

ESSAY 3

SYNTHESIS

(DESIGN)

EVALUATIVE

3.1. p184 THE ROLE OF THE ARCHITECTURE

3.1.1. Engaging the social dimension of scarcity through architecture

3.1.2. Engaging the physical dimension of scarcity through architecture

3.1.3. A consolidated syntax of design: an alternative gated community

3.2. p194 DESIGN AND TECHNICAL DEVELOPMENT

3.3. p246 THE ARCHITECTURE OF SCARCITY?

3.3.1. The landscape

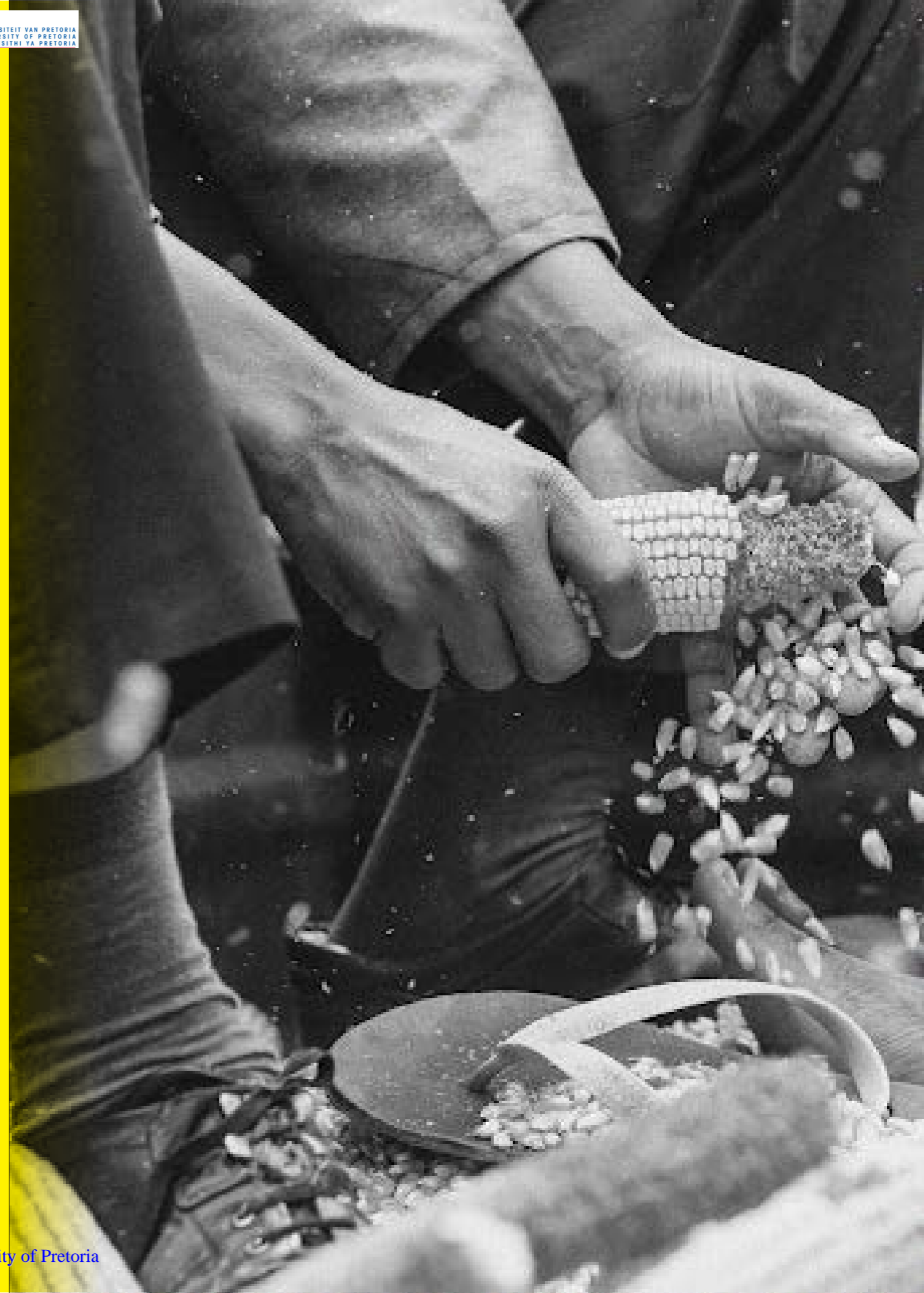
3.3.2. The dwelling

3.3.3. The water system

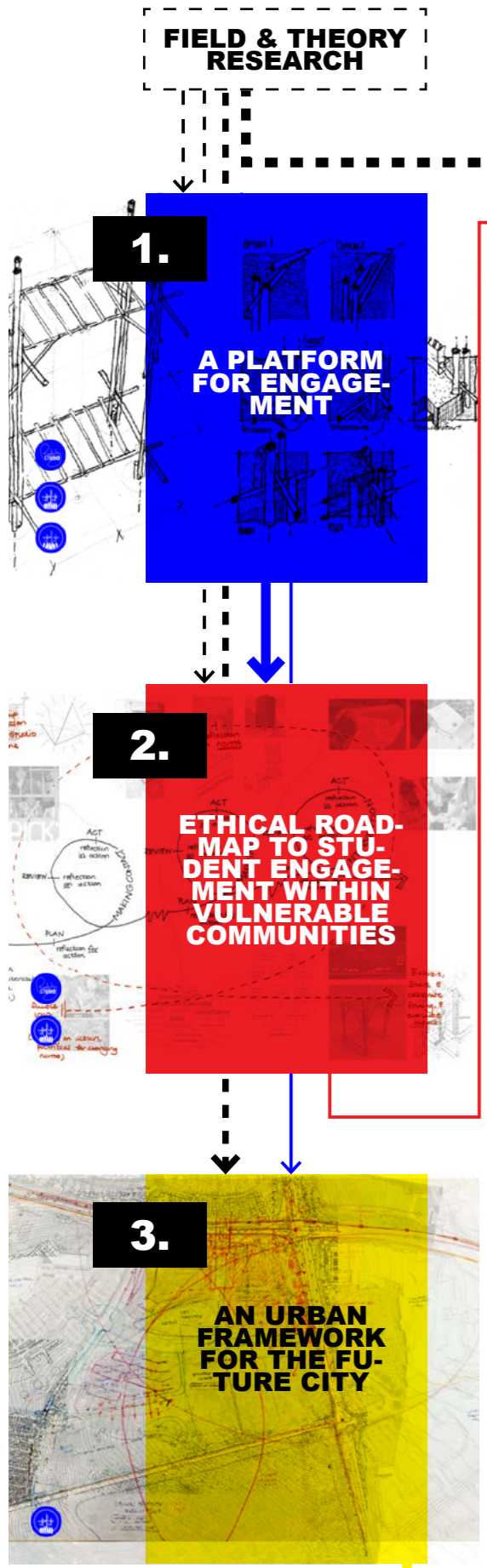
3.3.4. System Integration

3.3.5. SBAT report

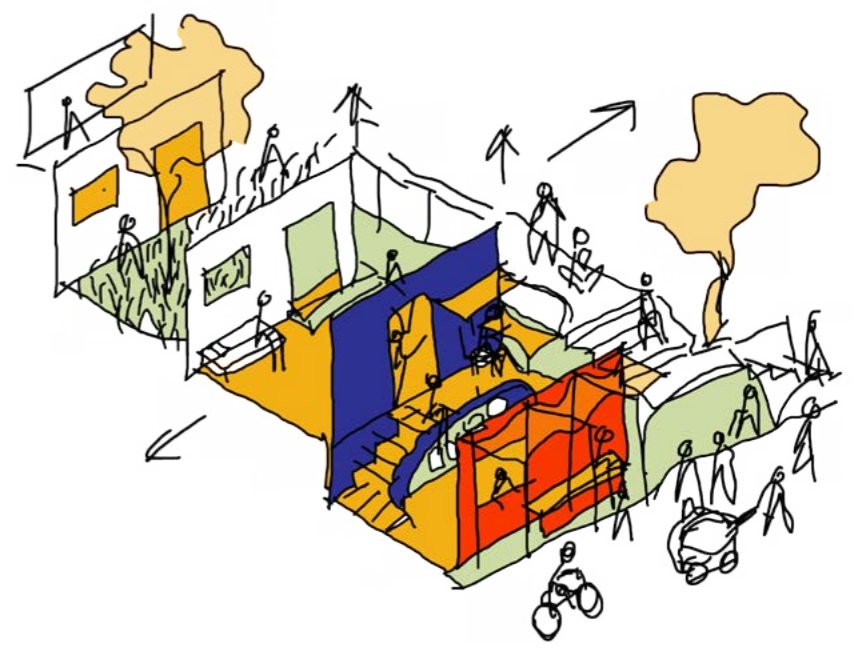
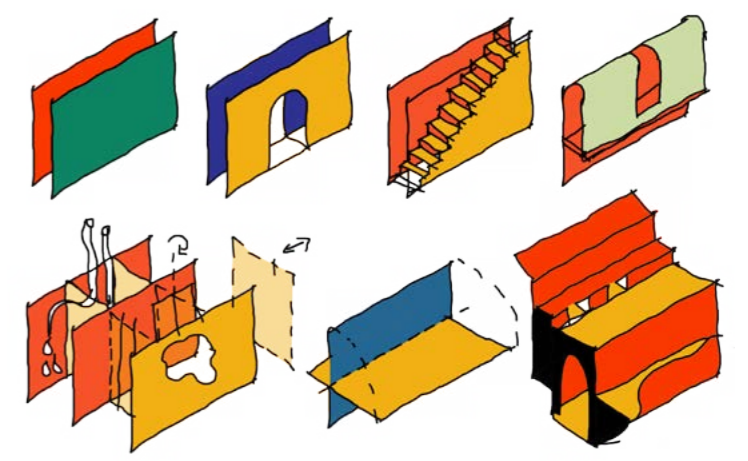
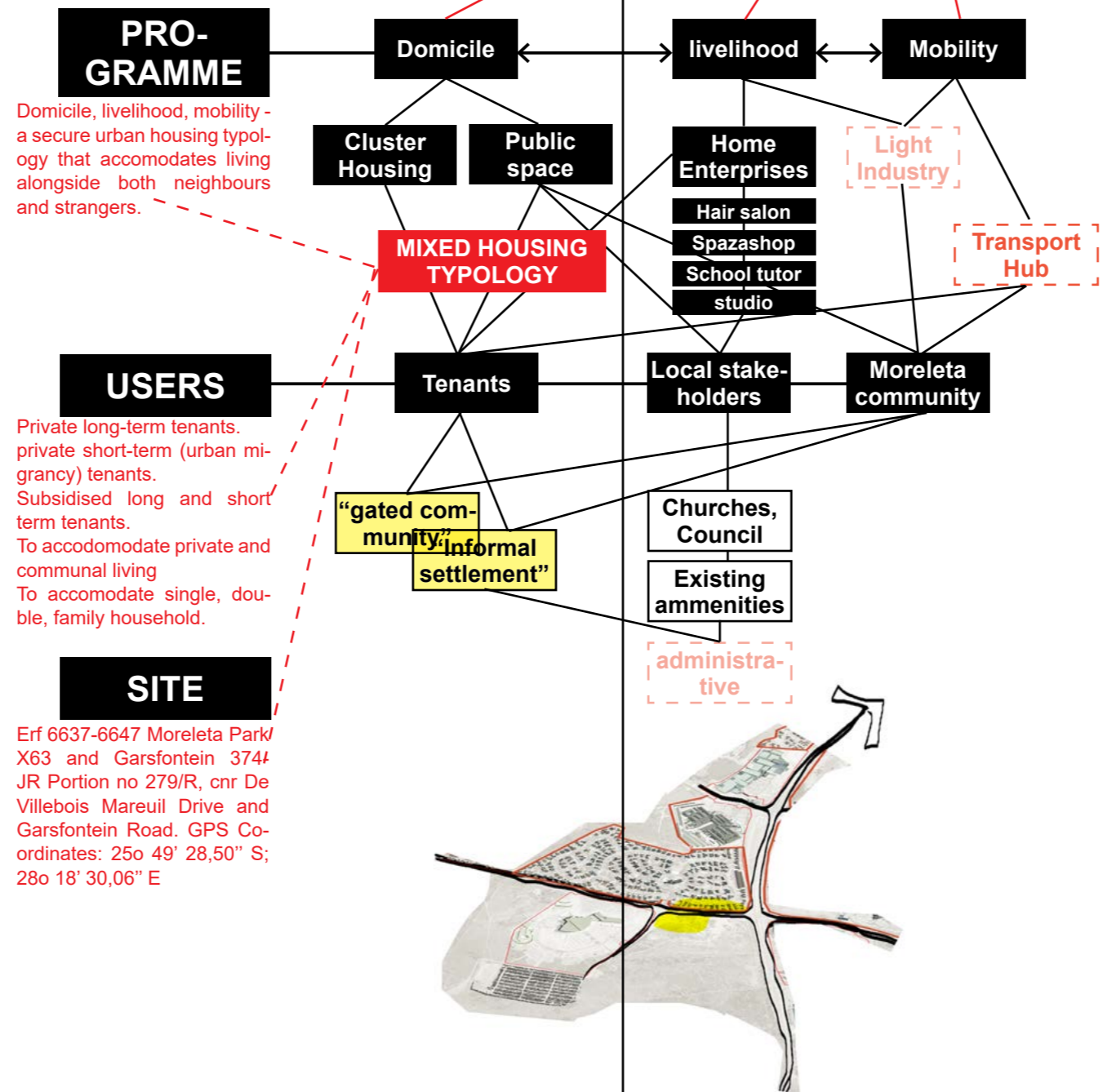
3.4. p270 SCENARIO TESTING



3.1. THE ROLE OF THE ARCHITECTURE

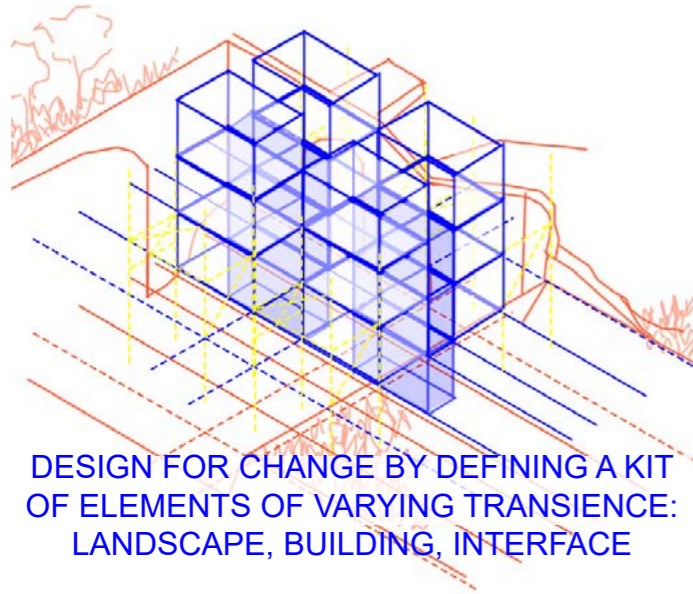


SOCIO-SPATIAL INTEGRATION

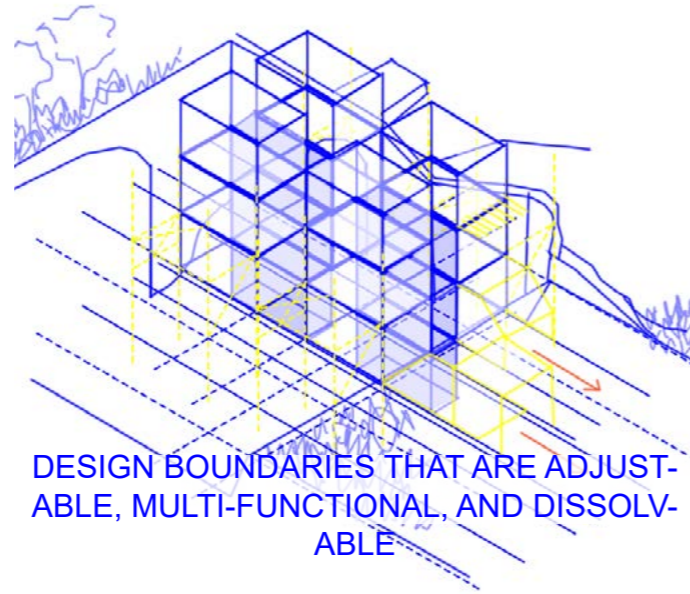


RETHINKING THE GATED COMMUNITY

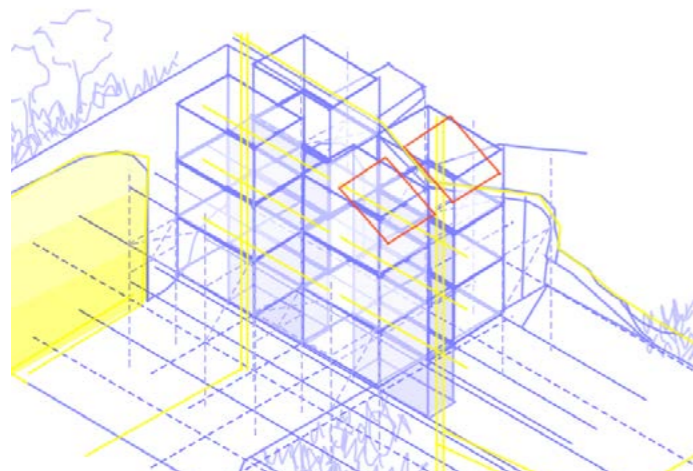




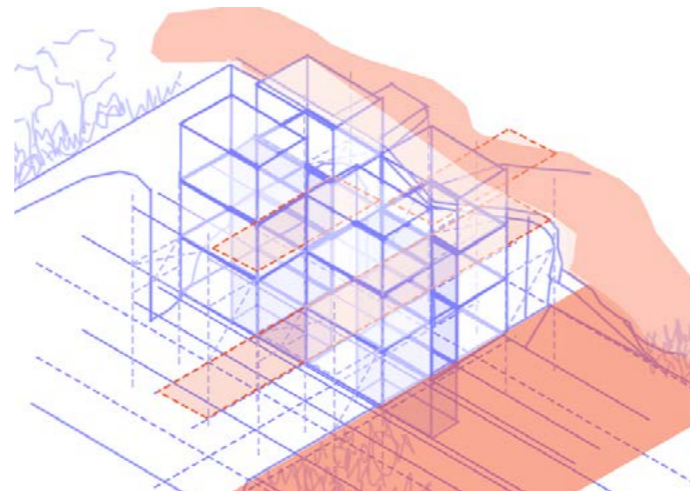
DESIGN FOR CHANGE BY DEFINING A KIT OF ELEMENTS OF VARYING TRANSIENCE: LANDSCAPE, BUILDING, INTERFACE



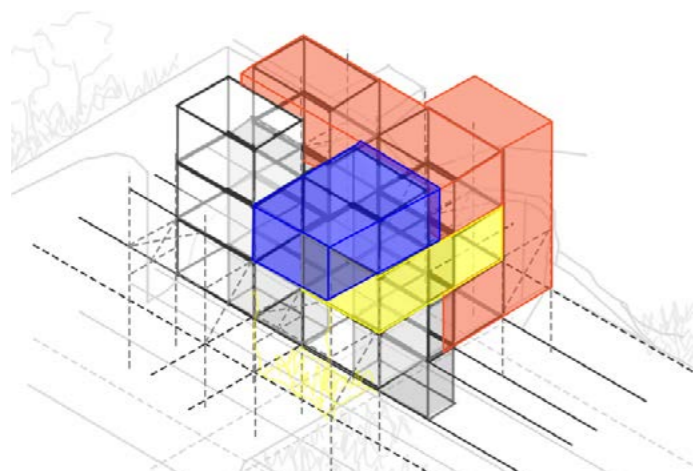
DESIGN BOUNDARIES THAT ARE ADJUSTABLE, MULTI-FUNCTIONAL, AND DISSOLVABLE



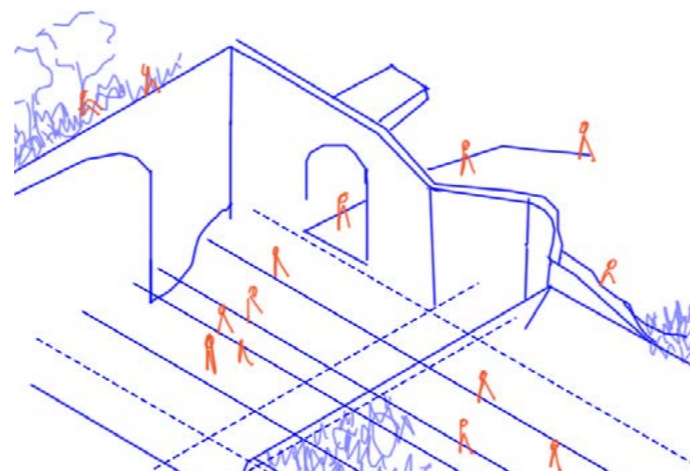
DESIGN FOR THE PROMOTION OF RELATIONAL SYSTEMS BETWEEN BUILDING AND LANDSCAPE, WITH A FOCUS ON HARNESSING WATER.



MEDIATE PUBLIC-PRIVATE AND DOMICILE-LIVELIHOOD SPACES WITH VARYING LAYERS OF STREET.



DESIGN FOR SUB-LETTABLE, HYPEROPTIMISED LIVING AND WORKING SPACES.



SECURE ACCESSIBLE PUBLIC SPACE.

DESIGN AIMS

3.1.1. Engaging the social dimension of scarcity through architecture

This project considers what it means to dwell within the South African city, where there exists socially constructed and physically manifested scarcity - and, invariably - spatial dichotomies, the “in-sider” and “outsider”, the compartmentalization and commodification of space, and security or enclosure at the expense of equal access to the right to the city.

Whilst the hard boundary condition woefully serves as the repressive mechanism through which these socially constructed rules are imposed in the name of security, it does, however, enable the opportunity for “stranger” and “stranger” to live in close proximity. Considering current spatial needs and practices, it becomes valuable to explore ways in which to subvert the gated community - where boundaries are articulated so that public space is protected and celebrated, opportunity for livelihood is secured, and edge conditions are activated and hyper optimized. These are believed to be prerequisites for achieving domicile at present, whilst embracing change

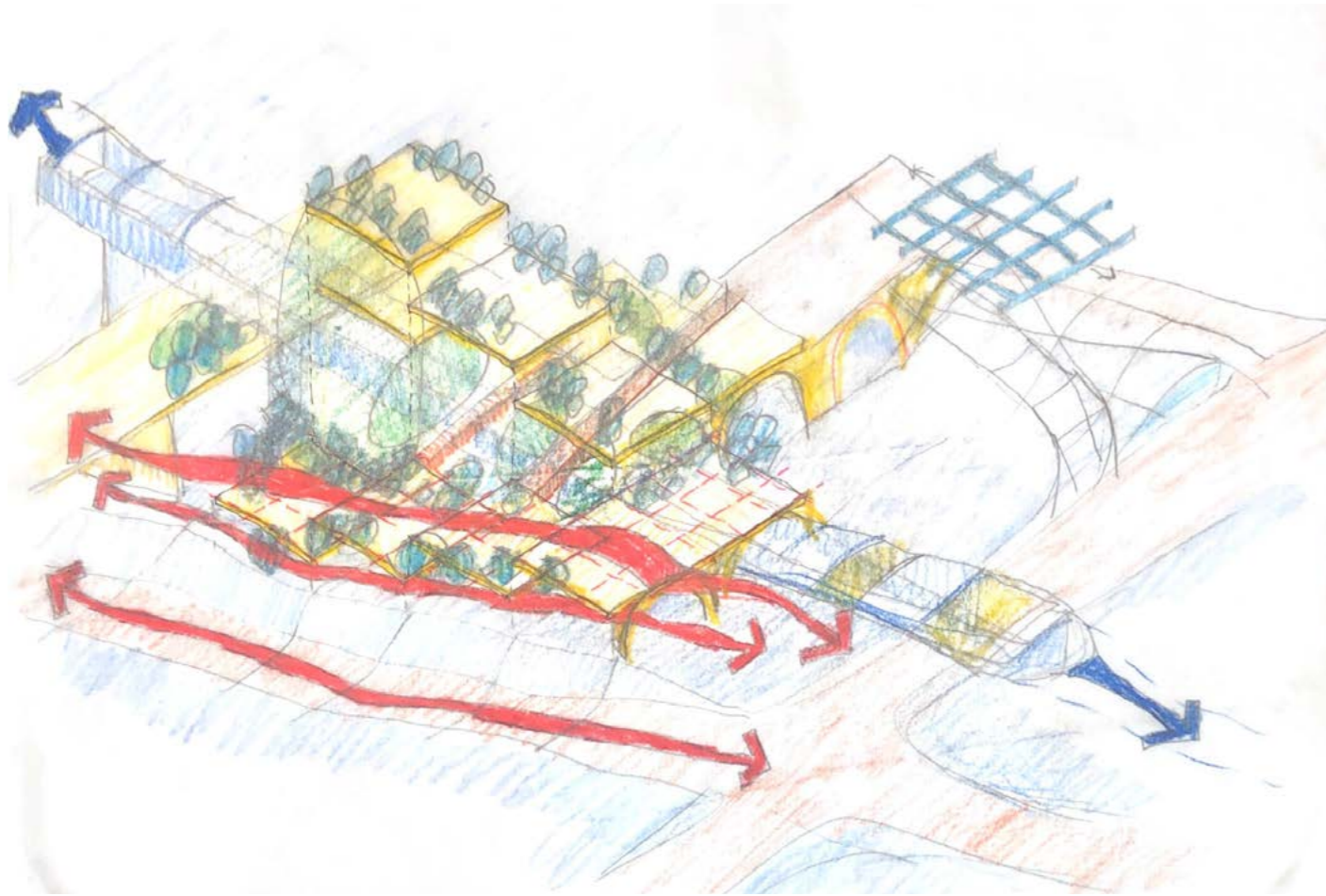
and anticipating a future where boundaries can dissolve, and neighbour meets neighbour.

3.1.2. Engaging the physical dimension of scarcity through architecture

With the planning and implementation of gated community-like developments – there is the unique opportunity to allow such neighbourhoods to enjoy the environmental and financial advantages of integrated infrastructure that sits between large-scale centralised and small scale individual decentralised infrastructure (with respect to water, sewerage, and electricity). Despite this, the area lacks the complexity of scale that would be attributed to a more resilient city/neighbourhood. For this reason, and due to the pressing existing issue of water scarcity experienced by households residing in Plastic View and Cemetery View, it is appropriate to explore ways in which architecture can integrate with infrastructure to participate and augment existing natural processes of water collection and filtration in the area.

user controls level of enclosure. opportunity to dissolve boundary whilst acknowledging current spatial needs. To dwell amongst neighbour and stranger.



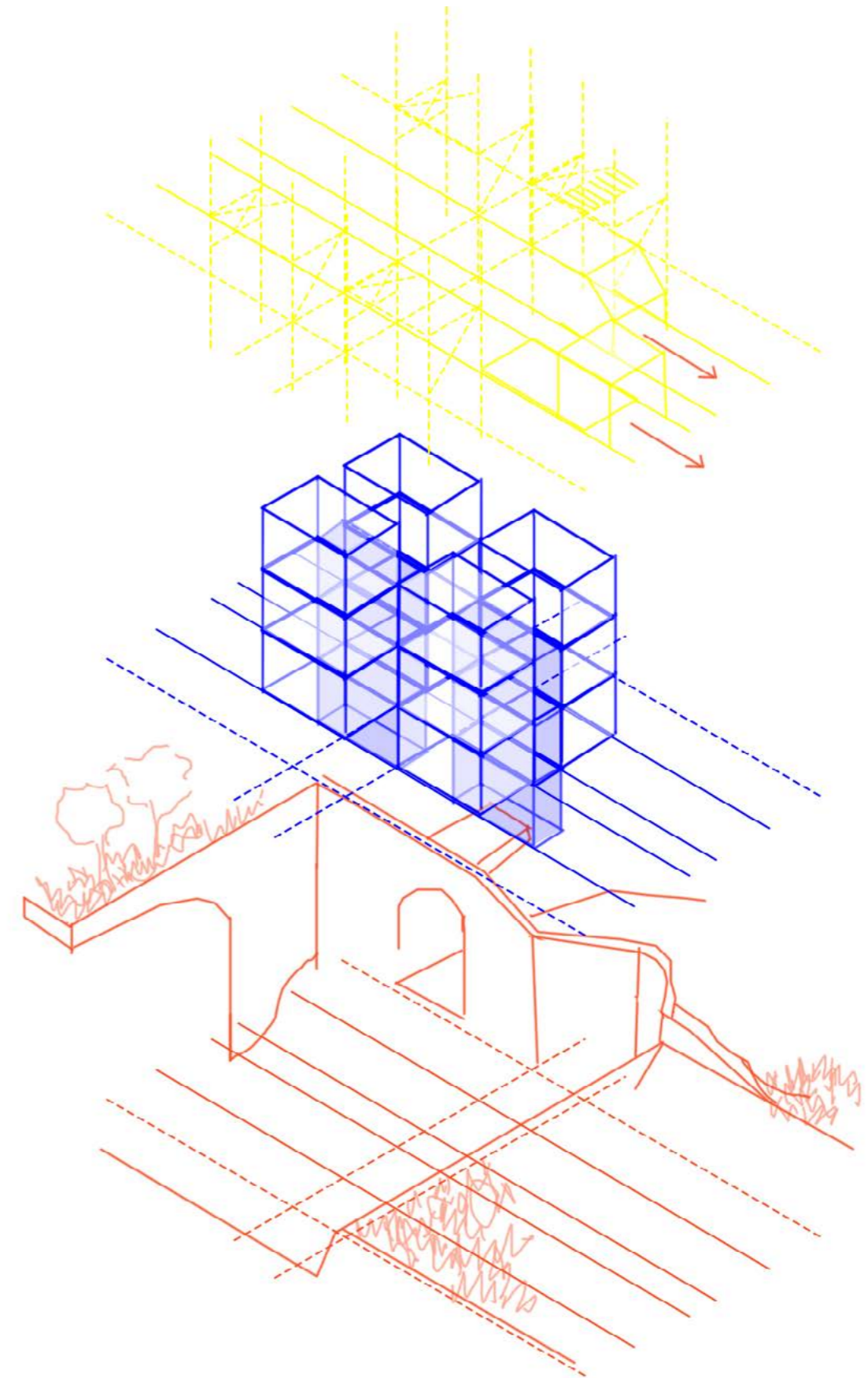


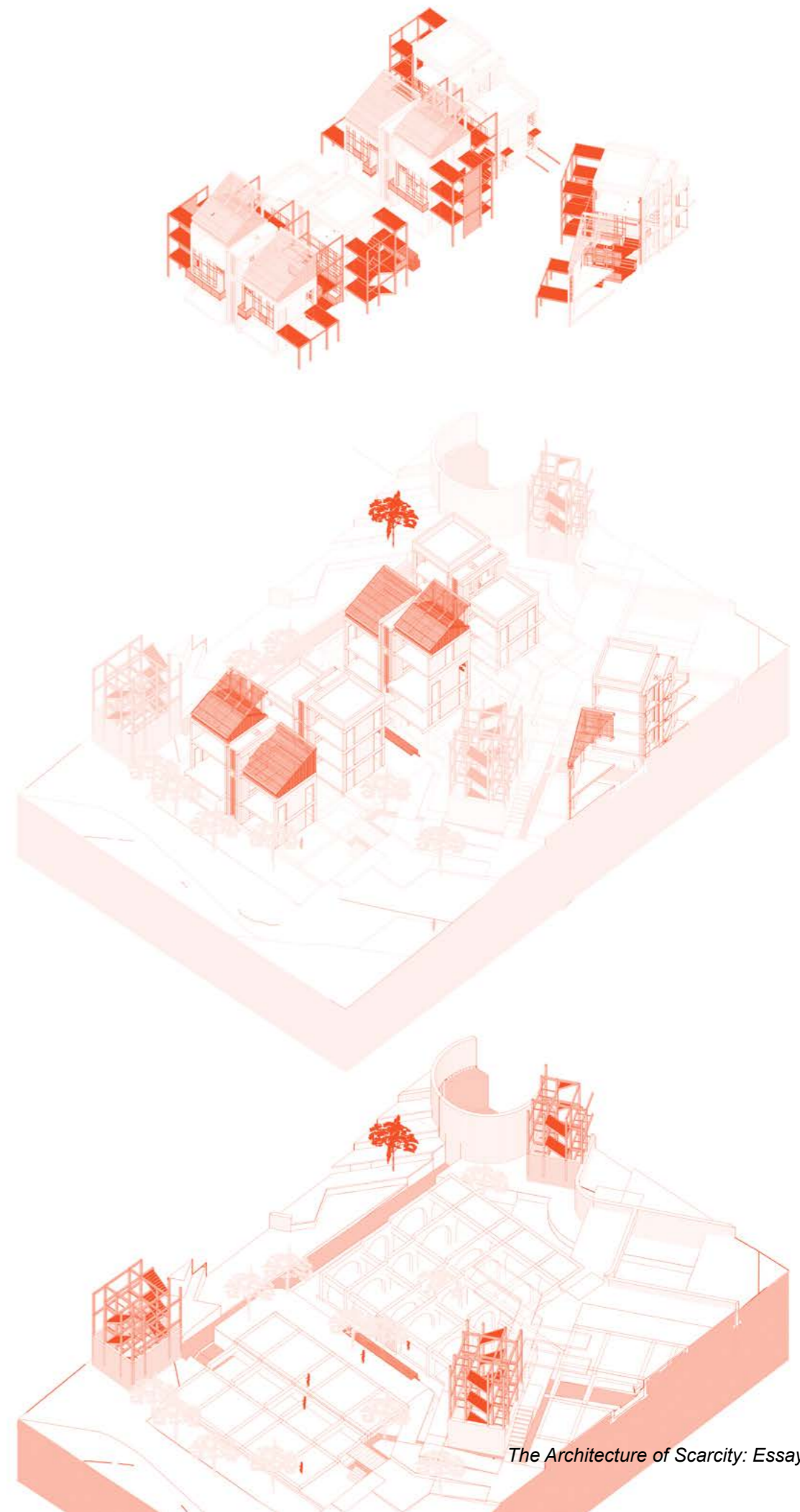
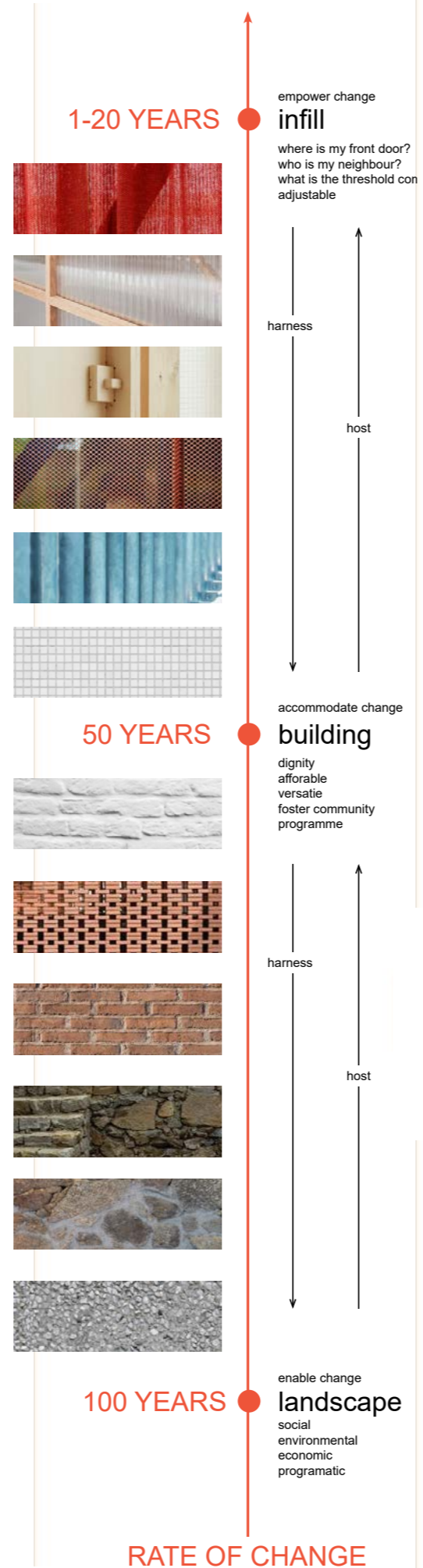
3.1.3. A consolidated syntax of design: an alternative gated community

