN, EISENMAN TOOK A LEAP FORWARD: HE MADE EXPLICIT WHAT WAS STILL LATENT IN CANNAREGIO: THE GRID WORKED LIKE A DIAGRAM, MANAGING THE COMPLEXITY OF THE PROJECT, WHILST AT THE SAME TIME SUPPORTING ALL OF THE FUNCTIONS OF THE BUILDING" (CORBO, 2014: 46).

CITY OF CULTURE

The City of Culture at Santiago De Compostela is the most recent in the series of 'Cities of Excavation' projects. It is the convergance of previous formal research: the obsession with syntax of the 1970s, represented here by the orthogonal grid; the artificial excavations of the 1980s, reproduced through the displacement of the medieval urban fabric onto the site; and the explorations of folding from the 1990s.

Like in Cannareggio and Berlin, superposition is central to the project's genesis and evolution. Here, the medieval plan of Santiago, the seashell (one of the city's symbols) and the diagrammatic scheme of pilgrimage routes into Santiago were the diagrams used by Eisenman as generators.

Through the additional operations of rotation and deformation the architect overlays city grid onto the two other diagrams and transforms the overall diagrams, transforming the overall composition into a dynamic whole.

Instead of viewing the project as the sum of several independent buildings, Eisenman worked on a new form of urbanism based on the re-interpretation of both topography and architecture (Ibid. 49).

"BY USING THE DEFINITION OF TOPOGRAPHIC ARCHITECTURE, EISENMAN AIMED TO REJECT THE OPPOSITION BETWEEN FIGURE AND GROUND, AND REVIEW THE TRADITIONAL DICHOTOMY BETWEEN TECTONICS AND STEREOTOMICS" (CORBO, 2014:49).

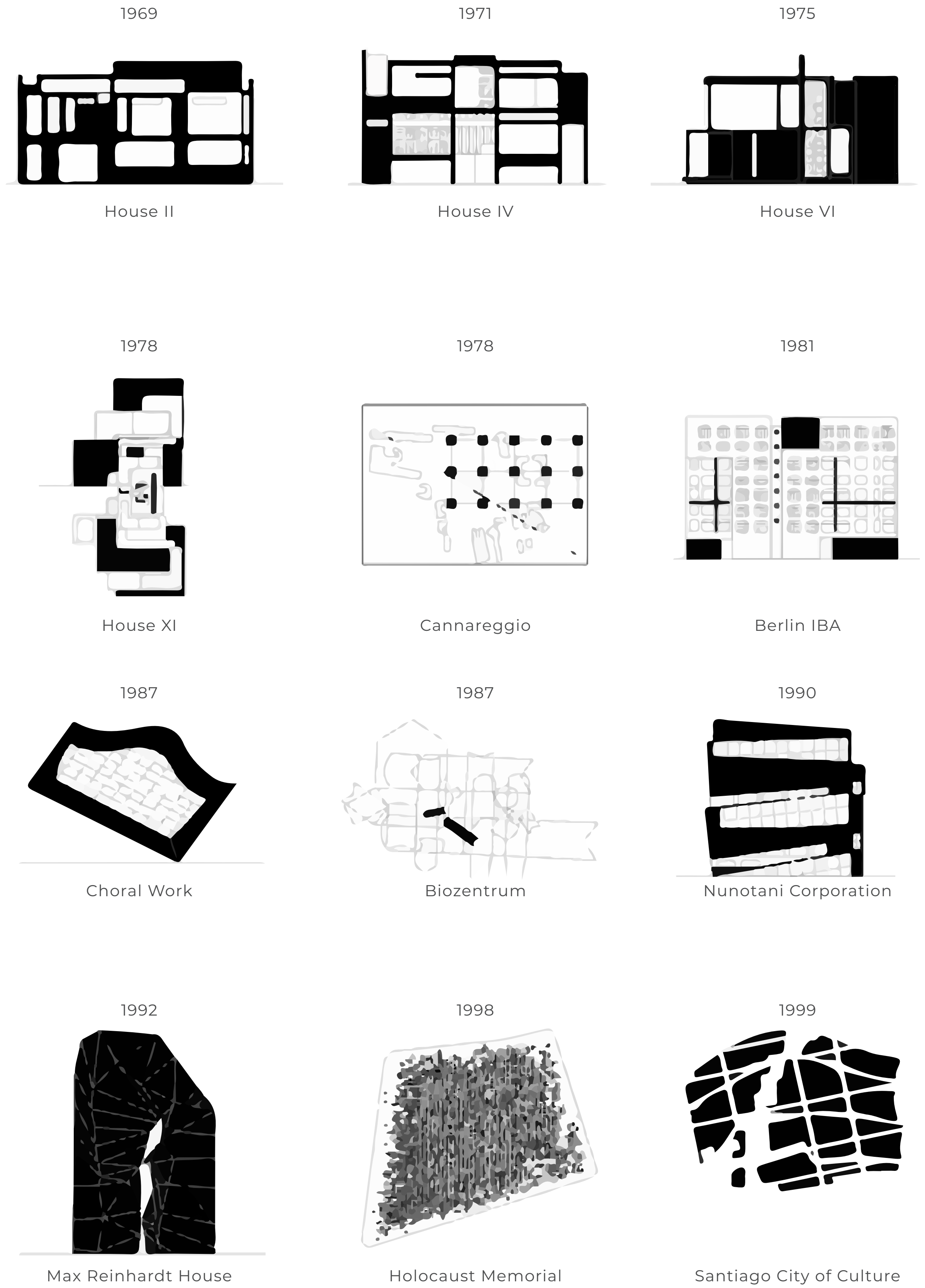


Fig. 5.5: Parti diagrams of the progression of Eisenman's work (Author:2018. based on edit from Ansari:2013)

PRECEDENT: 2012 SERPENTINE PAVILION. HERZOG + DE MEURON

ALTHOUGH THERE ARE NO RUINS BENEATH THE GREEN LAWNS OF KENSINGTON GARDENS, THE 2012 SERPENTINE PAVILION EXORCISES GHOSTS OF PAVILIONS PAST IN ORDER T0 RECALL AND LAYER FLEETING MEMORIES.

Fig. 5.6: Layering of previous pavilion foundations (Godding: 2012)

THE WOULD-BE ARCHAEOLOGICAL SITE INCORPORATES THE OVERLAYING OF PLANS AND ELEMENTS OF PREVIOUS PAVILIONS. THE PALIMPSEST FORMS THE CORK-COVERED FLOOR OF THE NEW PAVILION WHICH RISES AT THE POINTS OF NEWER GALLERIES AND FALLS AT THE POINT OF THE EARLIEST INSTANCES.

Fig. 5.7: Spatial experience (Godding:2012)

EXCAVATION AND LAYERING

Herzog & de Meuron and Ai Weiwei's Serpentine Pavilion develops a new method for design: layering (Tuncbilek 2013:22). The premise is the fact that numerous shapes and memories have previously been built on the site. Rather than creating a new form, the team dug to expose and celebrate traces of previous pavilions. In so doing they highlight the importance of the memory of past pavilions. A process of archaeological excavation formed the conceptual backbone of the scheme. It involved the identification of the remains of the previous 11 pavilions and using the locations and elements for the driver of a new structure (Ibid.). The extrusion of the foundations and walls from these remnants formed the load-bearing roof of the 2012 pavilion.

Formally, the pavilion creates an intersection and overlap of past iterations as a new layer. The structure sits 1.5 m below ground, allowing the traces left by past pavilions to be observed, revealed and reconstructed. The process results in a humble presence in the park as the primary intention was never the creation of a new object (Ibid.).

THE CRITICALITY OF LAYERING

The 2012 Serpentine Pavilion, designed as a collaboration between Herzog + De Meuron and Ai Wei Wei manifests as a critical response to the eleven preceding annual installations. Its criticality stems from the manner in which it is excavated into the ground, forgoing the tendency of contemporary

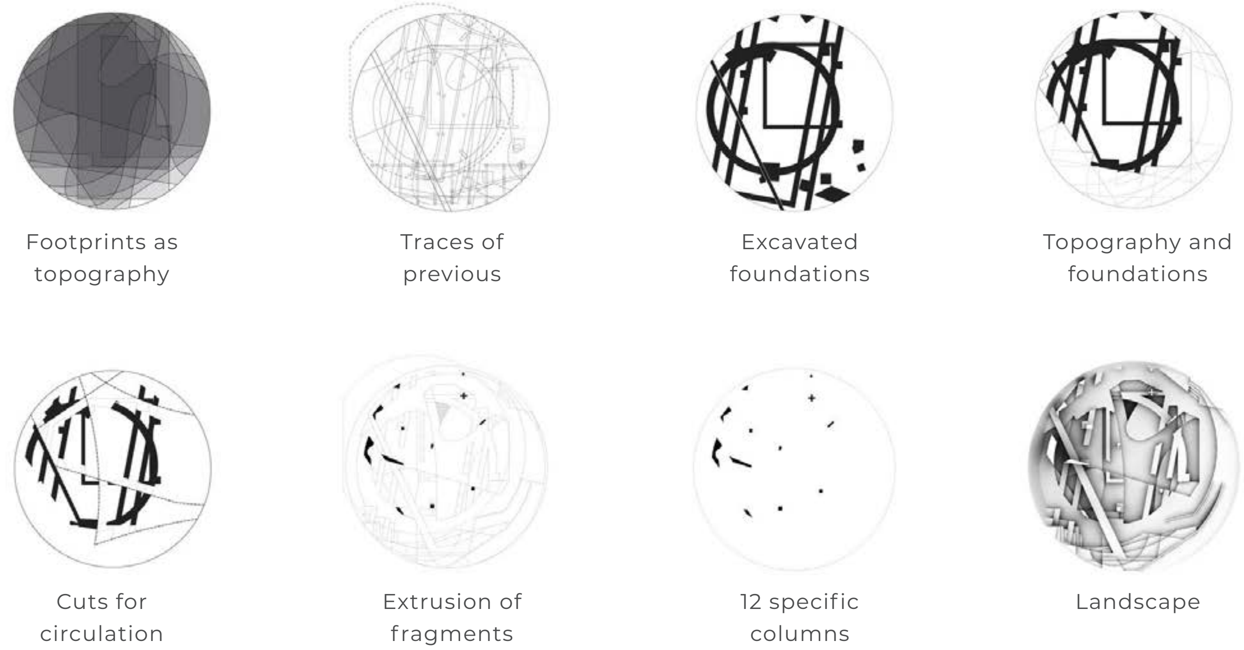


Fig. 5.8: 2012 Serpentine Pavilion layers (Godding: 2012)

pavilions to tend towards being singular objects Holden 2016:259). In so doing it re-claims a level of site-specificty and situates itself within a continuum of preceding and future architecture.

THE PASSAGE OF TIME

The operation of excavation reconstructs the footprints and services of a decade of galleries resulting in a cumulative archaeology of historical footprints. In so doing, the physical and cultural impact of the yearly programme is highlighted as well as the temporariness of the typology itself.

The use of cork in the pavilion as a covering material refers to temporality.

MANIFESTING THE INVISIBLE

The path to this unusual design involved 'digging' down two meters into the soil of the park until the groundwater level was reached. There a waterhole was dug as a sort of well for the collection of rainwater. In that way an otherwise invisible aspect of the reality of the park and city- the water under the ground is incorporated and manifested. This 'digging' also means that a diversity of constructed elements, such as foundations and telephone cables, are encountered.

As if a team of archaeologists, the designers identified fragments of the previous eleven pavilions and materialise them.

A distinctive landscape emerges out of the reconstructed foundations which is a form so unique it would not have come from a different methodology.

CONCEPTUAL APPROACH

The aim of the conceptual approach is to utilise layering as a overarching conceptual generator to create a synthetic concept capable of informing a response to heritage (through the layering of memory and material), industry (through the layering of cultural and programmatic informants), ecology (through regenerative layering of the site and the closed-loop linking of layers) and tectonic resolution (through building elements and tectonic layering of details).

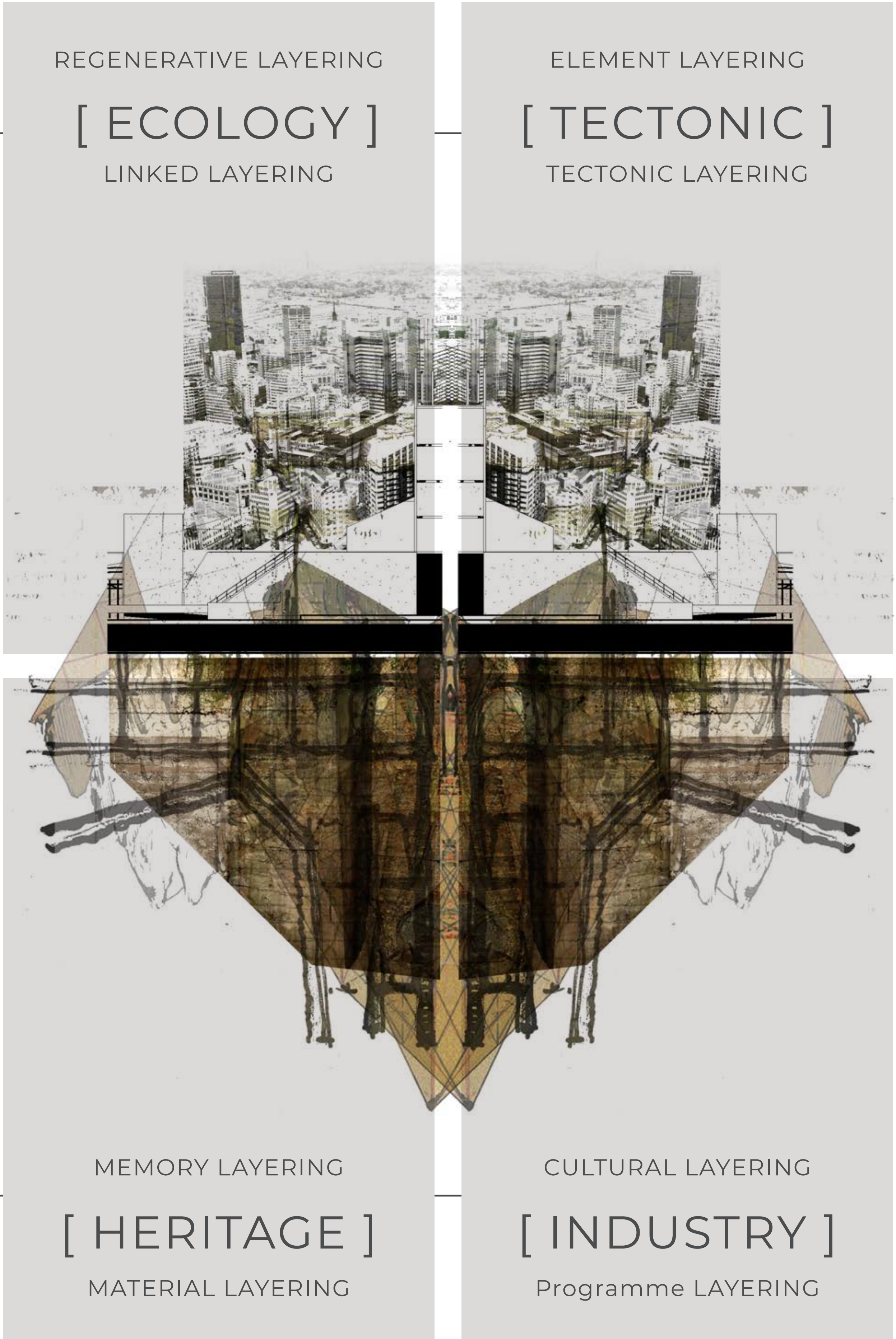
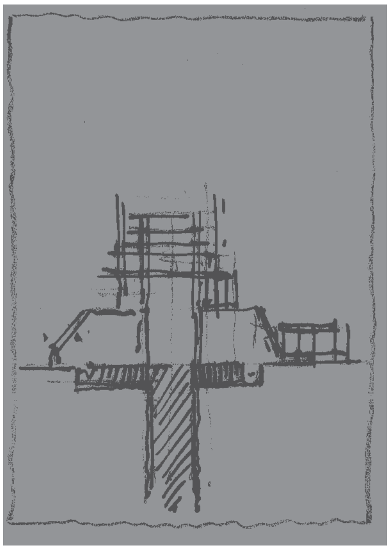


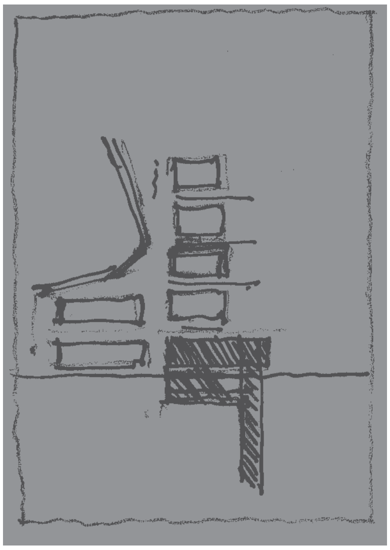
Fig. 5.9: Conceptual approach (Author:2018)

CONCEPTUAL GENERATORS

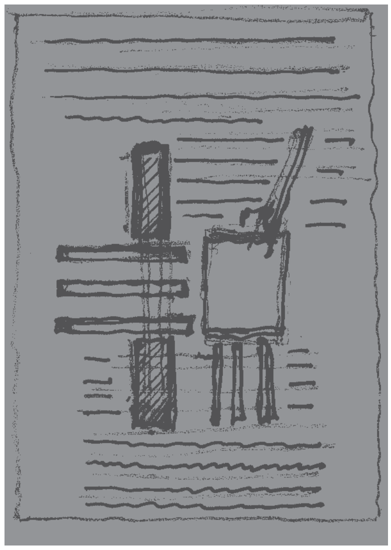
SUMMARY OF CONCEPTUAL INFORMANTS



[HERITAGE]



[INDUSTRY]



[ECOLOGY]

Fig. 5.10: Conceptual generators (Author:2018)

LAYERING OF THE CITY:
A COUNTER-POINT TO ERASURE OF THE CITY

The aim of the design is to counter the seemingly endless cycle of erasure and rebuilding that Johannesburg is ensnared in.

Through the process of layering physical fabric, the passage of time and presence of history can be simultaneously present in a design. This allows for the extension of sites and architecture to include additions not originally conceived. It also extends authorship from the singular to include multiple voices.

PROGRAMMATIC LAYERING:
A COUNTER-POINT TO MONOFUNCTIONALITY

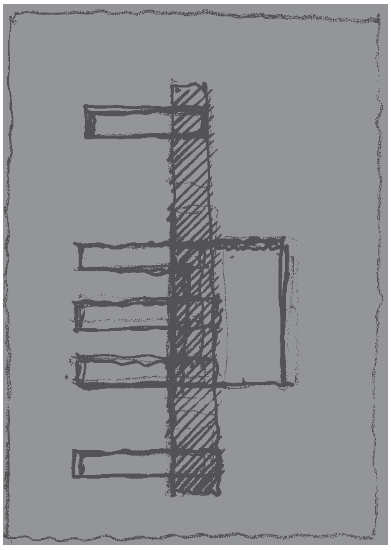
Due to zoning and economic pressures, there is a tendency for architecture to tend towards mono-functional programming. The result is buildings designed for fixed uses incapable of extending their life through the resilience afforded by mixed-uses and programmatic adaptation over time.

The design aims to be adaptable through its dimensions, structure and detailing.

REGENERATIVE LAYERING:
A COUNTER-POINT TO DESTRUCTIVE EXTRACTION

The project develops a new approach to industrial architecture by countering the extractive and destructive industrial processes of the mining industry.

By layering and linking process inputs, throughputs and waste become mutually beneficial and supportive of a larger programmatic ecology.



[ECOLOGY]

INTERLINKED LAYERS:
A COUNTER-POINT TO
ISOLATED PROGRAMMES

Layering, as a generative design process acknowledges the singular but interconnected nature of building elements and programmes.

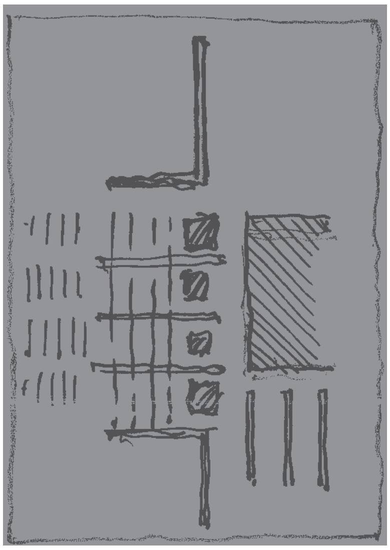
The aim of the design is to synergise new programmes with those which already exist on the site as well as establish relationships which strengthen their future prospects by allowing for modularity and change over time.

[TECTONICS]

SHEARING LAYERS:
A COUNTER-POINT TO
SINGULAR ARCHITECTURE

The scheme adopts Duffy and Brand's conception of layering but views skin as the most adaptable of all of the layers (after site, structure and services).

This re-conceptualises customary approaches to the re-use of existing architecture.



[TECTONICS]

LAYERED TECTONICS:
A COUNTER-POINT TO
SINGULAR CONSTRUCTION

A layered conception of tectonics rejects the view of architecture as a fixed object and views it as an ever-changing phenomenon capable of transforming to meet present needs and future aspirations.

Building elements, wherever possible, are given multiple functions and separated to allow for replacement and adaptation. Key to this aim is the utilisation of regular, standard and modular materials.

HISTORIC EXTRACTIVE ARCHITECTURE

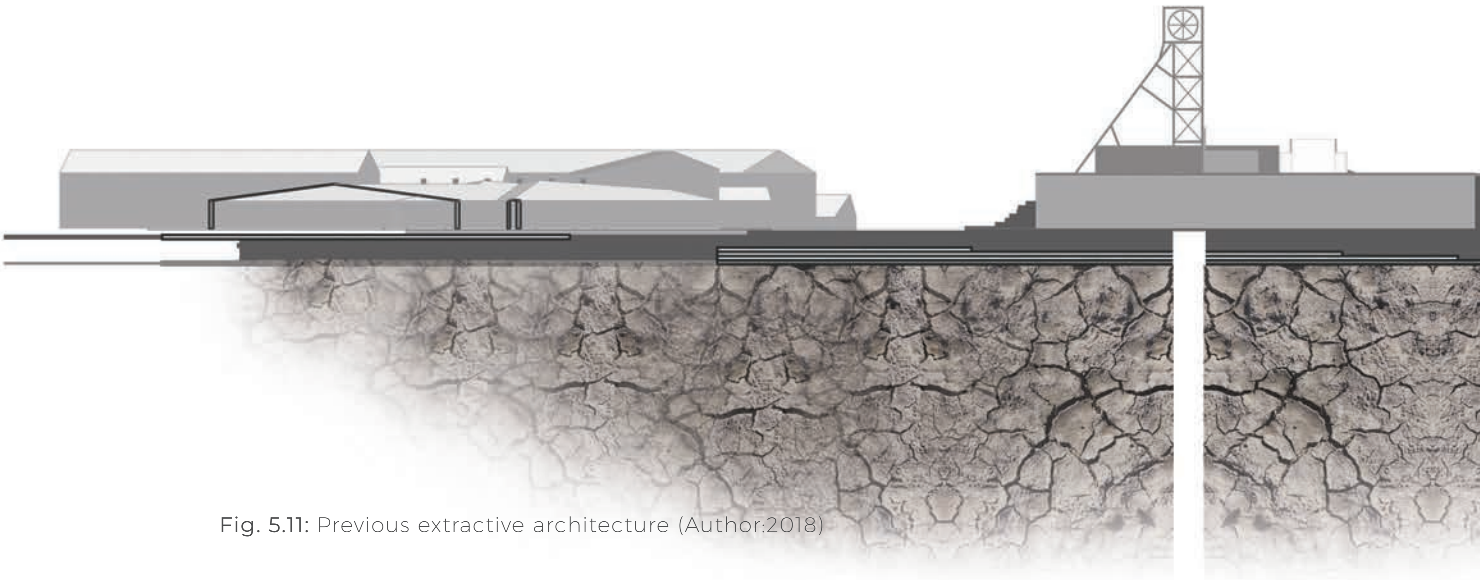
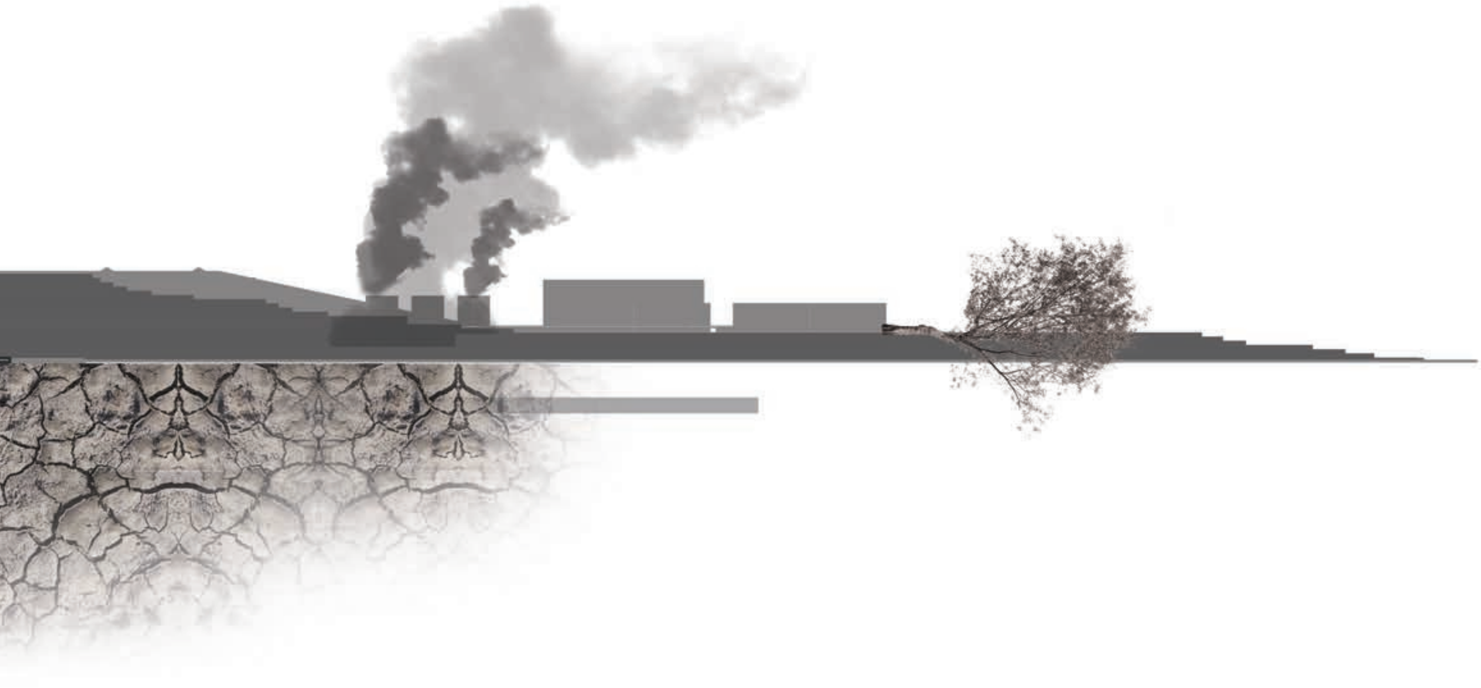


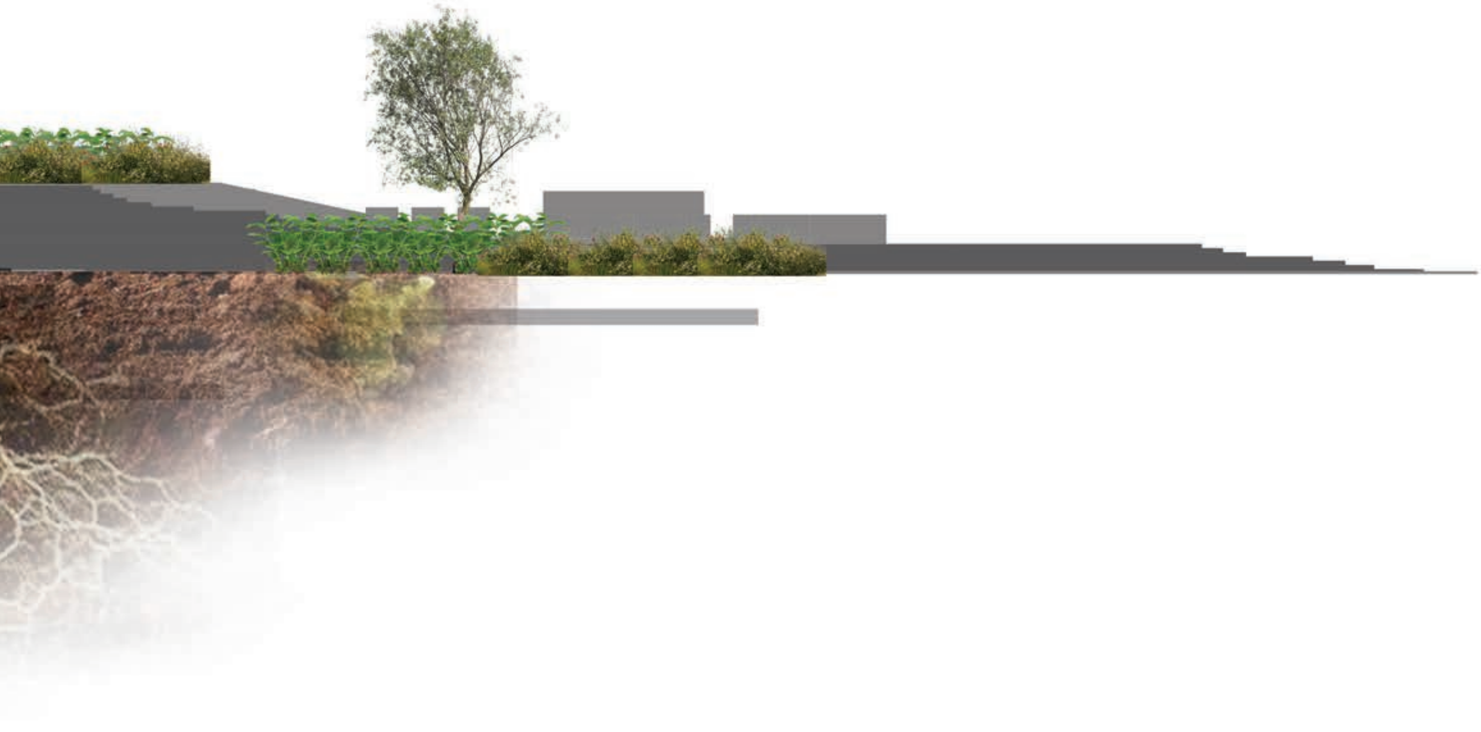
Fig. 5.11: Previous extractive architecture (Author:2018)

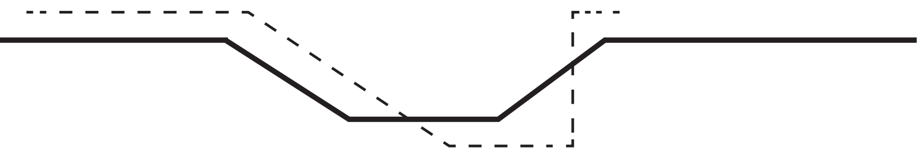
PROPOSED ARCHITECTURE AS LAYERED RE-GENERATOR

Fig. 5.12: Future regenerative architecture (Author:2018)

Fig. 5.13: Architecture as layered landscape (Author:2018)





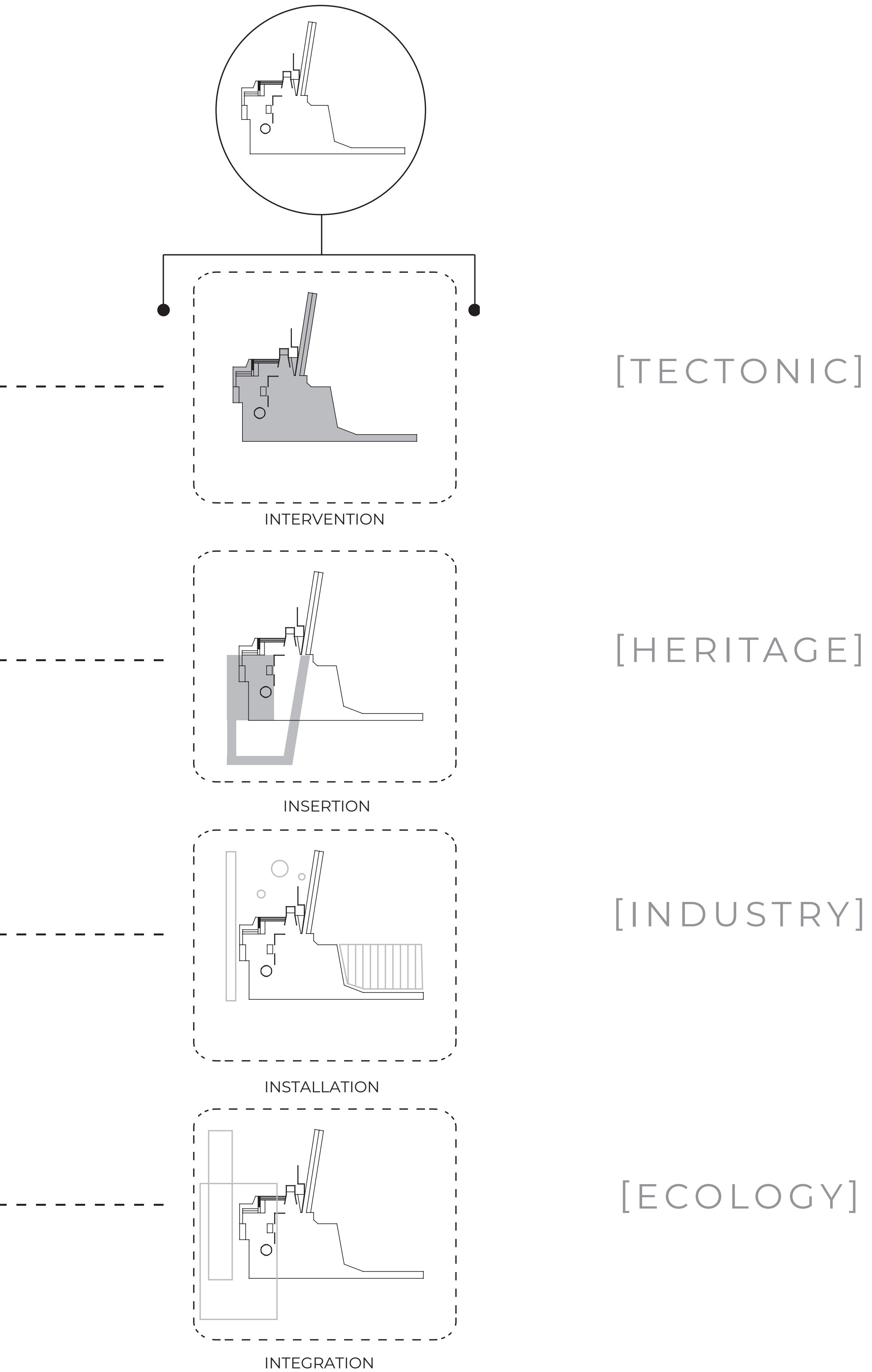


BUILDING AS LANDSCAPE

CONCEPTUAL SUMMARY
A DIAGRAM FOR DESIGN

The dissertation aims to facilitate a future prospect for the site through the layering the past and present informants. The conceptual diagram is a tool to understand and remedy the four main **tendencies** identified in Johannesburg which threaten prospect (to erase site, create mono-functional architectures, to have stagnating programme and to have processes and sites which lead to isolation).

Fig. 5.14: Conceptual matrix (Author 2018)



INTERVENTION
[TECTONIC]
INSERTION
[HERITAGE]
INSTALLATION
[INDUSTRY]
INTEGRATION
[ECOLOGY]

06

DESIGN DEVELOPMENT

DESIGN GENERATORS
SUMMARY OF DESIGN INFORMANTS

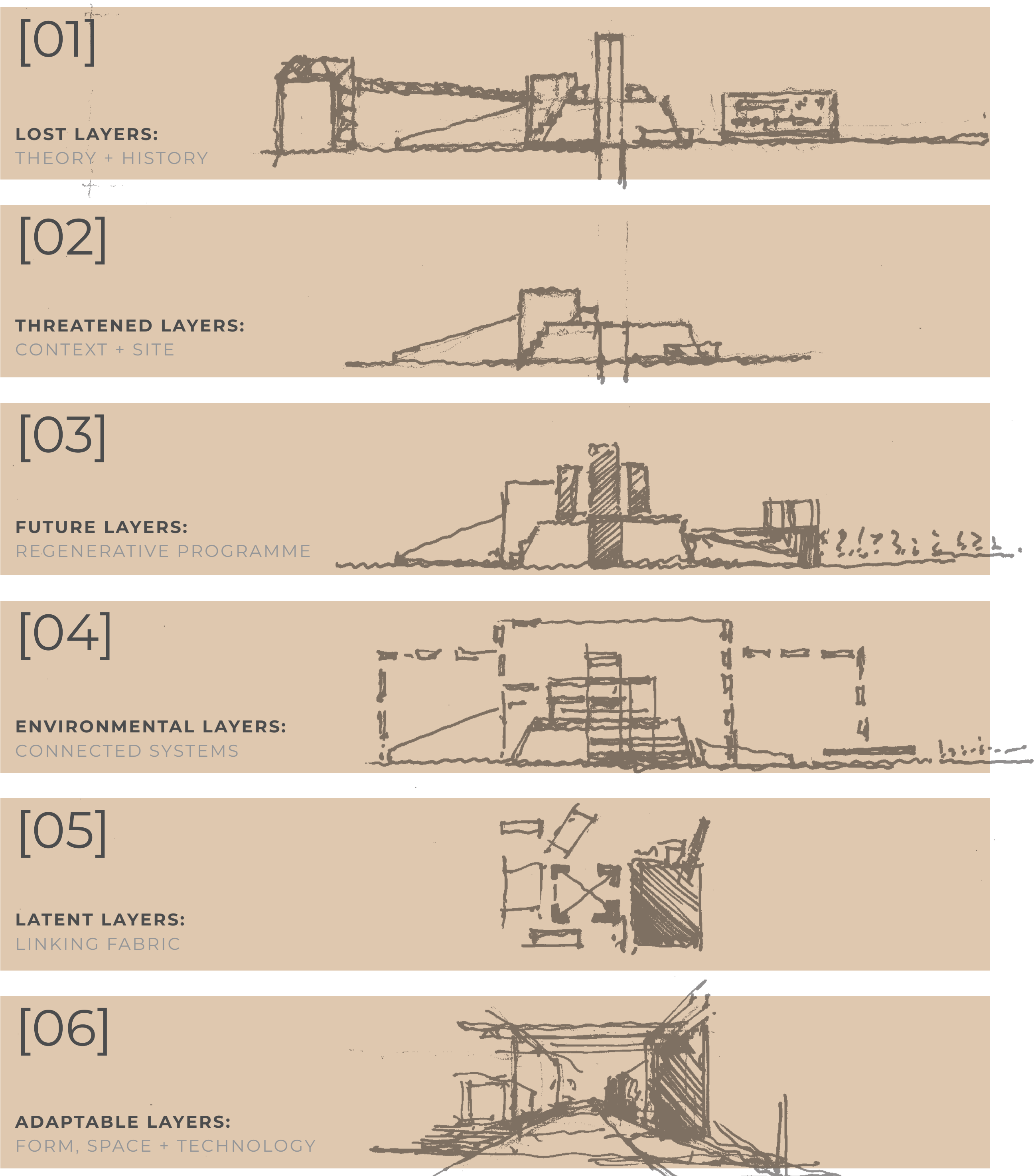


Fig. 6.1: Summary of design informants (Author:2018)

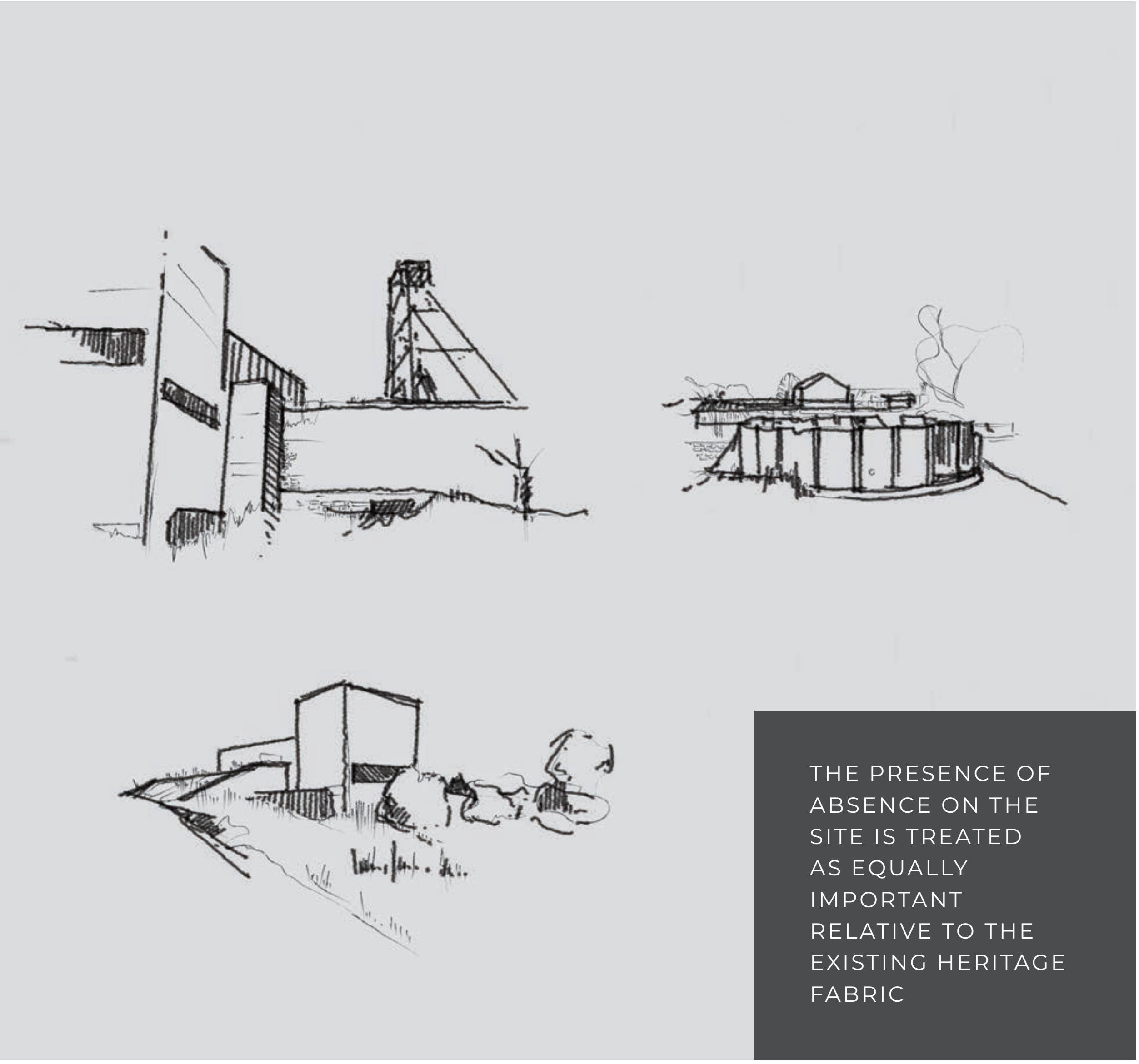
DESIGN GENERATOR 1
LOST LAYERS: THEORY + HISTORY

Most of the extant mining architecture at Village Main has been demolished and most of what remains is in the form of decaying administration buildings as well as the iconic concrete platform.

The lost layers are incorporated into the new design in the form of new and re-used concrete observation and recreation platforms.

NUMBER OF BUILDINGS AT VILLAGE MAIN ORIGINALLY: 50

NUMBER OF BUILDINGS AT VILLAGE MAIN CURRENTLY: 5



THE PRESENCE OF ABSENCE ON THE SITE IS TREATED AS EQUALLY IMPORTANT RELATIVE TO THE EXISTING HERITAGE FABRIC

Fig. 6.2: Touchstone: Lost layers (Author:2018)

DESIGN GENERATOR 2
THREATENED LAYERS: CONTEXT + SITE

What physically remains at Village Main is constantly threatened by encroaching surrounding development as well as the passage of time.

The scheme aims to not only prevent the erasure of the existing but to intervene in such a manner as to highlight the unique and poetic nature of the existing assets on the site.

THE PROTECTION AND CELEBRATION OF THE REMAINING BUT THREATENED HERITAGE BUILDINGS

CELEBRATION OF WHAT REMAINS AND ARMATURE FOR WHAT COULD BE

Fig. 6.3: Touchstone: Threatened layers (Author:2018)

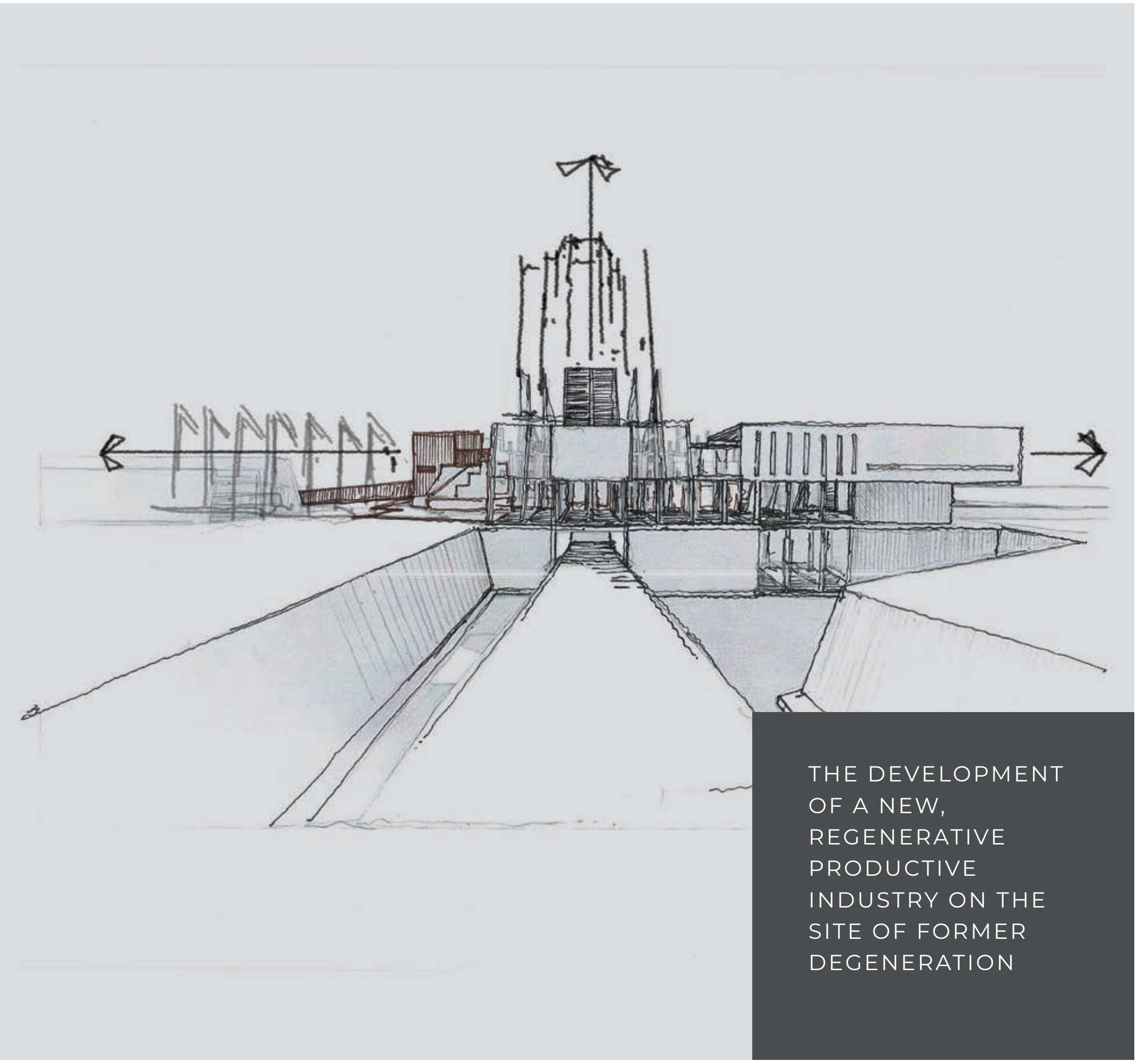
DESIGN GENERATOR 3

FUTURE LAYERS: REGENERATIVE PROGRAMME

The aim of the dissertation is to develop a new approach to industrial architecture by countering the extractive and destructive industrial processes of the mining industry.

This new programme utilises the latent potential of the underground component of the unused mine as well as the re-mediated site. The programme focusses on plantings appropriate for the production of bio-composites and cultivated building materials.

A CREATIVE ALTERNATIVE TO THE EXTRACTIVE LOGICS OF THE MINING PAST OF THE SITE



THE DEVELOPMENT OF A NEW, REGENERATIVE PRODUCTIVE INDUSTRY ON THE SITE OF FORMER DEGENERATION

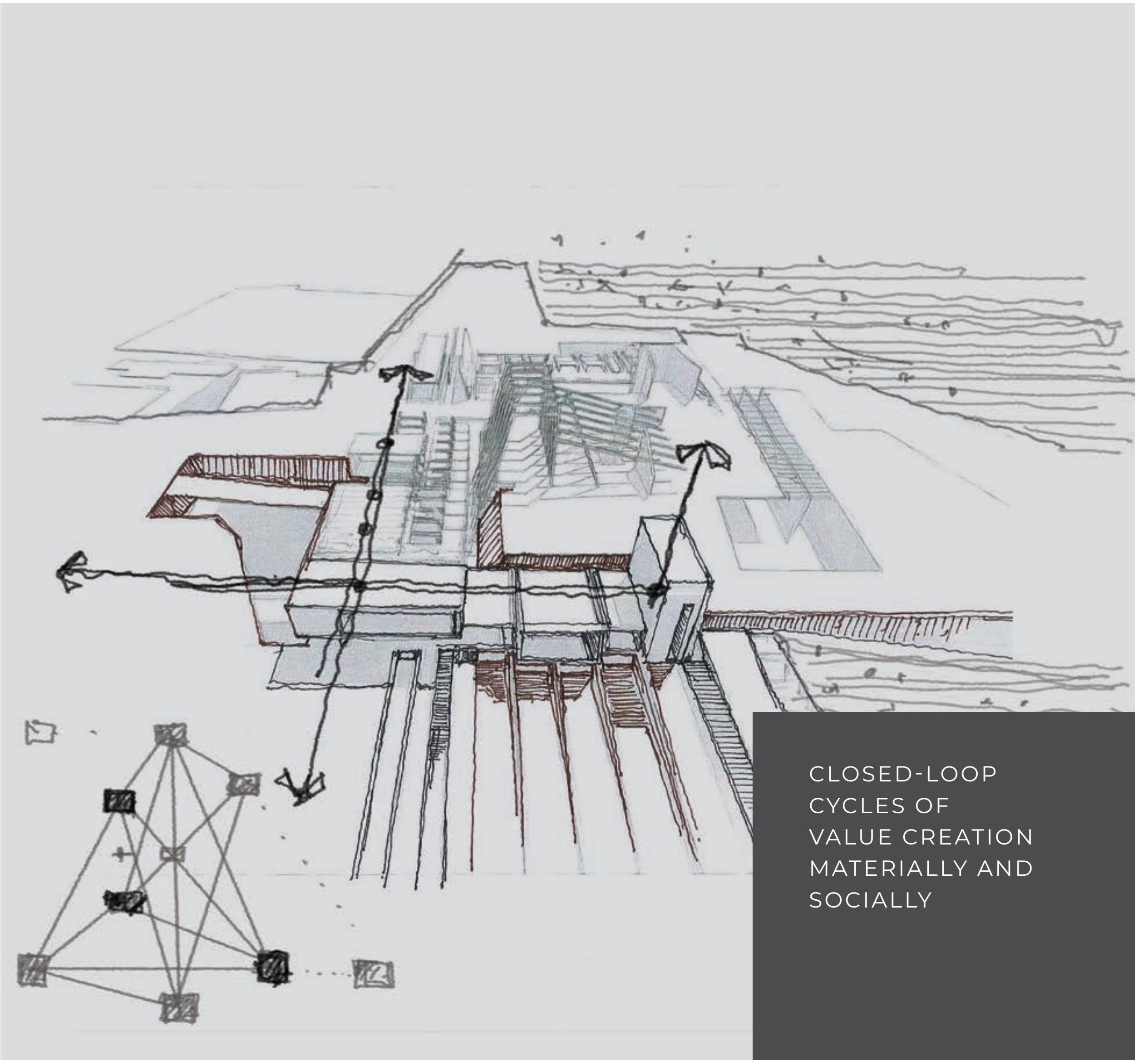
Fig. 6.4: Toucstone: Future layers (Author:2018)

DESIGN GENERATOR 4
ENVIRONMENTAL LAYERS: CONNECTED SYSTEMS

The original programme at Village Main involved a linear process from extraction to processing to transportation and eventually waste.

The dissertation aims to develop a closed-loop framework capable of incorporating the utilising the inputs and outputs from a number of systems and processes. These are to be expressed in an architecture which prioritises the retention, storage and re-distribution of resources effectively and poetically.

THE DESIGN OF CONNECTED AND CLOSED LOOP SYSTEMS ON THE SITE OF LINEAR PRODUCTION AND WASTE GENERATION



CLOSED-LOOP CYCLES OF VALUE CREATION MATERIALLY AND SOCIALLY

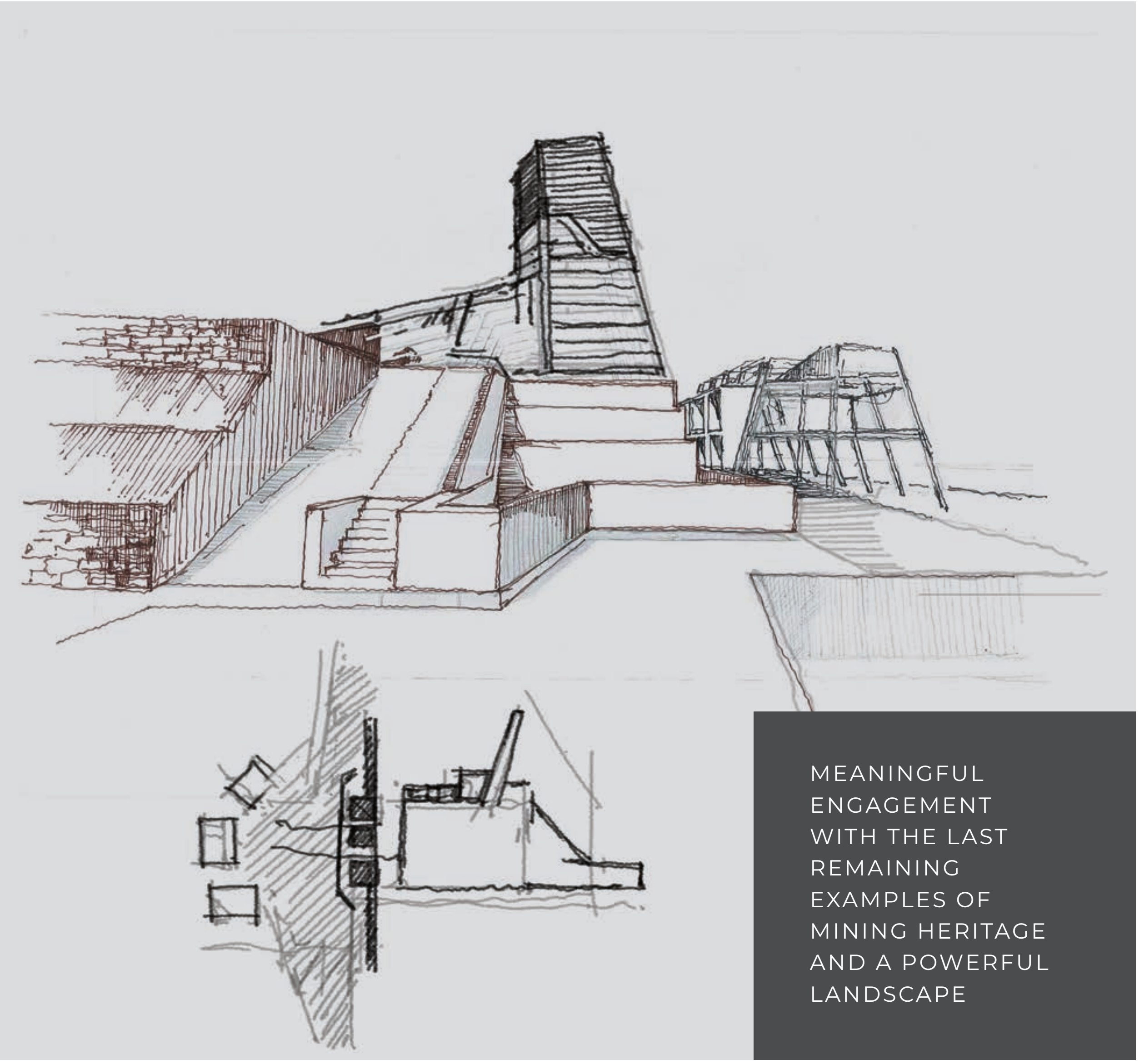
Fig. 6.5: **Touchstone:** Environmental layers (Author:2018)

DESIGN GENERATOR 5
LATENT LAYERS: LINKING FABRIC

The site represents the last remaining examples of mining architecture on the Witwatersrand. This presents a unique opportunity not only for industrial heritage architecture but also to develop a model for showcasing rare built heritage in a didactic manner.

The future relevance of the site is core to the endeavour and museum-ification is avoided at all costs. Therefore, a unique design capable of combining past, present and future is sought as well as combining natural and built assets.

THE SITE DEMANDS A SENSITIVE BUT DECISIVE RESPONSE TO ICONIC AND POWERFUL EXISTING FORMS AND LANDSCAPES



MEANINGFUL ENGAGEMENT WITH THE LAST REMAINING EXAMPLES OF MINING HERITAGE AND A POWERFUL LANDSCAPE

Fig. 6.6: Touchstone: Latent layers (Author:2018)

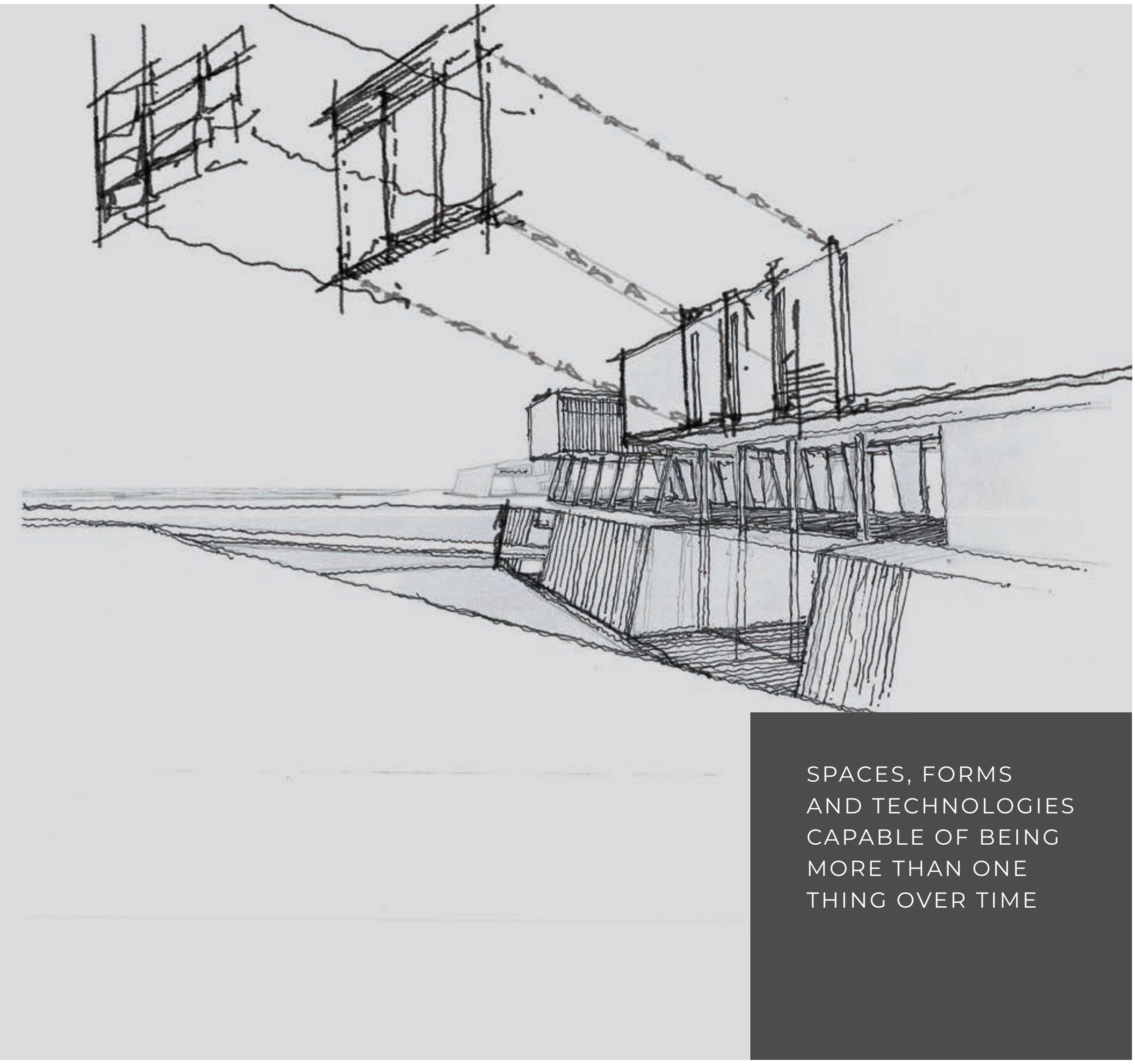
DESIGN GENERATOR 6
ADAPTABLE FORM, SPACE + TECHNOLOGY

The design aims to uniquely express the nature and specificity of the productive programme through its formal and technical resolution but in a way that is capable of change over time.

Part of the reason for the dereliction of the existing site is its inability to adapt to changing demands on production and the content of its productive programme.

The aim of the design is to develop a specific productive programme and facility but one that is capable of being dynamic and modular.

THE FACILITATION OF ONGOING PROSPECT AT VILLAGE MAIN THROUGH THE PRIORITISATION OF ADAPTABLE FORM, SPACE AND TECHNOLOGY



SPACES, FORMS AND TECHNOLOGIES CAPABLE OF BEING MORE THAN ONE THING OVER TIME

Fig. 6.7: Touchstone: Adaptable layers (Author:2018)

Fig. 6.8: Response to context (Serrano and Baquero:2014)

FORM PRECEDENT:
SERRANO + BAQUERO- MUSEO GUGGENHEIM. HELSINKI

The intention of the project is to become an urban artefact and participant. It provides a platform from which to see the sea and city as well as re-introduce citizens to the water-side. Views to the building are treated as secondary to those from it (Serrano and Baquero 2014).

The design begins with the modulation of its height to meet those of the nearby park and surrounding buildings. Thereafter the contours of the site are incorporated (ibid.).

The museum is then wrapped by a deck forming a pedestrian route and connection to the adjacent port. This connection is covered by a wooden portal.

THE MUSEUM FOLLOWS THE TRACES OF ERASED RAILWAY TRACKS, RE-CONNECTING THE SITE TO A FORGOTTEN PAST LAYER OF THE CITY.

The historic South Port's most recent function was the transportation of goods regionally and internationally. It was linked in-land through an extensive railway network. These rails are used as an organising device and the form of the landscape and building follows them and is organised around them programmatic-ally (ibid.)

The activities of the museum are unpacked under an extensive timber-roof, relating to and re-interpreting the Finnish architectural legacy in a way that belongs both to the past and future.

