



The To-Face City

Los Angeles as a Symbol of Western Excess and Urban Sprawl in the Climate Crisis and a response through means of Agricultural Sustainable Practices **An Architectural Approach**

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acknowledgements :

In the culmination of my studies to date, this thanks goes to all the educators, professionals and peers who have influenced the way I see the world around me and given me the skills to make it my own. I would like to specifically acknowledge the guidance and assistance from my supervisor in this research report and design, Anita Szentesi.

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abstract

: Food security in the Climate Crisis is a pressing issue and the base point for my research. The patterns in consumerism, agricultural practice and distribution processes have been marked as key points of focus.

I have chosen Los Angeles, USA, after quite some consideration and research, to host the representative site for my project. This "To-Face City" shows up in imagery around the world as a luxurious wonderland of film stars, palm trees and sunshine. Of opulence, influence and opportunity. Unfortunately, this is not the full picture. Behind the scenes this city is home to a massive population at risk that is subsequently putting the rest of the world at risk.

Los Angeles reveals extreme wasteful consumerism at the hands of a capitalist western mindset where money draws the puppet's strings. It is also a city that is showing disastrous effects of global warming. Droughts and wildfires have become increasingly frequent and devastating. Major earthquakes can be expected in this region and the imminent threat of 'The Big One' is looming over Los Angeles. Added to the pressure of maintaining such a large urban settlement, in these conditions, is feeding the population when the surrounding land is mountainous, desertous or rapidly decreasing in ability for agricultural use - and, the subsequent distribution of goods from elsewhere is contributing to the problem.

A response to the issues of this city are, in fact, a required intervention for the greater well-being of the globe. It is the most developed and wasteful civilisations that require the harshest and most swift responses to combat the climate crisis in the timeliest manner so that the less affluent nations are not left in irreparable ruins worsening the divide.

In my research I look for solutions via technology in agriculture, materiality and planning that could dramatically reduce the impact of the food industry on the environment. This is done by re-introducing agriculture to the city through urban farming methods thus shortening distribution processes and reconnecting consumers to responsibility around food production. This is done through an architectural intervention that re-uses a commercial concrete parking structure to house a new and productive programme. This is done through a carefully considered process of sustainable practice that meets architecture to form a consumer pattern-altering experience as well as a fresh produce resource. The intention is that this project is a starting point for a methodological approach that can later be repeated globally within the widely used concrete parking structure typology.

In conclusion, I have identified a site in a region that has been greatly affected by, and largely contributes to, the climate crisis to show a detailed contextual example of how sustainable decisions in an architectural intervention, of an urban agricultural nature, can encourage a shift in consumer patterns around food and its impact on the climate.

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Our planet, Earth, is not infinite. She lends her resources to all the living creatures that rely on her, but 'we' are using these resources at a pace that exceeds replenishment.

The effects of our collective abuse have and will result in atmospheric and environmental climate evolutions that will be detrimental to us and the other innocent life around us. This phenomenon is largely spoken about as 'the climate crisis'.

As a starting point to the response, commercial agriculture has been identified as a key contributor to the destruction and could very well be a key part of the solution with the right physical innovation. If this is true, the response to this crisis, whether proactive or reactive is one that can be immensely impacted by architectural innovation. Architecture not only directly effects the physical environment, but has the power to influence our patterns of physical and mental activity. The greatest battle is time, and the political

and economic barriers that halt active progress. "(W)e need new tools for fighting climate change: zero-carbon ways to produce electricity, make things, grow food, keep our buildings cool and warm, and move people and goods around the world." (Gates, 2021).

In my research, I aim to understand the effects and solutions around the climate crisis by focusing on the context of Los Angeles as an extreme example of wasteful consumption, distribution chains and agricultural metamorphosis. The city is also representative of western culture and a known centre of global influence, presenting an opportunity to use its influential status to shift habits of consumption on a global scale. Capitalism, car culture, urban sprawl and extremes in class divisions are also points of interest. It is here that Johannesburg can draw on similarities. It is challenging to understand a community from a distance but based on prior knowledge from visiting the site myself, information from property websites, menus from surrounding restaurants, Google Street Views of surrounding neighbourhoods, a representative taking me on virtual tours of my chosen site and a few more 21st century resources - a site-specific picture has been deduced.

Despite the popularity and praise of this Californian region, it is highly prone to natural disaster both inevitable and man-made - making it an intriguing anomaly. Additionally, as is the case in Johannesburg, Los Angeles is a city of contrast. It should never be assumed that the glamorous reputation this city has invented is a true depiction of its success. Los Angeles must grapple with homelessness, class divisions and ecological threats.

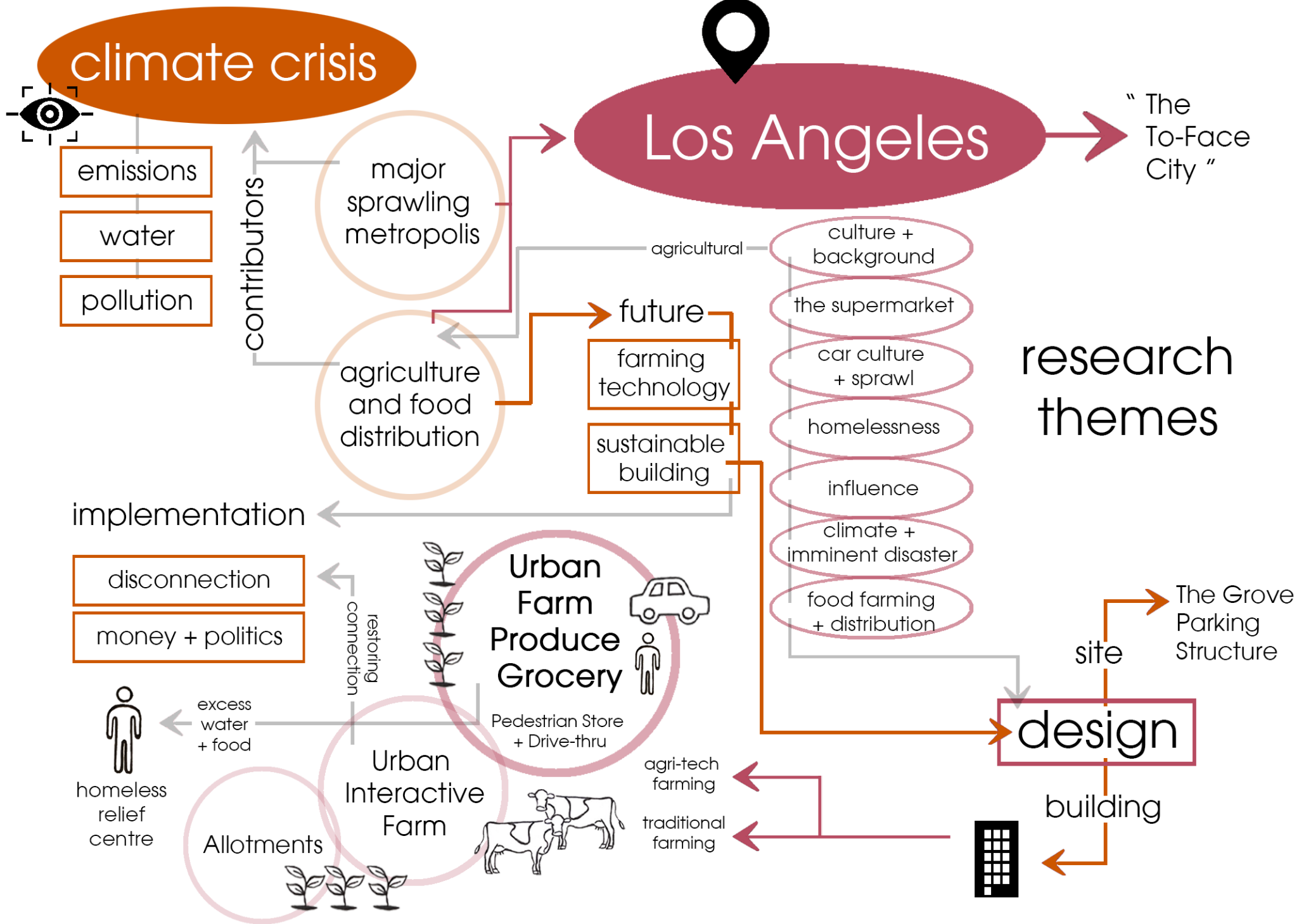
To understand the type of global community that stands to benefit from avoiding the same unstable ecological fate as Los Angeles, I look at Johannesburg as an example of a city that is on the fast track to a similar fate of urban sprawl, distribution and agricultural practice if not reconsidered promptly. My aim is to establish an architectural conceptual intervention that is tested in the worst case, extreme example, Los Angeles, to present a challenge to food consumerism and surrounding practices. If this is successful in the most extreme case, it can help prevent further decay in other major metropolises. Johannesburg could see Los Angeles as a picture of its future if maintaining its current wasteful trajectory. It is, however, important to acknowledge that this research is not about responding to one or two city's issues, but responding to a global crisis. Both cities mentioned share a comparable timeline faced with different defining events, like the oppression of the majority of the population in South Africa for the better part of its history, but a shared culture around sprawl, distance and transportation. My research will

be focused around merging this existing culture with an agricultural intervention to result in a convenient urban farm/produce grocery concept in an attempt to sway a habit of consumption to make an impact on the fight against the climate crisis.