Here, the parallel in the relationship between scarcity and time becomes significant. The intention is that architecture should enable, accommodate, and empower the everyday event as it changes and evolves - rather than disabling, defending, securing and preserving. Value lies not in what can be preserved and commodified, but in what is living and fleeting. In response to this, the architecture is conceptualized into three main, time

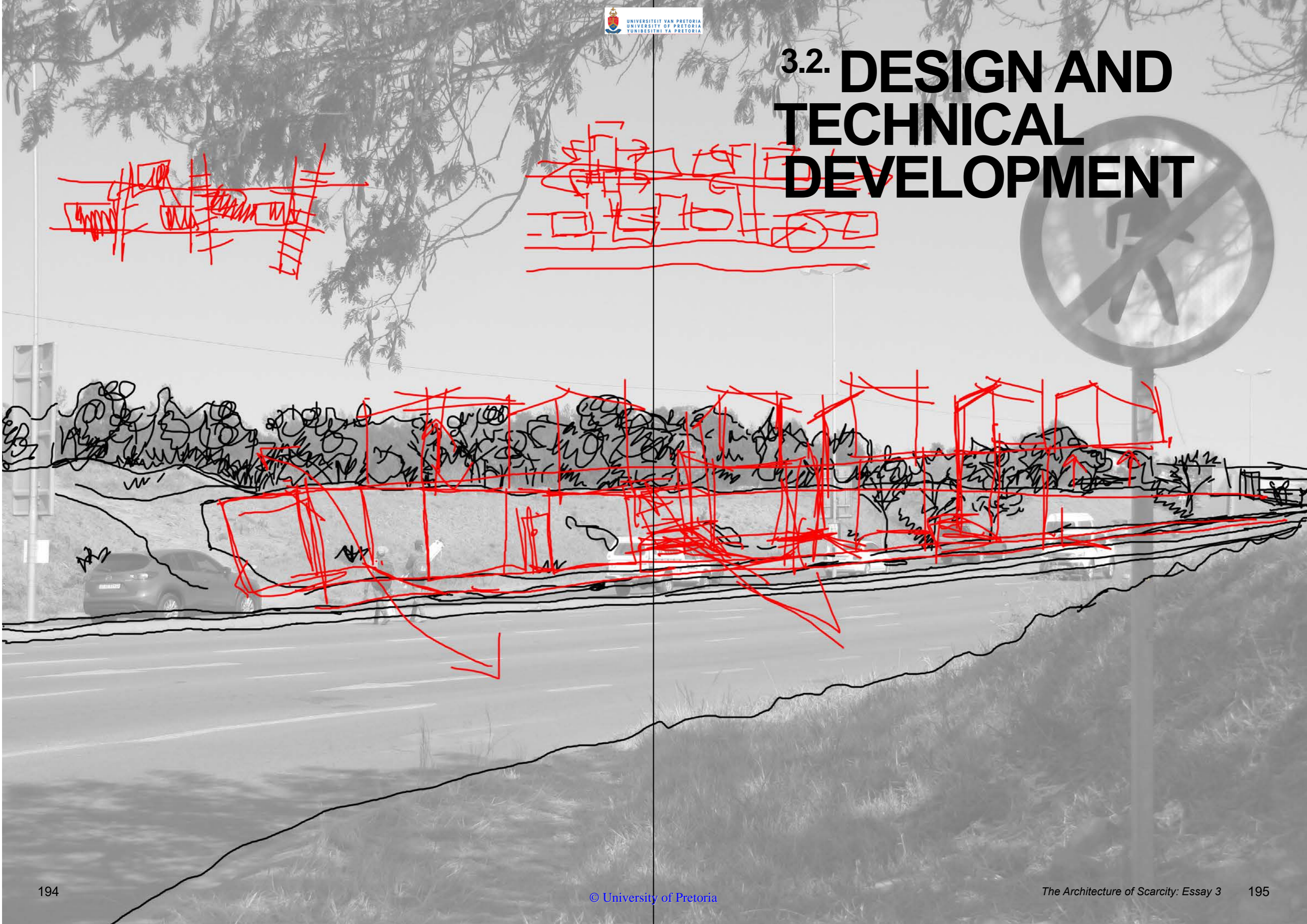
dependent fields: the more durable landscape (100+ years) - which uses spatial differentiation of the ground plane so that it becomes a generous street, and embodies a particular wholeness (not a series of parts). To facilitate and prevent the gautrain line from becoming an impenetrable buffer, the terraced landscape allows the opportunity to tunnel, or bridge over and between, with the help of an inhabitable, punctured "wall" and threshold which wraps around the landscape. The landscape hosts the ever-changing dwelling, functions, and people through the second layer of infrastructure in the form of a series of

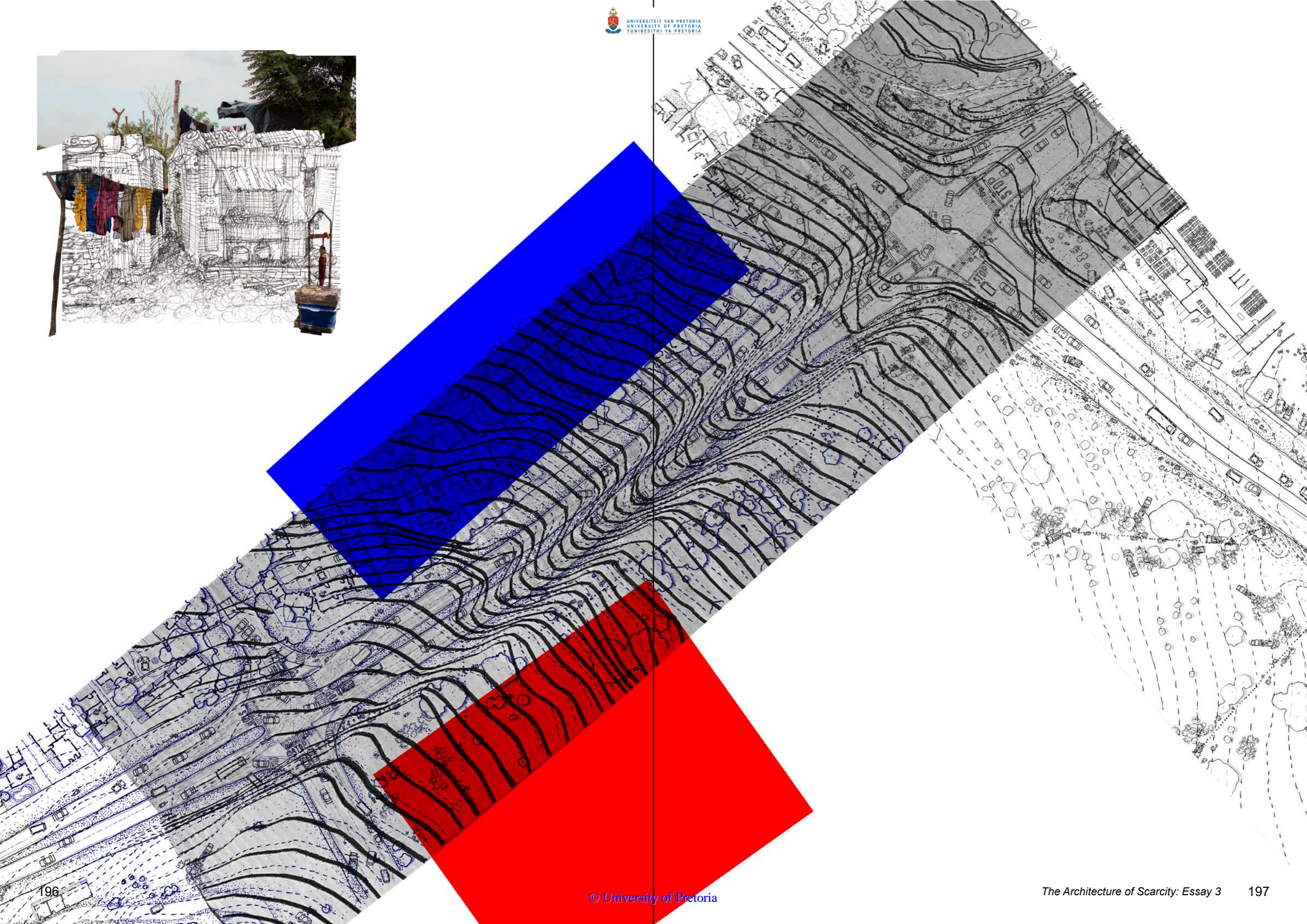
masonry bearing walled buildings (50+ years), more temporary, and intentionally designed with the optimization and versatility of the building envelope in mind. The wall is largely occupied, and spaces are organized so that units can easily sub-divide or be incorporated into larger units, depending on the articulation of the third layer. This layer (1-10 years), is where choice is afforded to the user in terms of how thresholds are layered and articulated.

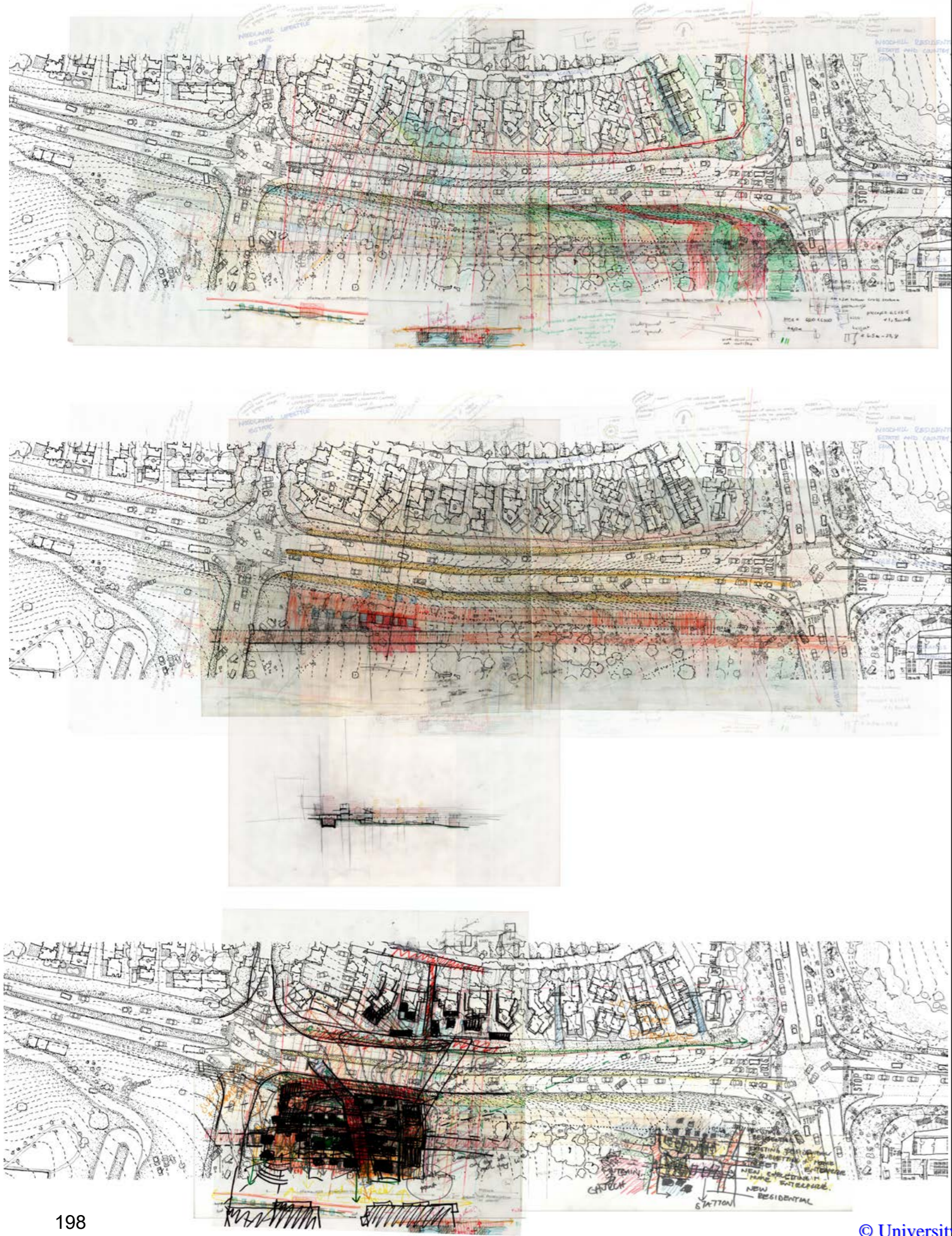


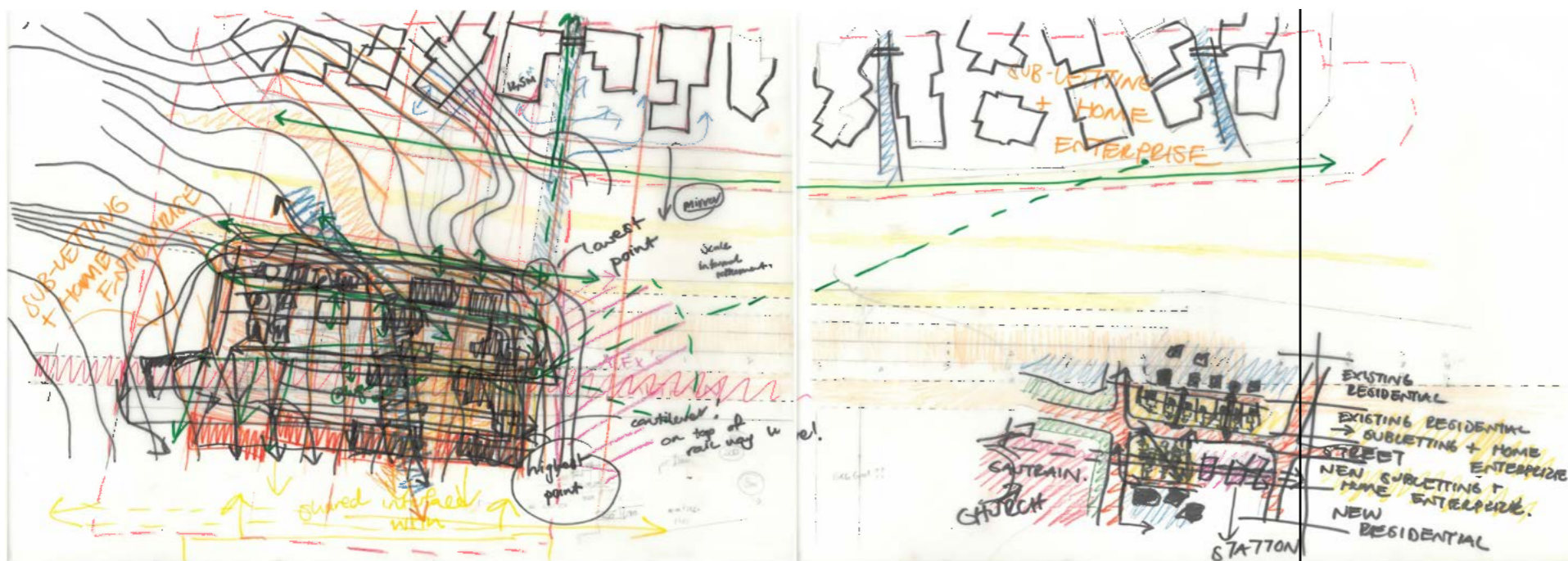
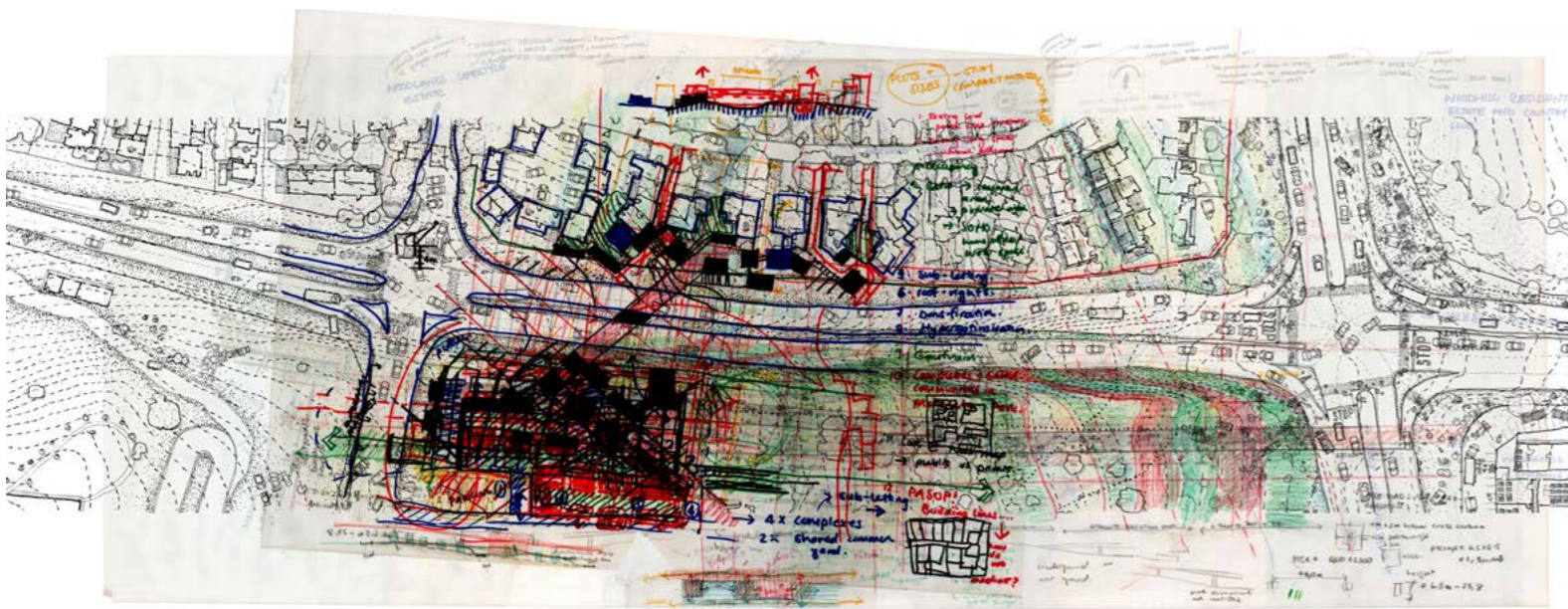
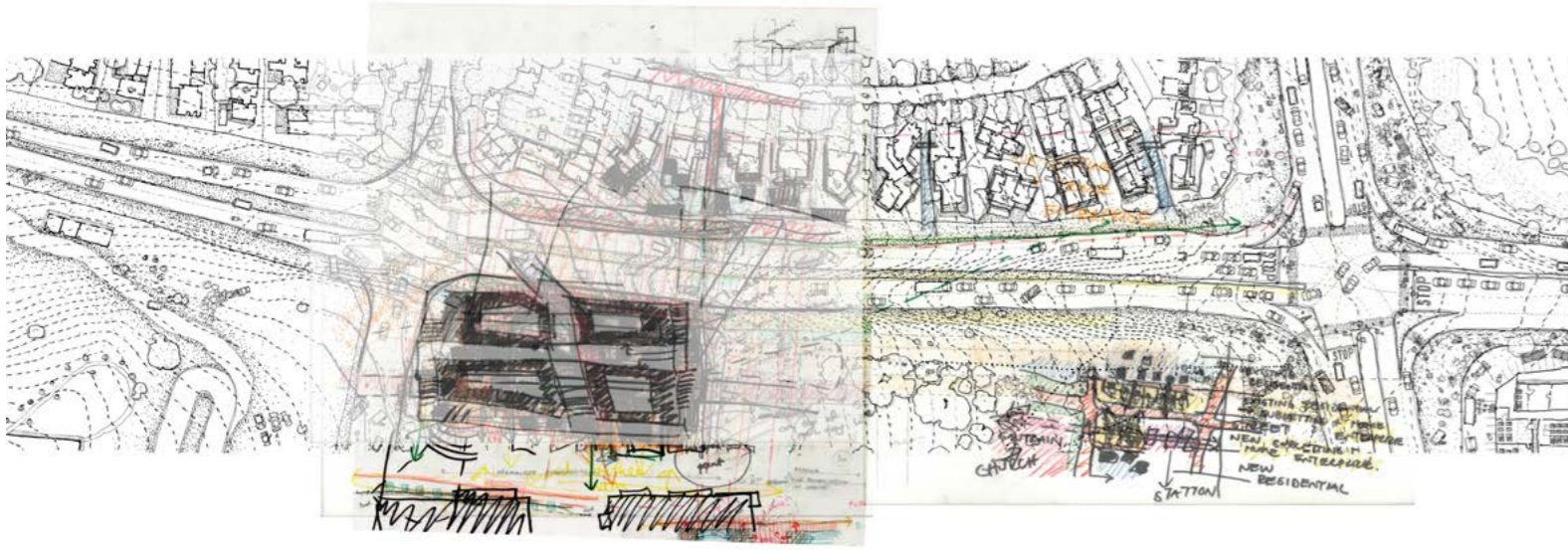


3.2. DESIGN AND TECHNICAL DEVELOPMENT



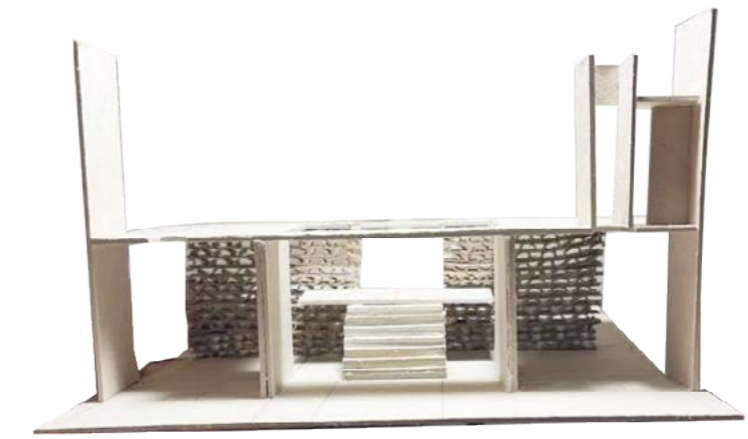
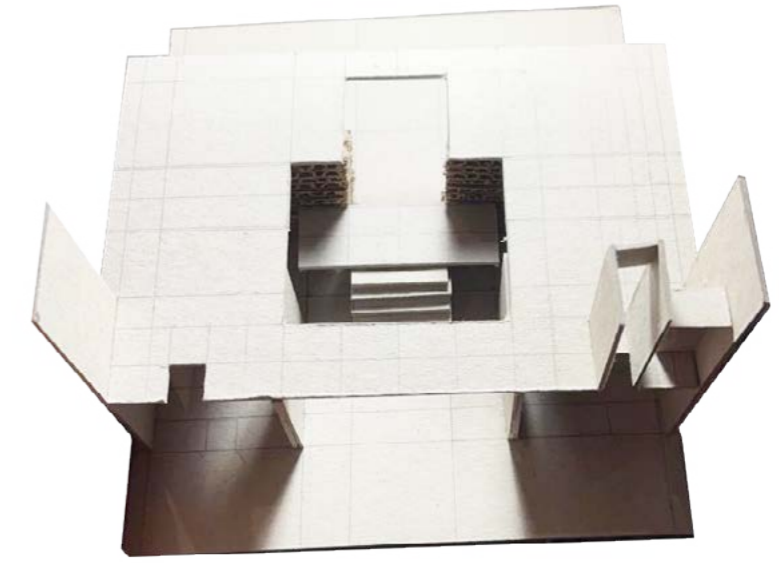
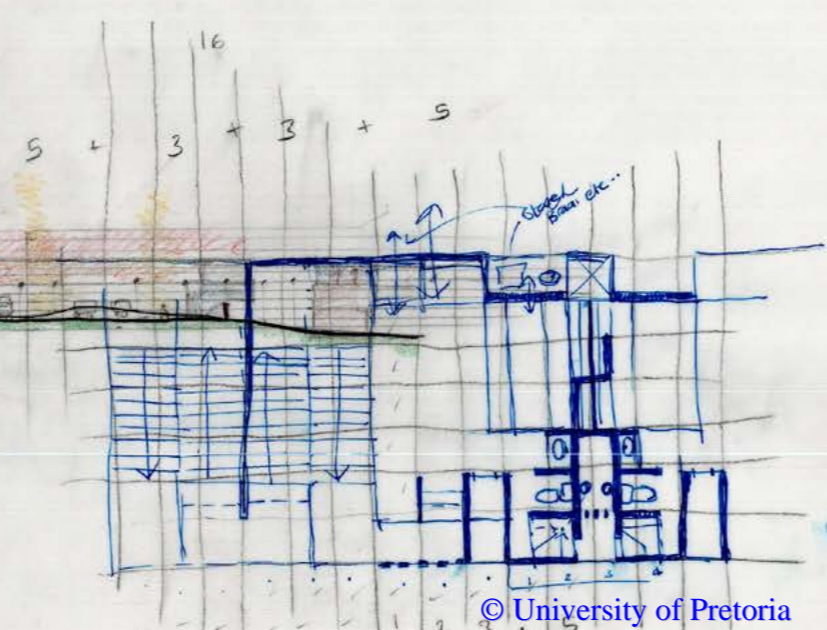
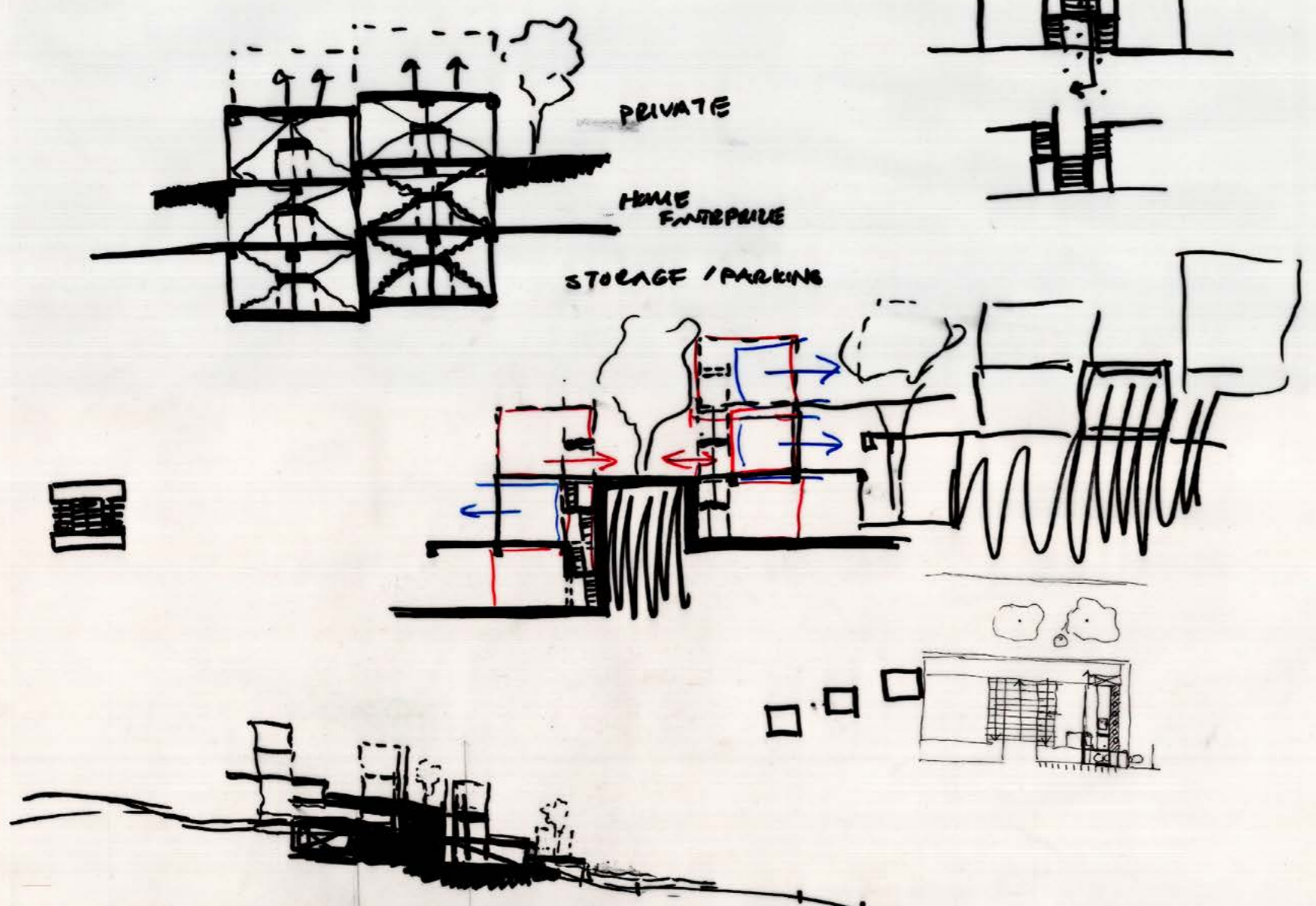