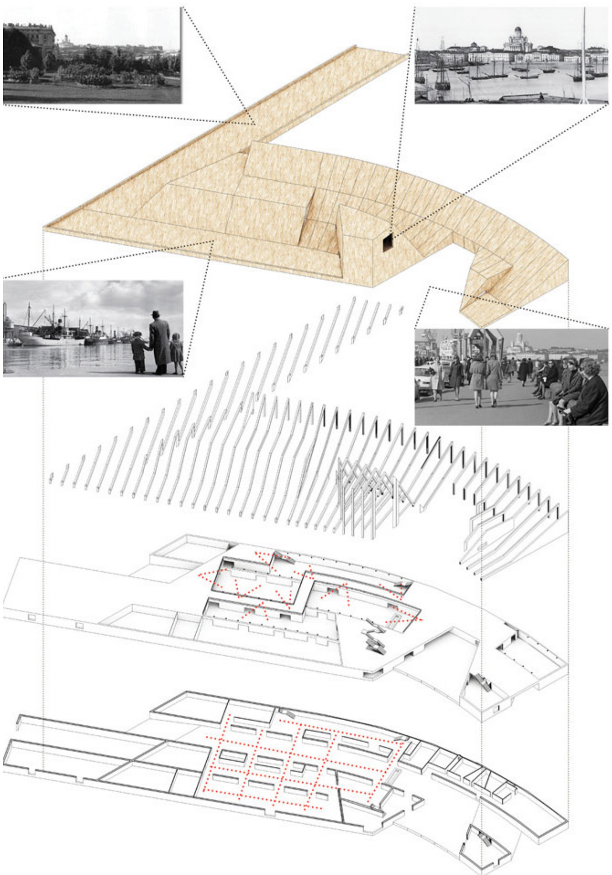
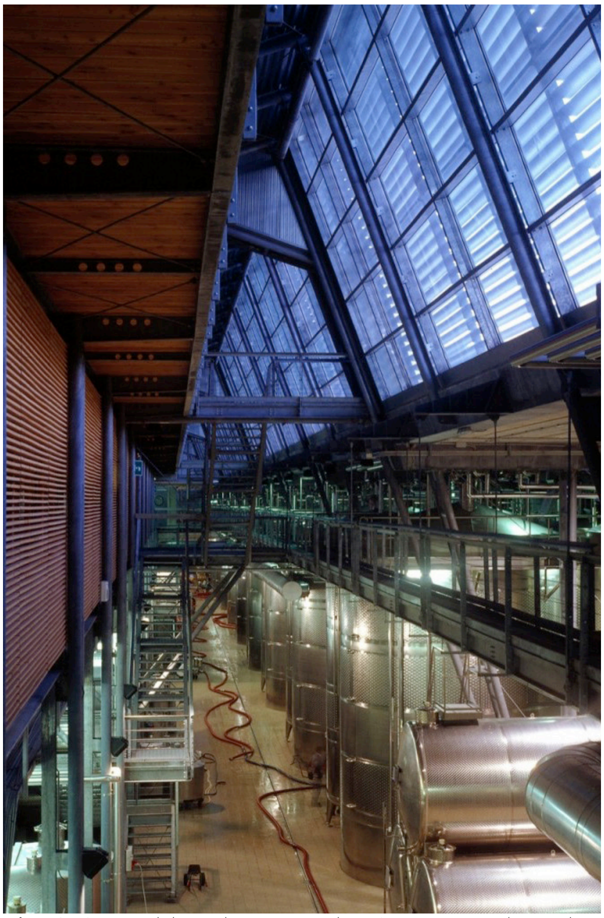


Fig. 6.9: Structural layers (Serrano and Baquero:2014)



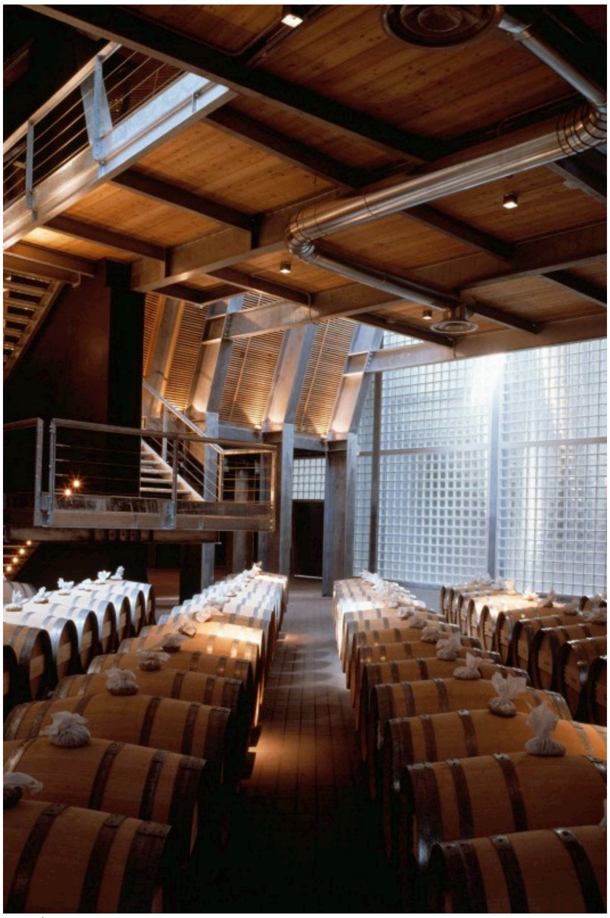


Fig. 6.10: Double volume production spaces (Cecchetto:2014)

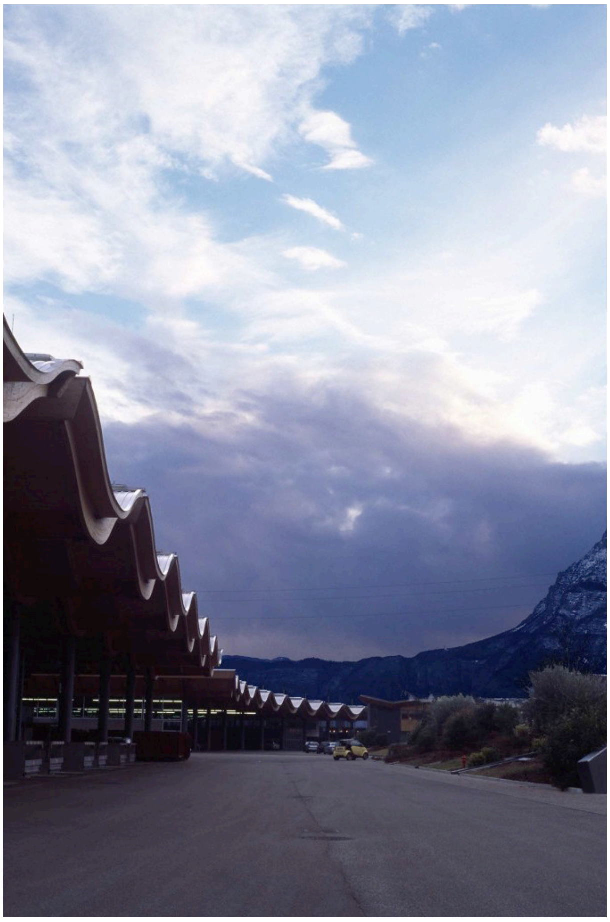


Fig. 6.11: Modular production volumes and relationship to landscape (Cecchetto:2014)

SPACE PRECEDENT:
CECCHETTO- MEZZACORONA WINERY


Fig. 6.12: Building and vines (Cecchetto:2014)


Fig. 6.13: Relationship to landscape (Cecchetto:2014)


Fig. 6.14: Section (Cecchetto:2014)

The Mezzacorona Winery is situated in an abandoned industrial area. The architect describes the project as straddling "two figurative domains: hillside vineyards and infrastructures running in the valleys between them" (Cecchetto 2014:1).

The facility takes the form of repeating modular double-volumes which are partially submerged. The wine production facilities are located in the basement and at ground floor level. There is an intersecting volume which links the two and establishes a link to the surrounding landscape. While the individual volumes are differentiated formally, they combine to form a coherent whole.

THE DESIGN PROVIDES A RELATABLE HUMAN INTERFACE TO AN INDUSTRIAL PROGRAMME AND POETICALLY SHOWCASES THE PROCESSES OF WINE-MAKING

The volumes are all designed with their specific programmes in mind with light, acoustic and air quality all varied according to technical requirements.

By off-setting the volumes, natural ventilation is possible in he majority of spaces. Expanded metal mesh cladding aids this as the through-flow of air generates a stack effect (cooling or heating the spaces as necessary).

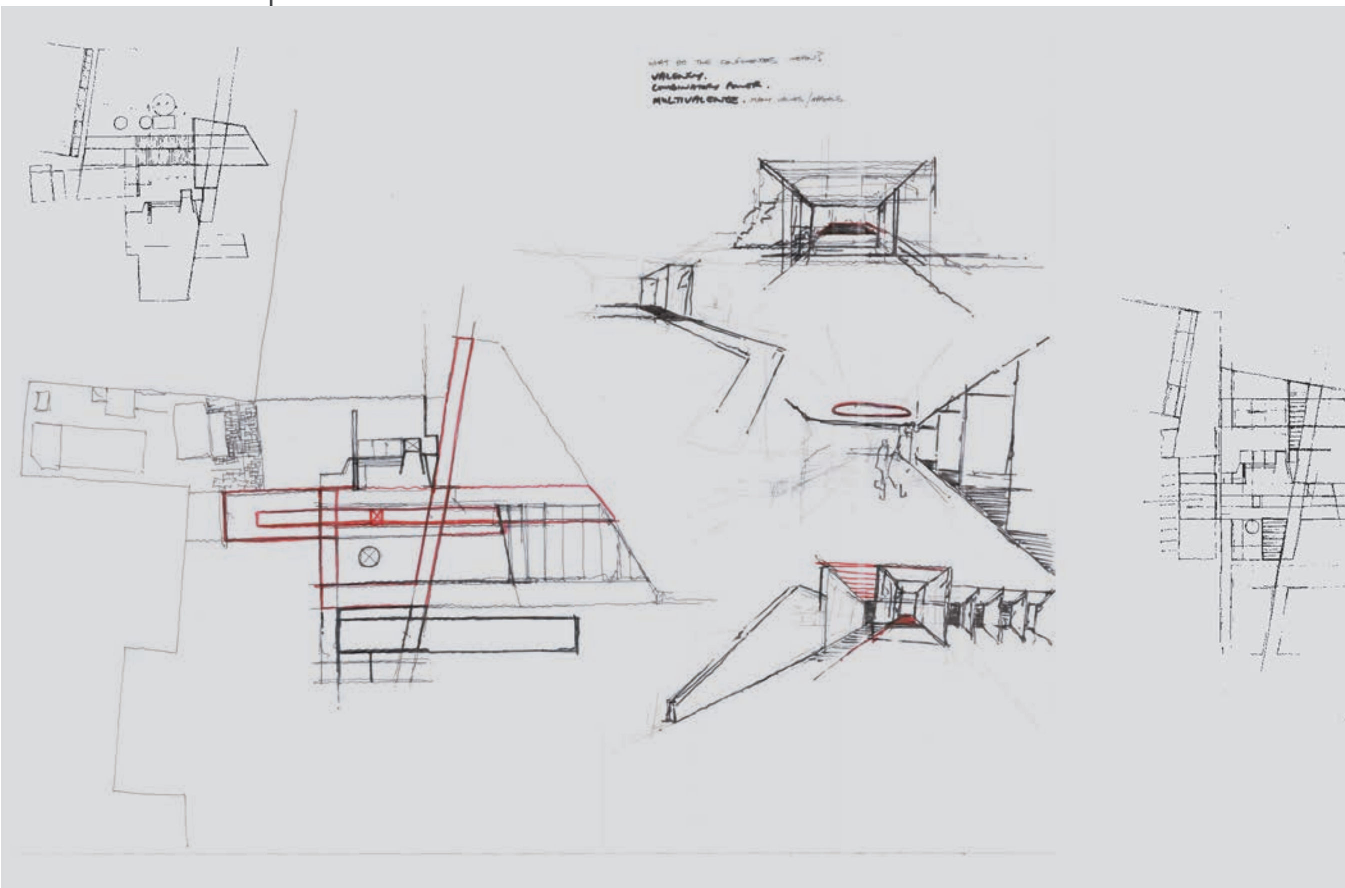
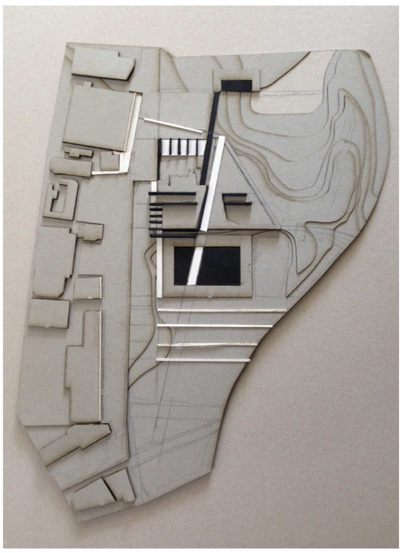
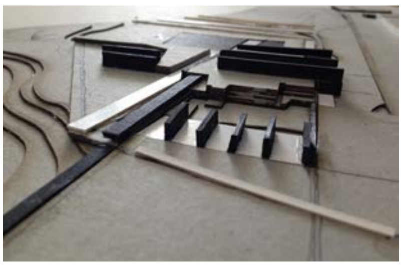
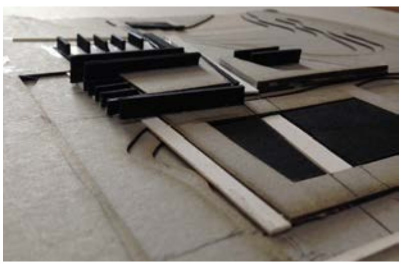
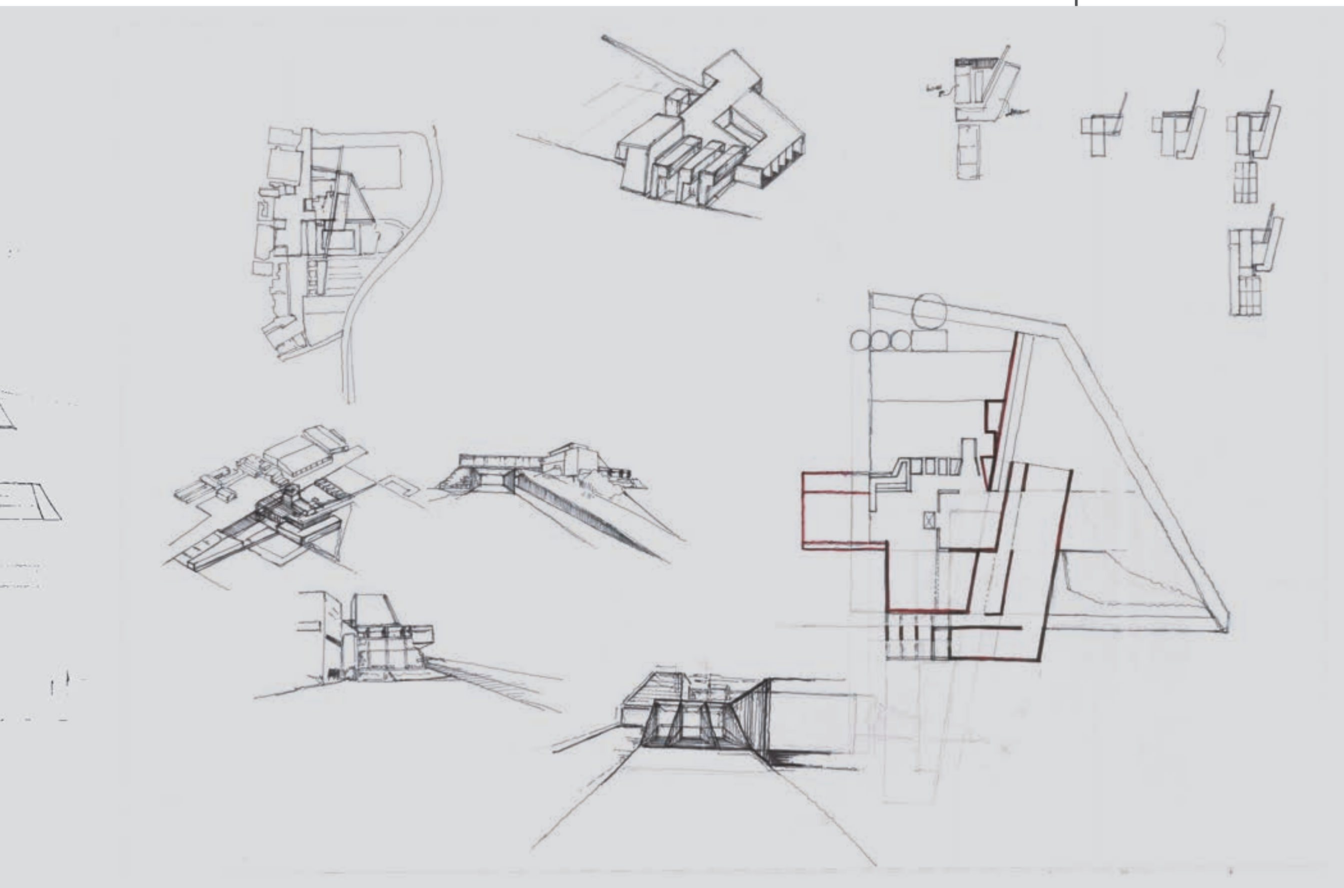


Fig. 6.15: Design exploration 1 (Author:2018)

DESIGN ITERATION 1: INSERTION

INCISION AND INSERTION IN THE HISTORICAL CONCRETE PLATFROM

The first iteration involved the most intimate engagement with the existing concrete platform. The new functions are mostly placed within an excavation of the existing structure. Prominent historic site axes are traced in the footprint of the building as well as the mirroring of the underground plan of the mine.

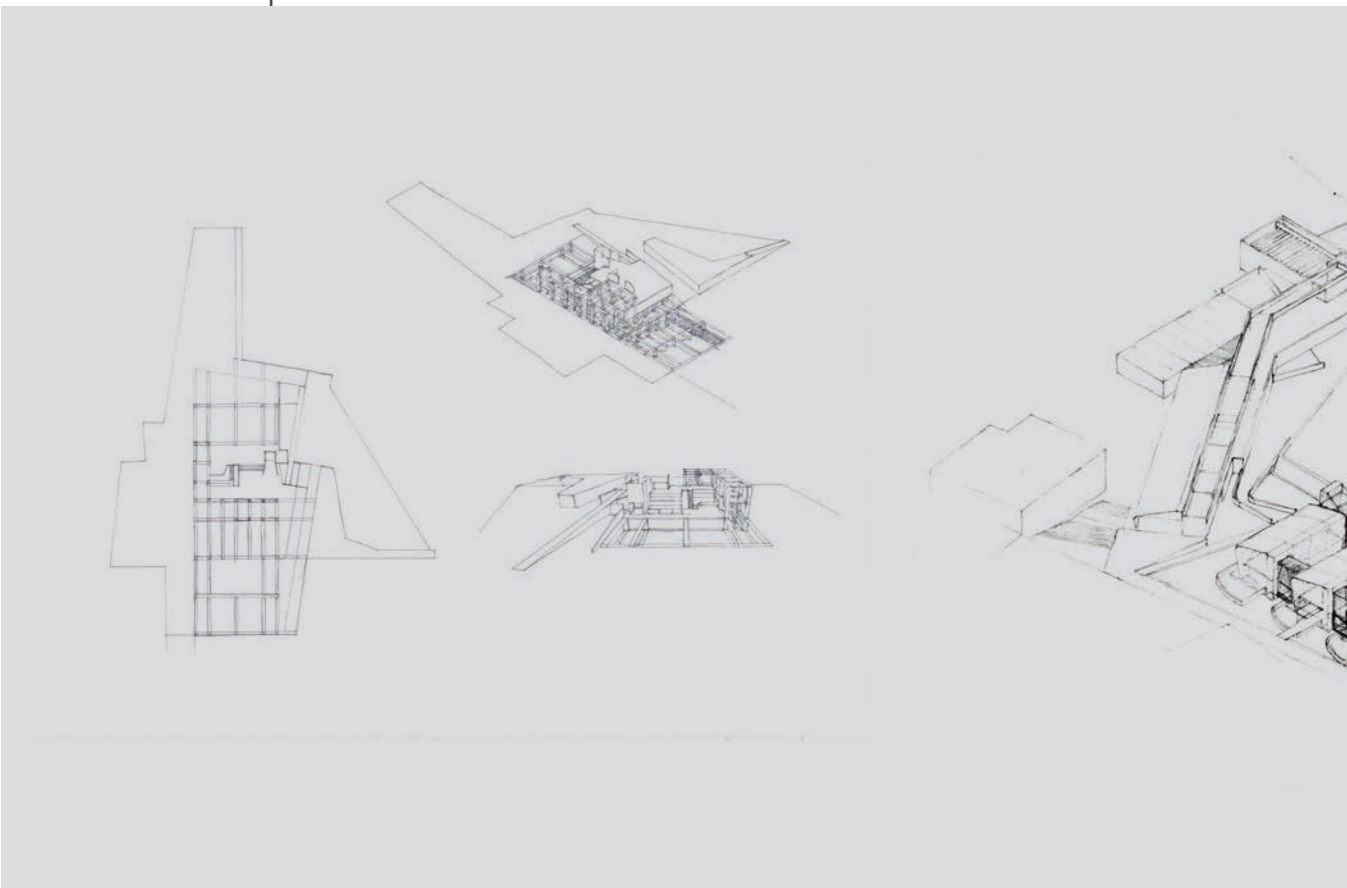
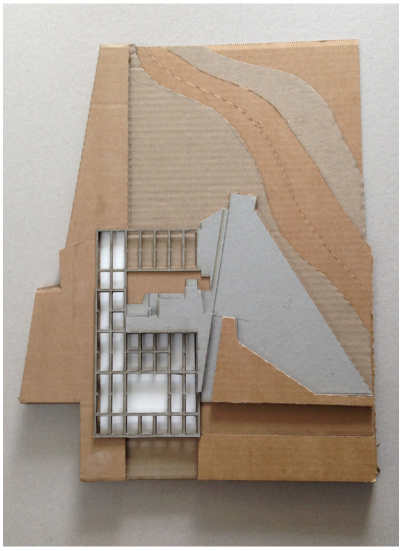
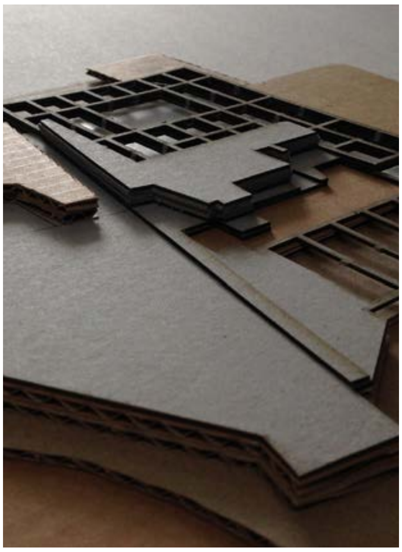
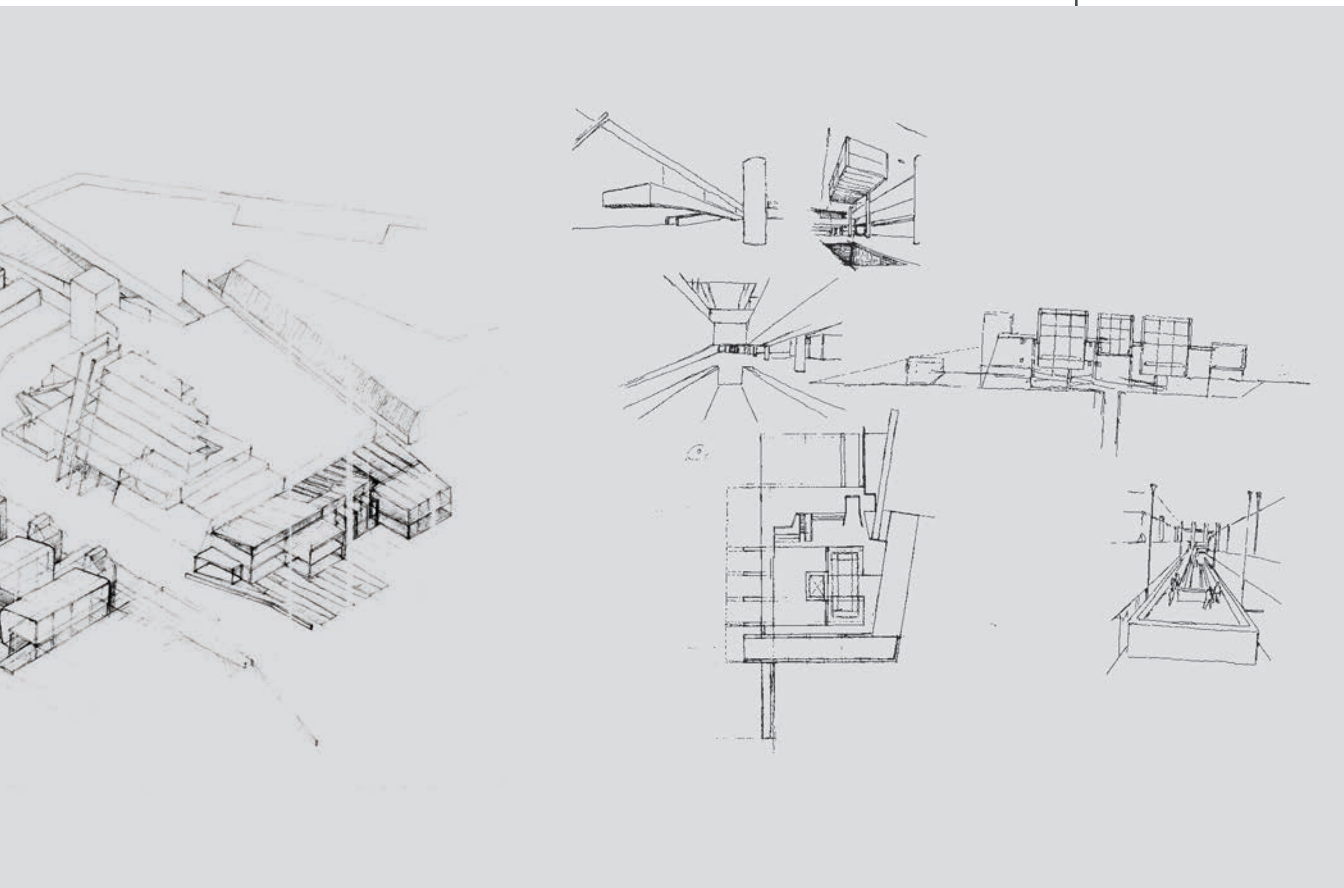


Fig. 6.16: Design exploration 2 (Author:2018)







DESIGN ITERATION 2: INSTALLATION

THE DESIGN OF AN 'ARCHAEOLOGICAL' FRAMEWORK FOR FUTURE INSTALLATION AND INFILL

This iteration takes the archaeological dig as its departure point and aims to provide a framework for later installation. It involves the gridded excavation of the site to the west of the platform in a manner that will provide a flexible framework for installation of functions over time.

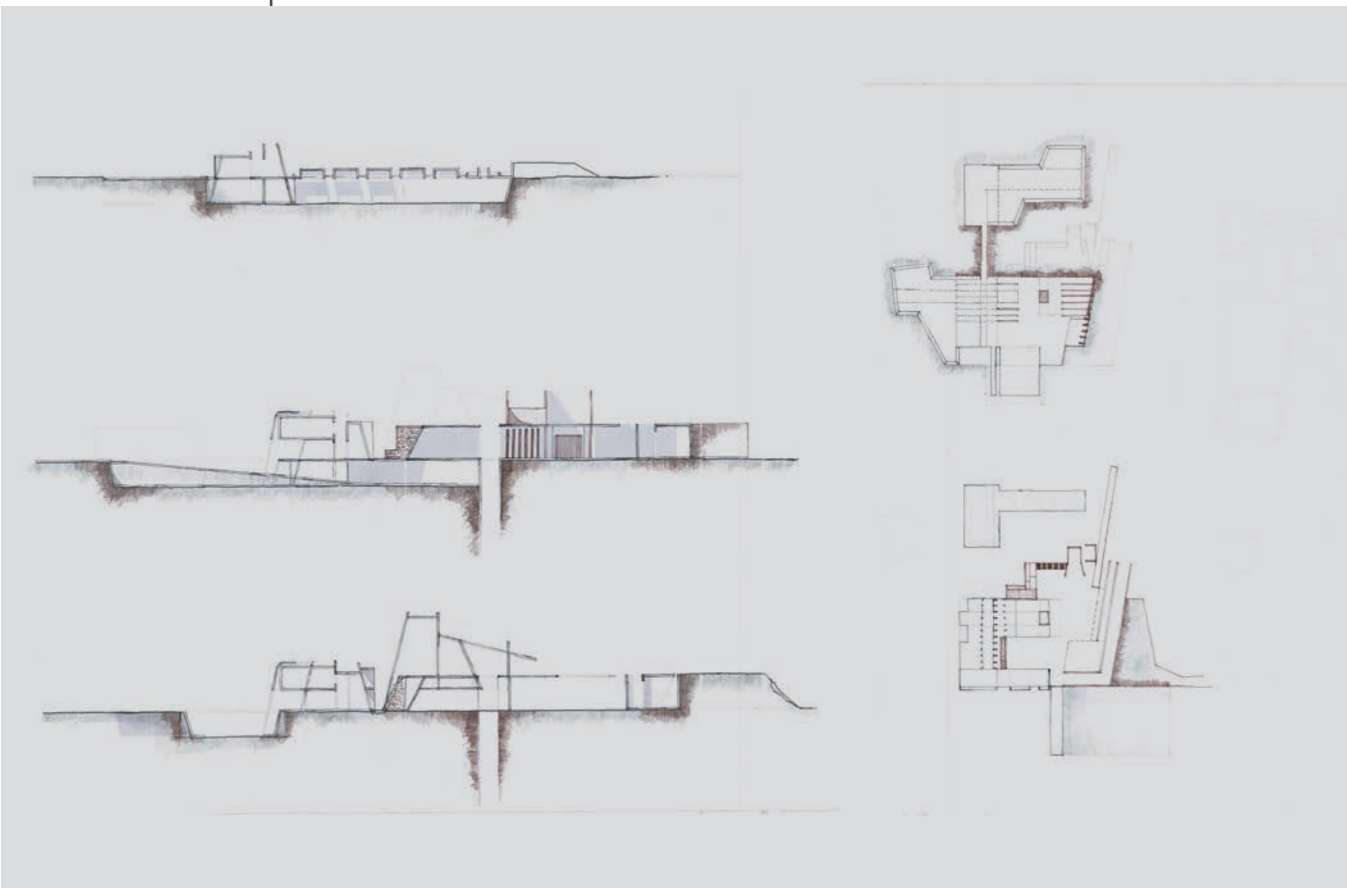
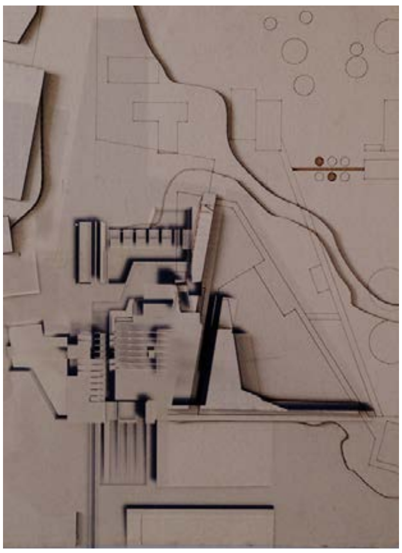
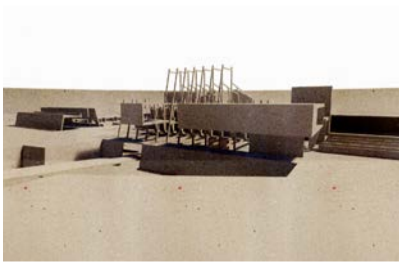
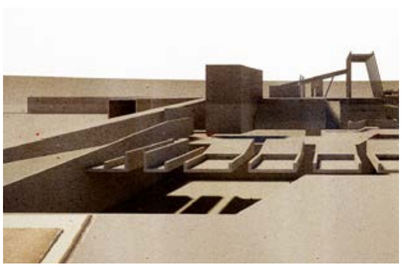
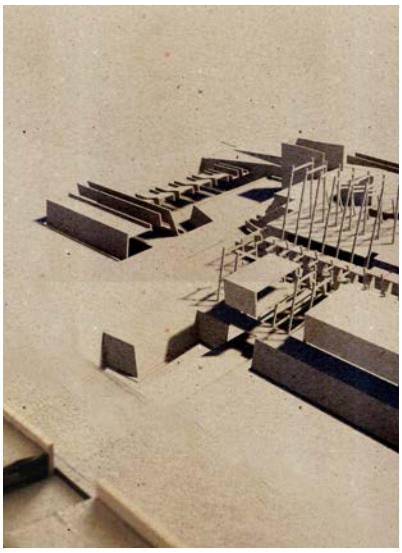


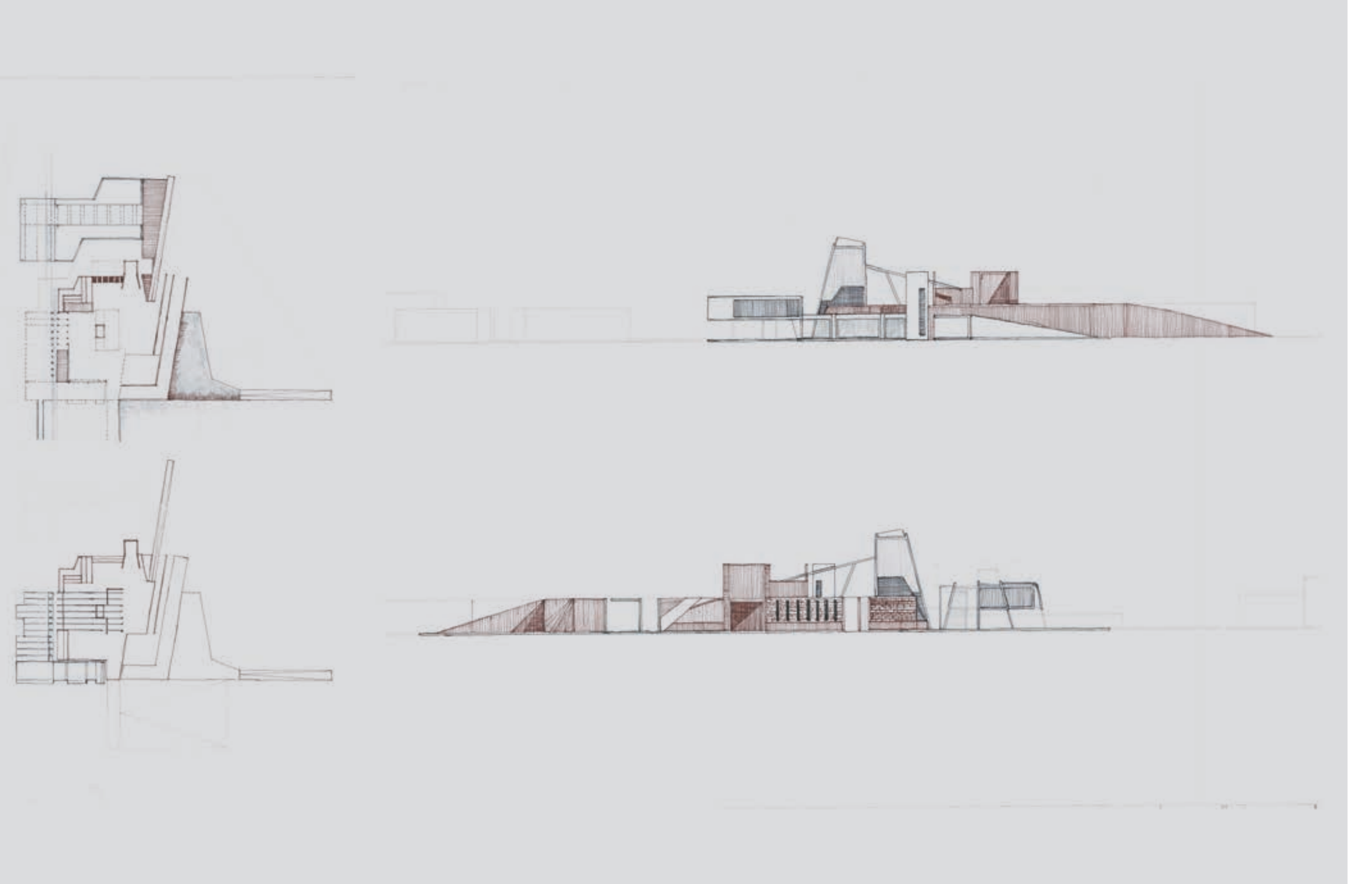
Fig. 6.17: Design exploration 3 (Author:2018)











DESIGN ITERATION 3: INTERVENTION

A DESIGN INTIMATELY RELATED TO THE EXISTING PLATFORM

The iteration places greatest importance on intervention into, on and around the historic concrete platform. The design latches onto the west side of it and wraps around it to the north. It involves the design of structures on top of and next to the structure as well as a substantial subterranean component.

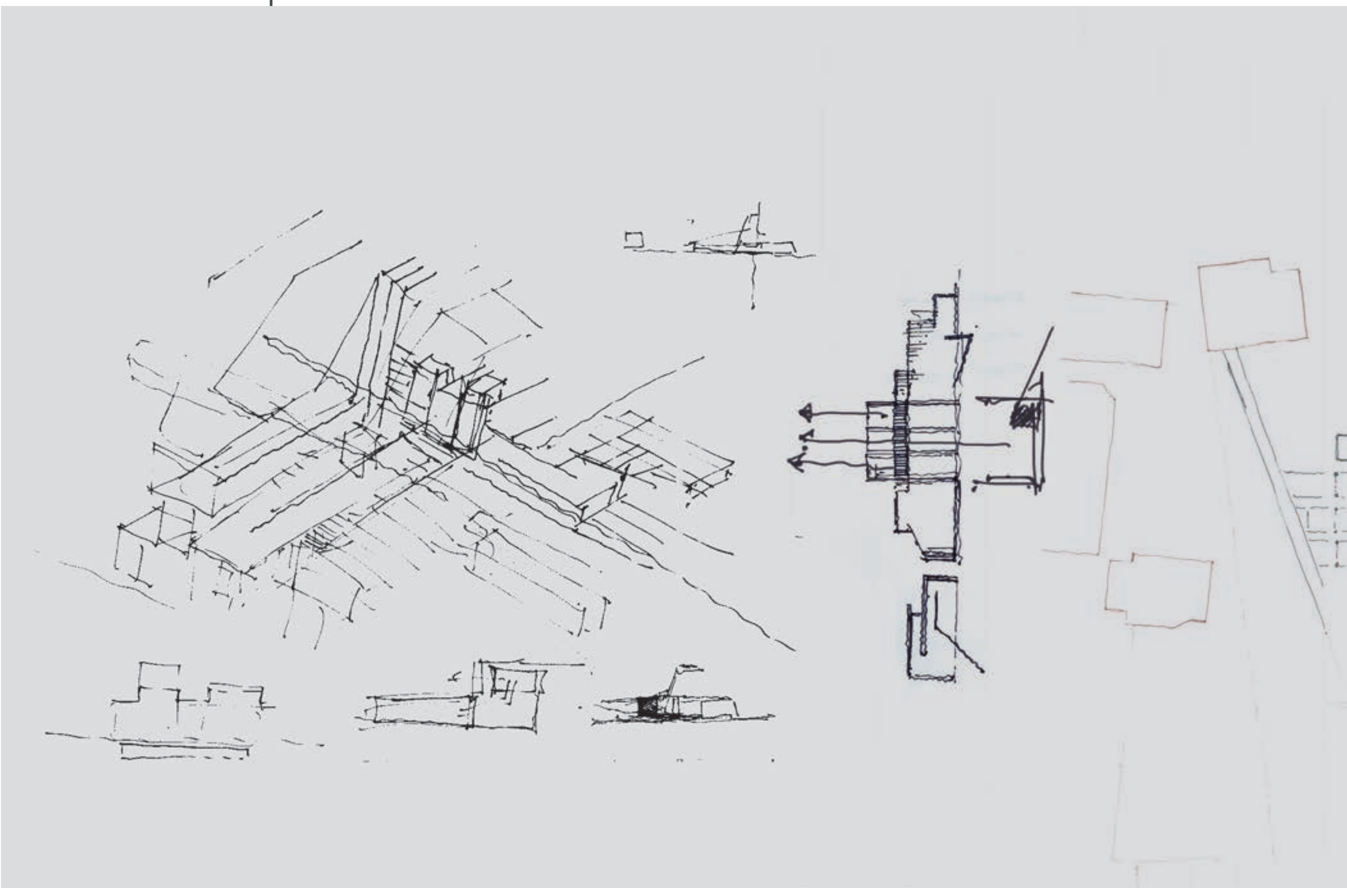
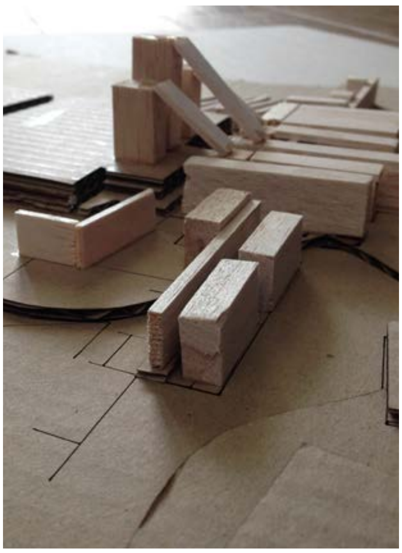
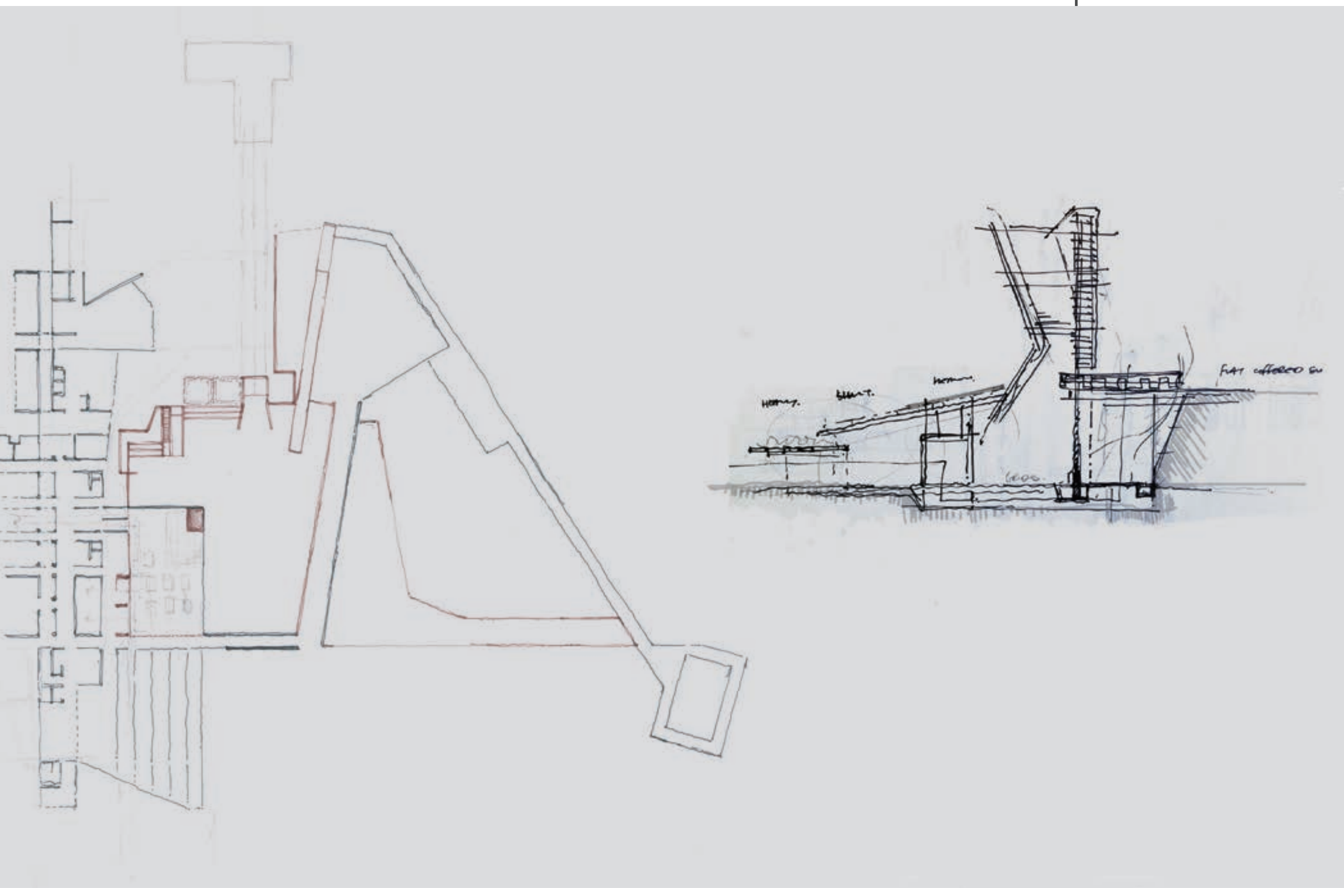


Fig. 6.18: Design exploration 4 (Author:2018)





DESIGN ITERATION 4: INTEGRATION

AN INTERVENTION BETWEEN THE EXISTING HERITAGE BUILDINGS AND THE PLATFORM

The iteration focusses on the creation of a spine along which functions can be located. While previous versions had a greater emphasis on enveloping the historic concrete platform, this situation gives greater importance to the north-south axis of the site as well as the historical admin buildings to the west.

The fourth iteration combines the previous three explorations (insertion, installation, and intervention) into a tactic of 'integration'.

FINAL DESIGN:
RESPONSE TO URBAN VISION AND PRECINCT AS INFORMANT

1. Links to key urban routes
2. Links to Village Main historic building cluster
3. Links to access
4. Service entrances and parking
5. Pedestrian entrances
6. Productive landscape
7. Recreational landscape
8. Village Main No. 2 Shaft

Fig. 6.19: Urban vision (Author:2018)

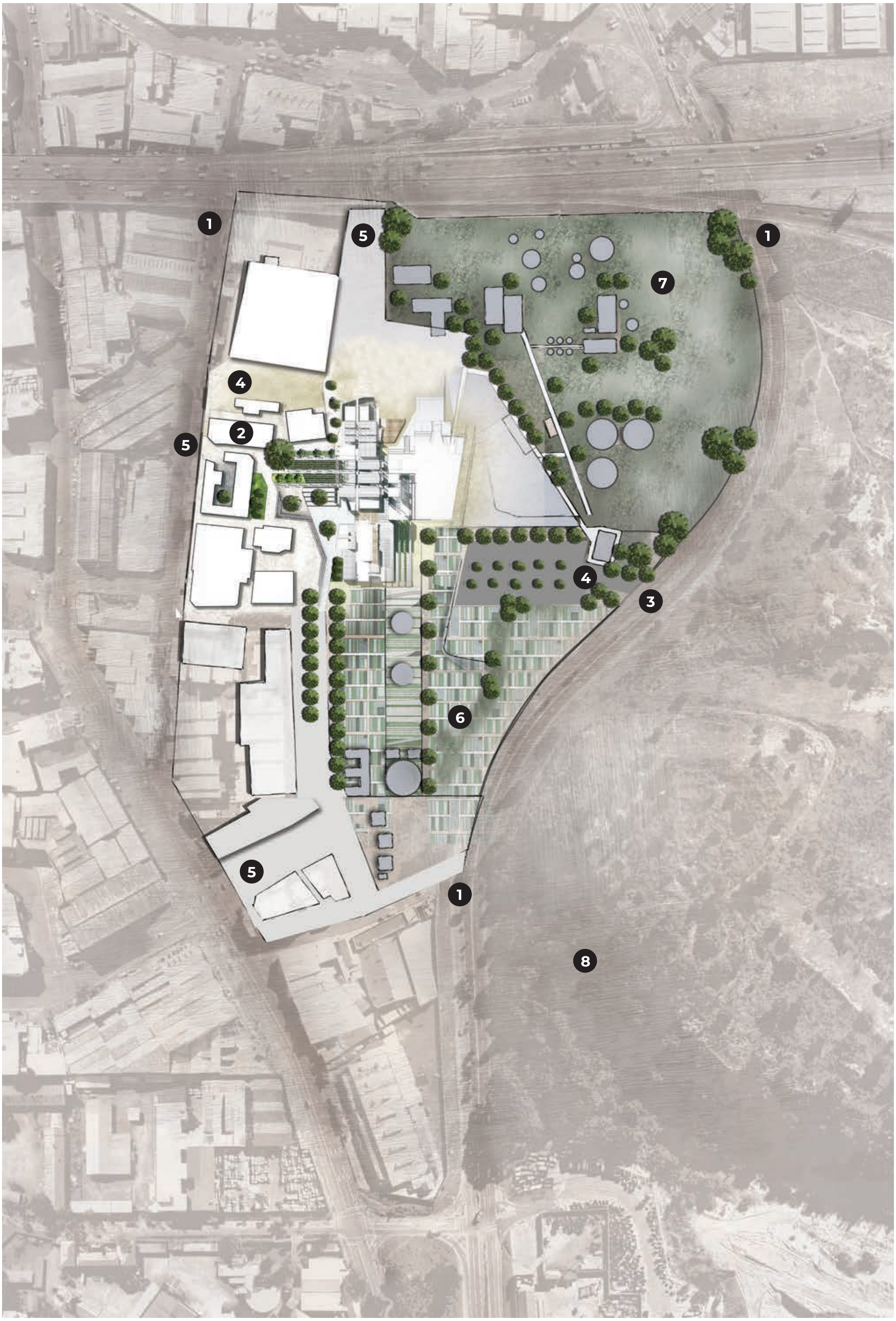


Fig. 6.20: Response to urban vision and precinct plan (Author:2018)

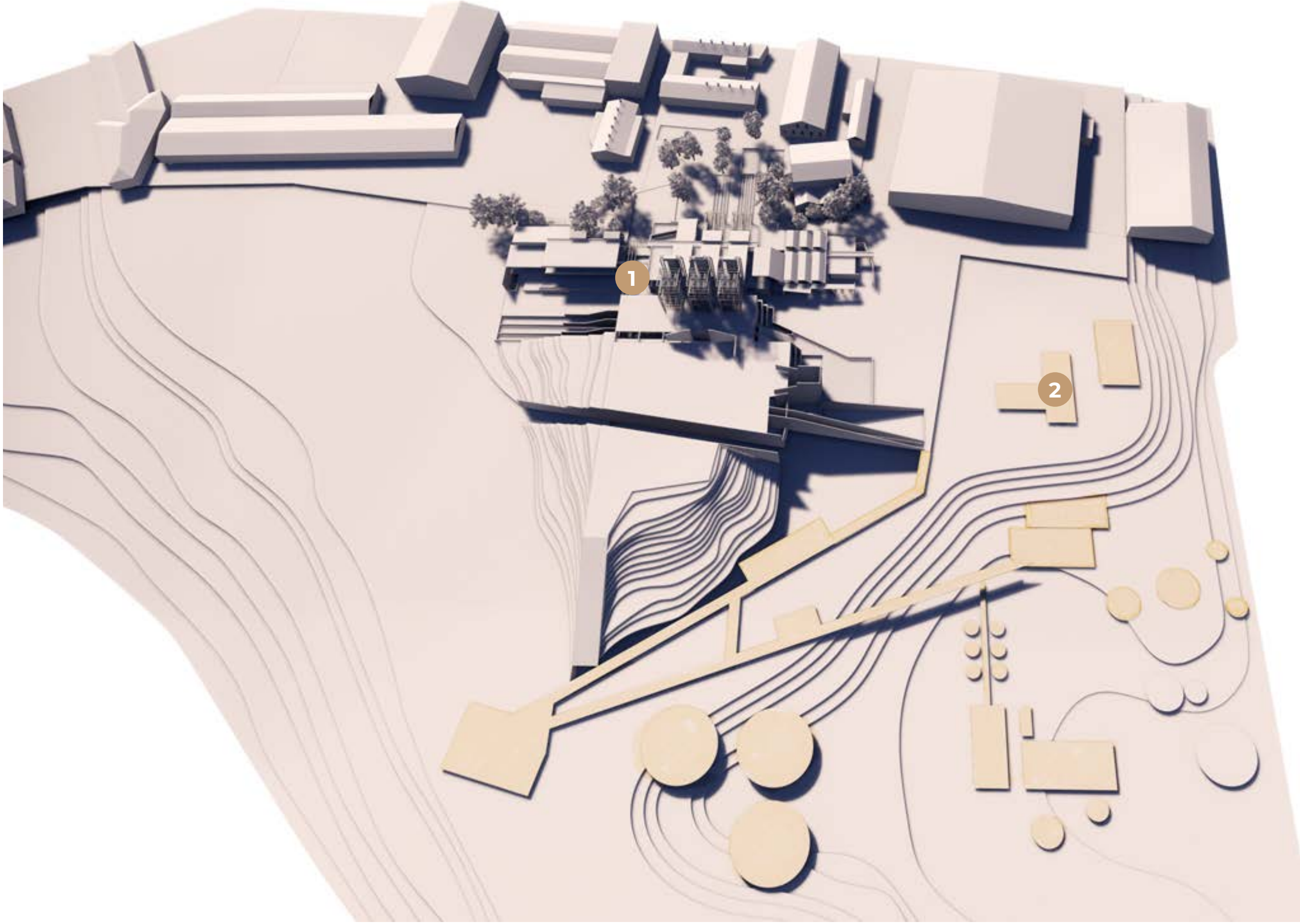


Fig. 6.21: Response to lost layers on the site scale (Author:2018)

Fig. 6.22: Response to lost layers through concrete platforms on foundation locations (Author:2018)

FINAL DESIGN:
RESPONSE TO LOST LAYERS AS INFORMANT

1 The memory of the historic headgear on site is mirrored in the three new towers on site. While the historic headgear was used to lift labour and material in and out of the mine-shaft, the new towers find purpose as vertical greenhouses and kilns. While the headgear was used for extractive and exploitative purposes, the new towers are used for productive and regenerative ones.

2 The historic footprints of the processing buildings are re-created as concrete platforms and linked by walkways. These serve as viewpoints for the mining landscape but also find purpose as additional places of ritual and worship for the Shembe community that currently utilises two concrete platforms on site.

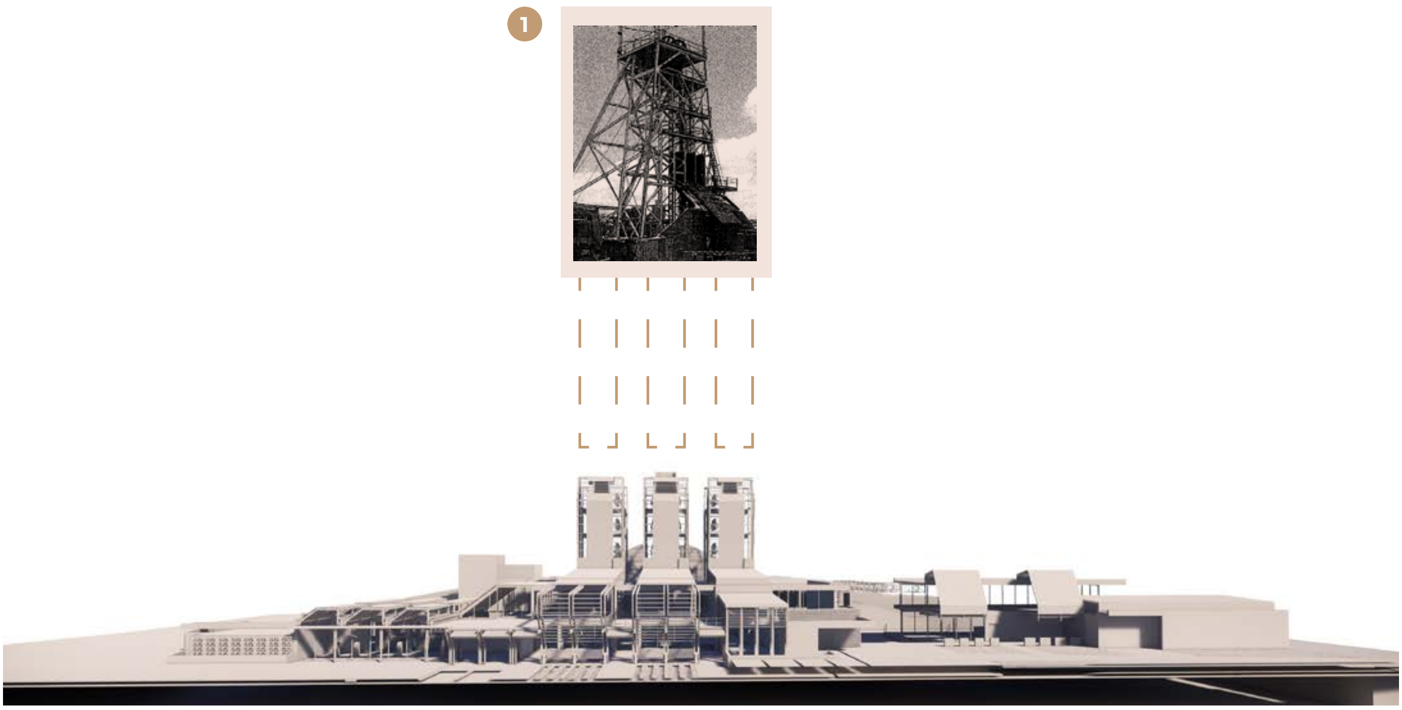


Fig. 6.23: Response to lost layers through towers (Author:2018)

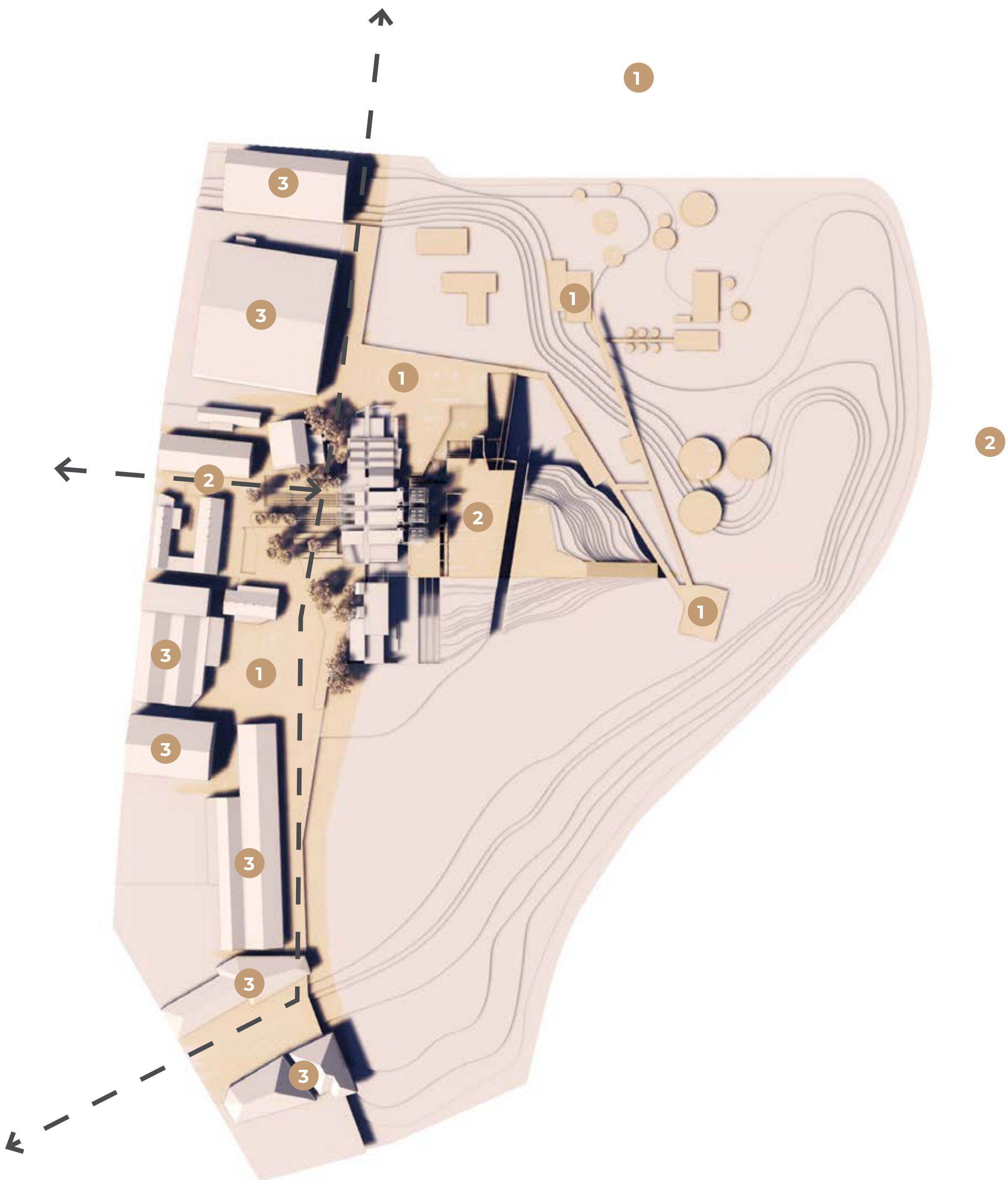


Fig. 6.24: Response to context (Author:2018)

FINAL DESIGN:
RESPONSE TO CONTEXT + SITE AS INFORMANT

1. Route and connective tissue
2. Historic buildings
3. Precinct and productive framework

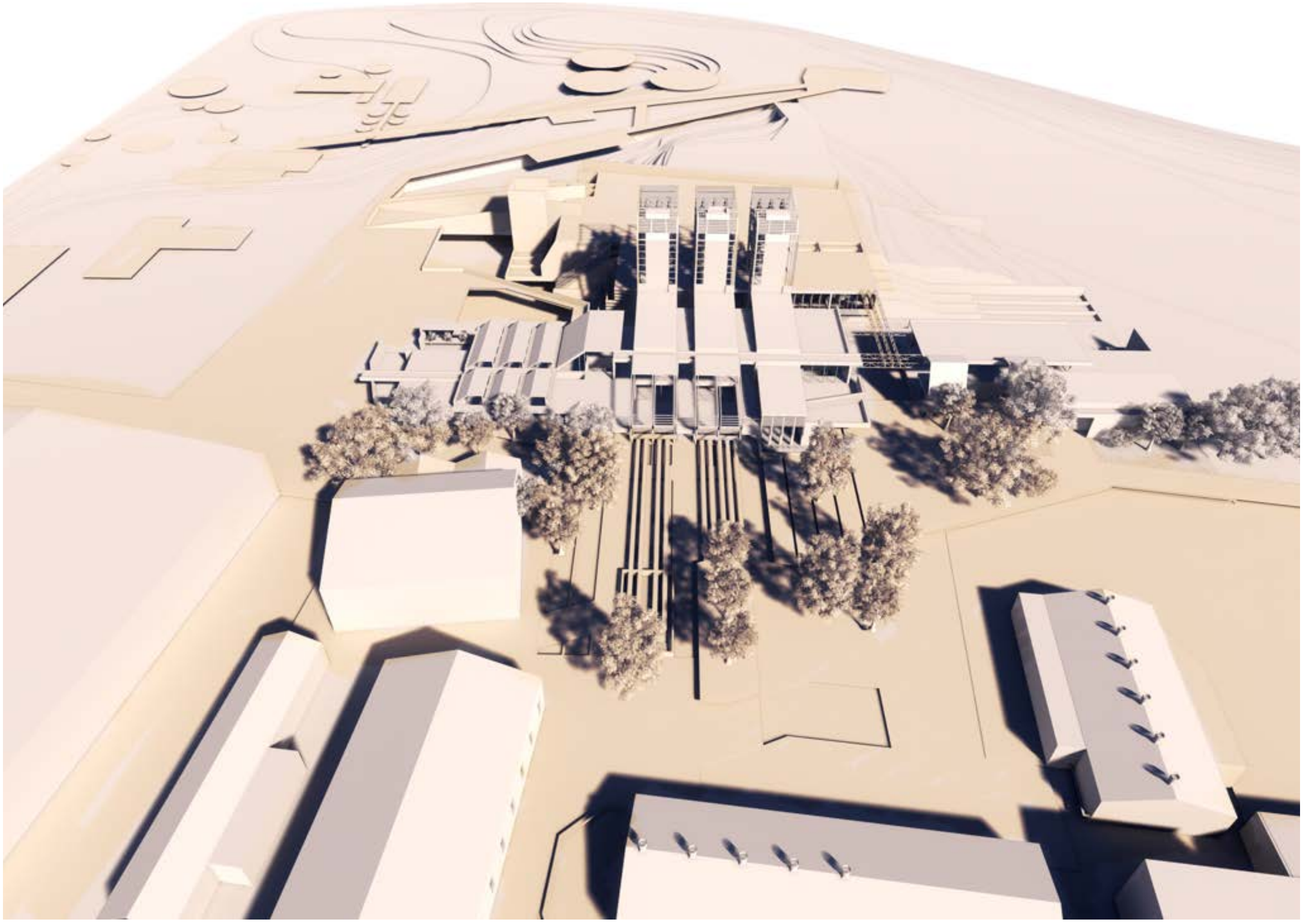


Fig. 6.25: Response to site buildings (Author:2018)

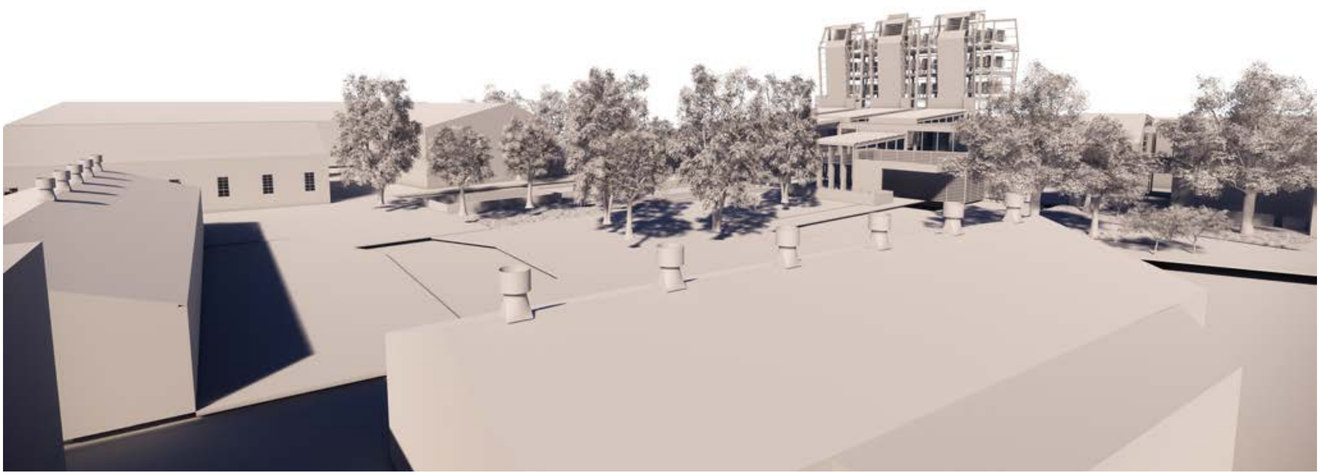


Fig. 6.26: Response to public space between site buildings (Author:2018)

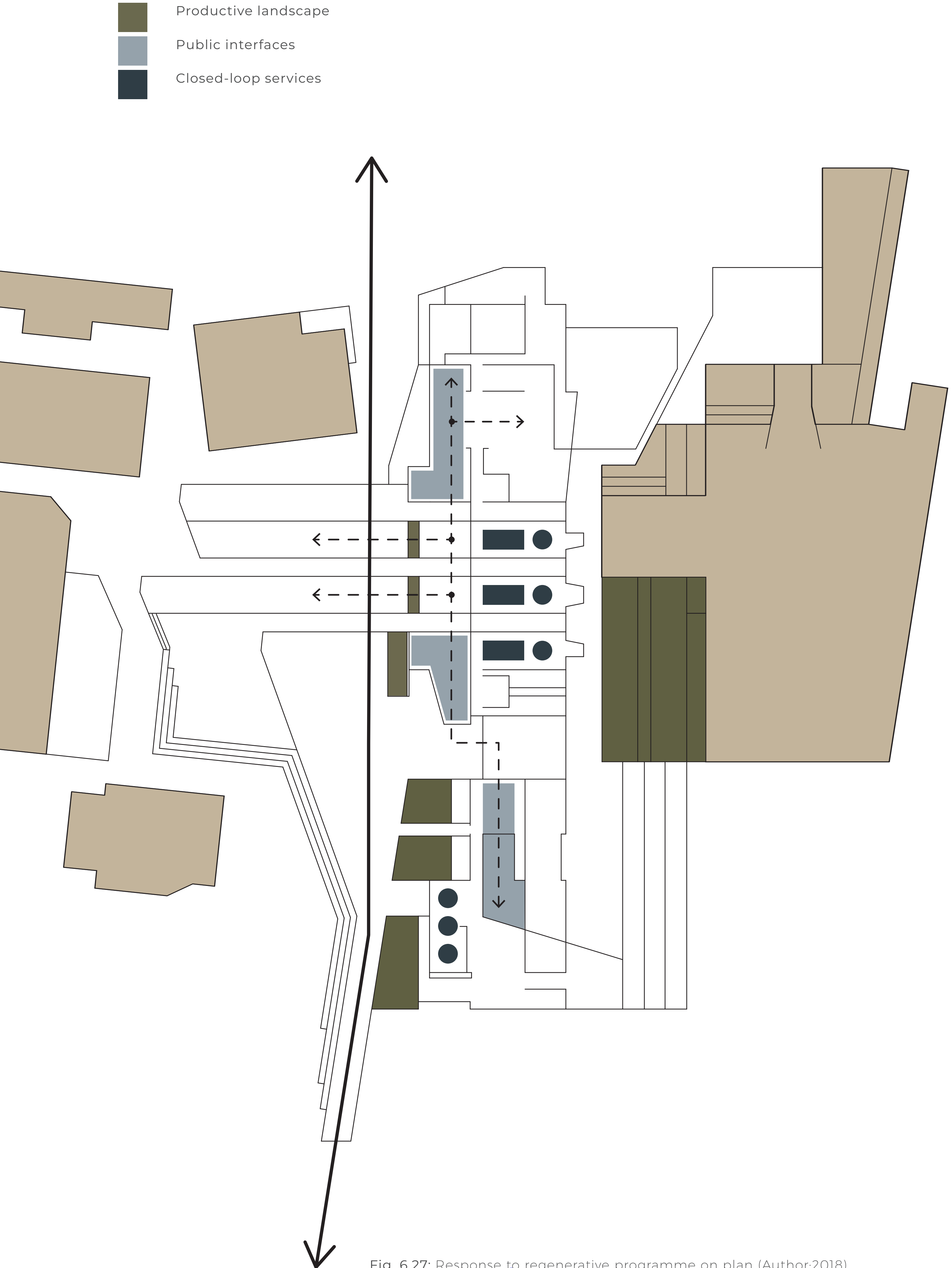


Fig. 6.27: Response to regenerative programme on plan (Author:2018)

FINAL DESIGN:
RESPONSE TO REGENERATIVE PROGRAMME AS INFORMANT

1 The design is situated in a productive landscape. This serves the purpose of providing material for the maker-spaces as well as for the restaurant. The existing bunker of the concrete podium is also incorporated into the productive landscape framework along with the three greenhouse towers and the public square linking the new building to the Village Main historic buildings.