Through research of geographic, political, social and economic informants, I determine Los Angeles' position in the climate crisis cause and effect. I conduct a study on factors that have caused delays to implementation of the necessary response.

I intend on designing a site-specific four-part urban farm. The first part will be a controlled environment (enclosed and sterile) urban farm that supplies a traditional pedestrian grocery store as well as a drive-thru pick up concept. Part two is an interactive open-air farm that encourages public involvement through a leisure aspect of design. The third part is an arrangement of allotments, growing space that can be rented out to residents. The fourth answers to the homelessness epidemic the City of Los Angeles faces by design of a homeless relief centre that allows the community to access excess produce from the urban farm and benefit from ablution facilities serviced by grey water from the hydroponic system outputs.

In summary, my architectural innovation is designed in Los Angeles, with the aim to combat a deadly threat to humanity by focusing on a plan to efficiently and rapidly implement behavioural change to society by focusing on the core contributors to the climate crisis.



Research Question (Predominant)

How can an **architectural intervention** shift consumerism to reduce the ongoing negative impact that the *agricultural and food distribution industries* have on the state of the **climate crisis**?

Research Question (Secondary)

How can this intervention address the contextual issues surrounding Los Angeles - as a region seeing devastating effects of, as well as extensively contributing to, the climate crisis - by understanding the fundamentals of the current environmental and social conditions?

My Frame of Reference 00

I have grown up in Johannesburg, South Africa. My mother always believed that no food should ever be wasted and it never was. At school we learned to recycle our paper worksheets and old books in orange Rondi bags at the door. In my high school years, plastic and glass recycling bins were easy to find. In my house, by about 2012, we had our own bins to separate waste material but because the rubbish disposal truck does not accommodate recycling, to this day, my mother drives to the nearest recycling drop-off to dispose of our glass and plastic waste every two weeks. My family does not use plastic grocery bags and always have our own permanent bags on hand. Water and electricity are expensive and my father constantly reminds us to have short showers and turn off lights and appliances when not in use. I did not always know the reasoning behind this, these were just the habits I was taught. In our school curriculum, the Greenhouse Effect was explained and we were made aware, over the years, of the human impact on the planet and its creatures. I was angered by the littered streets of my city, not realising that this was minor in the greater scheme of our destruction. It concerned me but I had assumed that the scientists would sort it all out for us.

After studying a Bachelor of Architectural Studies, my mind had been trained to view the world around me

differently. To ask questions. To unravel problems. To find solutions, even if only to make a difference to one person's experience or perspective.

In my internship year I was employed by Atelier New York Architecture, giving me the opportunity to go to the United States and test my independence. I believed that New York would be the movie scene experience I had seen on screens my whole life. It was exciting and wonderful but imperfect to say the least. I lived in a commune for a year and I was shocked by the lack of understanding around recycling and waste. Grocery stores provide excessive packaging for products, like bananas, that do not need it. Groceries are sent home in doubled up plastic bags. Residents regularly buy single-use plastic water bottles instead of using permanent options or drinking the clean tap water, going on to throw away the plastic into the mainstream trash rather than the recycling. The garbage collection does accommodate for recycling separation but residents are not well informed on the matter and I found myself re-sorting the bins each week. Products on the shelves are all shipped in from the west coast to the east coast or from overseas if it makes financial sense. Heaters, lights and air conditioners are regularly left on all day and night even when residents are not home. Many Americans still believe that global warming is

an optional belief rather than a critical concern. This directly flagged a pressing issue in my mind.

There are signs of a shift in urban behaviours. For example, when I attended the Global Climate Strike in New York City, 2019, led by Greta Thunberg. 60 000 people, mostly young, ambitious and ready for a fight, expressed their passion for change. Businesses and philanthropists have shown support through new innovations for the cause and financial prospects are making the green industry a desirable venture.

One day I found the opportunity to visit an urban farm, Square Roots Urban Growers in Brooklyn. I was in awe of the prospect. The concept made sense and I haven't stopped thinking about it. Later I met someone who happened to work at Square Roots. She told me her story. She was born and raised in California where the effects of climate change are visible and threatening. Her personal response was to move to New York because she believes it is irresponsible and wasteful to remain in a region that is lacking resources and subsequently has to import everything for its millions of residents. Her stories to follow consumed me and I booked my flight to Los Angeles.

As the aerial view from the plane went from hours of vast rocky desert terrain straight into a sea of man-made concrete landscapes, my attention was fixed on the scale of this urban development. I had never

seen anything like it. Not in Johannesburg, Cape Town, Durban, Chicago, Boston, Washington DC or even New York. From horizon to horizon, no untouched land remained. Los Angeles was even more of a shock to my previously picture-perfect perception of Hollywood. I quickly understood that the palm trees and film stars are only a small fraction of its personality. Along the sidewalks, the beaches and in public libraries, the homeless find shelter. The green suburbs I had seen on screen survive in patches and beyond them, the ground and foliage are parched. Signboards casually warned of earthquakes, landslides and wildfire zones. However, despite all the reasons one should not want to live here, millions choose to and this was fascinating to me. This city presents so many extremes. It is massive, unfair and wasteful - yet sunny, friendly and energetic. The wastefulness of this city alone is ecologically affecting other regions around the globe and it is the poorest countries that tend to suffer the harshest consequences. It was through this experience that my thoughts developed around the idea that habits of consumerism must be addressed in the biggest and most detrimental societies first to make the swiftest impact for our planet where time is of the essence in our fight to save her.

Human beings are resilient and resourceful. This is part of the problem and the solution. I have been inspired by the issue of the climate crisis and the context of Los Angeles for my research.



Los Angeles Culture + Background

01



Los Angeles + Johannesburg

02



Climate + Imminent Disaster

03



Food as a Contributor to the Crisis

06



Future of Farming: Concepts + Interviews

05



Sustainable Building Practices

06



Case Studies

07



Phenomenology + Implementation

08

PART 01A

research



Above:

Fig 1 - Los Angeles Department of Water and Power Poster, 1950 (Anon., n.d.)



Left:

Fig 2 - Rail Road Ads, 1908. (David Boulé California Orange Collection, n.d.)

Building an Image

Los Angeles was not always the Entertainment Capital of the World. It started with humble farmland roots. In 1848, Los Angeles became part of America when California was named the 35th state of the current 50 United States of America (History.com Editors, 2021). This is where my research begins. It had previously been occupied by Mexico and was prime property due to the gold deposits found in the Sacramento Valley at the time, leading to a gold rush (History.com Editors, 2021). There is a similarity to the initial influx of people to Johannesburg and its subsequent establishment here.

A landscape of opportunity was recognised in Los Angeles. Sunshine, space, coastal connections and fertile soil. It was only water that was somewhat lacking in this dry and hot Mediterranean climate. Nevertheless, advertisements were spread out to convince the nation that Los Angeles was the place to be. A prosperous citrus wonderland - and so, that is what it became.

Using refrigerator boxcar technology, the agricultural economy boomed and by the 1880s, citrus, wine grapes, beans, figs and other fruits and vegetables were grown in the Los Angeles area (Discover Los Angeles, 2020).