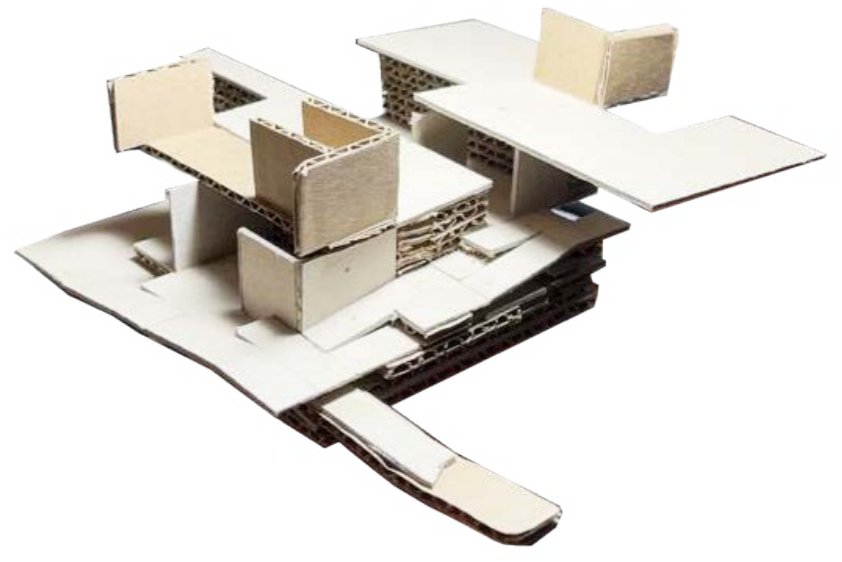
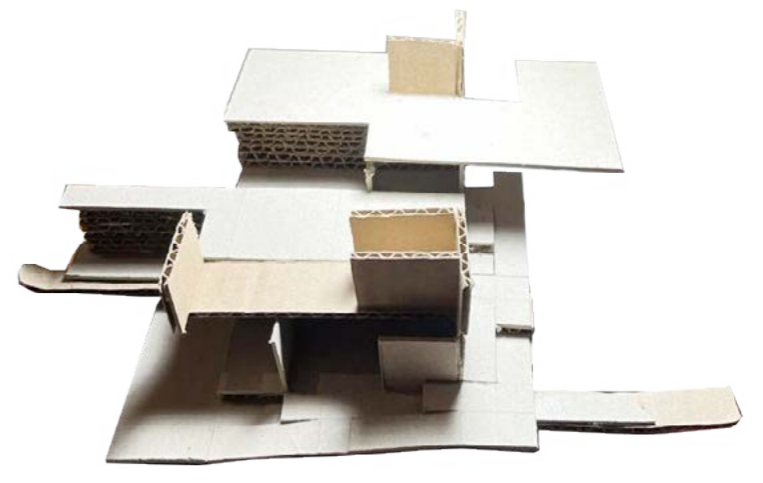
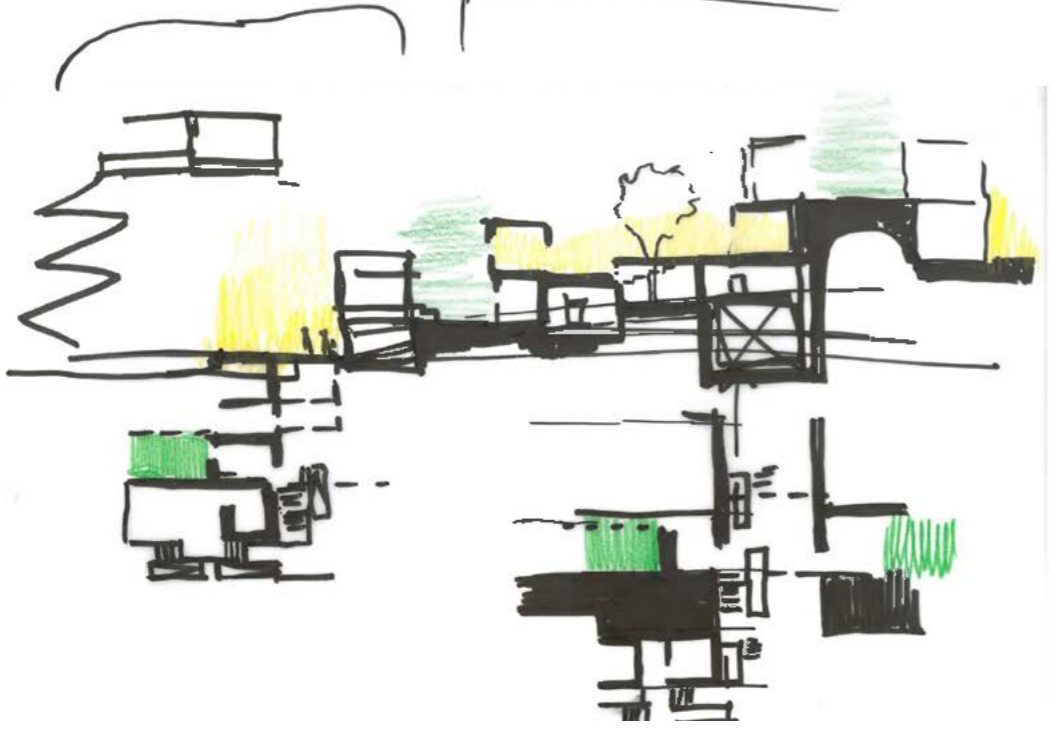
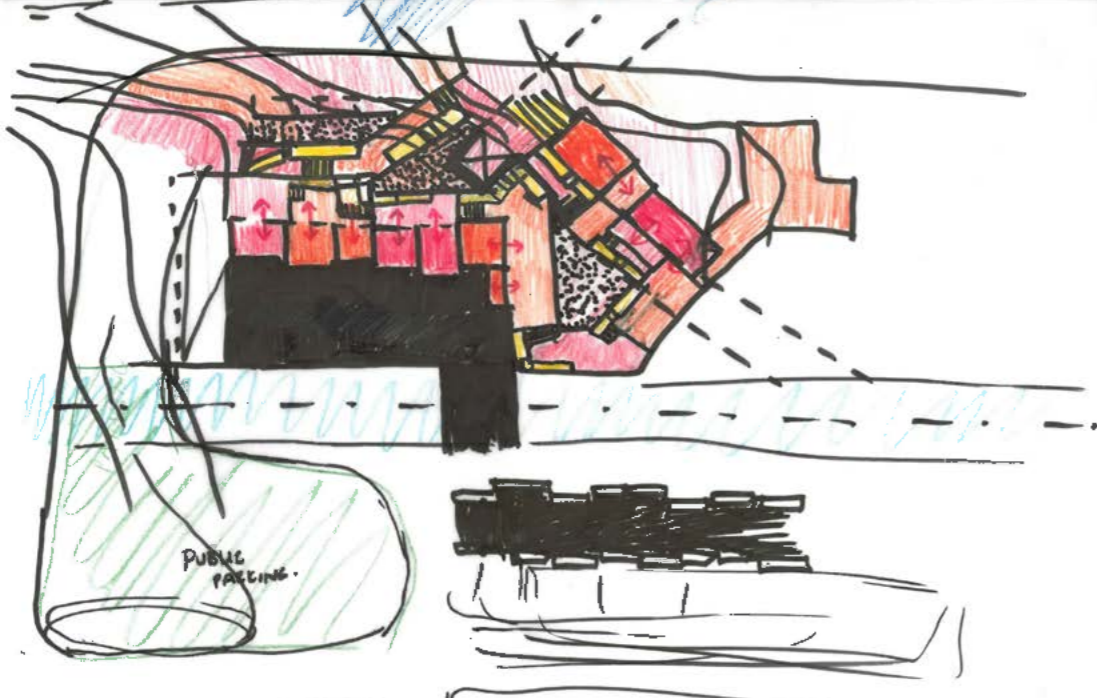
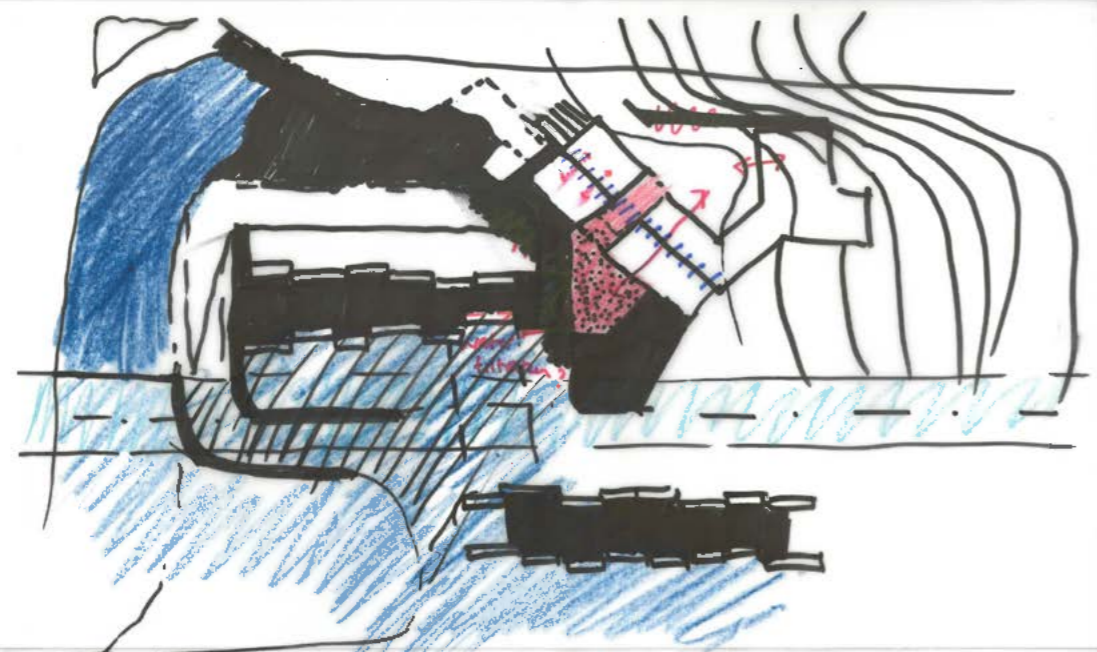




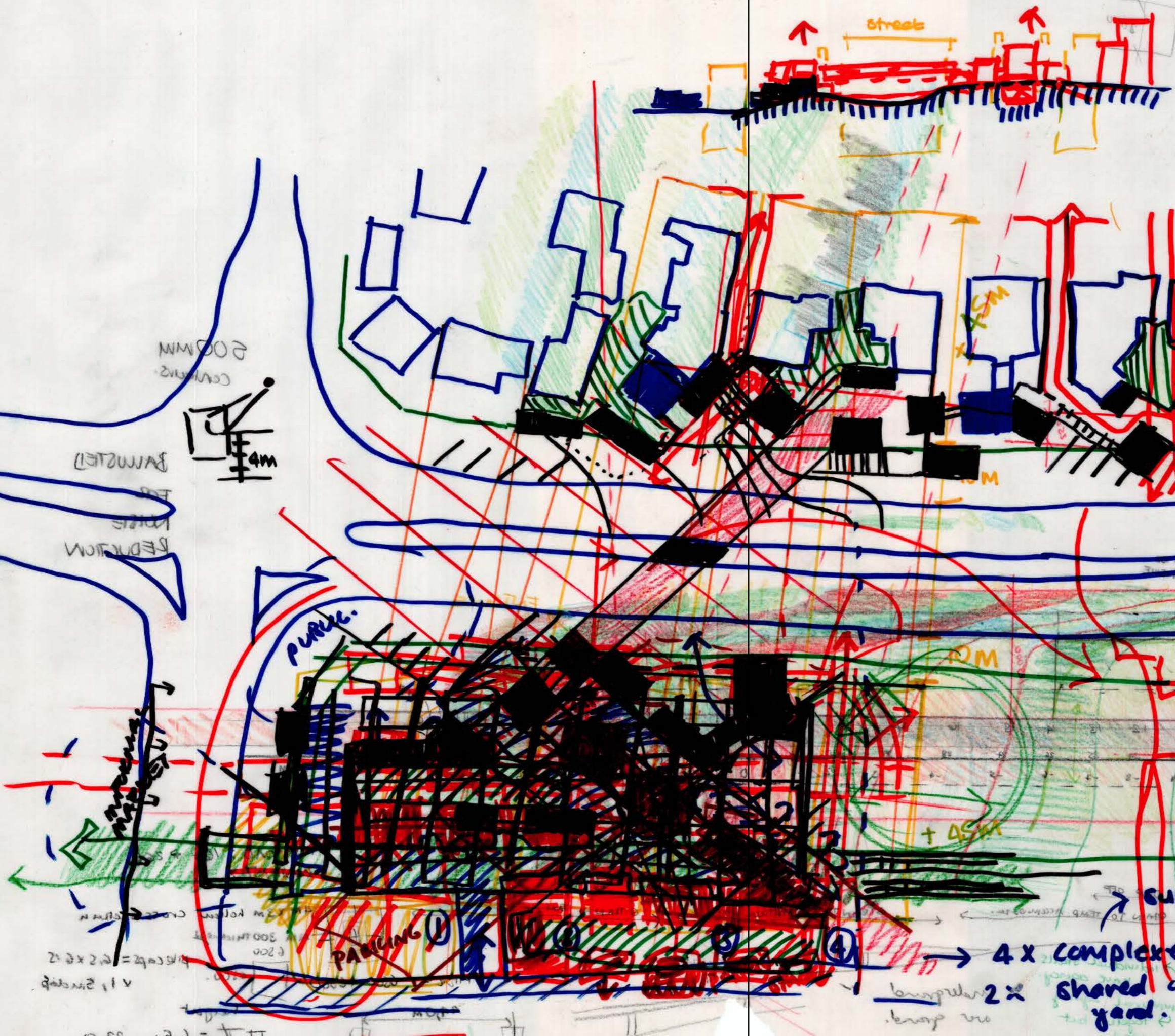
2210



$(13) \times 170 = 2210$
 $(13) \times 250 = 3250$

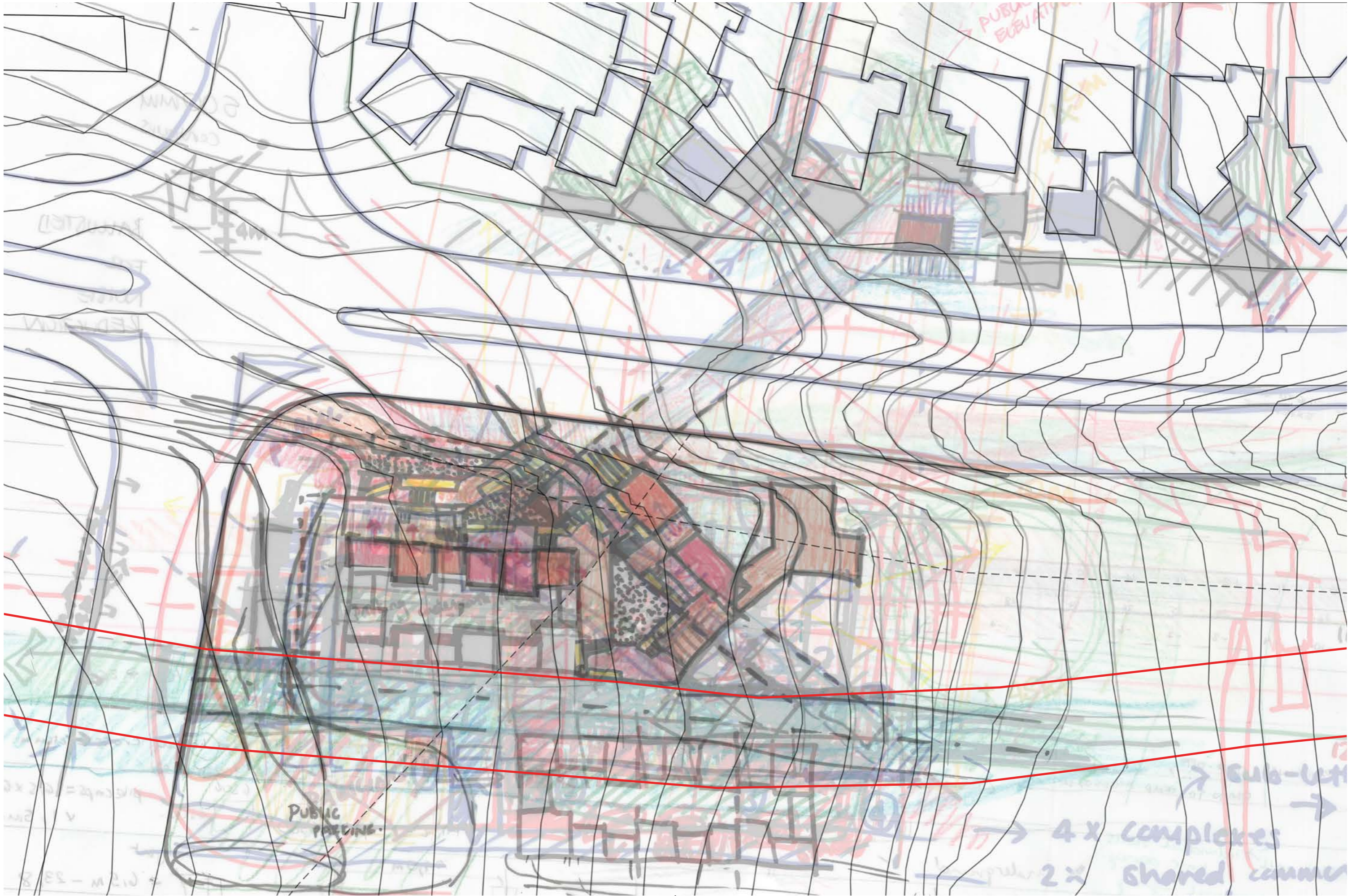


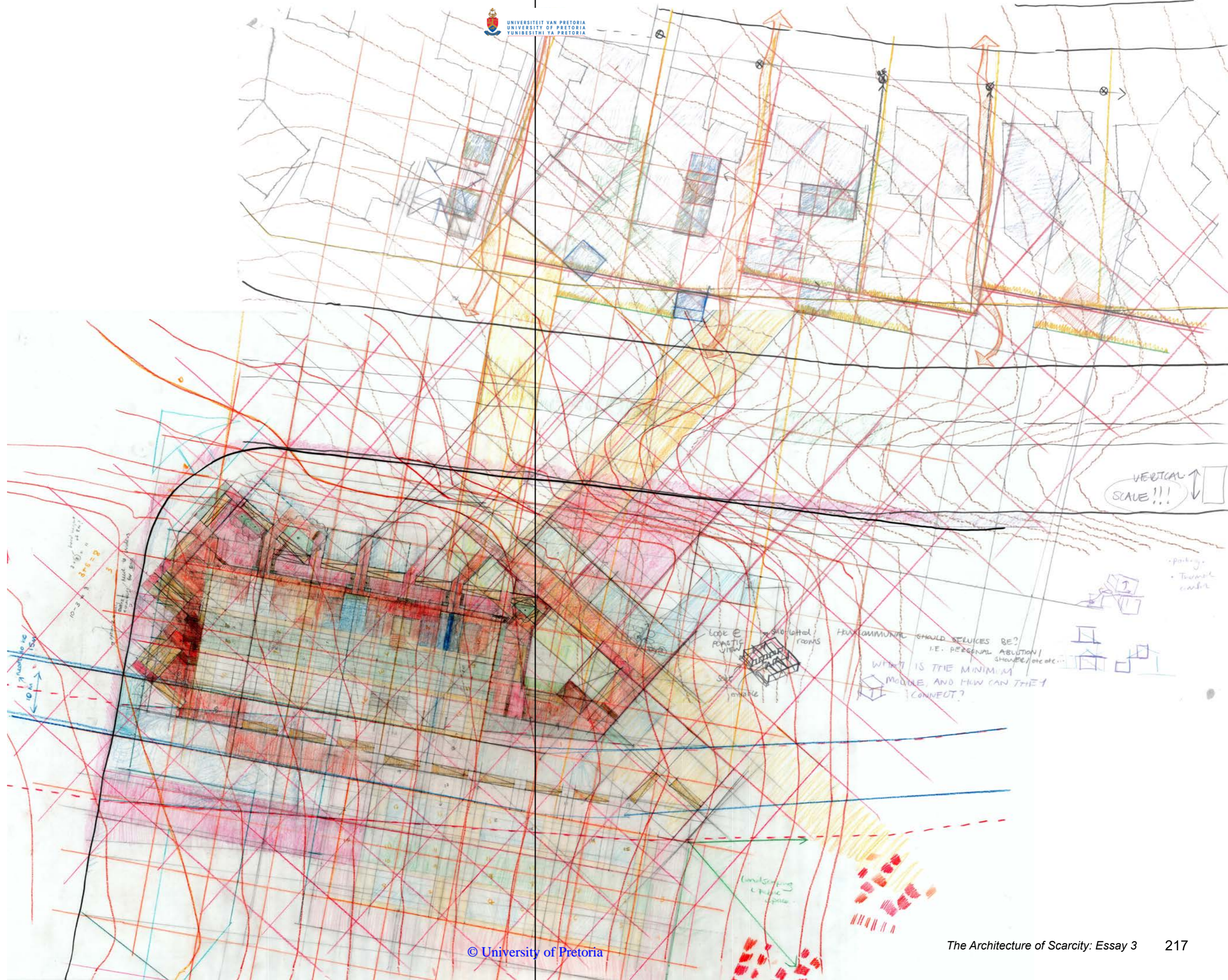


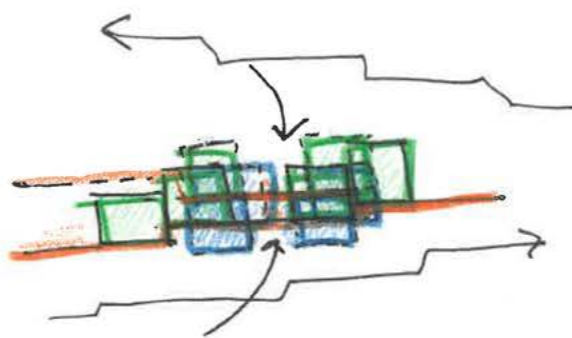
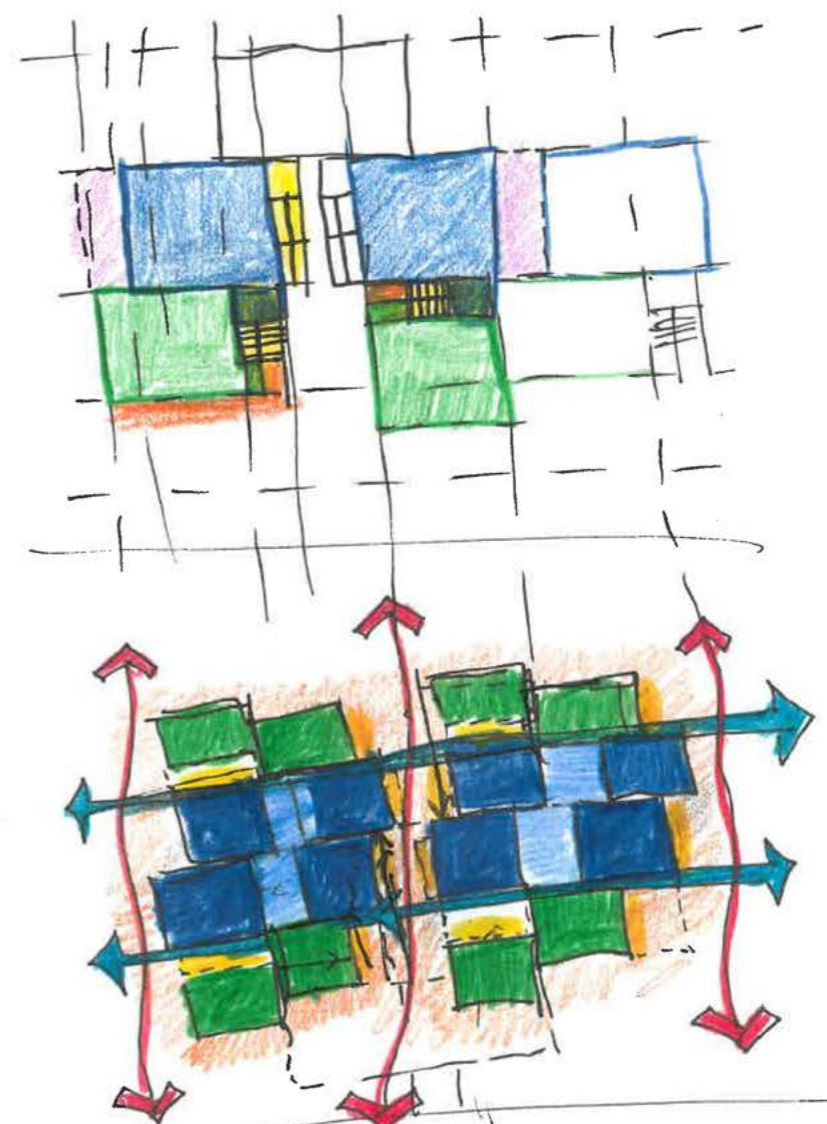
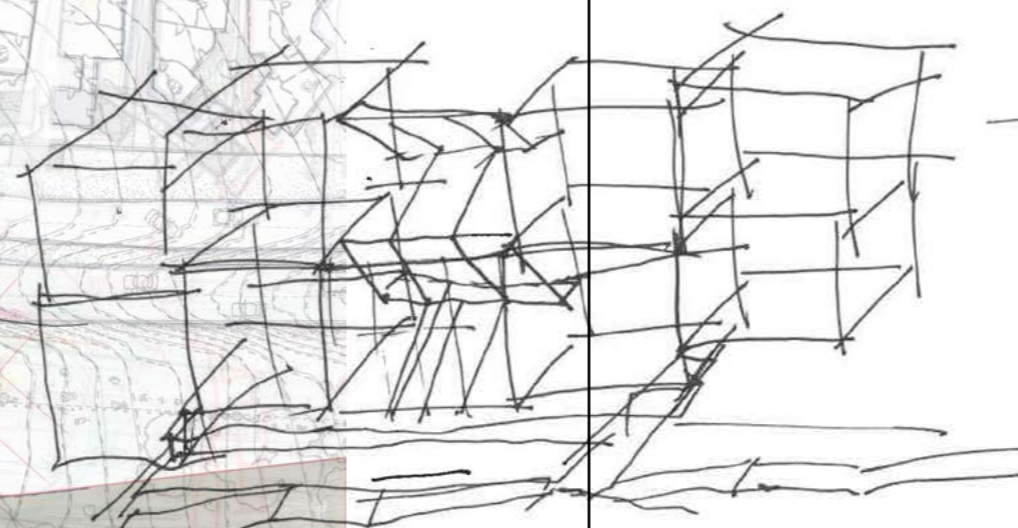
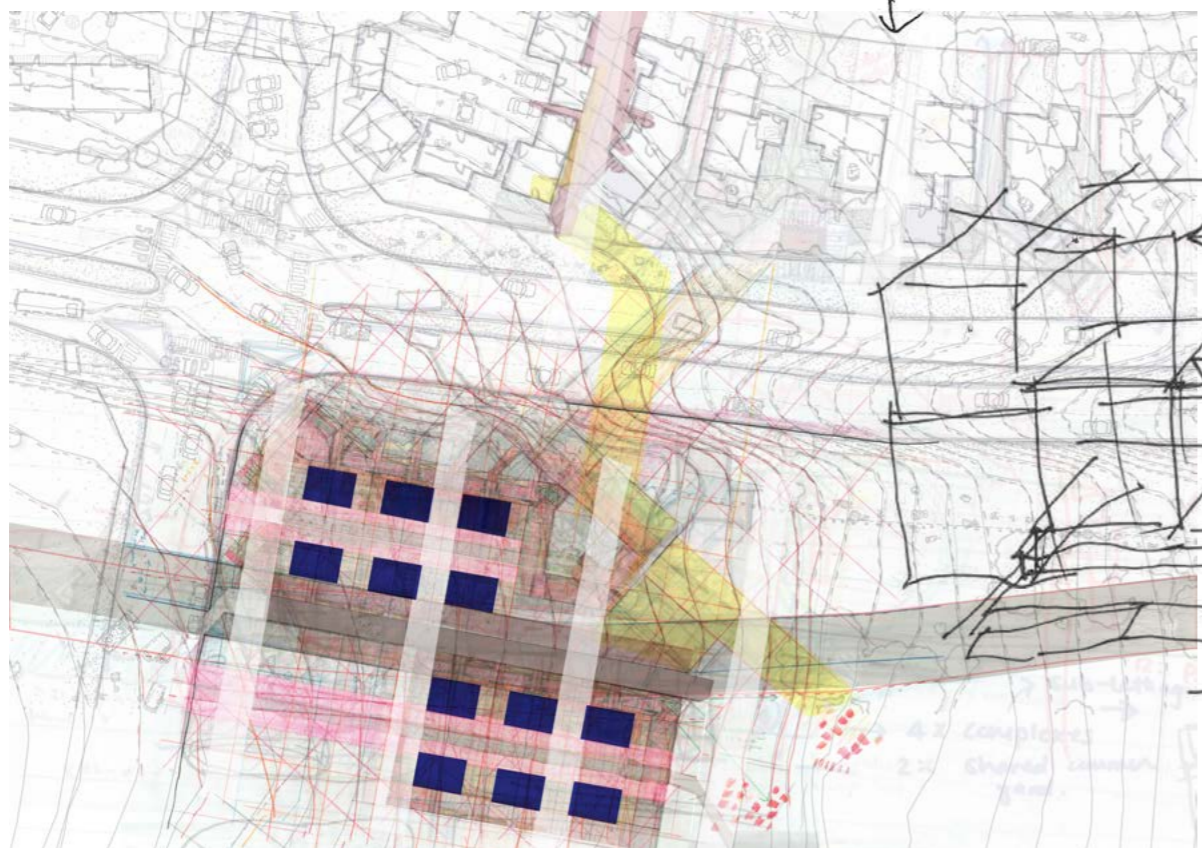
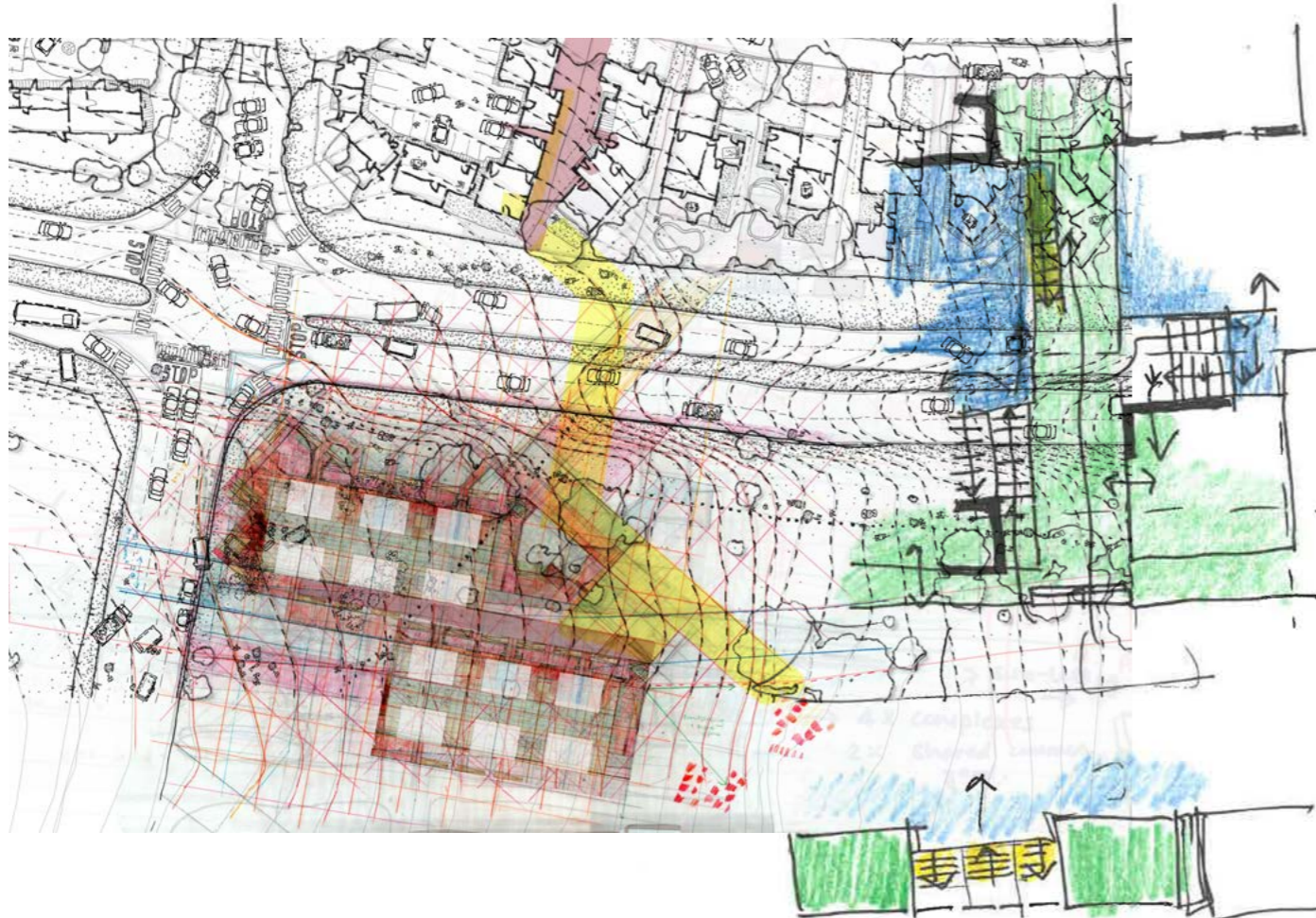