2 The plants from the productive landscape framework processed and then become part of the new productive economy of the scheme. The fibres of the plant material is utilised for material for the maker-space (either for moulded or printed applications).

3 The maker-space serves as a productive and educational programme. It serves to restore productivity to precinct and also become a model for a regenerative and ecologically beneficial form of industry.

3 Public interfaces and didactic elements

Fig. 6.28: Response to regenerative programme on west elevation (Author:2018)

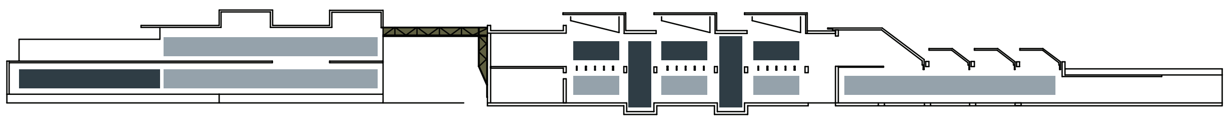


Fig. 6.29: Response to regenerative programme on long section (Author:2018)

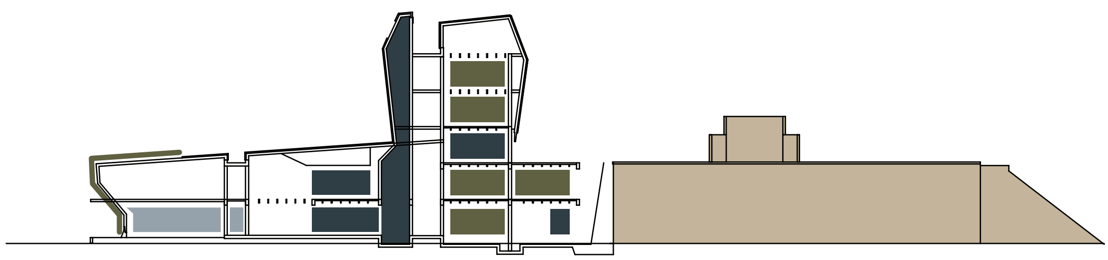


Fig. 6.30: Response to regenerative programme on short section (Author:2018)

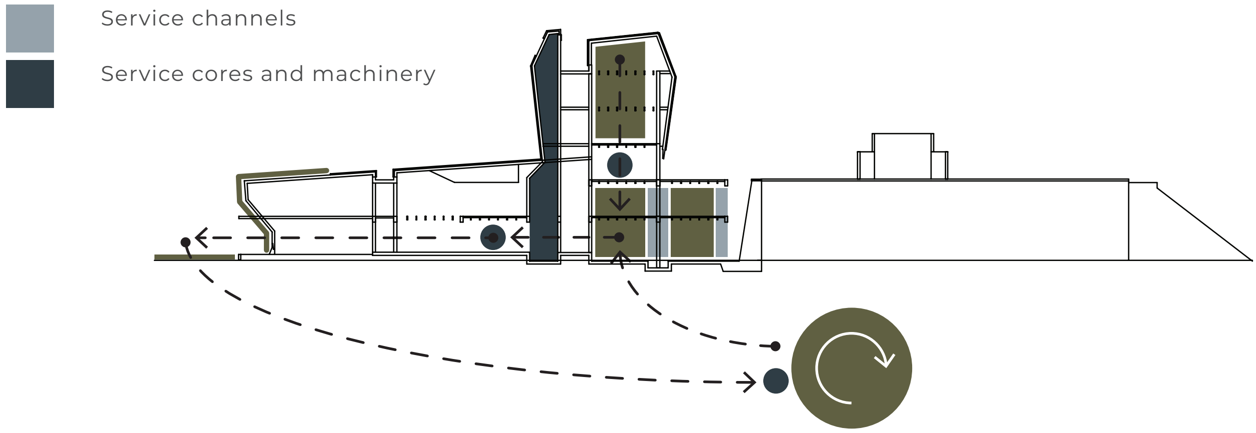


Fig. 6.31: Response to connected systems on short section (Author:2018)

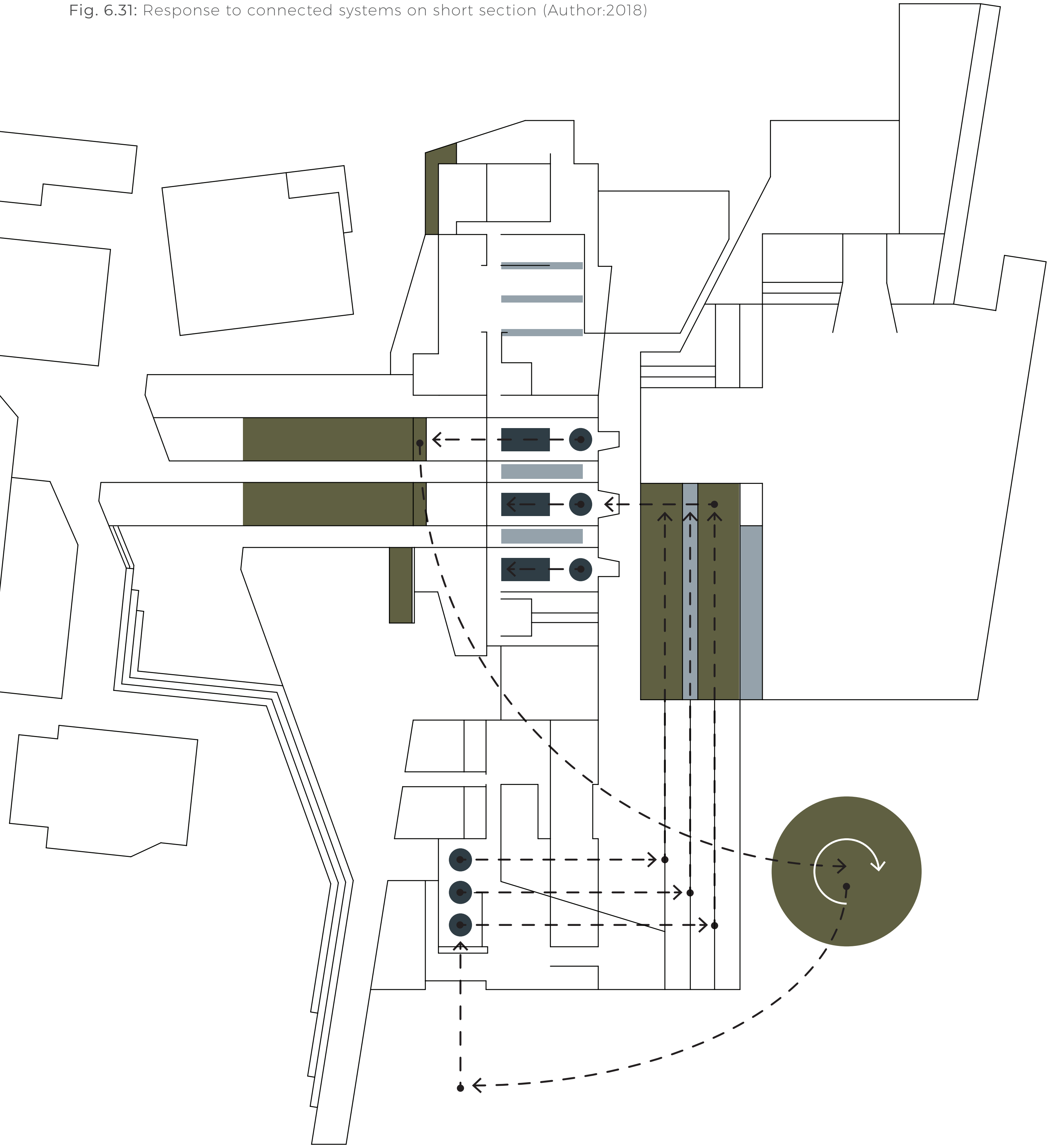


Fig. 6.32: Response to connected systems on plan (Author:2018)

FINAL DESIGN:
RESPONSE TO CONNECTED SYSTEMS AS INFORMANT

1 Planting system

2 Heating system and kiln

3 Water system

3 Service channels and spaces

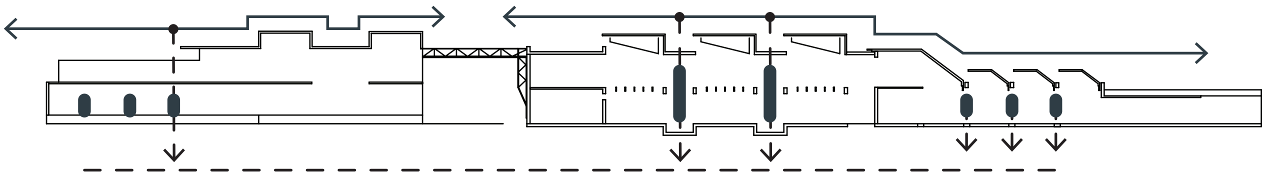


Fig. 6.33: Response to connected systems on long section (Author:2018)

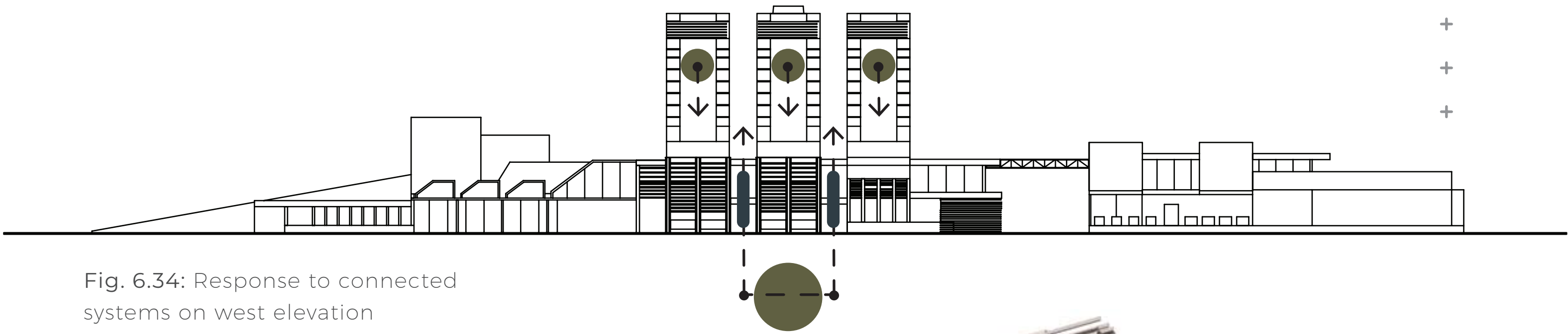


Fig. 6.34: Response to connected systems on west elevation (Author:2018)

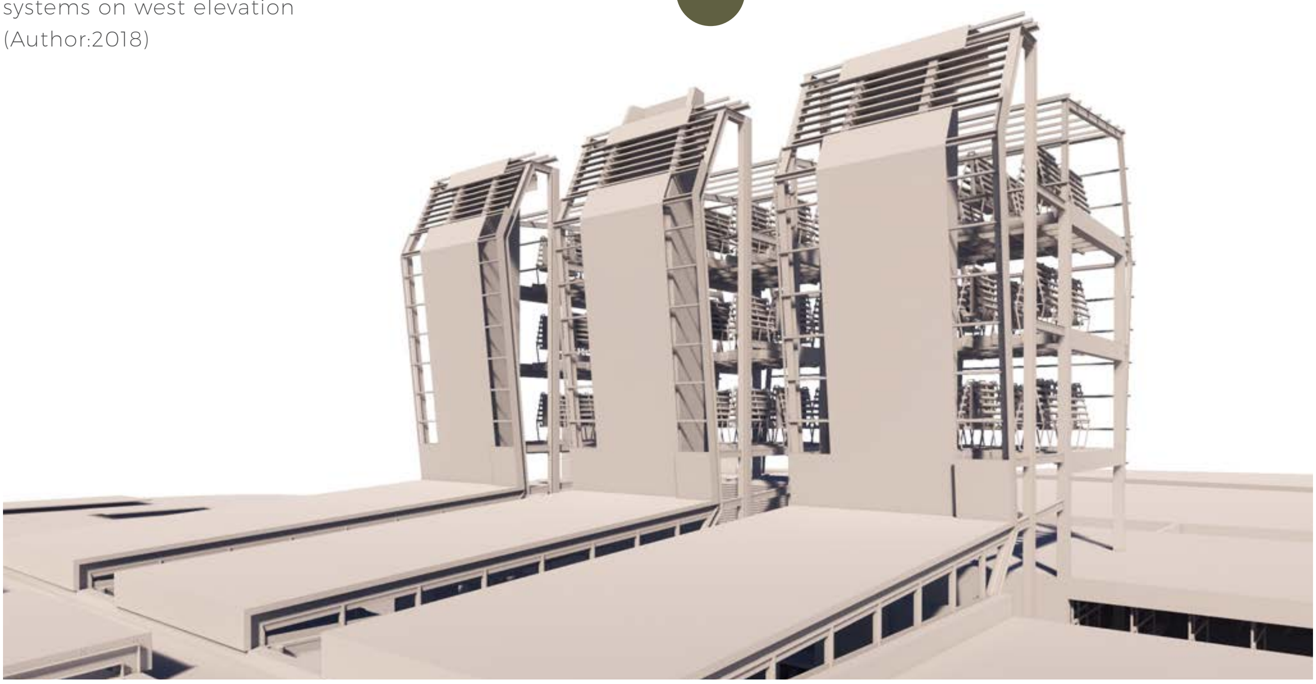


Fig. 6.35: Response to connected systems through roofs(Author:2018)

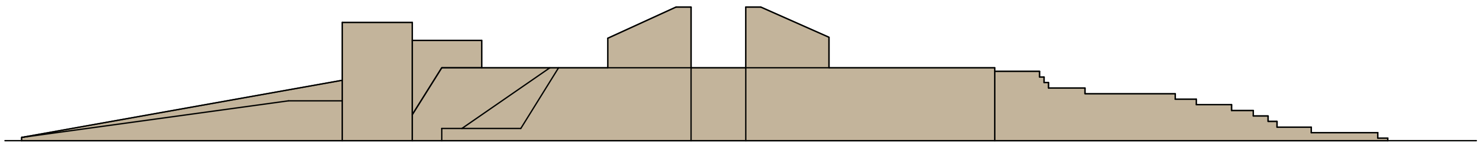


Fig. 6.36: Existing concrete platform (Author:2018)

Fig. 6.37: Response to existing concrete platform (Author:2018)

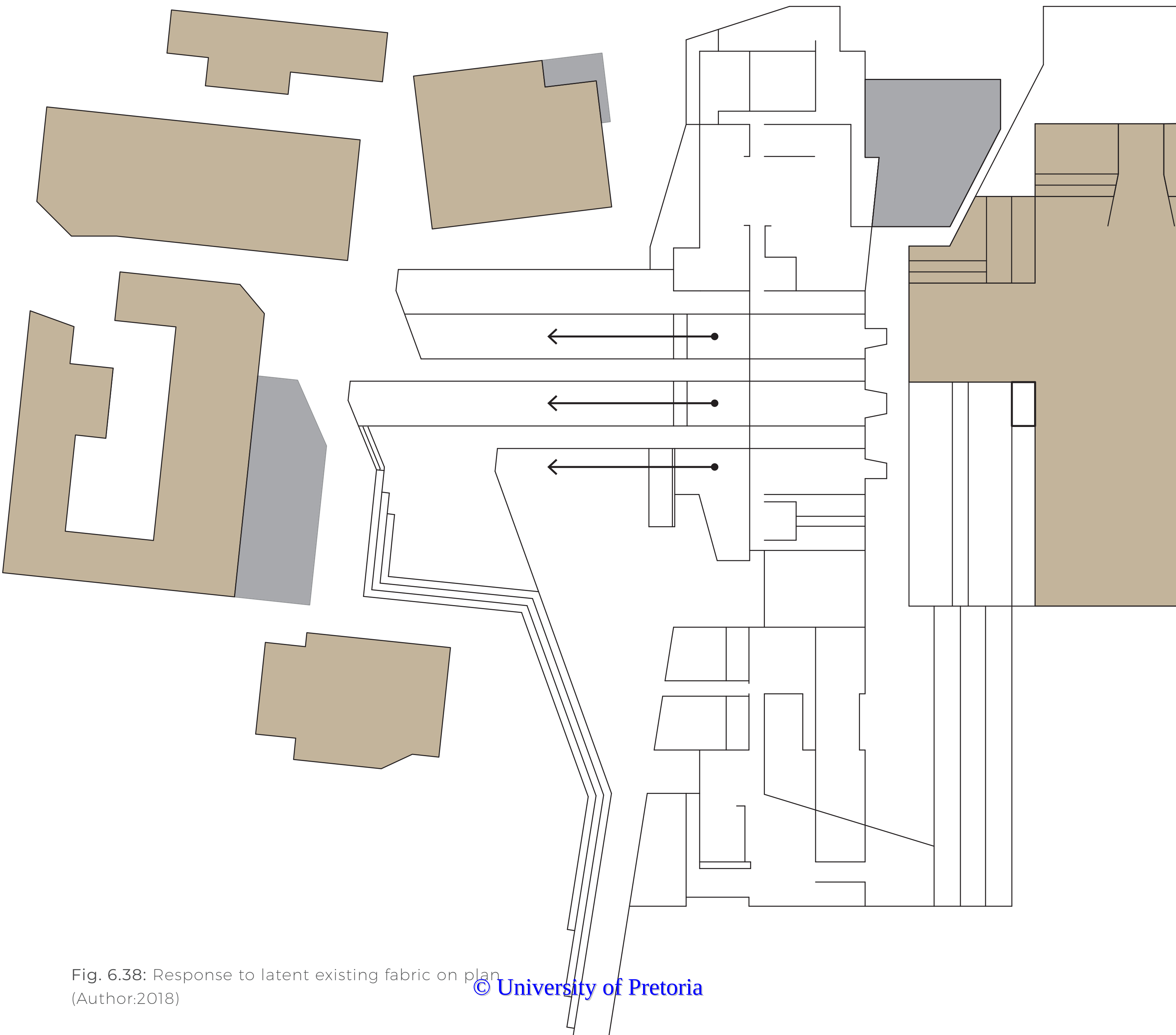
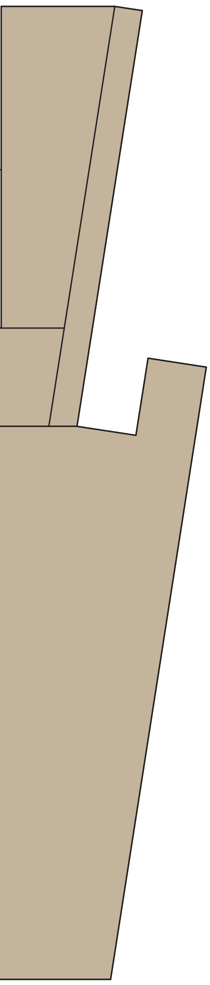


Fig. 6.38: Response to latent existing fabric on plan (Author:2018)

FINAL DESIGN:
RESPONSE TO LATENT EXISTING FABRIC AS INFORMANT

1. Platform and bunker
2. Village Main historic cluster
3. Surrounding buildings as productive precinct



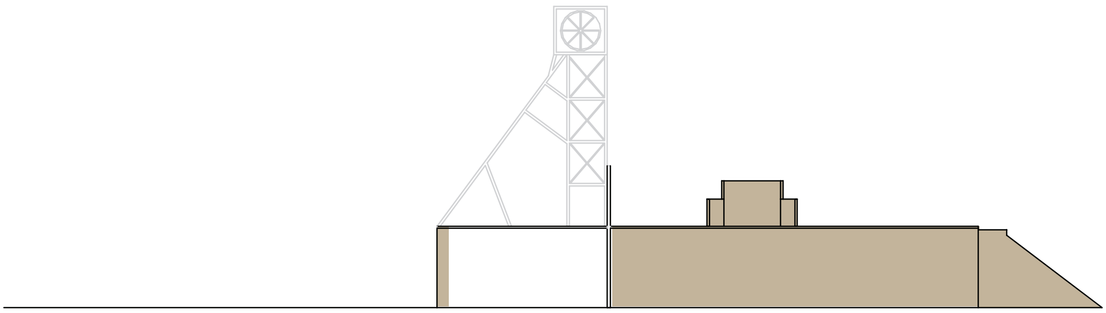


Fig. 6.39: Existing concrete platform showing erased headgear (Author:2018)

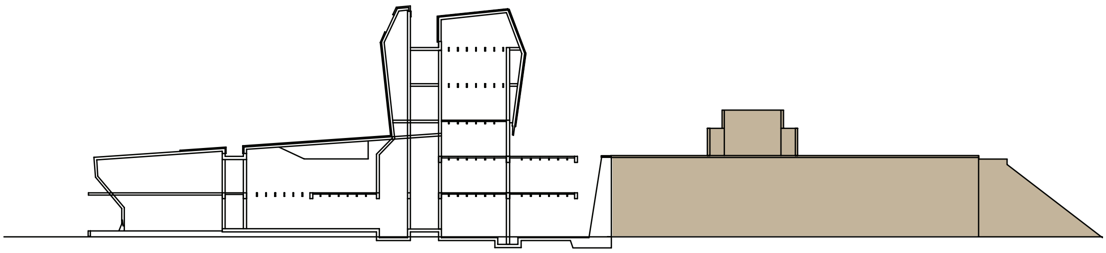


Fig. 6.40: Response to existing concrete platform on short section (Author:2018)

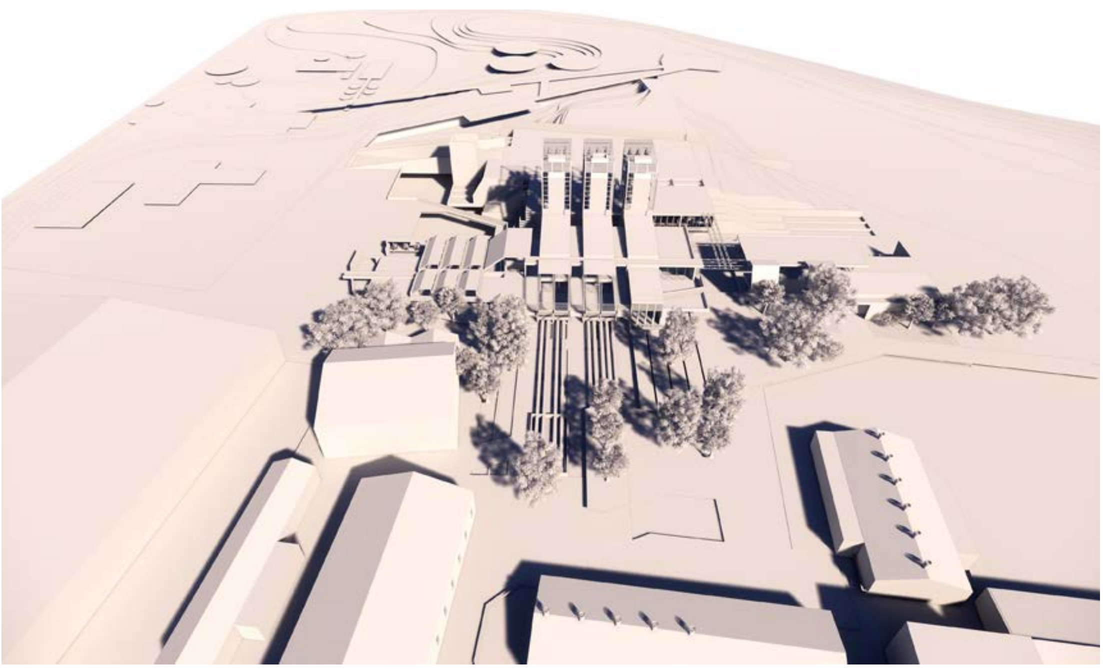


Fig. 6.41: Response to latent existing fabric through orientation and public space design (Author:2018)

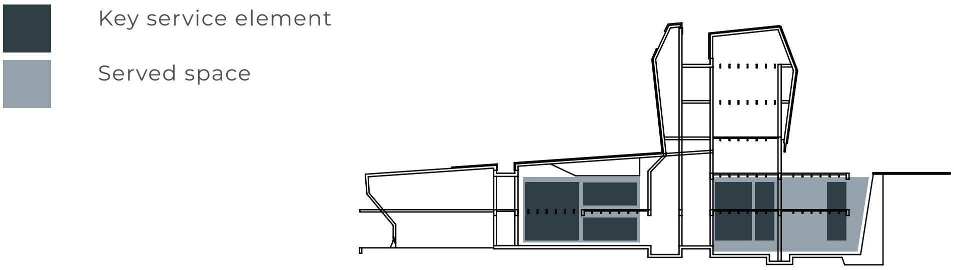


Fig. 6.42: Response to adaptable form, space and technology on short section (Author:2018)

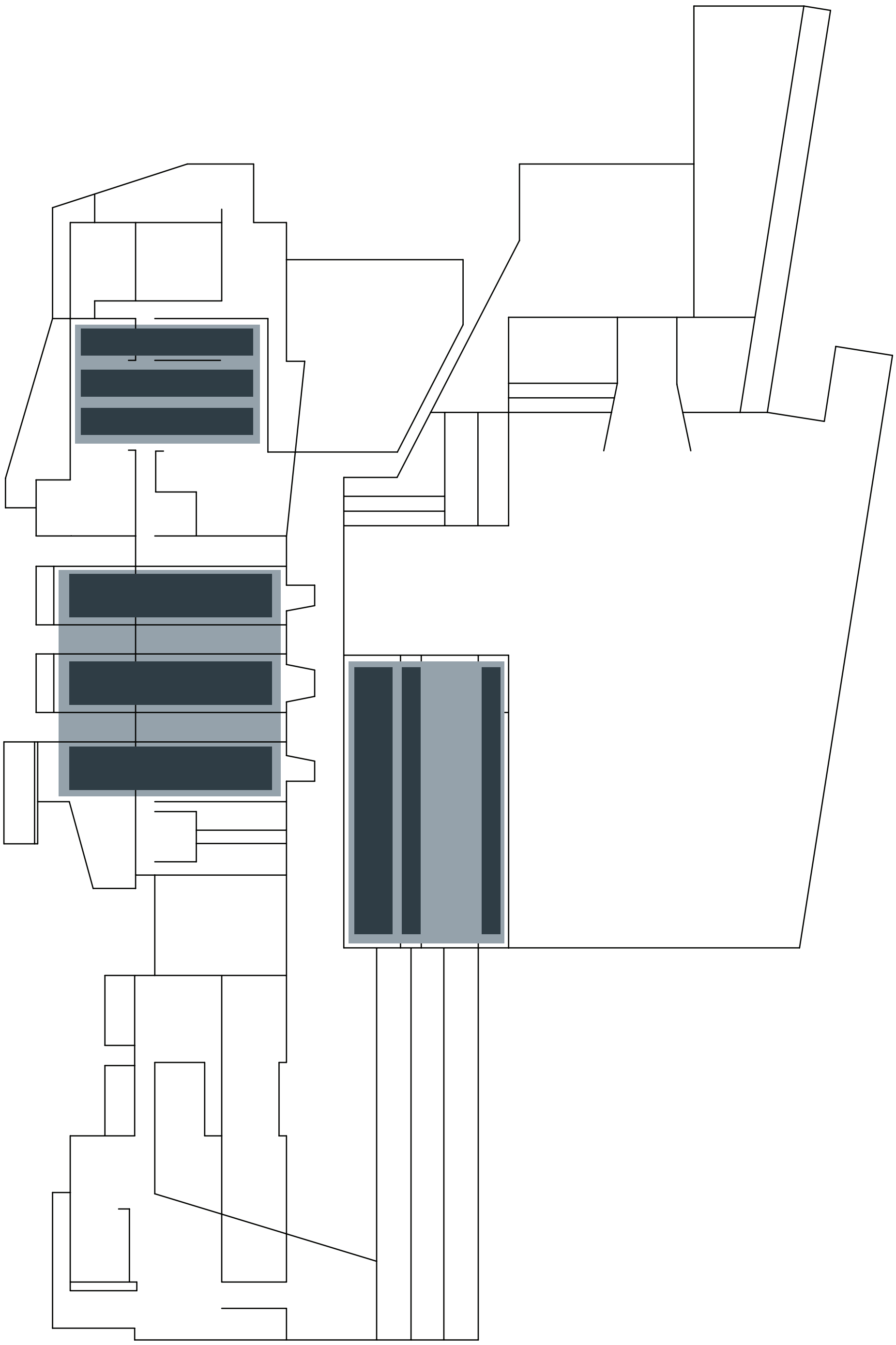


Fig. 6.43: Response to adaptable form, space and technology on plan (Author:2018)

FINAL DESIGN:
RESPONSE TO ADAPTABLE FORM, SPACE + TECHNOLOGY AS INFORMANT

The design acknowledges the fact that design problems are temporary and architecture should be capable of changing over time to accommodate and suggest other arrangements.

The scheme is treated as an armature: a designed support and facilitatory framework which reveals, redirects and invites processes and layering.

[01] RESILIENCE OF FORM:

Small buildings capable of combining to form a larger ensemble (in order to prevent mass redundancy), this involves the break down of scale into manageable and modular components

Local connections between the immediately adjacent Village Main buildings as well as the surrounding industrial zone and ecological corridor

Open and receptive platforms capable of serving as armature (thereby accommodating change)

Connected and receptive platforms capable of serving as armature (thereby accommodating change)

[02] ADAPTABLE SPACE AND TECHNOLOGY:

Multifunctional: the ability of the building and its components to accommodate multiple uses and iterations while remaining in a (similar) state

Modifiable: the capacity of the building, its spaces and its technology to become different things while still being able to revert back to the original state

Robust: the ability for the building to be adapted while retaining integrity and clarity

Legible: the fit to context as well as the clarity of detail and design which makes it easy for users to participate in the adaptation and layering of the building

Fig. 6.44: Response to adaptable form, space and technologyin production spaces (Author:2018)

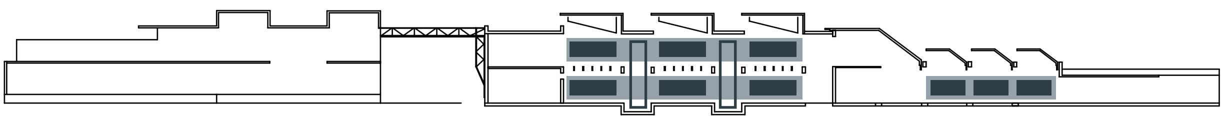


Fig. 6.45: Response to adaptable form, space and technology on the detail scale (Author:2018)

FINAL DESIGN:
RESPONSE TO LOST, THREATENE
AT VILLAGE MAIN

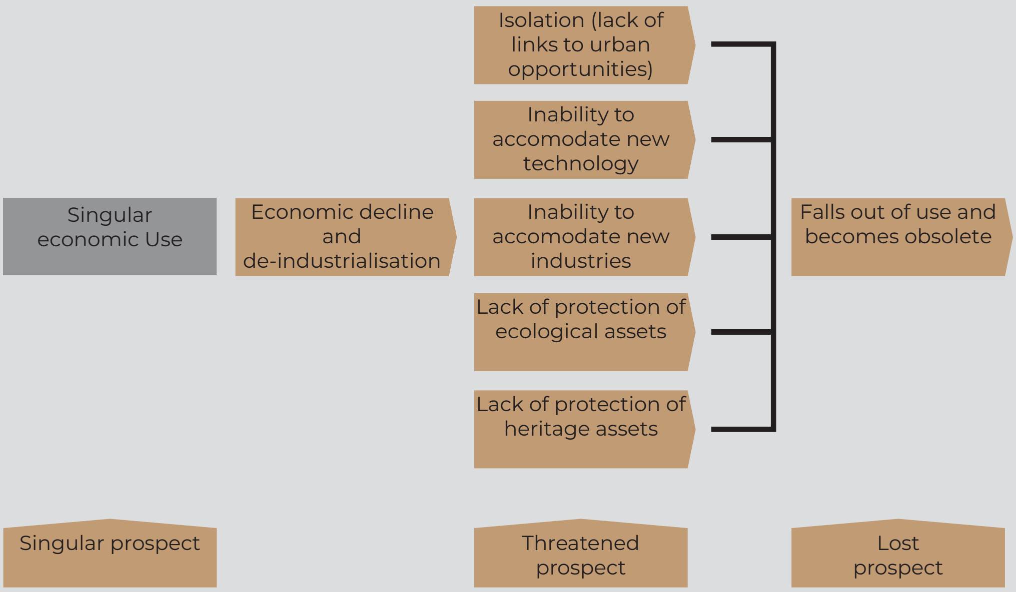


Fig. 6.46: Response to lost and threatened prospect through future prospect(Author:2018)

Fig. 6.47: Lost past prospect (Author:2018)

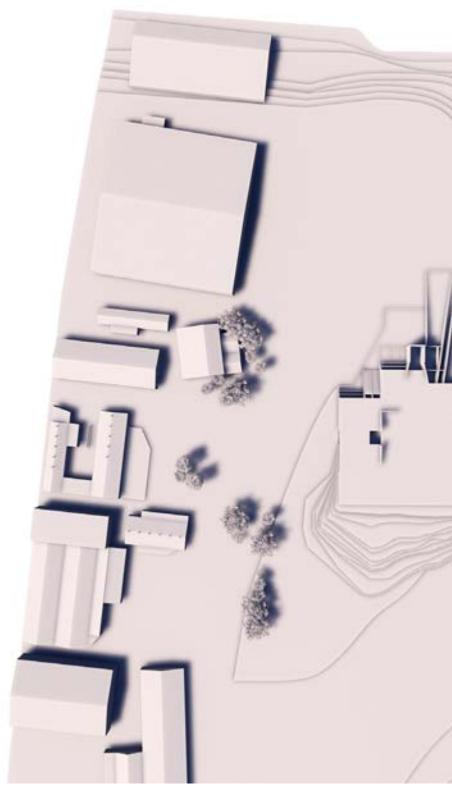
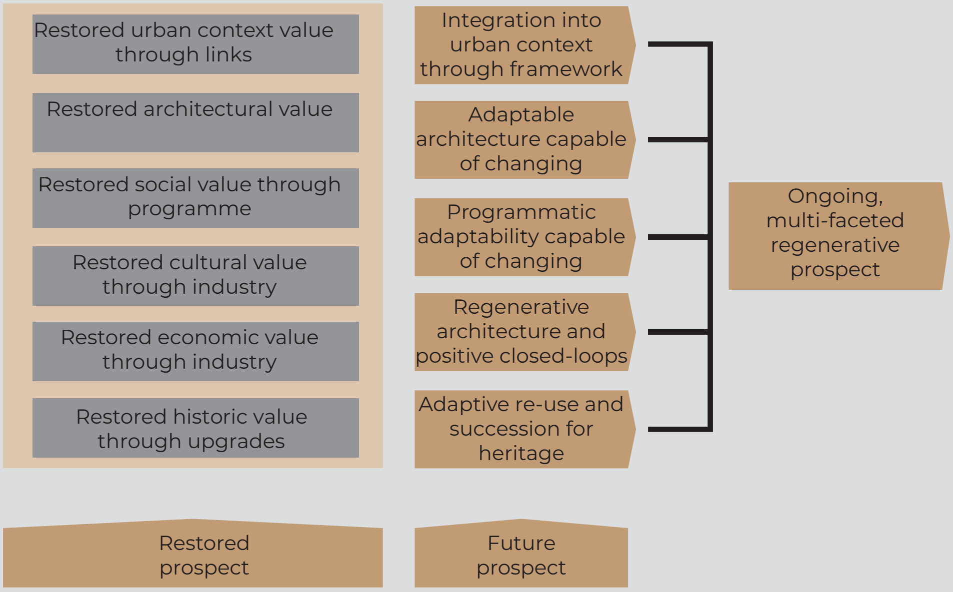


Fig. 6.48: Current threatened prospect (Author:2018)

D AND FUTURE PROSPECT



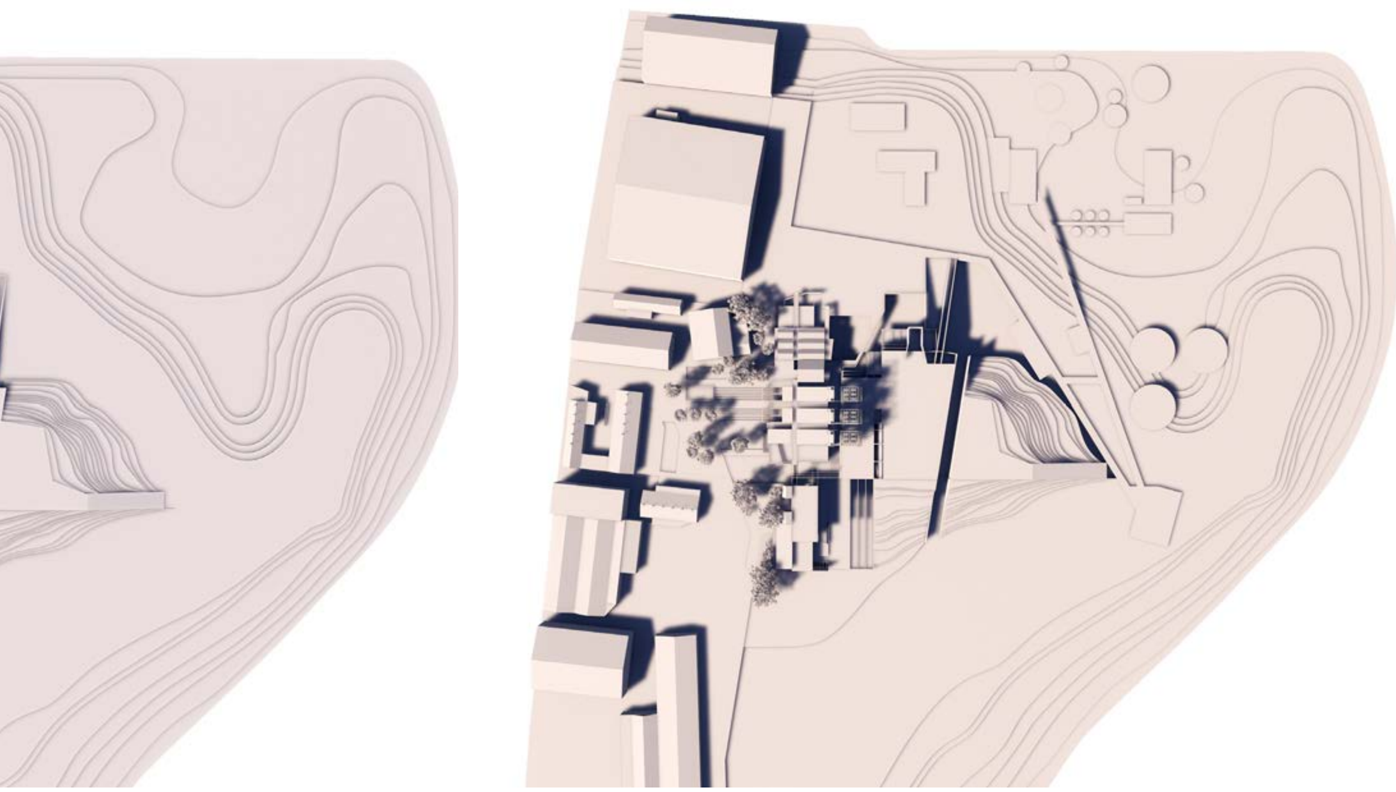


Fig. 6.49: Future prospect(Author:2018)

FUTURE PROSPECT:
ONGOING PRODUCTIVITY

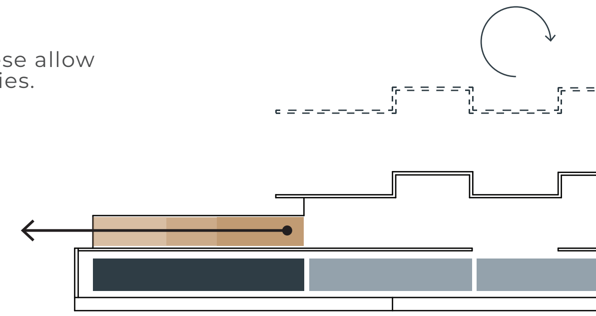
Future prospect from new forms of productive planting. These allow new bio-prospecting possibilities and therefore new industries.

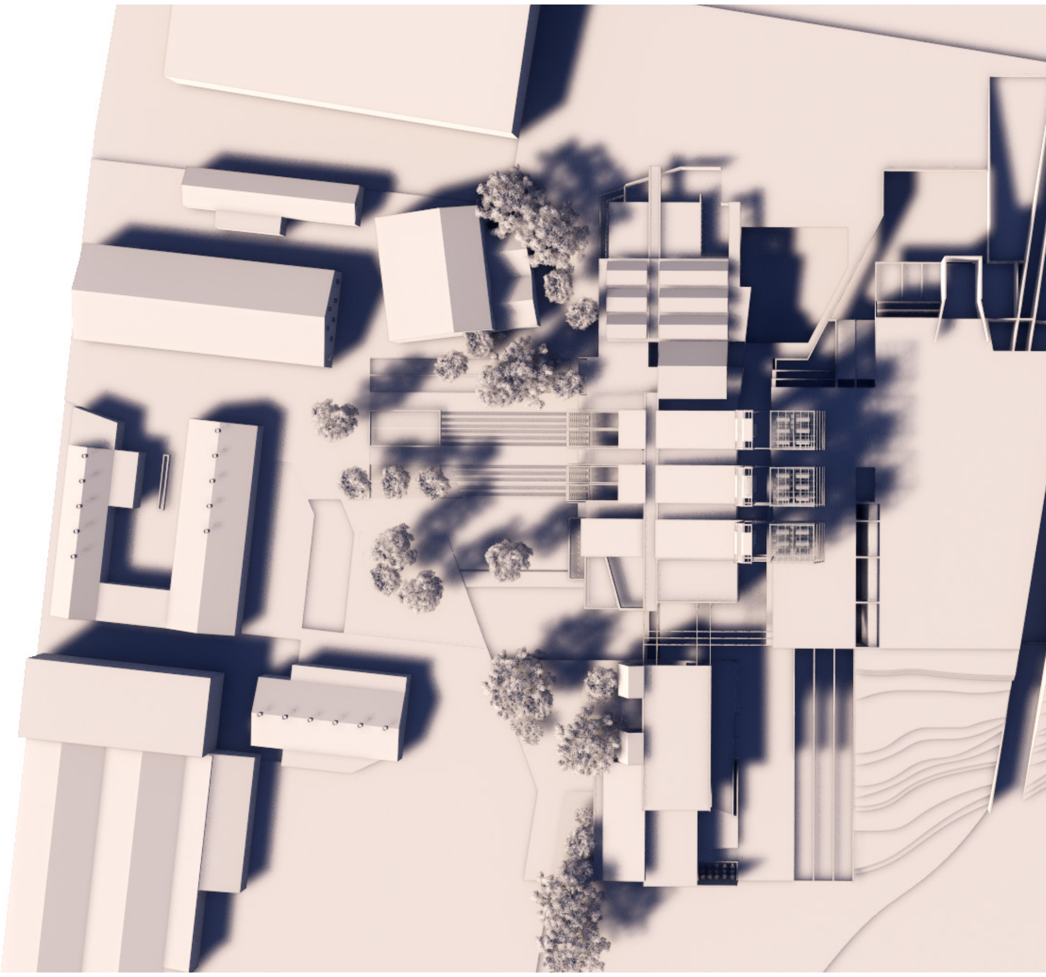
Future prospect from the extension of built fabric.

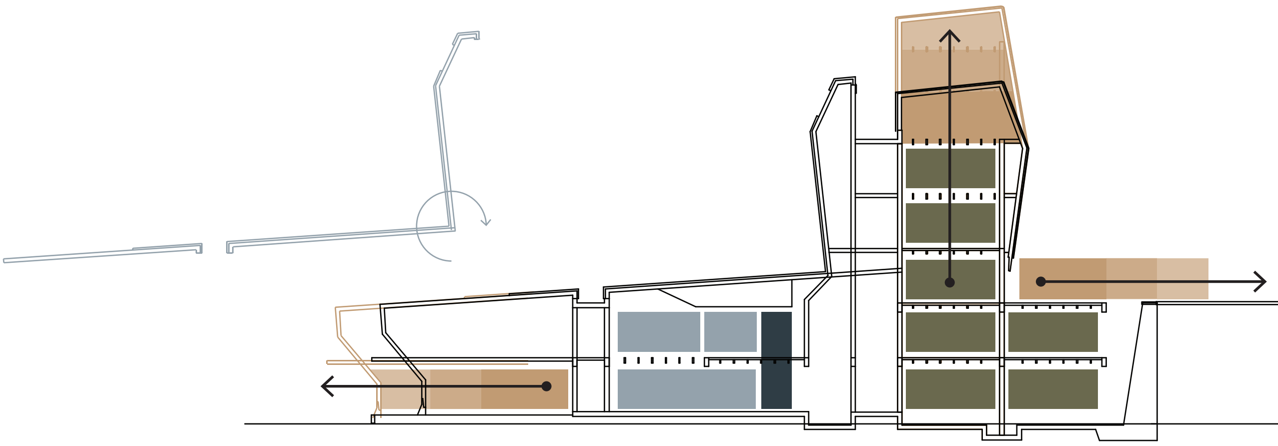
Future prospect from the adaptation of space to accomodate new programmes.

Future prospect from new technologies to facilitate new productive processes.

Future prospect through modifying building elements to accomodate new programmes.







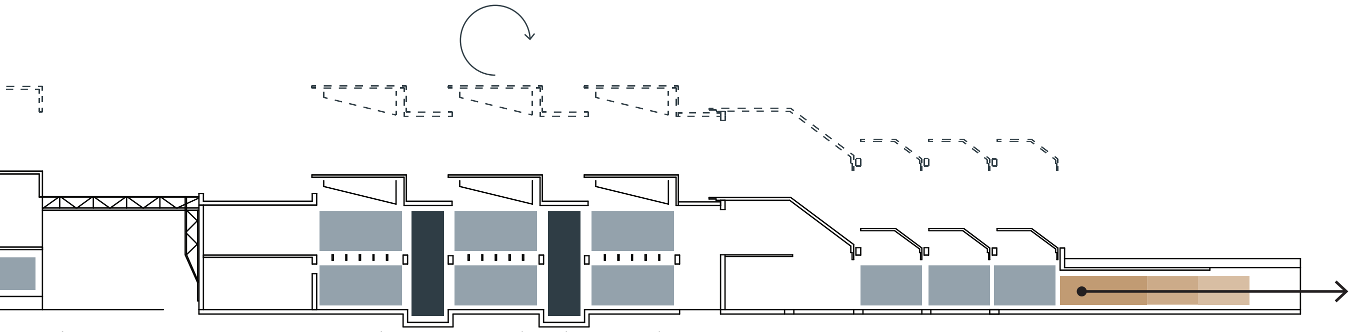


Fig. 6.50: Future prospect on long section(Author:2018)

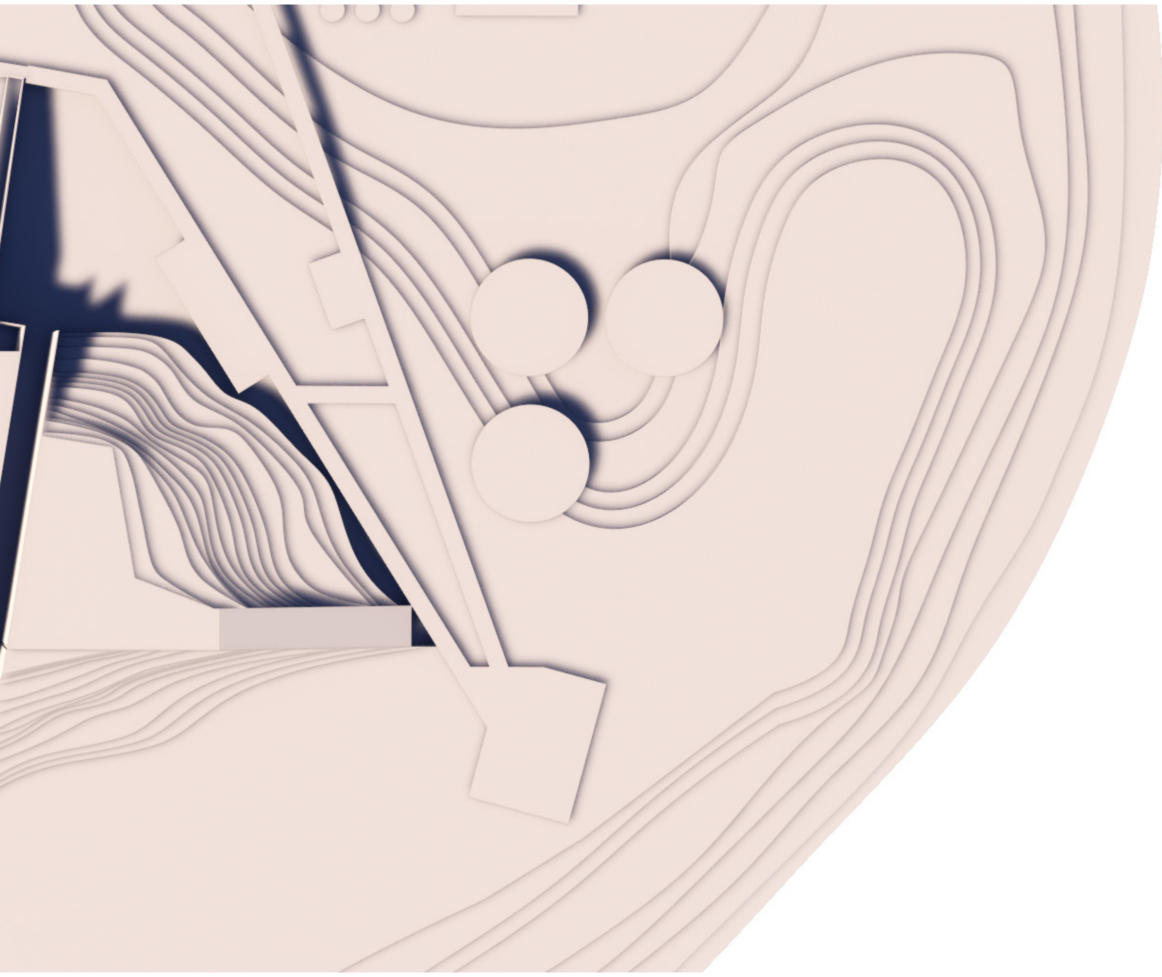


Fig. 6.51: Future prospect on site (Author:2018)

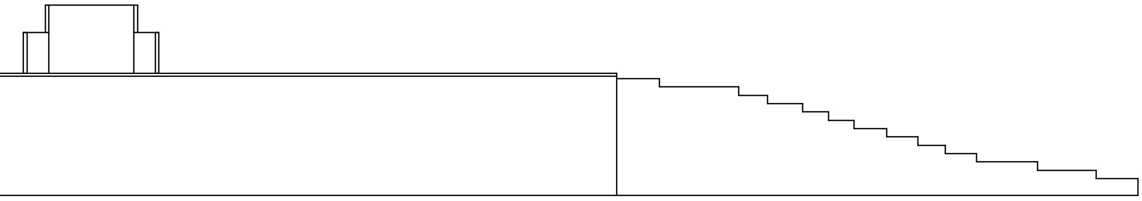


Fig. 6.52: Future prospect on short section (Author:2018)

FINAL DESIGN:
SOUTH WEST AXOMOMETRIC

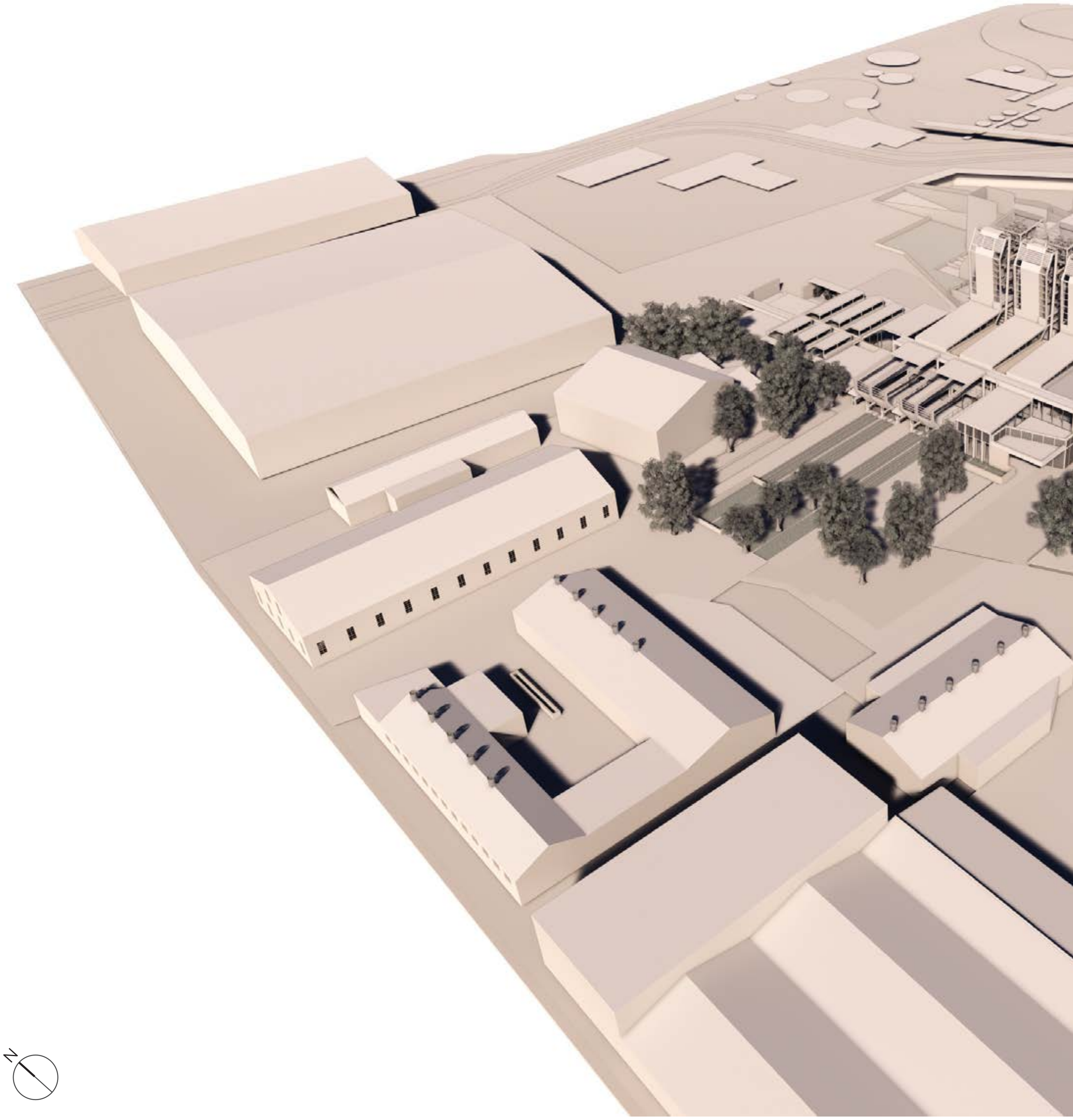


Fig. 6.53: Final design: South west axonometric (Author:2018)

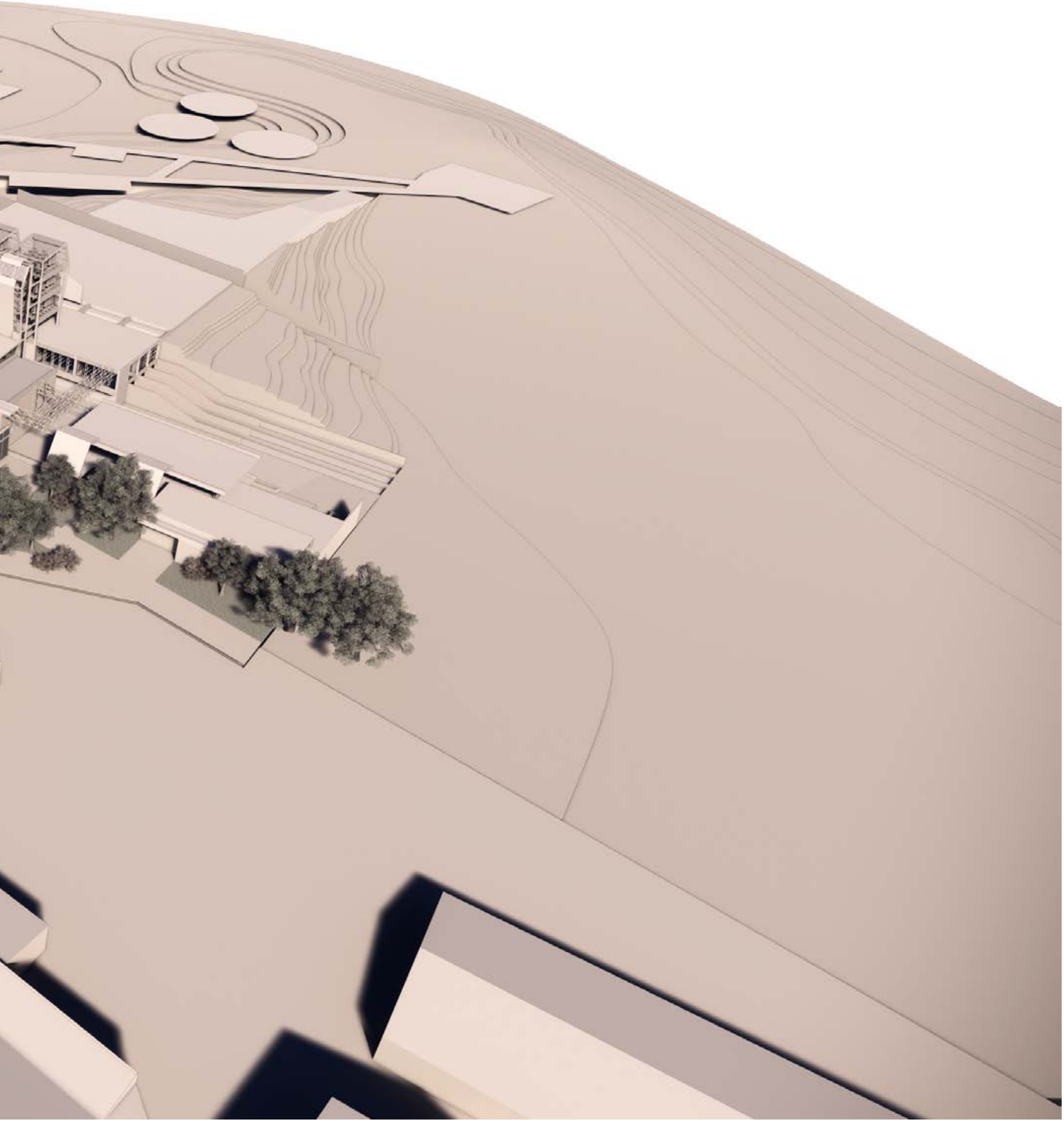
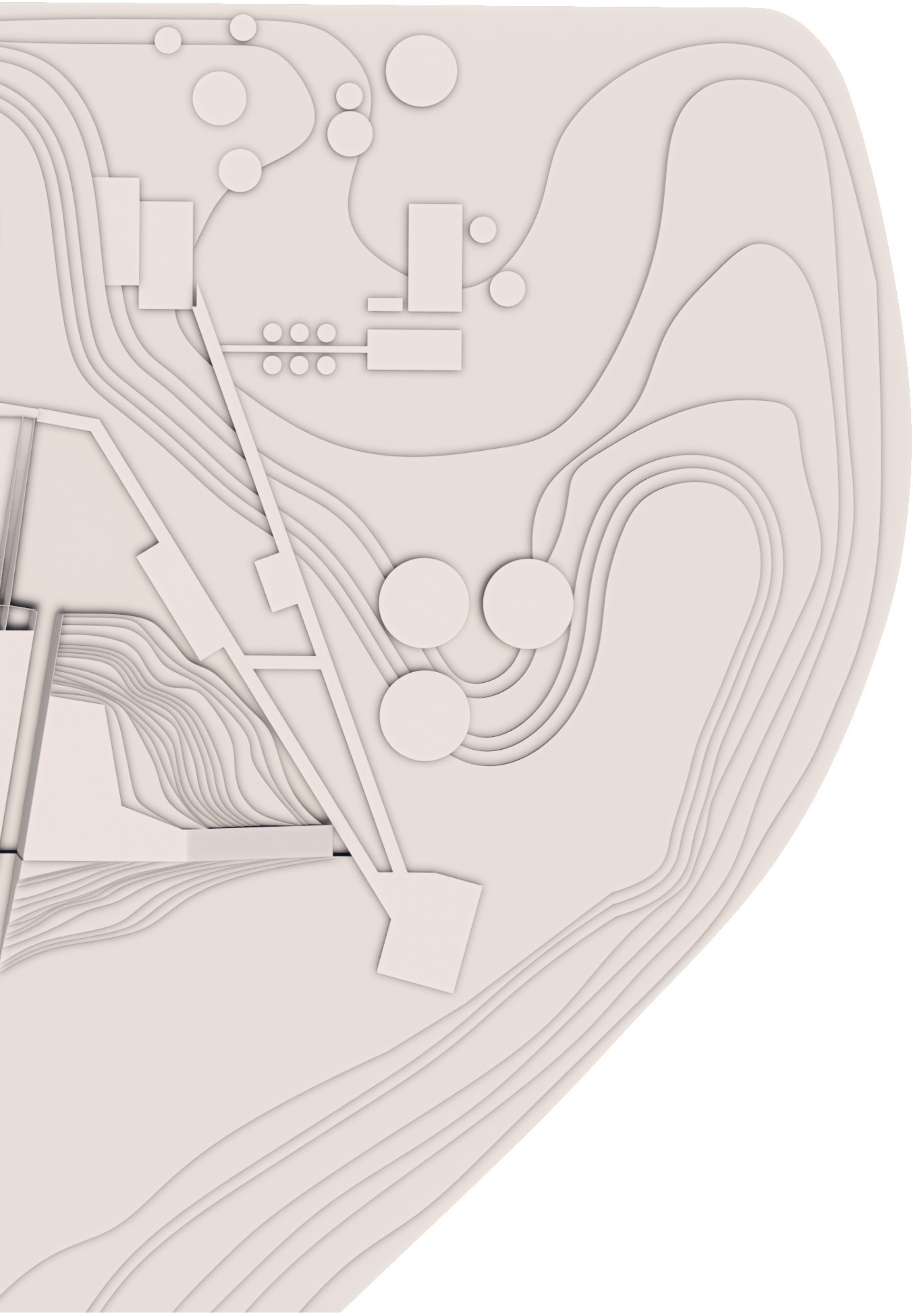