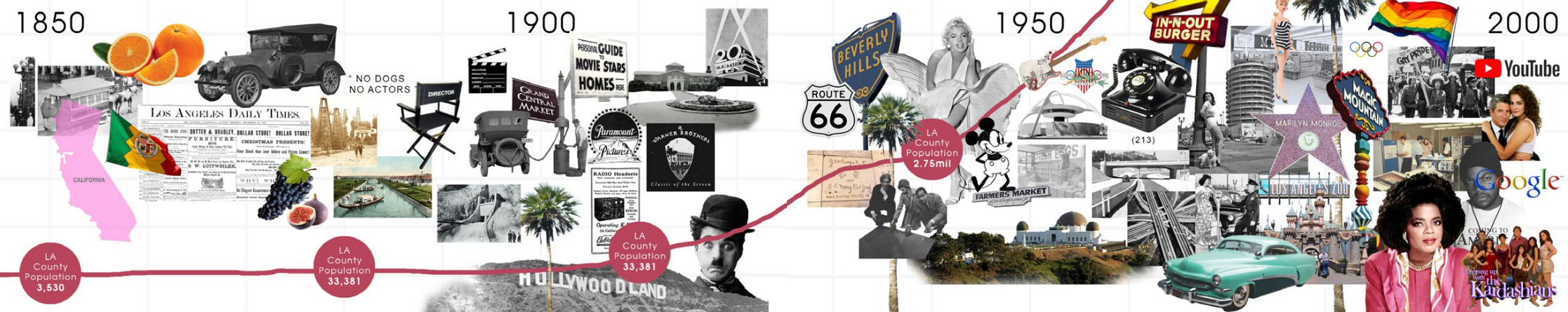
This economy sets the stage for new possibilities. In the 1880s, Los Angeles Times newspaper débuts, the first conservatory of music is established, Hollywood is named and the first electric street car is on the road (Discover Los Angeles, 2020). In 1882 oil was discovered in LA and after 5 years, there were over 500 operating oil wells in the area. Soon the city was growing rapidly. Parks were established, entertainment through sports and music became more prominent. Real estate was increasingly valuable. Railroads, trolleys and the automobile become the lifeline of the city for transport and distribution of produce.

In 1910, the first film was shot in Los Angeles, leading the way in the future of the image of this region and the establishment of the iconic entertainment industry. This industry is one of major influence to the rest of the globe. With some push-back from the residents, production companies started opening all over the city. The city is known, to this day, as the place people who want to reinvent themselves go. Make-up and acting helps create a made-up persona - but the city itself has gone through its own revolutions. The opulent image it portrays today could be considered

'invented' by well-marketed icons like the palm tree or movies that show the city to be the perfect edited version of itself. In reality Los Angeles is a real place with real people and real problems, to be discussed in the rest of the chapter. The region owes its success to timing.

As the urban landscape expanded, the agricultural capabilities of the land became secondary and were slowly pushed toward the outskirts of the city. From this point onwards, Los Angeles was all about entertainment, film, music, fame, swimming pools and status. Agriculture faded away as the base of the Los Angeles economy. In 1948 fast food restaurant, In-N-Out Burger, kick-started a new culture of food on a production line. Consumption in America and Western Culture was changed forever. This was not, however the first contribution Los Angeles had made to food culture as this was the origin place of the revolutionary 'drive-in supermarket' concept.

Fig 3 - Collaged timeline to express cultural development in Los Angeles



The Supermarket

In the 1910s, the grocery experience was altered to suit the car culture seen in Los Angeles. In discussion of the growing need to address the relationship between retail and the car "...in Los Angeles, where as many as one-quarter of the city's residents owned an automobile by 1920.", Davison (2015), reveals the informant behind the shifting trend in consumerism.

By having many separate stores lined up closely to appear as a one-stop shopping destination with a parking lot in front, drivers could come from far away

and park their cars right at the door of the stores they intended to buy from. The butcher, dry goods grocery, produce grocery, bakery and more were all under one roof and customers would walk from door to door as we would walk from section to section in a modern supermarket set-up. "At the same time, electric refrigerators started replacing iceboxes, enabling Angelenos to stock up on a week's worth of groceries in a single trip.", (Los Angeles Magazine, 2018).

The refrigerators in homes and in stores meant that fresher produce could be kept for longer and the



Fig 4 - Panorama
Market in 1956.
(Shulman, 1956)

distribution process became more convenient with more fresh food options for consumers. The popularity of this shopping experience led to a frequency of the supermarkets opening. An article by Los Angeles Magazine (2018) highlights the significance of the presence of the 'supermarket'. And how it can be noted as the starting point for many new neighbourhoods thus encouraging a sprawling expansion and growth of Los Angeles in the early days - decentralising the city.

"L.A. invented the supermarket and the supermarket invented L.A., or so said Vons founder Charles Von der Ahe ", (Los Angeles Magazine, 2018). I would say this is partially true but negates that this is only one part of the catalyst to Los Angeles' flourishing growth in the early 20th century. The other major catalyst, although closely interlinked with the invention of the supermarket, was the automobile and the subsequent infrastructure that allowed this city to extend extensively across the region.

Car Culture + Sprawl

The urban landscape of Los Angeles is characterised by its sprawling development and complicated interlinking highways. The region's infamous traffic is recognised globally. The city was reshaped and

invented around the automobile. Daily life in the area is reliant on it. "Los Angeles is notorious for being hostile to pedestrians. I know plenty of Angelenos who couldn't in their wildest dreams imagine navigating America's second largest city without a car." (Novak, 2013).

The average household in Los Angeles owns 2 cars (McCarty, 2018). Los Angeles Almanac (2020) states that there were 7,762,453 vehicles on the road in Los Angeles County in 2017 - including cars, trucks and motorcycles. For reference, Gauteng - which is 30% larger than LA County, had 4 210 656 vehicles in the same year (Arrive Alive, 2017). This number keeps rising for now but there are some theories about the future of the car and its ability to withstand the test of time as we move forward with our fast-paced lives that revolve around speed, convenience and sustainability. The city partially owes its financial success to the oil found in the area and its economy that runs on fossil fuels.

The subsequent carbon emissions from fossil fuels and specifically road travel is substantial at 15% of total global annual emissions. Most of it comes from passenger vehicles like cars and buses which contributes 45.1%. The other 29.4% comes from freight trucks according to H Ritchie (2021). The aim is to decarbonise or remove the cause entirely.

Some believe the car will disappear. Maybe not altogether, but services like Uber and car sharing apps might reduce the need to own your own personal vehicle. Some cities have or plan to introduce robust public transport networks to ease congestion and emissions.

These all help, but in my opinion, the personal automobile is not an aspect of life Angelenos are

ready to rid themselves of. With new technology in electric cars that run off clean energy becoming common place in Los Angeles, the car is adapting to the socio-economic climate of this generation. There are 2,801 charging stations for Tesla vehicles in Los Angeles, compared to 600 gas stations in the same region (Plugshare, 2021). Gavin Newsom, the Governor of California mandated that all new passenger vehicles sold in California must be zero-



Fig 5 - Heavy traffic on Los Angeles 101 Freeway. (Ralston, 2014)

emission by 2035 but a few issues with electric cars need to be addressed before this transition can go forward.

“Electric cars currently need hours to charge; and charging station customers may linger for a meal or to grocery shop. In five to 10 years, charging time could decrease and give people only enough time to grab a quick snack. Vehicles could also become autonomous and drive themselves to connect with a charger.” (Crale, 2020). This brings up an interesting relationship between the vehicle and retail/food services that will be considered beneficial to an urban drive-thru produce grocery that is considerate of these advancements in the culture around the automobile.

So, there is a way to make cars sustainable in terms of energy but what can be done about the increasing congestion?

In an article by Dhaliwal (2018), a few basic solutions were put forward including banning cars from the city centre, allocating carpool lanes for those sharing a car and bridging the gap between the end of the public transport and the destination with city owned bicycles. Other ideas included trying to get companies to allow more employees to work from home or work on alternating timed shifts to disperse peak traffic or

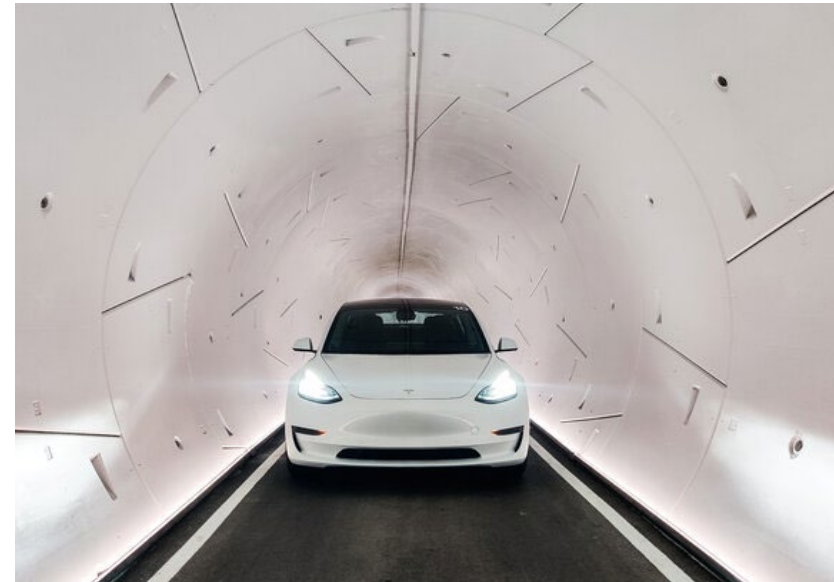


Fig 6 - The Boring Company's tunnel to divert vehicular congestion underground (The Boring Company, 2020)

offering tax benefits to those who use public transport systems. Unfortunately, the car comes with a lifestyle that the people of Los Angeles will not part with easily and so the best, and most widely applauded, ideas have been those that accept that the car is here to stay for now.