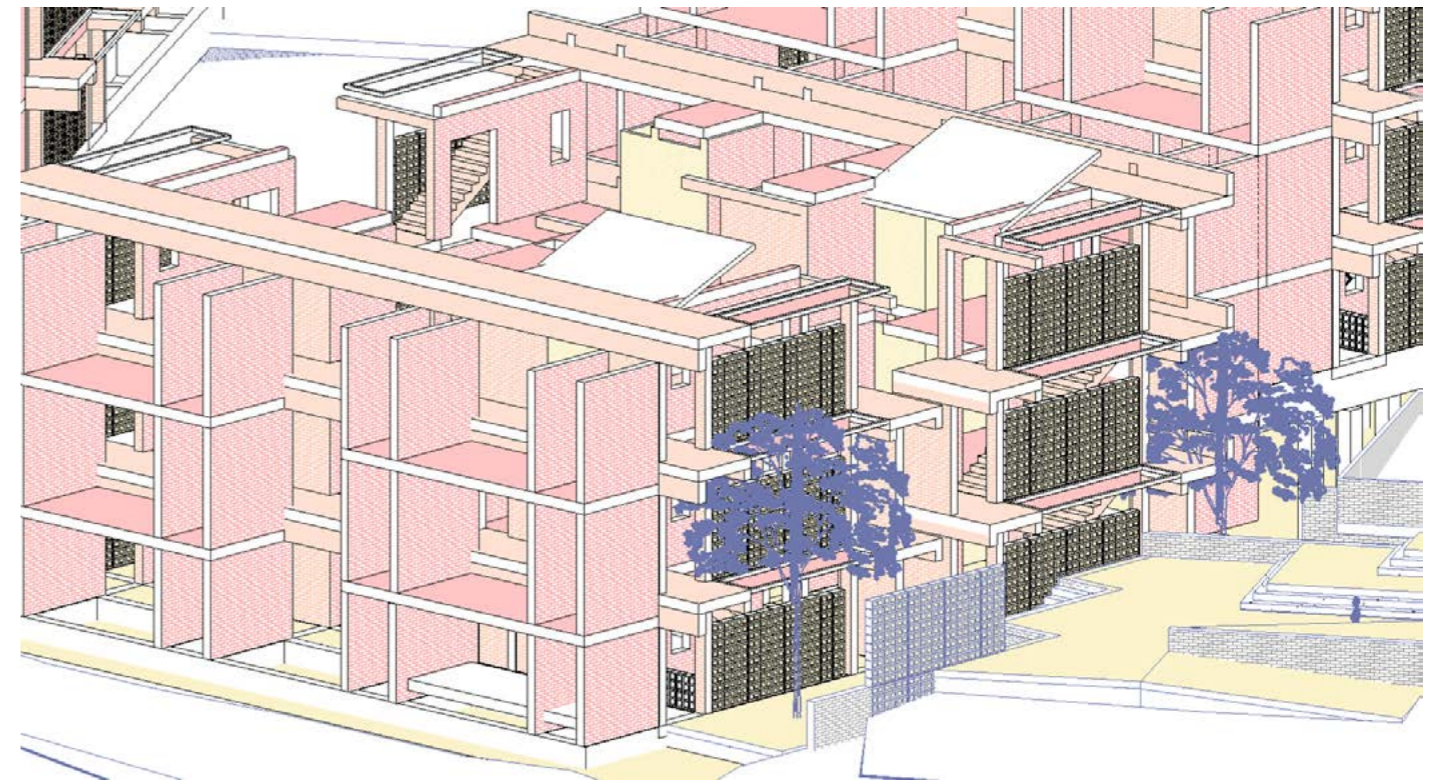
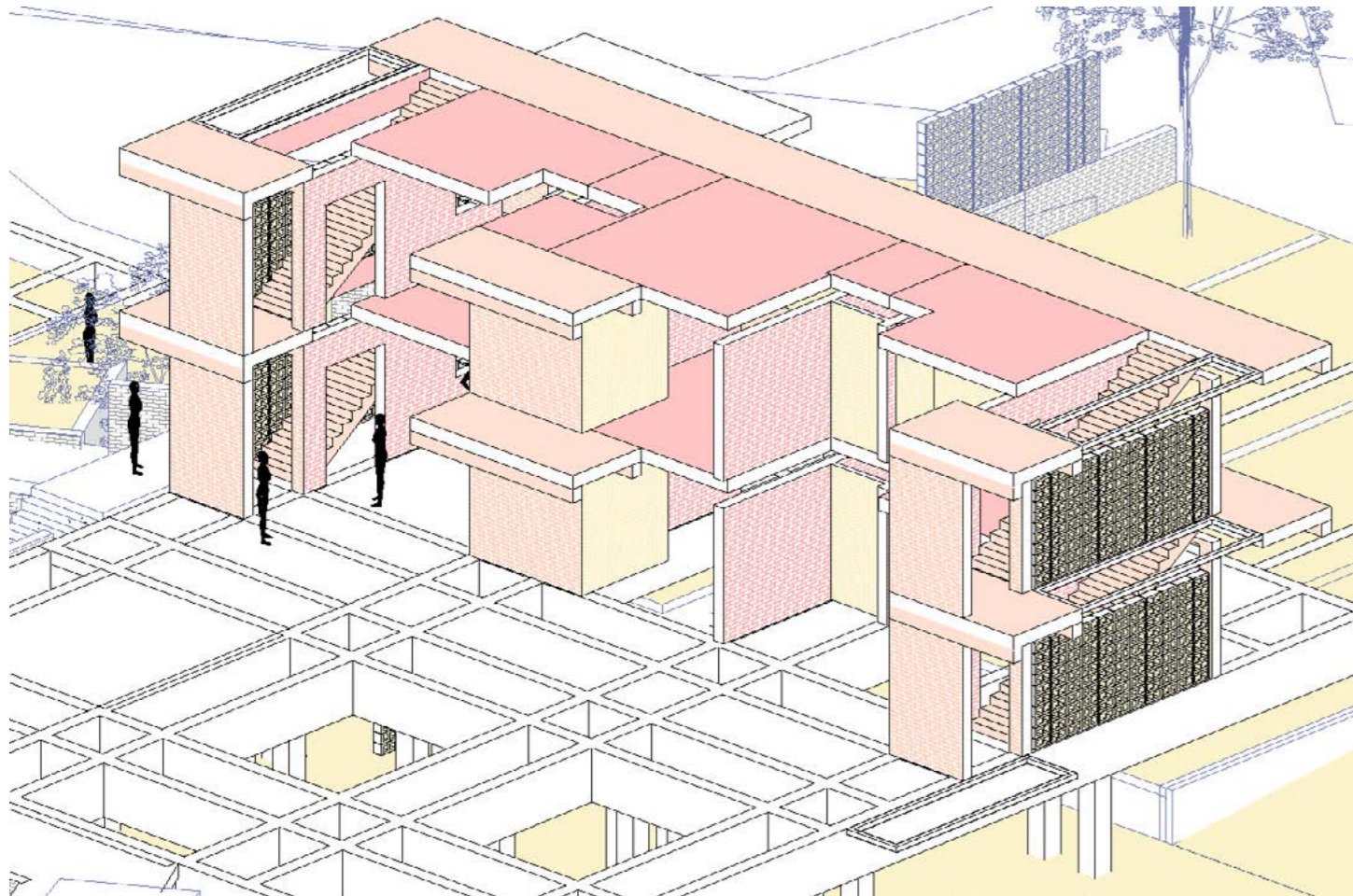
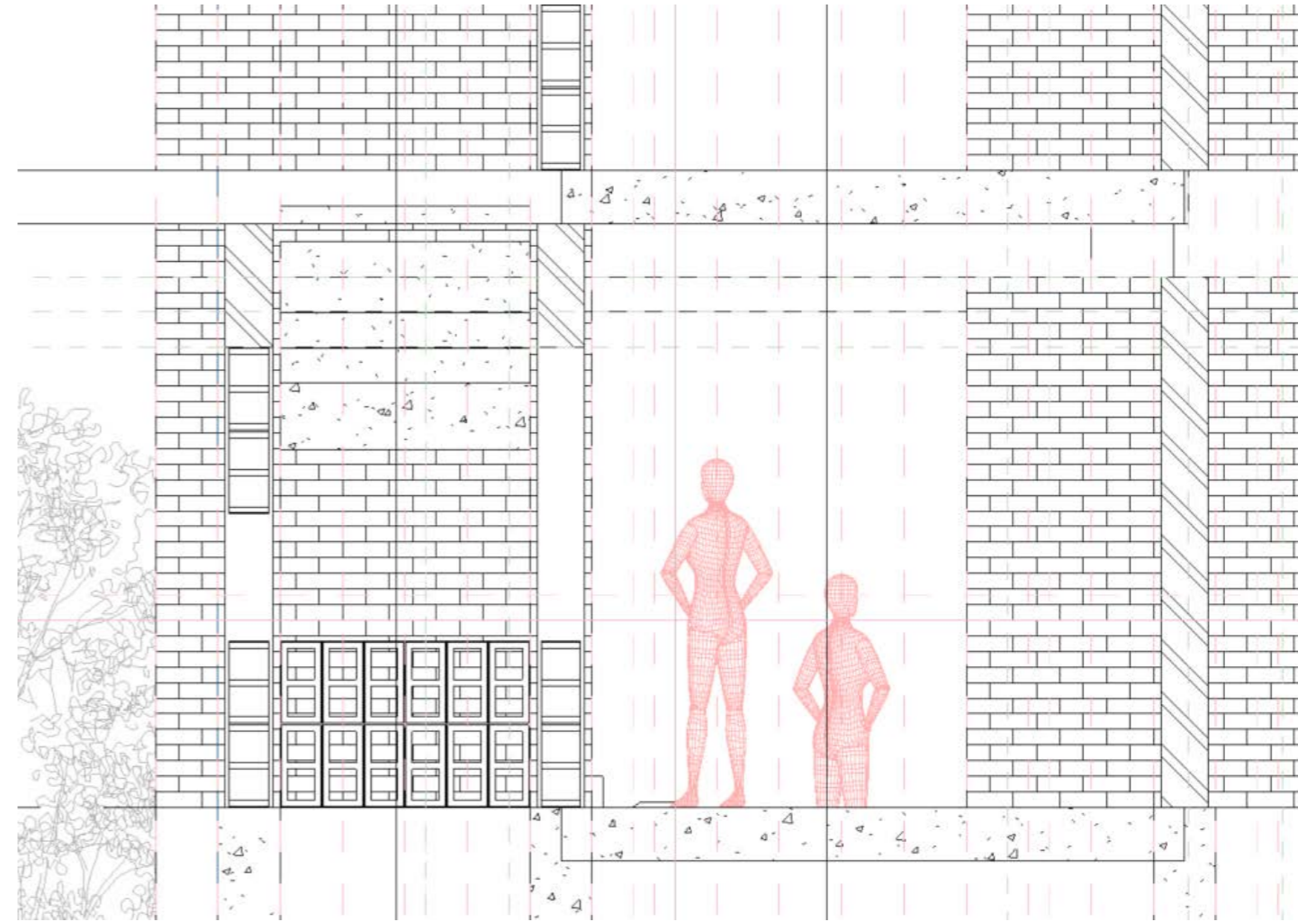
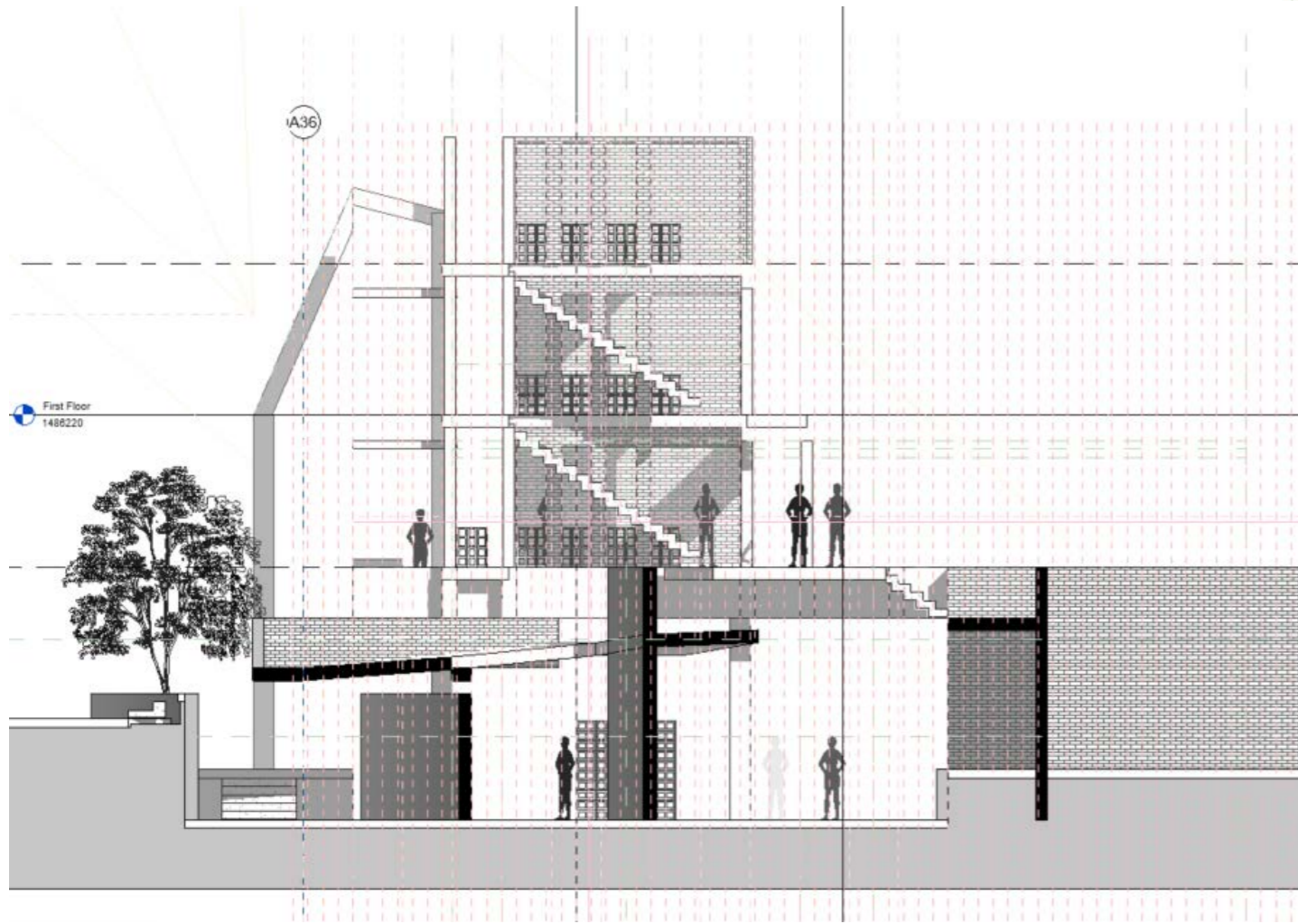


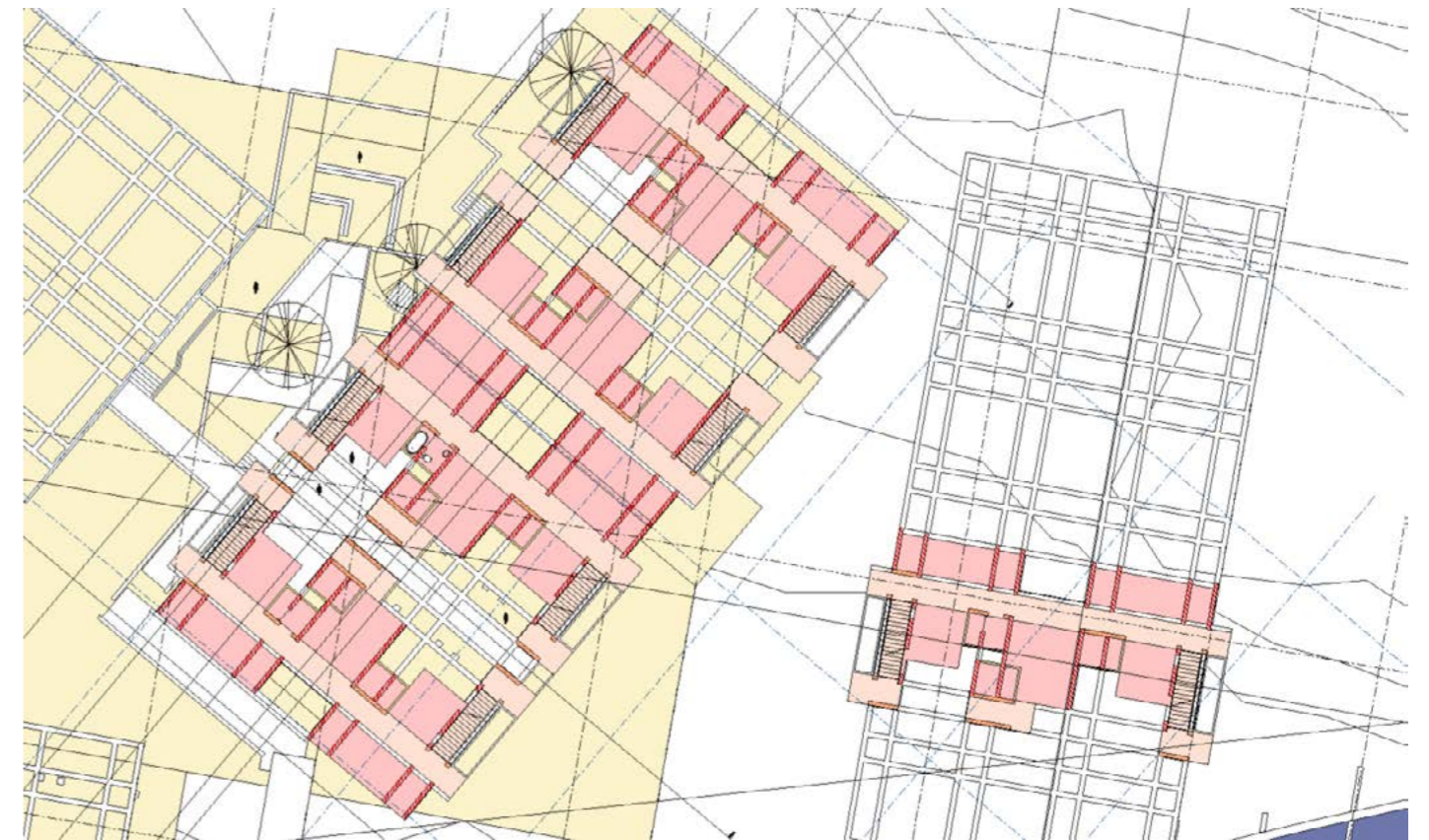
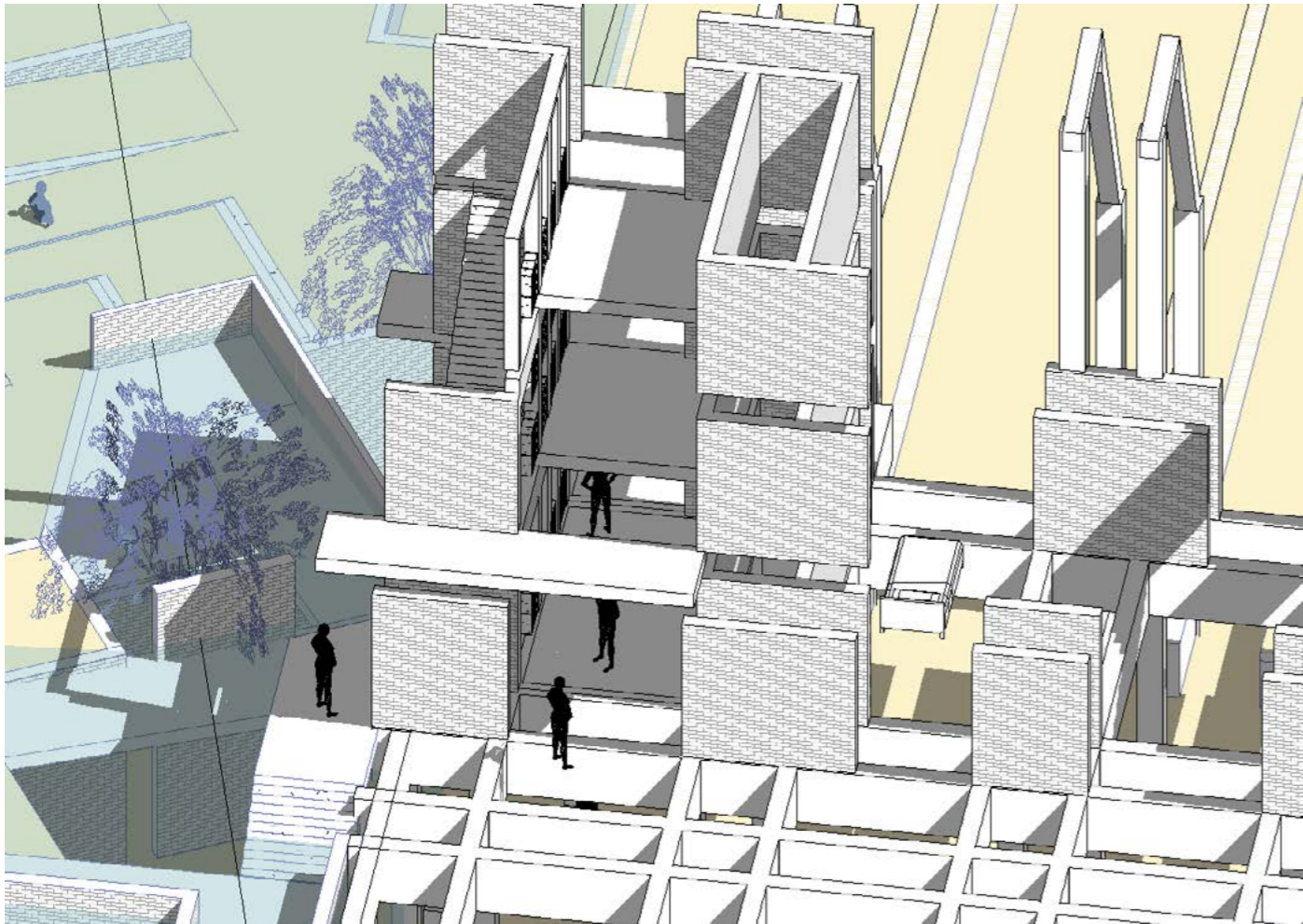
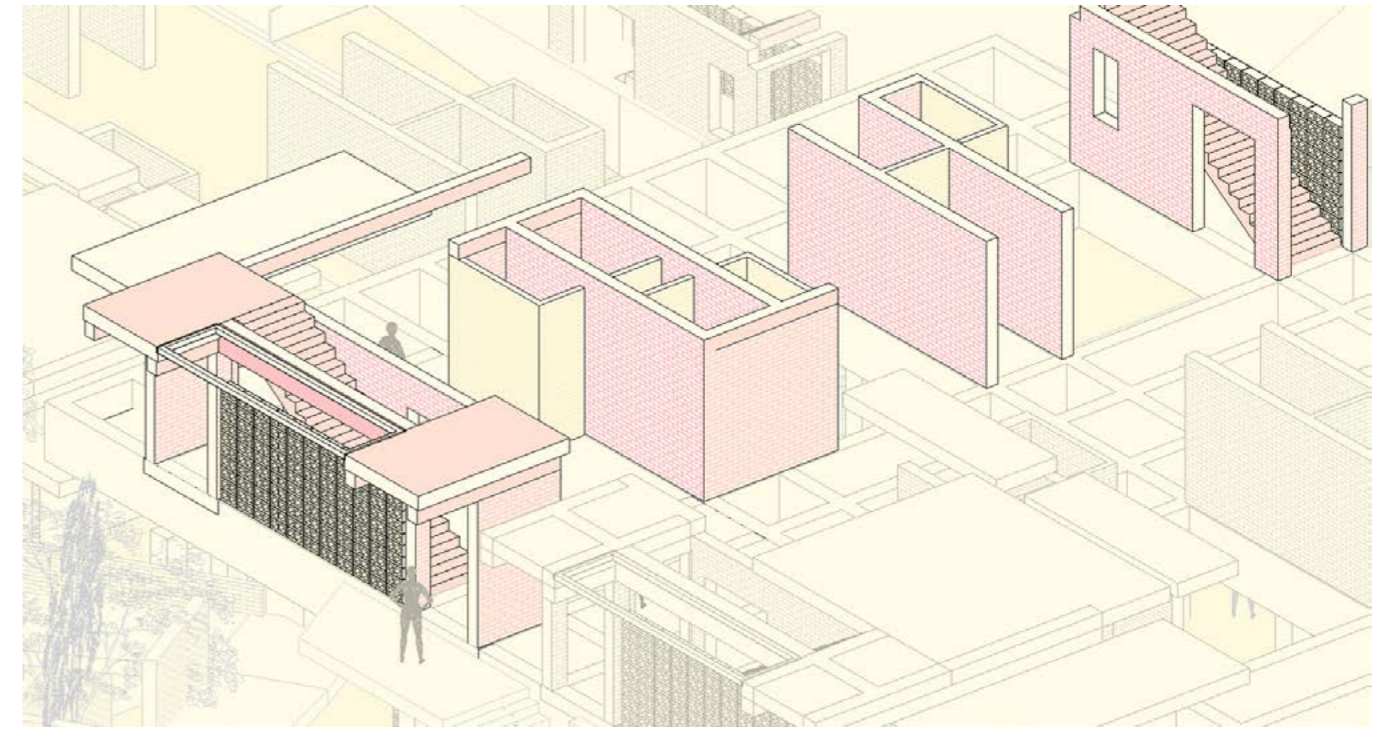
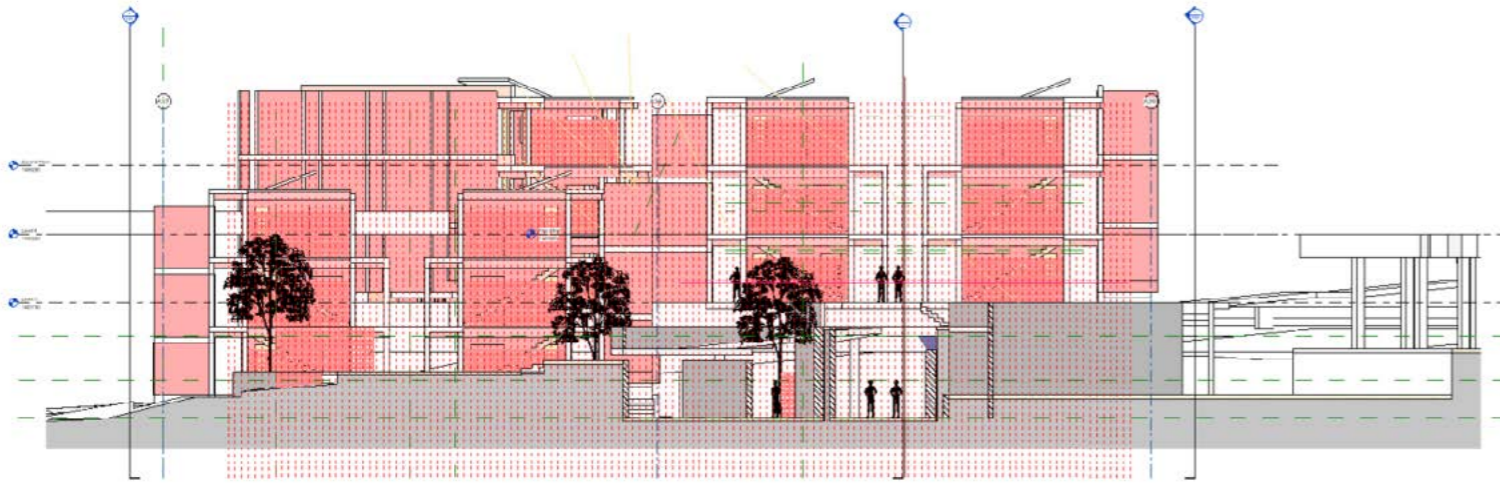
- PLOTS + SIZES** - STUDY COMPARTMENTALISATION
1. Existing land parcel sizes → estate.
 2. Existing living spaces informal settlement.
 3. Occupancy.
 4. Ratio → common area → private area → 'SOHO' home office/ work space.
 5. Sub-letting.
 6. roof-rights.
 7. Densification.
 8. Hyperoptimization.
 9. Gautrain
 10. Complexes + Gated communities in Mamelodi Park.
 