Fig. 6.54: Overview (Author:2018)



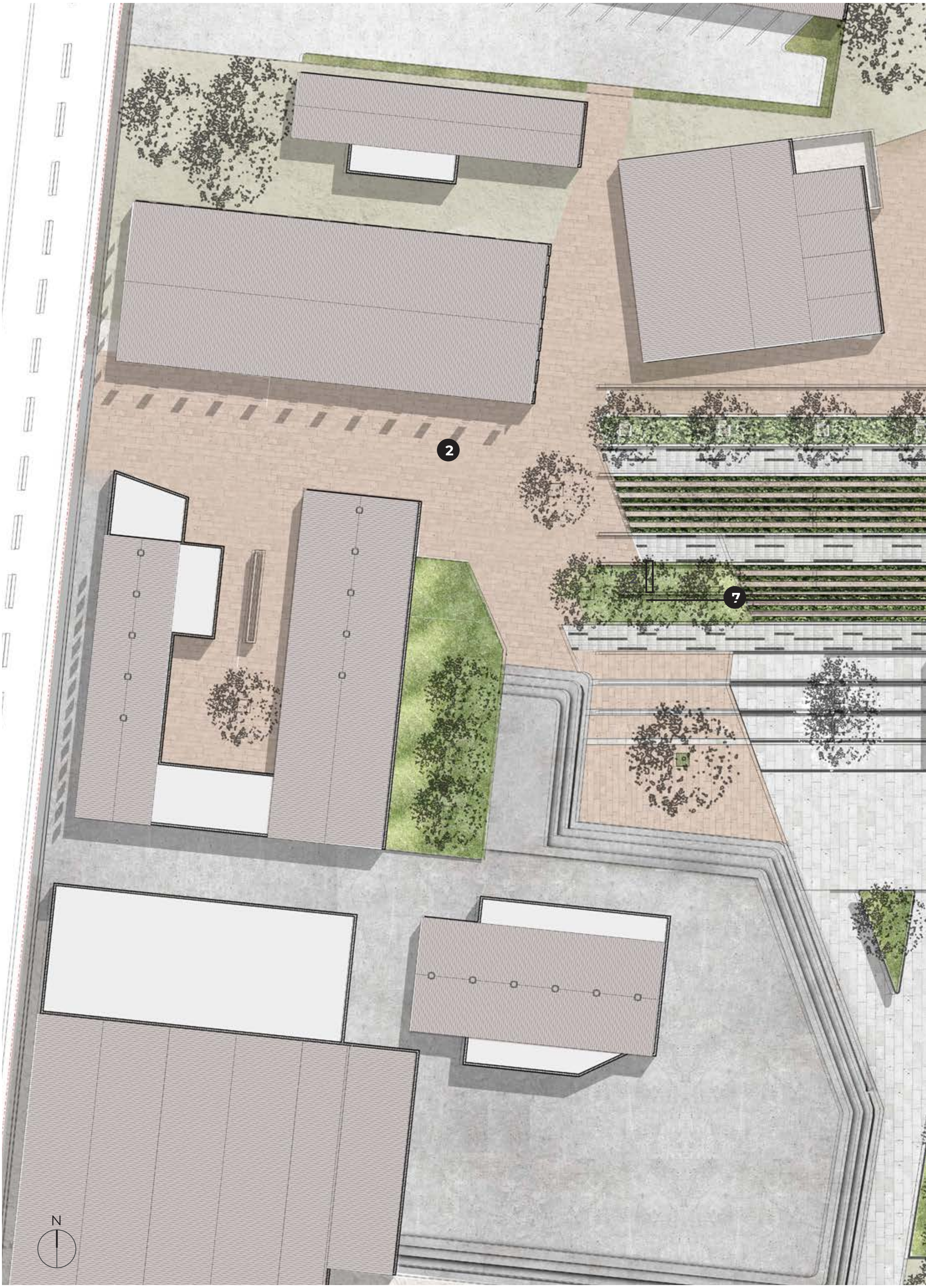
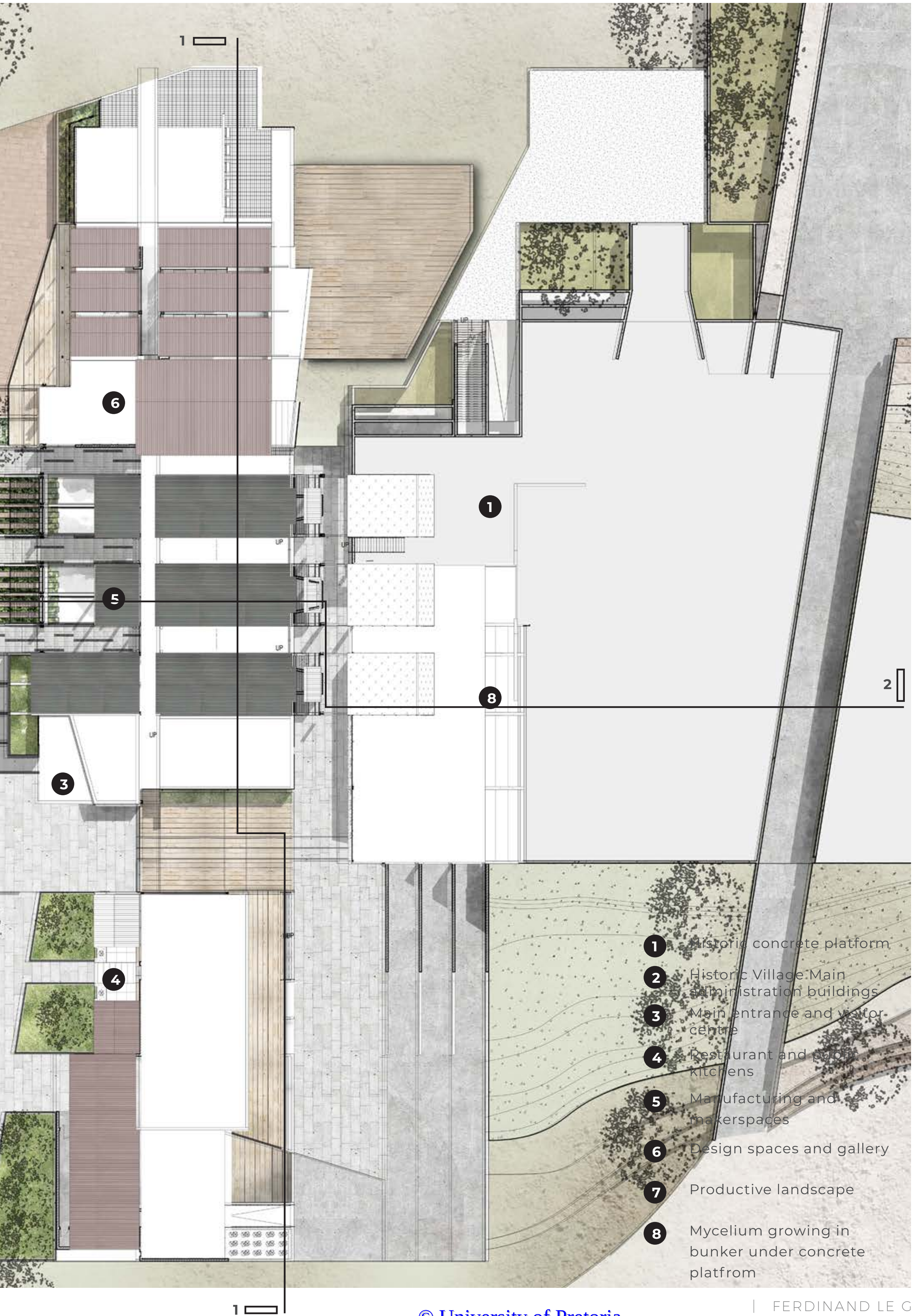


Fig. 6.55: Site plan (Scale 1:500, original drawing 1:200)(Author:2018)


1
1
2
UP
1 Historic concrete platform
2 Historic Village Main administration buildings
3 Main entrance and visitor centre
4 Restaurant and public kitchens
5 Manufacturing and makerspaces
6 Design spaces and gallery
7 Productive landscape
8 Mycelium growing in bunker under concrete platfrom

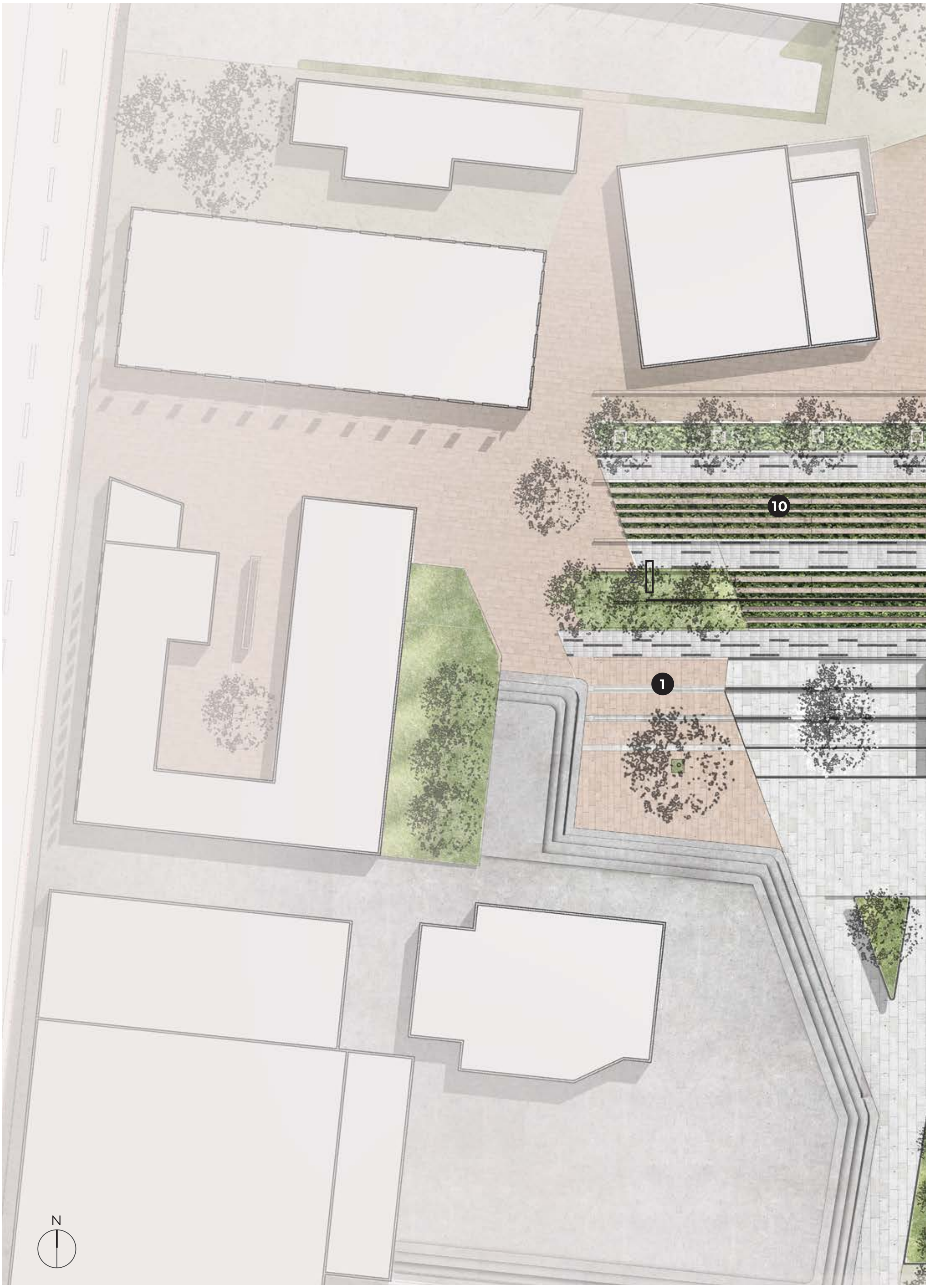
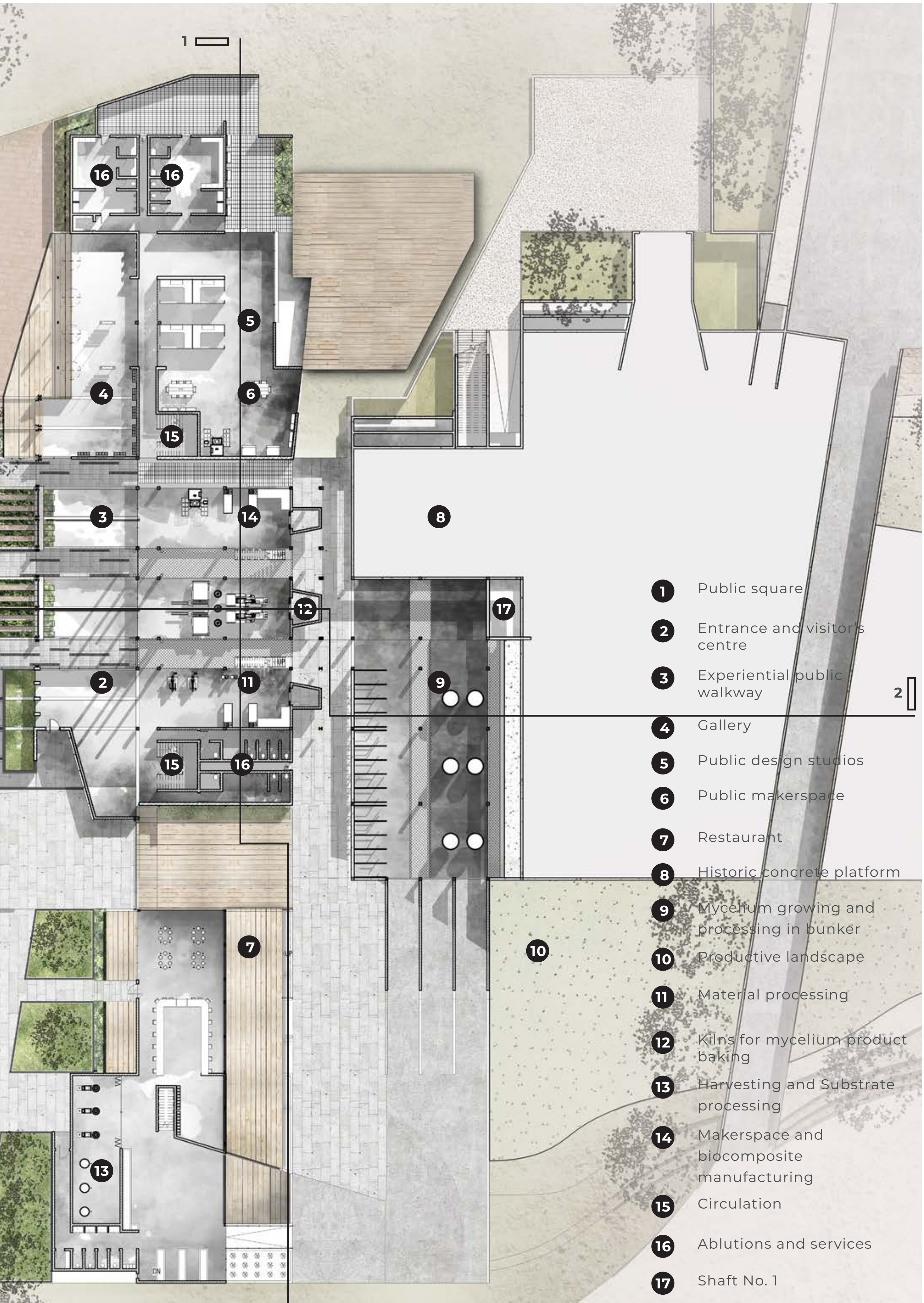


Fig. 6.56: Ground floor plan (Scale 1:500, original drawing 1:200)(Author:2018)



1 Public square
2 Entrance and visitor's centre
3 Experiential public walkway
4 Gallery
5 Public design studios
6 Public makerspace
7 Restaurant
8 Historic concrete platform
9 Mycelium growing and processing in bunker
10 Productive landscape
11 Material processing
12 Kilns for mycelium product baking
13 Harvesting and Substrate processing
14 Makerspace and biocomposite manufacturing
15 Circulation
16 Ablutions and services
17 Shaft No. 1

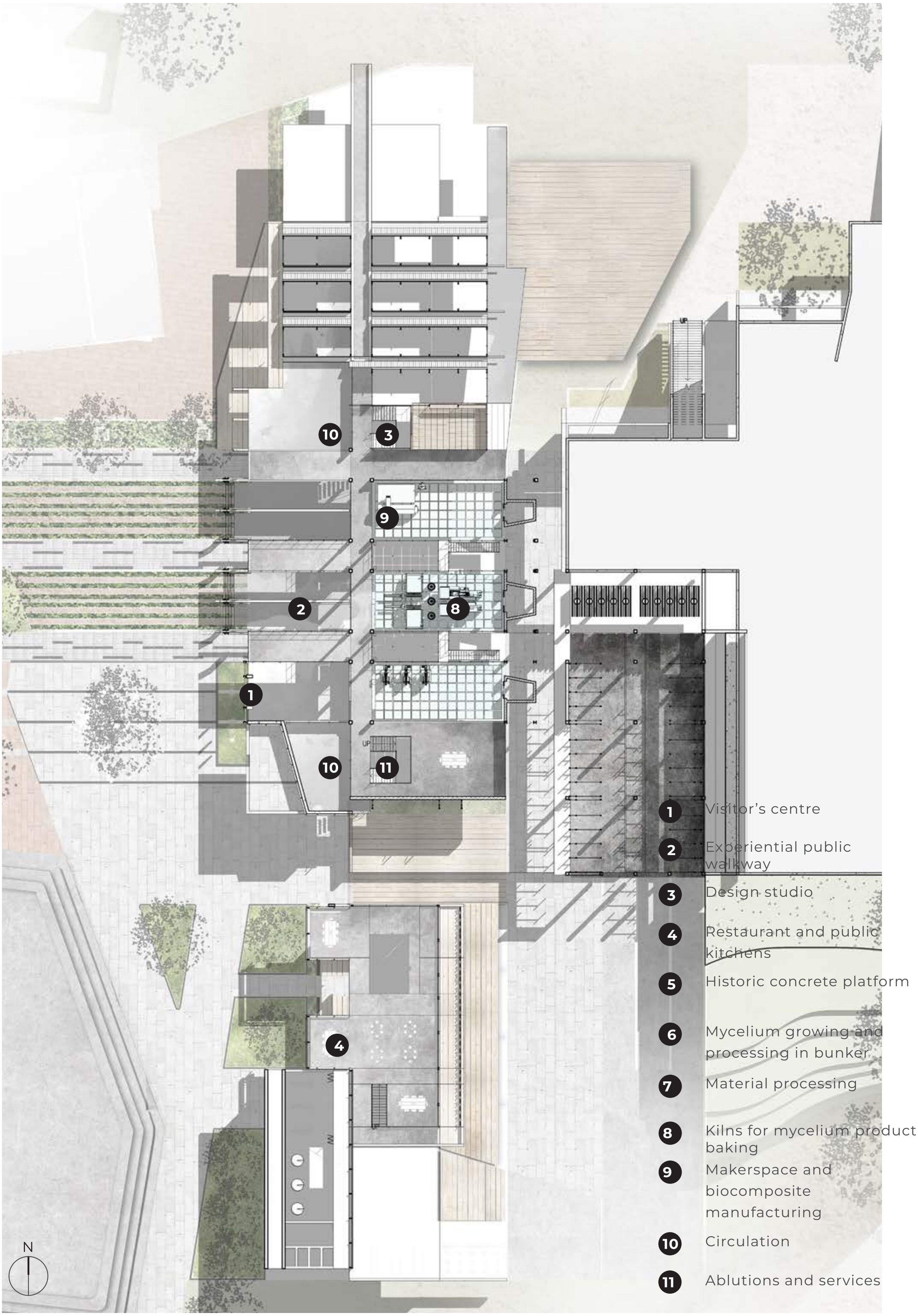


Fig. 6.57: First floor plan (Scale 1:500, original drawing 1:200) (Author:2018)

Fig. 6.58: Typical greenhouse and aquaponics floor plan (Scale 1:500, original drawing 1:200)(Author:2018)

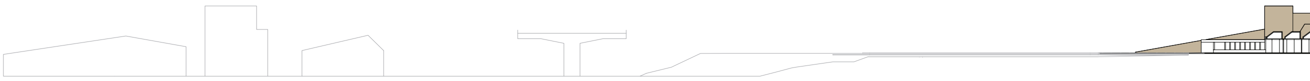


Fig. 6.59: West Elevation in context (Author:2018)

Fig. 6.60: West Elevation(Scale 1:400, original drawing at 1:100) (Author:2018)

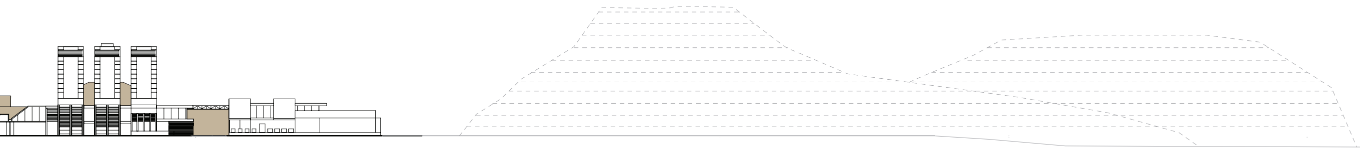


Fig. 6.61: Section 1 in context (Author:2018)

Fig. 6.62: Section 1 looking west from east (Scale 1:400, original drawing at 1:50) (Author:2018)

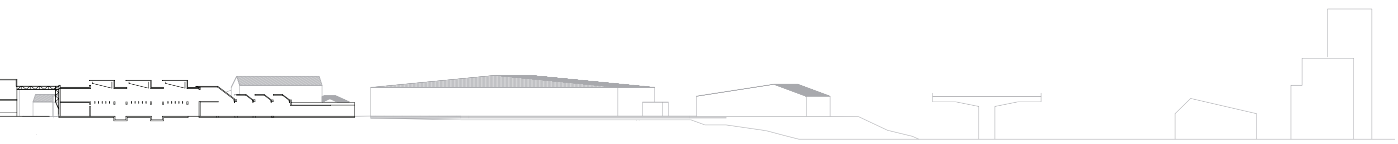


Fig. 6.63: Section 2 in context (Author:2018)

Fig. 6.64: Section 2 through tower and production space (Scale 1:200, original drawing at 1:50) (

Author:2018)

Fig. 6.65: Perspective of re-created historical footprints (Author:2018)

Fig. 6.66: Perspective of historical concrete platform and intervention (Author:2018)

Fig. 6.67: Perspective of greenhouse towers (Author:2018)

Fig. 6.68: Perspective of gallery and public square (Author:2018)

07

TECHNIFICATION

TECTONIC CONCEPT: LAYERED TECTONICS

LAYERING AS A PROPELLING PERMANENCE

Architecture is embedded in time and is affected by its passage. It therefore contributes to the growing and layering of the city over time. Rossi (1982:61) states that "the form of the city is always the form of a particular time of the city". Time forms part of Rossi's concept of permanence and relates to the transformation of the built environment, and implies the definition of a context contributed to by the interrelationship of past, present and future.

Buildings are permanent and primary role players in the growth and layering of the environment over time through their materiality. Rossi defines the slowing down of the urbanisation process as pathological, whereas the acceleration is defined as propelling (1982:6). Material layering over time has a catalytic effect on the development and urbanisation in the city whereas a stagnation of materiality is an inhibitor.

Pathological permanences in the city are idiosyncratic elements and preserved presences that are isolated within an isolated context, with rigid form and static usage. They are bound to a specific time period and are signifiers of a specific epoch in the historic course of the city.

While contributing to the memory of the city, these pathological elements are "unmodifiable artefacts whose dynamic linkage with the rest of the city is severed", due to the specificity of their function (Boyer 1996:187).

Propelling permanences, in contrast, transform from their original function and endure to become characteristic participants in the urban realm more generally. Due to their being defined by form, rather than original function or context, they are able to transform and accommodate multiple functions over time. It is because of their ability to remain as resilient formal structures with changing functionality that they manage to both condition the morphology of the city and remain as relevant focal points over time (Boyer 1996:187).

Therefore, propelling permanences ongoingly facilitate the past to be experienced in some way as layered records of time – even when the original function is altered and only form remains integral. These elements "serve to bring the past into the present, providing a past that can still be experienced" (Rossi 1982:6). Therefore, primary elements either boost or inhibit the understanding of they city in which architecture forms the additive components of the structure via the manifestation of the economic, social, political and historic complexities. Building typology and construction logic is therefore paramount to catalytic intervention.

Through tectonic ingenuity, the architect therefore becomes responsible for re-framing and re-defining the city through the analysis of these aspects through spatial design, which with memory, constitutes the armature of urban artefacts, contextual and spatial dynamism which cumulatively contributes to the making of place.

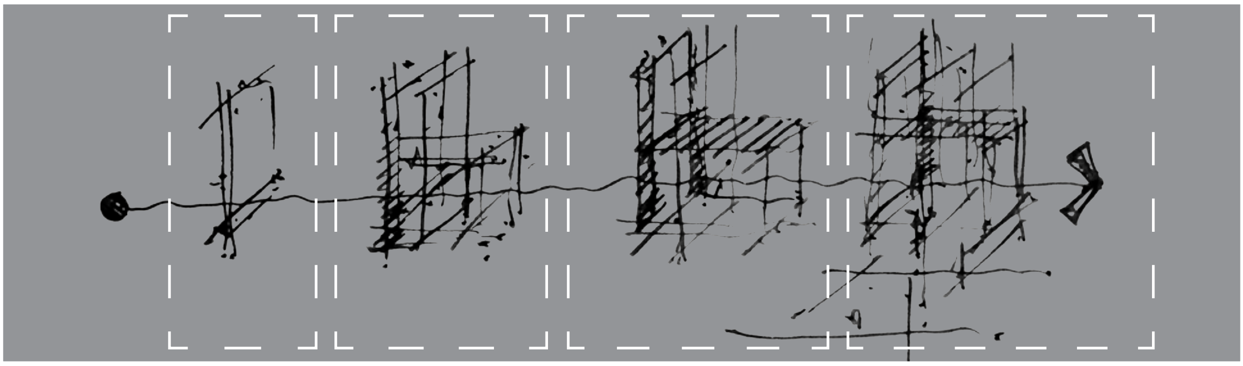


Fig. 7.1: Diagram of layering as a propelling permanence (Author:2018)

TECTONIC CONCEPT

Architecture's contribution to the layering of the city over time should be expressed in and driven by its materialisation. This aim of the design is to tectonically incorporate the layering of past and present while facilitating future layering ongoingly.

The tectonic concept is an extension of the Semper's four elements of architecture (hearth, roof, enclosure, mound) expressed as layered structure (Brand 1994). The project recognises that buildings are not static structures but rather layers which change at different rates. These rates of change are translated into a material strategy for dealing with the historic fabric as well as the proposed intervention.

The notion of material layering is expanded to include the layering in terms of:

-Ecological layers

-Tectonic layers

-Built heritage

-Industrial heritage

Fig. 7.2: Diagram of tectonic concept (Author:2018)

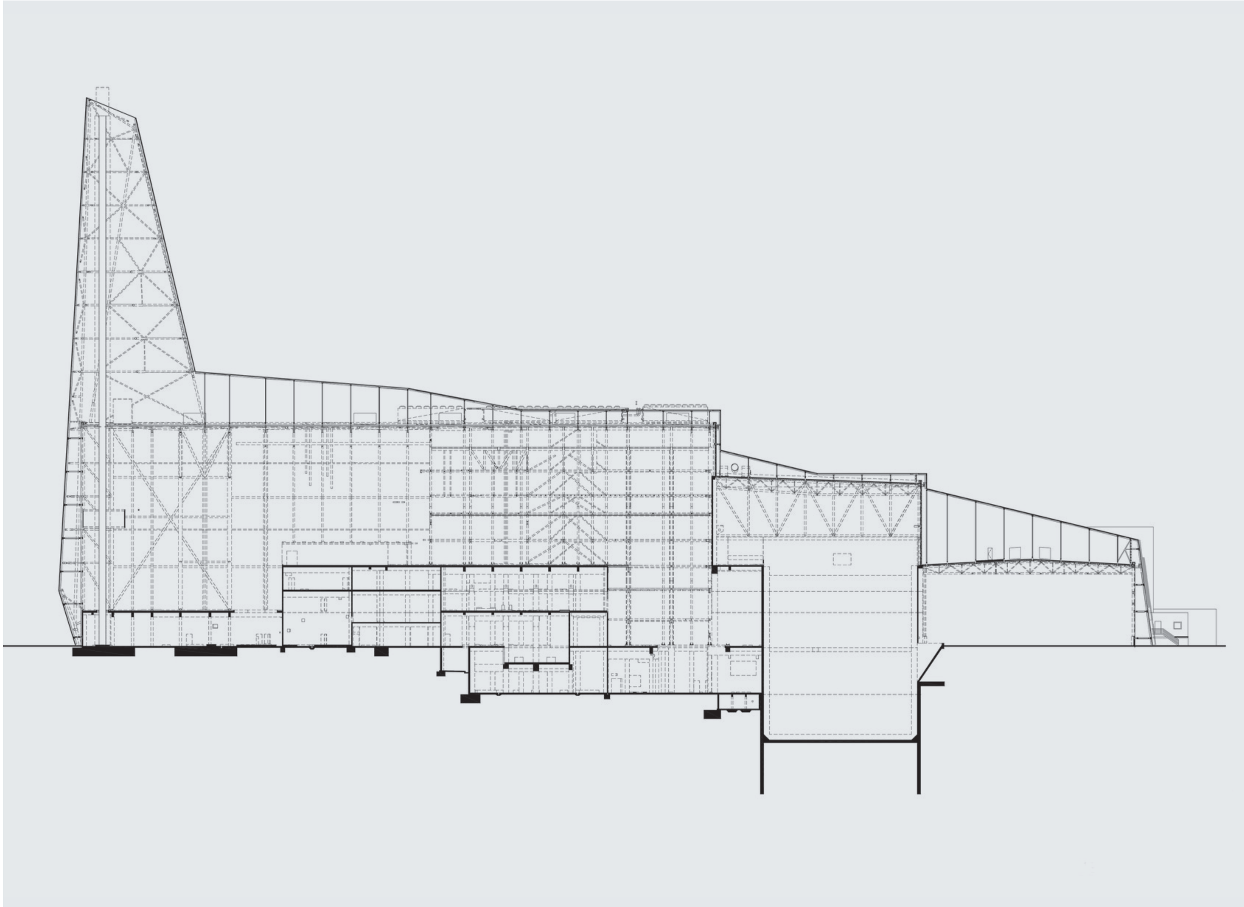


Fig. 7.3: Section of the incineration line (Archdaily:2014)

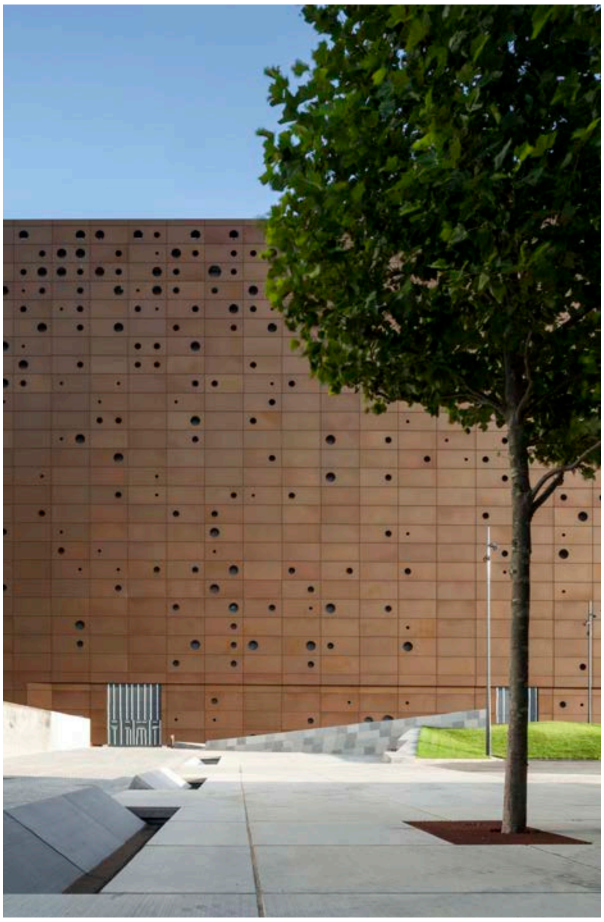


Fig. 7.4: Public space design (Archdaily:2014)

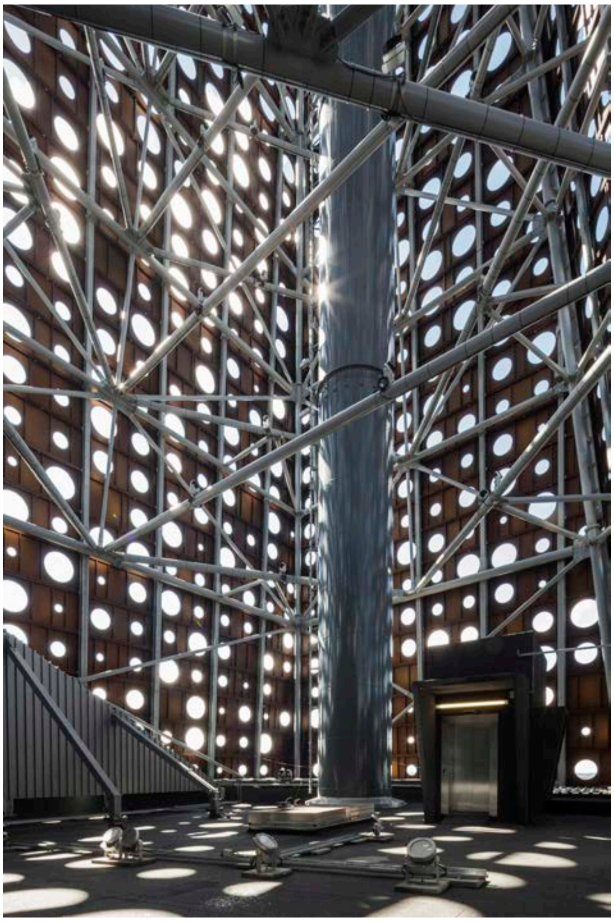


Fig. 7.5: Material separation (Archdaily:2014)

TECHNOLOGY PRECEDENT:
VAN EGERAAT- INCINERATION LINE IN ROSKILDE ERICK, DENMARK

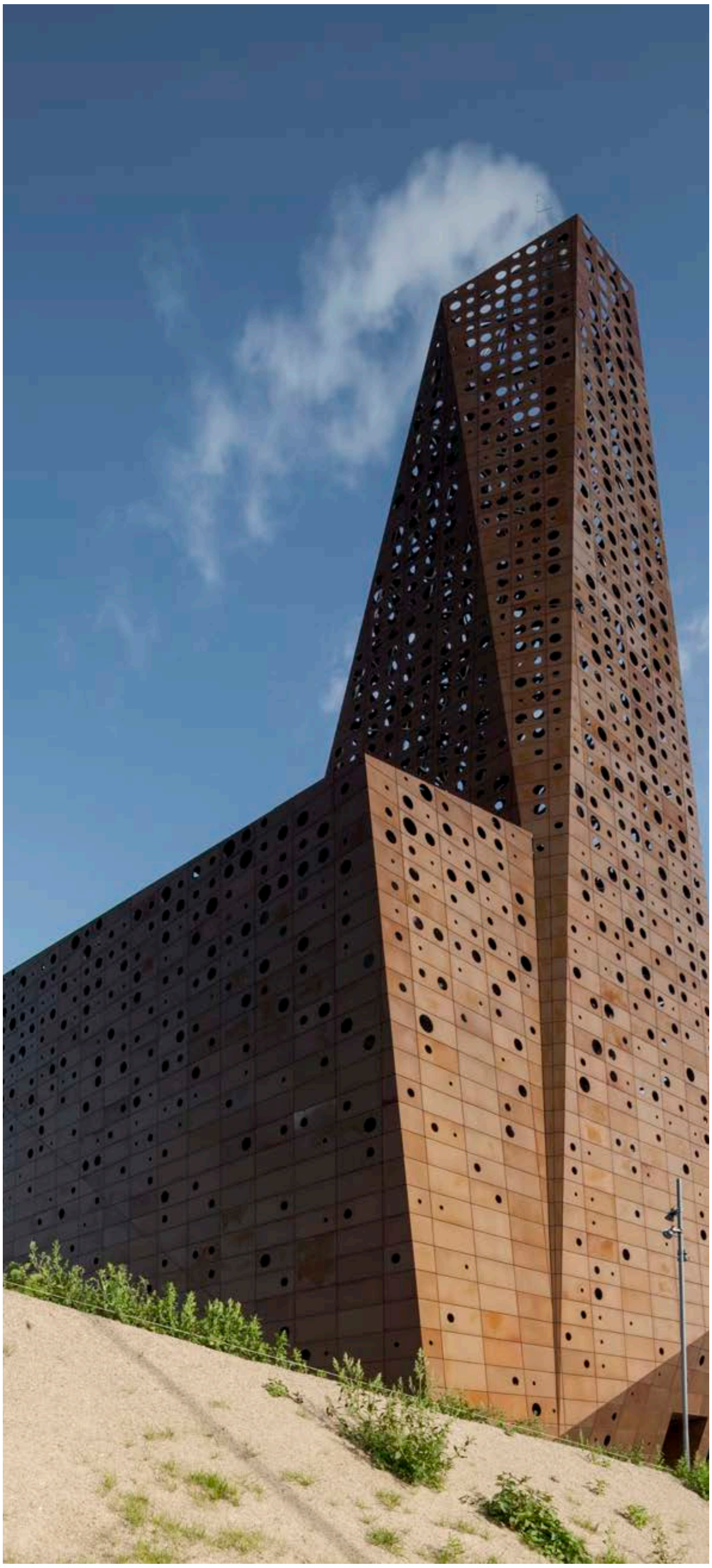


Fig. 7.6: Heritage response to surrounds (Archdaily:2014)

The incineration plant in Roskilde Erick is designed to facilitate the production of energy from waste. It does this through the incineration of various forms of waste (organic and inorganic). The process also results in heat energy which is supplied to the surrounding area.

The design challenge was to mediate the large form of the facility with the flat site and the relatively small scale of the surrounding area. To do so the facility's roof slopes from the industrial scale to the more domestic scale of the surrounds.

The facility is constructed next to a UNESCO protected cathedral. It makes a compelling case for the potential value added to surrounding communities through the provision of industrial and functional capacity.

THE INTERVENTION PRIORITISES THE SEPARATION OF LAYERS AS A VENTILATION STRATEGY AS WELL AS A MEANS OF ALLOWING FOR CHANGE OVER TIME.

The facade is constructed of two skins: the inner layer provides the climatic barrier while the outer skin of aluminium panels is treated more freely and has a more permeable nature.

The scheme aims to add value, in terms of energy and cultural relevance, to an otherwise purely industrial complex, thereby providing an invaluable lesson for the context at Village Main.

MATERIAL LAYERS:

EXISTING MATERIALITY

SITE

The ground of the site is either levelled earth or concrete slabs on top of the existing concrete podium. Due to it being unmaintained it has gone unmaintained and has weathered to the extent that plants now grow through cracks.

FLOORS

The historic floors of the site were constructed of red enamel painted concrete slabs. These were designed purely to carry large equipment loads and large numbers of people.

WALLS

The majority of the structural walls on the site are constructed of cast in-situ concrete. Large wooden planks were used as shuttering, giving them a distinctive coarse grain.

Fig. 7.7: Existing material palette (Author:2018)

ROOFS

The original roofs of the complex were constructed of S Profile corrugated iron. They were designed purely for economic efficiency and did not take thermal comfort into account. They were uninsulated and only made provision for the entry of light via saw-tooth roofs.

SKIN

Like the roofs, the original walls of the complex were constructed of S Profile corrugated iron. They were designed purely for economic efficiency and did not take thermal or visual comfort into account. They made no attempt to harness the views of the site or the possibilities of passive

TECHNOLOGY

The historic technology on the site was externalised and mono-functional. It focussed on the economical extraction of material resources and relied on a linear process resulting in waste.

NEW MATERIALITY

SITE

The condition of the weathering concrete is re-created in the use of permeable concrete pavers. These allow for the penetration of plants as well as a surface for pedestrian flow as well as the transportation of materials via carts.

FLOORS

The predominant floor treatment consists of treated and enamelled polished screed. In the case of the design studios, timber floors are used and clay brick pavers are used to provide legibility and entrance into the productive facility. Mentis grating is used for drainage.

WALLS

The new walls are cast in-situ concrete and brick depending on application. These provide stability and the structural base for the lighter enveloping layers of the skin and roofs. Their materiality recalls that of the existing buildings and platfrom but their form responds to the new programme.

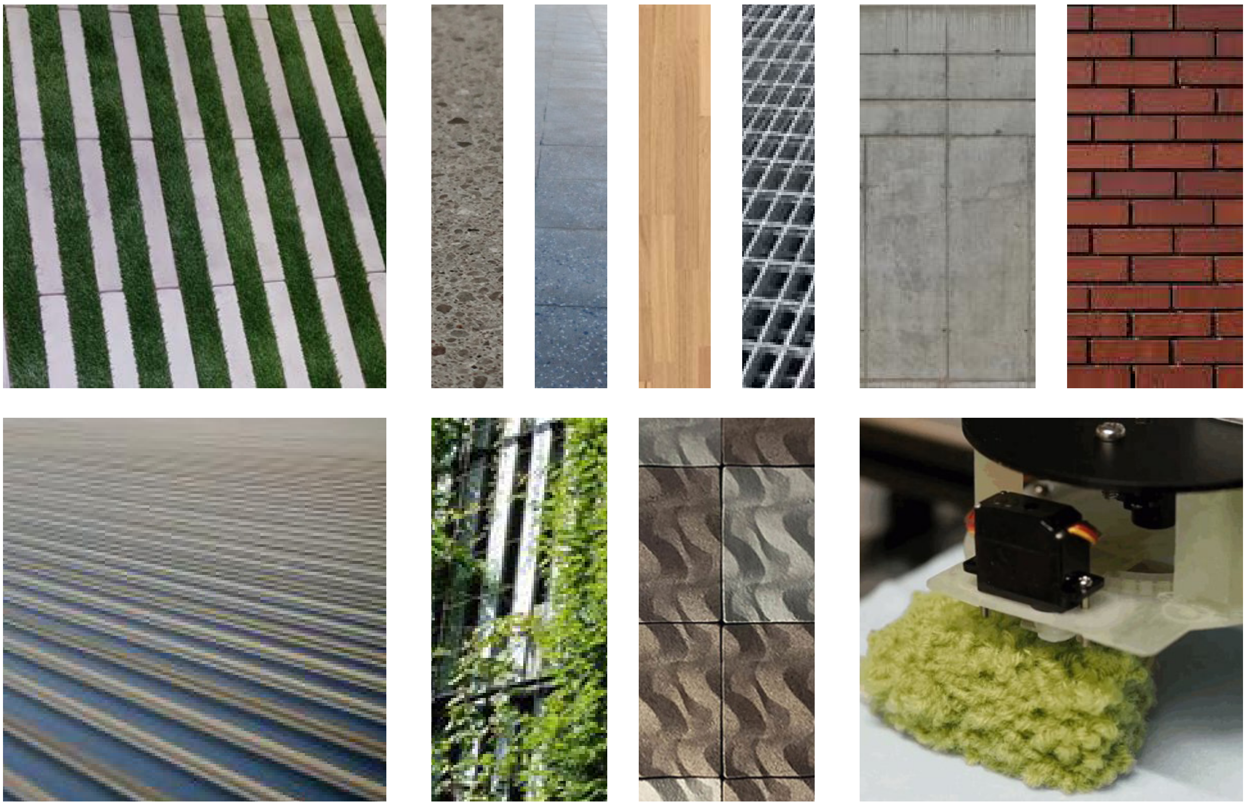


Fig. 7.8: New material palette (Author:2018)

ROOFS

The new roofs recall those of the original Village Main buildings in the design spaces as well as those of the restaurant space where S profile corrugated sheeting is used. In the new towers and production spaces, Zincalume GS 500 is used.

SKIN

The building has a second skin of glass and mycelium. This mediates the engagement between the internal productive spaces and the external landscape and historic site.

TECHNOLOGY

The new technology is incorporated into the design but in such a way as to be replaced and adapted over time. It makes use of renewable resources wherever possible and is part of a closed-loop material system.

LAYERS + RATES OF CHANGE

CENTURIES DECADES YEARS

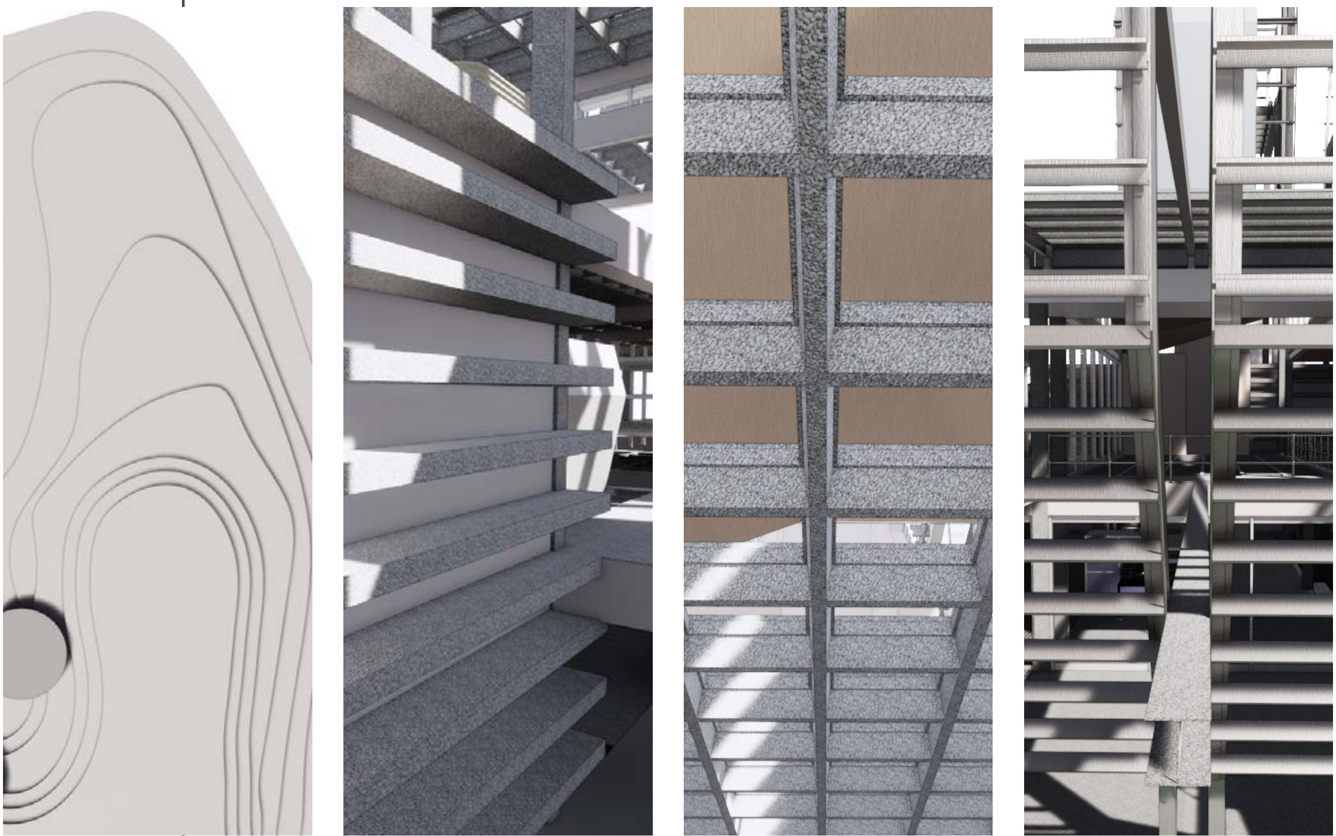


Fig. 7.9: Material palette transition from static to adaptable to impermanent (Author:2018)

SITE CAST CONCRETE COFFER SLAB STEEL

STEREOTOMIC + STATIC

The earth and the existing site is treated as the most static element of the scheme. Although sites do change over time, the existing condition is respected as a datum historically.

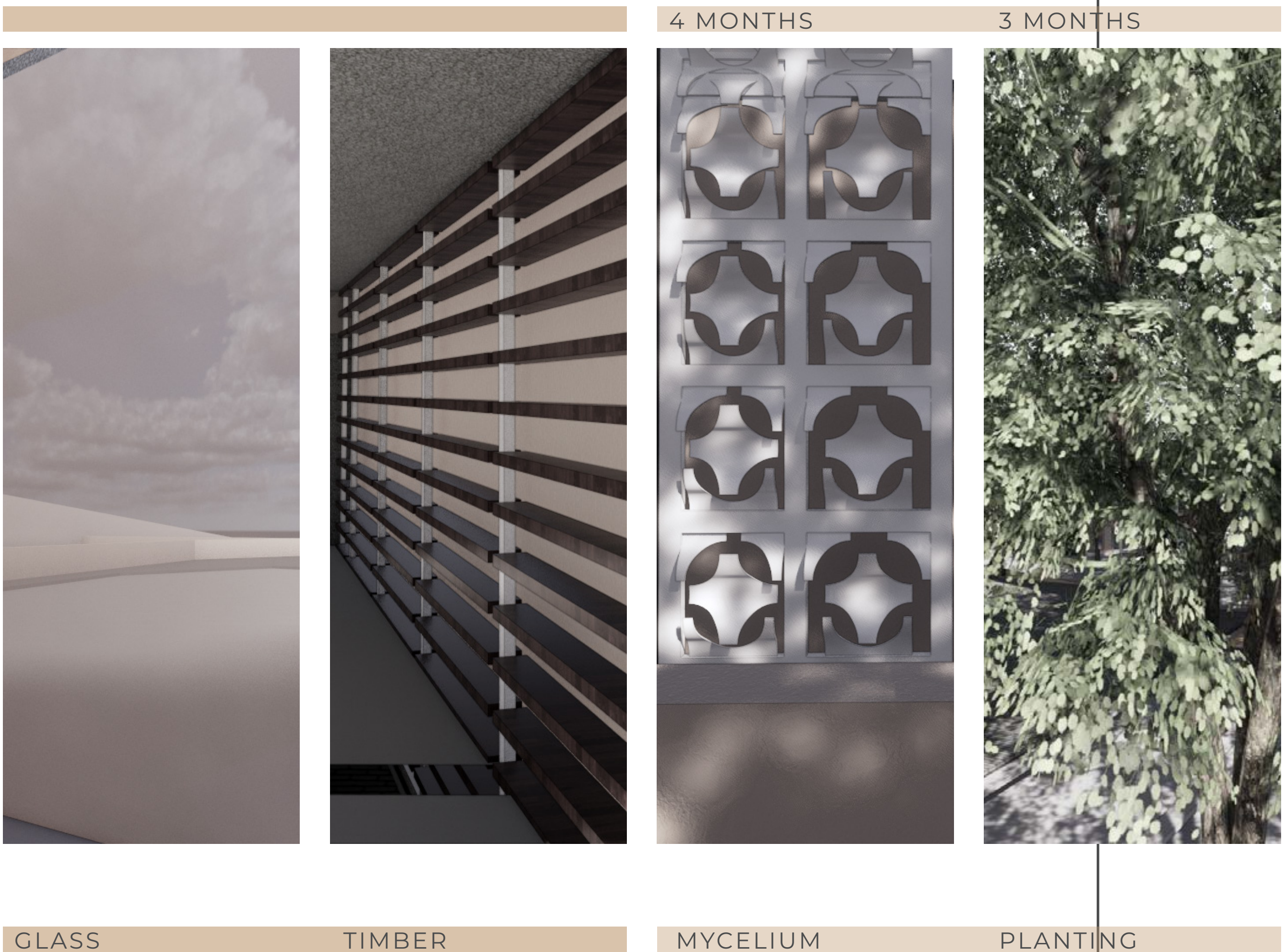
Cast in-situ concrete (whether existing or new) is also treated as a static and seldom changing entity. The concrete podium is used as a stable support and reference for the design and the addition of new concrete elements is approached as an extension of the original armature.

TECTONIC + ADAPTABLE

The tectonic elements of the desi
for change over time. They are tre
more static elements (earth and c

Concrete coffer slabs are treated a
able to either be used in their con
for the inclusion of floor panels ei

Steel is used for primary and seco
is used for certain floors and inter



NATURAL + IMPERMANENT

gn are able to offer more capacity
ated as mediators between the
cast in-situ concrete).

as the transition point as they are
nventional state or with space left
ther of glass or mentis grating.

ndary structural layers while timber
ior fittings.

The scheme's productive programme is premised on the growth of plants and mycelium as the input for a biocomposite production space.

These plants provide a monthly canvas change for the scheme. Plants change seasonally (every 3 months) whereas myclium elements have a 4 month lifespan. At the end of the cycle, these elements are returned to the productive landscape as compost.

STRUCTURAL LAYERS

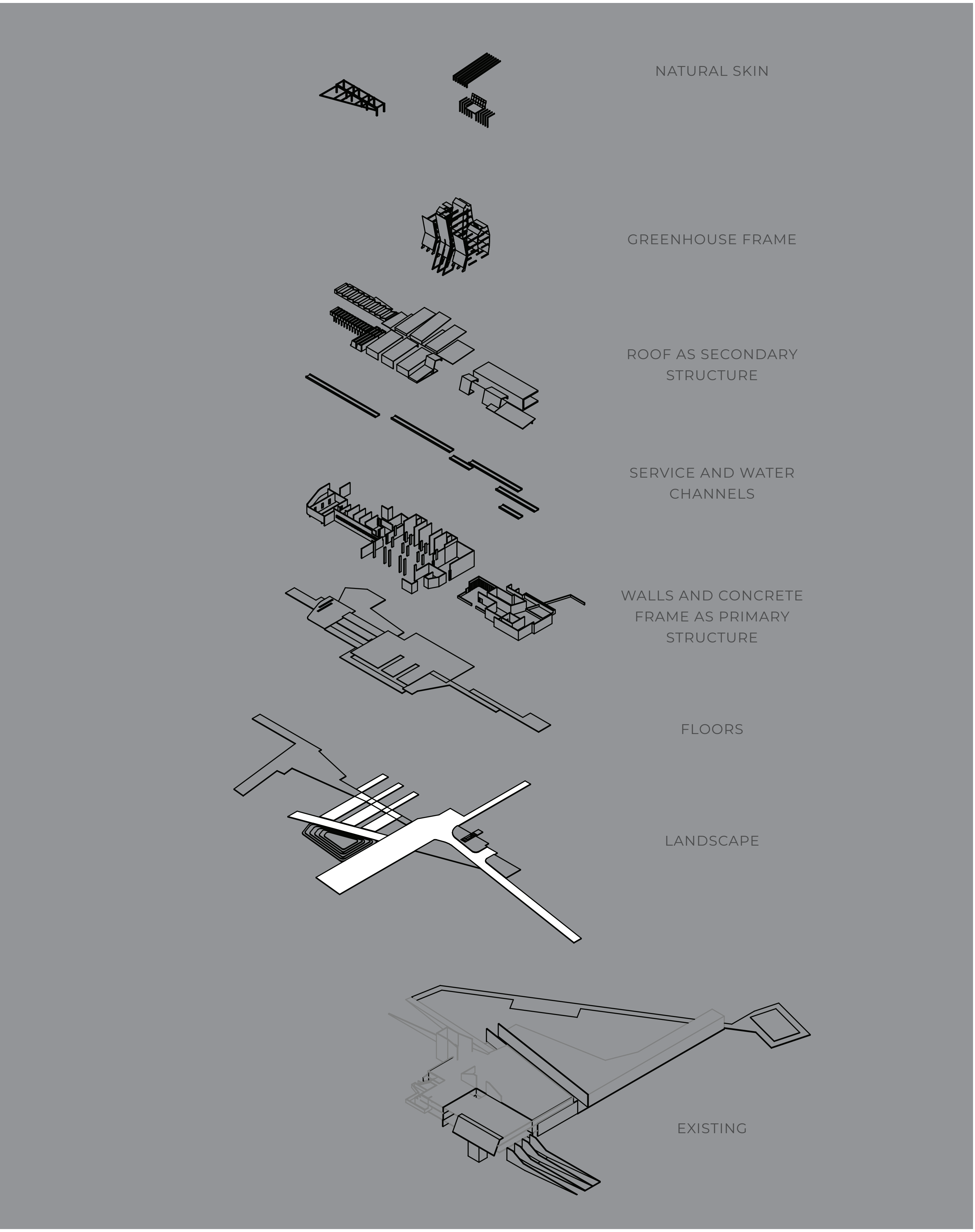
The architecture is conceived and composed of a series of layers, each with associated lifespans, heritage and permanence.

The primary structure consists of an existing stone and earth podium alongside which concrete and brick hearth walls form the key armature.

The secondary structure consists of steel and timber portal frames.

The skin (at times constructed of mycelium) acts as a layered transition between the operational landscape and the mechanical processes within.

Fig. 7.10: Structural and material layers of the design (Author:2018)


NATURAL SKIN
GREENHOUSE FRAME
ROOF AS SECONDARY STRUCTURE
SERVICE AND WATER CHANNELS
WALLS AND CONCRETE FRAME AS PRIMARY STRUCTURE
FLOORS
LANDSCAPE
EXISTING

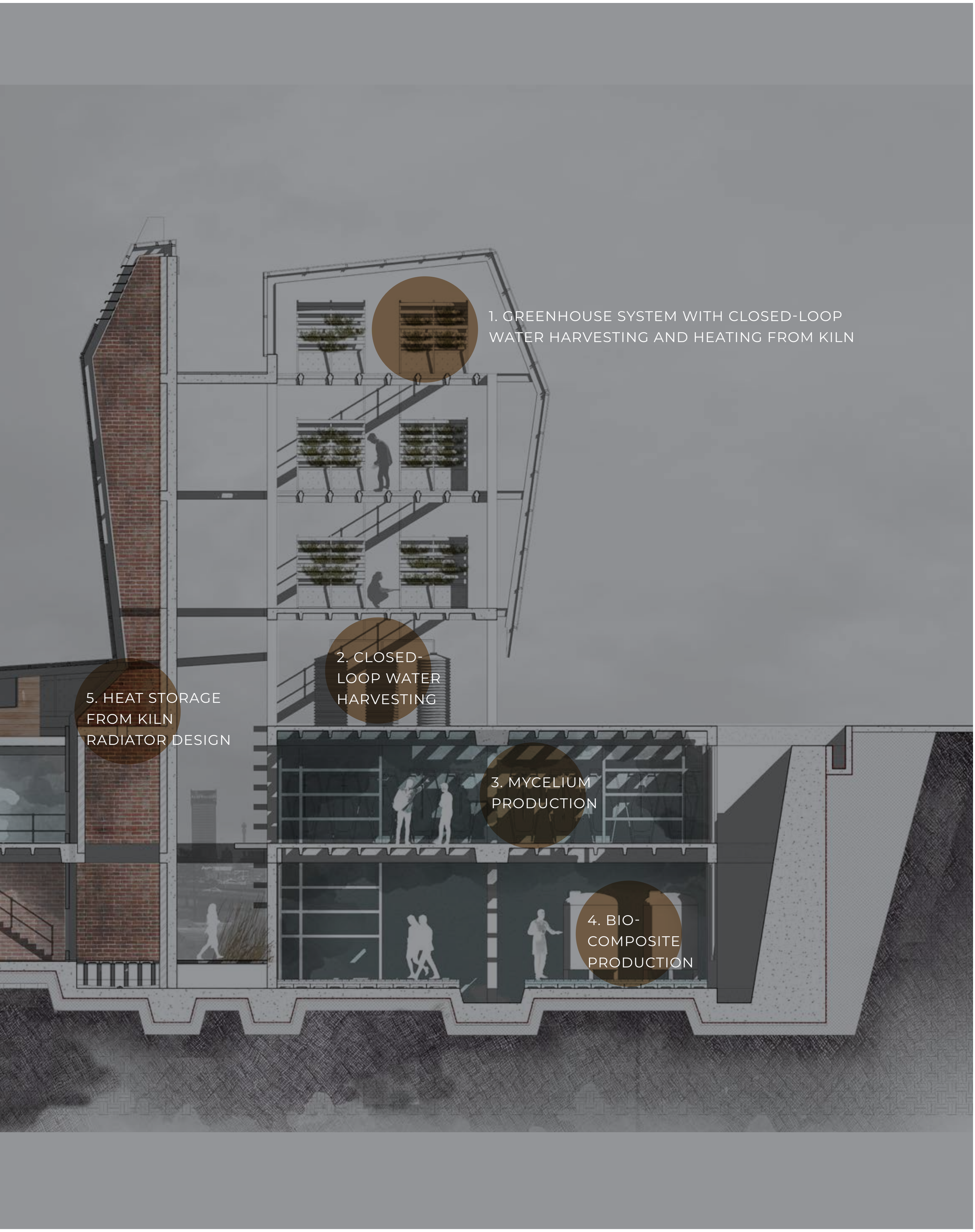
PRODUCTIVE + REGENERATIVE SYSTEM LAYERS

The systems of the building are primarily focussed on mycelium, both as a form of myco-remediation of polluted soil and as a bio-composite material for micro-production. The building prioritises natural systems and aims to counter the extractive logic of the mining past of the site by developing a closed-loop system.

Mycelium is grown underground (in the existing concrete podium) and is then processed in the new facility before becoming products for the skin, insulation and partitioning.

The greenhouse tower houses the growing of fibres for the use in bio-composite manufacturing processes. Both the mycelium and extra fibres are eventually composted and returned to the closed-loop.

Fig. 7.11: Productive and regenerative layers of the design (Author:2018) (Kiln radiator design influenced by (Koch, 2012)


1. GREENHOUSE SYSTEM WITH CLOSED-LOOP WATER HARVESTING AND HEATING FROM KILN
2. CLOSED-LOOP WATER HARVESTING
3. MYCELIUM PRODUCTION
4. BIO-COMPOSITE PRODUCTION
5. HEAT STORAGE FROM KILN RADIATOR DESIGN

PRODUCTIVE SYSTEM:
PLANTING PALETTE

Fig. 7.12: Planting section (Scale 1:300, original drawing 1:50) (Author:2018)

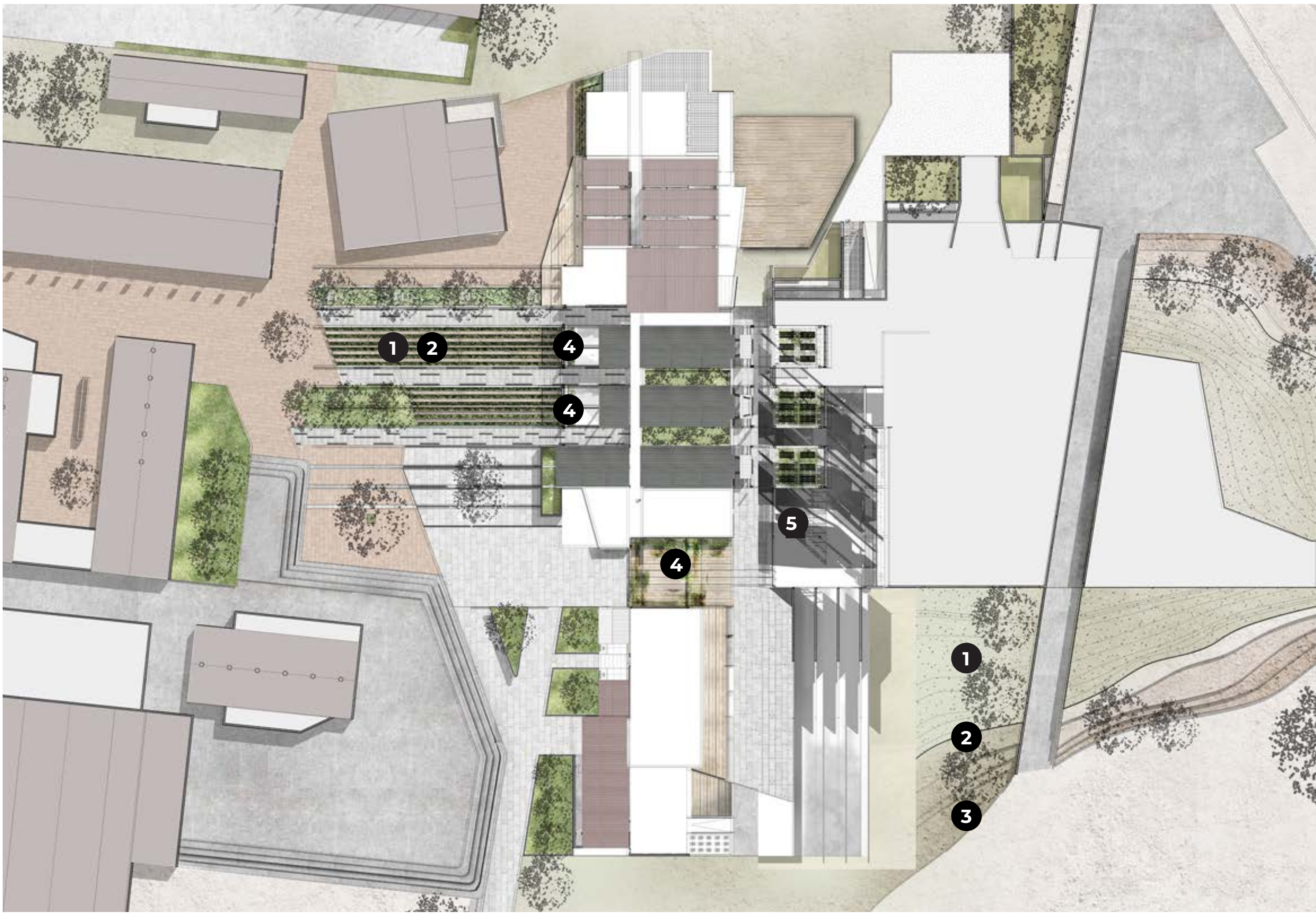


Fig. 7.13: Planting plan Scale 1:1000 (Author:2018)

PLANTS FOR BIO-COMPOSITES

The planting palette is predominantly selected for the capacity of the plants to contribute to the productive programme and the material required for the maker-spaces. Plants rich in fibre are favoured for this purpose.