The Boring Company, initiated by Elon Musk, has caught onto this and their response is to bore traffic/transportation tunnels. In the words of The Boring

Company, "To solve the problem of soul-destroying traffic, roads must go 3D, which means either flying cars or tunnels are needed. Unlike flying cars, tunnels are weatherproof, out of sight, and won't fall on your head. Tunnels minimize usage of valuable surface land and do not conflict with existing transportation systems. A large network of tunnels can alleviate congestion in any city; no matter how large a city grows, more levels of tunnels can be added."- in my opinion, an interesting concept that has similarities to the concept of verticality and stacking in agricultural practices.

My proposed urban produce grocery design will be a building that considers the car to be one of its primary users, opening an interesting array of aspects to accommodate this, like the motion, spatial requirements and what to do with the carbon emissions emitted in the building. This will be covered in the research to come. For now, understanding the concept of the car and what it represents in Los Angeles culture is the aim.

In terms of status, the car culture in Los Angeles is representative of the underlying class structure of this society. From people who own many expensive sport and collectable cars, to people living in their old cars, to those who don't have a car at all. The car that is so vital to navigate this city is not a given for all of its' residents.

Homelessness

Los Angeles has a considerable homeless community spread across the city, not dissimilar to South Africa's major cities. The problem is getting far worse in the wake of the COVID-19 Pandemic. Particularly in the Santa Monica, Skid Row and Los Angeles City areas.

According to the National Alliance to End Homelessness (2020), leading causes in homelessness include low income-to-housing-rental ratios, health and mental health issues, substance abuse, trauma victims and veterans who have struggled to integrate back into society, and the impact of racial disparities. What is notable in this list is that at least half of these criteria do not mean the person in question is incapable of working. Some homeless people should be considered as valuable because they are still able to work if the environment has made the environment positively conducive and suitable for their individual conditions.

From my point of view, the homeless population would largely benefit from a fresh affordable urban produce farm in close proximity to them. Unfortunately, there are more homeless people than there is capacity in homeless shelters in Los Angeles today. It is true that some people do not want to be in the shelters because of the restrictive lifestyles these shelters come with. To read more about my approach to addressing the



Fig 7 - Homeless Encampment on Skid Row, Downtown Los Angeles. (Sinco, 2021)

issues around homelessness in Los Angeles, see The Homeless Community in Site Context 08.

LA's Global Influence

Global presence is a key aspect of the site allocation for the introduction of an urban farm concept.

Mainstream media advertises the American ideals

of modern-day society, promoting trends of cultural immoderate lifestyles. Fast food and the brands that lead the industry have sprung up all over the world and fashion trends bounce out from the screens of American pop culture media onto the streets of the smallest towns everywhere. Many parts of the world have taken societal cues from American/Western culture. "The globalization of culture is often chiefly imputed to international mass media. After all, contemporary media technologies such as satellite

television and the Internet have created a steady flow of transnational images that connect audiences worldwide. Without global media, according to the conventional wisdom, how would teenagers in India, Turkey, and Argentina embrace a Western lifestyle of Nike shoes, Coca-Cola, and rock music?" wrote Kraidy, M. (2002). This statement notes that media has allowed America to broadcast their way of life to the rest of the world, subliminally introducing trends, advertising brands and persuading mimic culture. Los

Angeles is the Entertainment Capital of the World, home to some of the most influential individuals on our planet with an extraordinary platform. From the film and music industries to social media, Los Angeles has been set up as a global beacon of Western culture and notifies of shifts and trends to follow.

Social media is a relatively new addition to the platform but shows astounding results in the spread of information and reach. This allows the average

Fig 8 - Star on the Hollywood Walk of Fame





Fig 9 - Store Display on Rodeo Drive

person to create a global presence. If Los Angeles has the power to shift consumerism habits, the issue I would like to push into the scope of their influence is the response to the climate crisis. Young Hollywood stars like Jaden Smith have been the face of a new trend that makes sustainability “cool”, especially to

the Gen Z consumers - those born between 1997-2012. A 2021 advertising campaign for Levi's, shows Smith and other young 'influencers' advocating for less wasteful consumption. This is indicative of a shift that is catching on in all of Gen-Z worldwide as reach through TikTok and Instagram popularity escalates.

Other long-time celebrity top climate influencers, associated with Hollywood, include Leonardo DiCaprio, Mark Ruffalo, Brad Pitt, Arnold Schwarzenegger, and more (Arcadia, 2017). Along with hundreds of others that have publicly stated their backing of the fight against the climate crisis.

The importance of having a new innovative grocery concept be introduced in a region of the world that will not only accept and make use of the design, but have the power to advertise its success globally is priceless in the timeliness of the rollout of this concept across the planet.

The Palm Tree

Palm trees are iconic symbols of the Los Angeles lifestyle. They line the roadways shown in movies that portray Hollywood as a land of dreams and luxury.

The trees are systematically placed in rows. They are placed abundantly at each entrance, street or



Fig 10 - Palm Trees on Rodeo Drive

boulevard of relevance. This is no accident but rather a clever marketing plan.

The region has a Mediterranean climate with hot dry conditions. The palm trees do not naturally grow here but thrive in this sunny climate. Predominantly seen in Los Angeles, are the Mexican Fan Palms. The trees,

however, reacted to this climate unexpectedly by growing much taller in Southern California than in their native lands – now this is home to some of the tallest palm trees on earth (Nosowitz, 2018).

Though, until the late 1800s Los Angeles was a scrubland with few trees at all. The 'palm tree' became a prominent advertising tool that spread across the city despite not having fruit, shade or wood to offer. Their root structures make them easy to move around but offer no assistance with soil erosion (Nosowitz, 2018). The planting of these trees, which actually aren't formally considered trees at all, was intended to create the perception of a paradise oasis. To draw crowds from across the United States to settle and buy property in Southern California. "(P)alms took off as a symbol of wealth, luxury, nice weather, vacation." and Los Angeles was forever 'branded' (Nosowitz, 2018).

I find relevance in this occurrence of subtle change that had a notably major impact on this city's growth. A culture was created using a symbol thus building an image. This is a common theme as people from around the world go to Los Angeles to create an image of themselves through the arts and wealth creation. I hope to use the way in which this city has changed and adjusted to remain prosperous, as a guide to subtle change that incurs major difference and growth.

Fig 11 - Palm Trees Lining
Streets of Hollywood





So, why Los Angeles? A developed city home to celebrities and gorgeous sunset beaches? Well, because that is just the movie scene portrayal of 'The To-Face City'. The two core concepts revolve around the city's harsh fate in, as well as its contributing factors to, the climate crisis. With agriculture and food distribution at the centre of my focus, Los Angeles' location, sprawl and influence make a strong case for the design intervention I intend on implementing.