 11. Code @ Notti map → public vs private.
 12. PASOP! Building lines....
 
- 4 x complexes shared common yard.
- sub-letting →

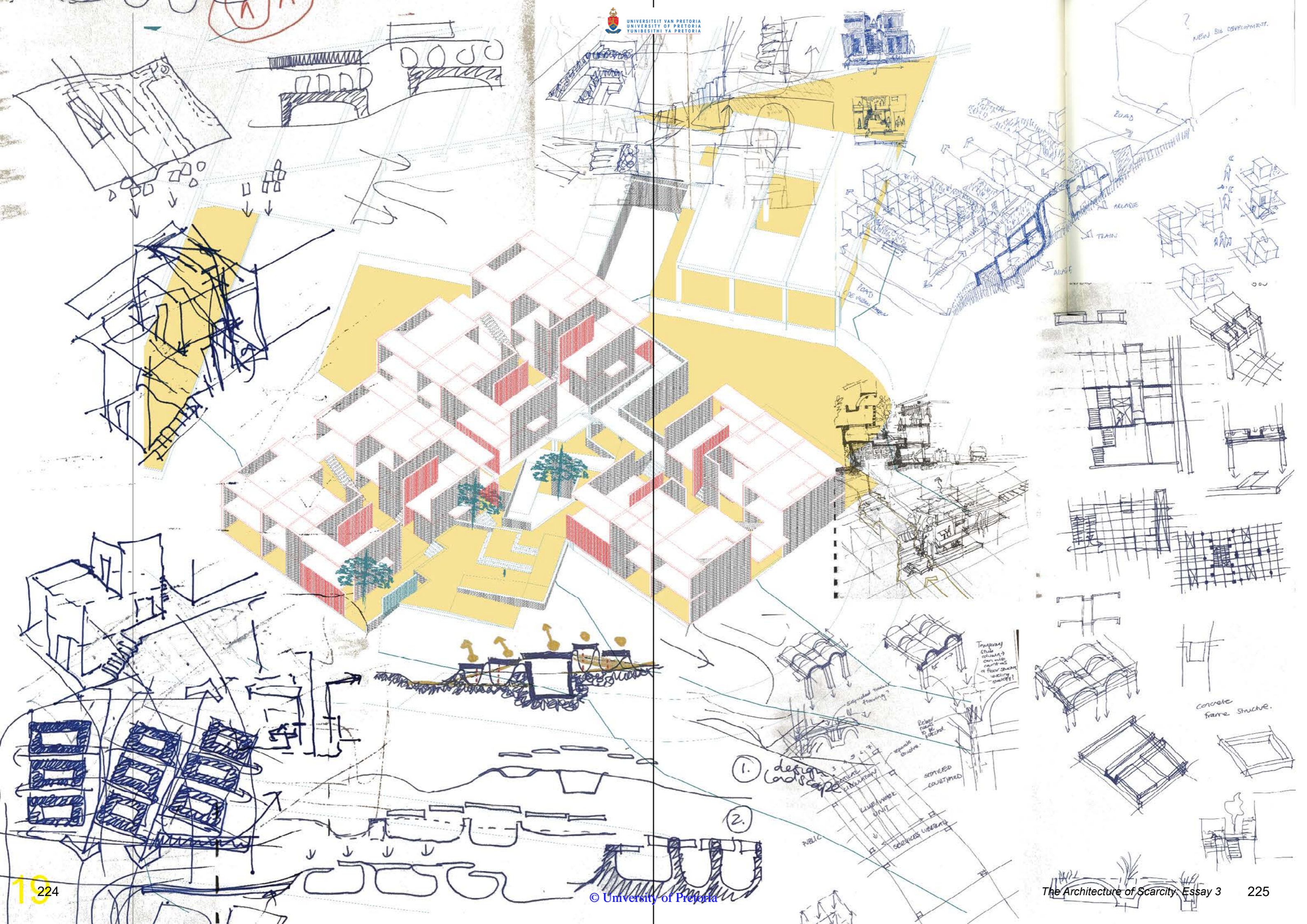


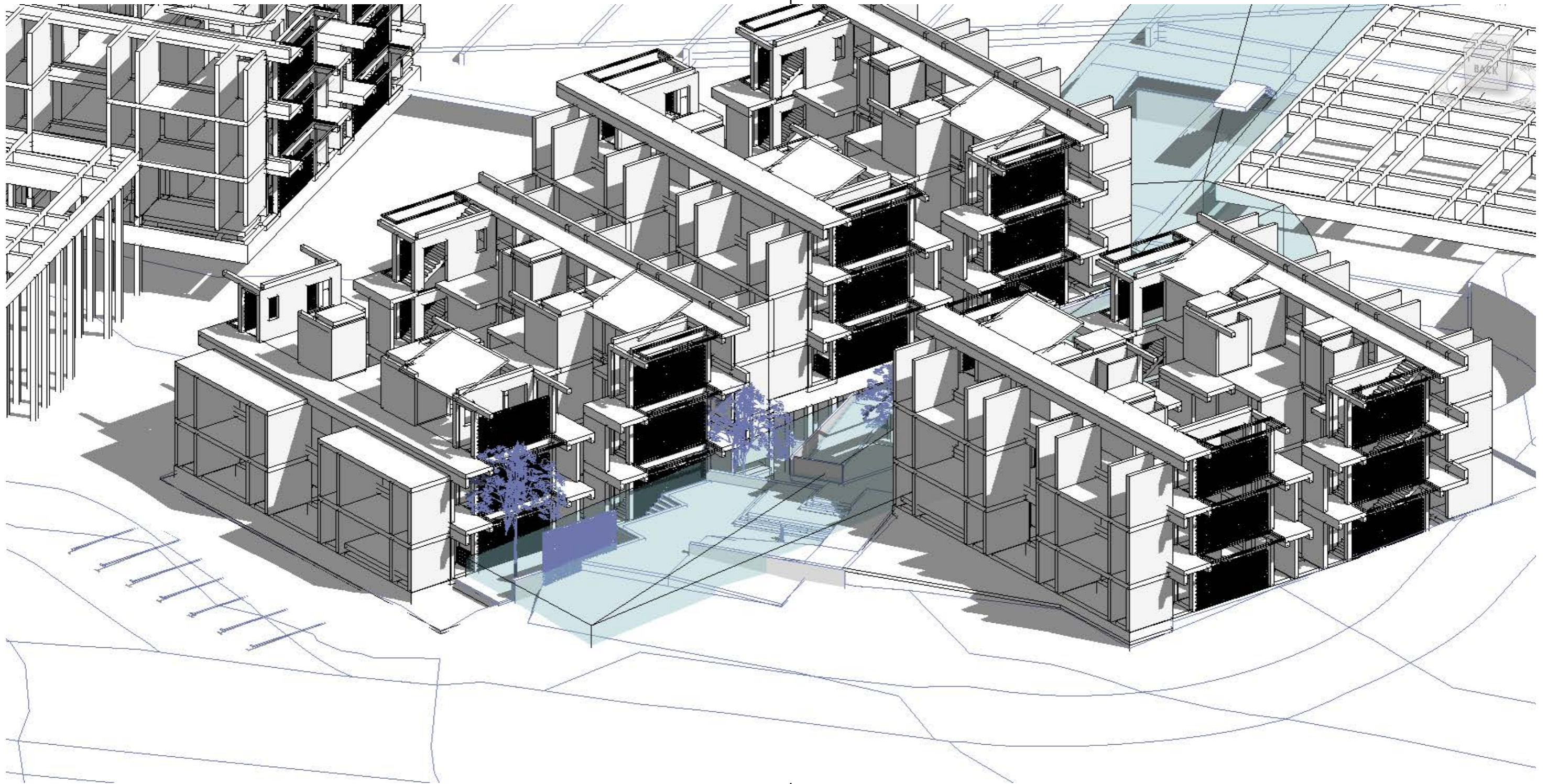




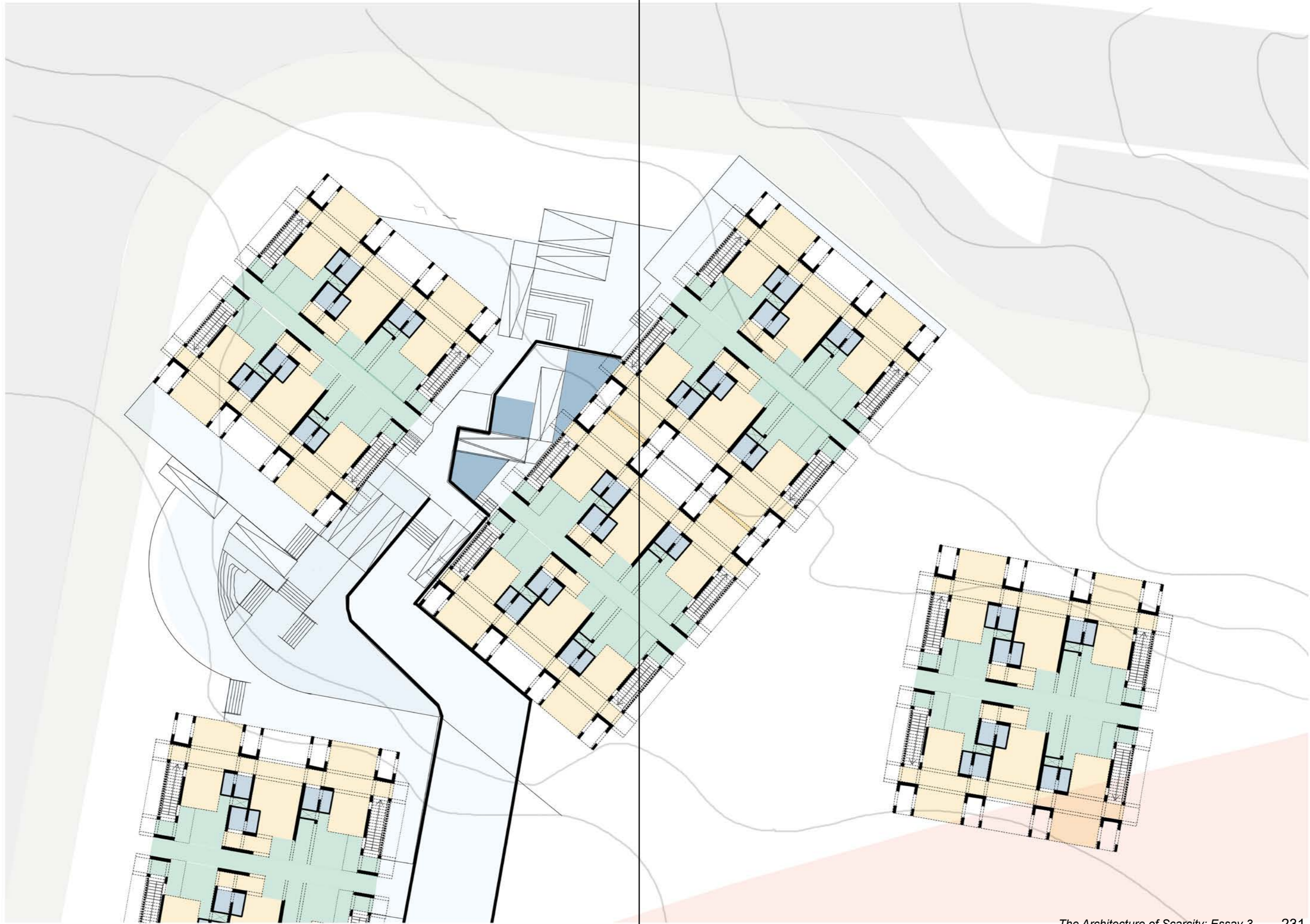


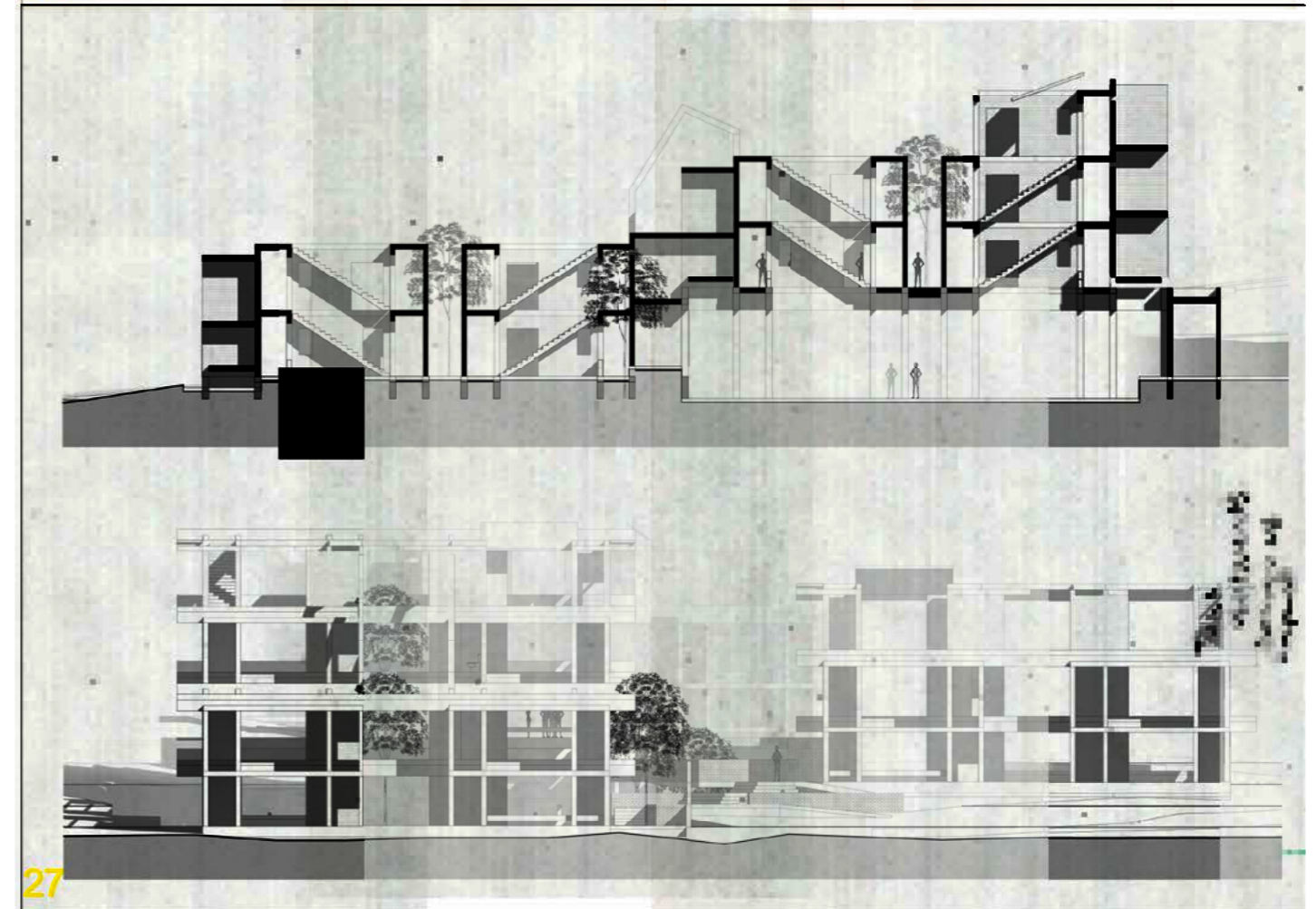
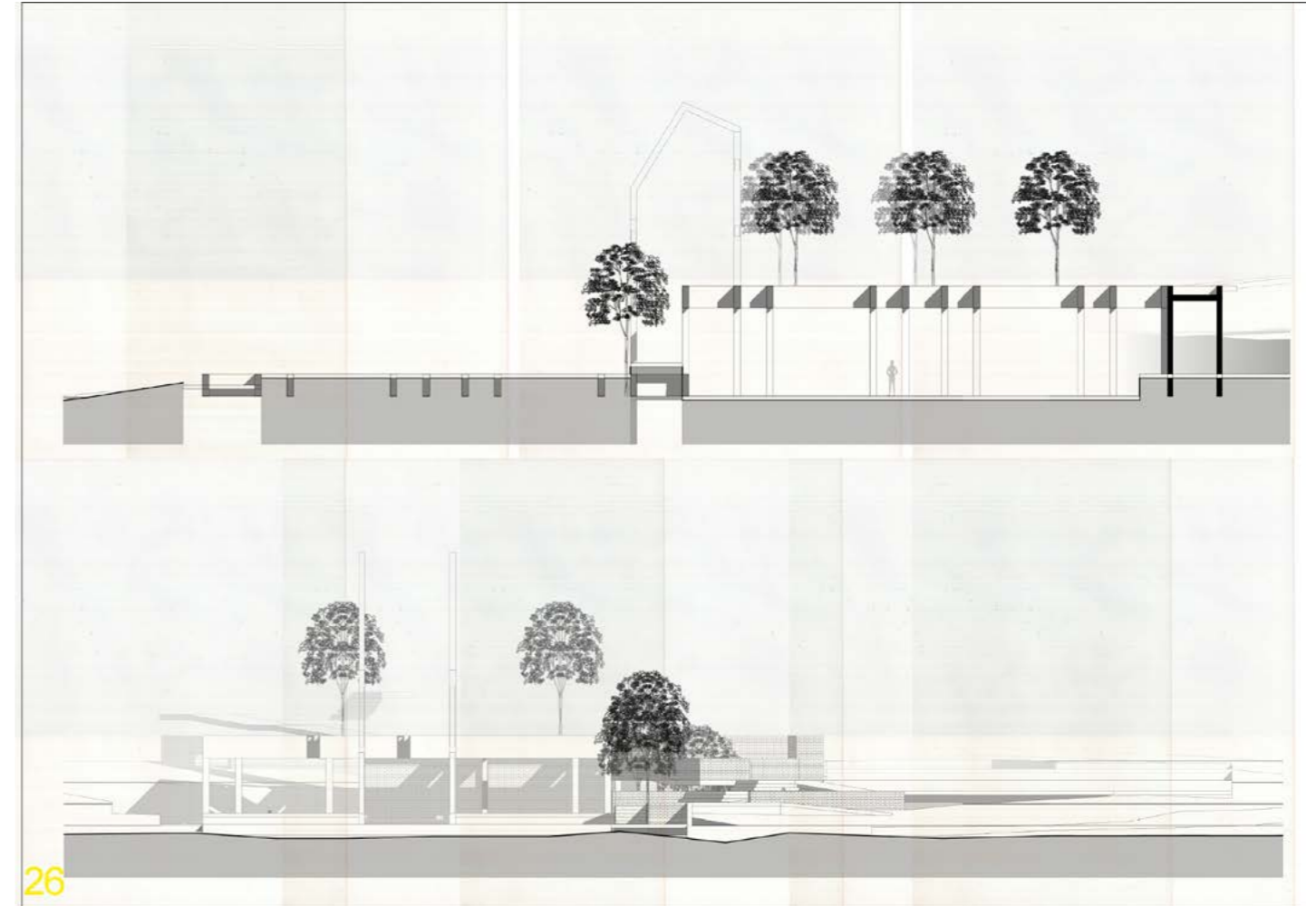
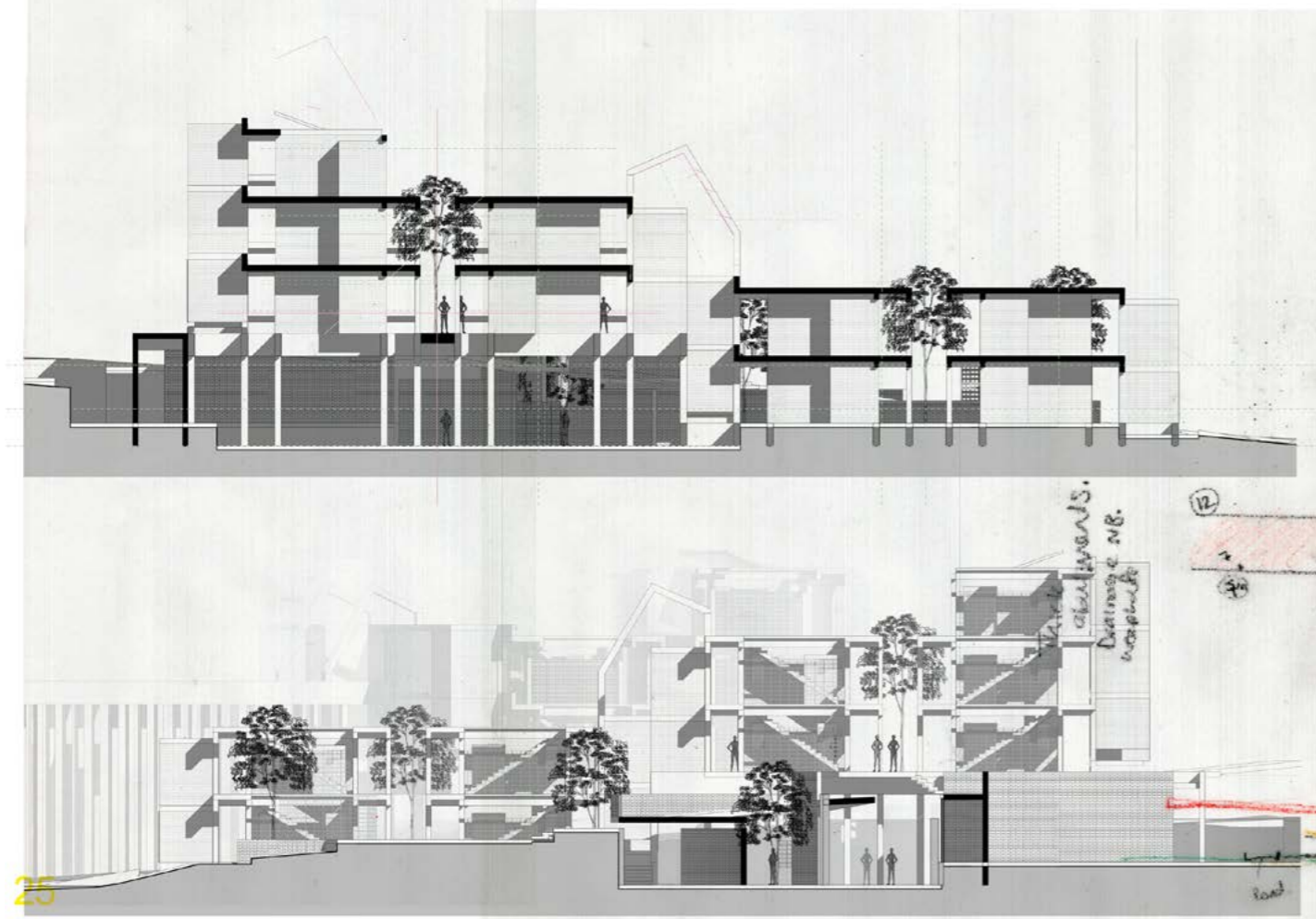
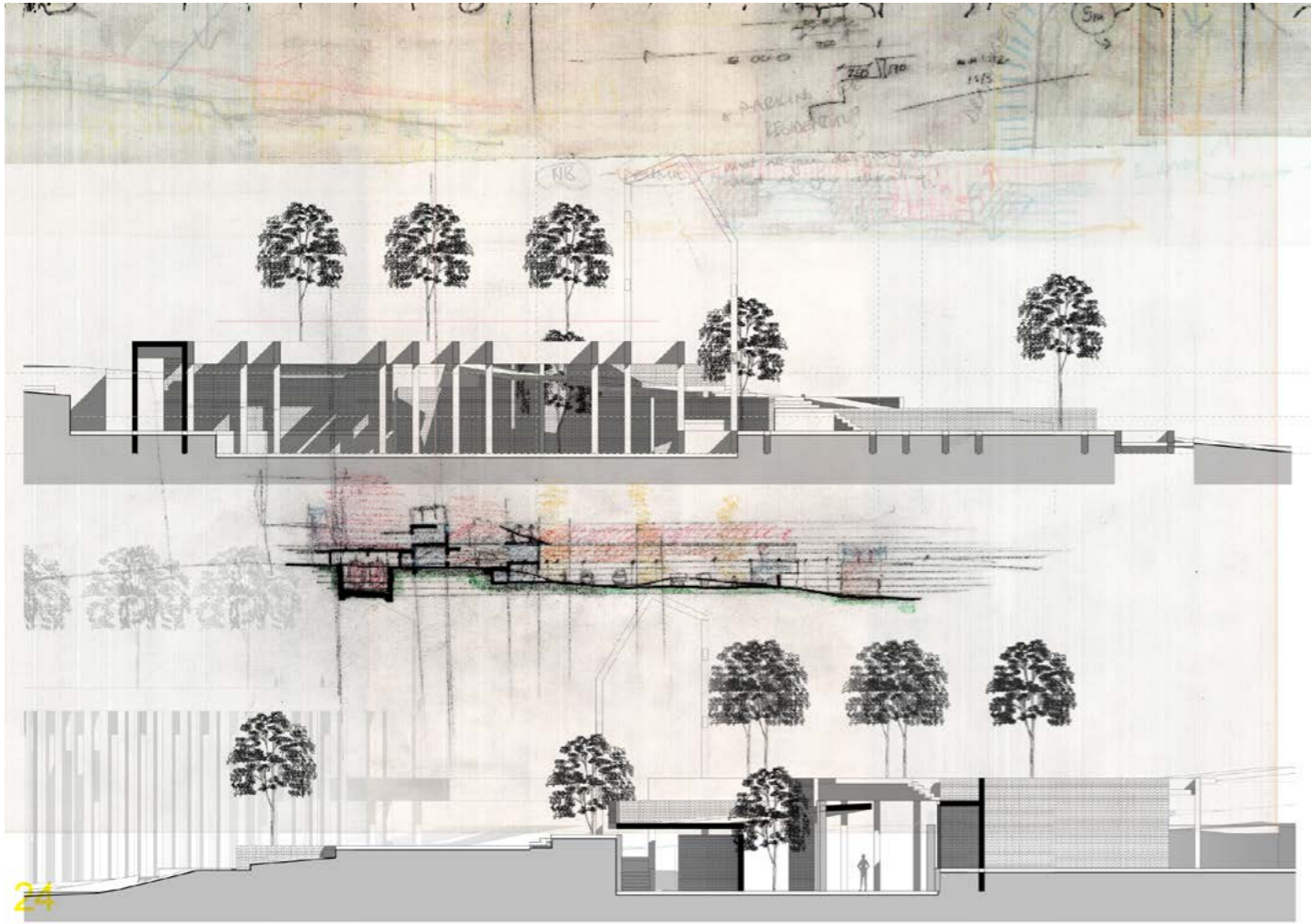


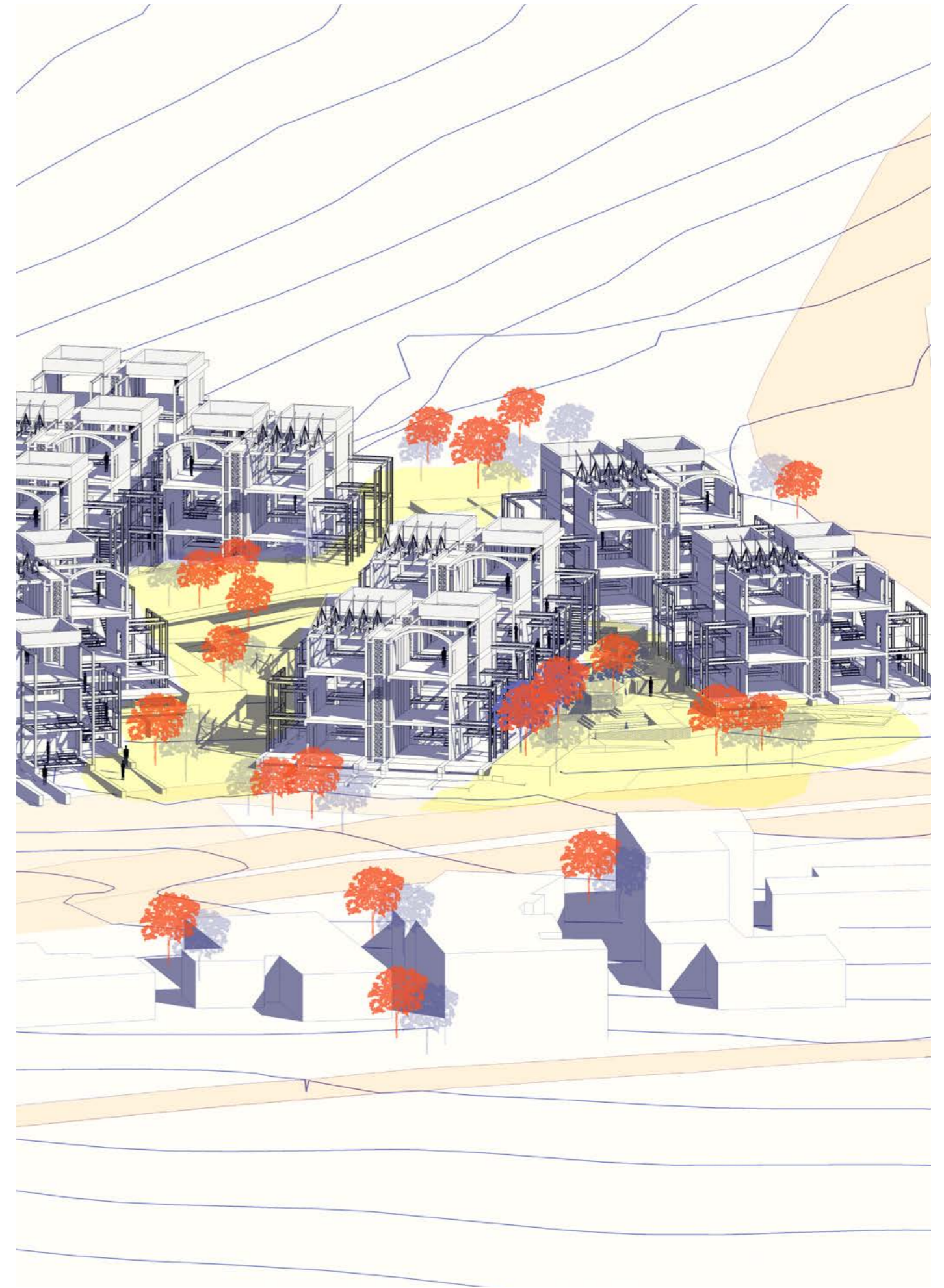
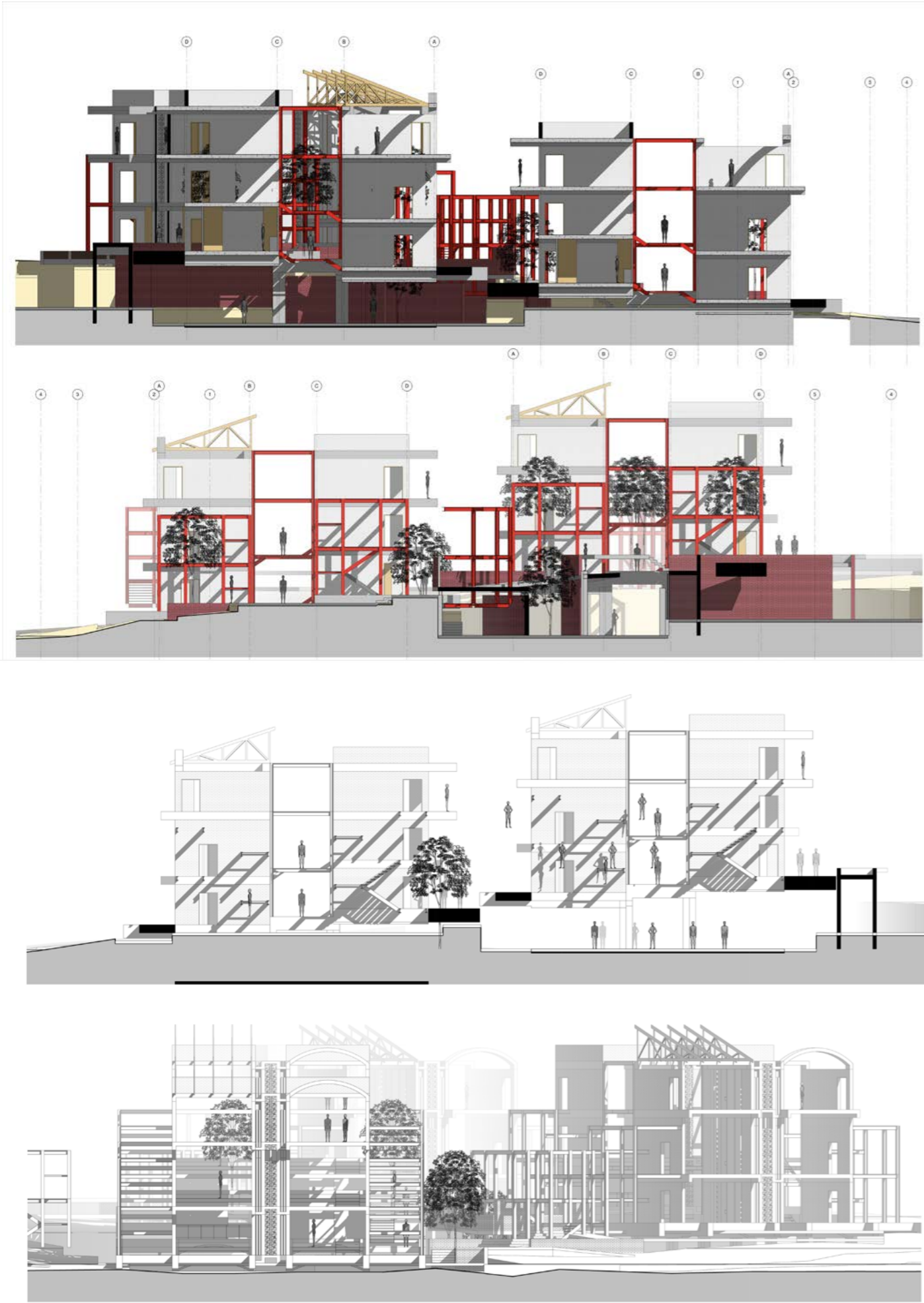