The planting palette is designed to maximise the unique potential of the site and the varying light conditions. Mycelium requires dark and is therefore grown in the bunker of the concrete platform, underground. Agave requires the most light and is allocated the highest level of the vertical greenhouse.

Fig. 7.14: Agave (Mexico News Daily:2018)

NAME: AGAVE (ASPARAGACEAE)

PROPERTIES + USE:
Biomass, fiber, rope, sweeteners, liquor, bio-fuel

SIZE:
1.2m tall, 1.2m wide

WATER + GROWTH:
Light to moderate (unglazed clay pots to allow evaporation).

LEVEL OF LIGHT REQUIRED: 32,000- 130,000 lux

TYPE OF LIGHT REQUIRED: Direct, full sun

Fig. 7.15: Flax (Arrowseed:2018)

NAME: FLAX (LINUM USITATISSIMUM)

PROPERTIES + USE:
Biomass, fiber, linseed oil

SIZE:
1,2m tall, extremely slender

WATER + GROWTH:
200mm per growing season

LEVEL OF LIGHT REQUIRED: 32,000- 100,000 lux

TYPE OF LIGHT REQUIRED: Direct, full sun

Fig. 7.16: Hemp (Labroots:2018)

NAME: HEMP (CANNABIS SATIVA)

PROPERTIES + USE:
Biomass, fiber, oils

SIZE:
2-4m tall, 600mm wide under cultivation

WATER + GROWTH:
Little irrigation required

LEVEL OF LIGHT REQUIRED: 25,000- 32,000 lux

TYPE OF LIGHT REQUIRED: Direct

Fig. 7.17: Flax (Plantinfo:2018)

NAME: FICUS PUMILA (CREEPING FIG)

PROPERTIES + USE:
Facade cover, ground cover, fruit

SIZE:
Leaves increase in size with age, covers facade

WATER + GROWTH:
Moderate water

LEVEL OF LIGHT REQUIRED: 32,000- 100,000 lux

TYPE OF LIGHT REQUIRED: Half sun

Fig. 7.18: Mycelium (Wikimedia:2018)

NAME: MYCELIUM

PROPERTIES + USE:
Biomass, fiber, food

SIZE:
Grow to the size of the environment/container

WATER + GROWTH:
Light, grown in dark bags to retain moisture and keep light out.

LEVEL OF LIGHT REQUIRED: 25,000- 100,000 lux

TYPE OF LIGHT REQUIRED: Protected in growing bags

PRODUCTIVE SYSTEM:
PLANTING TO PRODUCT

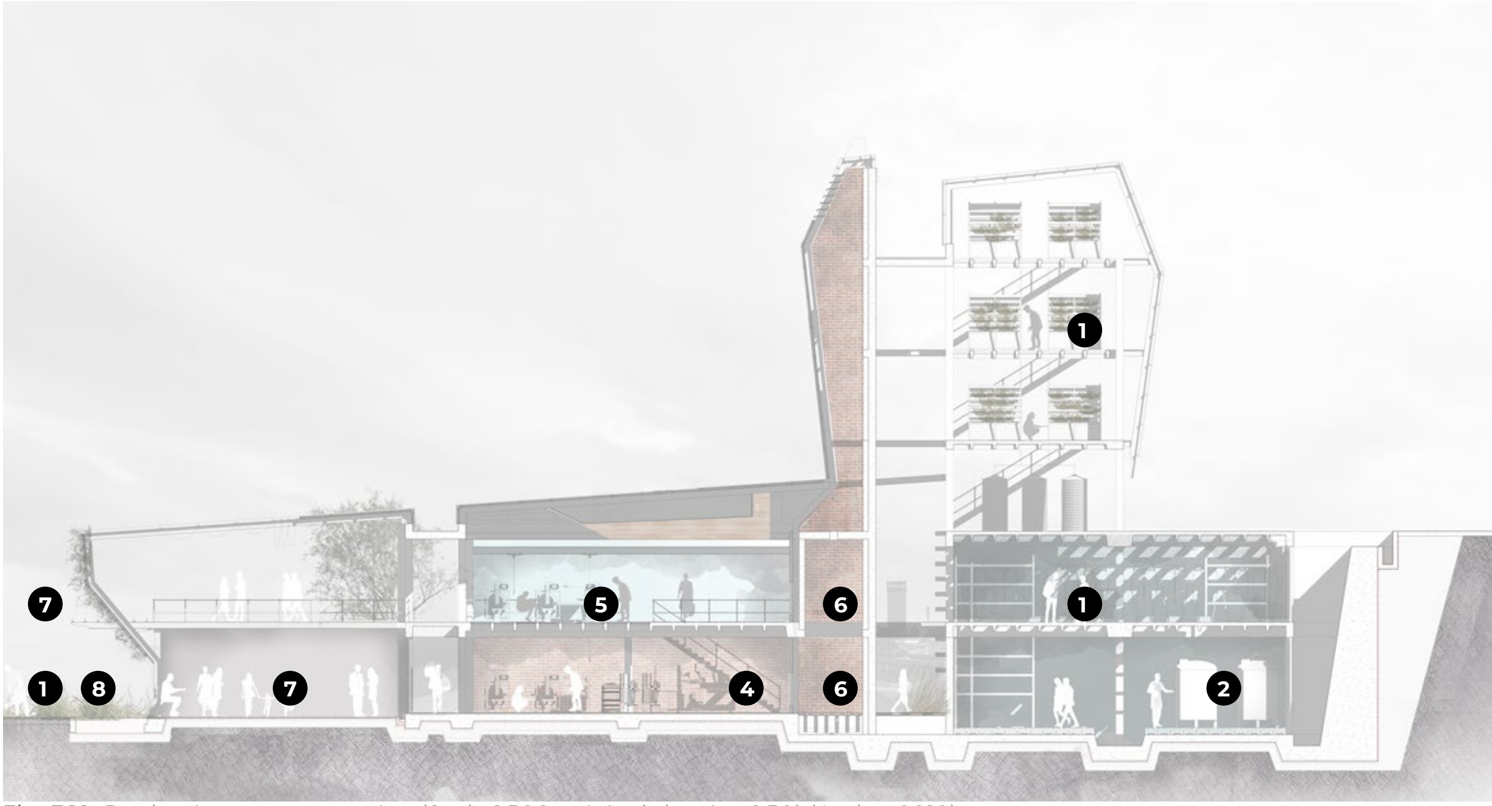


Fig. 7.19: Production systems section (Scale 1:300, original drawing 1:50) (Author:2018)

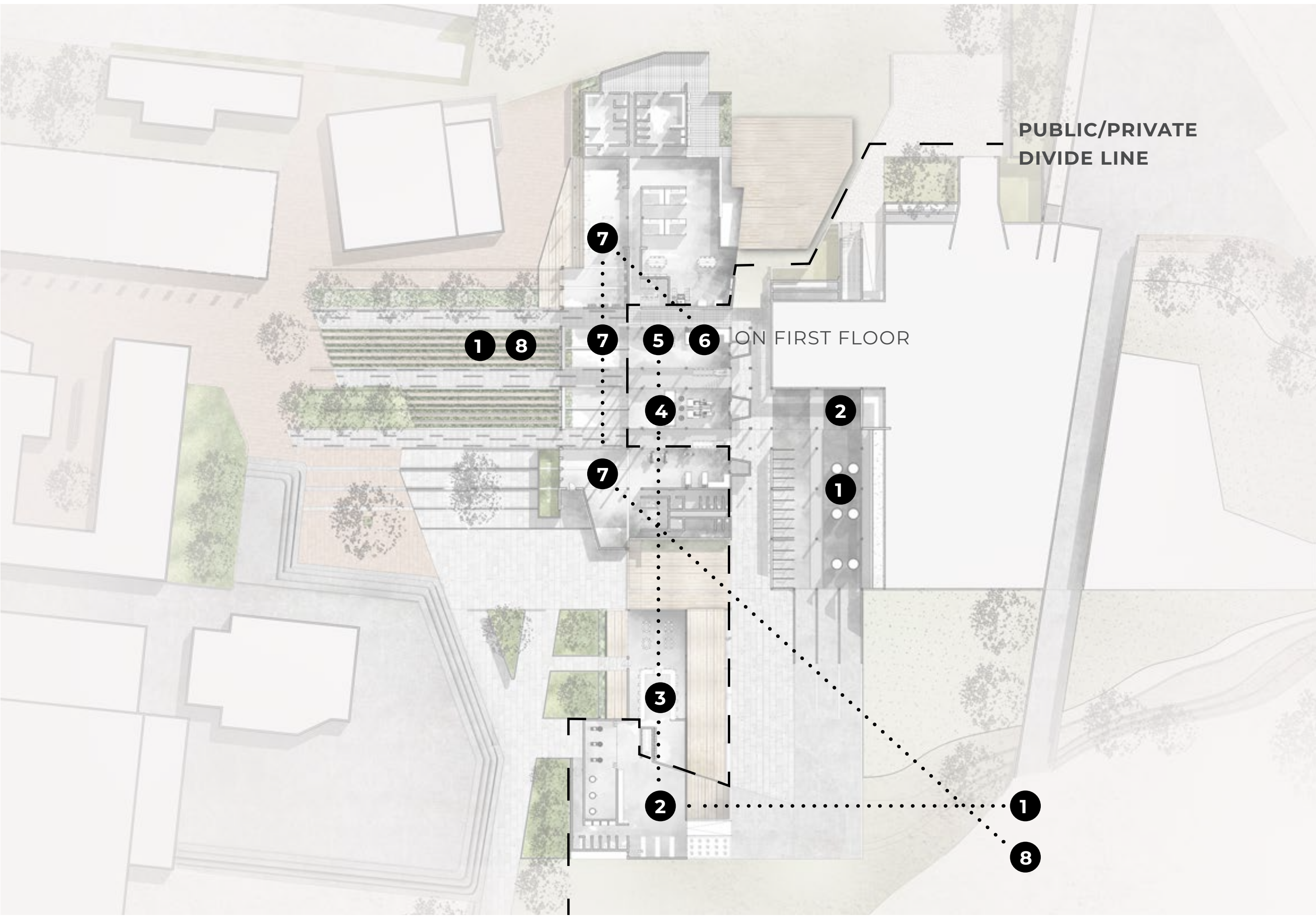


Fig. 7.20: Productive systems plan (Scale 1:1000, original drawing 1:200) (Author:2018)

MYCELIUM SCREEN

The mycelium screens are comprised of panels slotted into steel screens. The panels get their form from 3D printed moulds inside which the mycelium and substrate grows. The panels are placed on external facades and are exposed to the elements. They therefore have a four month lifespan. When they begin degrading they are returned to the composting loop.

BIO-COMPOSITE INSULATION PANEL

The bio-composite panels are manufactured from a combination of mycelium cores and outer panels created from a natural resin and fibre combination. The fibres either come from hemp, agave or flax. The panels are modular and can either be used as ceiling insulation or on walls. They have properties and densities suitable for sound or heat insulation.

MYCELIUM FITTINGS

The mycelium fittings are manufactured from a mixture of used coffee as substrate which is placed into a 3D printed mould. As it grows, it adopts the shape. The moulded material is then fired in a kiln to stabilise the product and prevent further growth. The products are then installed in or on the building where they have a lifespan of 4 months if exposed to water and years if not.

Fig. 7.21: Mycelium and bio-composite products (Author:2018)

THE CLOSED-LOOP BIO-COMPOSITE PRODUCTIVE SYSTEM

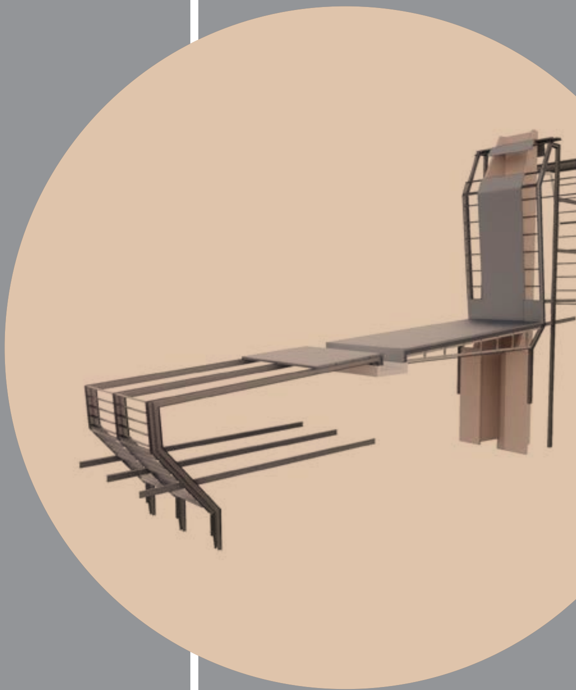
1. **Growth of plants and mycelium:** this happens in the productive landscape, tower or underground depending on the plant
2. **Harvesting and fibre processing:** this involves redeeming the fibre and returning the remaining material to landscape as compost
3. **Substrate collection:** this involves the collection of substrate from the restaurant in the form of used coffee beans specifically for the use in the mycelium products
4. **Combination of substrates, fibres and natural resins:** depending on the product fibres are combined with natural resins in moulds or mycelium is combined with substrate in moulds
5. **Mould design and manufacture:** product moulds are designed and then 3D printed
6. **Product manufacture:** products are manufactured using a combination of high and low-tech machinery, mycelium products are fired in the kiln to finish and stabilise
7. **Installation and exhibition:** products are installed in or on the building as educational examples of alternative building technologies
8. **Recycling and composting:** natural products are eventually returned to the composting and manufacturing loop

Fig. 7.22: Closed-loop bio-composite production process (Author:2018) (Based on Ecovative in SBIR (2015))

Fig. 7.23: Perspective of harrvesting space and restaurant (Author:2018)

Fig. 7.24: harvesting space looking towards towers (Author:2018)

SERVICE LAYERS



Every effort is made to utilise the potential of the site in servicing the building.

Passive ventilation is the predominant cooling strategy and narrow building form is prioritised to achieve this.

The roofs harvest water and collect it in service channels which also collect water from productive processes. These channels also serve to transport materials between zones in a separate channel.

A continuous concrete channel links roofs and ensures the collection and movement of roof water is economical and effective.

Fig. 7.25: Service layers of the design (Author:2018)


Fig. 7.26: Production space: planted roof and service channel in floor (Author:2018)

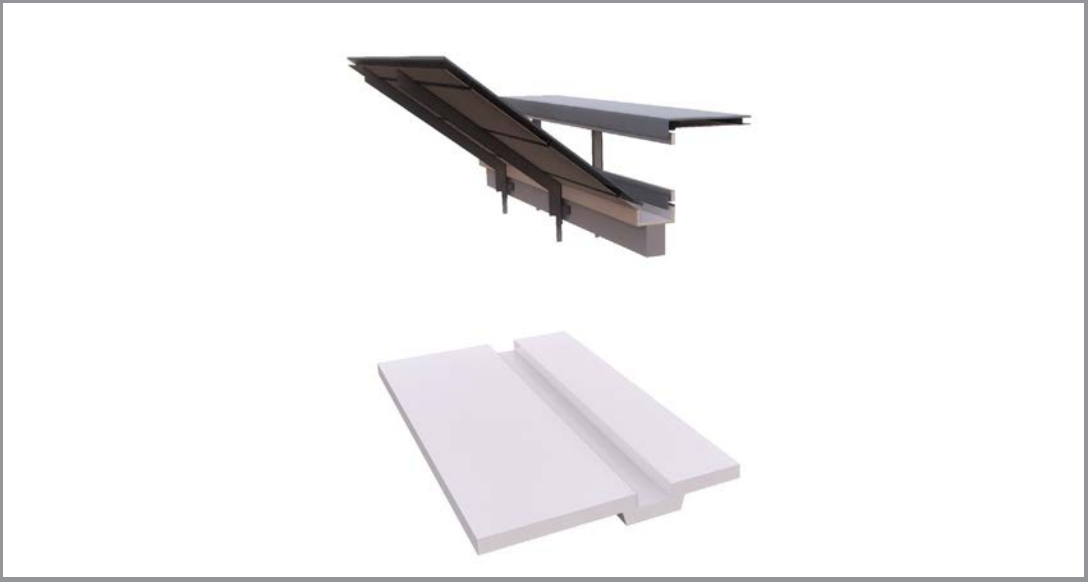


Fig. 7.27: Design space: roof water collection and floor service channel (Author:2018)


Fig. 7.28: Tower space: roof water harvesting and concrete channel (Author:2018)

SERVICE LAYERS:
REGENERATIVE SYSTEMS

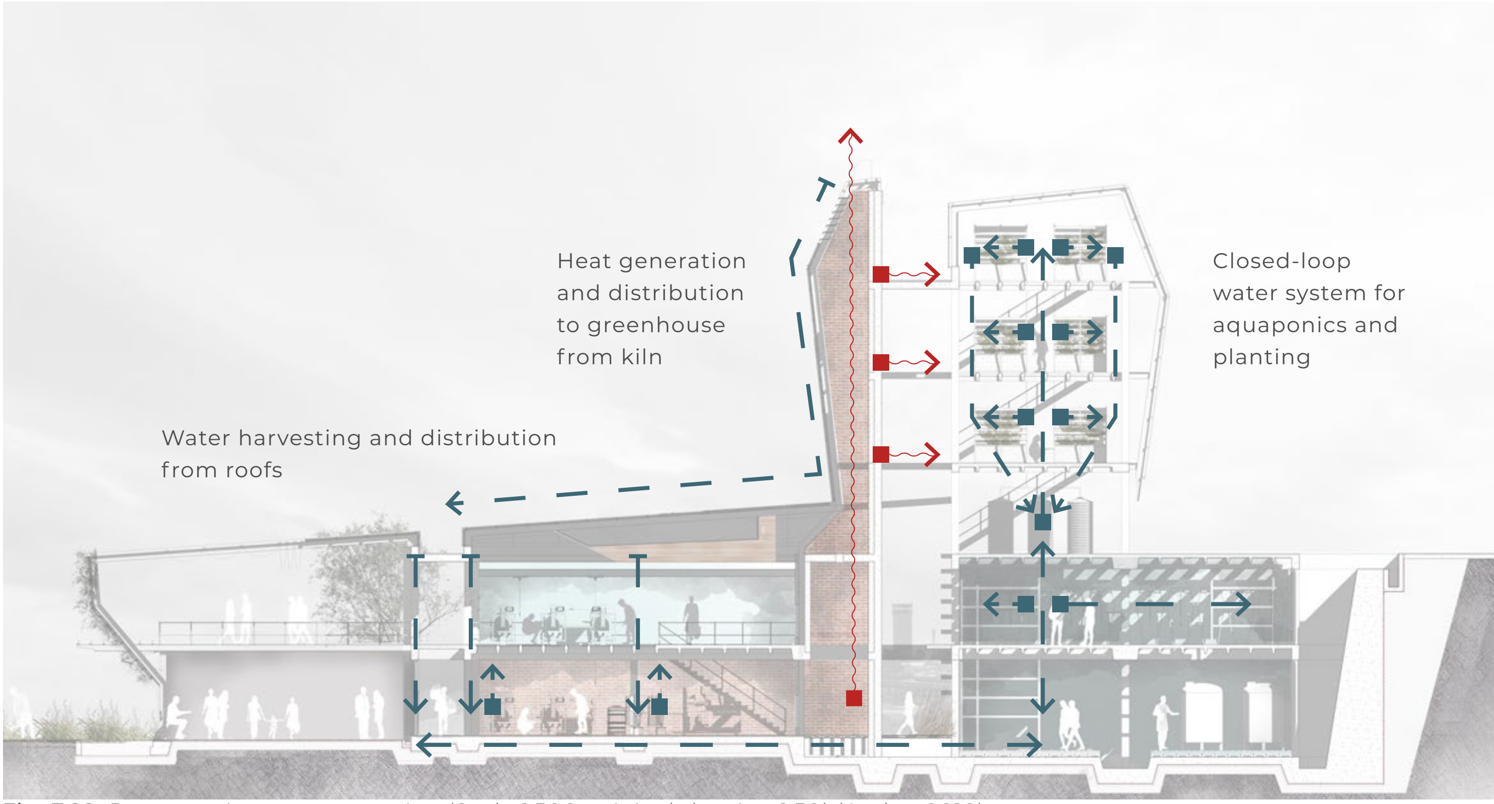


Fig. 7.29: Regenerative systems section (Scale 1:300, original drawing 1:50) (Author:2018)

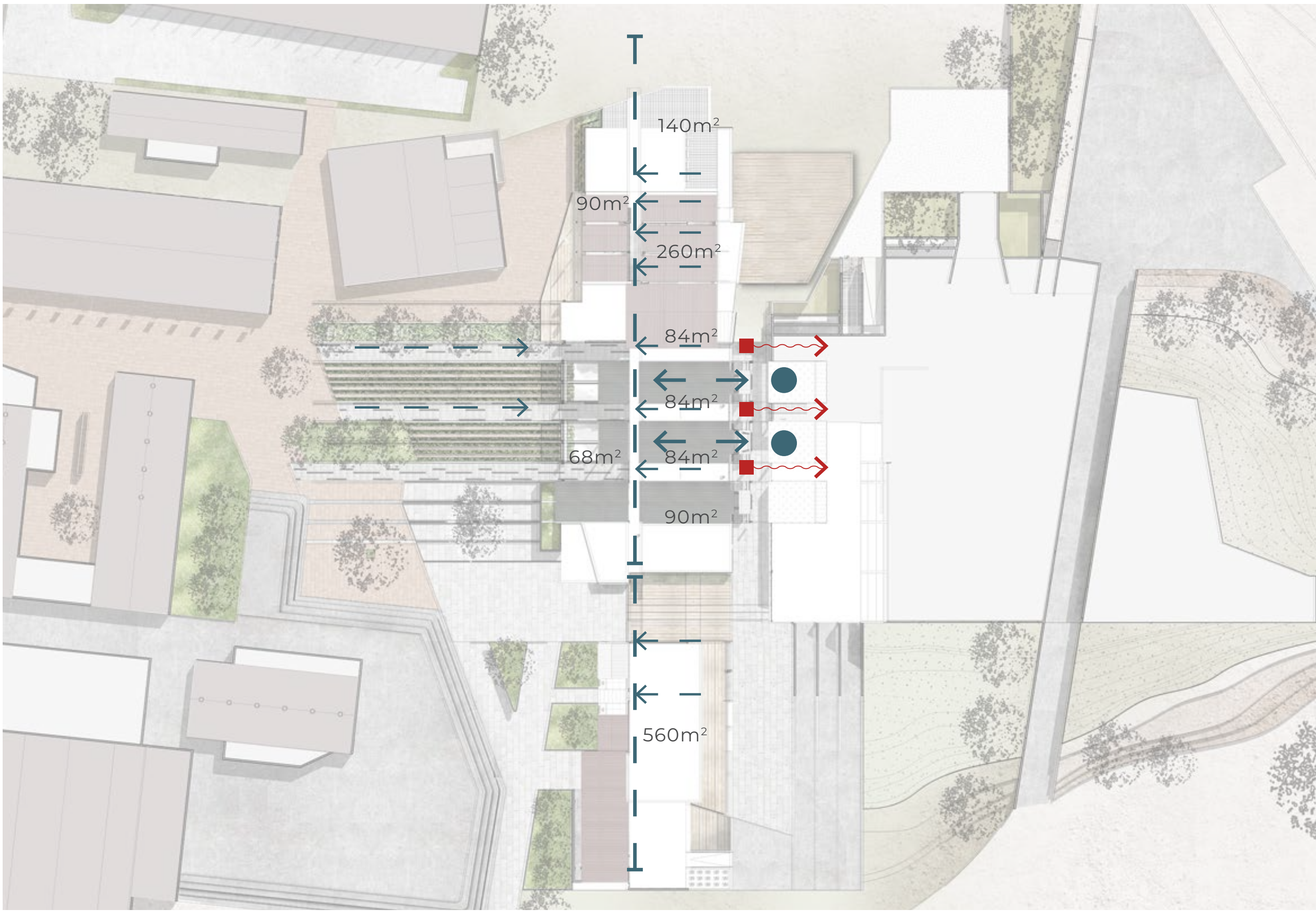
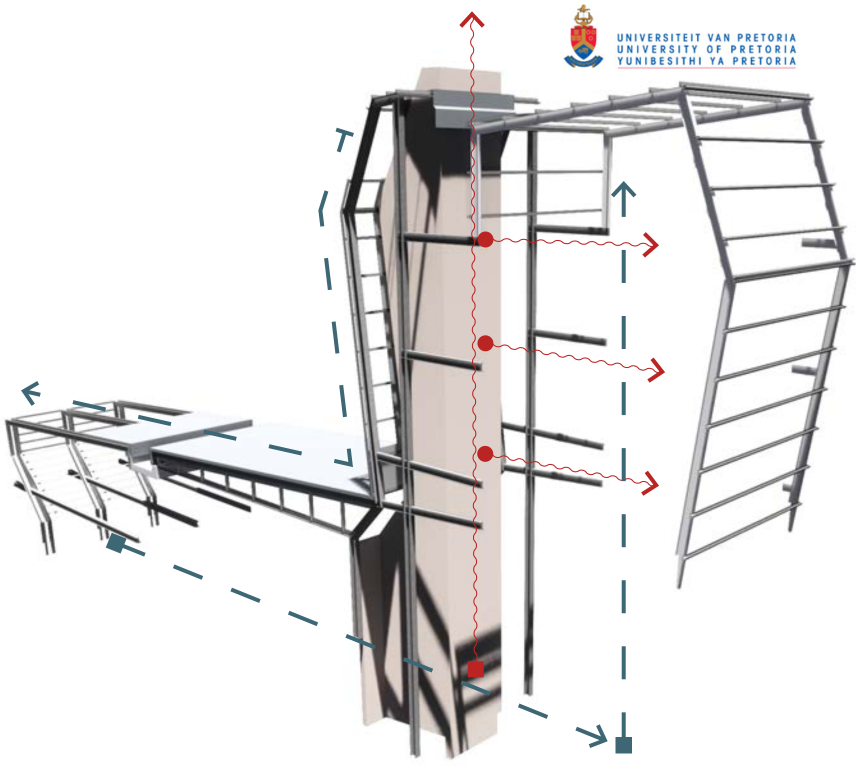


Fig. 7.30: Regenerative systems plan (Scale 1:1000, original drawing 1:200) (Author:2018)



RAINWATER HARVESTING CALC.	
ROOF AREA=1460m2	
MONTH HARVEST	**TOTAL**
JAN 1460 x 0.9 x 125mm=	164250L
FEB 1460 x 0.9 x 93mm=	122202L
MAR 1460 x 0.9 x 87mm=	114318L
APR 1460 x 0.9 x 51mm=	67014L
MAY 1460 x 0.9 x 15mm=	19710L
JUN 1460 x 0.9 x 9mm=	11826L
JUL 1460 x 0.9 x 4mm=	5256L
AUG 1460 x 0.9 x 5mm=	6570L
SEPT1460 x 0.9 x 7mm=	9198L
OCT 1460 x 0.9 x 7mm=	9198L
NOV 1460 x 0.9 x 10mm=	13140L
DEC 1460 x 0.9 x 102mm=	134028L

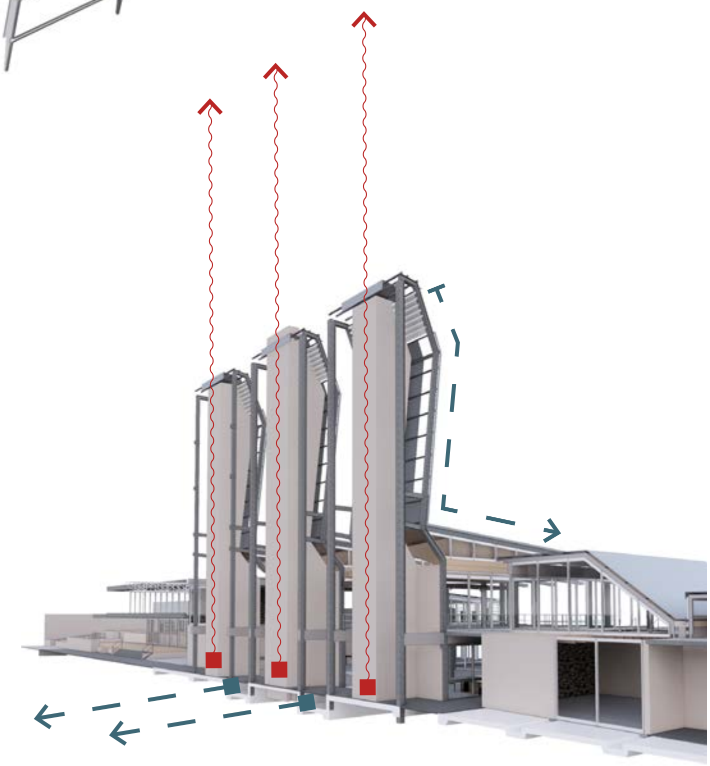


Fig. 7.31: Diagrams showing water harvesting and distribution and heat generation and distribution from kiln (Author:2018)

WATER SYSTEMS SUMMARY

Water is harvested from all roofs and transported via channels to treatment and retention tanks in the tower. From that point, water passes through a sediment filter and is then distributed to facilities. A closed-loop system runs between greenhouse planting and aquaponics systems.

HEATING SYSTEMS SUMMARY

The kiln is predominantly used for baking moulded mycelium products to stabilise them but is a substantial source of heat generation. This heat is captured through 100mm mild steel pipes which act as radiators for water heating as well as a source of heat for the greenhouse space in winter when required.

RESOLUTION:
THE DESIGN OF THE DESIGN + MAKING SPACES

INTENTION:

The design and making are designed for maximum user comfort (thermally and in terms of the optimal levels of light).

The spaces are designed to be adaptable and for change to occur over time if necesary. This is achieved through high floor-to-ceiling dimensions as well as adaptable partitioning.

Services are fed from the floor and the ceiling.

Fig. 7.32: Section perspective of design and making space space (Author:2018)

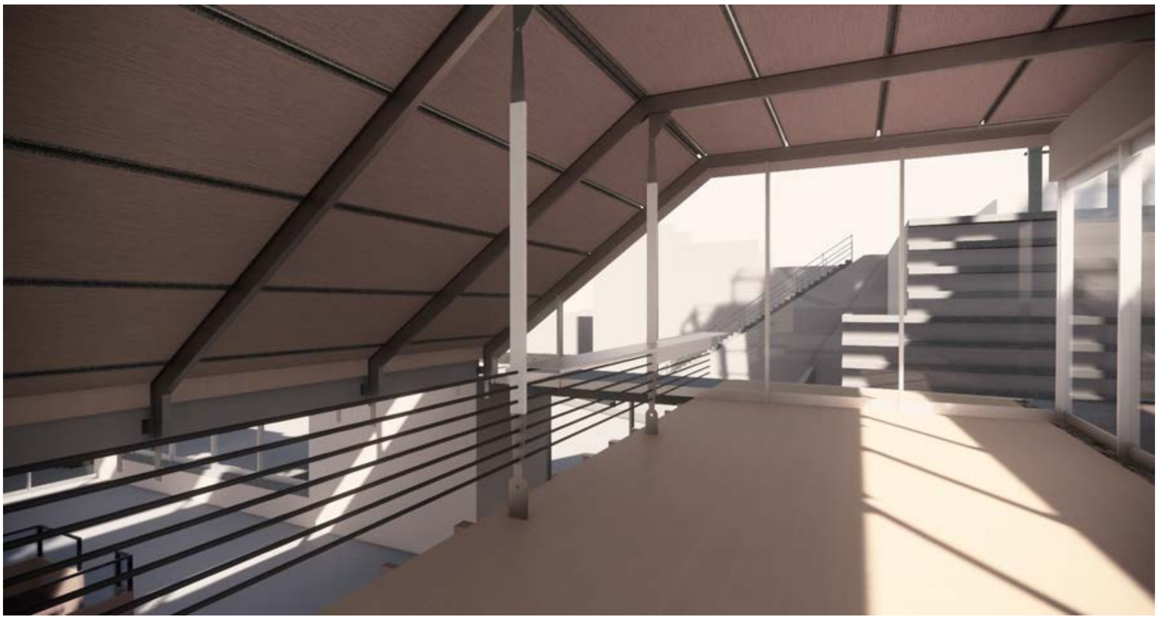


Fig. 7.33: Interior perspective of design and making space space (Author:2018)

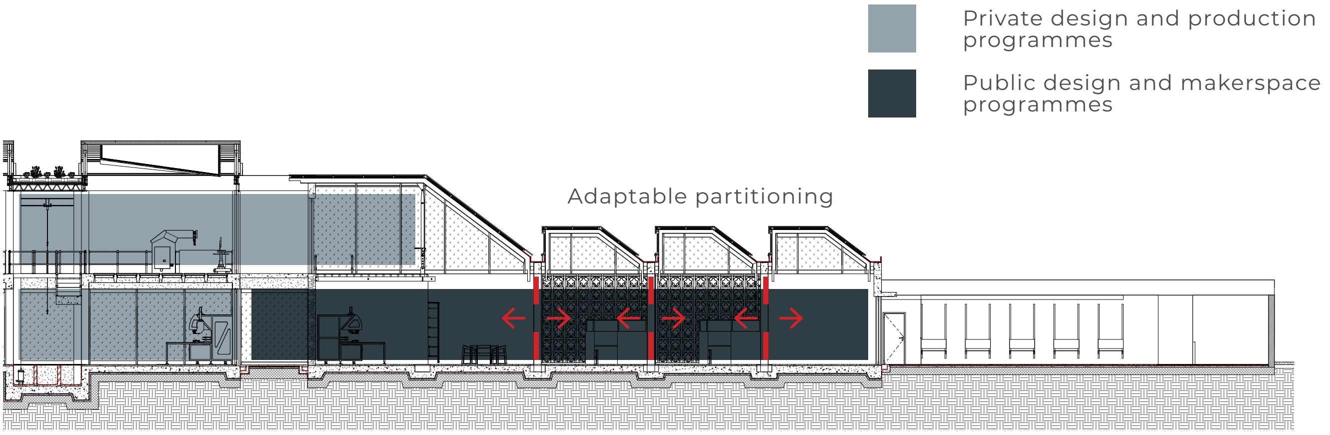


Fig. 7.34: Public versus private programmes with adaptable partitions indicated (Author:2018)

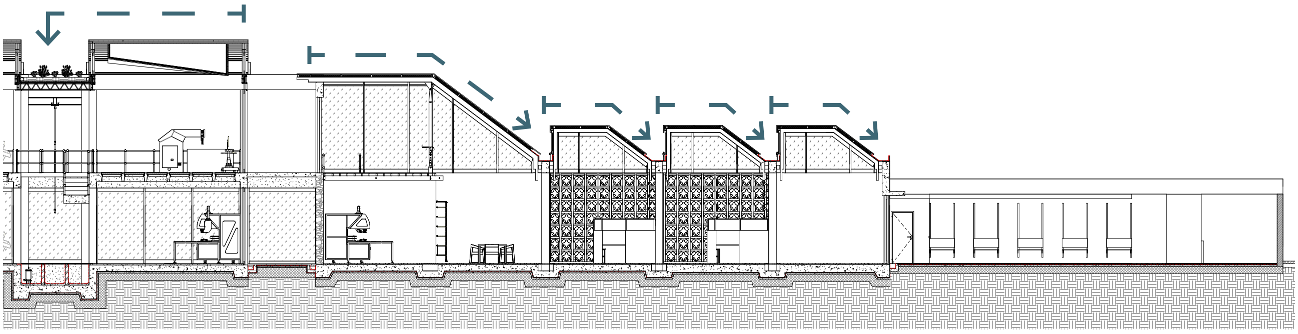


Fig. 7.35: Water harvesting and light (Author:2018)

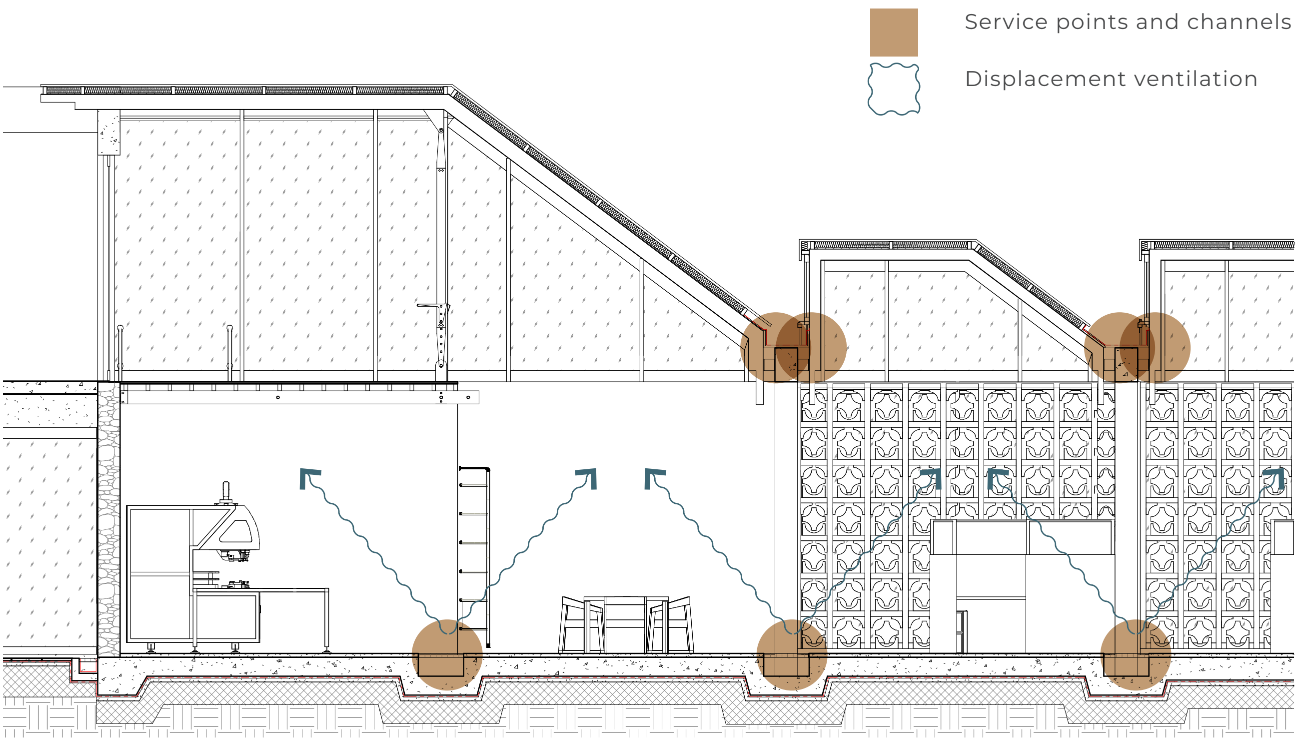


Fig. 7.36: Diagram showing service points, channels and displacement ventilation (Author:2018)

Fig. 7.37:Perspective of public makerspace (Author:2018)

Fig. 7.38: Perspective of public gallery (Author:2018)

RESOLUTION:
THE DESIGN OF THE PRODUCTION SPACES

INTENTION:

The production spaces are designed to combine practicality and adaptability as well as user comfort (thermally and in terms of the optimal levels of light)

The spaces are designed around vertical circulation zones underneath which a channel runs (for the transportation of water and materials).

Services are located in columns which feed the spaces from the floors of both levels

Fig. 7.39: Section perspective of production space (Author:2018)

Fig. 7.40: Interior perspective of production space (Author:2018)

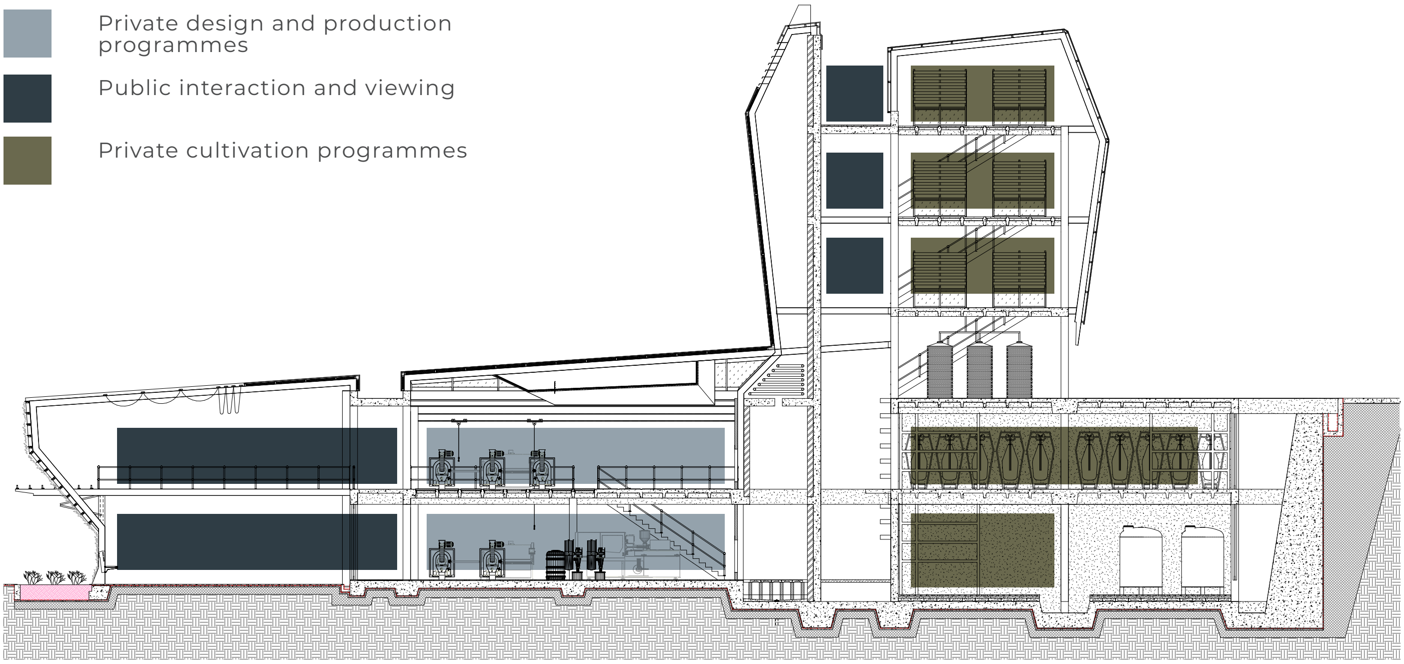


Fig. 7.41: Public versus private programmes with cultivation programmes indicated (Author:2018)

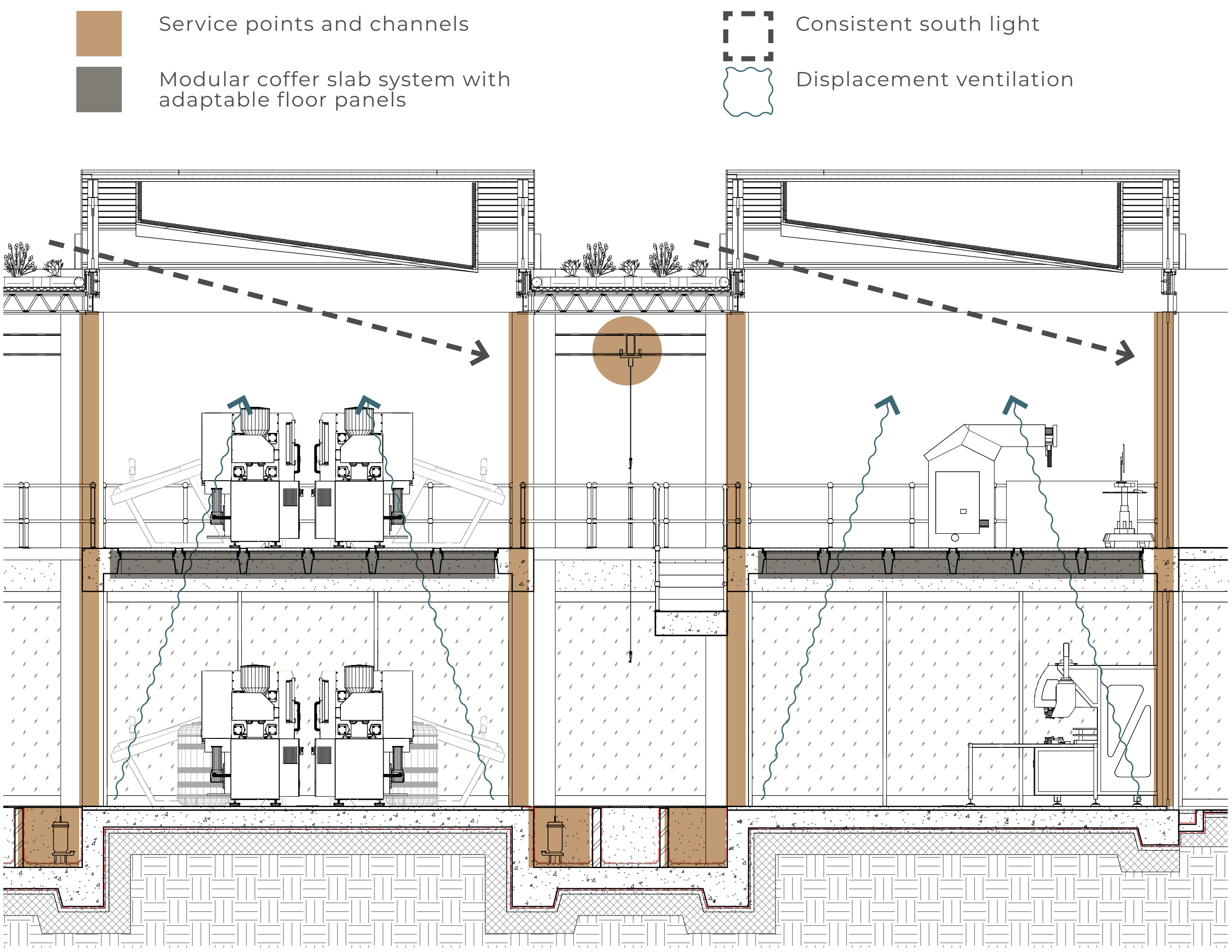


Fig. 7.42: Diagram showing service point and channels, adaptable slab, light, and displacement ventilation (Author:2018)

Fig. 7.43:Perspective of bio-composite production, injection-moulding and kiln (Author:2018)

Fig. 7.44: Perspective of bio-composite pellet production (Author:2018)

ITERATION:
THE INTERNAL SAW-TOOTH PRODUCTION SPACE

INTENTION:

The design of the roof for the production spaces came from the need to reconcile the tower form with a linear roof spanning a large distance. This necessitated the use of portal frames spanning from east to west supported on concrete columns. The direction of the portals made it impossible to achieve a conventional and simple south-facing portal frame roof for even light flow. In order to achieve the effect of a portal frame, the south facing portion was designed to incorporate a window while the north facing portion was left solid.

The ceiling was designed to slope from the north at its lowest and raise to the north in order to allow for increased and more consistent light flow from the south.

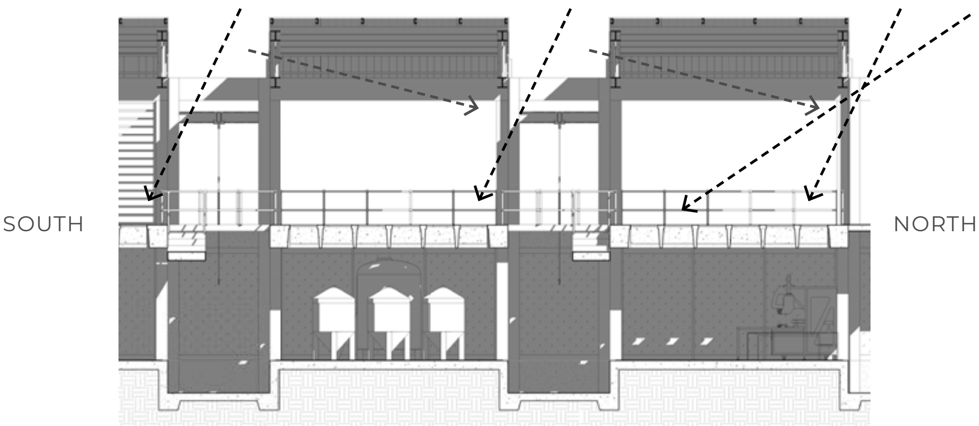


Fig. 7.45: Iteration 1 section with inconsistent light (Scale 1:200) (Author:2018)

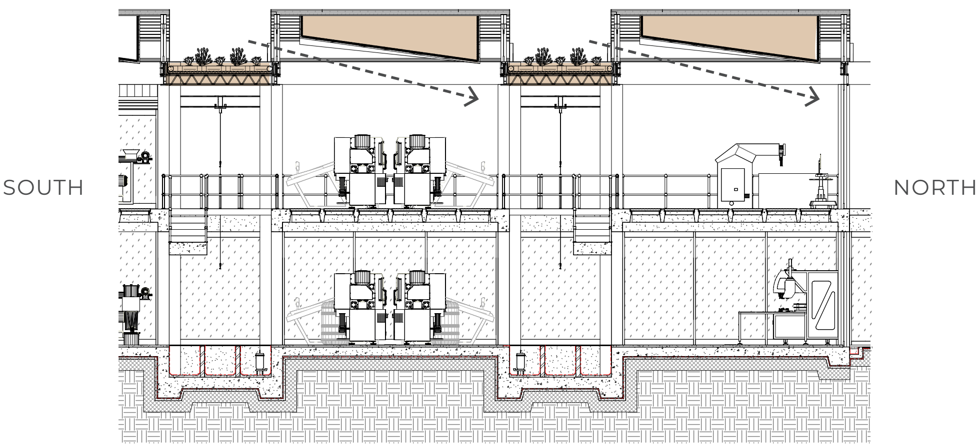


Fig. 7.46: Iteration 2 section maximising consistent south light (Scale 1:200) (Author:2018)

Fig. 7.47: The suspended ceiling design (Author:2018)

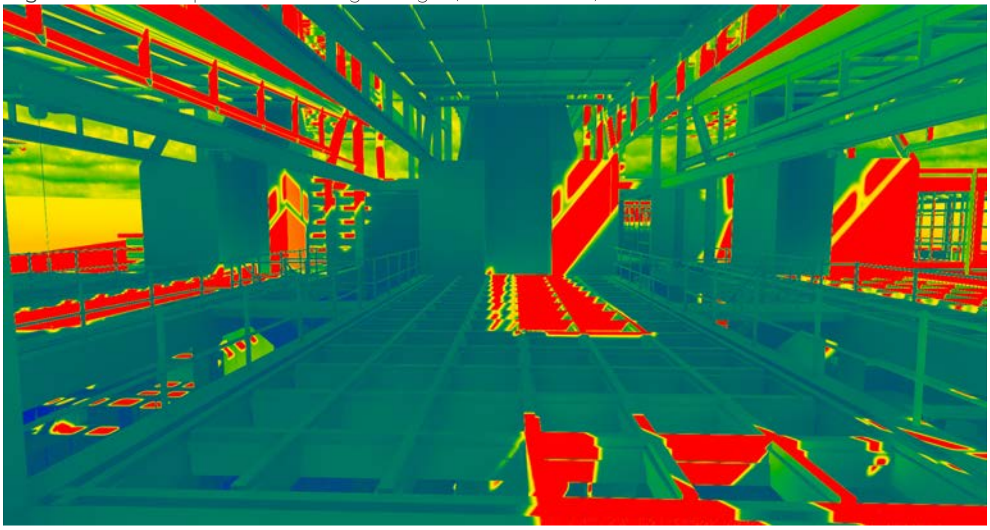


Fig. 7.48: Light quality and heat before intervention (Author:2018)

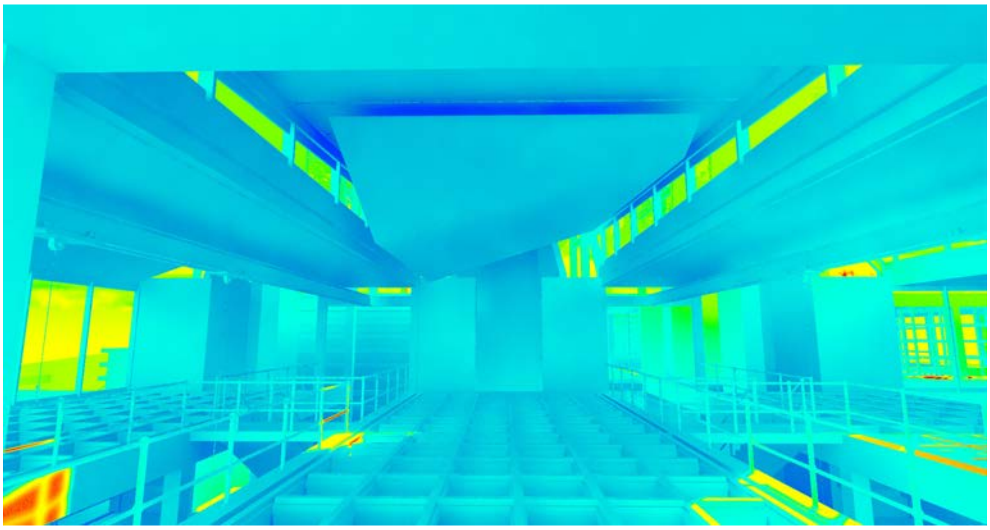
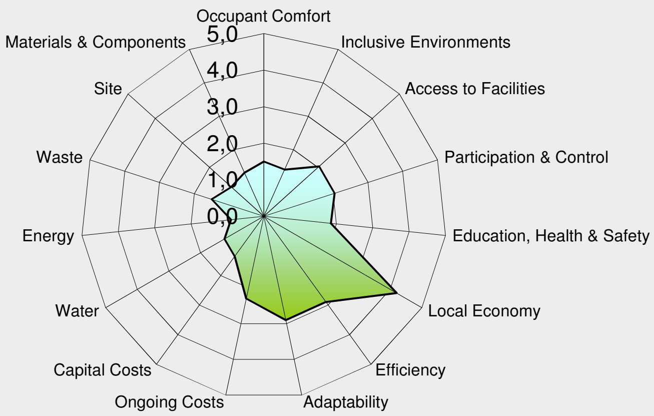


Fig. 7.49: Light quality and heat after intervention (Author:2018)

PROJECT		ASSESSMENT	
Project title:	Existing cluster	Date: 2018/09/26	
Location:	Sprinz Avenue, Village Main	Undertaken by:	Ferdinand le Grange
Building type (specify):	Commercial		
Internal area (m2):	1000m2		
Number of users:	20		
Building life cycle stage (specify):	Operation		

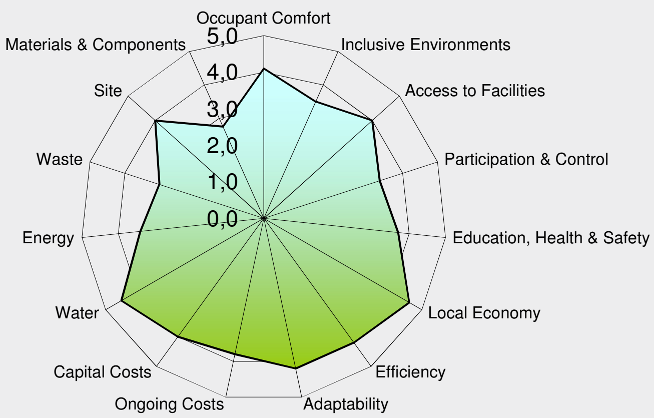


Social	1,8	Economic	2,7	Environmental	1,2

Overall	1,9

Fig. 7.50: SBAT analysis of the space pre-intervention (Author:2018)

PROJECT		ASSESSMENT	
Project title:	Existing cluster	Date: 2018/09/26	
Location:	Sprinz Avenue, Village Main	Undertaken by:	Ferdinand le Grange
Building type (specify):	Commercial		
Internal area (m2):	1000m2		
Number of users:	20		
Building life cycle stage (specify):	Operation		



Social	3,7	Economic	4,2	Environmental	3,5

Overall	3,8

Fig. 7.51: SBAT analysis of the space post-intervention (Author:2018)

SBAT: SUSTAINABLE BUILDINGS ANALYSIS TOOL

THE TOOL:

The Sustainable Building Assessment Tool (SBAT) has been designed by Jeremy Gibberd (CSIR) to evaluate the sustainability of buildings according to a number of metrics within the social, economic and environmental spheres. The tool takes developing countries and their unique conditions into account and therefore includes aspects such as the building's impact on the local economy.

SUMMARY:

The simplicity of construction and materiality meant that the original building fared extremely well in terms of local economy. Due to its construction and programme, it was however poorly rated in terms of its impact on the site and environment.