Comparative Timelines

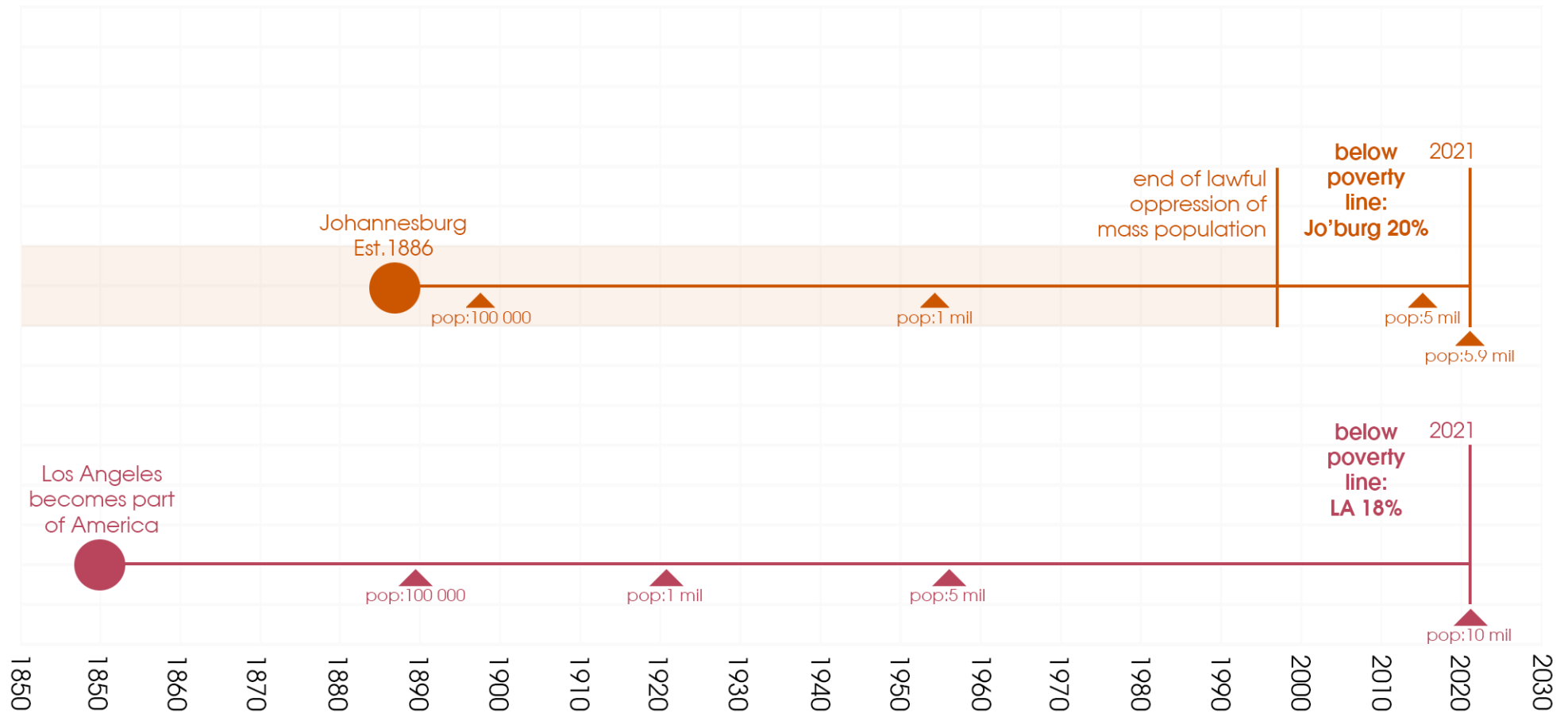


Fig 1 - Comparative timeline showing population growth, similarities and differences between the development of Johannesburg and Los Angeles, respectively. (Beedy, 2015), (Discover Los Angeles, 2020), (World Population Review, 2021)

Los Angeles + Johannesburg Comparative Development

Los Angeles and Johannesburg share many similarities. Both cities enjoy plentiful sunshine, sprawling urbanisation, extensive interlinking highway infrastructure and a thriving car culture. Their backgrounds and early timelines are similar in terms of a goldrush initiation and agricultural backgrounds leading to their establishments. There are, however, defining differences in the development of these cities.

South Africa's past was devastated by the oppression of Apartheid. The majority of the population was controlled and discriminated against, dehumanising the people that were vital to the prosperity of the nation. As Los Angeles grew and developed rapidly from the mid 1800s to the 2000s, Johannesburg was set back. Today, Johannesburg is still in a state of recovering lost time and attempting to repair the class divisions and poverty caused by Apartheid and the subsequent corruption.

Although this was not the case in Los Angeles, this society has problems too. Both cities are comparable in sprawl and homelessness statistics but these

alternate pasts lend a difference to the capabilities of each city to approach these issues today.

In terms of my project and proposed intervention, the difference to note, between the two cities, is this:

When agriculture was pushed outward due to urbanisation in Los Angeles - a city surrounded by other urban landscapes, mountainous terrain and desert - agricultural practices had to be moved far away to other states across the nation causing a distribution process that is wasteful and unsustainable. The population of Los Angeles and the surrounding major urban settlements have to rely on imported food and water for their survival. In Johannesburg there is fertile arable land surrounding the city in a broad radius. So, the distribution of produce into the city is still viable and responsibly handled. Water supply comes from a nearby dam and there is only one other major formal urban settlement in range, Pretoria. Not to be ignored, are the informal settlements - but according to satellite imagery, all combined settlements are proportionally sustainable in relation to the expanses of land that still exist surrounding them. The food and water resources are still available to handle this urban development and population at this time.

Additionally, street vendors selling fresh produce on the streets of Johannesburg are thriving and reliant

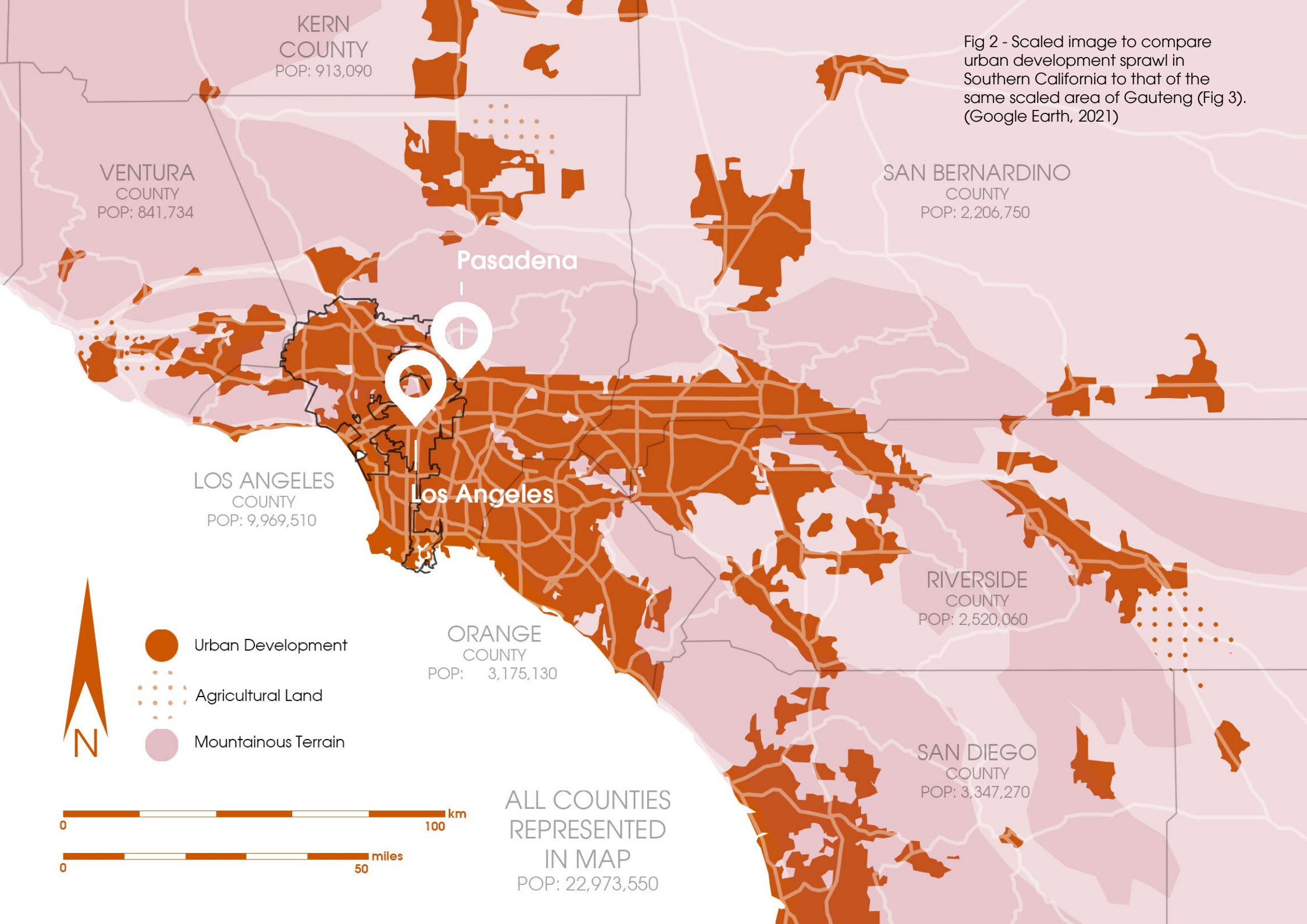


Fig 2 - Scaled image to compare urban development sprawl in Southern California to that of the same scaled area of Gauteng (Fig 3). (Google Earth, 2021)