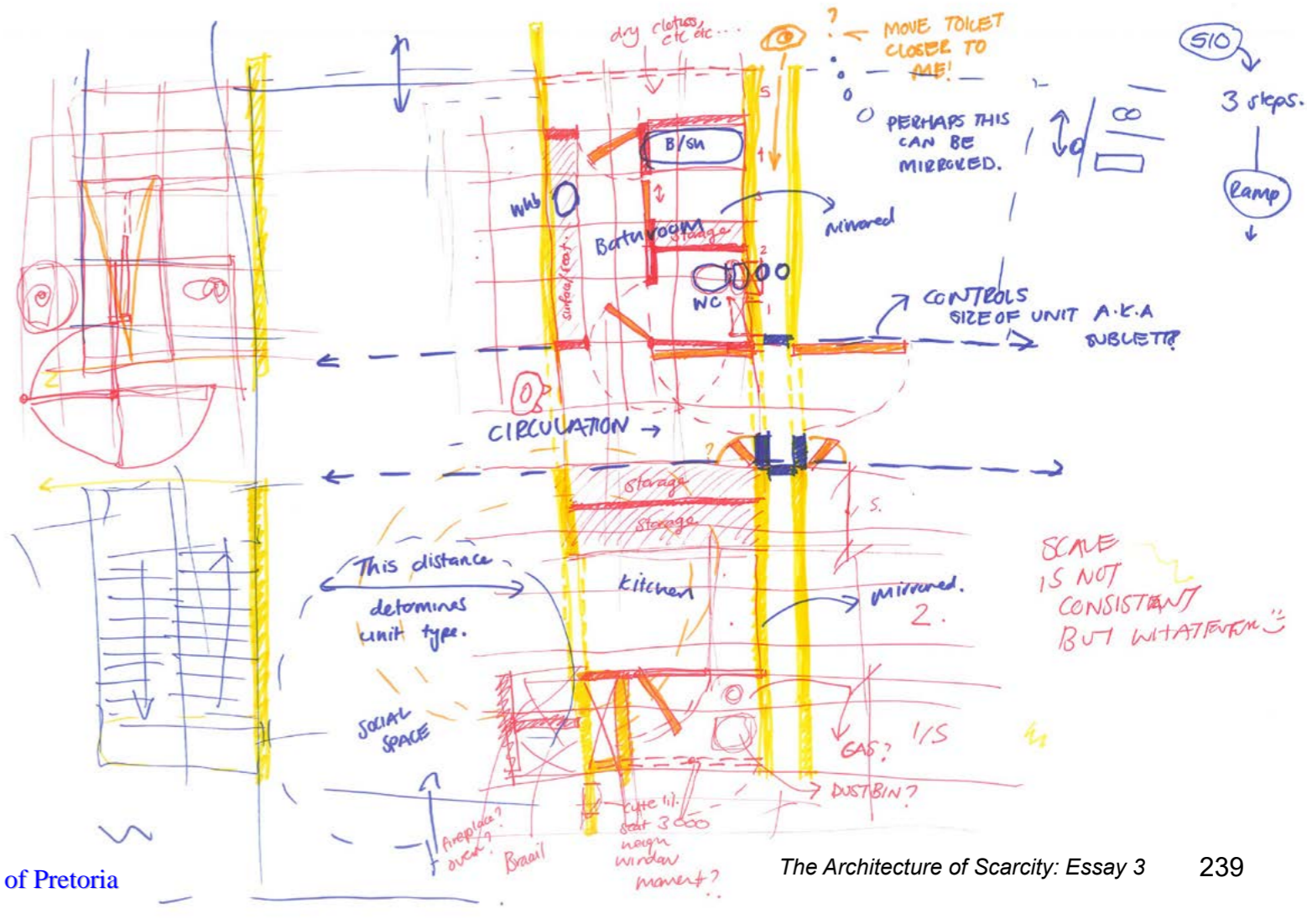
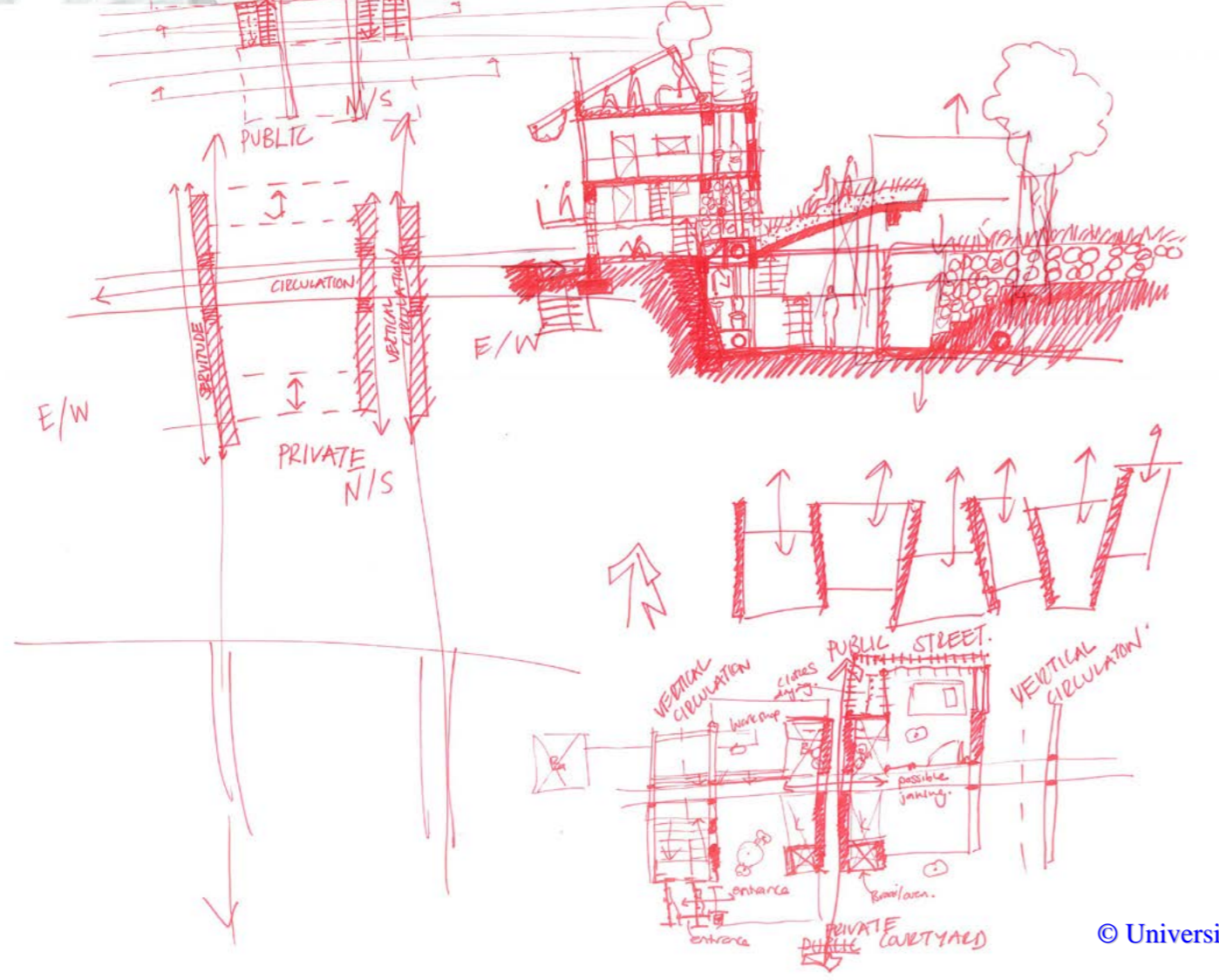
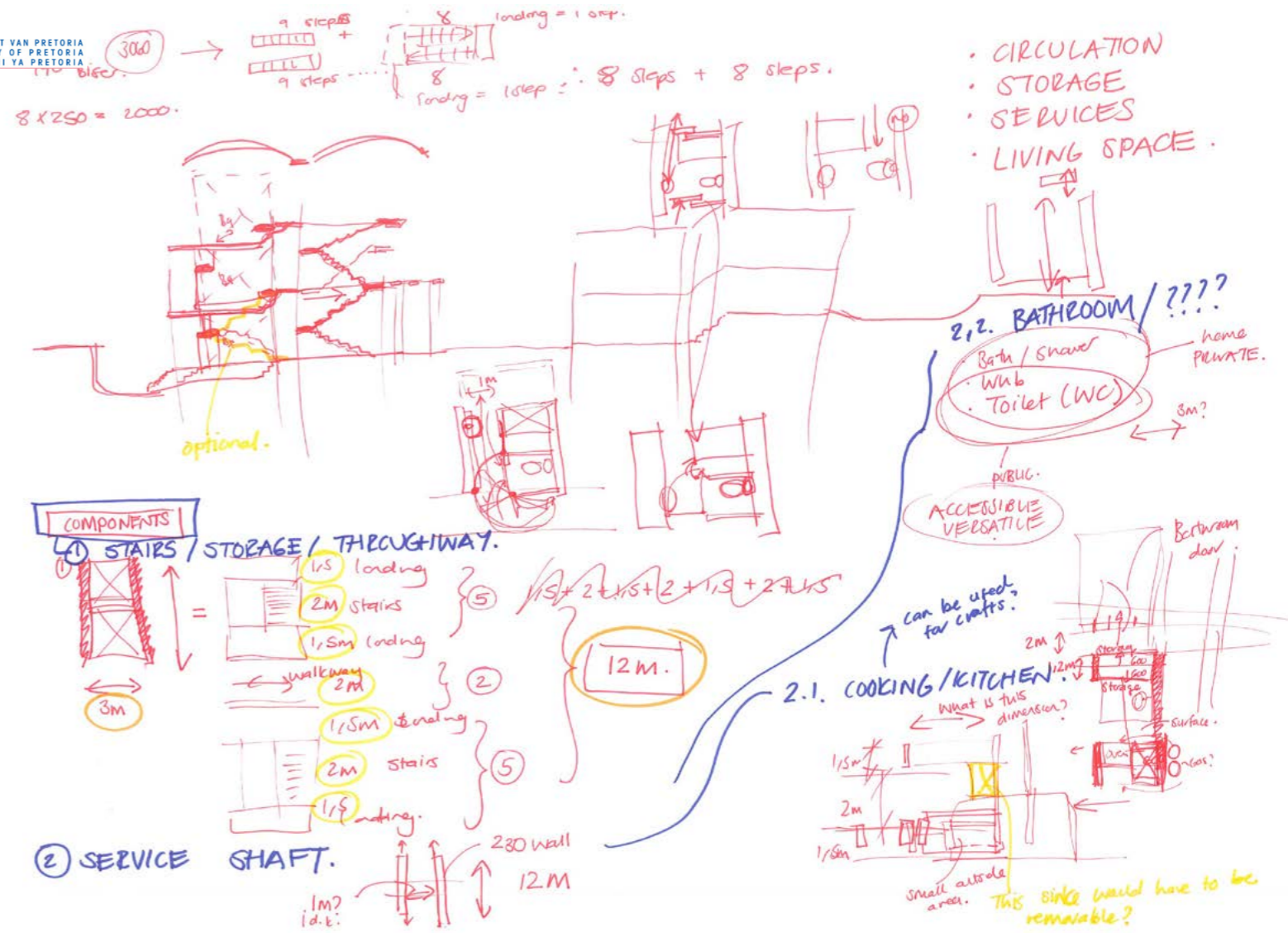
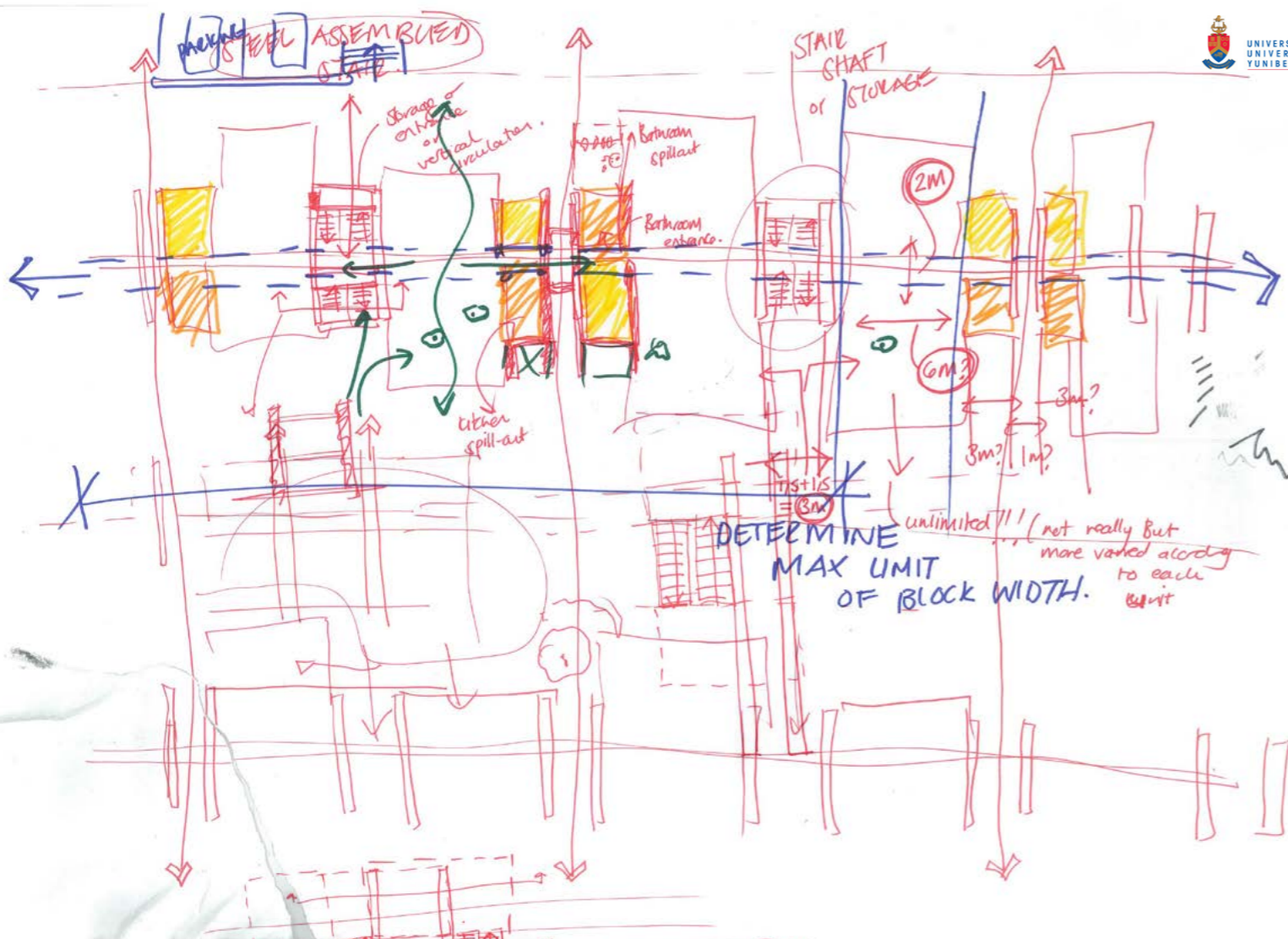


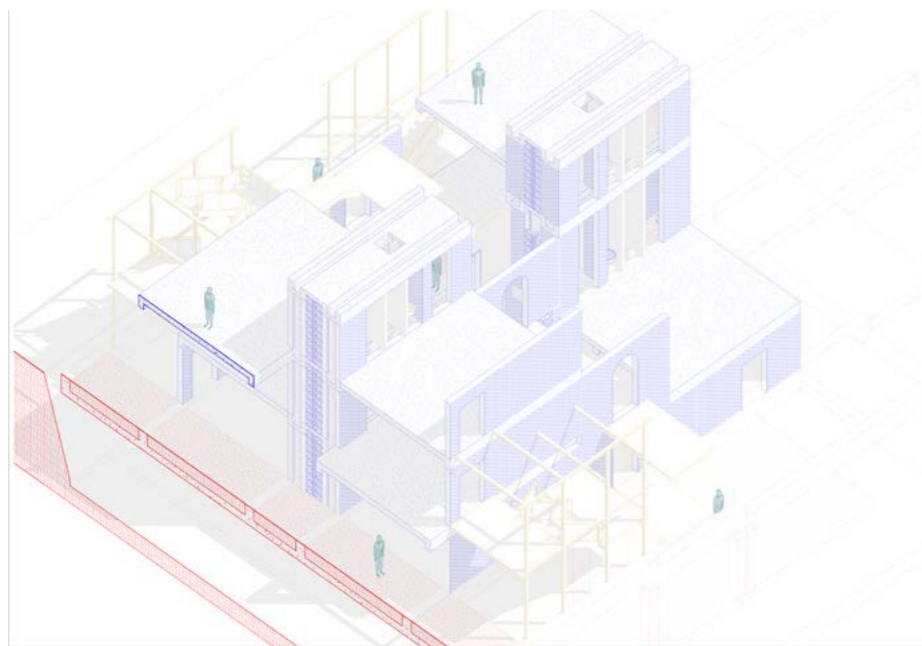
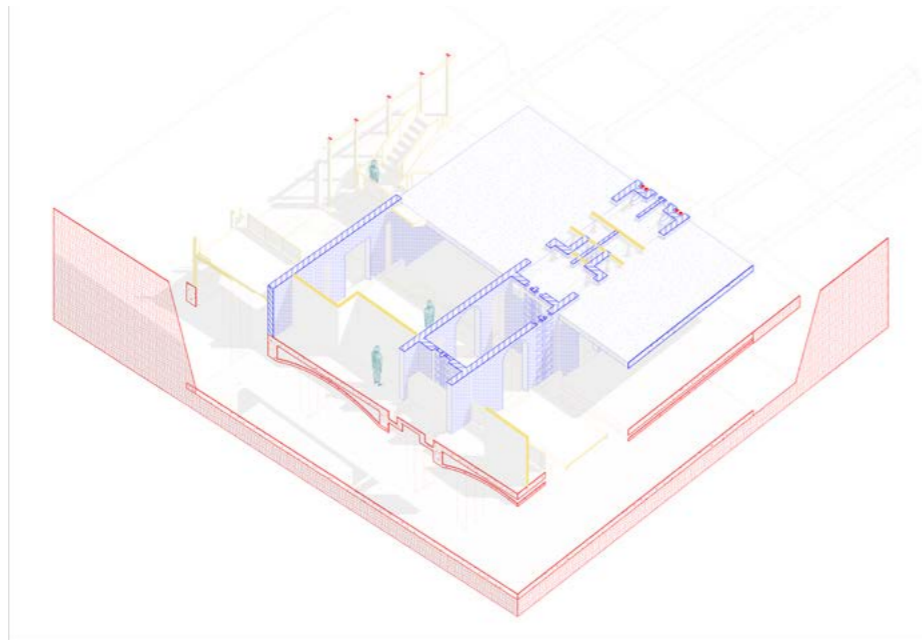
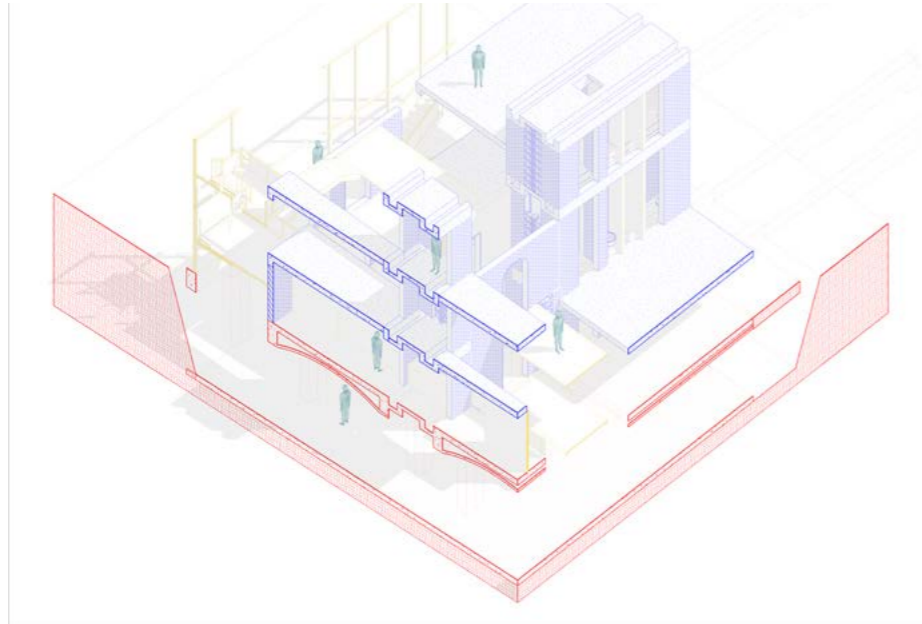


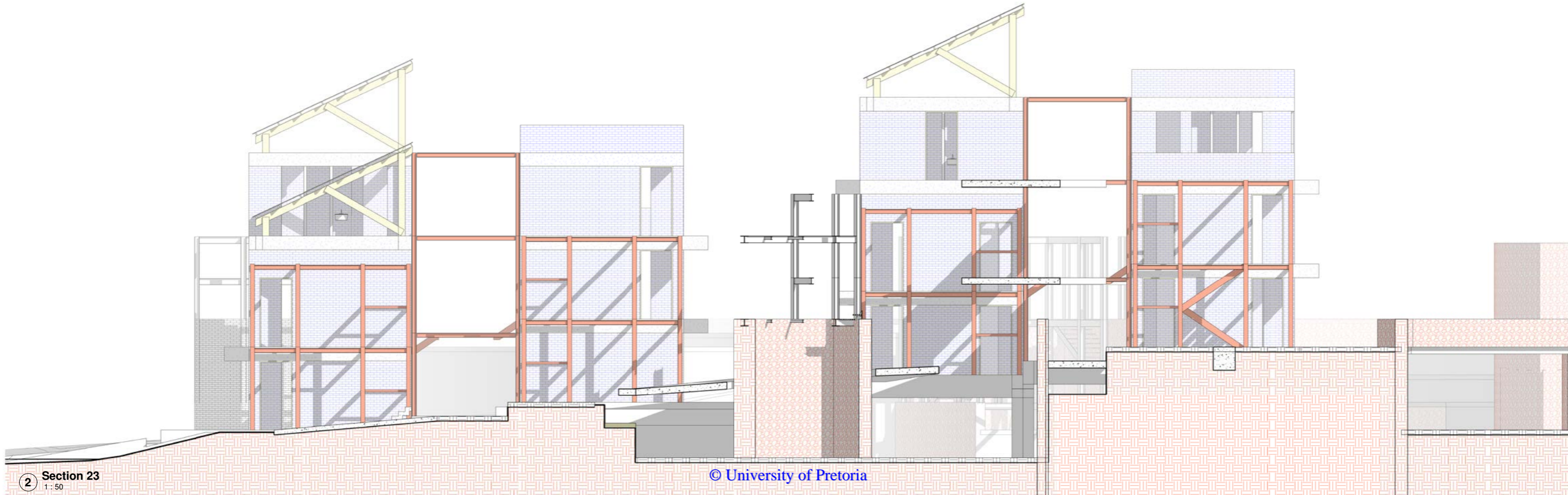
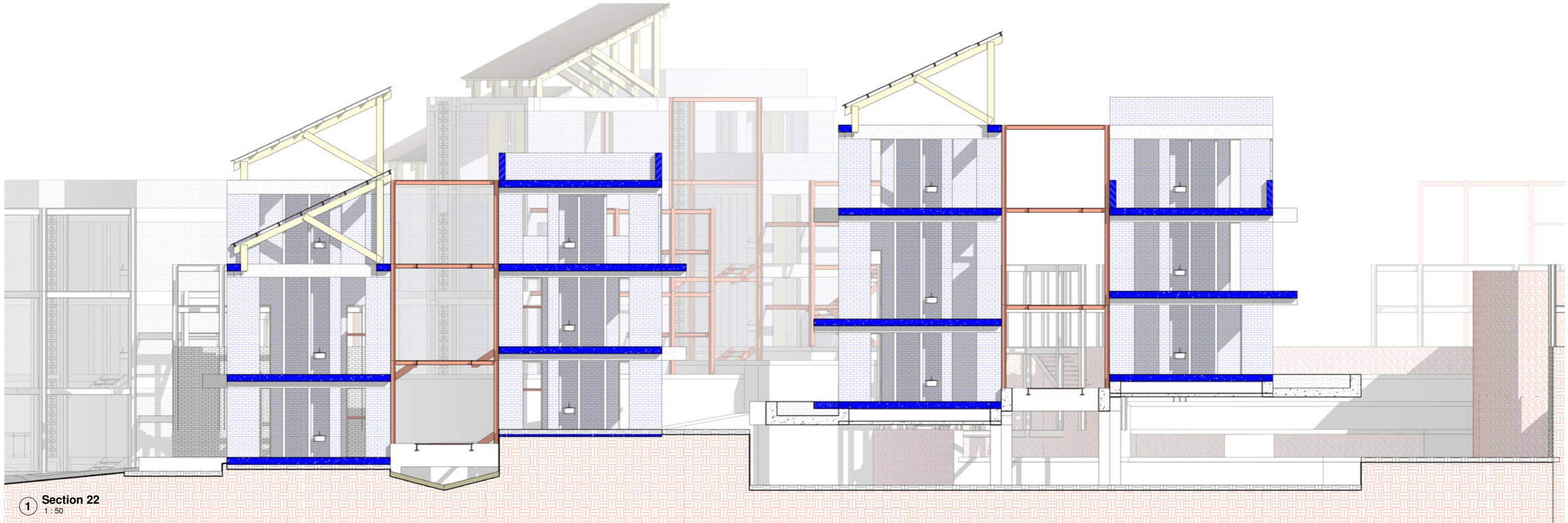


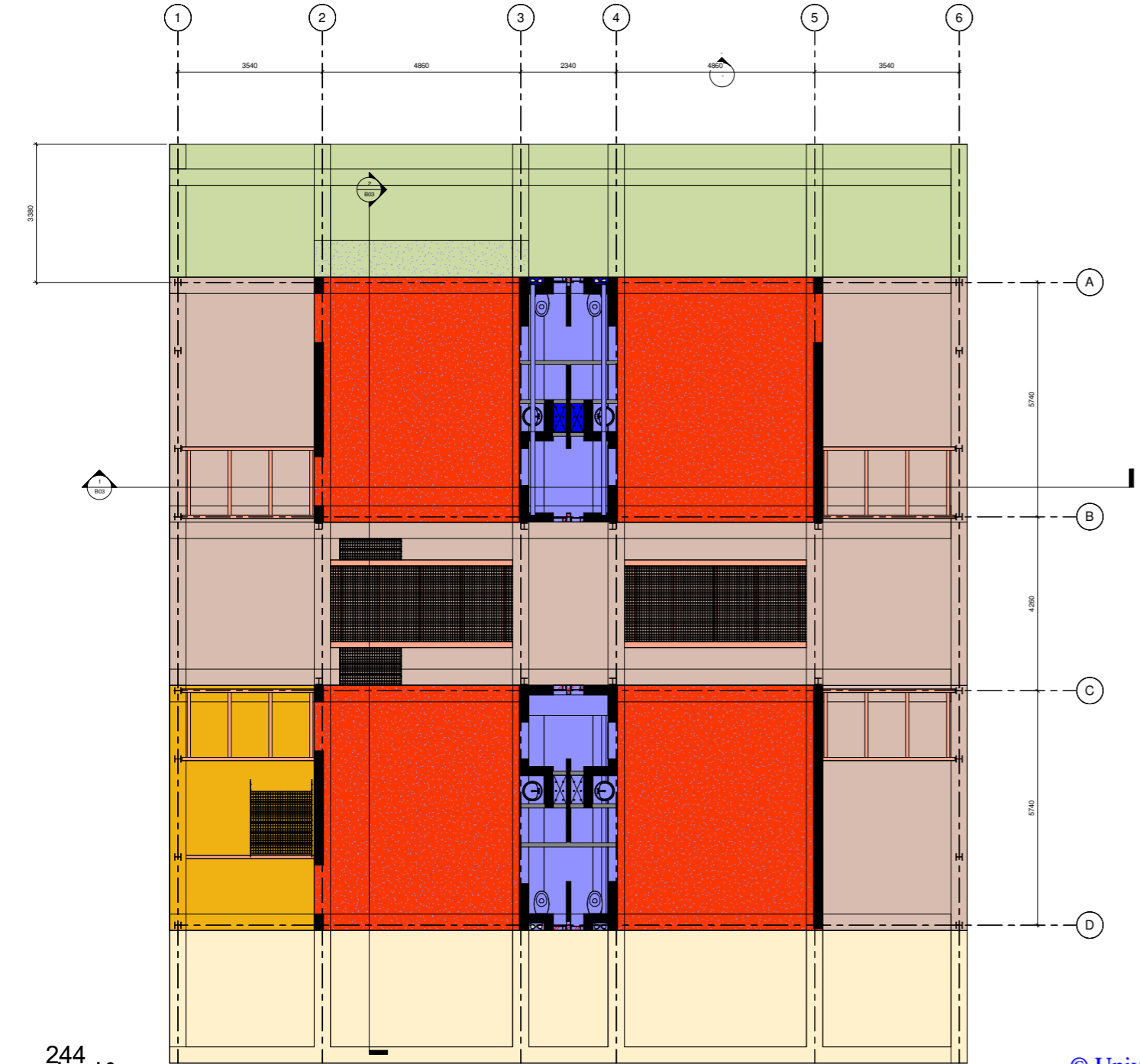
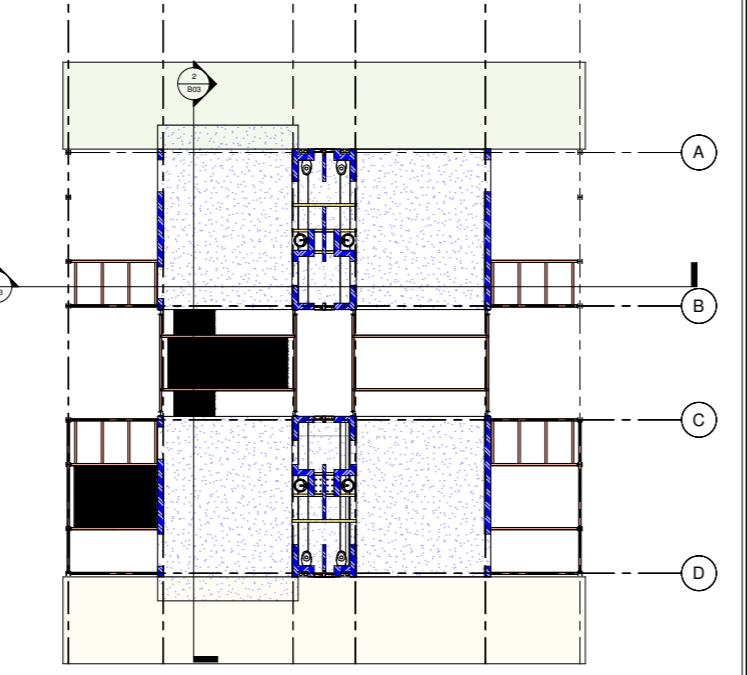
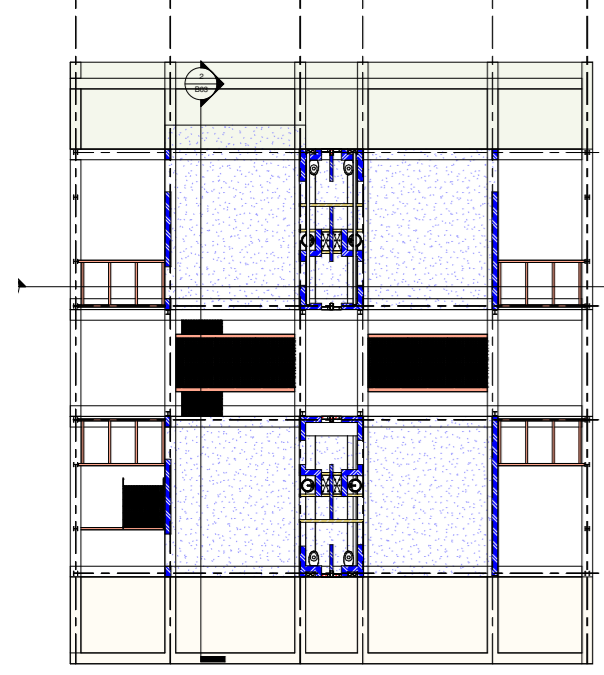