The areas showing improvements are:

- Occupant comfort (due to increased insulation and improved daylighting)
- Inclusive environments (due to the links to public transport and provision made for ambulant users)
- Access to facilities (due to public transport links as well as the expanded and inclusive programme)
- Participation and control (due to thermal comfort climate strategies)
- Education, health and safety (due to improved signage as well as access to education spaces)
- Local economy (due to reliance on the surrounding area for construction and maintenance)
- Efficiency (due to the incorporation of passive strategies)
- Adaptability (due to flexible space use and partitioning)
- Ongoing cost (due to recycling programmes and monitoring of resources)
- Capital costs (due to the reliance on sustainable building technologies as well as re-use)
- Water (due to the retention and recycling of rainwater)

-Energy (due to the passive strategies and renewables)

- Waste (due to the recycling of organics)
- Site (due to the use of the brownfield site and remediative processes)

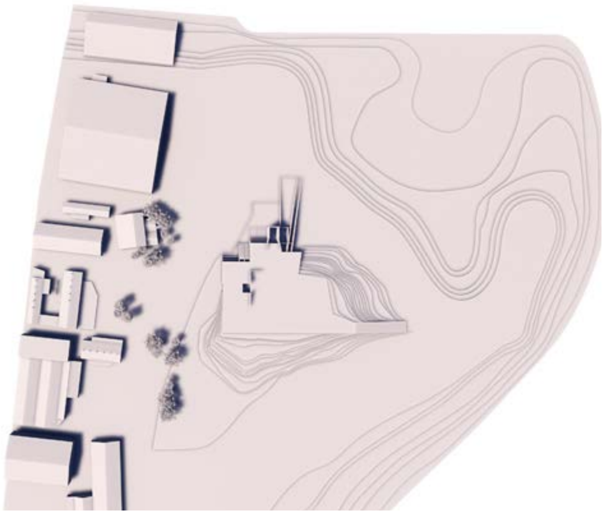


Fig. 7.52: Site prior to intervention (Author:2018)

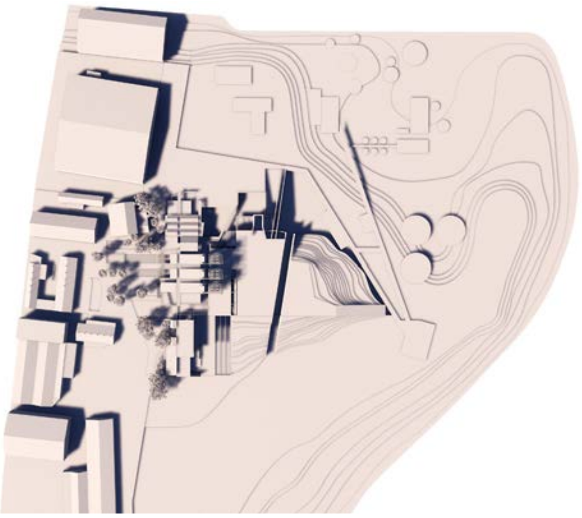


Fig. 7.53: Site after intervention (Author:2018)

Fig. 7.54: Portion of west elevation (Scale 1:100, original drawing 1:100)(Author:2018)


Existing concrete platform
Planters and mycelium screen

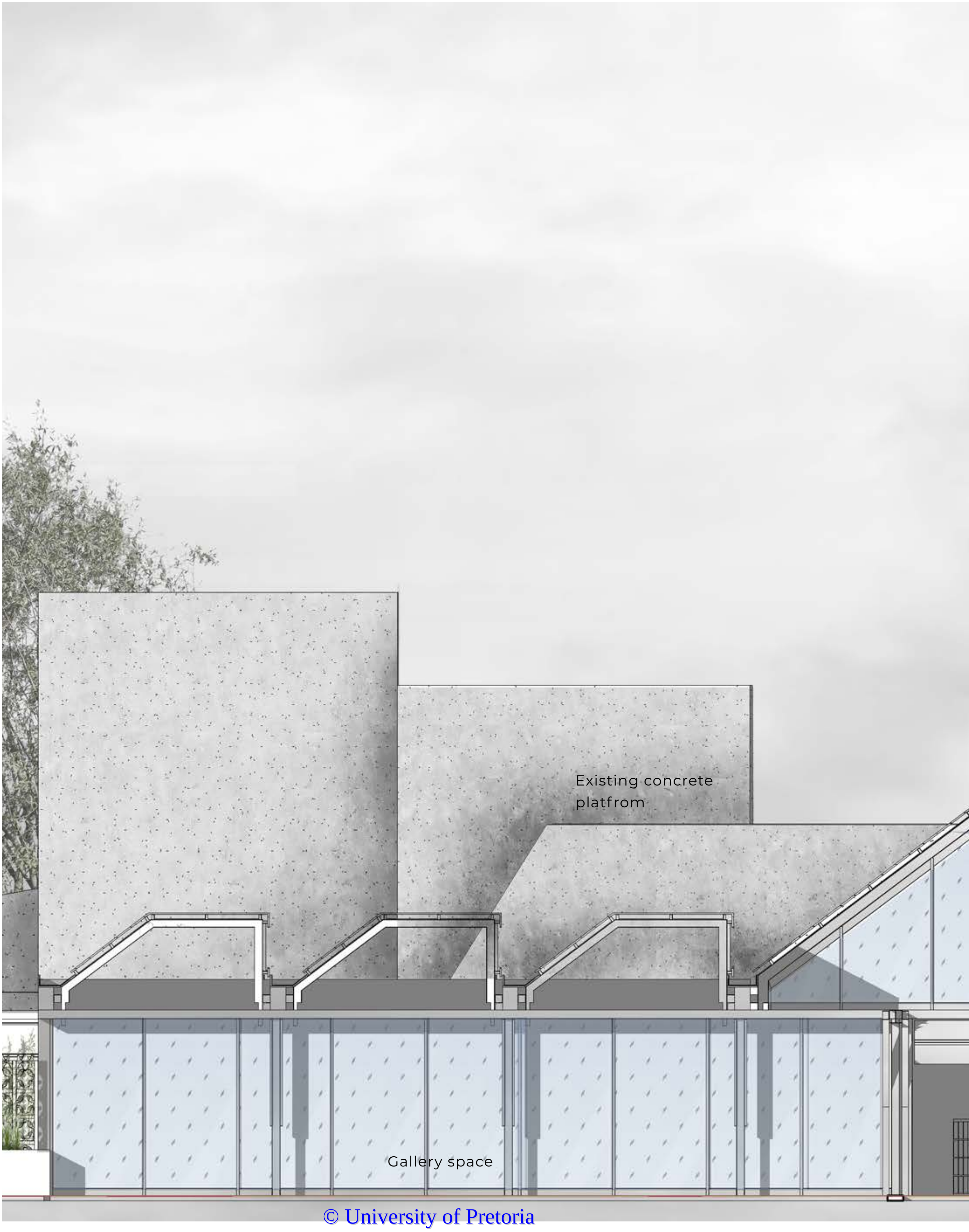


Fig. 7.54: Portion of west elevation (Scale 1:100, original drawing 1:100)(Author:2018)


Greenhouse and
aquaponics tower
Kiln tower
Design space
Planted facade
Public experiential
walkway

Fig. 7.54: Portion of west elevation (Scale 1:100, original drawing 1:100)(Author:2018)


Greenhouse and
aquaponics tower
Kiln tower
Existing concrete
platform level
Design space
Main entrance and
visitor's centre

Fig. 7.54: Portion of west elevation (Scale 1:100, original drawing 1:100)(Author:2018)


ed framework
Public walkway to
productive landscape

Fig. 7.54: Portion of west elevation (Scale 1:100, original drawing 1:100)(Author:2018)


Service entrance
to harvesting and
substrate processing
space

Fig. 7.54: Portion of west elevation (Scale 1:100, original drawing 1:100)(Author:2018)


Shaft No. 1 and No. 2
Mine Dump
Substrate processing
space

Fig. 7.55: Portion of section 1 (Scale 1:100, original drawing 1:50)(Author:2018)


FLOOR NOTE: Min. 30mm Hygiene Epoxy treated cement screed with minimum 1:100 fall towards drainage channels laid onto 255mm RC cast in-situ concrete foundation to engineer's specification on 300 micron DPM on 50mm clean sand blinding on min. 300mm well rammed earth filling to engineer's specifications
GreenGrid growing trays on galvinised corrugated sheeting on drainage core on Derbigum SP4 waterproofing membrane with 75mm side laps and 100 mm end laps, sealed onto index adhering membrane laid on non-woven continuous filament needle-punched polyester geotextile
150 mm diameter service ducts
Bio-composite manufacturing
Material processing

Fig. 7.55: Portion of section 1 (Scale 1:100, original drawing 1:50)(Author:2018)


ROOF NOTE:Zincalume GS 500 sheeting on 100 x 50mm GMS Top Hat lipped channel purlins @ 1200mm centers bolted to 254 x 246 x 6.1mm hot rolled galvinised steel I profile beams @6000mm centers
300 mm RC cast in situ concrete service channel wall, to receive ADOMAST Extraseal AC3 clear resin finish
350 x 170mm single-tee custom Kwik-Strip coffer slab system at 900mm grid spacing with 60x40mm spaces to be left for 80x 40mm RS40 RECTAGRID Mentis grating floor panels to 60 x 40mm unequal angle channels fixed to slab system using Fischer RG M threaded rod and RM resin capsule (for small axial spacing)
Bio-composite manufacturing
Makerspace

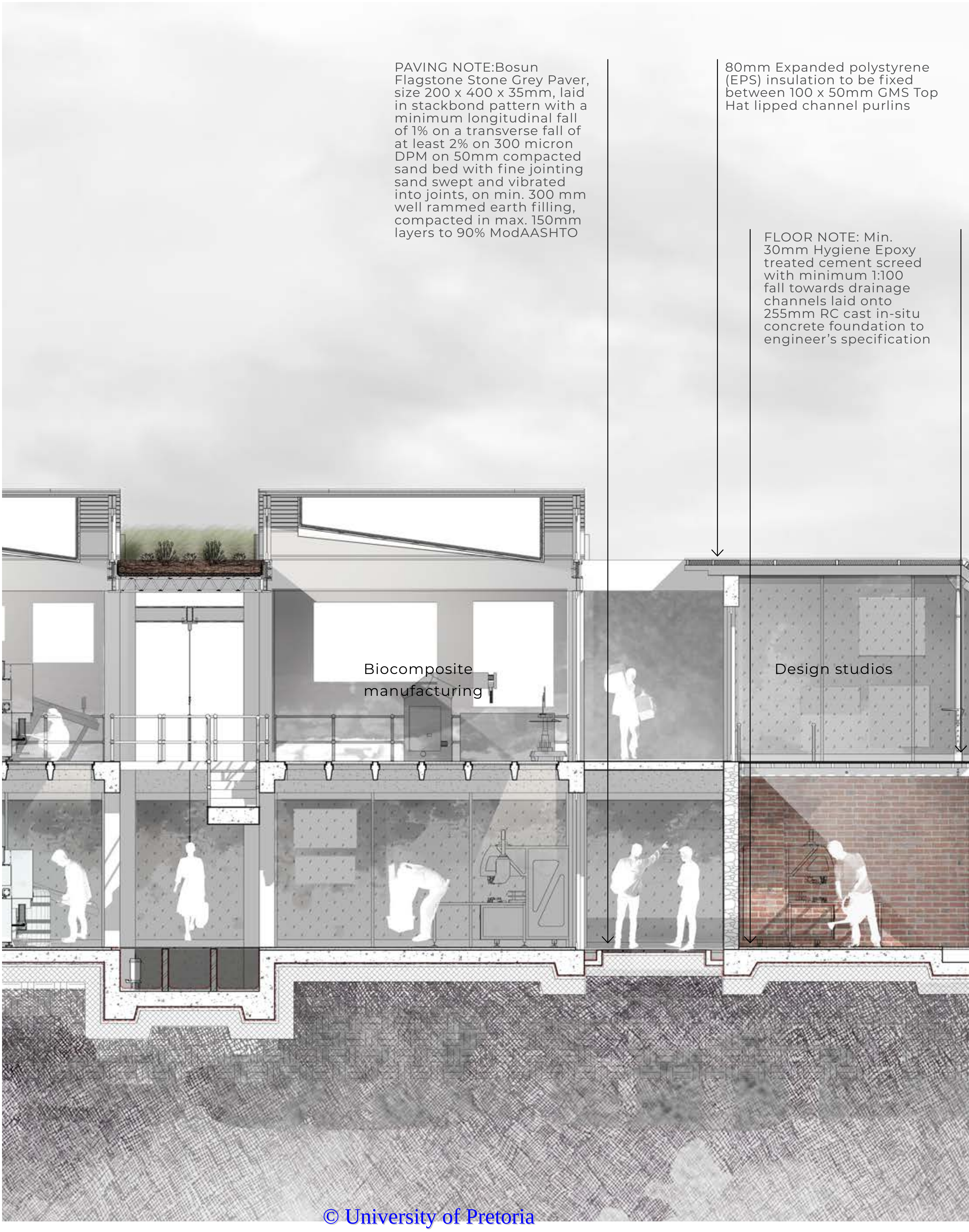


Fig. 7.55: Portion of section 1 (Scale 1:100, original drawing 1:50)(Author:2018)

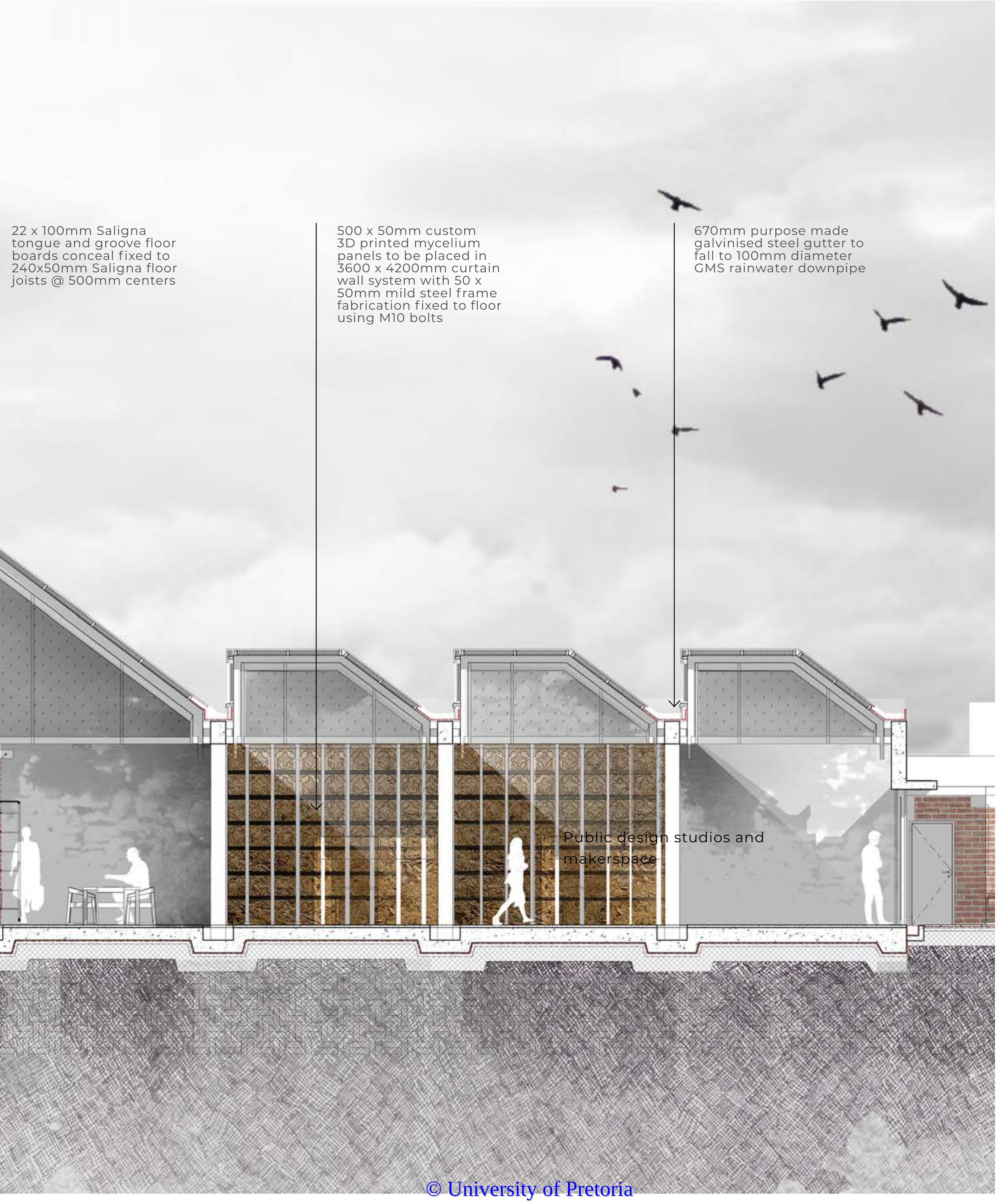
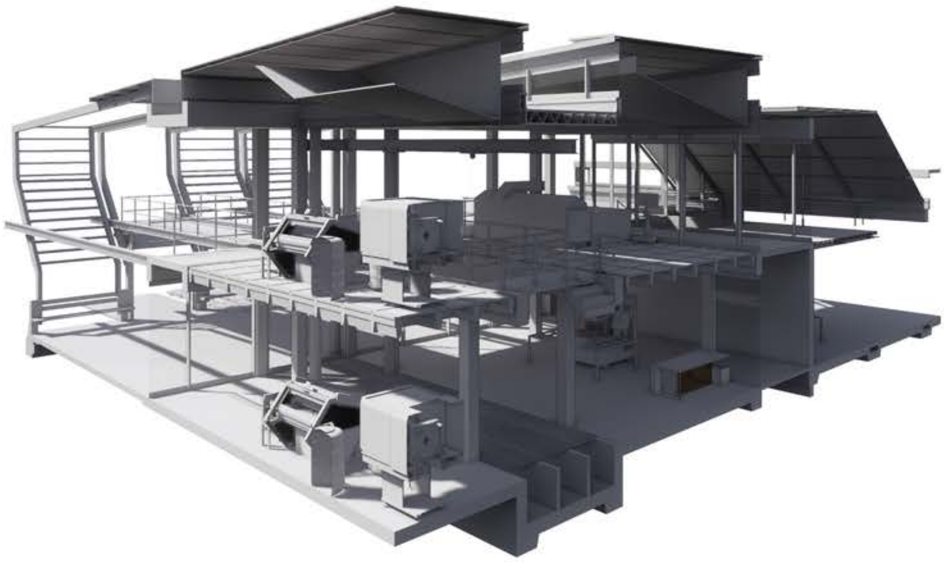

22 x 100mm Saligna tongue and groove floor boards conceal fixed to 240x50mm Saligna floor joists @ 500mm centers
500 x 50mm custom 3D printed mycelium panels to be placed in 3600 x 4200mm curtain wall system with 50 x 50mm mild steel frame fabrication fixed to floor using M10 bolts
670mm purpose made galvinised steel gutter to fall to 100mm diameter GMS rainwater downpipe
Public design studios and makerspace

Fig. 7.55: Portion of section 1 (Scale 1:100, original drawing 1:50)(Author:2018)


Service entrance



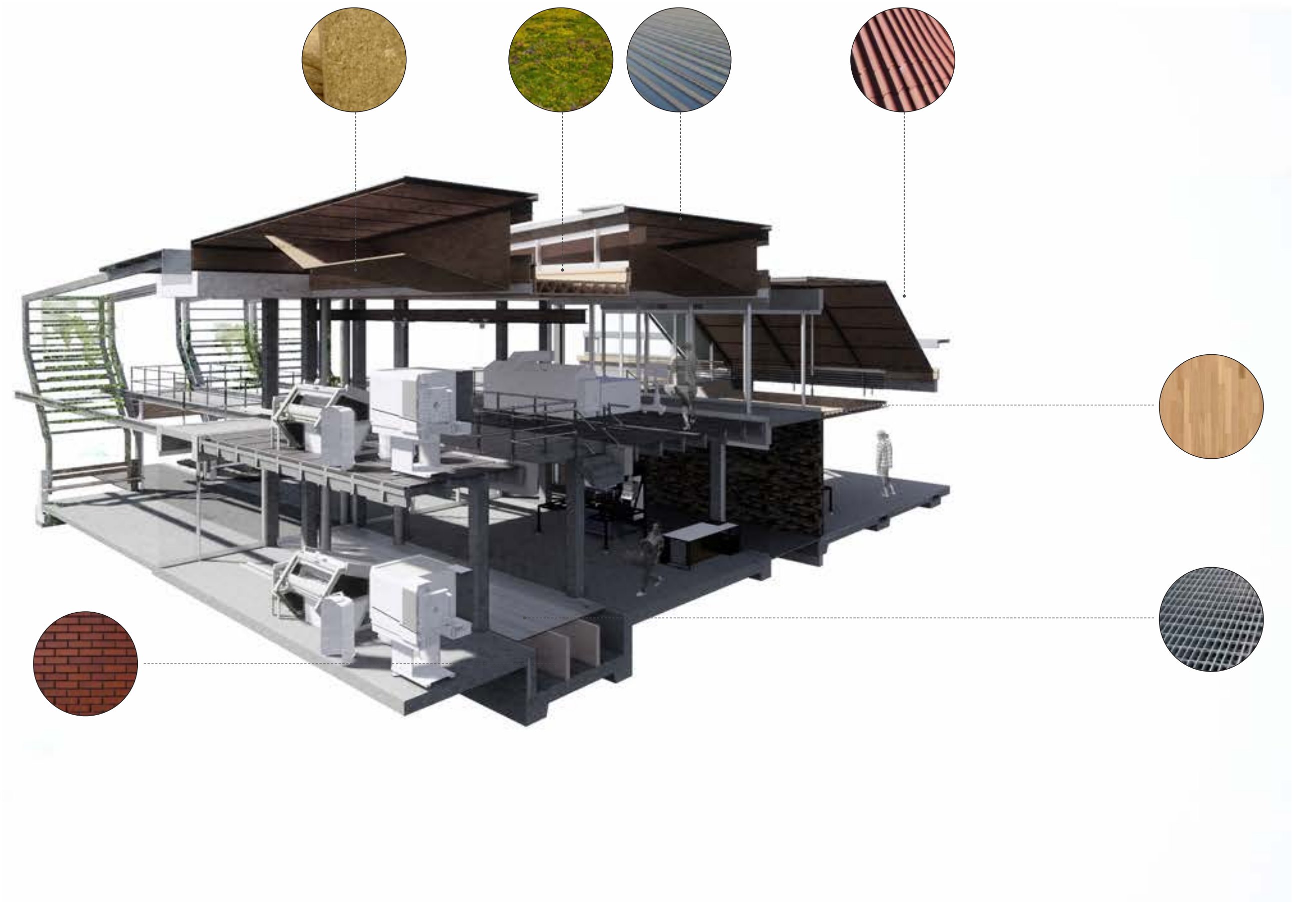


Fig. 7.56: Form, materiality and technology of production space (Author:2018)

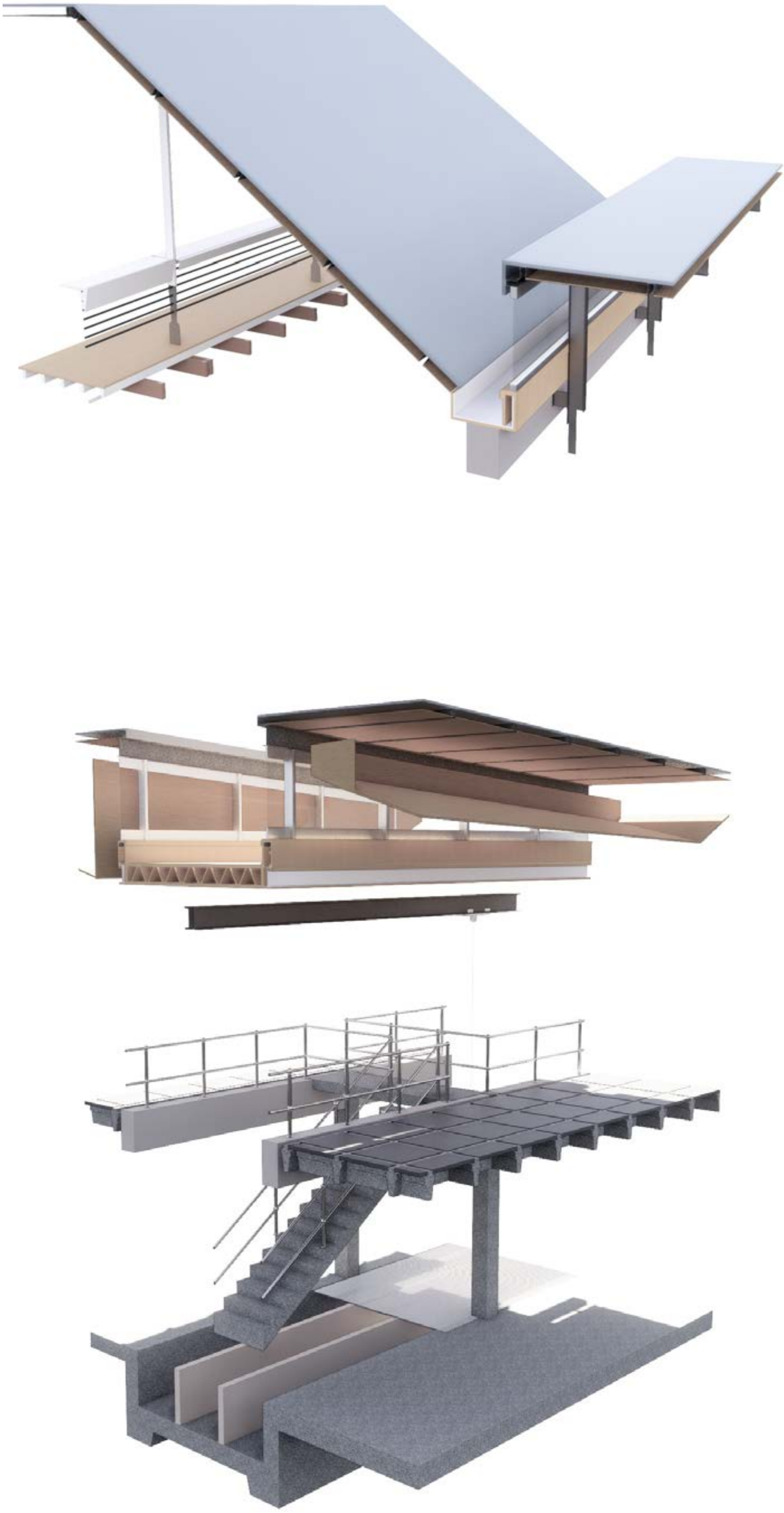


Fig. 7.57: 3D construction resolution of production space (Author:2018)

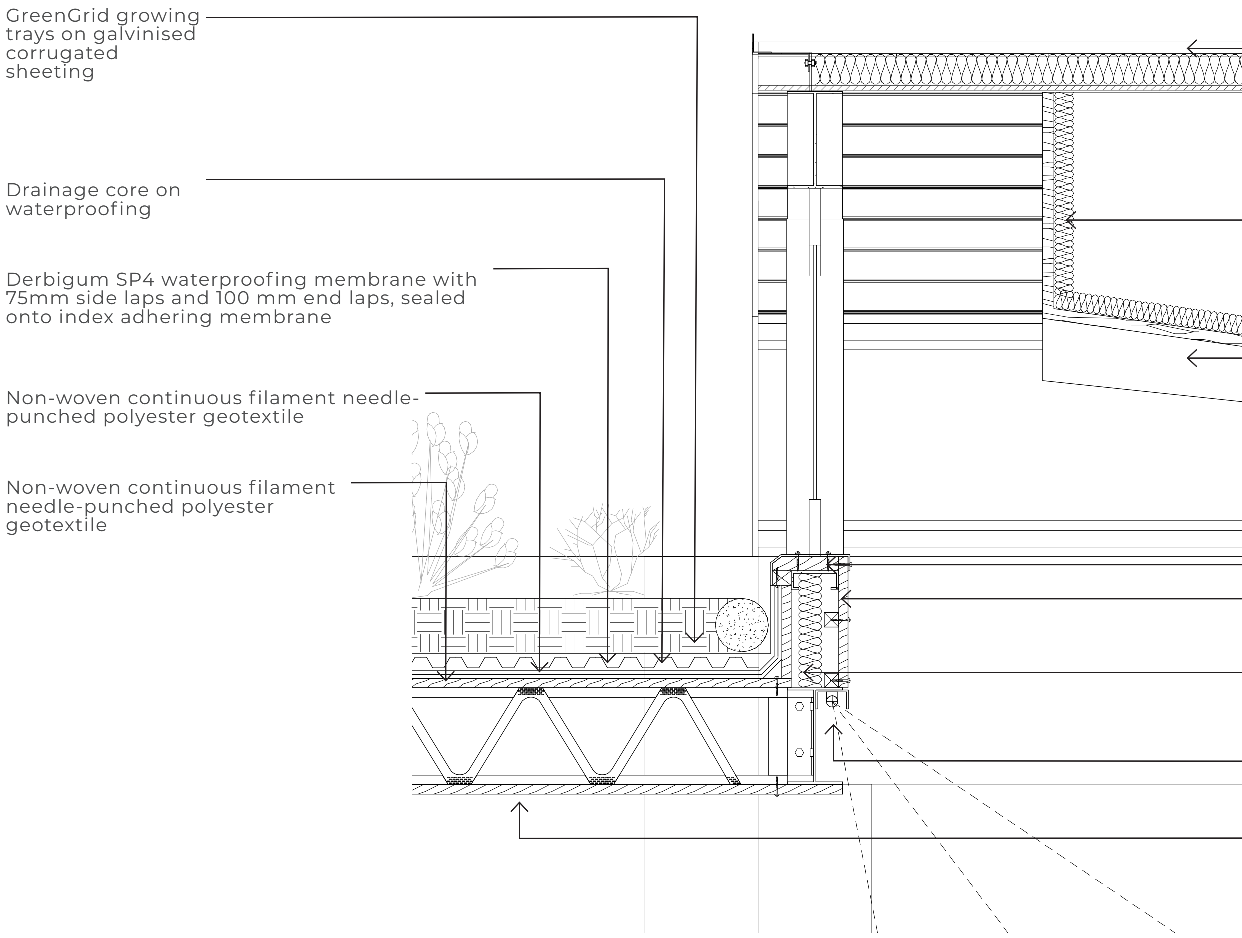


Fig. 7.58: Detail of production space roof (Drawing at 1:20) (Original drawing at 1:10) (Author:2018) (Detail influenced by Raubenheimer (2014))

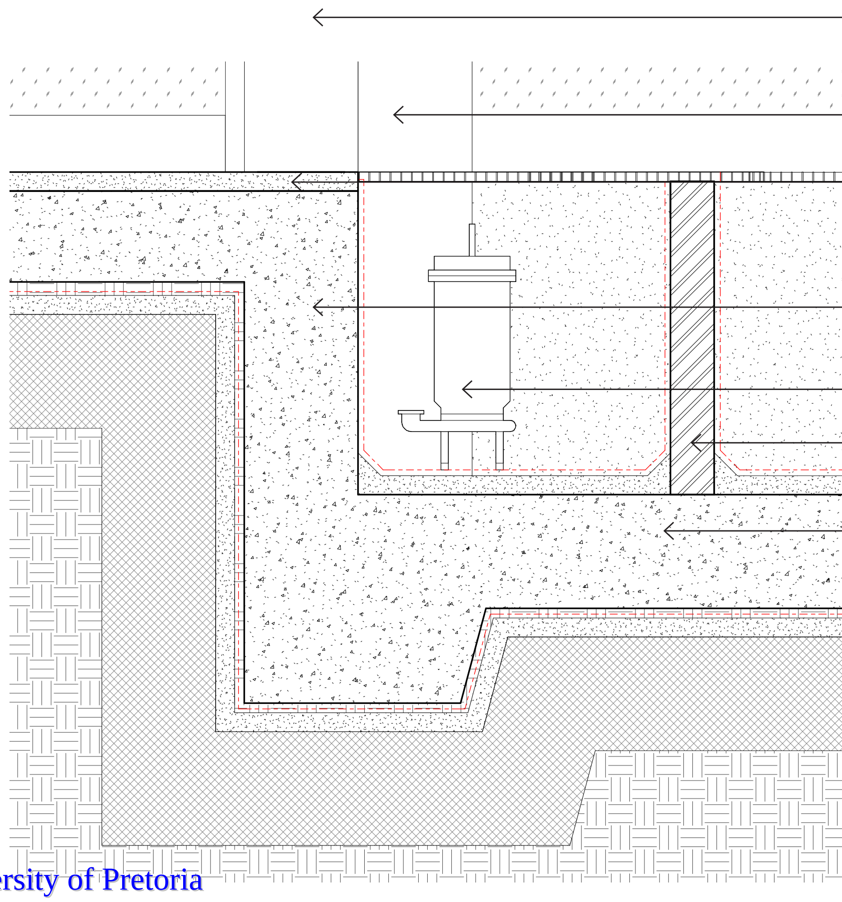


Fig. 7.59: Detail of production space service channel (Drawing at 1:20) (Original drawing at 1:10) (Author:2018) (Detail influenced by Raubenheimer (2014) and Nieuwoudt (2011))

Zincalume GS 500 sheeting on 100 x 50mm GMS Top Hat lipped channel purlins @ 1200mm centers bolted to 254 x 246 x 6.1mm hot rolled galvinised steel I profile beams @6000mm centers

80mm thick mycelium insulation panels (stabilised through firing in kiln) with a density of 16kg/m and U value of 0.31W/m2 °C

Suspended Ceiling: Custom clear resin coated Acoustic-Ply ceiling fabrication with slotted finish fixed to 25 x 38mm T38 Main Tee galvinised steel ceiling grid system @ max. 1200mm spacing

185x38 saligna sill treated with sealant and fixed to channel with screws

22mm marine ply board fixed to 50x50mm treated SA pine timber battens fixed to 254 x 246 x 6.1mm hot rolled galvinised steel I profile beam

80mm mycelium insulation panels (stabilised through firing in kiln) with a density of 16kg/m and U value of 0.31W/m2 °C

Light fixture fitted to 76x55 parallel flange channel pre-welded to 254 x 246 x 6.1mm hot rolled galvinised steel I profile beam

Timber and steel open web joists with 38mm x 114 timber top and bottom chord members @600mm centers

300 x 450mm concrete column

150 mm diameter service ducts

Min. 30mm cement screed with minimum 1:100 fall towards drainage channels laid onto 250 micron DPM Base: 300mm RC cast in-situ concrete foundation to engineer's specification

300 mm RC cast in situ concrete service channel wall, to receive ADOMAST Extraseal AC3 clear resin finish

Sump in service channel

110mm brick wall in service channel to receive ADOMAST Extraseal AC3 clear resin finish

Foundation to engineer's specification on 300 micron DPM on 50mm clean sand blinding on min. 300mm well rammed earth filling to engineer's specifications

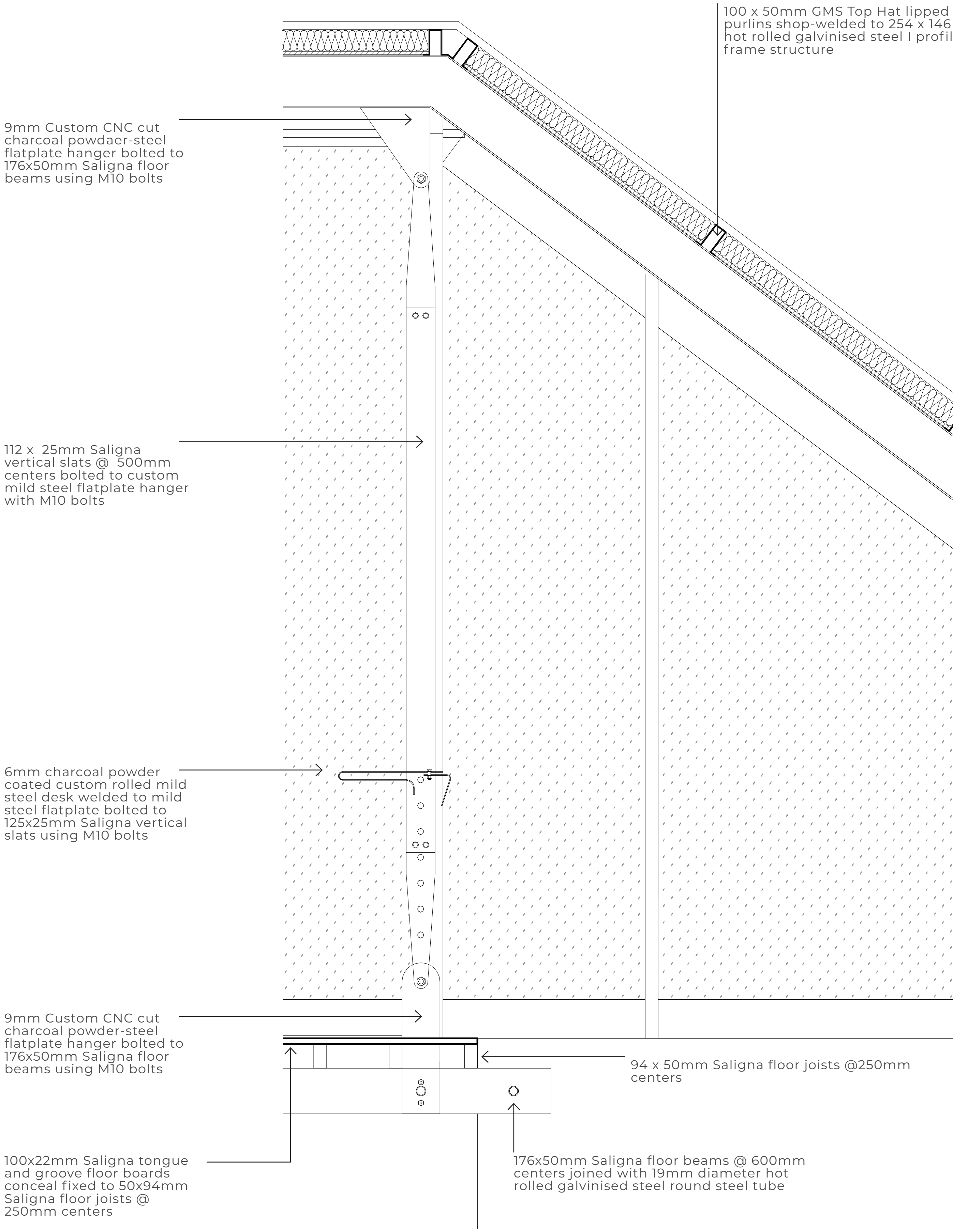
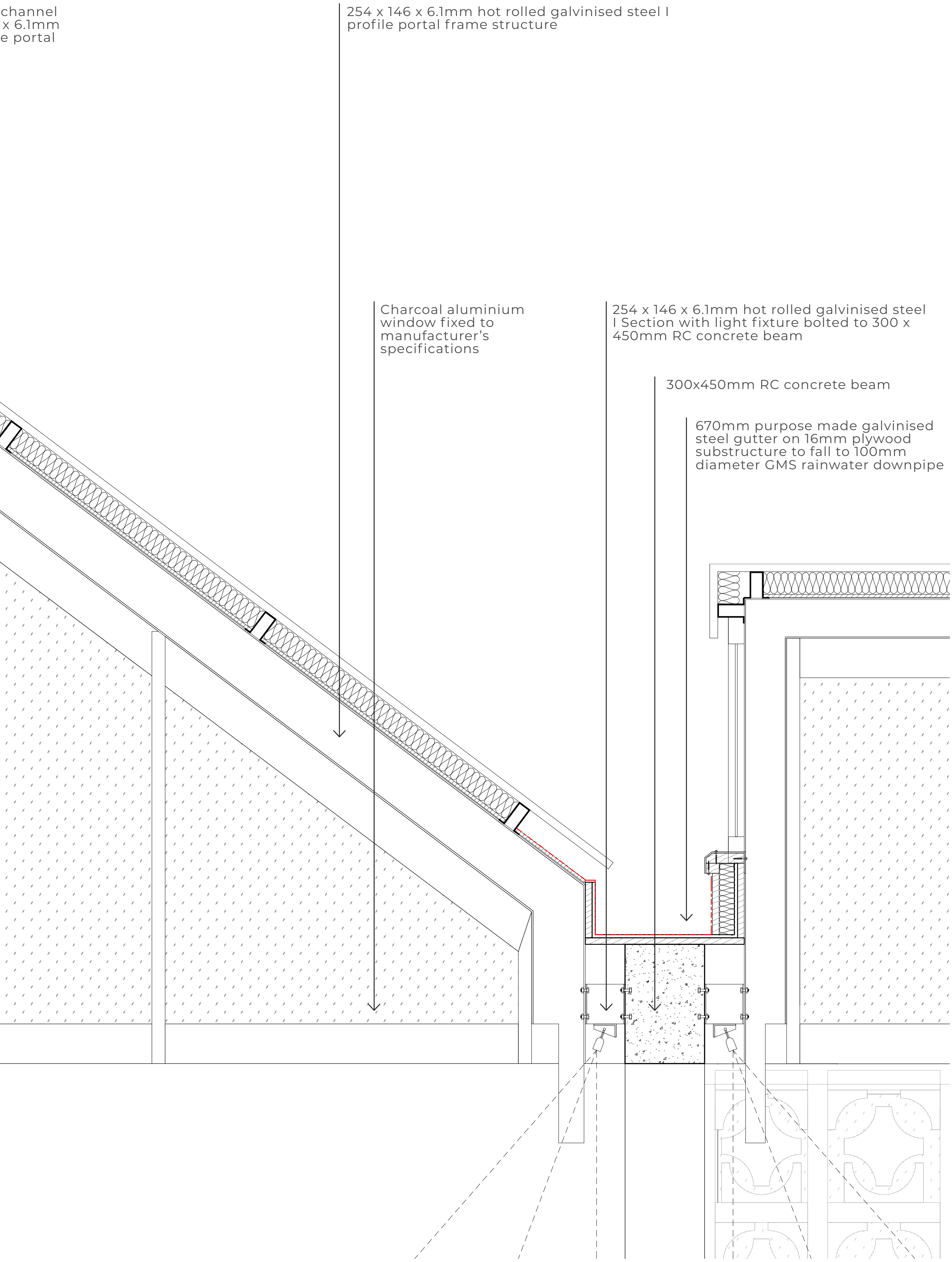


Fig. 7.60: Detail of design space roof (Drawing at 1:20) (Original drawing at 1:10) (Author:2018)


channel
x 6.1mm
e portal
254 x 146 x 6.1mm hot rolled galvinised steel I profile portal frame structure
Charcoal aluminium window fixed to manufacturer's specifications
254 x 146 x 6.1mm hot rolled galvinised steel I Section with light fixture bolted to 300 x 450mm RC concrete beam
300x450mm RC concrete beam
670mm purpose made galvinised steel gutter on 16mm plywood substructure to fall to 100mm diameter GMS rainwater downpipe

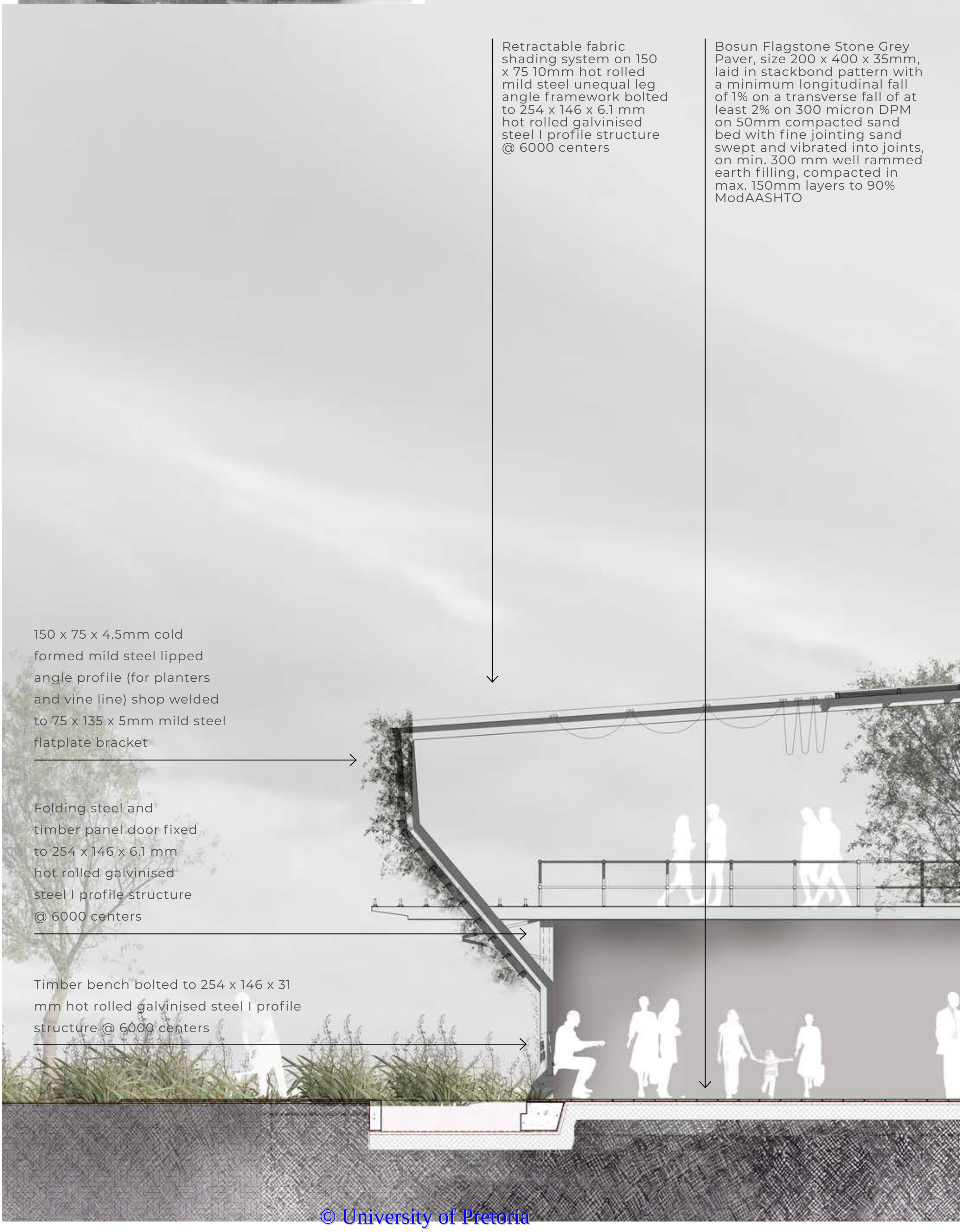
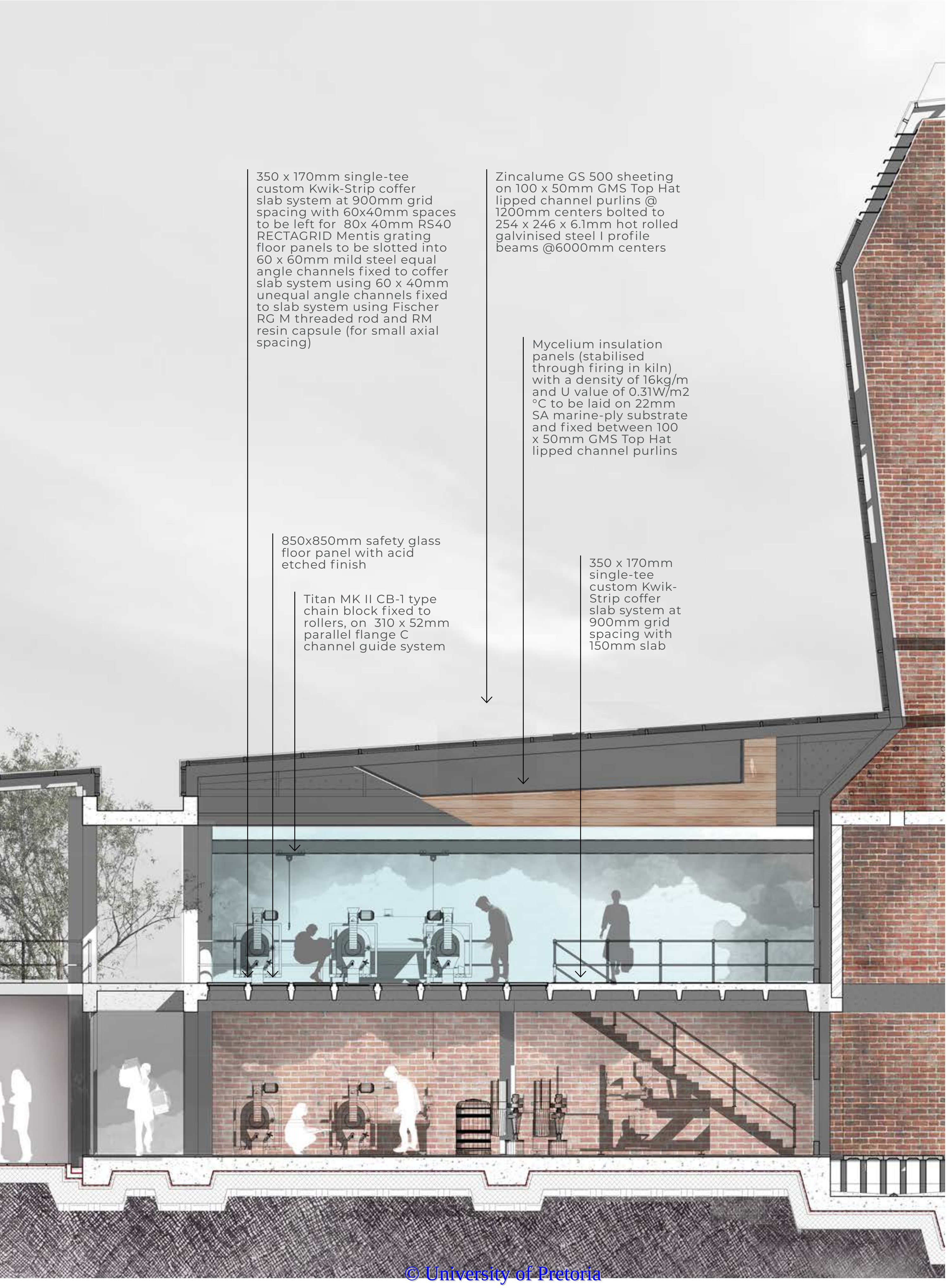


Fig. 7.61: Portion of section 2 (Scale 1:100, original drawing 1:50)(Author:2018) (Kiln radiator influenced by Koch (2012))


350 x 170mm single-tee custom Kwik-Strip coffer slab system at 900mm grid spacing with 60x40mm spaces to be left for 80x 40mm RS40 RECTAGRID Mentis grating floor panels to be slotted into 60 x 60mm mild steel equal angle channels fixed to coffer slab system using 60 x 40mm unequal angle channels fixed to slab system using Fischer RG M threaded rod and RM resin capsule (for small axial spacing)
Zincalume GS 500 sheeting on 100 x 50mm GMS Top Hat lipped channel purlins @ 1200mm centers bolted to 254 x 246 x 6.1mm hot rolled galvinised steel I profile beams @6000mm centers
Mycelium insulation panels (stabilised through firing in kiln) with a density of 16kg/m and U value of 0.31W/m2 °C to be laid on 22mm SA marine-ply substrate and fixed between 100 x 50mm GMS Top Hat lipped channel purlins
850x850mm safety glass floor panel with acid etched finish
Titan MK II CB-1 type chain block fixed to rollers, on 310 x 52mm parallel flange C channel guide system
350 x 170mm single-tee custom Kwik-Strip coffer slab system at 900mm grid spacing with 150mm slab

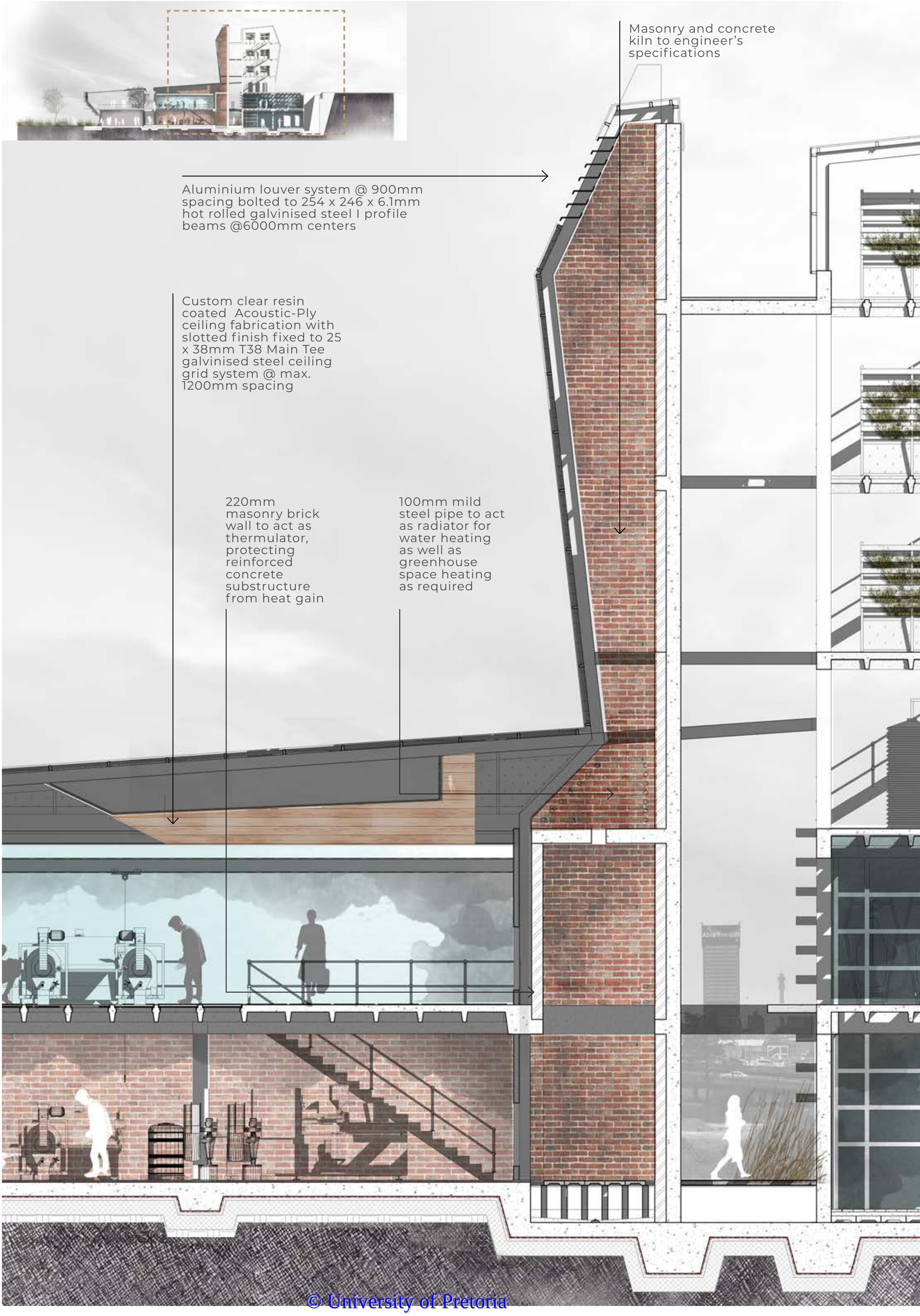
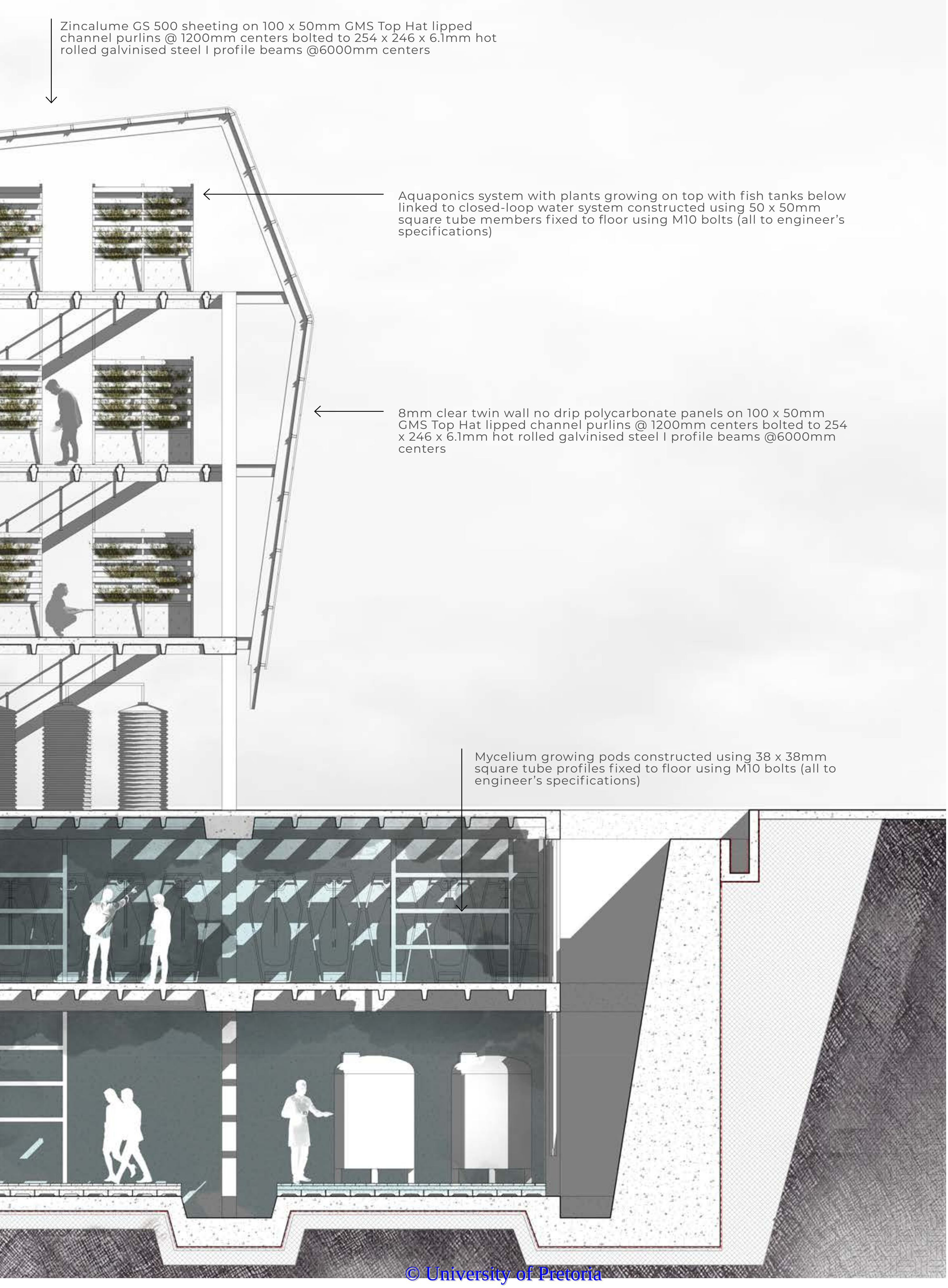


Fig. 7.61: Portion of section 2 (Scale 1:100, original drawing 1:50)(Author:2018) (Kiln


Zincalume GS 500 sheeting on 100 x 50mm GMS Top Hat lipped channel purlins @ 1200mm centers bolted to 254 x 246 x 6.1mm hot rolled galvinised steel I profile beams @6000mm centers
Aquaponics system with plants growing on top with fish tanks below linked to closed-loop water system constructed using 50 x 50mm square tube members fixed to floor using M10 bolts (all to engineer's specifications)
8mm clear twin wall no drip polycarbonate panels on 100 x 50mm GMS Top Hat lipped channel purlins @ 1200mm centers bolted to 254 x 246 x 6.1mm hot rolled galvinised steel I profile beams @6000mm centers
Mycelium growing pods constructed using 38 x 38mm square tube profiles fixed to floor using M10 bolts (all to engineer's specifications)

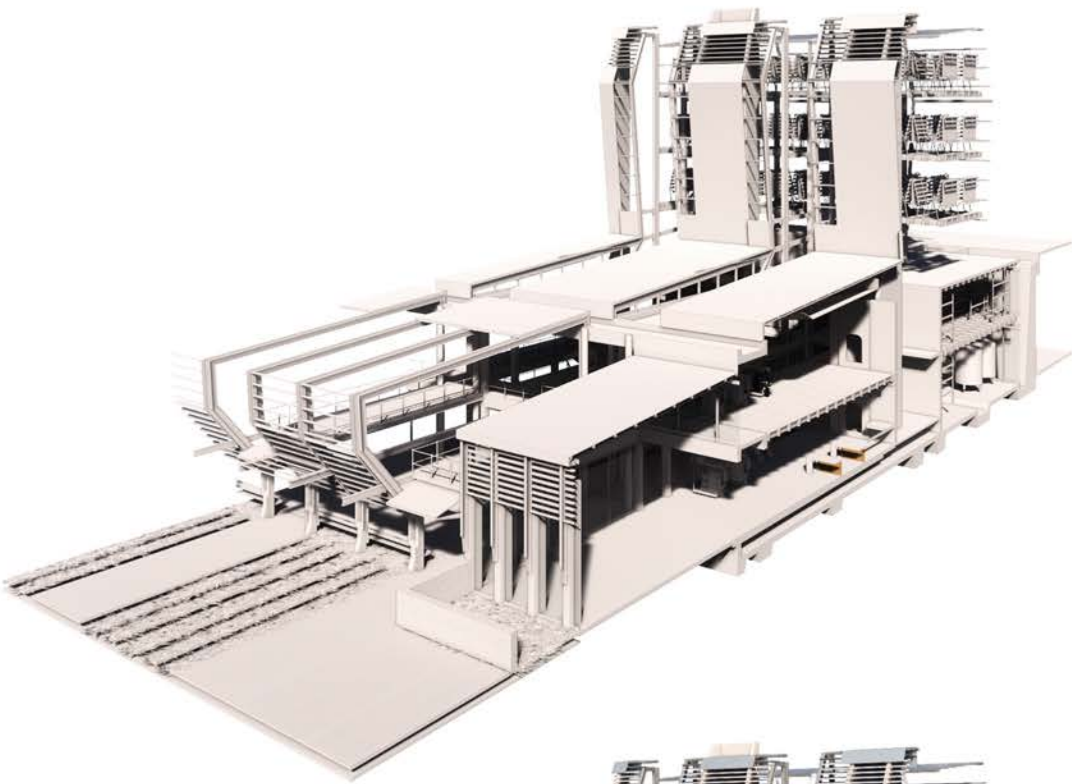


Fig. 7.62: Form, materiality and technology of entrance and processing space (Author:2018)

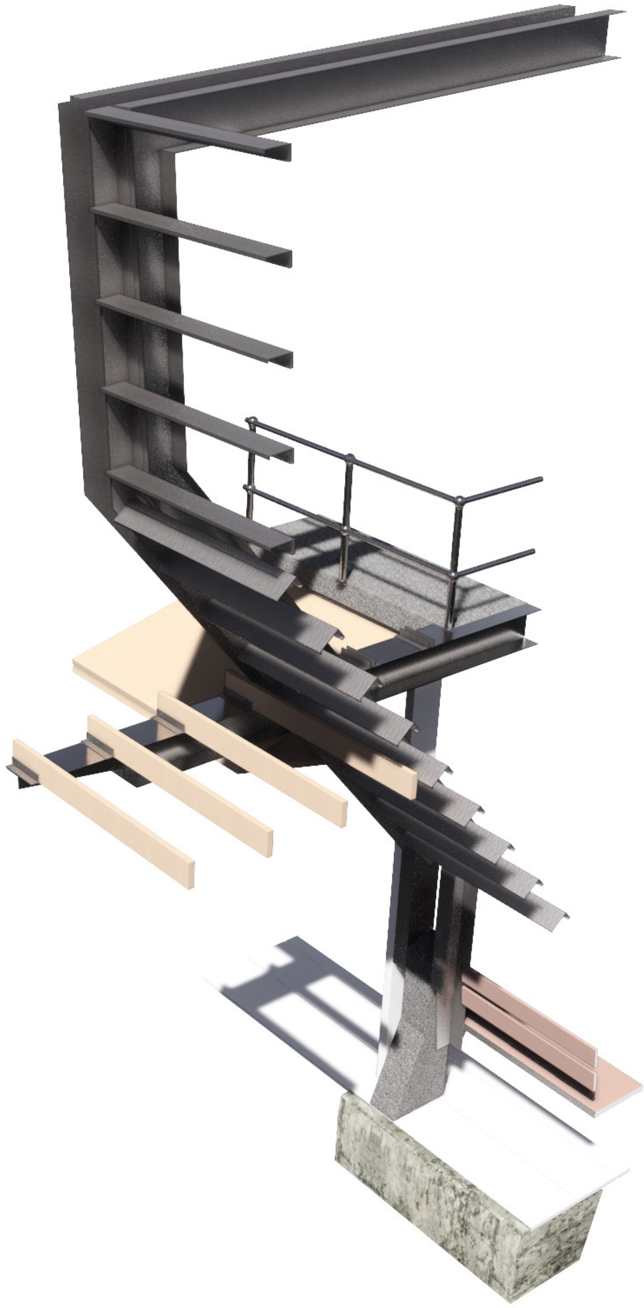


Fig. 7.63: 3D construction resolution of planted facade (Author:2018)

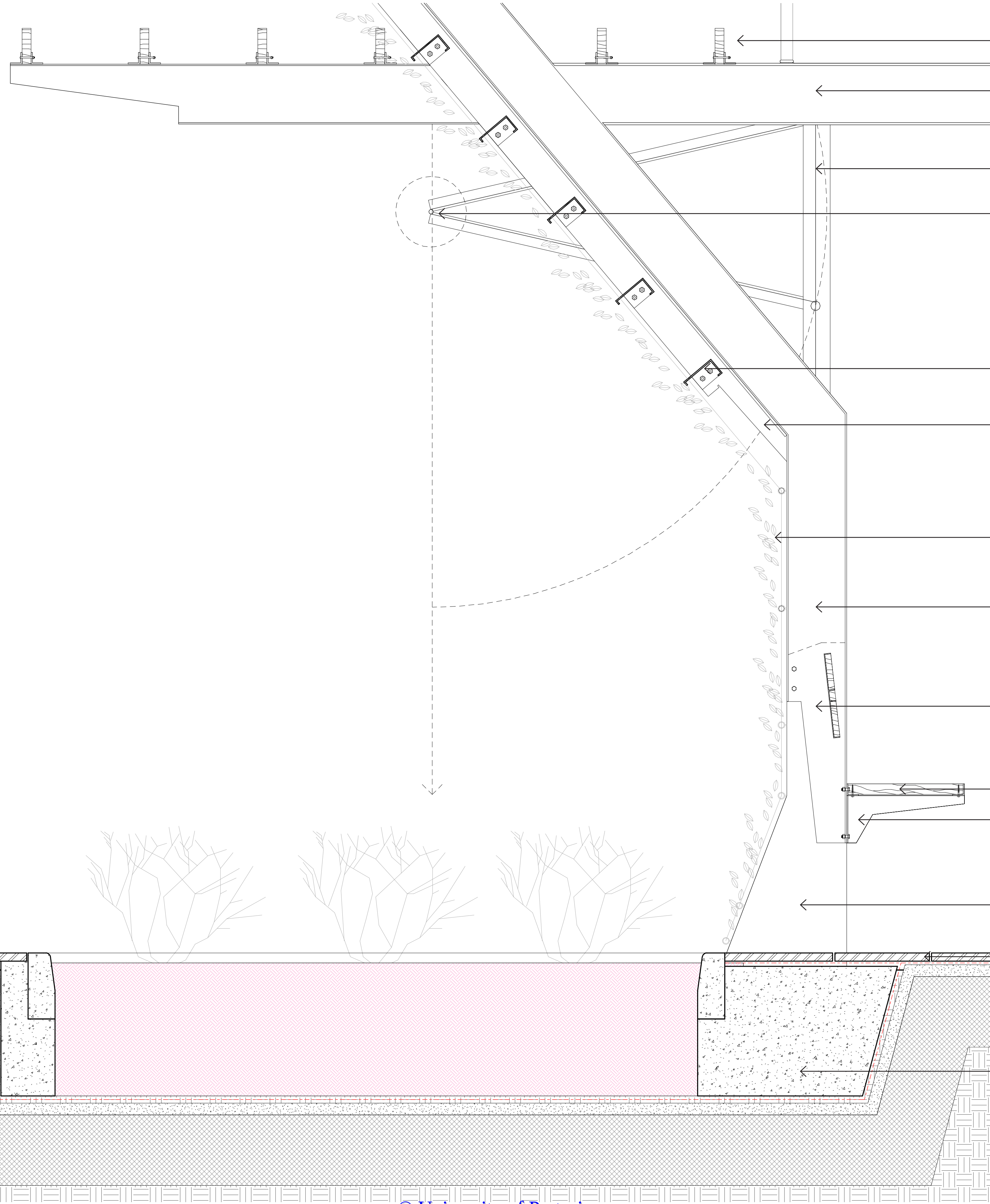


Fig. 7.64: Detail of planted facade (Scale 1:20, original drawing 1:10)(Author:2018) (Slats influenced by Raubenheimer (2014))

38 x 152mm Saligna slats bolted to 50 x 50mm Hot rolled galvinised mild steel equal angle profile using M8 bolts welded to 254 x 146 x6.1mm I profile section

Cuatom profile 254 x 146 x 6.1mm hot rolled galvinised steel I profile @ 2700mm centers

Folding panel door frame fixed to 254 x 146 x 6.1mm I profile portal frame structure

Folding timber panel door in steel substructure

150 x75 x 4.5mm cold formed mild steel lipped angle profile shop-welded to 75 x 135 x 5mm mild steel flatplate bracket

150 x 75 x 10mm hot rolled mild steel unequal leg angle framework bolted to 254 x 146 x 6.1mm I profile portal frame structure

Stainless steel trellis system fixed 254 x 146 x 6.1mm hot rolled galvinised I-section using eye-bolts

254 x 146 x 6.1 mm hot rolled galvinised steel I-section cut to profile, shop welded to custom profile

10mm Mild steel side plate bolted to 300mm custom profile pre-cast concrete footing using M10

Timber bench of 220x22 mm PAR Saligna fixed to 6mm mild steel bracket using screws

10mm cutom cut mild steel bracket fixed to 10mm mild steel side plate using M10 bolts

300mm wide custom profile pre-cast concrete footing

Bosun Flagstone Stone Grey Paver, size 200 x 400 x 35mm, laid in stackbond pattern with a minimum longitudinal fall of 1% on a transverse fall of at least 2% on 300 micron DPM on 50mm compacted sand bed with fine jointing sand swept and vibrated into joints, on min. 300 mm well rammed earth filling, compacted in max. 150mm layers to 90% ModAASHTO

Foundation to engineer's specification on 300 micron DPM on 50mm clean sand blinding on min. 300mm well rammed earth filling to engineer's specifications

Fig. 7.65:Perspective of public entrance and walkway (Author:2018)

Fig. 7.66: Perspective of production spaces and internal saw-tooth roof design (Author:2018)

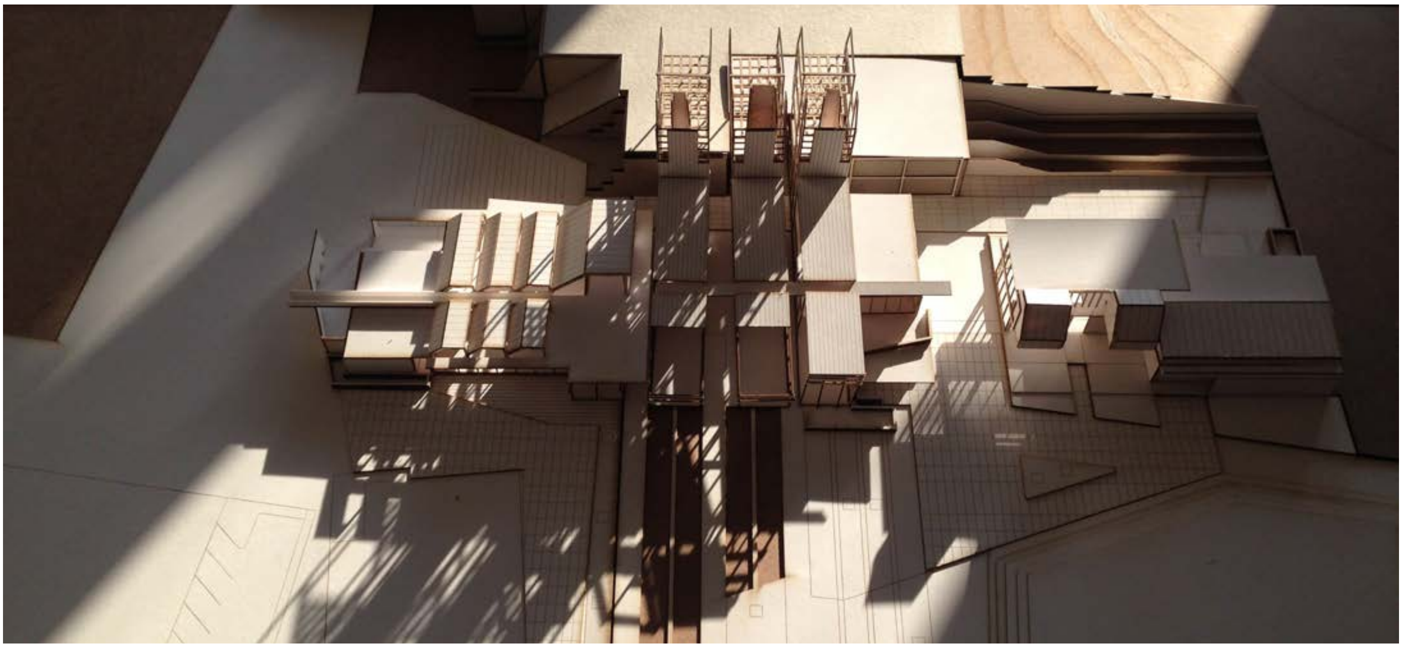


Fig. 7.67:November exam model (Author:2018)

Fig. 7.68:November exam model 2 (Author:2018)

Fig. 7.69:November exam model 3 (Author:2018)

Fig. 7.70:November exam venue 1 (Author:2018)

Fig. 7.71:November exam venue 2(Author:2018)

Fig. 7.72:November exam vanue 3(Author:2018)

08

CONCLUSION

ON-GOING PROSPECT

The dissertation intention was to question the seemingly inevitable fate of industrial heritage sites in Johannesburg— pollution and eventual erasure. It did so through exploring the potential re-use, regeneration and future prospects of the Village Main No. 1 Shaft site in Johannesburg.