KERN COUNTY
POP: 913,090

VENTURA COUNTY
POP: 841,734

SAN BERNARDINO COUNTY
POP: 2,206,750

Pasadena

LOS ANGELES COUNTY
POP: 9,969,510

Los Angeles

RIVERSIDE COUNTY
POP: 2,520,060

ORANGE COUNTY
POP: 3,175,130

SAN DIEGO COUNTY
POP: 3,347,270

ALL COUNTIES REPRESENTED IN MAP
POP: 22,973,550

- Urban Development
- Agricultural Land
- Mountainous Terrain



0 100 km

0 50 miles

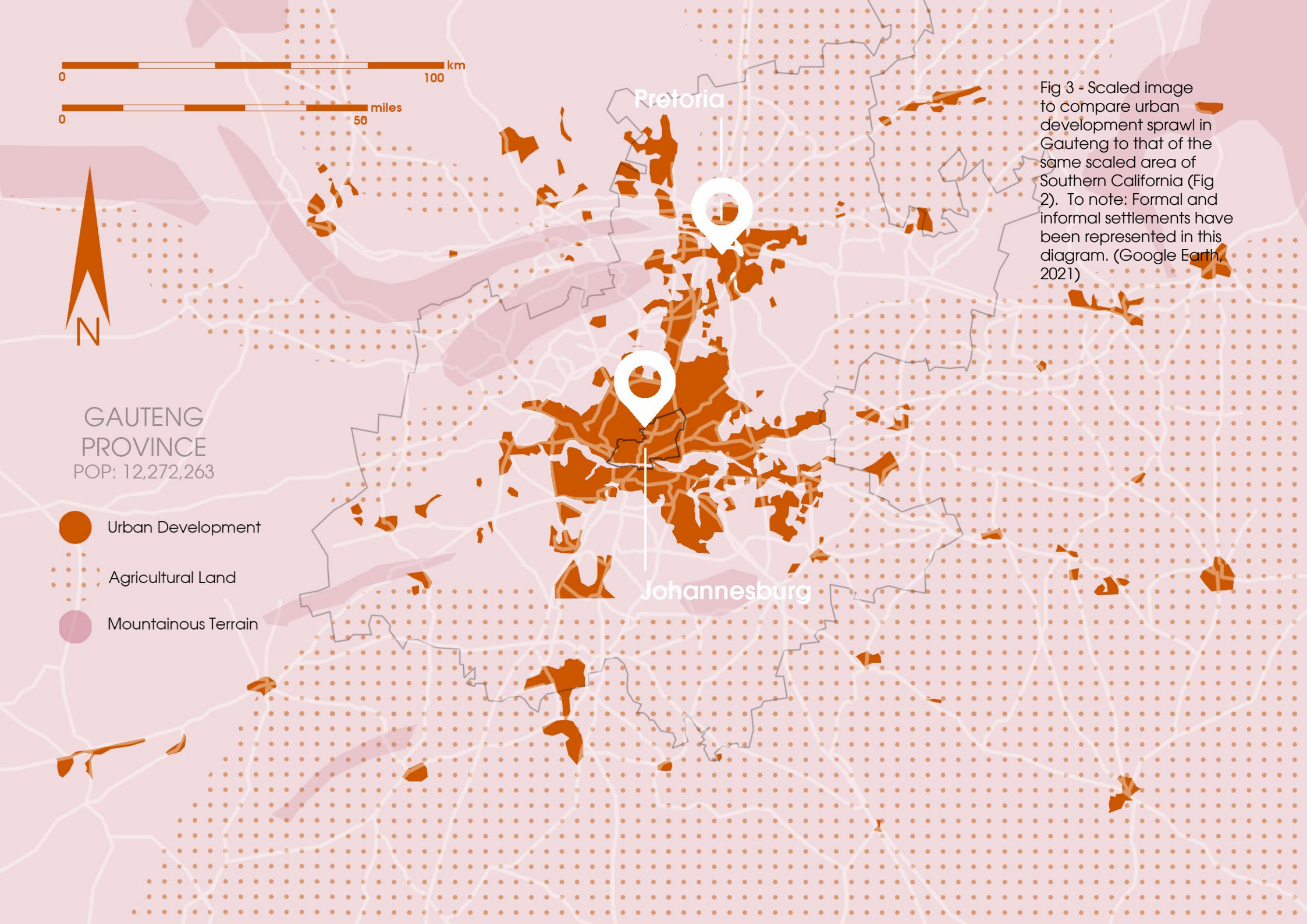


Fig 3 - Scaled image to compare urban development sprawl in Gauteng to that of the same scaled area of Southern California (Fig 2). To note; Formal and informal settlements have been represented in this diagram. (Google Earth, 2021)

GAUTENG PROVINCE
POP: 12,272,263

- Urban Development
- Agricultural Land
- Mountainous Terrain

on informal and formal trade – offering affordable fresh produce sourced from surrounding regions and relatively nearby farms. This practice itself offers a food security to the less affluent population of the city. Although these traders are meant to have licenses to do so, South Africa’s constitution allows leniency for them because informal trade has been an aid to the economy when unemployment rates keep rising. “South Africa faces a number of developmental challenges, including high levels of unemployment, poverty and accelerated rates of rural-urban migration. Informal trade has an important role to play in addressing these challenges. According to Statistics South Africa (Stats SA)’s April – June 2017 Quarterly Labour Force Survey (QLFS), 2 689 000 South Africans reported working in the informal sector. Of these people, approximately 1 101 000 or 41% are in informal trade. Informal trade therefore makes up a significant component of the economy. It is for this reason that the national government has acknowledged that it is important to ensure that the informal sector, and consequently informal trade, is given room to develop and flourish.”, wrote Hodgson (2018). In Los Angeles, the opportunity for the homeless to source their own food from nearby farms is more difficult because these are usually large commercial establishments or not in proximity the city. Although both cities require licenses to sell produce, informal trade is far more highly regulated in Los Angeles

and there is no leniency for it. This means that the lower-income population in the region are in need of alternate means of food resources that are close by, affordable or offer an opportunity to provide free excess produce to those in need.

With this being said, Johannesburg is showing signs of following the trajectory of Los Angeles as it becomes a modern city. Growing informal and formal urban populations and higher standards of living come with larger scales of manufacturing and urban development which cause a greater threat to the natural environment. Currently, South Africa is still fertile and prosperous in regards to the climate situation. My design is situated in California but South Africa can still learn from the conceptual intervention I am proposing to safeguard the future through a gradual shift in consumerism using the elements in my design. In this way “California is a postcard from the future.” (The Daily Show, 2021), and presents an opportunity to test future responses.

The climate crisis and further sprawling urban growth could begin to effect South Africa’s ability to produce enough food to feed its nation in the future, therefore a need for more sustainable systems are to be considered here. Although this is certainly a possibility, there is no time to wait for such a situation to occur when there are regions in the world where the

targeted innovation is already desperately needed to make the timeliest impact.

Right now, I believe that Los Angeles is in need of a technological innovation in food security and I have flagged it as a satisfactory starting point in terms of my proposed design for five main reasons which I will unpack below.

Why Start with Los Angeles in Terms of the Climate Crisis?

The first is that the region needs to bring agricultural practice back into proximity to address sustainability in distribution and agriculture. The second is the increased area of drought and wildfires in the region showing increasing risk to the habitability of the region. The third is the necessity to target the most wasteful civilisations. The fourth is that Los Angeles is directly attached to other major urban settlements making this region one of the largest human settlements to target. The final reason is that, I think this is the perfect place, in terms of western influence, to have a design concept become global knowledge, and furthermore, encourage implementation in the timeliest roll-out.