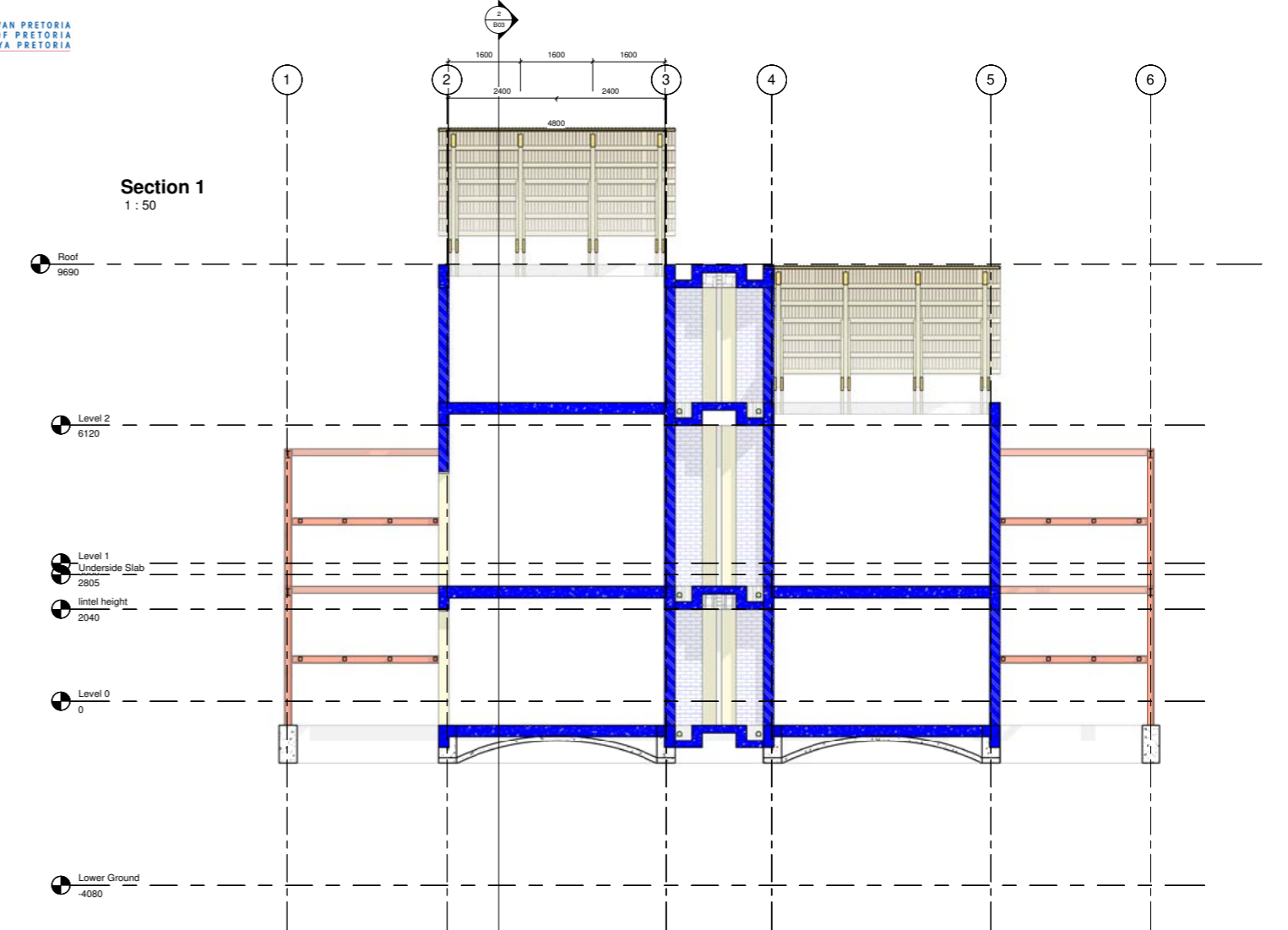




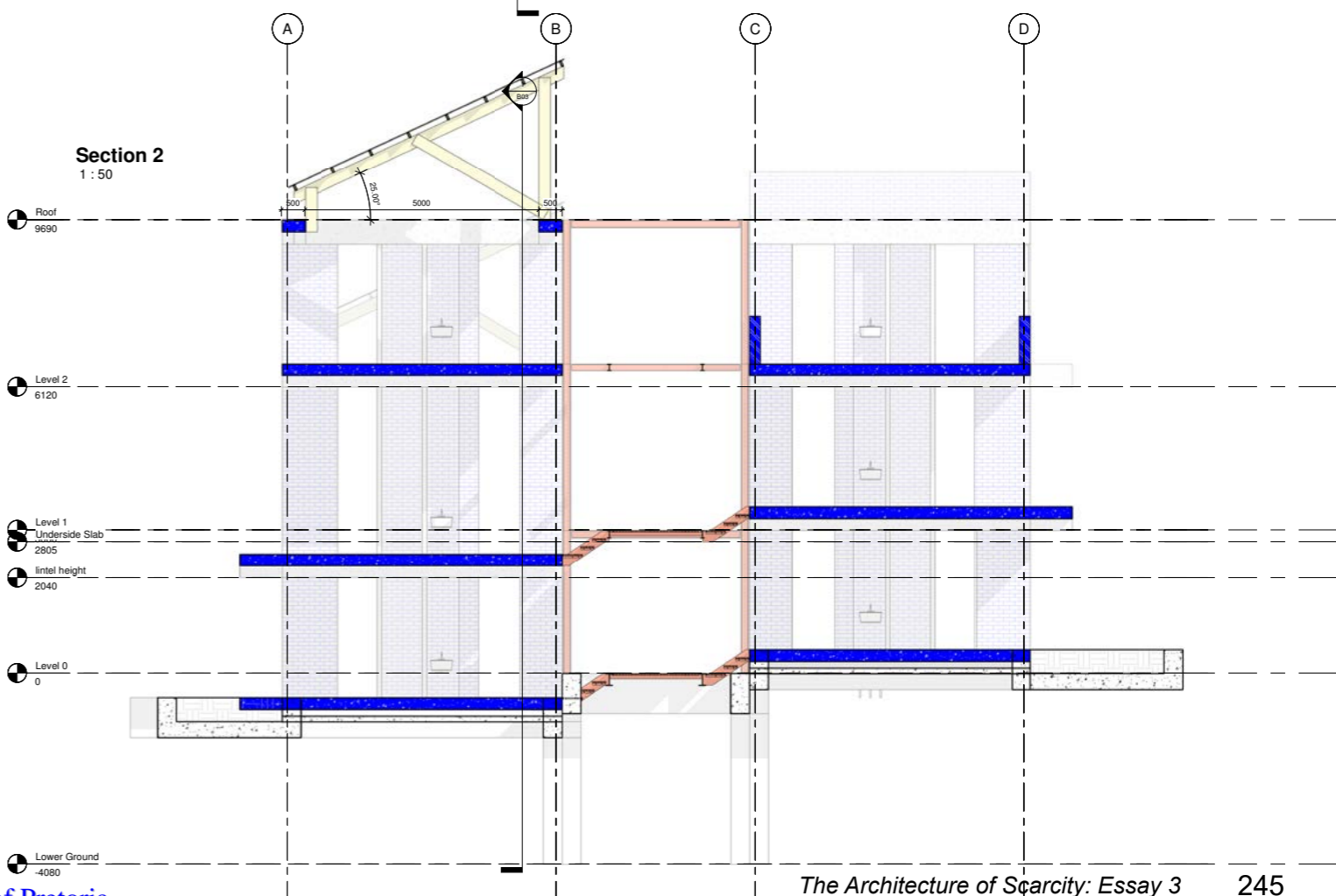




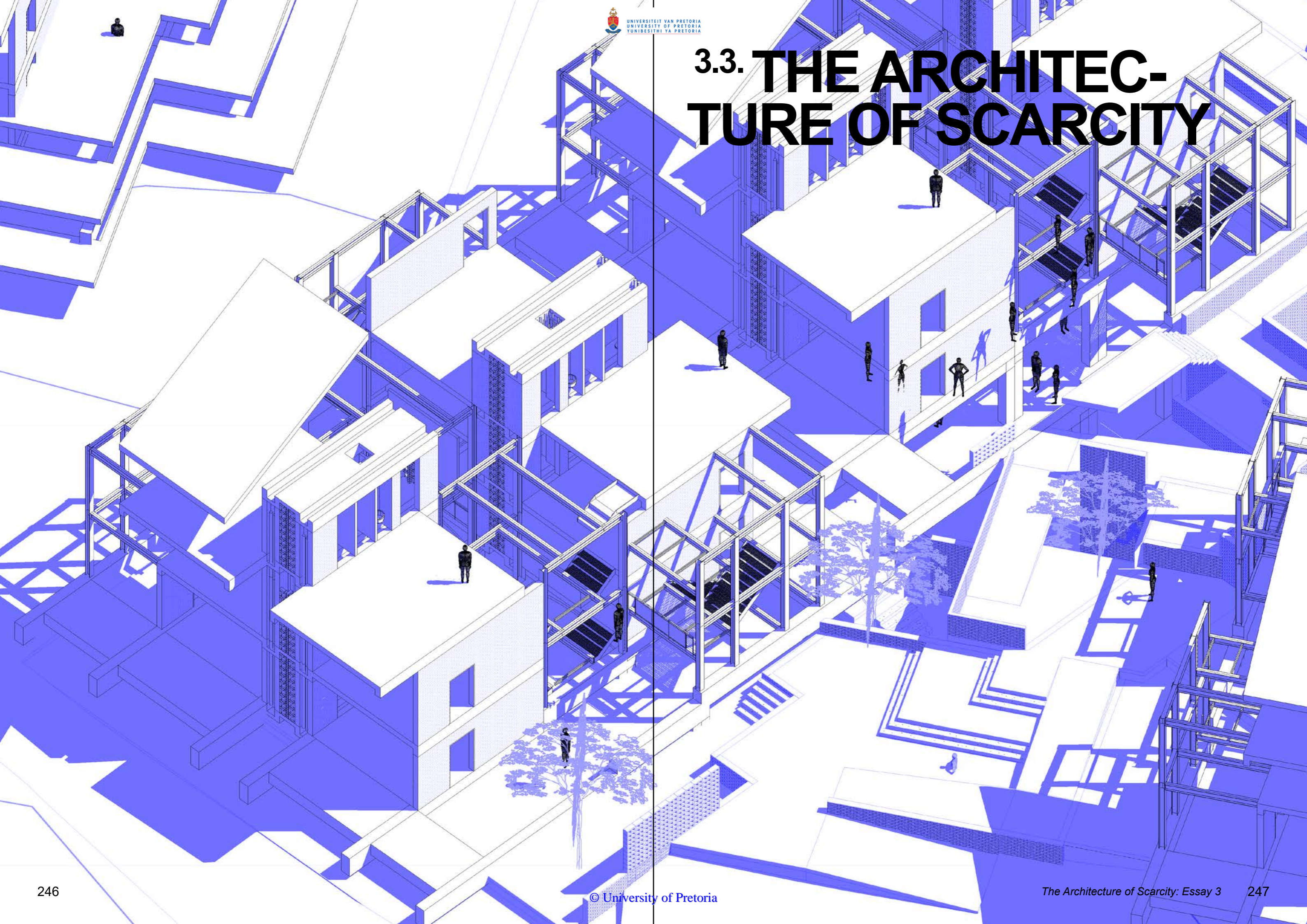
Section 1
1:50

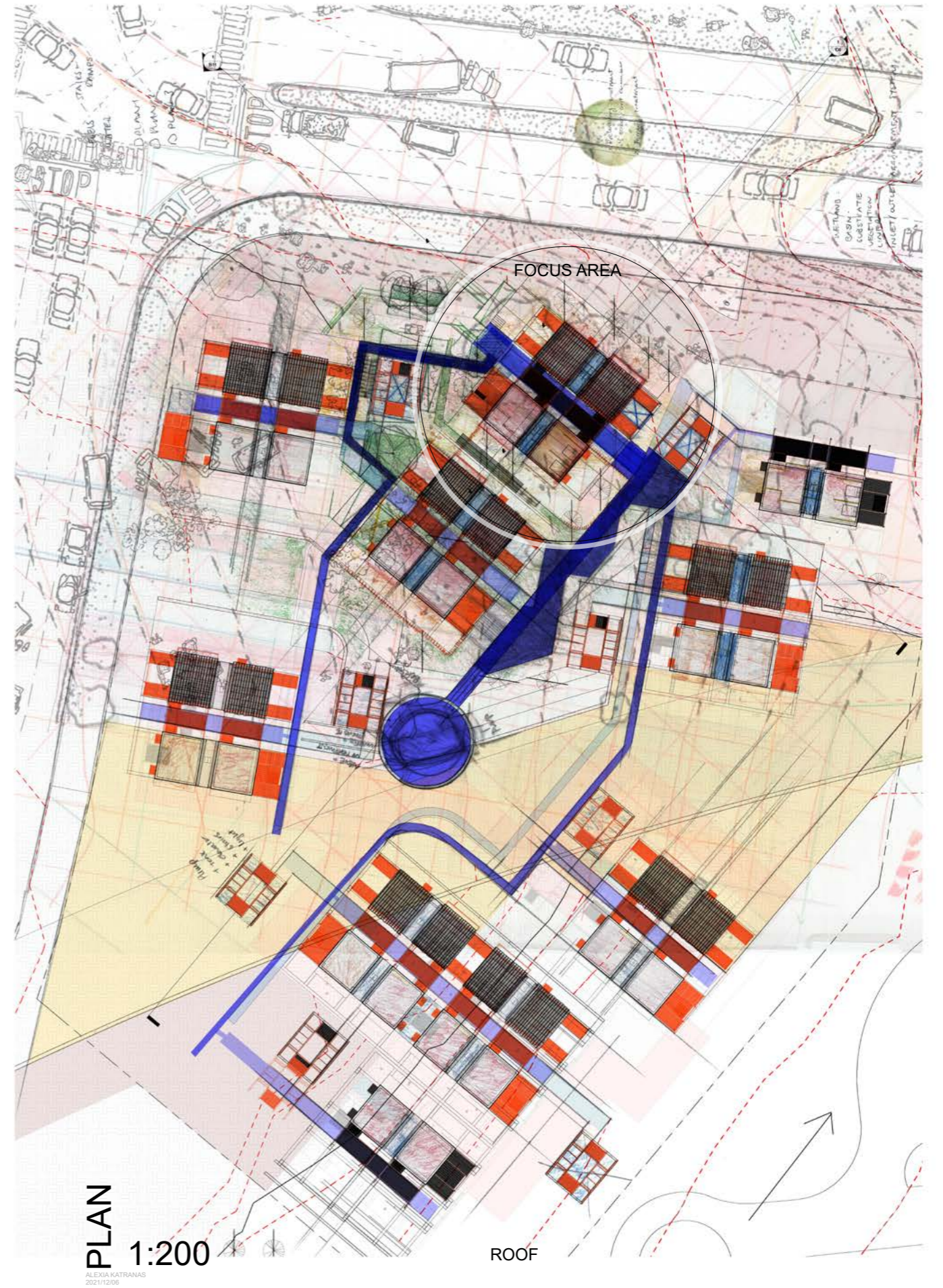
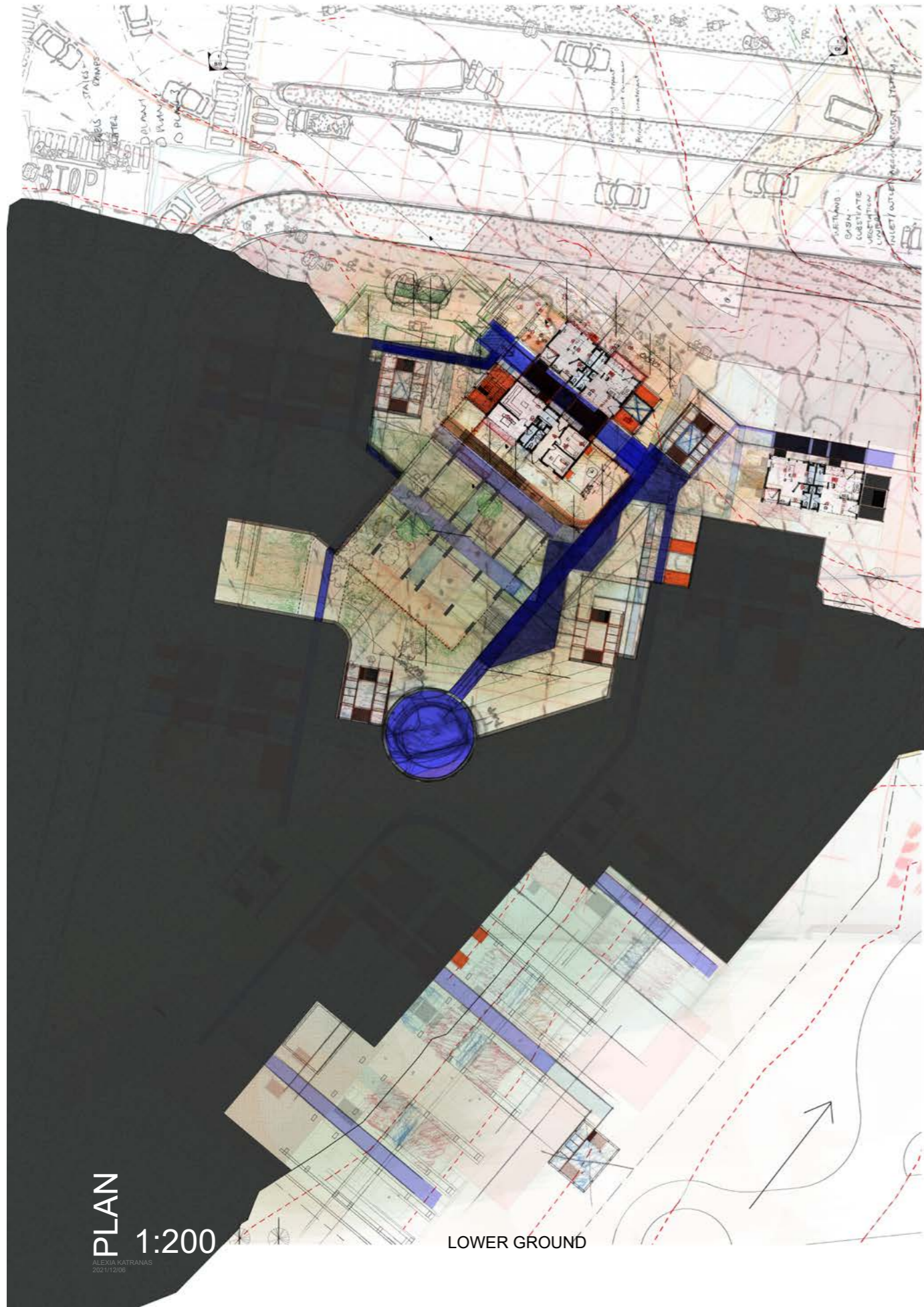


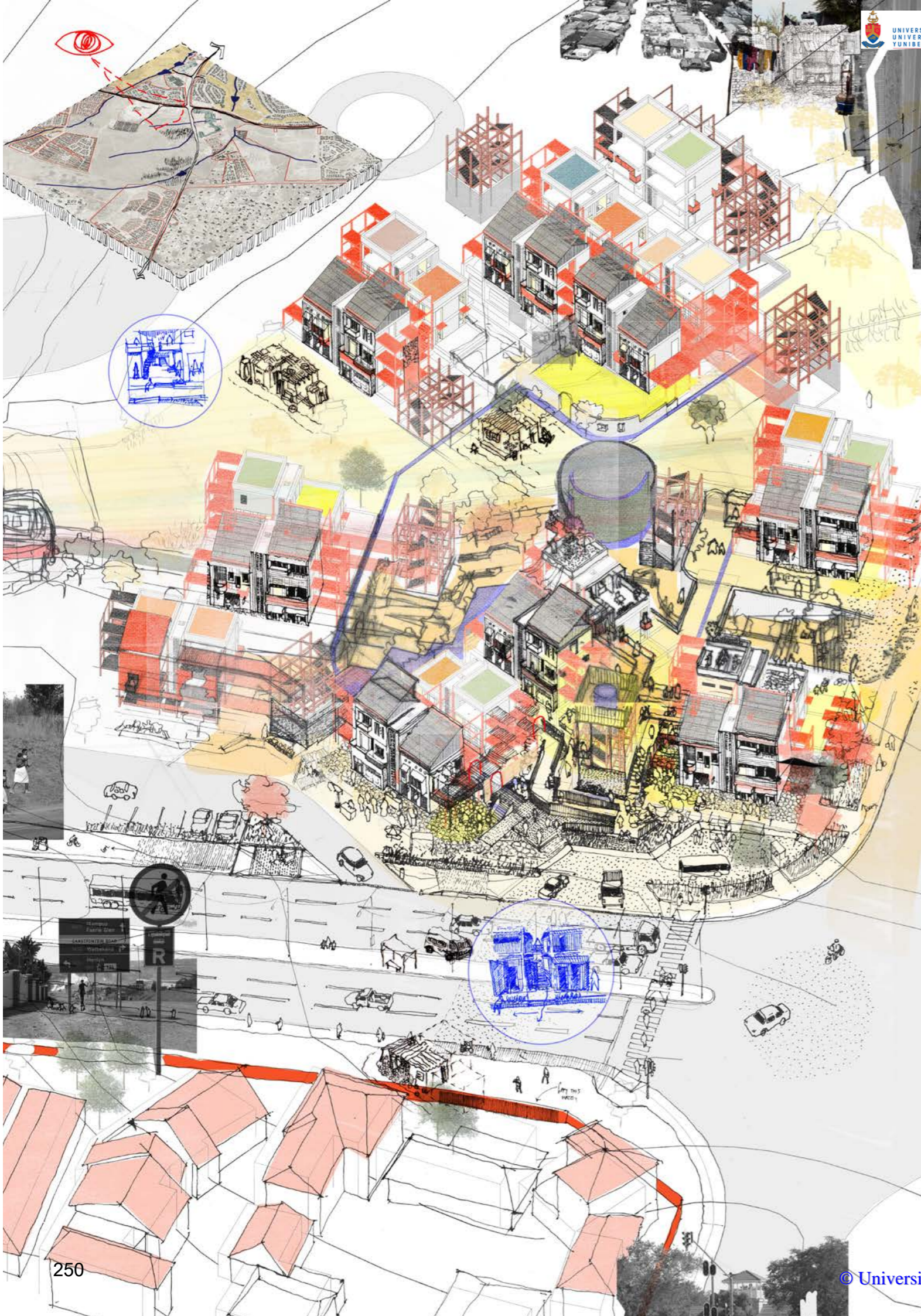
Section 2
1:50



3.3. THE ARCHITECTURE OF SCARCITY





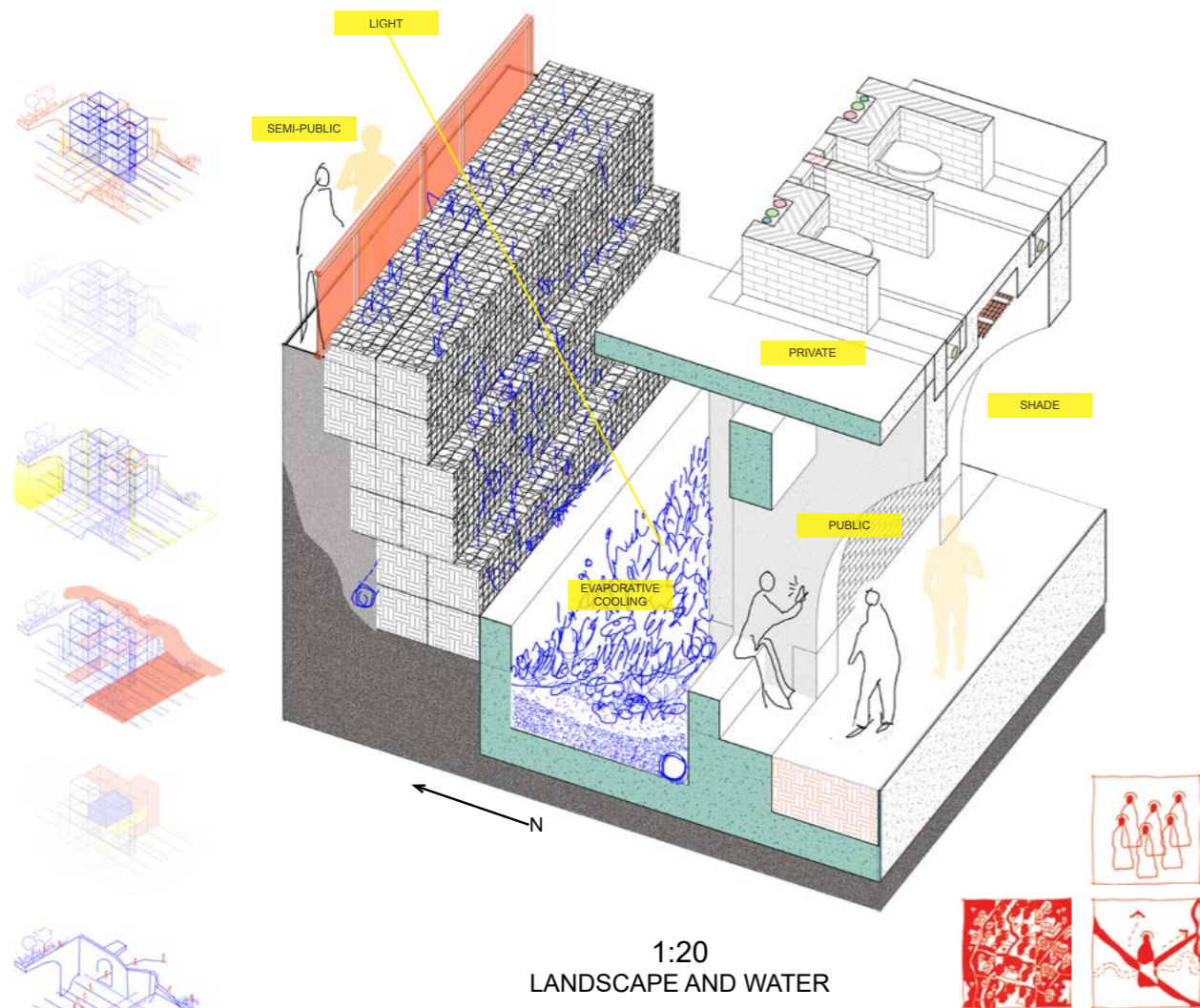


3.3.1. The landscape

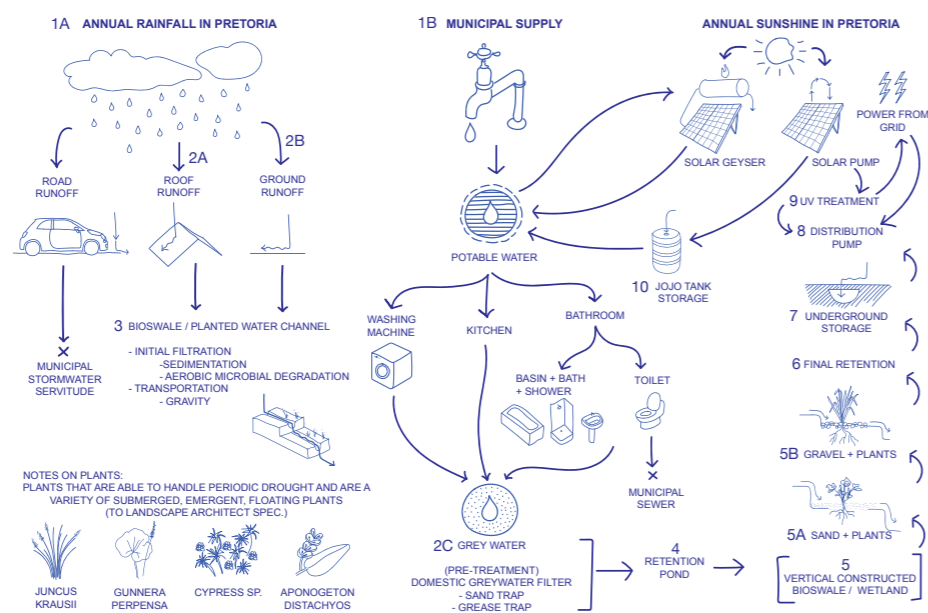
The landscape ruin provides the first architectural opportunity with which to leverage the potential of site, through an act of creating spatial differentiation and articulating boundary. The argument here is to take conventional methods of compartmentalising space, but subverting it so that instead of merely supporting the formation of an “inside-outside” spatial dichotomy (which is typically exclusionary and inside-centric) – the architecture seeks to secure public space through this act of partitioning by setting up the conditions upon which varying levels of threshold, boundary, and enclosure may be achieved. Much like the gesture of Bo Bardi’s MASP, the spatial securing of public space beneath the suspended museum helps to mitigate the otherwise transactional phenomena whereby previously open, accessible space becomes privatised.

On a material level, the use of thick durable elements which articulate the sculpting of earth, and furthermore are time-embracing and participate in natural cycles of decay and evolution, best support and differentiate this landscape from the more temporary elements it hosts. As a structural system, it is important that any structures built over the landscape phase can be demolished or dismantled without compromising the structural integrity of the landscape that supports it. Exposed masonry, terraced gabion walls and concrete structures that make use of the existing rubble available on site following earthworks, as well as the appropriate planting palette – assists both in serving the spatial experiential needs of the landscape and infrastructure it hosts, as well as the organisational and systematic requirements.

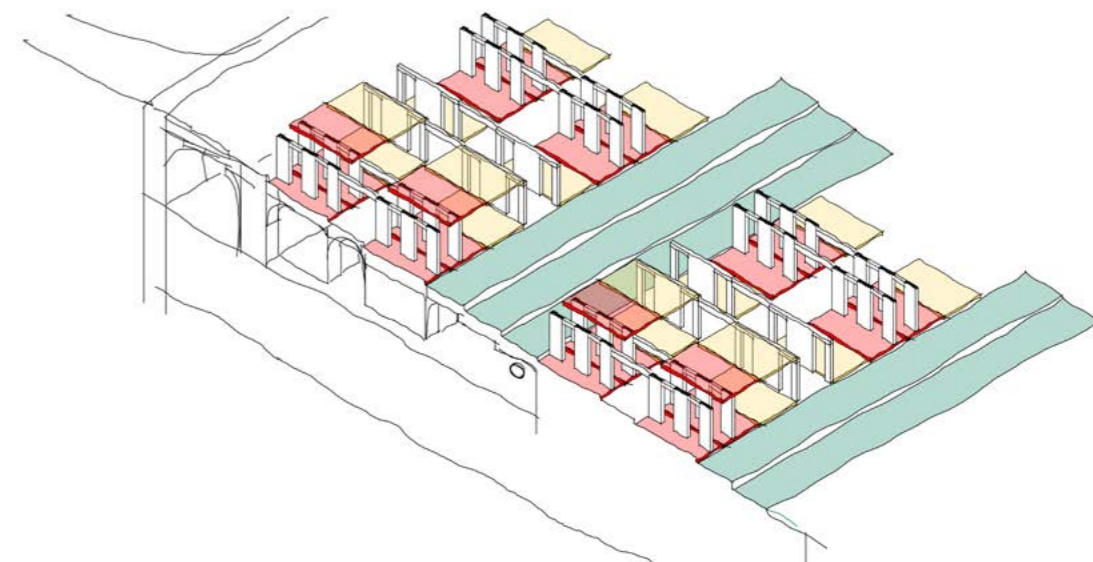
The major wall threshold systems that frames and provide



1:20
LANDSCAPE AND WATER

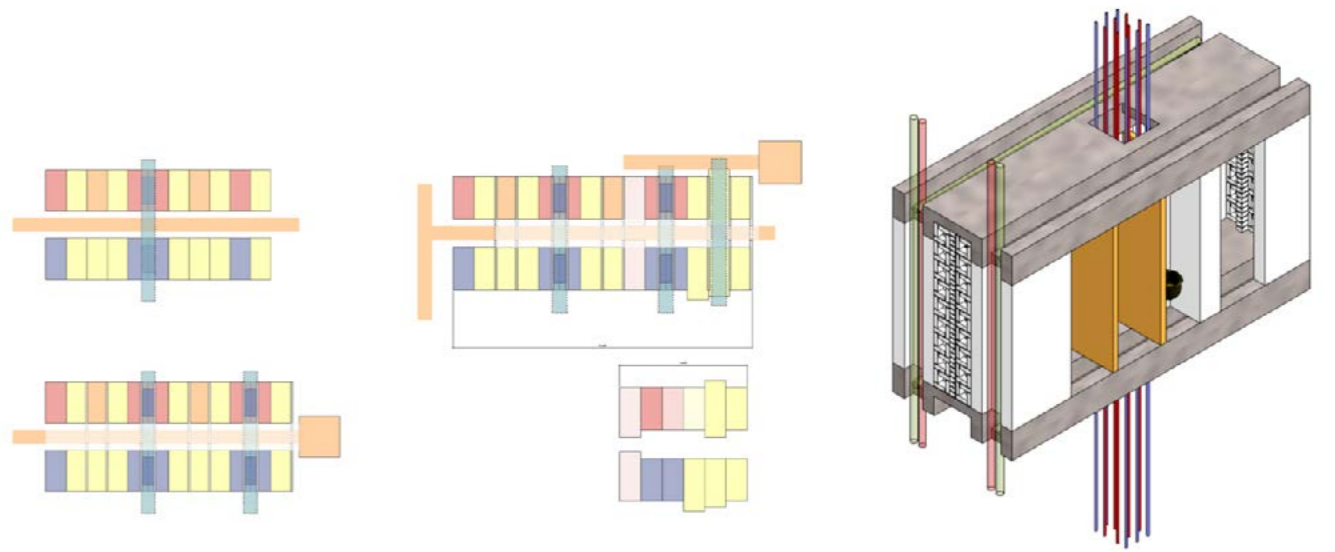
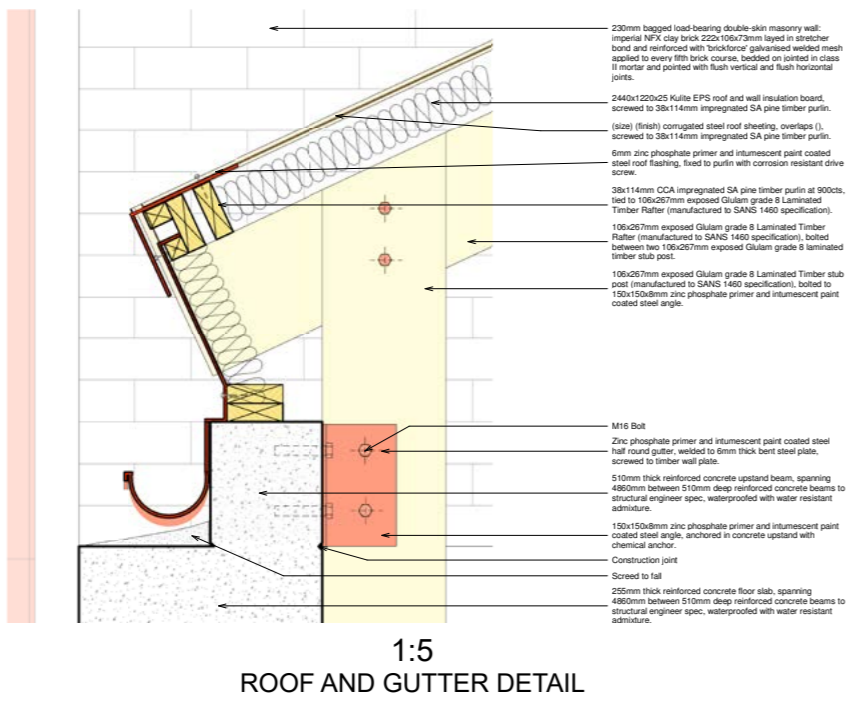
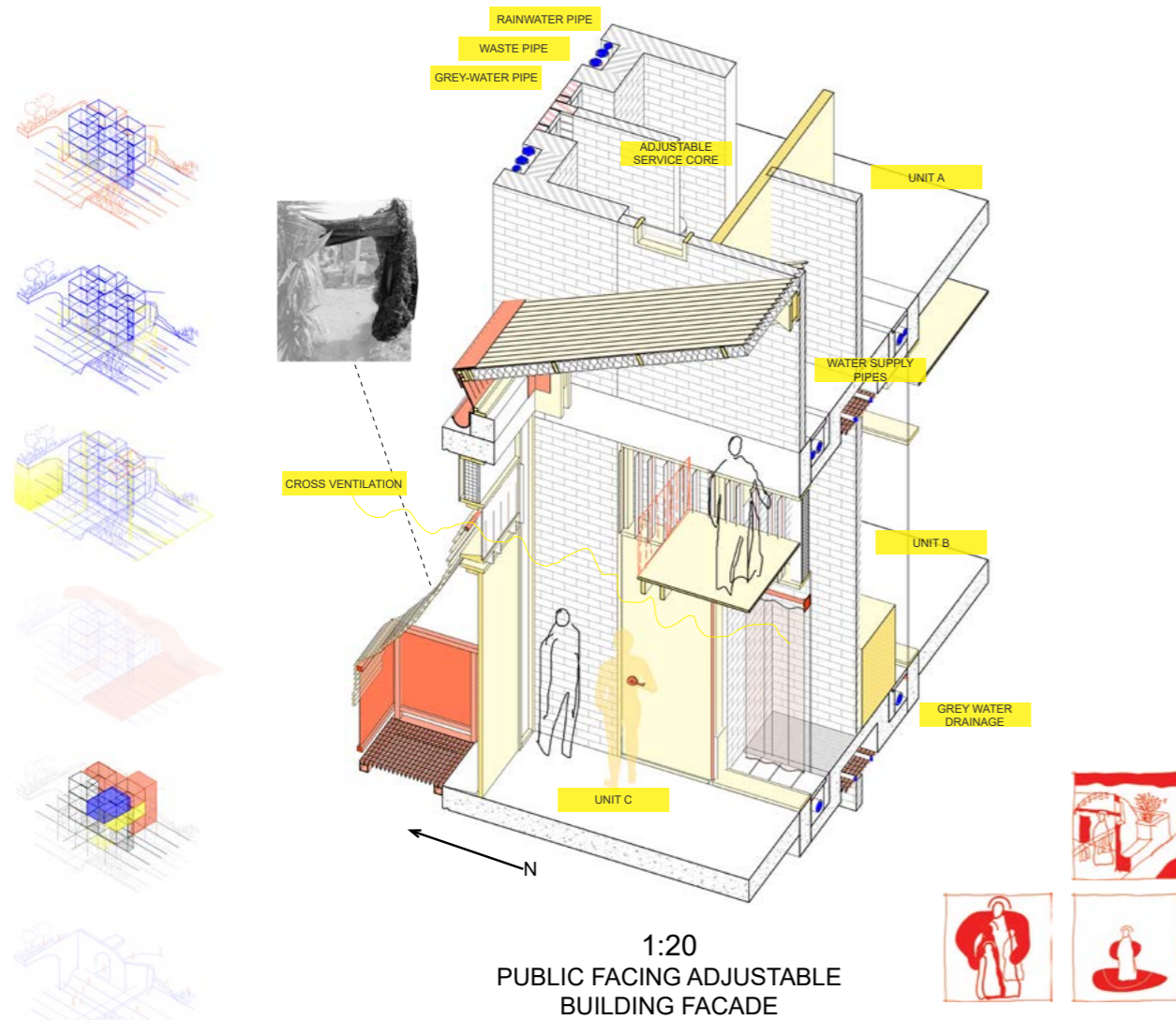


WATER SYSTEM DIAGRAM
(Katranas & Pulles 2021)



access to portions of the landscape, makes use of bioswales and an integrated drainage pipe reticulation system in order to collect and transport rainwater surface run-off and deposited grey water to a central collection point. The landscape space which exists above the Gautrain is leveraged to house the various chambers needed to greywater into potable water, and furthermore allows the final stored water to be accessed and collected at a public outlets. This infrastructural intervention supports the position taken that values a relational connection with the environment over the presently transactional one. For the purpose of fostering a resilient urban condition that is designed in harmony with scarcity instead of fearing it, it was important to prioritise allowing architecture to harness the same otherwise damaged existing landscape systems and flows of the site, as it sits within a catchment area, in close proximity to a wetland, and over a damaged

non-perennial stream. Instead of allowing the new development to further damage or enclose these crucial water systems, this interventions aims to secure access to it, albeit artificially, and make the outputs accessible to those typically living furthest on the outside in terms of service delivery. Given the deperate need for water in the surrounding informal settlements at present, this gesture, in addition to the myriad of environmental gains precipitated such as absorbing surface runoff and improving thermal comfort through evaporative cooling – also aims to foster the kind of socio-environmental stewardship required by infrastructure to better respond to the physical dimension of scarcity.