This led to an investigation into the role of regenerative layering as an architectural strategy for dealing with threatened industrial heritage and polluted landscapes.

The application of regenerative principles, combined with layering as an approach, highlighted the potential of the site and led to the development of an approach to adaptive re-use architecture capable of incorporating the past, resolving current issues and ensuring a productive future.

The potential of the site coupled with theory regarding future industries and economies led to the design of a facility for bio-prospecting and bio-design. The programme allows for the creation of an inter-connected and closed-loop productive and economic system for the site capable of catalysing related and new industries in the surrounding industrial zone. The programme also re-positions industry's relationship with nature and initiates one of co-evolution and mutualism where in the past it was one of extraction and destruction.

The proposed architecture, through layers of productive and cultural landscape, aid in the remediation of the polluted site while establishing new economic and experiential possibilities. In this way, architecture is no longer employed solely for economic and material extraction but for regenerative purposes.

The conception of the architecture as a layered regenerator argues that rather than simply rehabilitating or leaving the existing landscape and buildings, a new layer of productive landscape and architecture will ensure future prospect and add to the sense of place which makes Village Main so unique.

The proposed architecture celebrates and enhances the relationship between the scarred landscape and the latent industrial heritage by re-connecting the mine, platform and surrounding building cluster. The space between these becomes a public space with new value through the re-establishment of a historic site route with new recreational programmes.

The proposed building takes human experience and the environment into consideration in a way that the functionally-focussed historic buildings never did. The result is a mixed-use, multi-faceted productive space which aims to be equally beneficial to the public and the site. The industrial typology is therefore redefined and a precedent set for the re-use of other examples of industrial heritage in Johannesburg where didactic interfaces allow the public to engage with innovative processes.

Like all buildings in Johannesburg, the possibility exists that this building will also face its own loss of prospect and be threatened by erasure at some point in the future. The nature of the adaptable design, modular construction and modifiable detailing means that this building will be able to accomodate new programmes and technology as the need arises. Its future prospects lie in the continuous regenerative layering and architectural co-evolution with the surrounds, city and its people.

The design suggests a proto-type for dealing with threatened industrial heritage in Johannesburg and South Africa. It demonstrates an approach to regenerating latent and polluted sites through a process of layering capable of expressing past, present and future prospects.

Through the combination of re-use, layering and regenerative theory, post-industrial sites like Village Main can be developed into sites of development capable not only of remediating polluted landscapes, but also of re-defining places of cultural significance in a city marred by environmental and human exploitation brought on by industrialisation.

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9

APPENDIX

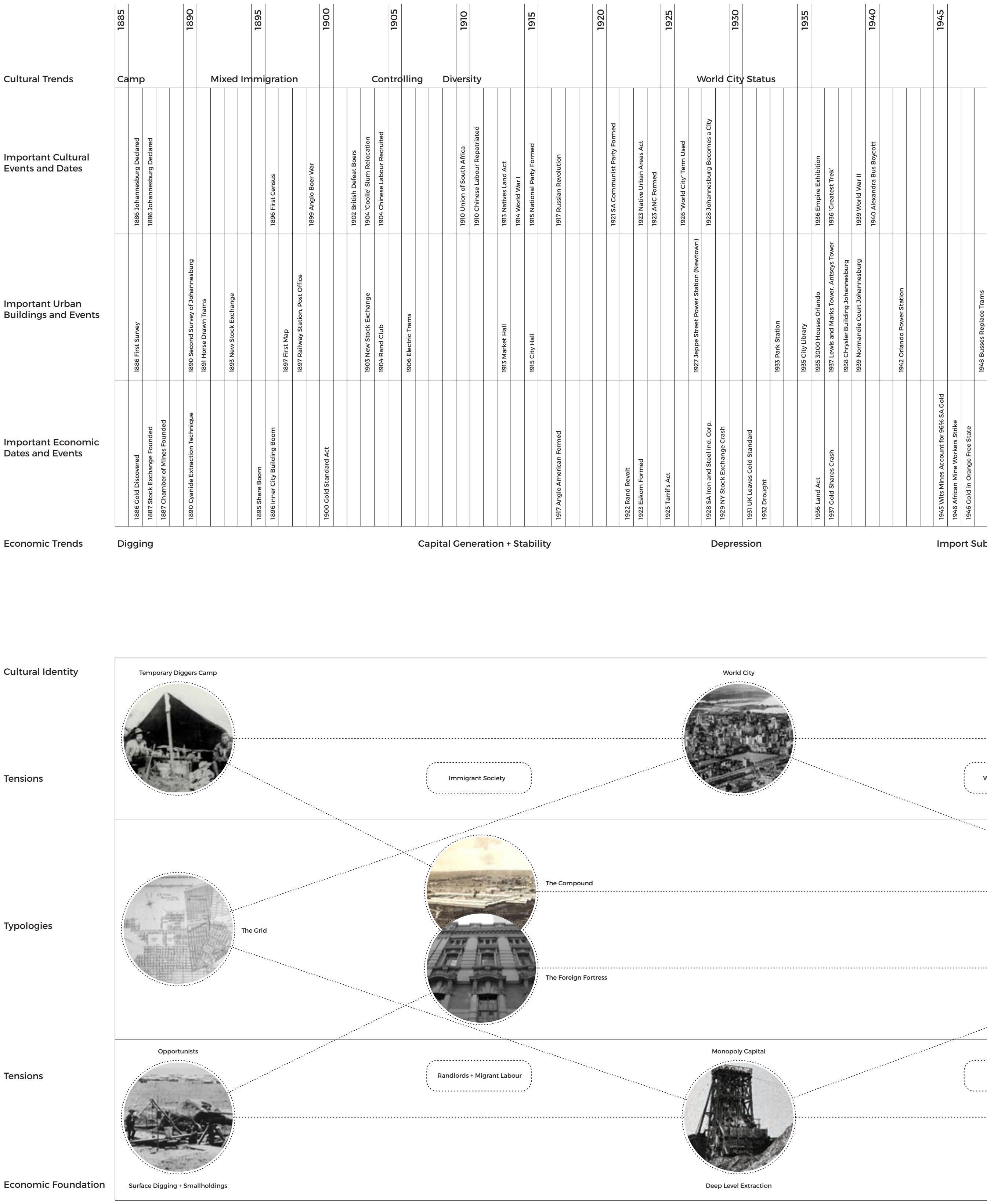
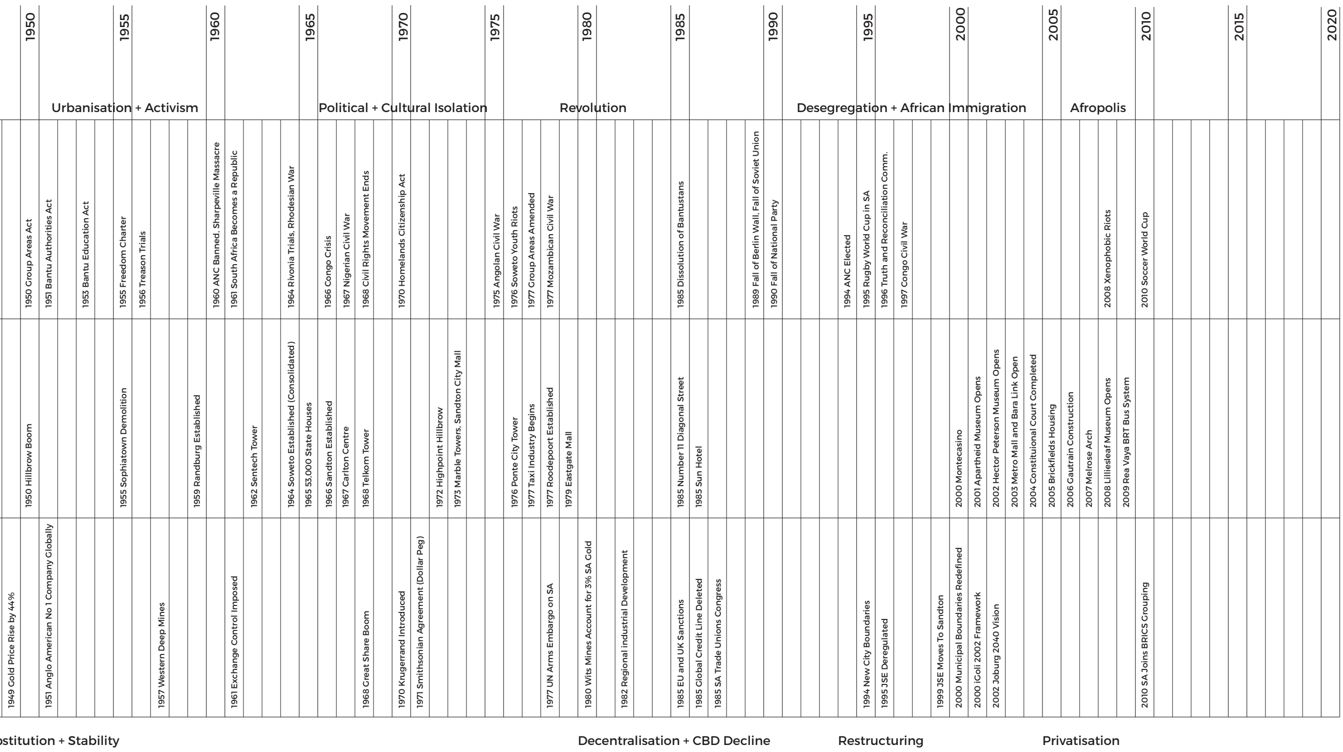
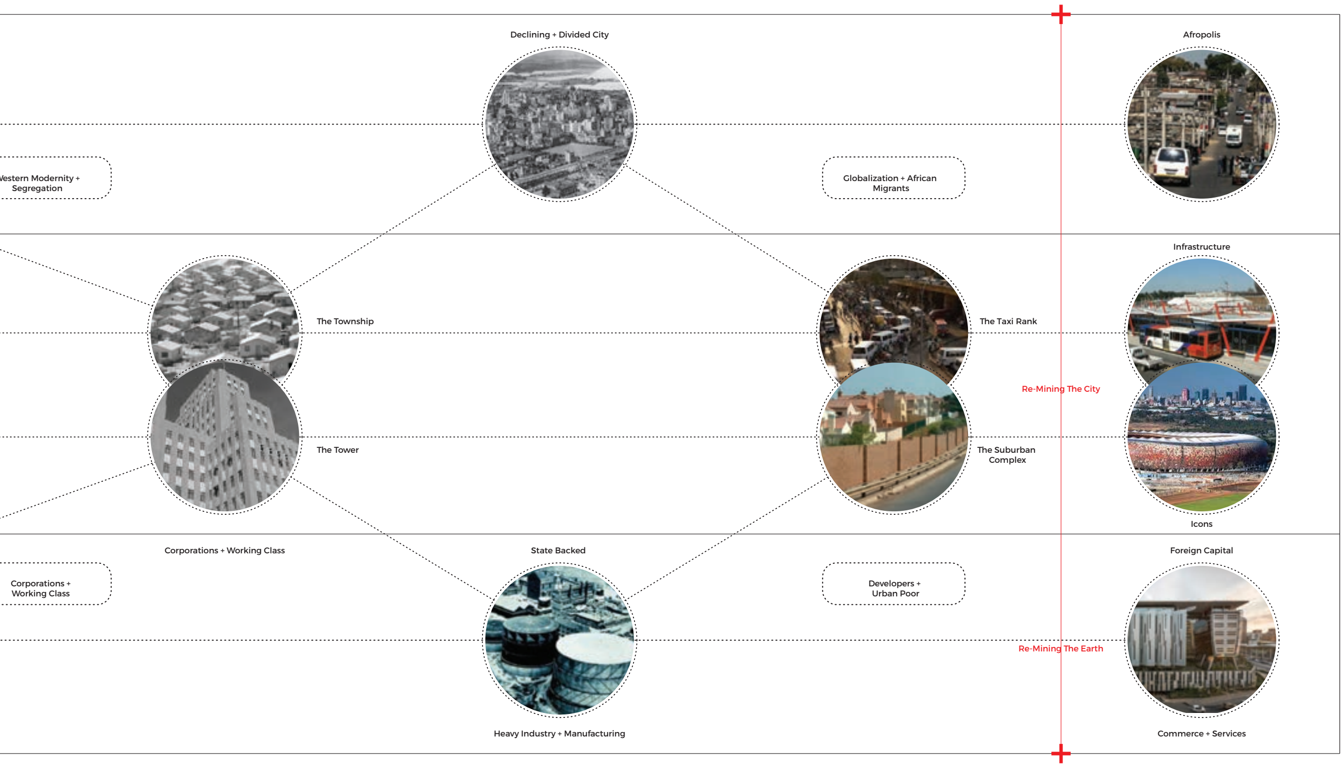


Fig. 9.1 Johannesburg timeline and architectural moments (Author:2018) (Adapted from (Lubell, 2014:56))


1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Urbanisation + Activism
Political + Cultural Isolation
Revolution
Desegregation + African Immigration
Afropolis
1950 Group Areas Act
1951 Bantu Authorities Act
1953 Bantu Education Act
1955 Freedom Charter
1956 Treason Trials
1960 ANC Banned, Sharpeville Massacre
1961 South Africa Becomes a Republic
1964 Rivonia Trials, Rhodesian War
1966 Congo Crisis
1967 Nigerian Civil War
1968 Civil Rights Movement Ends
1970 Homelands Citizenship Act
1975 Angolan Civil War
1976 Soweto Youth Riots
1977 Group Areas Amended
1977 Mozambican Civil War
1985 Dissolution of Bantustans
1989 Fall of Berlin Wall, Fall of Soviet Union
1990 Fall of National Party
1994 ANC Elected
1995 Rugby World Cup in SA
1996 Truth and Reconciliation Comm.
1997 Congo Civil War
2008 Xenophobic Riots
2010 Soccer World Cup
1950 Hillbrow Boom
1955 Sophiatown Demolition
1959 Randburg Established
1962 Sentech Tower
1964 Soweto Established (Consolidated)
1965 53,000 State Houses
1966 Sandton Established
1967 Carlton Centre
1968 Telkom Tower
1972 Highpoint Hillbrow
1973 Marble Towers, Sandton City Mall
1976 Ponte City Tower
1977 Taxi Industry Begins
1977 Roodepoort Established
1979 Eastgate Mall
1985 Number 11 Diagonal Street
1985 Sun Hotel
2000 Montecasino
2001 Apartheid Museum Opens
2002 Hector Peterson Museum Opens
2003 Metro Mall and Bara Link Open
2004 Constitutional Court Completed
2005 Brickfields Housing
2006 Gautrain Construction
2007 Melrose Arch
2008 Lilliesleaf Museum Opens
2009 Rea Vaya BRT Bus System
1949 Gold Price Rise by 44%
1951 Anglo American No 1 Company Globally
1957 Western Deep Mines
1961 Exchange Control Imposed
1968 Great Share Boom
1970 Krugerrand Introduced
1971 Smithsonian Agreement (Dollar Peg)
1977 UN Arms Embargo on SA
1980 Wits Mines Account for 3% SA Gold
1982 Regional Industrial Development
1985 EU and UK Sanctions
1985 Global Credit Line Deleted
1985 SA Trade Unions Congress
1994 New City Boundaries
1995 JSE Deregulated
1999 JSE Moves To Sandton
2000 Municipal Boundaries Redefined
2000 iGoli 2002 Framework
2002 Joburg 2040 Vision
2010 SA Joins BRICS Grouping
stitution + Stability
Decentralisation + CBD Decline
Restructuring
Privatisation


Declining + Divided City
Afropolis
Western Modernity + Segregation
Globalization + African Migrants
Infrastructure
The Township
The Taxi Rank
Re-Mining The City
The Tower
The Suburban Complex
Icons
Corporations + Working Class
State Backed
Foreign Capital
Corporations + Working Class
Developers + Urban Poor
Re-Mining The Earth
Heavy Industry + Manufacturing
Commerce + Services

INDUSTRY TIMELINE

ESTABLISHMENT

1880 — 1888- JOHANNESBURG LIGHTING COMPANY IS FORMED, THE FIRST TELEPHONES ARE INSTALLED AND THE FIRST PIPED WATER IS DELIVERED

1890 — 1890- EAST-WEST RAILWAY LINKING THE MAIN-REEF IS ESTABLISHED, 1890- CYANIDE PROCESS
1891- JOHANNESBURG TRAMS
1892- JOHANNESBURG GAS WORKS

1900 — 1906- HORSE DRAWN TRAMS REPLACED BYELECTRIC TRAMS

1910 — 1911- FIRST INDUSTRIAL STRIKE IN JOHANNESBURG (TRAM WORKERS)
1913-MINEWORKERS STRIKE
1917- ANGLO AMERICAN FORMED

1920 — 1923- ESKOM FORMED
1928- SA IRON AND STEEL CORP. FORMED

1930

1940 — 1945- WITS MINES ACCOUNT FOR 96% OF SA GOLD

1950 — 1951- ANGLO AMERICAN NO. 1 COMPANY GLOBALLY
1957- WESTERN DEEP MINES

NATIONAL SUPPORT

1960 — 1960- MINES RECEIVE STATE ASSISTANCE

1970

SANCTIONS

1980 — 1980- WIS MINES ACCOUNT FOR 3% OF SA GOLD
1982- HEIGHTENED REGIONAL INDUSTRIAL DEVELOPMENT

DIVERSIFICATION

1990

PRIVATISATION

2000 — 2006- GAUTRAIN BEGINS
2008- RE-MING OF TAILINGS

2010

2020

Fig. 9.2 Industry and economy timeline (Author:2018)

ECONOMY TIMELINE

LAUNCH

1880 — 1886- FIRST JOHANNESBURG EXCHANGE; 1887- CHAMBER OF MINES

DIGGING

1890 — 1895- SHARE BOOM

1900 — 1900- GOLD STANDARDS ACT

CAPITAL GENERATION + STABILITY

1910 — 1917- ANGLO AMERICAN FORMED

1920 — 1922- RAND REVOLT

DEPRESSION

1930 — 1931- UK LEAVES GOLD STANDARD

1940 — 1949- 44% SHARE PRICE RISE GLOBALLY

IMPORT SUBSTITUTION + STABILITY

1950

1960 — 1968- SHARE BOOM

1970 — 1970- KRUGERRAND INTRODUCED; 1971- SMITHSONS AGREEMENT (DOLLAR PEG)

CBD DECLINE + DECENTRALISATION

1980 — 1985- EU AND UK SANCTIONS; 1985- GLOBAL CREDIT LINE DELETED

RESTRUCTURING

1990 — 1994- RDP PROGRAM; 1995- JSE DEREGULATED, 1996- GEAR PROGRAM; 1999- JOHANNESBURG MOVES TO SANDTON

PRIVATISATION

2000 — 2005- GEAR REPLACED BY ACCELERATED AND SHARED GROWTH INITIATIVE

2010 — 2010- SA JOINS BRICS GROUPING

2020

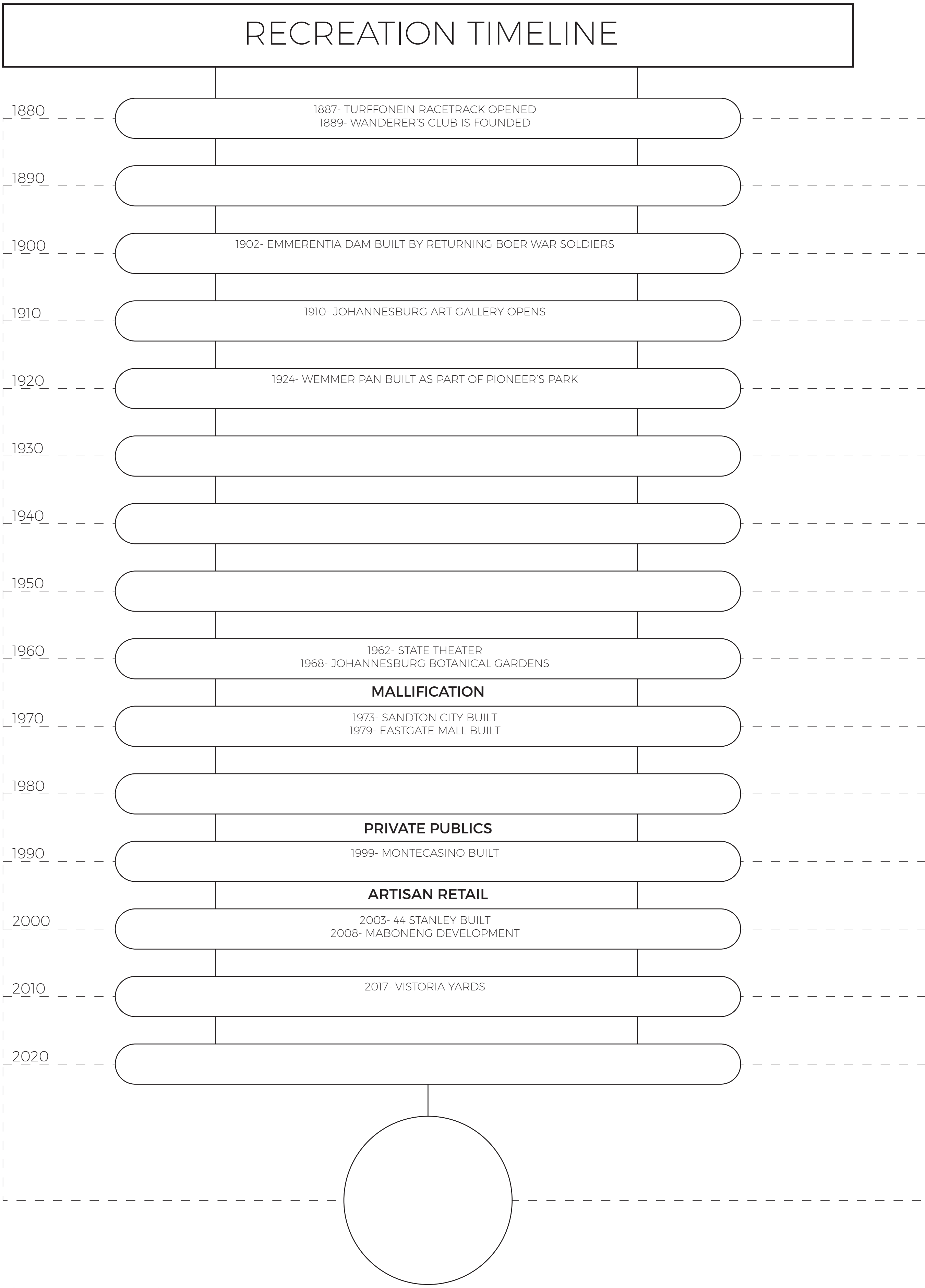


Fig. 9.3 Industry and economy timeline (Author:2018)

CULTURAL TIMELINE

CAMP

1880 — 1886- JOHANNESBURG DECLARED

MIXED MIGRATION

1890 — 1896- FIRST CENSUS

CONTROL

1900 — 1904- CHINESE LABOUR RECRUITED

DIVERSITY

1910 — 1910- UNIFICATION OF SOUH AFRICA; 1915- NATIONAL PARTY FORMED

1920

WORLD CITY STATUS

1930

1940

URBANISATION + ACTIVISM

1950 — 1950- GROUP AREAS ACT, 1953- BANTU EDUCATION ACT; 1955- FREEDOM CHARTER; 1956- TREASON TRIALS

1960 — 1960- ANC BANNED, SHARPEVILLE MASSACRE; 1964- RIVONIA TRIALS; 1968- JOHANNESBURG BOTANICAL GARDENS

POLITICAL + CULTURAL ISOLATION

1970 — 1976- SOWETO YOUTH RIOTS

REVOLUTION

1980

DESEGREGATION + AFRICAN MIGRATION

1990 — 1994- ANC ELECTED; 1995-RUGBY WORLD CUP IN SOUTH AFRICA; 1996- TRUTH AND RECONCILIATION COMMISSION

AFROPOLIS

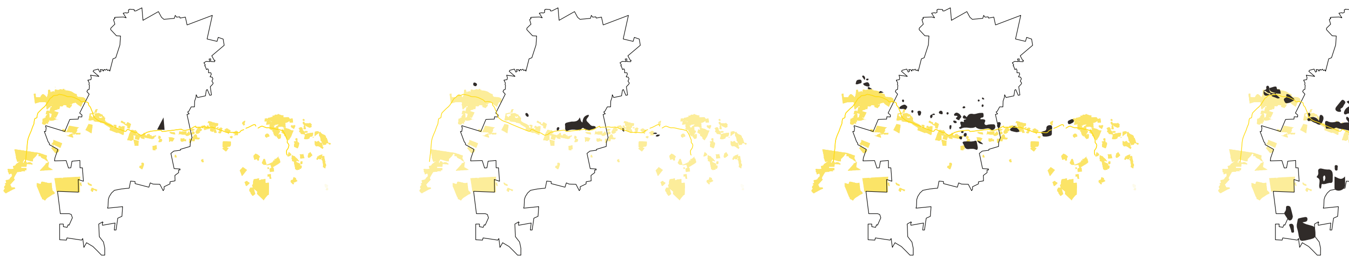
2000 — 2008- XEONOPHOBIC RIOTS

GLOBAL CITY

2010 — 2010- SOCCER WORLD CUP

2020

1887	1900	1917	19
POPULATION: 5,000	POPULATION: 140,000	POPULATION: 270,000	POPUL 500,
GOLD PRICE: $20/oz	GOLD PRICE: $20/oz	GOLD PRICE: $20/oz	GOLD I $34,
3% OF WORLD'S GOLD PRODUCED IN SA	3% OF WORLD'S GOLD PRODUCED IN SA	45% OF WORLD'S GOLD PRODUCED IN SA	35% OF WOR PRODUC



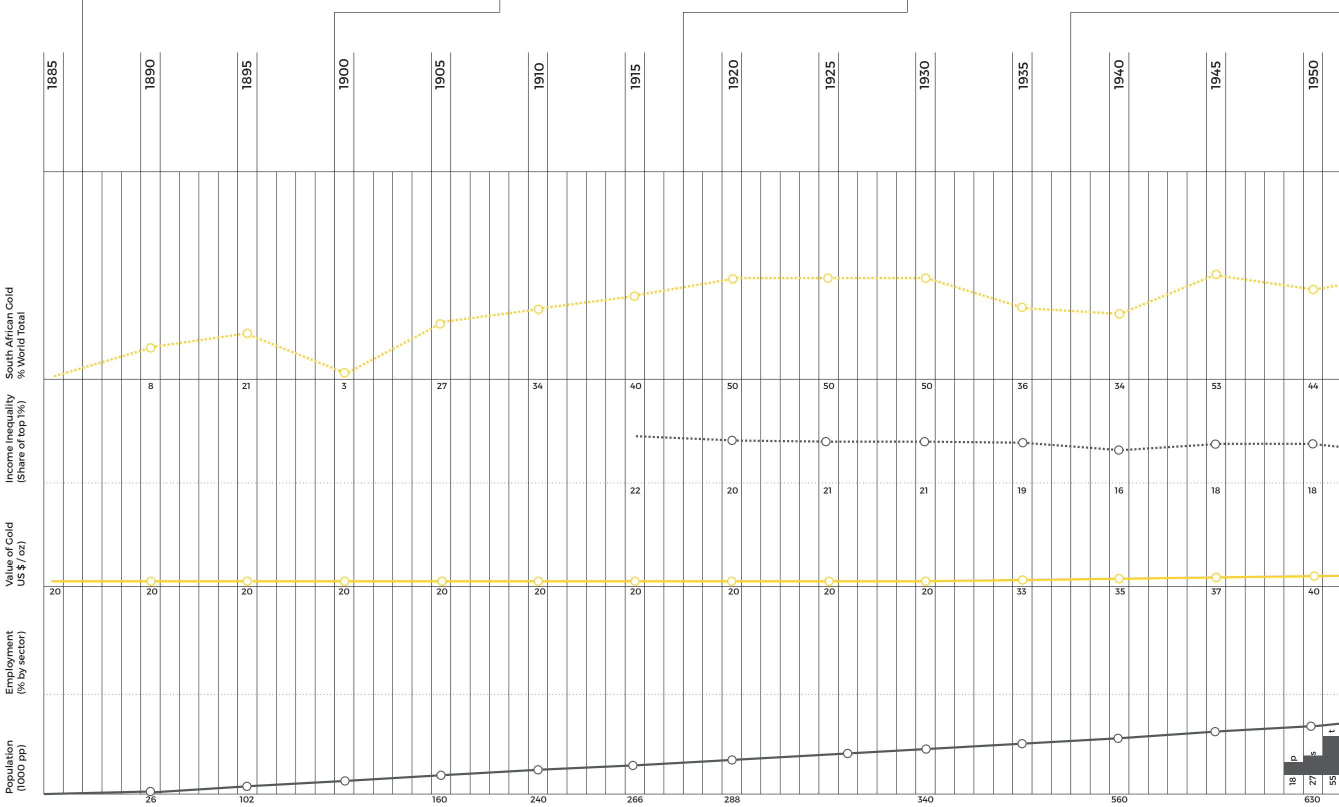


Fig. 9.4 Gold mining timeline (Author:2018) (Adapted from (Lubell, 2014:60))

37
ATION:
000
PRICE:
/oz
RLD'S GOLD
ED IN SA

1957

POPULATION:
800,000

GOLD PRICE:
$40/oz

56% OF WORLD'S GOLD PRODUCED IN SA

1984

POPULATION:
1,750,000

GOLD PRICE:
$330/oz

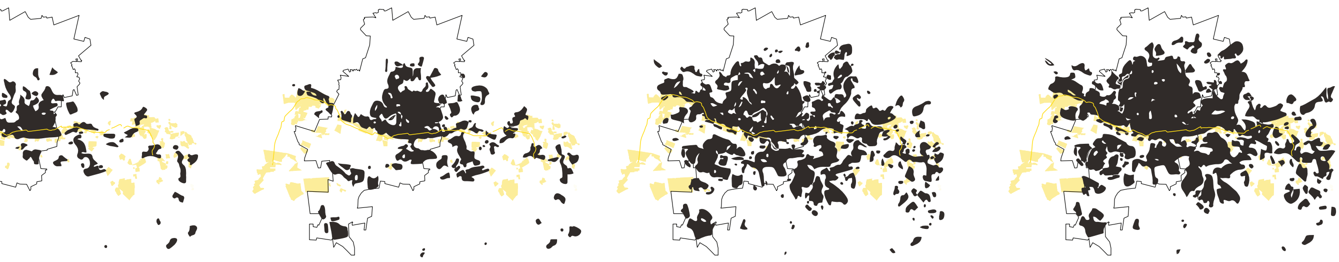
49% OF WORLD'S GOLD PRODUCED IN SA

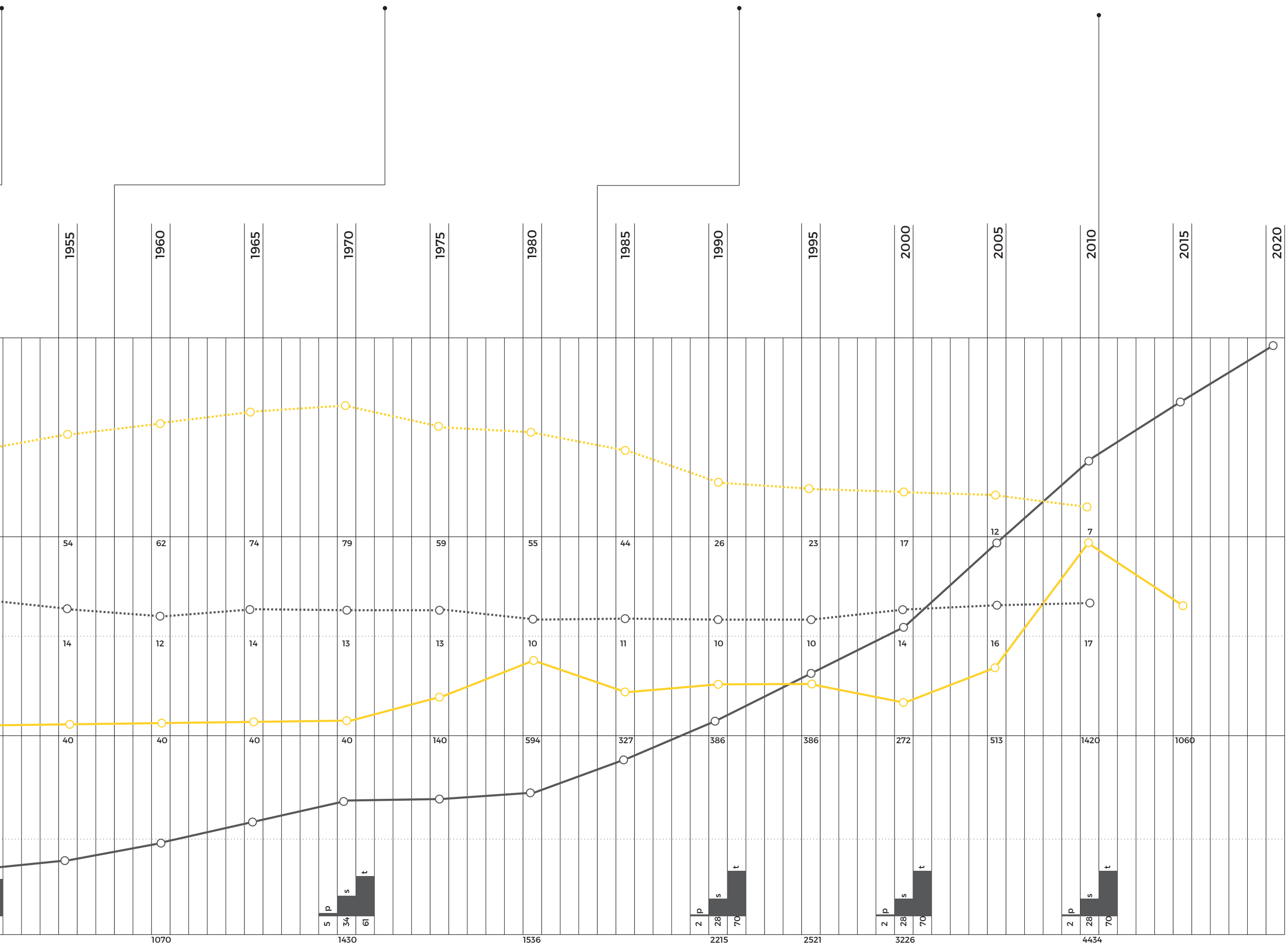
2010

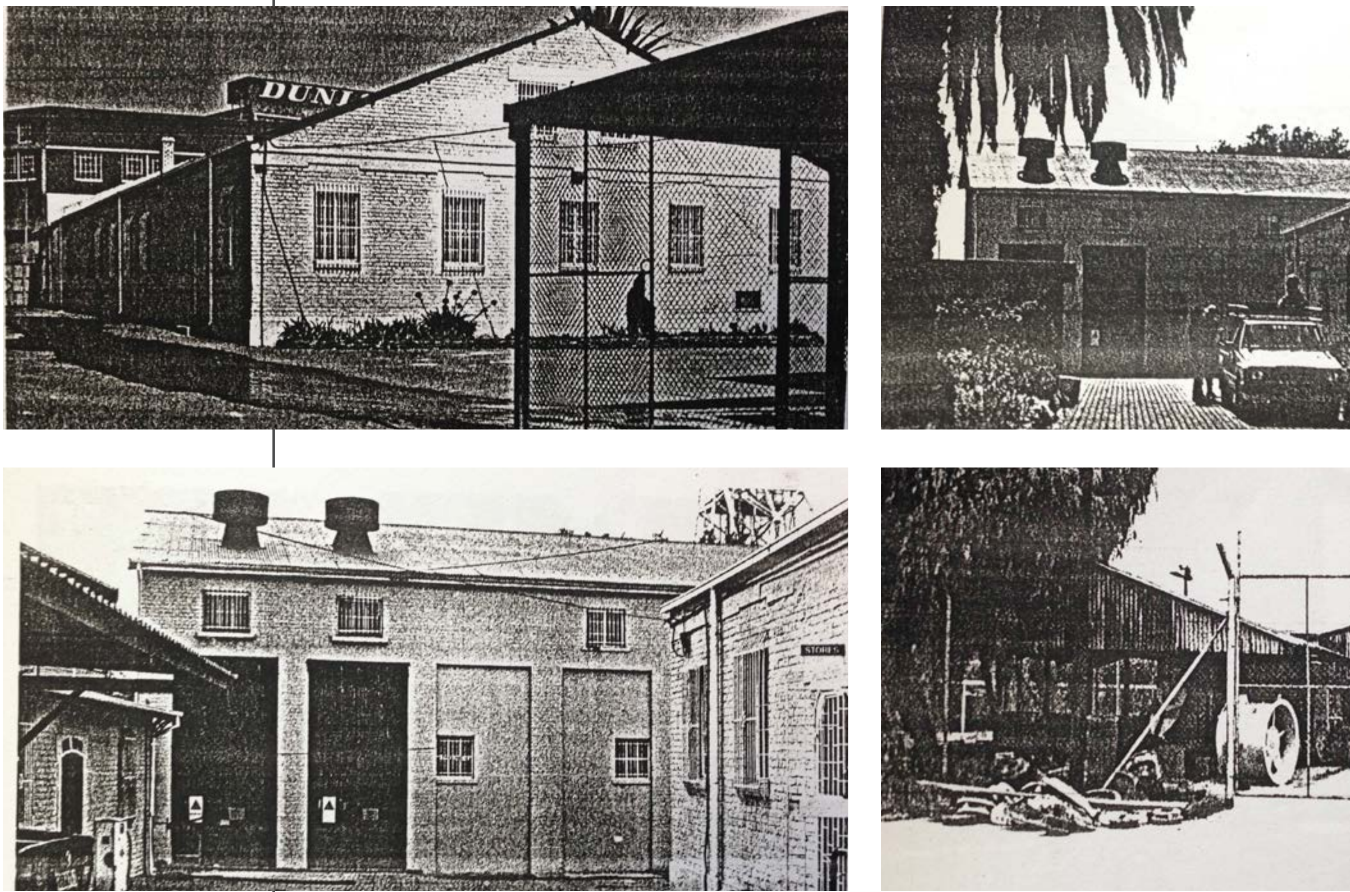
POPULATION:
4,430,000

GOLD PRICE:
$1420/oz

7% OF WORLD'S GOLD PRODUCED IN SA







VMR 1,1

VMR 1,2

VMR 1,3

VMR 1,4

Fig. 9.5: Village Main Building Complex 1 (Author:2018)

VMR 1.1
Type: Offices

Description: Single storey rectangular brick and corrugated iron building under saddleback roof, hipped roof at one end.

VMR 1.2
Type: Recreation room, bar

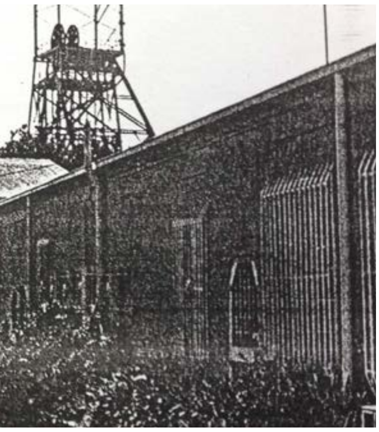
Description: Single storey rectangular brick and corrugated iron building under saddleback roof

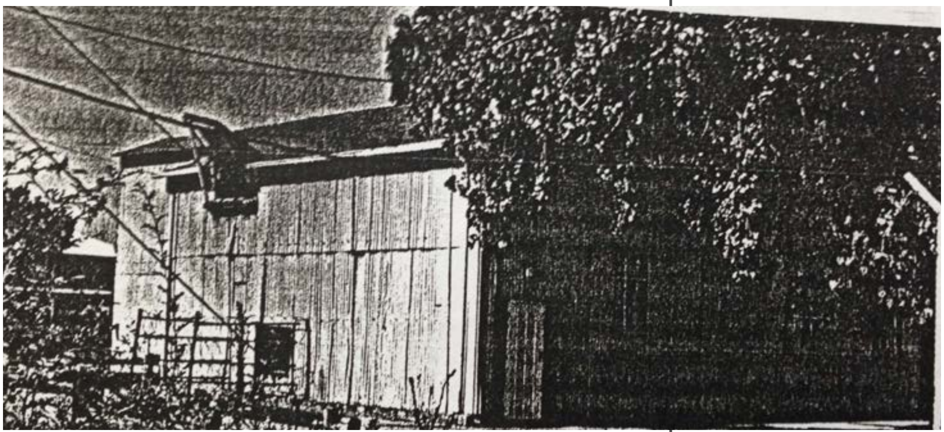
VMR 1.3
Type: Electrical sub-station

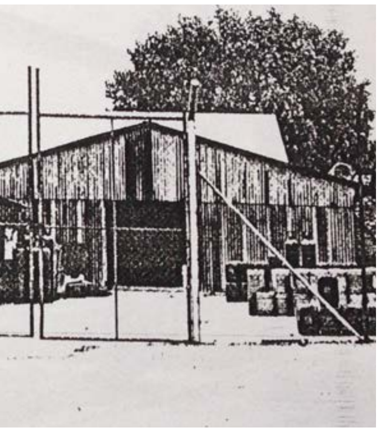
Description: Double volume rectangular
iron building with tall doors and roof ver
roof

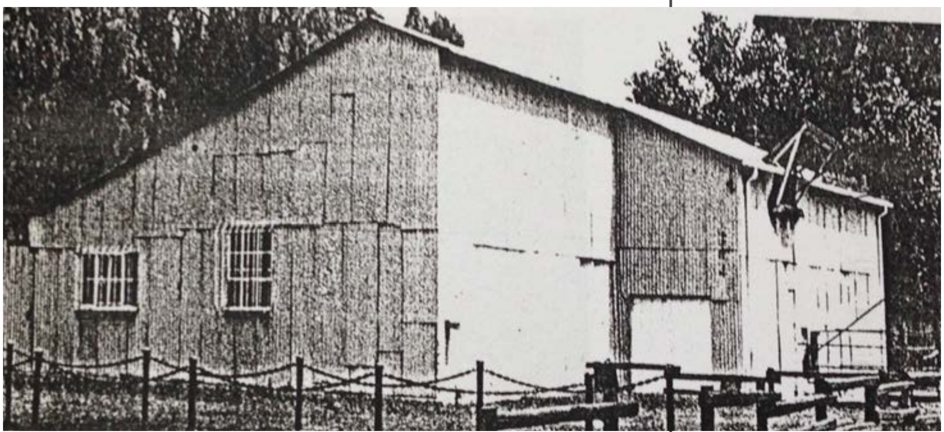
VMR 1.4
Type: Workshop

Description: Single storey rectangular co
under saddleback roof, extension on one









VMR 1,5

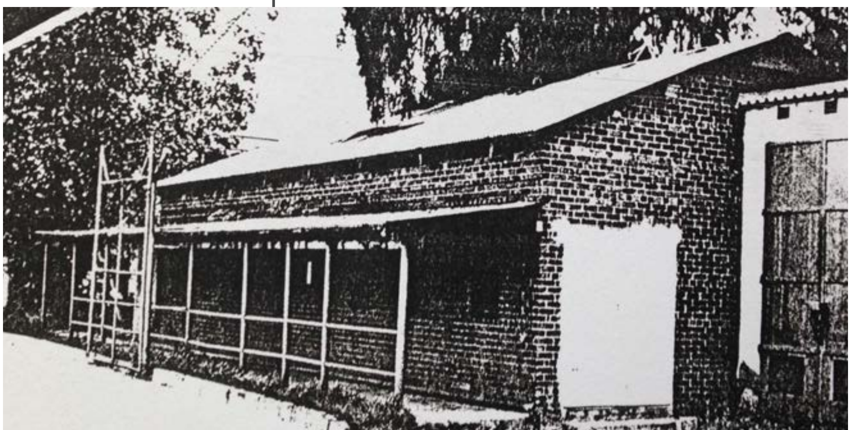
VMR 1,5

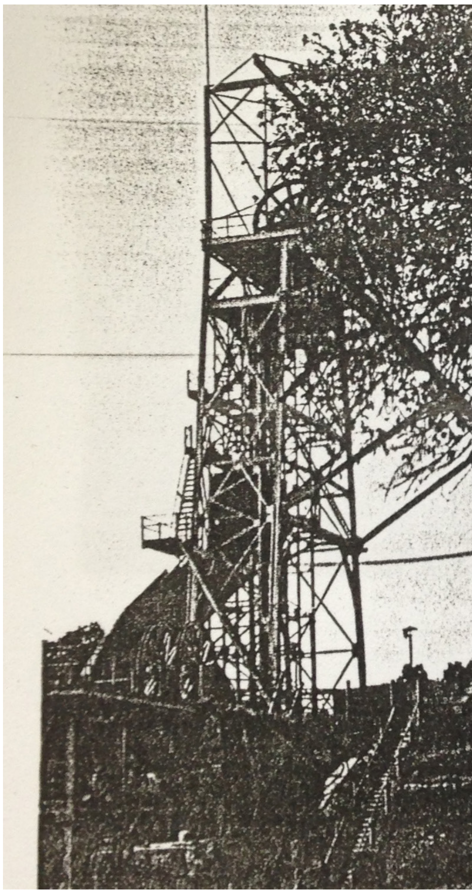
brick and corrugated
ntilators on saddleback

orrugated iron building
e side with open sides

VMR 1.5
Type: Winder house

Description: Double volume single storey corruagted iron building under assymetrical saddleback roof with lean-to extension at back





VMR 1,6

VMR 1,7

VMR 1,8

Fig. 9.6: Village Main Building Complex 2 (Author:2018)

VMR 1.6
Type: Change house

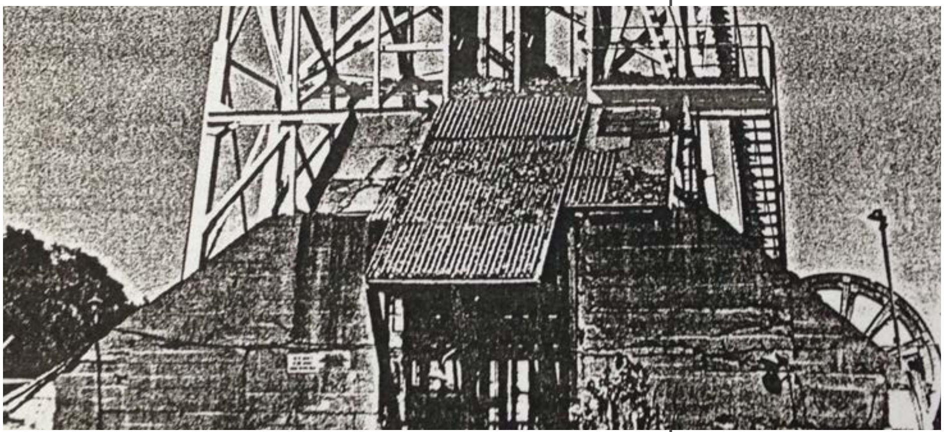
Single storey rectangular brick building under saddleback roof with articulated lean-to extensions at front and one end

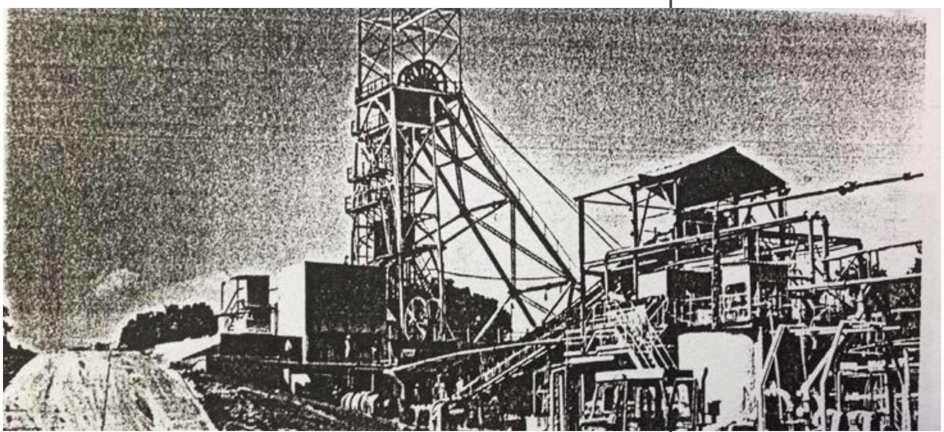
VMR 1.7
Type: Lamp house

Description: Single storey rectangular building under saddleback roof with integrated verandah on one side under lean-to roof and a row of hatch openings onto verandah for issuing and receiving of lamps

VMR 1.8
Type: Mine headgear

Description: Large steel headgear struct





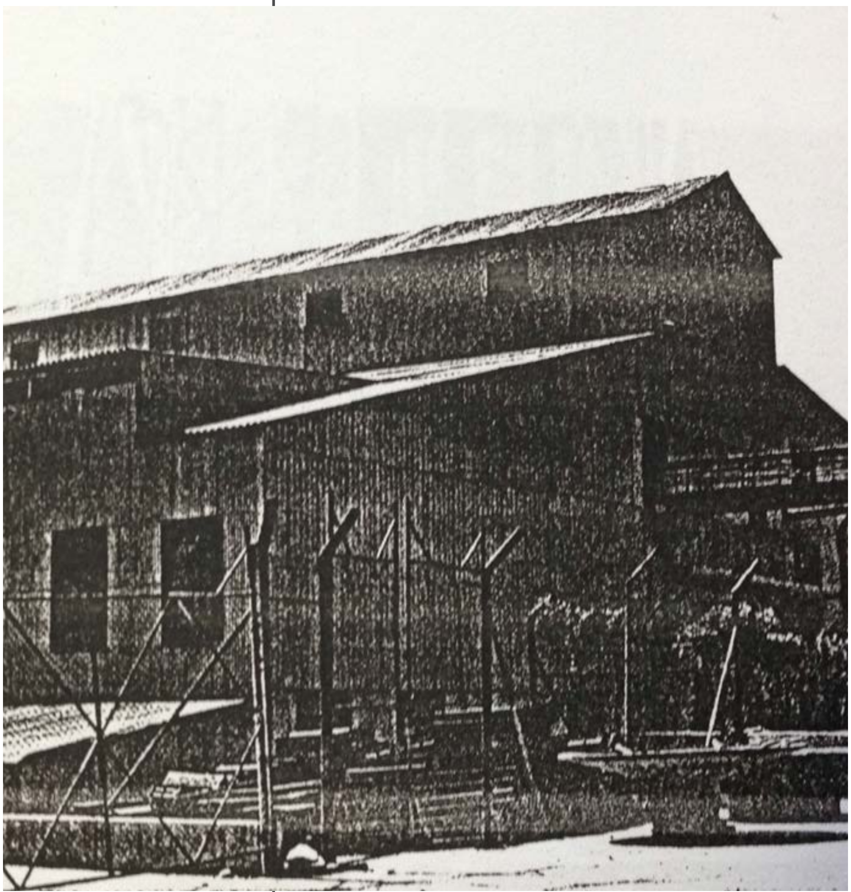
VMR 1,8

VMR 1,9

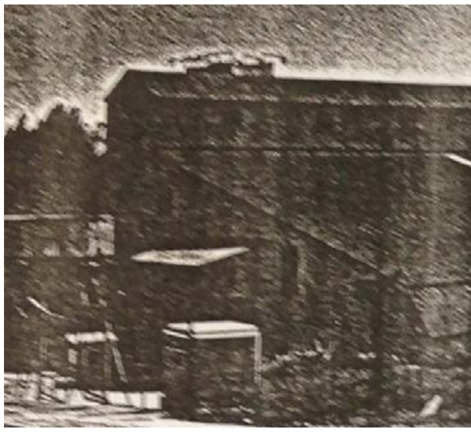
VMR 1.9
Type: Mine conveyor structure

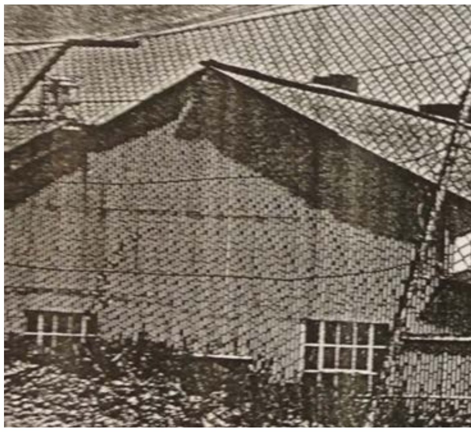
ure

Description: High saddlebacked roof rectangular open steel frame structure with inclined flat domed roofed conveyor structure on one end and similar domed bridge at one side across to reduction plant building



VMR 1,10





VMR 1,11

VMR 1,12

Fig. 9.7: Village Main Building Complex 3 (Author:2018)

VMR 1.10
Type: Mine reduction plant

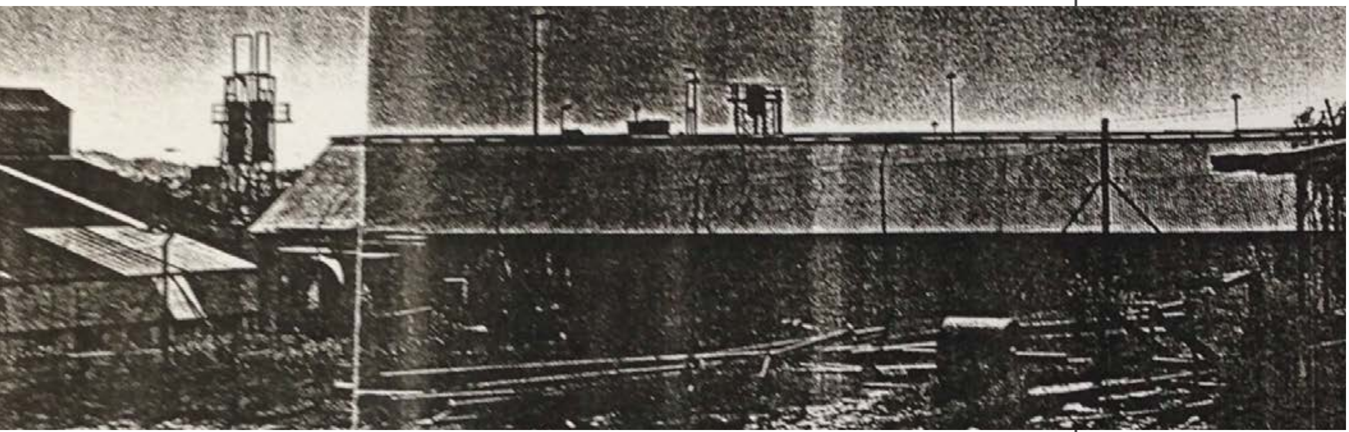
Description: Large span multiple-volume rectangular building with raised portion under a saddleback roof and side portions under extended lean-to roofs and with dormer raised roof at one end, with treatment tanks at side

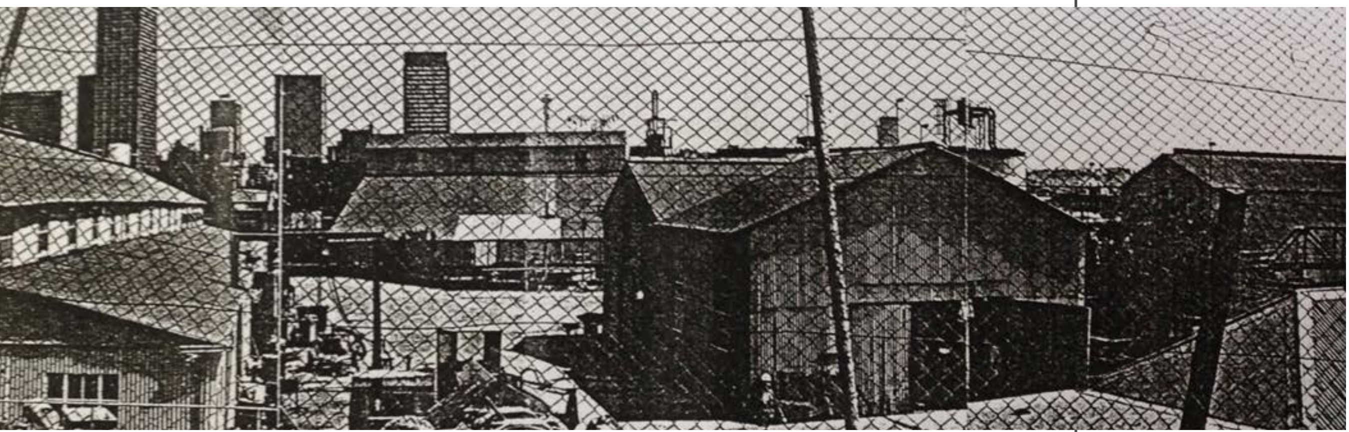
VMR 1.11
Type: Workshop

Description: Long single storey double-v and integrated single story lean-to roofe

VMR 1.12
Type: Workshop

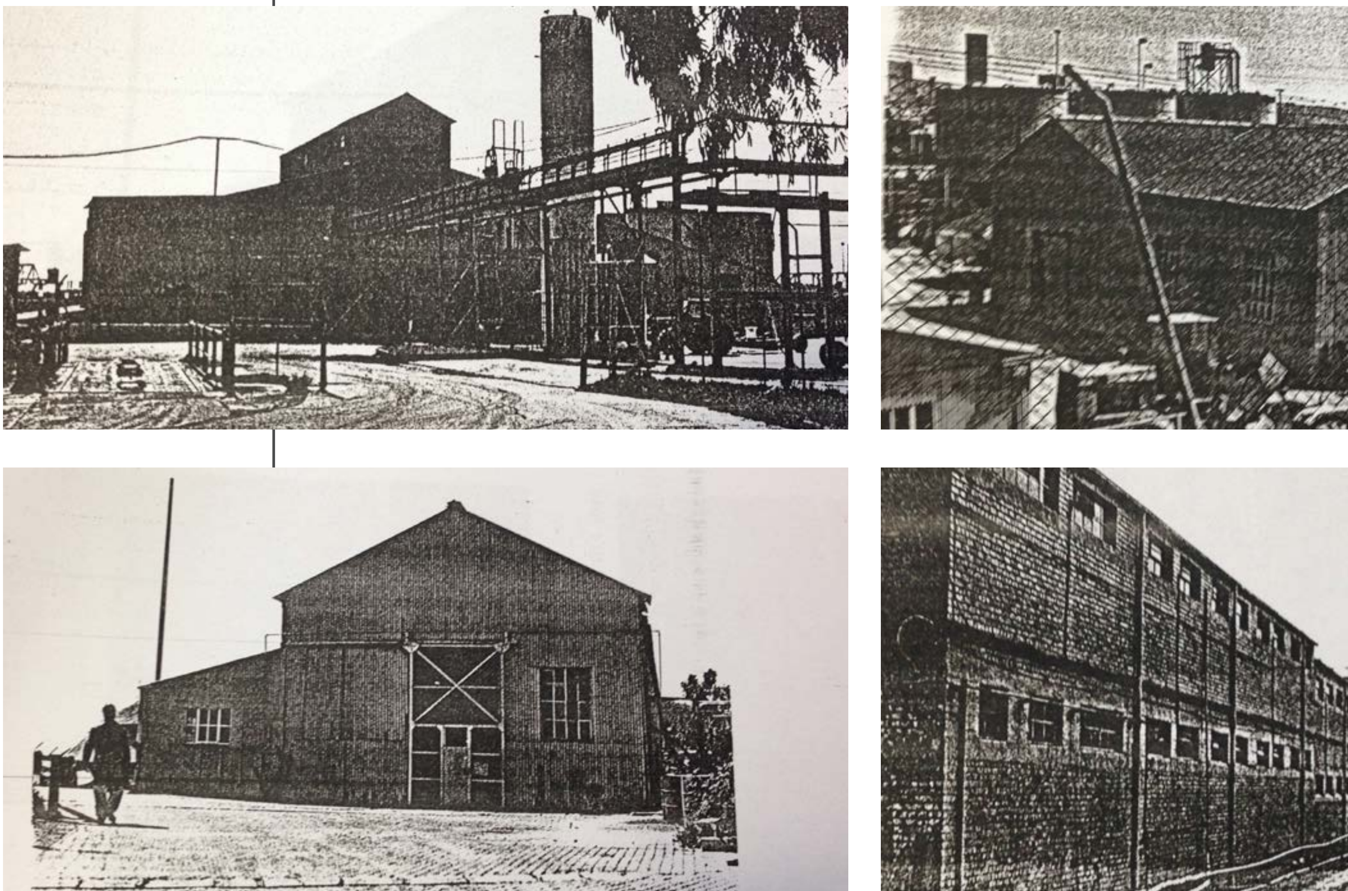
Description: Single storey double-volum another





olume rectangular building with continuous raised ridge ventilator above saddleback roof
ed extension along one side

e rectangular building in two lengths each under saddleback roofs at right angles to one



VMR 1,10

VMR 1,11

VMR 1,12

VMR 1,13

Fig. 9.8: Village Main Building Complex 4 (Author:2018)

VMR 1.10
Type: Mine reduction plant

Description: See page 48

VMR 1.11
Type: Workshop

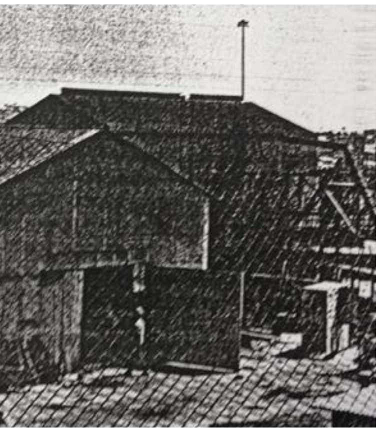
Description: See page 48, 49

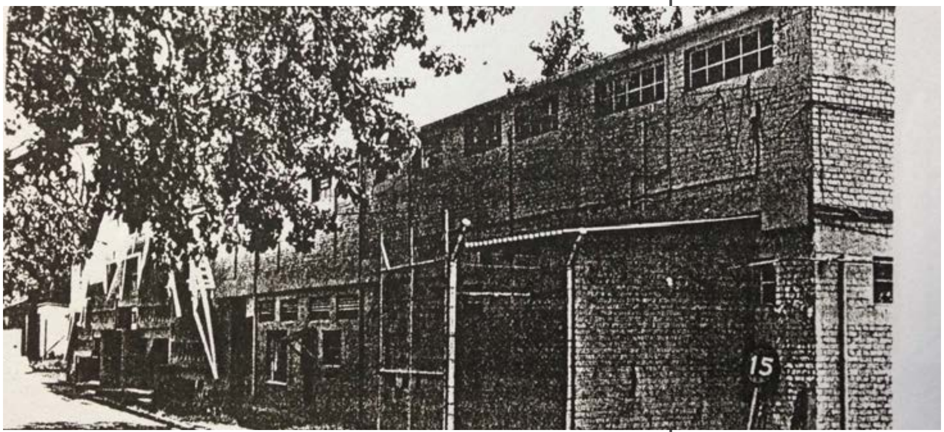
VMR 1.12
Type: Workshop

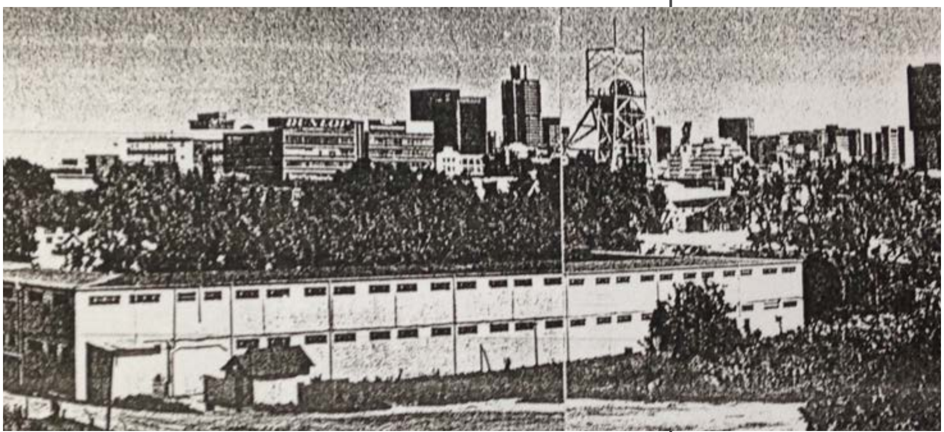
Description: See page 48, 49

VMR 1.13
Type: Hostel

Description: Characteristic hostel compl
central courtyard with communal living,
to roofs