- produces less than consumed
- produces close to amount consumed
- produces more than consumed
- no data

Global Production & Consumption

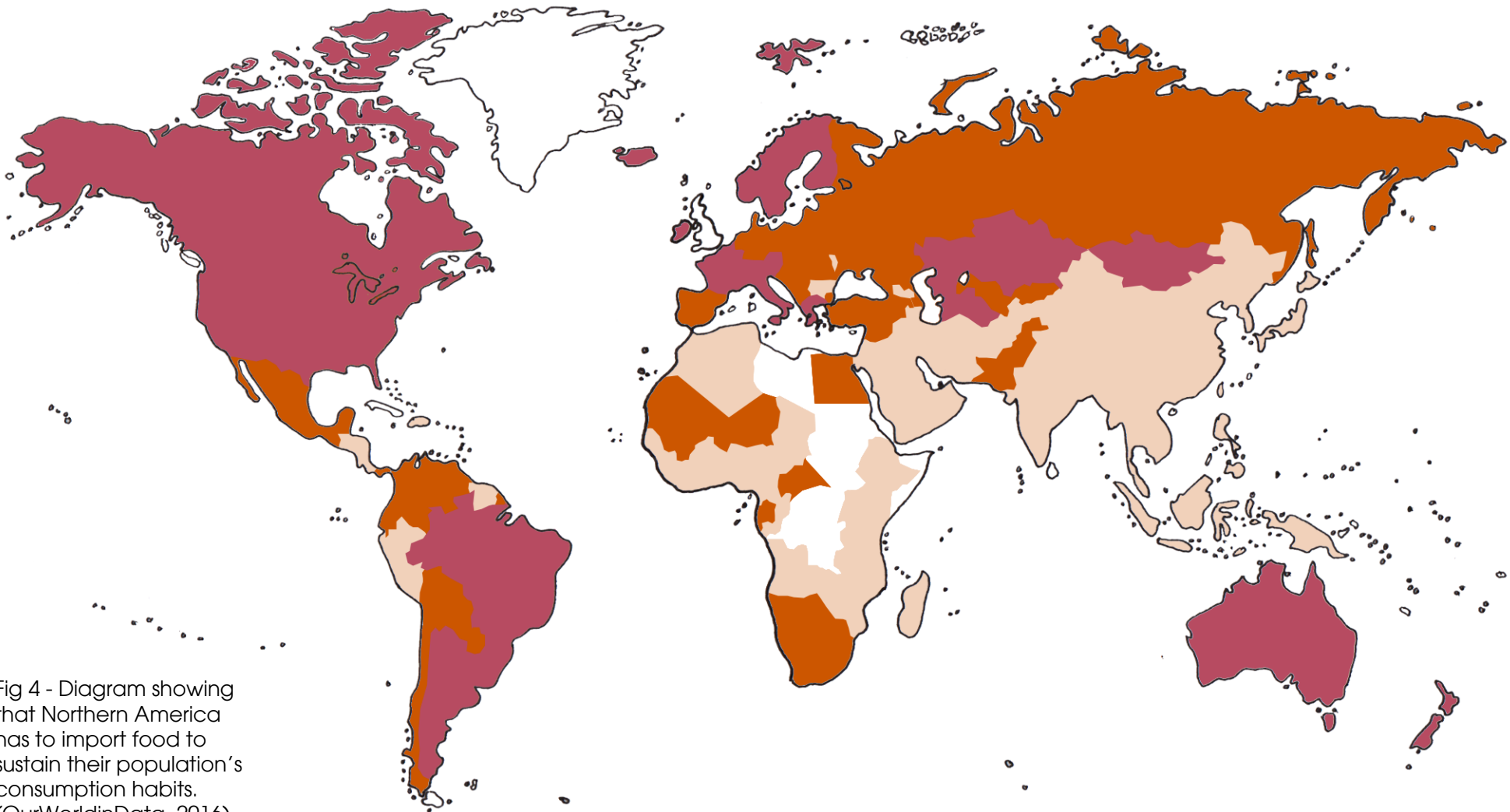




Fig 4 - Diagram showing that Northern America has to import food to sustain their population's consumption habits. (OurWorldinData, 2016)

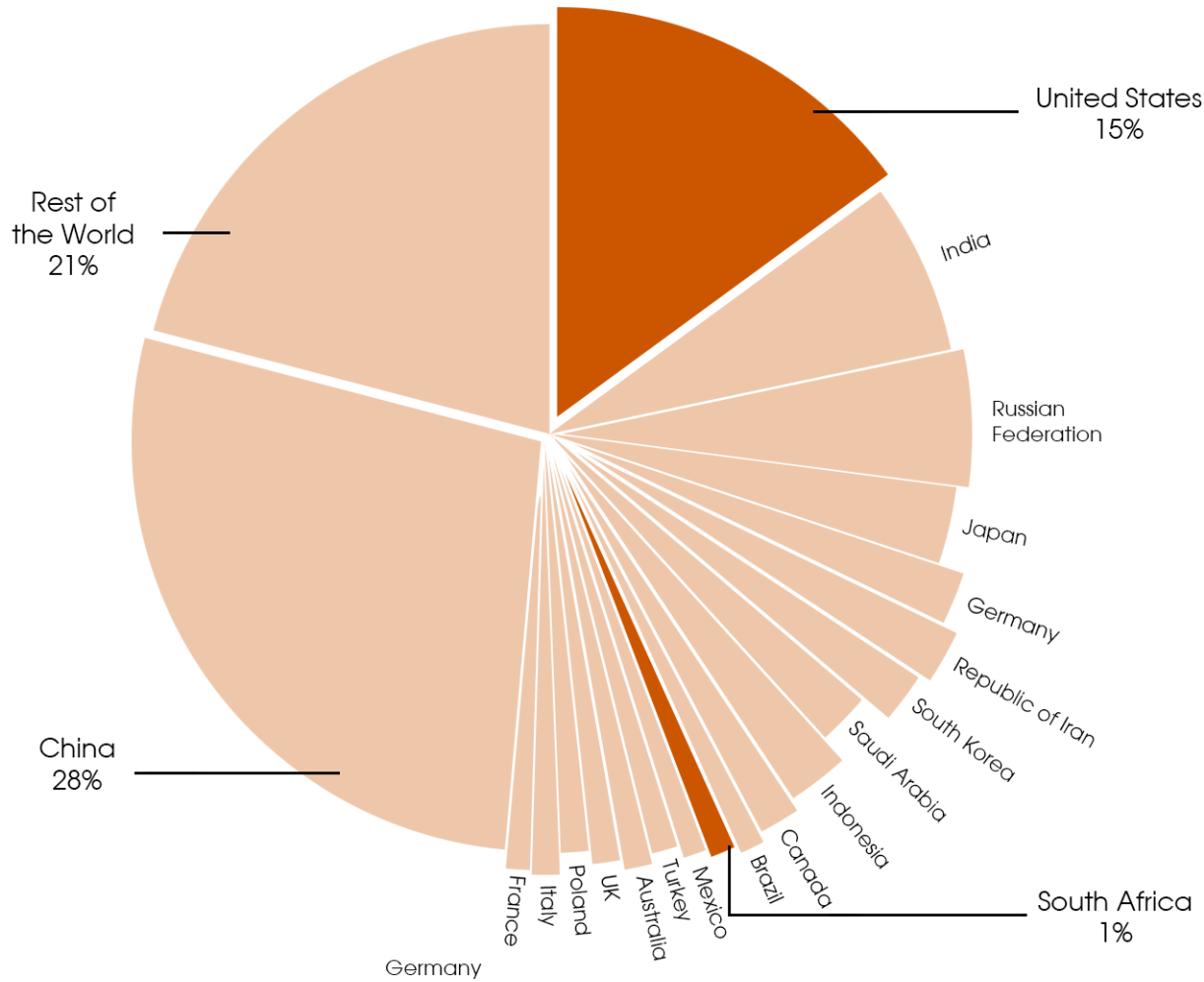
-  Fresh Produce Imports to the USA
-  Fresh Produce Imports to SA

Imports of Fresh Produce



Fig 5 - Diagram showing common regions that California (pink) and South Africa (orange) source their fresh produce from. (Daily Maverick, 2020), (USDA, 2015)

Fig 6 - The United States (and specifically their major urban developments) are contributing to 15% of Global Greenhouse Emissions. The USA is the 4th highest GH emission producing country per per capita (2018). (Union of Concerned Scientists, 2020)