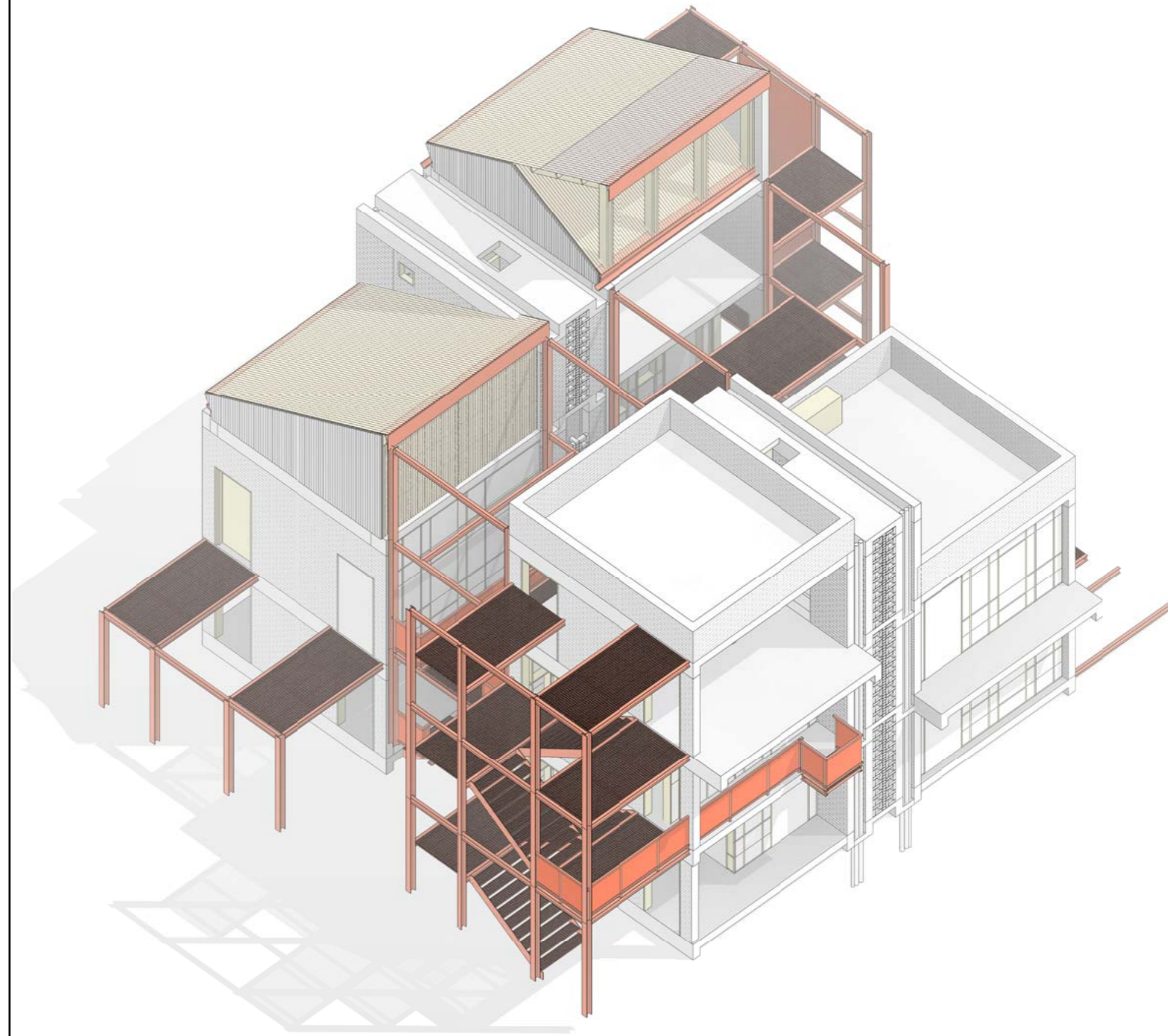
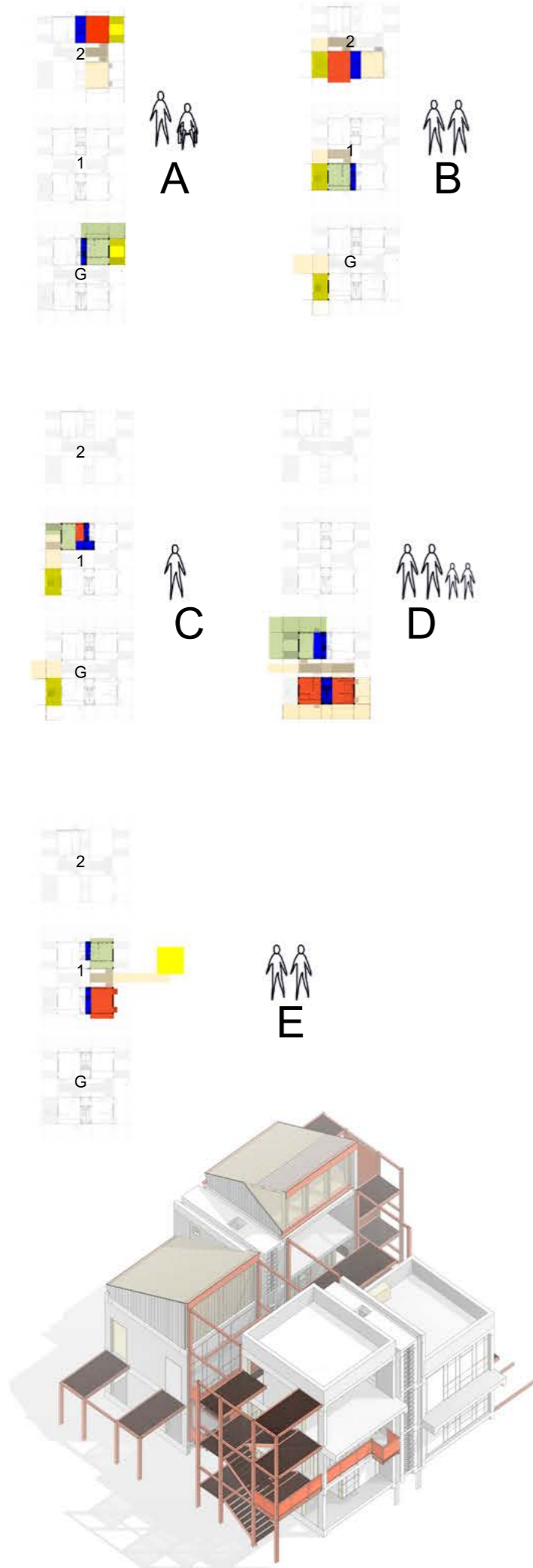
3.3.2. The dwelling

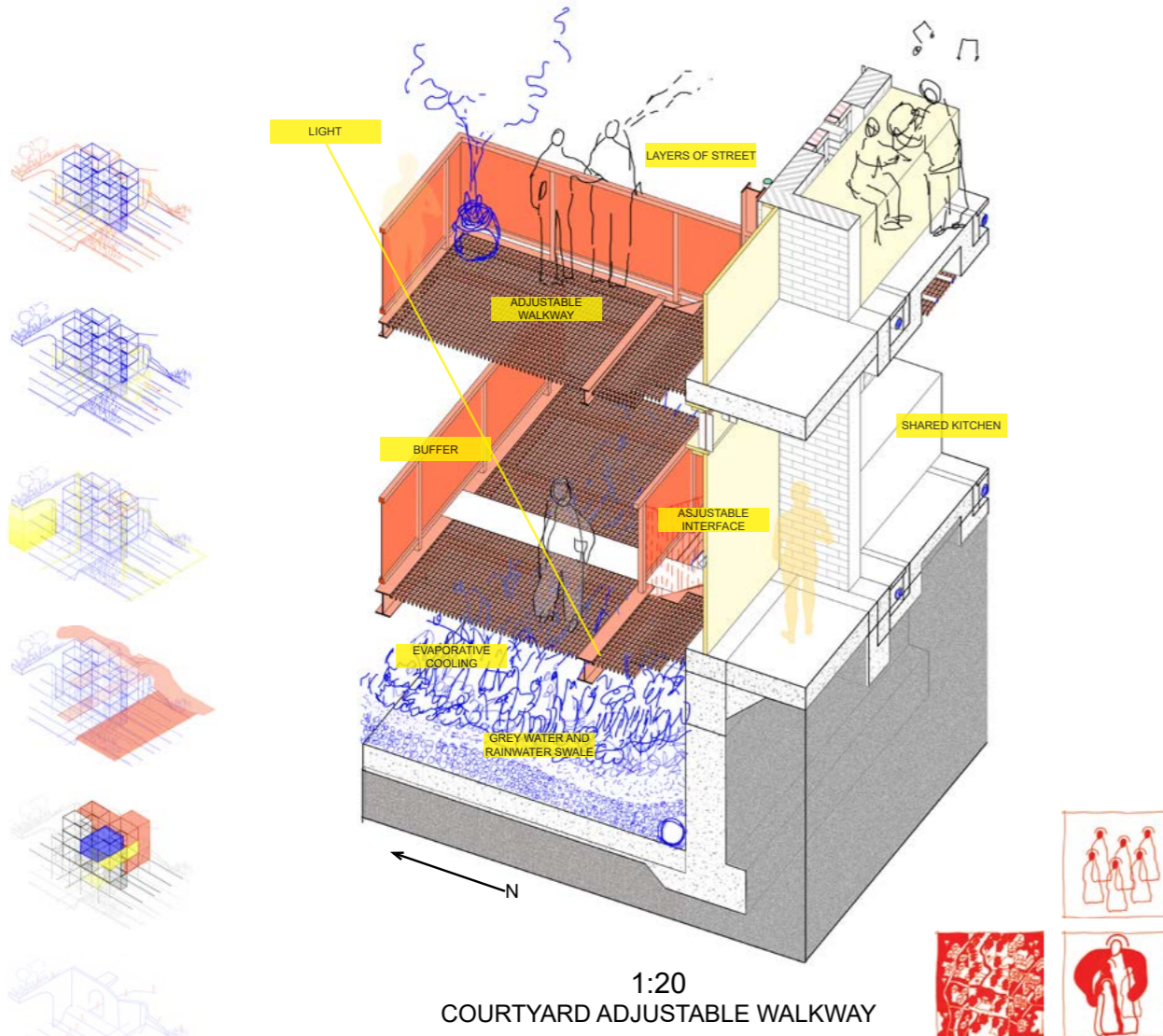
3.3.2.1. The masonry service core

The housing/dwelling layer speaks directly to the occupational requirements of both permanent dwellings and short-term accommodation, and necessitates the insertion of a double and triple storey, terraced, row-house typology buildings within the landscape. These buildings are intentionally designed to allow an open versatile north and south façade, by making use of a series of parallel load bearing brick walls in the east and west façade directions. These northern and southern interfaces are articulated according to the user's needs, and open either onto a more public street (favouring a business shopfront interface) or into a semi-public shared courtyard (favouring a private leisure space). In this way, the streets and courtyard spaces become extensions into which the domicile and ev-

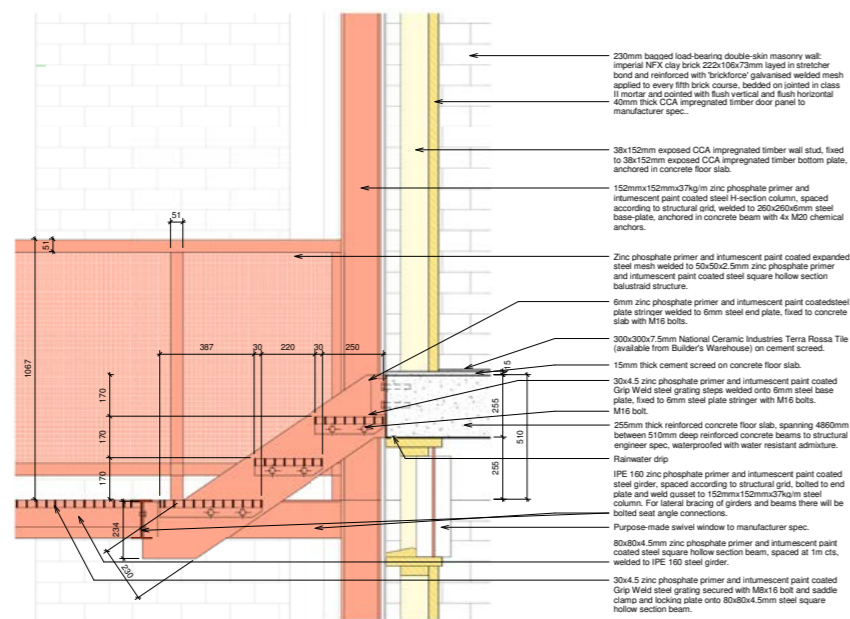
eryday rituals it houses, may spill out. The typical footprint of each collective building block is informed by existing stand sizes in the gated community situated across the road, and achieves a much needed, higher density despite the building footprint area and building height not being too much larger than the surrounding existing low-density homes. This can be attributed to the approach taken in the organisation of services, which are housed and reticulated neatly through a thickened service wall core, that each smallest possible unit module plugs into. Many of the outlets such as basins and toilets are contained within this wall so that they may be more easily concealed when not needed in a particular dwelling configuration. For the purpose of improving thermal comfort, daylighting, and ventilation, the building mass is opened by a 4m wide circulation corridor and courtyard through the middle.

DETAIL
2
ALEXIA KATRANAS
2021/12/06





1:20
COURTYARD ADJUSTABLE WALKWAY



1:10
STEEL STAIR DETAIL

DETAIL
3

ALEXIA PATRANAS
2021/12/06

3.3.2.2. External Circulation

Both the floor area within the dwellings, the intermediate service interfaces (E-W), and most pertinently, the North-South street and courtyard interfaces – are thus hyper optimized in terms of function and habitable area. The incredible potential of healthy, activated streets have been realised in the social housing projects of Peter Barber in London, public buildings by architect-activist Lina Bo Bardi, as well as within Plastic View informal settlement. Barber argues that by simply placing front doors directly onto the street, and allowing most circulation to happen outside and within the public sphere, the potential of street to build community and identity is accessed; where architecture becomes a background to peoples' worlds (Barber 2021). This is an attractive proposition for any housing project within South Africa's temperate climate, and on a more hermeneutic level, is often visible within the enclosure of gated communities. This highlights that within our socio-political climate, despite a longing for direct connection to the street, there still exists a need for an extension and layering of thresholds to simultaneously ensure a feeling of safety. Achieved through side-entrances opening into narrow minor roads perpendicular to the street and between dwellings in Plastic View, and in this proposed intervention, through a similar approach

that also leverages the potential of ground plane manipulation for spatial differentiation – this project relies on a layered approach to circulation and threshold, which, at its most secure, should satisfy the level of security sought after in security complexes and gated communities, and at its most porous, should allow boundaries to dissolve and reconfigure. For this reason, vertical circulation and suspended corridors are constructed from steel and expanded steel grid surfaces, allowing a significantly higher level of adjustability than the masonry dwelling spaces. These circulation spaces, existing on the west and east facades, allow for single homes to occupy more than one storey, and can be utilized as an extra room, or external courtyard. In addition to these multi-purposed private circulation spaces, an extra more public vertical circulation core is housed for each block within the surrounding landscape infrastructure, also yielding shade and providing public Wi-Fi-hotspots and phone charging stations, powered by solar panels above. These plug into existing landscape 'minarets' that also provide light and electrical service reticulation.

3.3.2.3. The harnessed boundary

The final and most temporary layer of building comprises the use of interior and exterior partitioning. By affording the end-user the opportunity to shape the interface according

to the amount of space needed, programmatic needs, and security needs – the true value of the steel circulation, masonry service core, and landscape, is leveraged. It is through this layer that boundaries are augmented or dissolved, and that the architectural opportunity of scarcity is most tangible. This is because, despite a reliance on the many layers of architecture that host it, it is the architecture most immediately accessible and malleable by its users that will reflect our evolving relationship to scarcity and time – be it positive or negative. For the purpose of this investigation, a few standard interface articulations were developed according to a hypothetical scenario of conditions and user personas with block A as the backdrop.

3.3.3. The Water System

3.3.3.1. Water Calculations

1. Surface areas and runoff coefficients

Table 3.1.1: Ground surface areas and runoff coefficients (SANRAL 2013, Architective 2015).

Catchment	Runoff coefficient, C	Catchment area, A (m ²)	Adjusted area, A x C (m ²)
Concrete block paving	0,90	3477,00	3129,30
Softscaping	0,35	2753,00	963,55
Constructed wetland	1,00	300,00	300,00
Ground adj. area, A _G (m ²): $A_G = \sum(A \times C)$			4392,85

Table 3.1.2: Roof surface areas and runoff coefficients (SANRAL 2013, Architective 2015).

Catchment	Runoff coefficient, C	Catchment area, A (m ²)	Adjusted area, A x C (m ²)
Steel roof sheeting (sloped)	0,95	978,00	929,10
Flat concrete roofs	0,90	1378,00	1240,20
Roofs adjusted area, A _R (m ²): $A_R = \sum(A \times C)$			2169,30

Total adj. area, A_T = A_G + A_R: 6562,15 m²

2. Supply from rainwater

Table 3.2.1: Monthly rainwater supply from surfaces according to Pretoria average rainfall (Climate-Data 2021).

Month	Average rainfall, P (mm)	Rain yield, R (m ³) R=A _T xP
January	107	702,15
February	99	649,65
March	88	577,47
April	40	262,49
May	17	111,56
June	7	45,94
July	3	19,69
August	7	45,94
September	18	118,12
October	65	426,54
November	92	603,72
December	118	774,33
ANNUAL	661	4337,58

3. Losses from evaporation

Table 3.3.1: Loss of water within swale areas due to evaporation potential in Gauteng Province (Schulze et al. 2001).

Month	Potential evaporation, e (mm)	Rainwater Swale area, a (m ²)	Evaporation, E (m ³) E= e x a
January	228	300	68,40
February	187	300	56,10
March	184	300	55,20
April	144	300	43,20
May	130	300	39,00
June	106	300	31,80
July	118	300	35,40
August	162	300	48,60
September	207	300	62,10
October	239	300	71,70
November	232	300	69,60
December	239	300	71,70
ANNUAL	2176		652,80

4. Demands (designed for the maximum)

Table 3.4.1: (full spread) Average annual daily demands (after City of Tshwane 2017).

Zoning and units for AADD	Domestic	Garden
Residential		
Cluster housing: 41 to 60 units/hectare – kl/day per unit	0,6	0,1
Gate house for security villages – kl/day per unit	0,6	-
Business		
General business with an FSR – kl/day per 100m ²	-	-
Car wash facility	-	-
General		
Park grounds – kl/day per hectare	-	-
Private open space – kl/day per hectare	-	-
Parking grounds – kl/day per hectare	-	-

Commercial	General	Total (AADD/unit)
-	-	0,7
-	-	0,6
0,8	-	0,8
10,0	-	10,0
-	15,0	15,0
-	15,0	15,0
-	3,0	3,0

Table 3.4.2: (full spread) Total demands: (Daily demand = AADD/unit x no. of units).

Zoning	Number	Domestic (kl/day)	Garden (kl/day)
Residential			
Cluster housing	114 units	68,40	11,40
Gate houses	6 units	3,60	-
Business			
General businesses	1272 sqm	-	-
Car wash facilities	1 unit	-	-
General			
Park grounds	0,28 hectares	-	-
Parking grounds	0,2 hectares	-	-
TOTAL		72,00	11,40

Commercial (kl/day)	General (kl/day)	Total daily demand (kl/day)
-	-	79,80
-	-	3,60
10,18	-	10,18
10,00	-	10,00
-	4,20	4,20
-	0,60	0,60
20,18	4,80	108,38

Table 3.4.3: (full spread) Monthly demands: (1m³ = 1kl).

Month	Domestic consumption (m ³)	Garden & irrigation (m ³)	Commercial usage (m ³)
January	2232,00	353,40	625,46
February	2016,00	319,20	564,93
March	2232,00	353,40	625,46
April	2160,00	342,00	605,28
May	2232,00	353,40	625,46
June	2160,00	342,00	605,28
July	2232,00	353,40	625,46
August	2232,00	353,40	625,46
September	2160,00	342,00	605,28
October	2232,00	353,40	625,46
November	2160,00	342,00	605,28
December	2232,00	353,40	625,46
ANNUAL	26280,00	4161,00	7364,24

General usage (m ³)	Total demand, Q (m ³)
148,80	3359,66
134,40	3034,53
148,80	3359,66
144,00	3251,28
148,80	3359,66
148,80	3359,66
144,00	3251,28
148,80	3359,66
148,80	3359,66
144,00	3251,28
148,80	3359,66
144,00	3251,28
148,80	3359,66
1752,00	39557,24

Greywater harvested as a percentage of the domestic and business water use

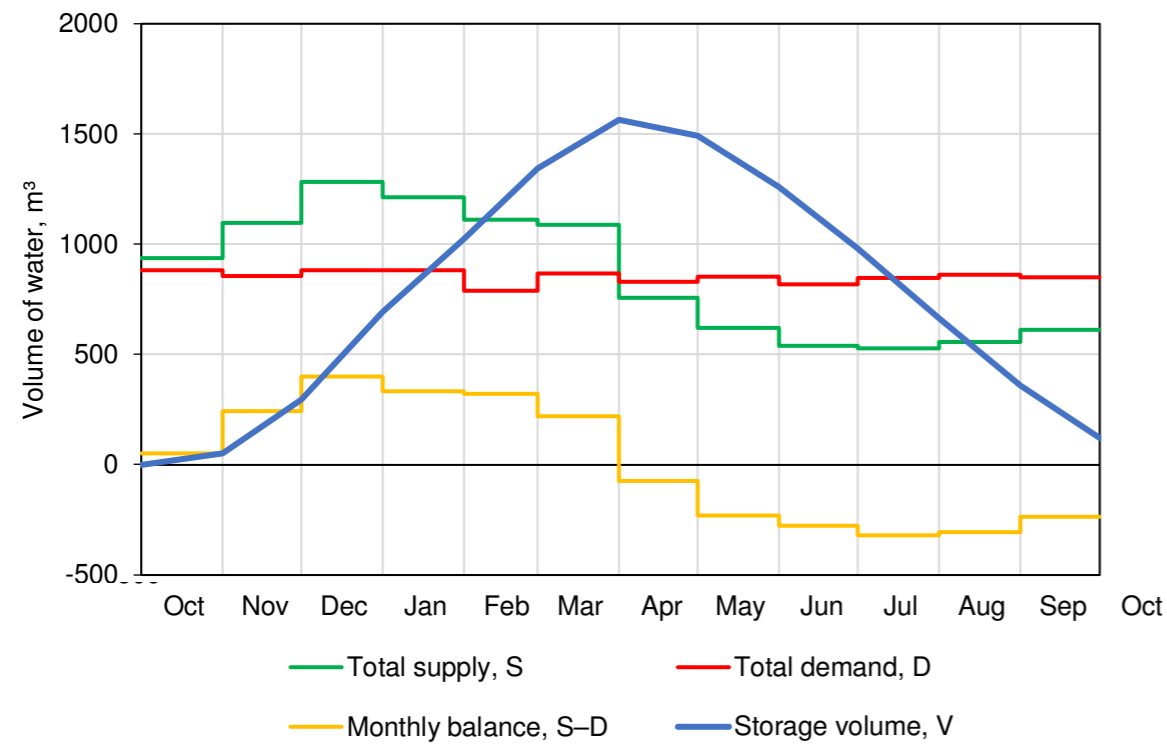
Domestic greywater percentage = 20%

5. Storage level - Assuming an empty facility on 1 October (start of the South African hydrological year)

Table 3.5.1: Projected monthly storage level as a function of supply, demands, and losses.

Month	Garden demand, I (m ³)	General use demand, G (m ³)	Car wash demand, C (m ³)	Evaporation losses, E (m ³)
September				
October	353,40	148,80	310,00	71,70
November	342,00	144,00	300,00	69,60
December	353,40	148,80	310,00	71,70
January	353,40	148,80	310,00	68,40
February	319,20	134,40	280,00	56,10
March	353,40	148,80	310,00	55,20
April	342,00	144,00	300,00	43,20
May	353,40	148,80	310,00	39,00
June	342,00	144,00	300,00	31,80
July	353,40	148,80	310,00	35,40
August	353,40	148,80	310,00	48,60
September	342,00	144,00	300,00	62,10
ANNUAL	4161,00	1752,00	3650,00	652,80

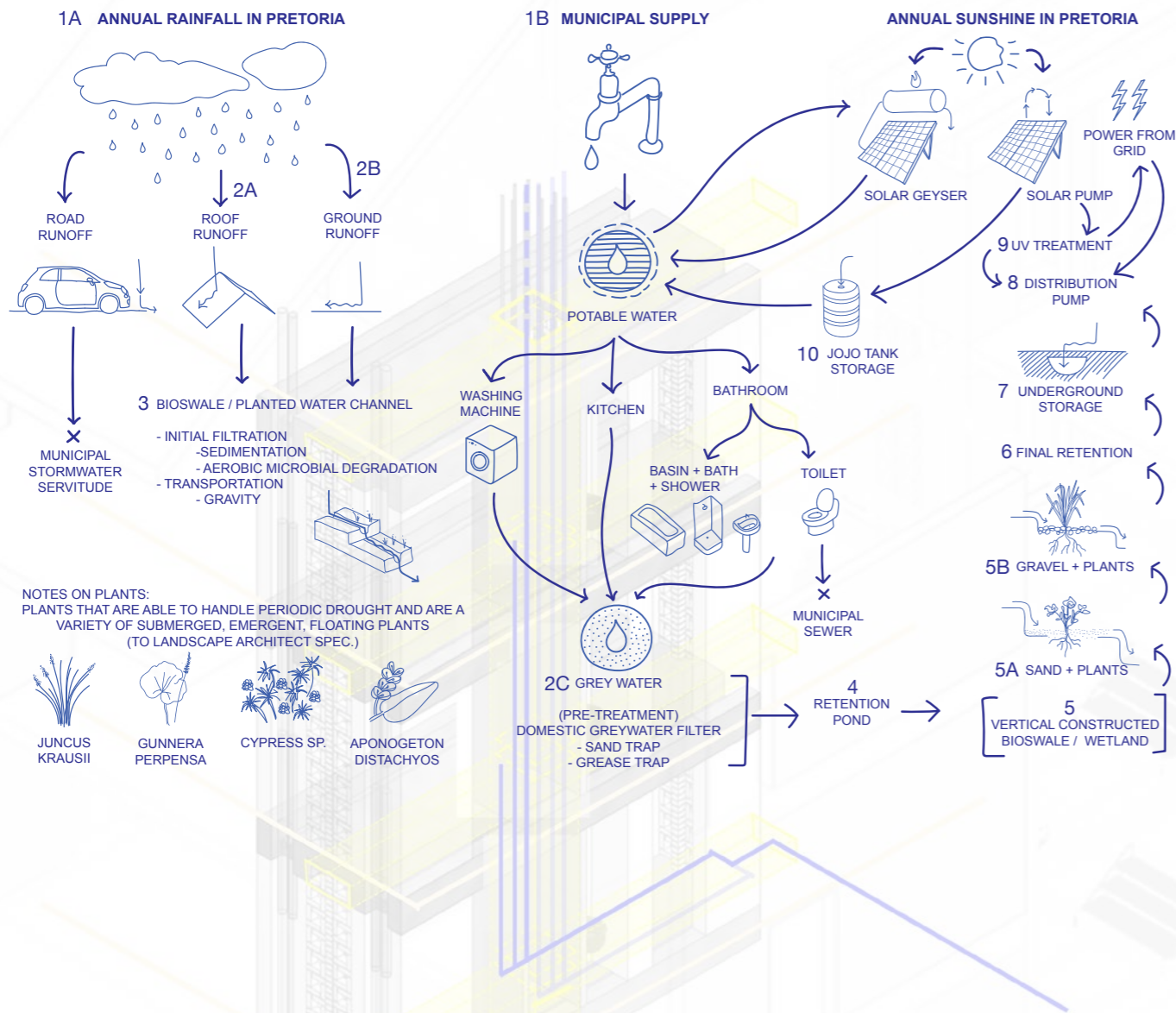
R + H - G - I - C - E			Cuml. balance at month END
Greywater supply, H (m ³)	Precipitation yield, R (m ³)	Monthly balance (m ³)	Storage volume, V (m ³)
			0,00
509,49	426,54	52,13	52,13
493,06	603,72	241,17	293,30
509,49	774,33	399,92	693,23
509,49	702,15	331,04	1024,27
460,19	649,65	320,14	1344,41
509,49	577,47	219,56	1563,97
493,06	262,49	-73,66	1490,31
509,49	111,56	-230,15	1260,16
493,06	45,94	-278,81	981,35
509,49	19,69	-318,42	662,93
509,49	45,94	-305,37	357,55
493,06	118,12	-236,93	120,63
5998,85	4337,58	120,63	



Graph 3.5.1: Projected monthly storage level as a function of supply, demands, and losses.

Maximum storage volume in year 1, V_{max}	1563,97 m ³
Swale depth, d_w	0,30 m
Swale surface area, A_w	300 m ²
Swale volume, $V_w = d_w \times A_w$	90 m ³
Req'd tank storage, $V_{max} - V_w$	1473,97 m ³
1480 kl of underground storage to be provided	
Depth of underground storage	3 m
Area of underground storage	493,33 m ²

3.3.4. System Integration Dwelling service cores



3.3.5. SBAT report

SUSTAINABLE BUILDING ASSESSMENT TOOL RESIDENTIAL

1,04

Achieved
3,8

SB SBAT REPORT

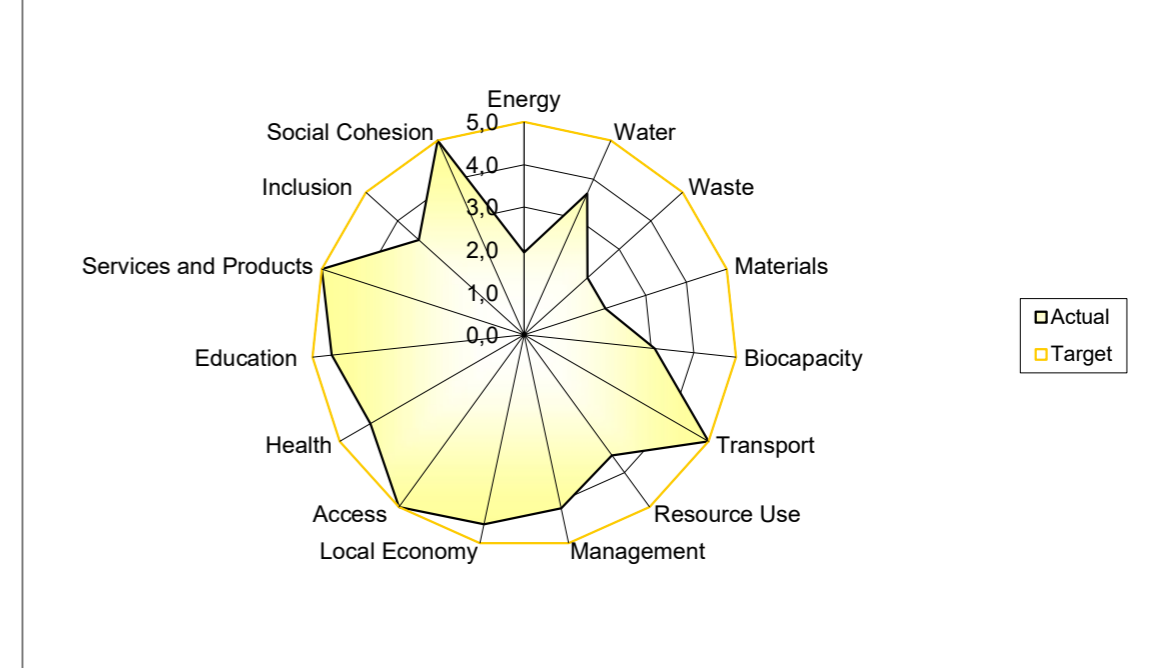
SB1 Project

0

SB2 Address

0

SB3 SBAT Graph



SB4 Environmental, Social and Economic Performance

Score

Environmental	2,5
Economic	4,4
Social	4,4
SBAT Rating	3,8

SB5 EF and HDI Factors

Score

EF Factor	3,2
HDI Factor	4,1

SB6 Targets

Percentage

Environmental	51
Economic	89
Social	88

SB7 Self Assessment: Information supplied and confirmed by

Name	Date
Signature	

SB8 Validation: Documentation validated by

Name	Date
Signature	

SB9 Validation Report Version

IVR

3.4. SCENARIO TESTING