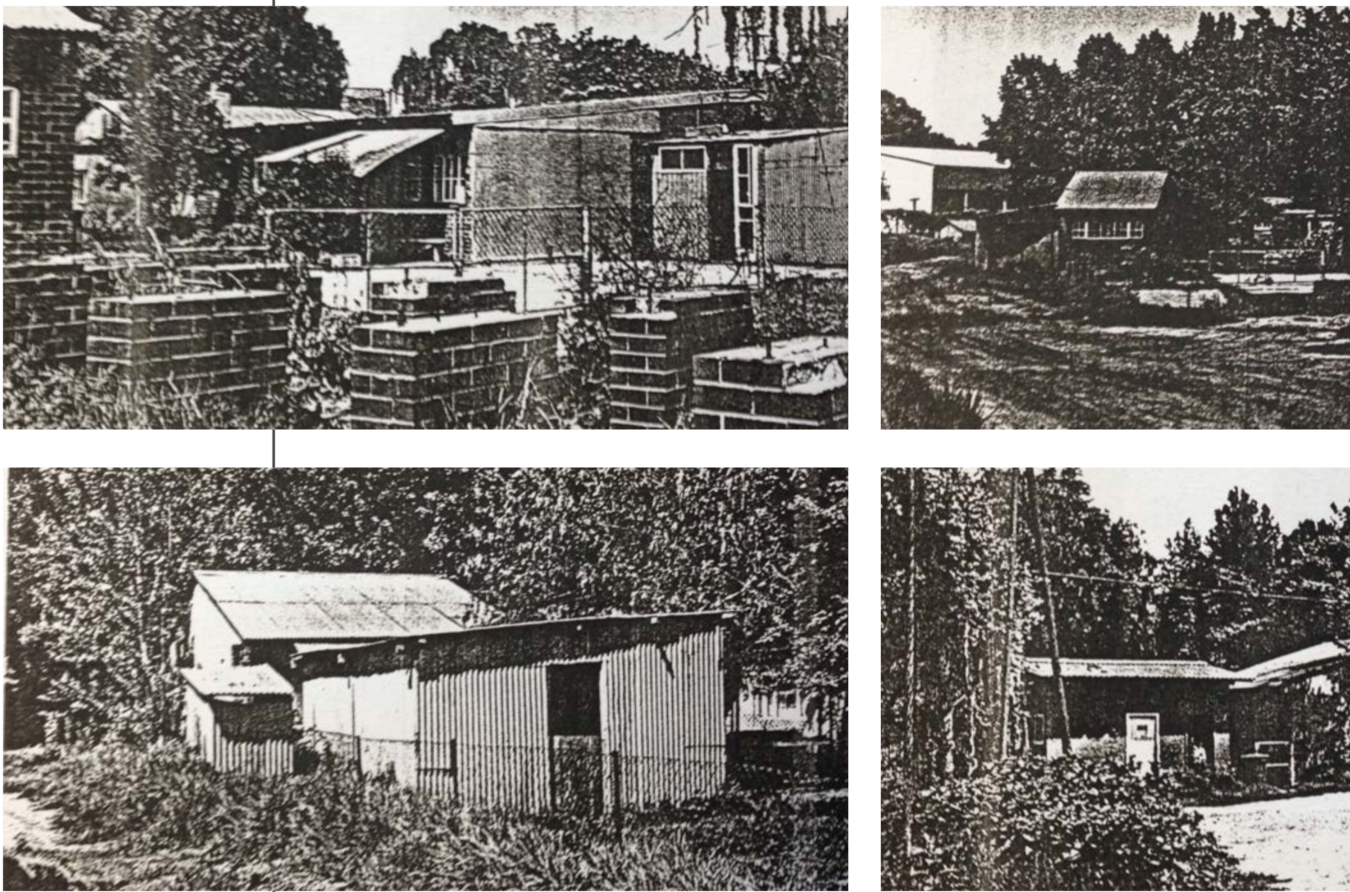






VMR 1,13

ex type with double storey dormitory block forming continuous square enclosure around a dining and ablution facilities in centrally placed buildings, perimeter building under lean-



VMR 1,14

VMR 1.14

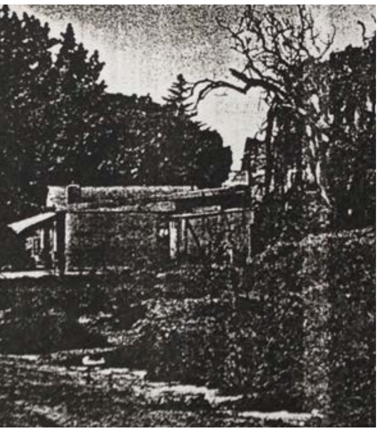
VMR 1,14

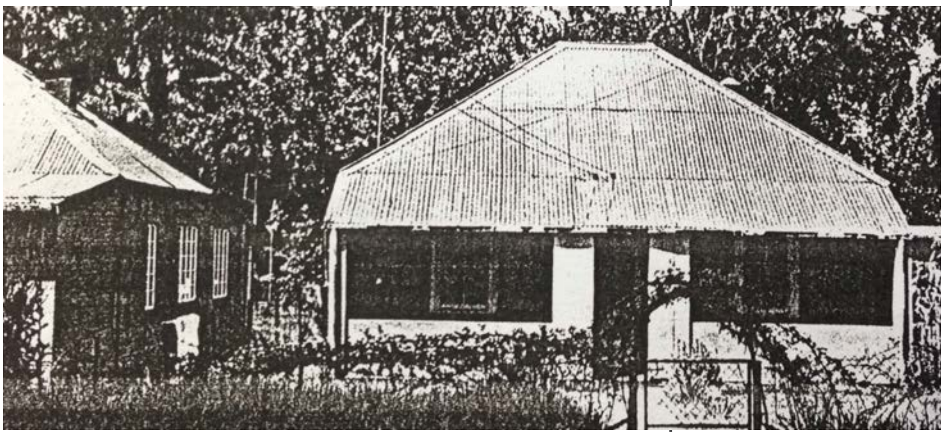
VMR 1,14

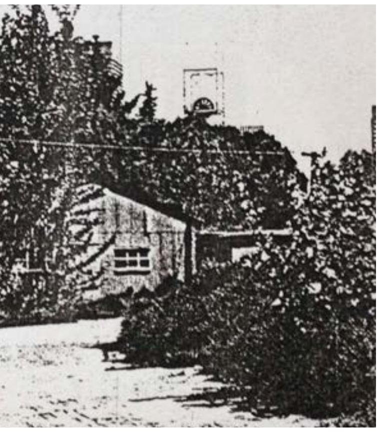
Fig. 9.9: Village Main Building Complex 5 (Author:2018)

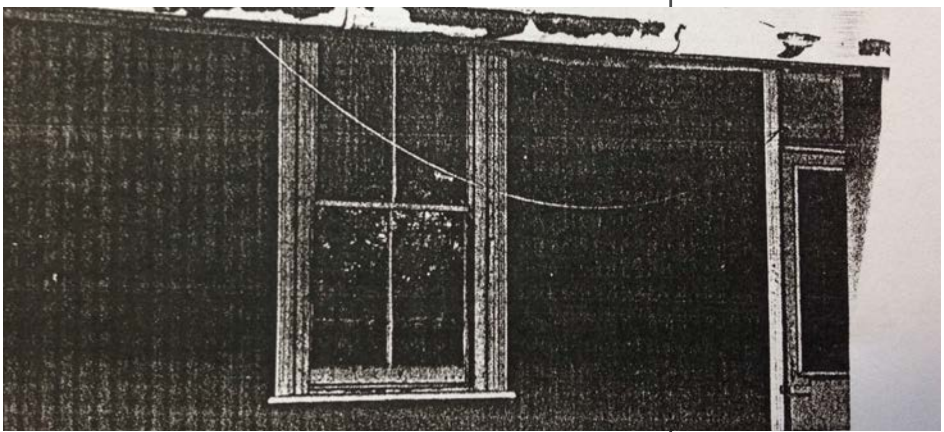
VMR 1.14
Type: Residential

Description: Group of rectangular single storey buildings and outbuildings a central courtyard under saddleback and lean-to roofs







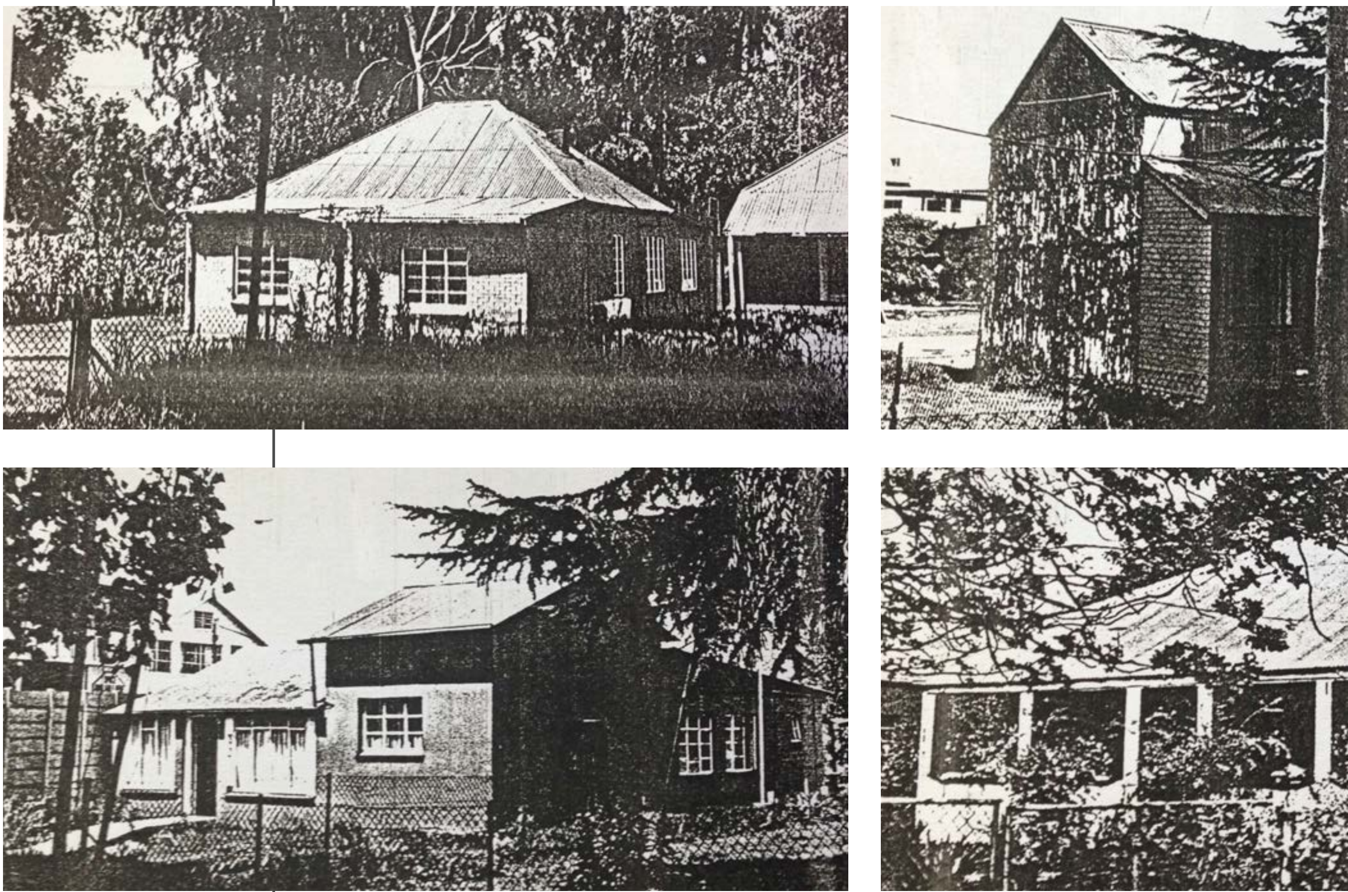


VMR 1,14

VMR 1,15

VMR 1.5
Type: Residential

Description: Single storey rectangular building under hipped roof with lean-to extensions front and back



VMR 1,15

VMR 1,17

VMR 1,18

VMR 1,20

Fig. 9.10: Village Main Building Complex 6 (Author:2018)

VMR 1.15
Type: Offices

Description: See page 53

VMR 1.17
Type: Residential

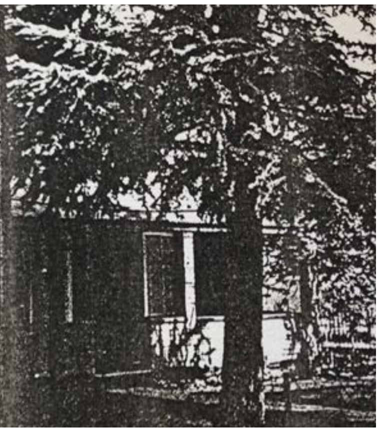
Description: Single storey rectangular winged L-shaped building with raised corner under saddleback roof and articulated wings, one side under lean-to roof and other side saddleback roof

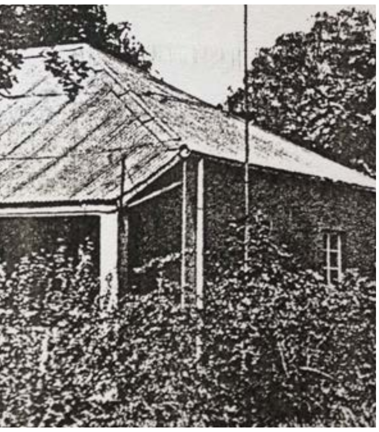
VMR 1.18
Type: Residential

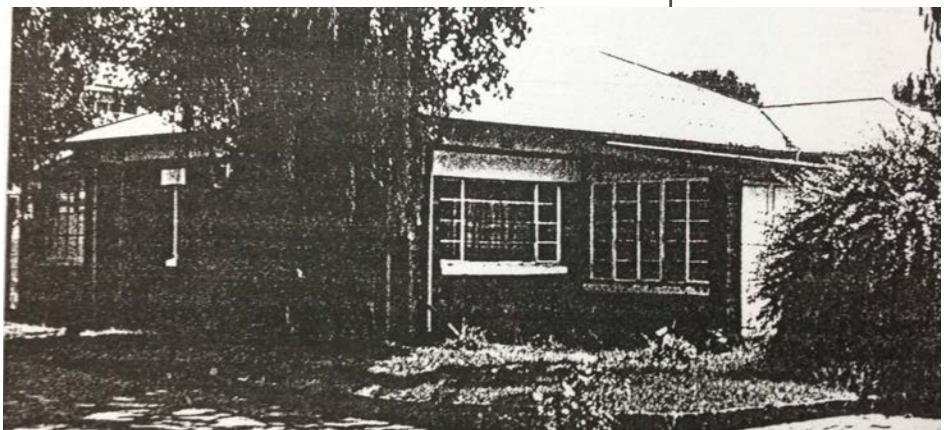
Description: Single storey double-volum
under saddleback roof with articulated v
under lean-to roof and with lean-to exte

VMR 1.20
Type: Residential

Description: Single storey rectangular bu
with integrated front verandah under ex







VMR 1,22

VMR 1,23

e rectangular building
verandah along one side
nsions at back

uilding under hipped roof
xtended lean-to roof

VMR 1.22
Type: Residential

Description: Single storey rectangular building with attached rectangular garage building all under hipped roofs

VMR 1.23
Type: Residential

Description: Single storey rectangular building with rectangular wing at one end all under hipped roofs and lean-to extension at back

R | Regenerative Layering

Regenerative layering onto the lost layers of Johannesburg's industrial heritage at Village Main

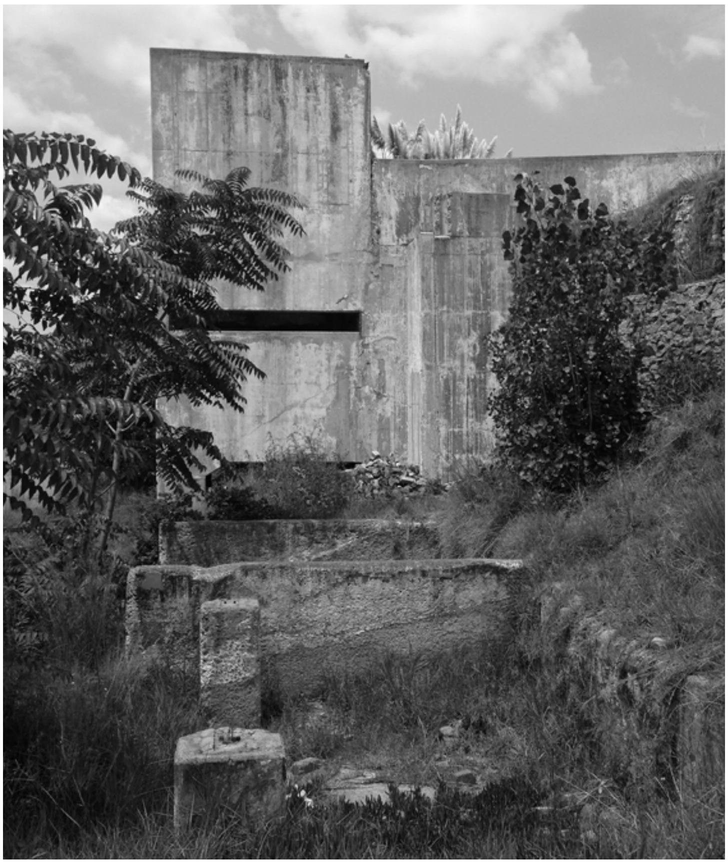


Fig. 01. Above; Village Main Shaft No 1 Remains (Author, 2018)

INTRODUCTION

As a result of an inherently extractive, exploitative and destructive mentality as well as the frenetic urban sprawl associated with competing morphogenic CBDs and sites of production, much of Johannesburg's built fabric lies abandoned or has been lost to new development. One of the most pertinent consequences of changing industry is the obsolescence of infrastructure, technology, labour and built artefacts associated with those industries (Kirkwood 2001). These sites, known as manufactured landscapes, brownfields, and post-industrial latent sites, are scattered across the city but can be found in maximum density along the mining belt (ibid.).

This paper investigates architecture's role as a potential mediator between polluted natural systems and latent industrial architecture through exploring the combination of heritage and environmental theories. In so doing, it hopes to develop an archetype for a new layer of industrial architecture capable of regenerating latent industrial sites. Village Main is the case study with the intention of it becoming a precedent for further application.

THE SIXTH INDUSTRIAL REVOLUTION

Johannesburg is a city which exists because of the planet's richest gold deposits, but was only made possible by the exploitation of the environment and the utilisation of technology. To truly appreciate the past and future of the city it is important to understand the industrial revolutions which materialised it.

The Industrial Revolution of 1760 led to a shift in production processes from hand-production methods to increased mechanisation. This led to increased efficiencies, quantities and speeds of production which launched industrialised societies onto a trajectory of unprecedented levels of technological, economic and urban growth (Ashton, 1948:3). The first Industrial Revolution globally was fuelled by the extraction and harnessing of natural resources. Similarly, South Africa's own industrial revolution was brought about by the discovery of natural deposits in the form of diamonds and gold (Wilson 2010:77). Landscapes and societies were plundered by industrialists that had no regard for the sustainability of their practices.

Since the Industrial Revolution, "the tide of progress has ebbed and flowed in cycles known as 'long waves' of innovation" (Moody & Nogrady 2010:3). Society is now in the throes of a fifth industrial revolution. In order to understand the current condition and our future, it is important to reflect on the previous cycles of innovation.

The first wave of innovation was the Industrial Revolution itself which saw great strides in innovation and incorporated new technologies causing a shift from artisanal to industrial production (Silva & Di Serio 2016: 121). Its final stage was influenced by the Napoleonic War, which eventually signalled its end. The second wave of innovation was the 'Age of Steam', which allowed for the transportation of goods and people over long distances (Ibid:130). It contributed to the expansion and development of markets of many companies and ended as a result of the great depression. The third wave of innovation was the 'Age of Electricity' which remote communications and generally redefined the productive potential of companies (Ibid.). It too ended as a result of the great depression. The fourth wave of innovation was the 'Age of Mass Production' which empowered companies to scale up production, meet new demands, and discover new business opportunities (Ibid.). It ended with the 1970s Oil Crisis. Finally, the fifth wave of innovation is currently based on information and communication technology and networks, and is characterized by the widespread use of computers and the reconfiguration of businesses with the development of the Internet (Ibid.).

The development of modern capitalism in the wake of the Industrial Revolution allowed for the exploitation of human and natural capital for the maximisation of profit (Ali 2006:1). This extractive logic has underpinned all five subsequent waves of innovation and the signs of this can be seen in the destruction of the natural environment.

Sustainability has attracted increasing attention in recent years as a response to depleting natural resources, pollution, overcrowding of cities, climate change and energy and water shortages (Markard , et al. 2012). Such problems provide opportunity for action and highlight the need for sustainable innovation systems, incentive policies and support for sustainability, as well as the development of technologies that enable organizations to combine economic, environmental and social objectives (Han, et al. 2012). Moody and Nogrady (2010:117) argue that this imminent future will be premised on resource efficiency with the focus on "minimising inputs, such as fuel or water, while maximising all the right outputs, such as energy and food, products or services, and minimising or eliminating all the wrong outputs, namely waste". As a result of the constant need for innovation and progress combined with the heightened sensitivity to the environment, there are now signs of a sixth wave of industrial revolution: the combination of sustainability and biotechnology (Silva & Di Serio 2016: 121).

At the centre of this emerging sixth innovation revolution is bioprospecting: the search for biological material with valuable technological, bichemical and genetic properties (Harvey & Gericke 2011: 323). Core to this field is the discovery and development of new materials capable of generating new products. While the first five waves of innovation had resource extraction at the core of its project, the sixth wave has the potential to reverse centuries of degradation and exploitation brought about as a result of extractive practices by harnessing closed-loop thinking rather than the one-way thinking which has dominated since the 1760s. Crucially, in a South African context this both addresses the need for development while addressing environmental degradation brought about by centuries of mining. Sites of historic industrial activity can become important instances of didactic difference where new approaches to industry can be overlaid on those of the past.

LOST LAYERS OF THE CITY

The combination of the industrial revolutions of the past three centuries

Fig. 02. Right; Extractive worldview and its resultant loss of built fabric (Author, 2017)
Fig. 03. Below Right; Aerial Photograph showing site (The Heritage Portal)

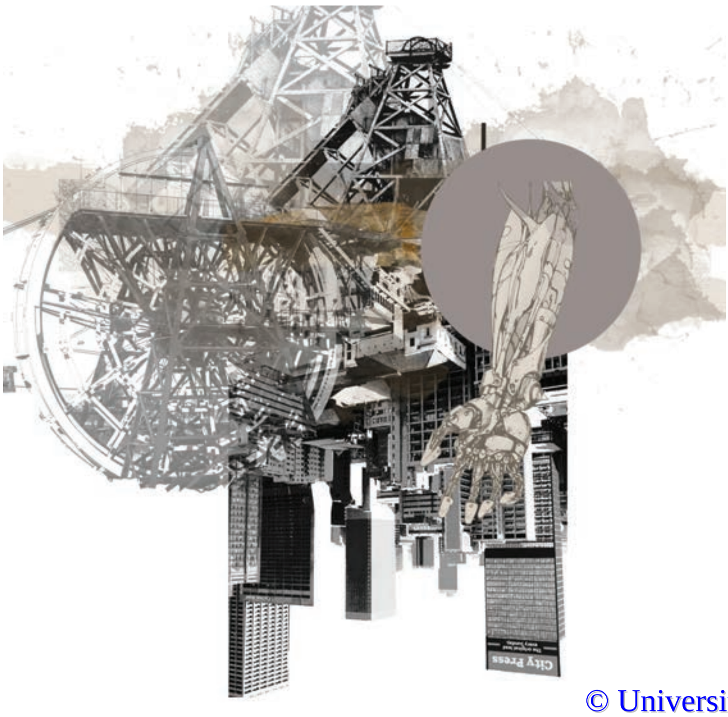


Fig. 04. Left; Lost, threatened and new layers of the city (Author, 2018)

and the acceleration of globalisation have resulted in dramatic changes to the built environment (Sassen 2005:27). Nowhere is this more obvious than Johannesburg where the built environment has been perpetually re-invented over the last thirteen decades. The combination of competing political regimes, changing industry and the mechanisms of capitalist speculative development mean that previous built layers of the city do not persist, leading to a general sense of urban and historical forgetfulness.

Chipkin (1993) posits that the city has been entirely rebuilt four times (tent and tin town, Victorian city, Edwardian city and modernist city) and is famous for obliterating its history. Despite the fact that without the gold-bearing beds of the Witwatersrand, Johannesburg would not have existed, the built landscape of the city is largely devoid of any reference to that history or the architectures that facilitated those processes. Fragmented and speculative additions for the most part have further reinforced this condition.

Architecture in Johannesburg can be characterised both by its amnesia and incessant need for reinvention (Kruger 2013:1). Much of the urban and architectural theory, too, tends to focus on the present 'Afropolis' (Nuttall & Mbembe 2008) or foreshorten the past without looking much further back (Tomlinson , et al., 2003). While it may be advantageous for current stakeholders (be it in policy, activism or design) to highlight the rapidly changing present or compress the past, this approach only perpetuates the boom and bust cycles that have characterised the city since its founding. A true understanding of the city needs to understand the full extent of the economic, productive and cultural layers of the city through history in order to produce architecture which emerges from the terroir of Johannesburg and which allows for future extension without eradicating the past. The place where all of these forces converge is on the mining belt.

THREATENED LAYERS ON THE MINING BELT

As a city built by prospectors, opportunists and entrepreneurs: each physical metamorphosis of Johannesburg was built in rapid succession following booms (of varying form and intensity) with little time for sedimentation (Harrison & Zack 2012:551). This has been compounded as the city's economy has over the last century transformed from a mining to manufacturing to service to finance focus extremely rapidly. The mining mentality of extraction and removal extends to the treatment of urbanity and architecture of Johannesburg where once value has been gleaned, it is discarded or forgotten.

The city's gold deposits lie along an east-west axis and stretch almost the entire width of the Gauteng province. The continued extraction of this resource and the associated waste products created a vast landscape of mine dumps and processing sites all along the reef. The logics of this extraction coupled with the political policy of segregation has seen a division of the city with the mining belt as its centre.

The process of deep-level gold mining is an intensely destructive one and its consequences persist globally. The focus on reducing costs and extracting wealth mean that the direct environmental consequences as well as the indirect social impacts of the practice and the direct environmental impacts create a destructive heritage that is extremely difficult to remedy and extend far beyond the physically altered landscape (Trangos & Bobbins 2015:1).

The majority of the gold mines ceased operations in the 1970s, leaving large portions of land vacant in the mining belt (Tang & Watkins 2011). Today, mining is virtually invisible apart from the few mine shafts and dumps which dot the landscape as many of these areas have been converted to other uses or have and have become sites of insurgent informal activity (Bremner 2014). A variety of ecosystems, both of the built and natural variety, adjoin the urban realm of the city. These crucial resources and infrastructural networks make life in the city possible are threatened by the combination of urbanisation, industry and mining. The same can be said of the rapidly disappearing reminders of the mining history of the city.

TERRAIN VAGUES AND THEIR PROSPECTS

Gold mining landscapes are inextricably bound with waste in two ways: as a by-product of their operations as well as the fact that sites of mining become waste landscapes (Barnett 2008:29). The 'terrain vague' is condition that exists in almost all cultural and geographical contexts and comes as a result of the fragmentation of physical and intellectual territories (Girot 2016:283). Our age and the industrial processes mean that landscapes are treated with incredible violence, leading to the obliteration and removal of traces (both physically but also in terms of memory).

The term, coined by Ignasi de Sola-Morales (2008:118), refers to a ground condition that has been subjected to dilapidation as a result of uncontrolled aggression. In that vein it is the complete antithesis, and enemy of, conscious and sustainable design. The terrain vague is not the romantic landscape interspersed with ruins, but rather a total 'ground zero' of absolute environmental and cultural annihilation in the age of the 'Anthropocene', typified by contaminated and eroded land (Girot 2016:283). It straddles the aftermath of a series of depredations but also has an unlikely future promise. This past plundering and future uncertainty are both evident on the mining belt of Johannesburg. While the terrain vague has a ubiquitous nature, there is also specificity in the way that it came about and the forces that have contributed over time.

Berger (2007) describes 'drosscapes' as the vast, leftover tracts of land with no apparent purpose or designation as a by-product of our post-industrial reality. While differing in their nature and formation, they too occur across the world. One of the great legacies of the Apartheid city are the buffer-spaces designed to keep population groups and functional zonings apart which in many ways resemble the drosscapes described above.

The lens through which we view these environmental problems needs to be through culture as environmental problems are created first and foremost by culture and then facilitated through science (Comp 2008;63). For the most part, the cultural dynamic has been absent from the debate. Such environments have tended to viewed primarily as technical hazards and their reclamation has tended to be viewed purely as a function of engineering and mechanistic ways of thinking. This is both ironic and problematic as the solution should not be derived from the same mind-set that gave rise to the problem in the first place. When dealing with environmental degradation we are to pursue creative, synthetic, holistic solutions capable of solving economic, environmental and cultural issues simultaneously (Comp 2008:65).

Sound historical understanding of the environmental problem opens up opportunities for the proper understanding of the origins of the contamination we seek to re-mediate, as well as for greater reflection on the values and achievements of our predecessors. Furthermore, this illuminates our contemporary role in that continuum of history and environmental commitment (Comp 2008:63).

THE VALUE OF INDUSTRIAL HERITAGE

The history of the contemporary city has been affected by numerous and differing visions with regard to urban models but most significantly by changes in manufacturing and consumption arrangements (Siverts 2003). The latter part of the last century brought with it major innovations in the industrial sector and the consequent demise and obsolescence of many industrial landscapes. Globally these effects are being experienced as a result of economic restructuring, process automation and well as the flight of industries to areas with lower production costs (Jameson 1991).

This globalisation of industry has profoundly affected industrial areas the world over and has partly led to the dereliction and underutilisation of these sites. As a result of the economic downturn, environmental degradation and social distress as a result of contamination there is an increased need to redefine these places through the processes of community-based, interdisciplinary action which has the ability of integrating mixed-use long-term solutions based on ecological, economic and social objectives (Loures 2009:294).

These industrial sites have traditionally been viewed mainly as sites of ecological degradation (Conesa, et al. 2008). The combination of this perception and the momentum behind conservation efforts has recently catalysed the renaissance and redevelopment of industrial sites. The reclamation, conservation and transformation of these sites represents an important cultural goal which is intrinsically sustainable as it is premised on the positive reuse of redundant industrial buildings (Loures 2009). There are mounting calls for these ecologically diminished assets to be returned to productive and positive uses capable of contributing to the surrounding communities and natural infrastructures. (Ibid:293).

Post-industrial sites, largely due to their environmental damage, often suffer the fate of demolition to make way for more fruitful forms of development. Such an approach, that of the tabula rasa, annihilates not only the physical remnants of the past but also the invaluable historical traces and connections to collective identity. Due to this, the distinctive and unique characters of place give way to generic forms of development so rampant in the 21st century global city. This destructive approach is all too prevalent; powerful counter-arguments as well as frameworks need to be developed in order to safeguard and celebrate these portals into our past.

While discourse on industrial heritage is increasing, the term is very seldom used in reference to Johannesburg. This is extremely problematic as the industrial heritage of South Africa is both rich and important (Läuferts & Mavunganidze 2009:533). Unfortunately, South Africa (along with many developing countries) has fallen behind in protecting its heritage assets, particularly those of an industrial nature (ibid.).

Johannesburg, largely due to the mining industry and the associated industries, has a rich heritage of productive architecture. Rather disappointingly, this aspect of Johannesburg is not communicated or celebrated in the city's frameworks or tourist strategies. With the dawn of democracy in 1994 and the new heritage legislation published in 1999, focus (understandably) shifted to sites of struggle history and places that exhibited the resistance of people during the Apartheid era. Industrial

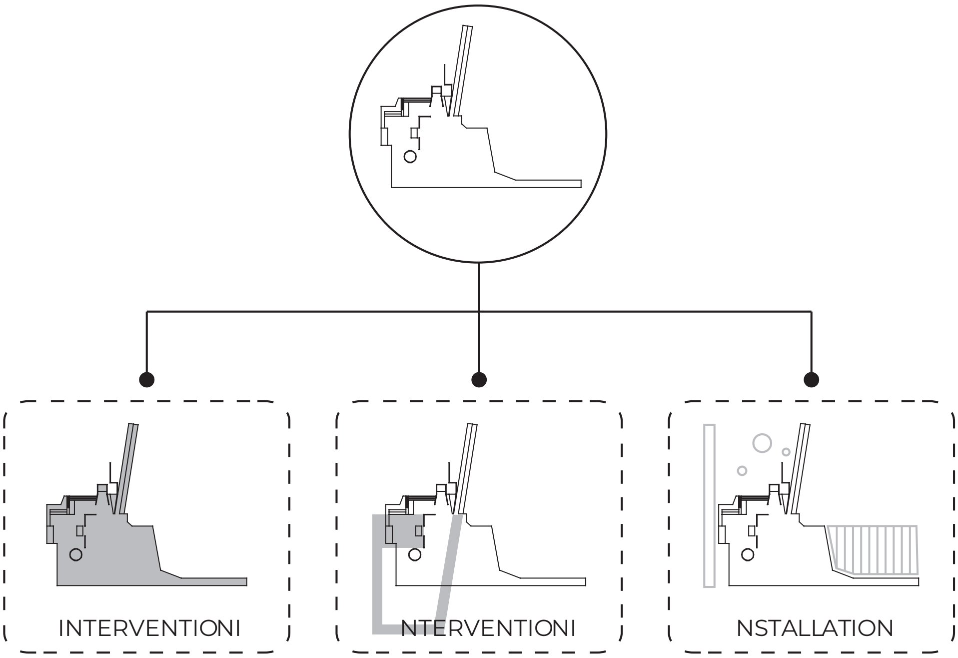


Fig. 05. Left; Re-use and transformation strategy: intervention, insertion, installation (Author, 2018)

heritage, for the most part, was not prioritised.

Rapid and unsympathetic cycles of redevelopment has seen much of Johannesburg's industrial heritage destroyed. This is partly due to the hastiness of developers but also the overzealousness of politicians eager to clean up industrial sites in decaying areas. It is imperative that industrial heritage in Johannesburg is not treated in isolation but rather as sites forming part of complexes and networks of productivity but also as contributors in larger narratives of industry (Läuferts & Mavunganidze 2009:538). An example of one such complex is the Johannesburg Gas Works precinct which forms part of the broader inner-city infrastructure network as well as a key informant in the narrative arc of 20th century industry in the city. Rather than viewing these places and processes in isolation and thereby obliterating their meaning and character, they should be linked through intelligent frameworks.

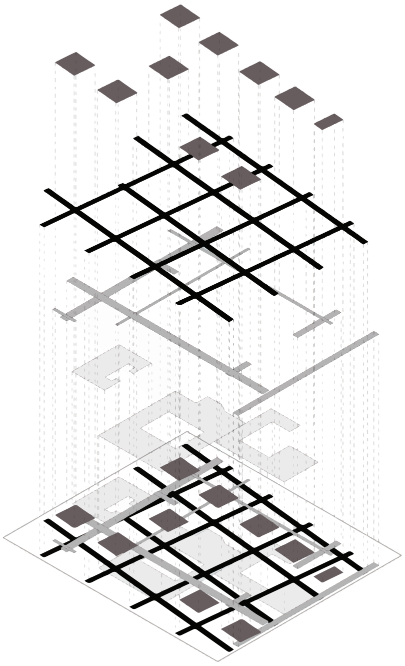
Industrial heritage is an integral constituent of the cultural heritage underlying the founding and growth of the city over time. Its features should be uncovered and traced in order to retain and exemplify contained cultural values. This gives us an understanding of a sense of place as well as our connection to that place over time as they embody features of our origins and progress through their forms, histories of use and features (Loures 2009:296). In the past, changes and adaptations to industrial heritage have been limited in scope to functional and economic concerns. It is becoming more apparent that holistic responses to industrial heritage take cognisance of cultural and social factors (Romeo, et al. 2015:1306). Such an approach should however not ignore the need for structural, formal and energy requirements. By taking advantage of the latent cultural and social potential of industrial heritage sites, preservation and ongoing reuse can find a sustainable driver.

The tangible (physical and material) aspects of industrial heritage tend to be emphasised while the intangible aspects are often ignored (Sutestad & Mosler 2016:321). Intangible aspects include identity, community spirit and story. It is of the utmost importance to gain insight into place in order to deepen one's understanding of what a community values and how a site relates to the community. Such aspects of cultural community hold the keys to understanding the site's location historically but also the secrets to unlocking its future relevance and possibilities, The local integrity of heritage as well as nuanced connections to everyday life need to be rooted in and involve with community in order to ensure the authenticity of the everyday as opposed to a museum setting (ibid.)

These intangible qualities can be broadly explained as the genius loci of place — it's intrinsic spirit — and fundamentally imbue it with distinctiveness and quality (Norberg-Schulz 1979:8). The quality resides not only in the material and structural dimensions but also in the spirit which is in the place. If managed correctly, this quality develops and persists through time although things change. On the other hand, the 'genius loci' of a site should not be overemphasized at the expense of sincerity and authenticity.

Industrial heritage is represented by stratified and layered architectural complexes characterized by a variety of formal and technical solutions which over time have been added to one another. These layers happen as a result of demand due to the evolution of technology as well as innovations in production processes (Romeo, et al. 2015:1305). It is this layering (additions, use changes, abandonment, reuse and adjustment) which gives the industrial complex its unique value (ibid).

One can go as far as to say that it is this continuous evolution which constitutes the essence of this particular architectural typology. From the earliest industrial buildings to the present day, industrial architectures have had the capacity to adapt their form as well as their technological logics to meet the changing needs of production. This quality has enabled the reading of the history of industrial sites indicative of material and technological superimpositions. For example one can chart phases related to the testing and use of materials and elements as well as artificial and natural energy sources



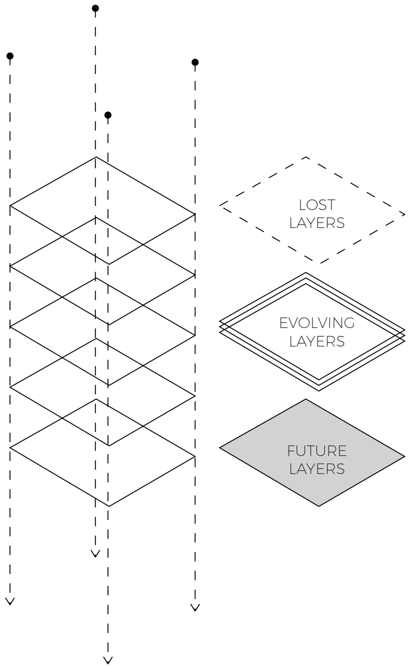


Fig. 06. Left; Eisenman's layering process (Author, 2018)
Fig. 05. Right; Evolving layering (Author, 2018)

(Romeo, et al. 2015:1306).

Cultural heritage embodied in industrial heritage sites reveal past actions and societal behavioural patterns as layered landscapes. Here, history is a dynamic element embedded in a series and succession of places capable of teaching us of past mistakes and success stories. Present and future generations are participants in the ongoing constitution of identity and meaning grounded in place. The emphasis on everyday activity and participative practices prevents the site from being monumentalised or caught in a cycle of irrelevance down the line. Flux, temporality and adaptation become important foundations to such an approach (Sutestad & Mosler 2016:333).

REUSE AND TRANSFORMATION

Existing buildings embody meaning and memory. The discriminate re-reading of these artefacts can lead to both dynamic and appropriate results (Stone 2005:125). The embodied and inherent qualities of place, combined with the anticipated future uses can create a multi-layered richness and complexity impossible to recreate in new buildings (ibid:126). The re-use of buildings emphasises continuity.

Machado (1976:46) positions remodelling as a way of balancing the past and the future and uses the device of palimpsest as a metaphor to describe the process of building re-use. A strategy which finds its manifestation in the early process of Peter Eisenman (Karaman, 2012). In it, layering and archaeological operations are applied in order to express the spatialisation of layered time.

The re-modelling of any existing building is to respond to the structural, environmental, aesthetic, contextual and programmatic dimensions of the project and needs a coherent strategy in order to dictate the intentions and operations (Stone, 2005: 125). It is only through such a strategy and the analysis of the pre-existing and the archaeology of previous layers that the remodelled building can be imbued with a greater and enhanced meaning.

Analysis should form the basis of the argument for the remodelling strategy and should involve context, structures, spaces, function, history and site (ibid:125). Structural analysis should involve a study of mass, size, rhythm and form as well as physical historical significance. In the analysis of existing buildings, narrative can be an extremely important device in the uncovering, clarification, revelation and ultimate activation of the artefact.

The transformation strategy informs the logic and order of the intervention and is to be underpinned by analysis. Three strategies can be identified in relation to their intimacy between the old and the new: intervention, insertion and installation (ibid:129).

Intervention: which is a complete interdependence between the old and the new which activates potential or repressed meaning (ibid:130).

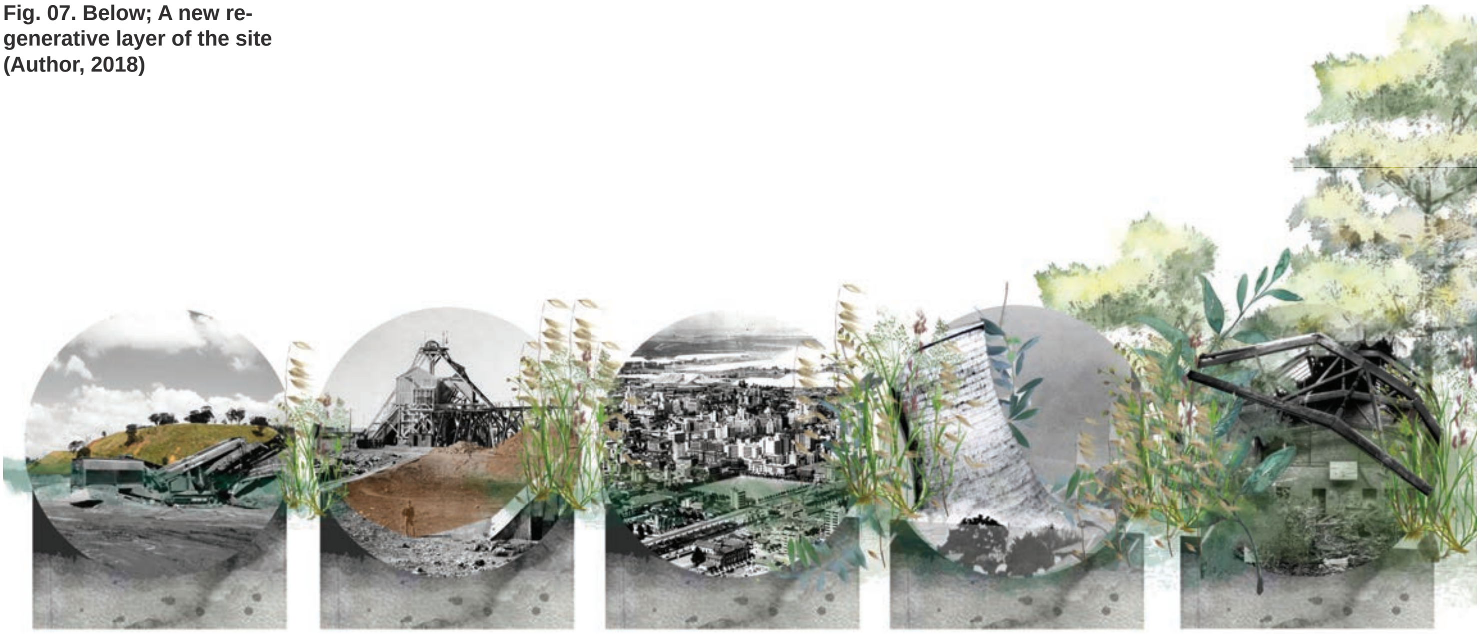
Insertion: involves an intense relationship between the old and the new yet allows the character of both to the strong and independent. New elements are inserted which can be an interpretation of the existing or past. This strategy can use tension, juxtaposition and contrast (ibid: 131).

Installation: involves the placement of a series of related elements within the context of the existing. This approach heightens the awareness of the existing without compromising or interfering. This strategy can be used to clarify, delineate and order (ibid: 132).

An understanding of time, both in the past and in the future, is essential in achieving a nuanced and complete understanding of the present (Layne 2014:63). Palimpsest, a metaphorical trope combines the constructs of past and present as well as offering a productive device to nuance and augment re-use of architectural artefacts in the future (ibid.).

The notion goes beyond the literal and becomes a tool useful for holding multiple separate ideas in parallel, echoing the numerous layers of a piece of writing (ibid.). It is most useful as it allows past layers to be held in consideration with those of the present. Specifically, and most advantageous for architecture, the palimpsest merges space and time, allowing the contemplation of both without forcing them to become homogeneous and

Fig. 07. Below; A new re-generative layer of the site (Author, 2018)



indistinguishable. It is a metaphor more relevant now than recent years as technology has created a blurring of the boundary between past and present (ibid.). The architecture of the city should endeavour to express the layering of the past and present as well as facilitate future layering.

Peter Eisenman in his Cannareggio, Berlin IBA, and City of Culture projects explores notions of archaeology and layering. These projects represent a move away from the pursuit of 'deep structure' to the discovery and exploration of context as a driver (Corbo, 2014:6). While his 'Houses' series employs geometric models to describe inner logic, the focus here shifted to a preoccupation with the figure/ground principle (ibid.). In the same vein as an archaeologist Eisenman brings to light the layers that constitute the city and overlays them with narratives (sometimes artificial and sometimes historical) and geometries. The operative process of these projects becomes that of 'superposition. Fundamentally this phase of the architect's practice represents a shift from the focus on interiority to the focus on exteriority (ibid.). The result is that architecture becomes a text with multiple readings often indeterminate in nature. Importantly they allow for the spatialisation of layered time.

A NEW REGENERATIVE LAYER OF THE CITY

There exists great potential and responsibility for the future layers of the city to acknowledge and address harm caused by architectures of the past, whether of an industrial, economic, social or environmental nature. In order to do so these layers need to be conceived differently to those that caused harm in the first place. If we are to design a world fit for ongoing human habitation and flourishing, there needs to be a shift from a 'mechanistic' to 'ecological' way of thinking (Mang & Reed 2012:23). In order for this to happen, those involved in the built environment ought to develop, apply and evolve new methodologies intrinsically shaped and founded in the paradigm of 'regenerative' sustainability (ibid.). This shift requires not only the adoption of new technologies but also new mindsets which are capable of governing action (Du Plessis 2012:11).

The shift to an ecological worldview demands thought capable of comprehending a world comprised of dynamic systems versus one comprised of static building blocks (Mang & Reed 2012:30). It begins by attempting to identify the core of a system as well as the associated systems around which it is organised and ordered. It necessarily views all things within a web of larger contexts of reciprocal relationships within which it is embedded as well as smaller systems which comprise it. This allows the premise for revealing the potential inherent in all living systems. The need to be more 'whole' and to improve is the basis for regenerative thinking.

The regenerative worldview can be best understood within the conceptual framework of 'Levels of Work' (Mang & Reed 2012:27). It describes four "nested, dynamic, complex, interdependent and evolving" levels in which all living systems engage (ibid.). The 'levels of work' approach offers an ecosystemic view that is premised on, and harnesses, the interdependent and interrelated nature of systems and sustainability approaches.

While the shift from a focus on sustainability to regenerative thinking is both profound and necessary, the two must coexist. It is necessary to be working both with the minimisation of impact in mind as well as a living systems understanding focussed on the mutually beneficial interdependence with nature as a partner (Reed 2007:2).

The premise of the regenerative methodology is fourfold: it assumes a new role for humans, it demands the adoption of a new mind and therefore a new role, and finally demands working developmentally (ibid.). The theory places huge significance on the consequences of human presence on the planet. While 'green', 'sustainable' or 'eco-efficient' design aim to mitigate that impact, they miss the opportunity to organise human activity in such a way as to feed into and off living systems within which they are involved and embedded (Mang & Reed 2012:26). It is simply insufficient to mitigate the role humans have on nature, humans have to re-assume their role in nature and do so in a positive manner. From this point, regenerative design and development reconnects the activities and aspirations of humans with evolving natural systems and aims for a co-evolving of both through interconnection. Rather than simply aiming at the preservation or restoration of an ecosystem, this is the continual and mutually beneficial intertwining of culture and nature.

Buildings within this framework are involved in reciprocal relationships where they are aided by and support a greater whole. Consequently, buildings cannot simply be of a high technically performance to be considered sustainable. A high-performance building which isn't holistically integrated is useless in comparison to a contextually embedded one (Reed 2007:1). Architecture only gains purpose within context.

By viewing architecture as part of living systems it must be acknowledged that it is caught up in processes of change and that it necessarily evolves as life is not static. By implication, all architecture (new or existing) must be designed with succession and progression in mind.

ADAPTABILITY AND FUTURE PROSPECTS

African cities are notoriously elusive to grasp and have perplexed many theorists in their complexity and ever-changing nature. They are at once familiar and entirely foreign and often defy the norms of cartography and theory. South African cities are no different. AbdouMaliq Simone (2010:6) explains that the study of these cities is often approached with wariness as if "such cities are in need of something which is not already present". The perceived deficiencies in African cities tend to dominate the discussion with the consequence that the dynamic interactions between existing people, economies, ideas and architecture are overlooked.

No city ever stands still but this is especially true of African cities which are characterised by change and seemingly incessant movement. Residents constantly jostle for positions and compete for resources in the frenzied attempts to stay alive and prosper (nowhere is this more apparent than in Johannesburg). This is not the full picture however as African cities are also characterised by a level of orderliness and ordinariness which is often not factored into the discussion. Coquery-Vidrovitch (1991) argue that much of what happens in the economic, political and built environment of African cities is, in fact, an attempt to tend towards stability and fixity. Contestations in the African city often embody not only resilience but also attempts to harness the passions of conflict into more stable relationships and fixed configurations (Vlassenroot & Büsher 2006). To ignore fixity in the African city is a major oversight. The dance of the African city truly is the dance between fixity and flux.

The abstract model of the archetypal Apartheid city finds physical manifestation in the city of Johannesburg and its fragmented and ever-growing sprawling suburbs and townships. While Apartheid may no longer be the official policy of South Africa, its laws and the cities it built are an enduring reality. The consequences of its urban planning policies are a painful reality to the vast majority of South Africans who live every day in cities and towns designed to control and limit their lives physically. This, however, does not mean that citizens, through everyday actions and defiant practices, don't implement ways of undoing and subverting the inherited city and its architecture.

The Apartheid city and Johannesburg is a story of fixity and flux: the fixity of buffer zones, barriers, designations and buildings and the flux of people and their attempts to circumvent the seemingly immovable. Residents over the thirteen decades since its construction have wrestled with and tested the limits of the fixed built fabric and layouts and have begun to subvert its power through additions, alterations and in some cases even demolitions. While the physical fabric of the city of Johannesburg can best be understood through its mutable but fragmented fabric, these characteristics begin to accurately describe the ever-changing population too. Citizens are caught in patterns of prospect and opportunism.

The architect in such a context is to adopt a way of working that allows for the simultaneous and complimentary existence of both stability and emergence. This way of working acknowledges the reality of unforeseen but inevitable future changes.

The role of design is in the facilitation of emergence in such a way as to provide the scaffolding for emergent phenomena to take root and for those phenomena to become sophisticated over time. Stacey (2001) explains that most self-organising organisations and social groupings operate at the edge of emergence where stability and instability are hard to separate. At this point there is a fine balance between the level of infrastructure provided and the amount of control exerted which can stifle further emergence and cause the organism to become unresponsive to its environment.

Implied in this way of working is the assumption that the finite buildings of the architect are inadequate with dealing with the unknown requirements of the future and should begin to make provision for the unforeseen. Tied to these concerns are the issues of ownership, technology and time: buildings, through appropriate use of technology should accommodate changing needs over time by leveraging the efforts of people as they exercise ownership over their environments. This also opens the architecture up to notions of layering over time, thereby contributing to heritage and legacy.

Buildings designed this way make room for re-use and appropriation as well as new ownership and occupation possibilities. In these cases the interfaces of interaction and adaptation between the building and the user become incredibly important and legibility as a key concern comes to the fore.

Architecture in industrial contexts can be approached as armatures for the everyday productive rituals. Design should employ the logic of support and infill so as to tactically provide enabling environments for places of public exchange and ongoing redefinition. The aim should be to frame and celebrate the everyday activities and urbanism on the site, as well as elevate everyday processes which have the potential to mutate over time. The traces of productive ritual and social interactions should be retained through the design of the building as an amplifier of immediate conditions. In this sense, meaningful architecture can act as social and historical condenser as well as a datum for a particular

time. The building in this case should position itself as a bridge between the physical and the social concerns of the present and those of the future, thereby celebrating the creativity of emergence but utilising the stability of design. Buildings in these settings should be designed to be incrementally completed and occupied rather than being viewed as complete and fixed artefacts.
This will allow for the organic and sustainable occupation of the building gradually over time, thereby ensuing ongoing and sustainable prospect.
The provision of infrastructure for production and economic activity, will provide the necessary stability for the emergence of new livelihoods bolstered by architectural support.

An appropriate intervention for the site needs to mediate between the cycles of fixity and flux. This balance needs to guard against Johannesburg's tendency for of the site to be erased regularly but also needs to prevent a condition of stasis and redundancy. The productive industrial and historical value of the site needs to be both celebrated and retained but done in such a way as to allow for future potential and change.

VILLAGE MAIN AS IT WAS

Village Main represents a notable example of the impact of the Industrial Revolution on the landscape. The process of increased industrialisation was accompanied by rapid urbanisation as people were drawn to Johannesburg to seek employment opportunities and at the same time being repelled from rural areas as a result of both a drought and the mechanisation of agricultural practices (Wilson 2010:73). The extraction of minerals from the subsurface played a crucial role in the development of the South Africa's economy but also in the exploitation of its people and the environment (Davenport 1991:2). Today, most of what remains is a scarred landscape layered with decades of environmental damage. The mind-set underpinning the extraction of minerals was applied to the architectural heritage of the site which has been eroded and erased in the same reckless pursuit of profits from development.

Village Main Reef Gold Mining Company (the first limited liability company in the city) was registered on 25 February 1889 (Holz 1992:19). The company was the owner of 14 claims immediately south of the Randjieslaagte triangle. By 1908, thanks to the introduction of new mills, the site was crushing 40,000 tons per month. This period of productivity ended rather suddenly on 21 October 1921 when an earth-tremor caused the collapse of the 15th level of the mine (Ibid.). As a result of the damages it was believed that the mine was worked out and no effort was made to re-open the mine. This represented the first instance of bust in a boom and bust cycle that would come to characterise the mine and city for the next 90 years.

In the year 1960, the timber headgear of the Village Main No 1 shaft was condemned by the management of the mine and was replaced with a steel alternative. The wooden headgear was so solid that it took a full week to demolish (Ibid.). This event represents the first instance of removal of built artefacts from the site, a process which culminated in 2008 when the steel headgear was removed as the last remaining remnant of built industrial heritage on the site. This was a loss both for the steel detailing on the artefact as well as the iconic nature of the headgear and its position as a Johannesburg landmark.

Of the original twenty-three buildings on the Village Main site only four remain). At present all that remains on the site are the administration buildings on Sprinz Street (dating from 1934) and the concrete podium upon which the second generation headgear was mounted (dating from 1934). It is extremely unique in that it represents the only instance of that type of technology on the Witwatersrand mine belt. Their weathering tells the story of the centuries of mining as well as the site's eventual abandonment. It is absolutely vital that the remaining built structures be protected against possible removal, vandalism or indiscriminate development.

Although the majority of the equipment and processing buildings have been removed from the property, the site represents an example of a deep level gold mine of the sort that made Johannesburg the world's largest gold producer until 1970. The extractive nature of the operations can be clearly seen in the surrounding mine tailings as well as the pollution on the site. This too represents an important, albeit unpleasant, facet of the site's history as it represents a period of particular industrial activity and attitude towards the environment.
Through the 109 years the mine was operational, it witnessed dramatic changes in the nature of gold mining as an industry as well as changes in the urban context of the surrounds. The site was originally a lone mine in the veld to the south of the Randjieslaagte triangle but is today very much a part of the CBD of the city. Its proximity to the industrial area to the west, Jeppestown to the north-east and the financial district to the north make it an instance of the mining belt with heightened presence and worth. The synthetic landscape created by the excavations and tailings is largely vacant (save for the Shembe church) but could once more become a site of cultural significance and industrial productivity.

THE MINING BELT AS AN INCUBATOR FOR NEW FORMS OF INDUSTRY

The mining belt is representative of the city's genesis and past but has the potential to become its great future prospect too. As the north and south of the city continue to densify, the mining belt of the city is going to represent ever more appealing developable land. Apart from its centrality, the future prospect of the mining belt lies in the potential of creating landscapes that support regenerating and inclusive natural landscapes supporting new forms of production and creation that go beyond mere extraction and exploitation.

This extractive landscape is uncomfortably interrupted by the city's settlements, infrastructure and ecological networks. The remaining areas — characterised by islands of toxic mining effluent and capped shafts— are challenging for ecology, spatial integration and the future development of the region (Trangos & Bobbins 2015). If the mine dumps alone are reprocessed and rehabilitated, a further 5,500 hectares of prime land will be freed for new development (Tang & Watkins 2011).

Restoring life to the toxic and torpid mining territories is critical to achieving an inclusive and liveable city-region for the future as well as reconnecting the city to its subterranean past. Understanding and appreciating the

Fig. 10. Left; The mining belt as it could be (Author, 2017)

complex urban ecologies as well as the guiding forces is key to proposing alternative prospects in this overlooked region (Trangos & Bobbins 2015;1). In such a context there exists huge potential for new forms of industry capable of once again becoming a productive armature for the city but this time in a manner than ensures the flourishing of society and the environment. According to Reed (2007:2) such regenerative endeavours should be about "framing restoration as a whole — engaging the earth systems, the biotic systems and the people of each place in a unique and continuous dialogue of restoration and evolutionary development — a healing or 'wholeing'".

Any design process serious about the sustained flourishing of life in a place needs to begin with an understanding of the unique processes already present on a site (Reed 2007:5). All design engages with living systems — whether consciously or unconsciously. It is through the expansion of our conceptualisation of design to incorporate these interactions that we harness the unrealised opportunity to not only script sustainable interactions but regenerative ones capable of contributing to the wealth and health of place (ibid.). In the case of Village Main it is crucial to incorporate both the industrial capacity of the site and the natural assets of the surrounds. The theory of 'industrial ecology' provides the lens through which to do so.

The idea acknowledges the co-evolution of societies, nature and economies (Brent , et al. 2008:9). The theory recognises the embedded nature of these systems and acknowledges that they are tied to larger natural systems which need to operate within their own capacity and that industrial material and energy flows combine with those of nature (ibid.). The fundamental underpinning of industrial ecology is that systems should minimise their dependence on external resources, focussing instead on local interconnectedness (ibid.).
The approach and application of industrial ecology has developed along two trajectories: islands of sustainability and eco-industrial parks. De-carbonisation on the one hand and de-materialisation on the other.

Eco-industrial parks are designed to re-frame industrial complexes through the linked use of waste and by-products by surrounding industries. This is also known as 'industrial symbiosis' (ibid.). This approach, due to its systemic nature, finds application at a number of embedded scales. The idea is premised on biocenosis — associated organisms which form closely related communities. However, in this case the relationships and communities are premised on specific industrial activities.

By reframing the productive capacity of industrial infrastructure through 'industrial ecology' and reclaiming the surrounding landscape, the mining belt has the potential to become new productive industrial zone and a site of regenerative transformation.

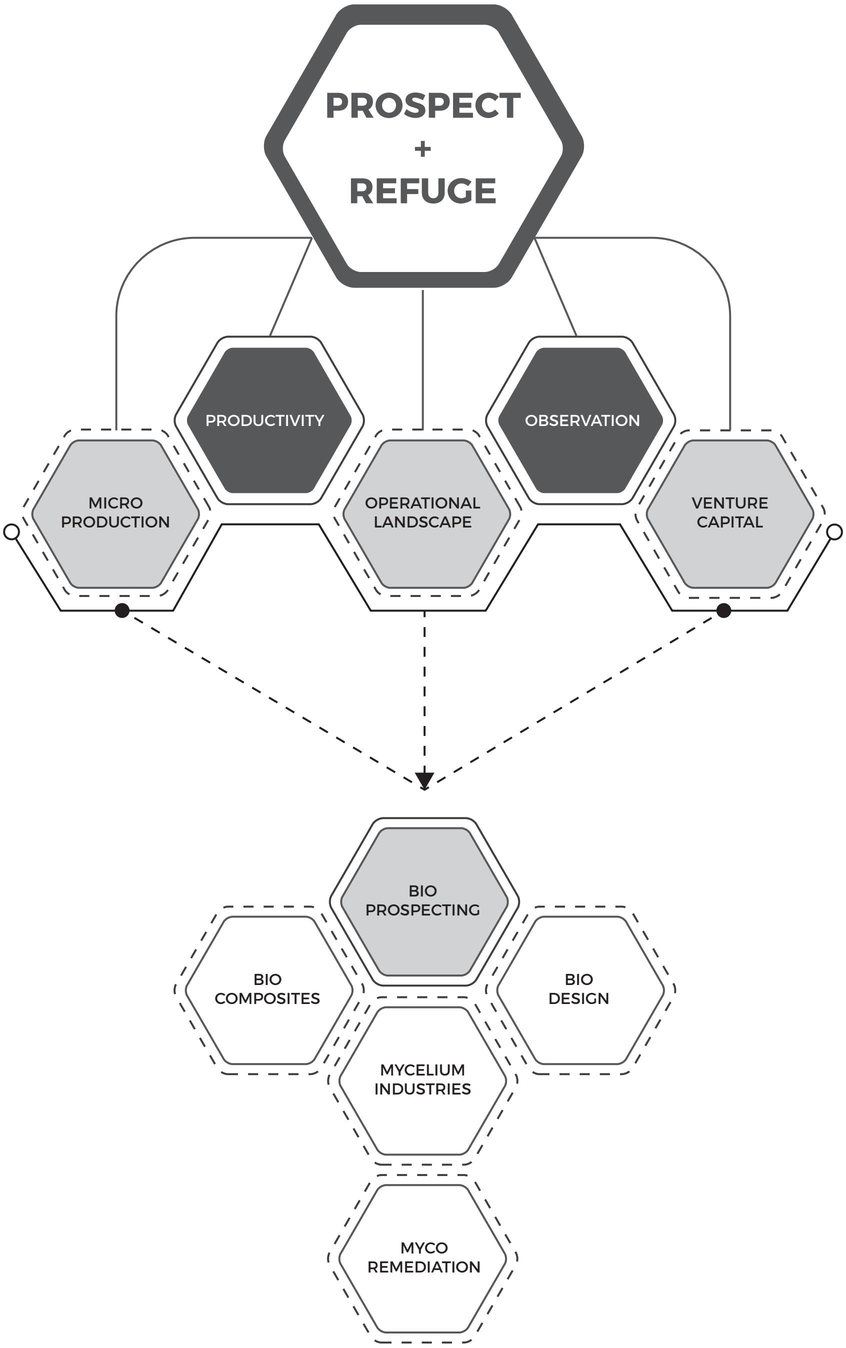
A BIOPROSPECTING CENTRE AND OPERATIVE LANDSCAPE AS A REGENERATIVE LAYER

Much of Johannesburg comes as the result of the value placed on materials as well as the processes associated with mining them. Its future could be driven by a similar material culture but with entirely different means of obtaining them. While the period of the first industrial revolution (18th and 19th centuries) resulted in a shift from regenerative (agrarian) to non-regenerative (mined) material sources the future should re-focus on sustainable resources (Hebel & Heisel , 2017, p. 8). The project explores that possibility.

While the conception and construction of architecture adopted in the first Industrial Revolution results in an inert object with the consequence of a one-way transfer of energy and materials from the environment to building waste, this project places the architecture in constant contact and conversation with the surroundings. It utilises materials unconventionally utilised for design including fungi for the growth of structures that demonstrate common biological characteristics of plants in buildings that absorb nutrients, grow, produce and self-repair.

The program is derived from a mapping of the previous layers of economic, recreational, cultural and industrial development at Village Main as well as a regenerative approach to the existing architecture and landscape. It

Fig. 09. Left; Program diagram (Author, 2018)



manifests as a facility integrating micro-production, enterprise development, an operative recreational landscape and a centre for bioprospecting. The latter, partly a postulation of the sixth-industrial revolution in Johannesburg (Harvey & Gericke 2011:323). In this case, the potential of fungal materials (more specifically mycelium) is harnessed through cultivation in the underground portion of the site. A process which also aids in myco-remediation of the contaminated soil.

Through harnessing the natural potential of the site and the productive capacity thereof, a new layer of regenerative architecture mediates between the cycles of fixity and flux in order to guard against Johannesburg's tendency for erasure but also prevents a condition of stasis and redundancy. The productive and historical industrial value of the site is both celebrated and re-interpreted but done in such a way as to allow for future prospect and change.

CONCLUSION

Places of industrial heritage link the current world to that of the past and in so doing tell of the architectural, technical, economic achievements as well as the transformation of materials and societies (Heritage council Victoria 2014:4). The reuse of heritage buildings is not only important for its ability to layer cultural significance and contribute to local communities but also for its contribution to regenerative goals by preventing unnecessary demolition and waste as well as by ensuring the retention of embodied energy and lowering the consumption of resources (Ibid:14).

Current definitions of architecture divorce buildings and place by dividing the operational aspects of the structure from the biosphere and landscape (Littman 2009:2). What this results in is the synthesis of building systems and the continual input of resources and energy from elsewhere which inevitably results in waste. Regenerative architecture embraces and incorporates the place, site, flora, fauna, building and systems in a manner that co –evolves as a holistic entity (Ibid.). The result is that the entire ecosystem improves through the architecture itself producing more than it consumes, resulting in an upward spiral both for humans and the environment. This conception acknowledges that through the inclusion of regenerative processes, the environment contains and provides solutions to problems faced.

Adaptable architecture combines the aims of both the re-use of industrial architecture and regenerative architecture by enabling the continuous layering of efforts and materials in such a way that harnesses the potential of what exists as well as re-framing it in such a way that positively contributes to the shared future of the planet and society.

Through the combination of re-use, layering and regenerative theory, post-industrial sites like Village Main can be developed into precedents for development capable not only of remediating polluted landscapes, but also of re-defining places of cultural significance in a city marred by environmental and human exploitation brought on by industrialisation.

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