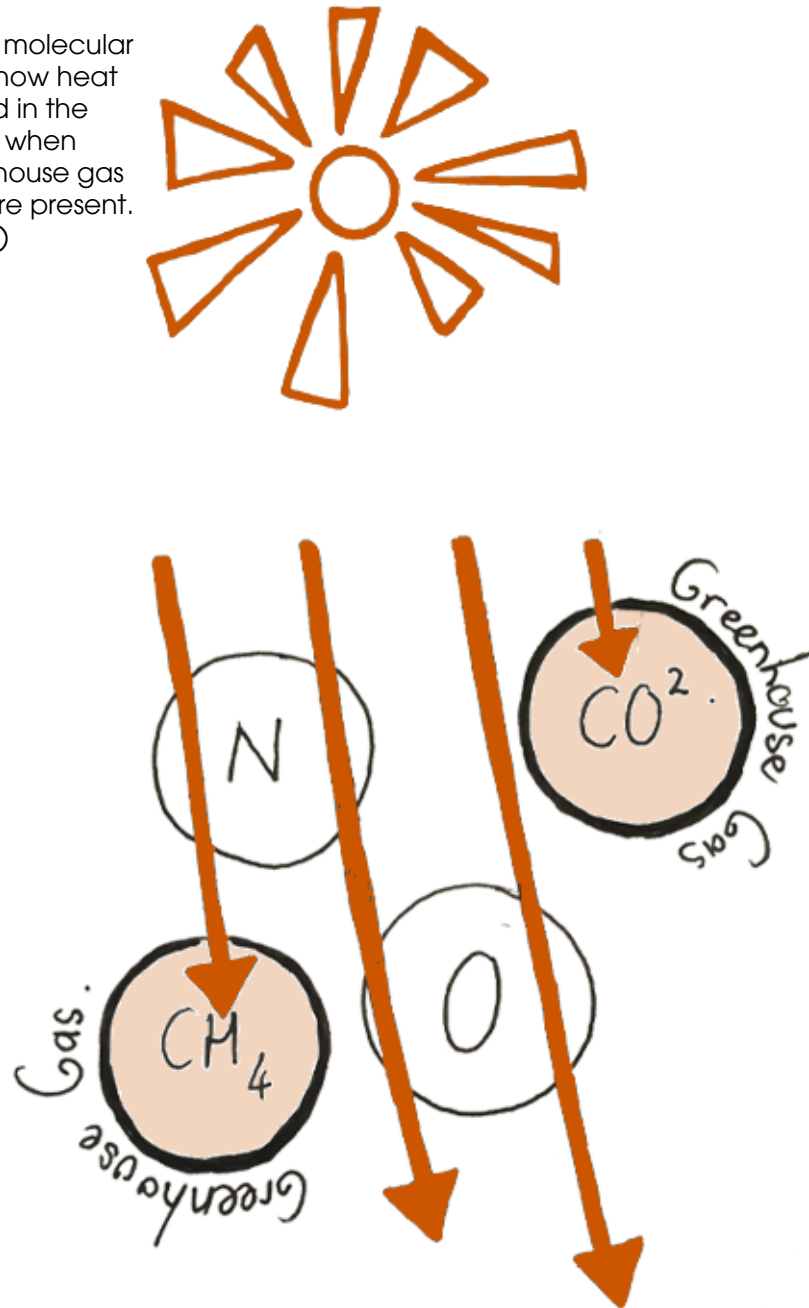


Global Greenhouse Gas Emissions Global Contributors

per capita in 2018

1 Saudi Arabia	18.48T
2 Kazakhstan	17.60T
3 Australia	16.92T
4 United States	16.56T
5 Canada	15.32T
6 South Korea	12.89T
7 Russian Federation	11.74T
8 Japan	9.13T
9 Germany	9.12T
10 Poland	9.08T
11 Islamic Republic of Iran	8.82T
12 South Africa	8.12T

Fig 1 - Basic molecular concept of how heat gets trapped in the atmosphere when more greenhouse gas molecules are present. (Mann, 2020)



Understanding the Climate Crisis

On a basic molecular level this is how the “climate crisis” has come about:

The sun emits a range of light such as ultraviolet, microwaves, infrared light and more. Some of that is absorbed by the Ozone Layer and some is reflected off of the clouds, dust and the Earth’s surface. The rest is absorbed by the land, water and vegetation on the Earth’s surface. We need this heat to survive.

The atmosphere is made up of 99% Nitrogen and Oxygen, which do not absorb infrared light. The other 1% of the atmosphere is water vapor and can absorb some of the infrared light. This means the heat from that light is held in the atmosphere and if it was not, it would be too cold on our planet to survive. However, the water vapor does not absorb all of the frequencies of infrared.

Here is where the problem comes in. As soon as more of those frequencies get absorbed and held in the atmosphere, the temperature rises - which is what happens as we introduce carbon dioxide and other greenhouse gases into the atmosphere. This is the base of the rising temperatures causing the climate crisis.

(Explanation adapted from C. Mann, 2020)

Some other greenhouse gases, like methane and nitrous oxide, “molecule for molecule... cause more warming than carbon dioxide does – in the case of methane, 120 times more warming the moment it reaches the atmosphere. But methane doesn’t stay around as long as carbon dioxide.” (Gates, 2021).

In a book by Bill Gates called *How To Prevent A Climate Crisis* released in 2021, he talks about two vital numbers. The first is 51 billion, representing the tonnes of carbon dioxide we are putting into the atmosphere each year. The second is Zero, which is where we need to get to in terms of our Carbon emissions. “ ‘Zero’ is going back to a point where the atmosphere was balanced and plants absorbed about as much carbon as emitted.” (Gates, 2021). A term often used to explain carbon neutral buildings is “net zero” which is when a building counteracts the emissions it incurs by ways of storing and absorbing an equal amount. Gates uses the analogy of a bathtub filling up to represent the effect of the global input of carbon emissions. We can slow it down but the only action that will stop the tub from overflowing is if we stop our greenhouse gas emissions altogether. There is no imaginable future where we can completely stop all emissions and so, we should aim to reduce them as well as create ways to remove, store and counteract the carbon emitted. Even after we achieve this goal, it will take a long time for the rise in temperature to subside.

Gates believes, as more people begin living a modern lifestyle, the emissions will surely rise unless we find sustainable large-scale methods of providing clean energy. There was a notable rise in greenhouse gases as humans started using fossil fuels extensively, which coincides with the establishment of some of Americas largest automobile-based cities like Los Angeles (Gates, 2021). As Gates discusses solutions to cleaner and more sustainable methods of energy creation, he said, “One thing that became clear to me was that our current sources of renewable energy – wind and solar, mostly – could make a big dent in the problem...”. “It also became clear why, on their own, they aren’t enough to get us all the way to zero. The wind doesn’t always blow and the sun doesn’t always shine, and we don’t have affordable batteries that can store city-sized amounts of energy for long enough.”. Bill Gates can be considered a ‘wizard’.

C. Mann wrote a book called *The Wizard and The Prophet*, where he talks about the global population reaching 10 billion and a necessity for 50-100% more food to sustain this growth.

He explains that there are two players in the climate crisis approach. The ‘prophet’ says that nature has limits which we have to obey otherwise we will disrupt a balance and we will lose. And that all species eventually die out which is a reality we should accept. The ‘wizard’ challenges this reality and believes the

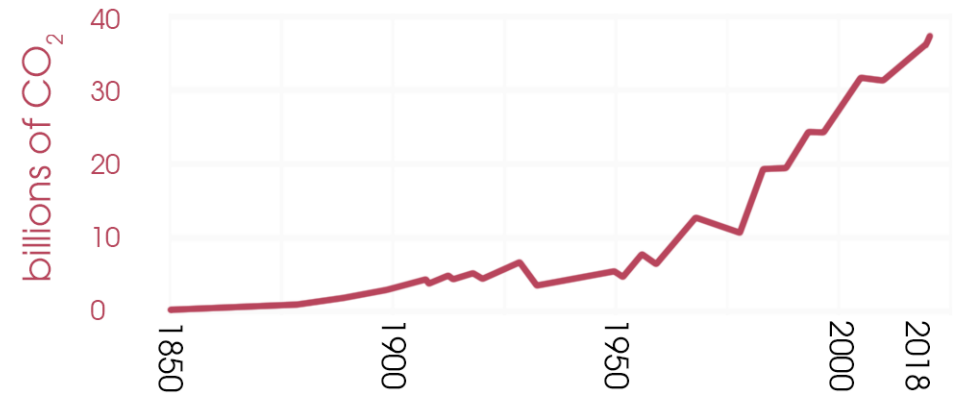
limits can be altered by means of technology and innovation to counteract the effects of the crisis and we can win.

To further understand and keep updated with climate findings, The Intergovernmental Panel on Climate Change (IPCC) is a reliable source. Now that we have established a brief understanding of the climate crisis, what effects have become apparent?

Effects of the Climate Crisis

In Los Angeles, data shows that temperatures have risen by 2.3°C between 1895 and 2018. This sounds minimal but these increases can cause extreme effects. As a global standard, “The United Nations Intergovernmental Panel on Climate Change warns that if Earth heats up by an average of 2 degrees Celsius, virtually all the world’s coral reefs will die; retreating ice sheets in Greenland and Antarctica could unleash massive sea level rise; and summertime Arctic Sea ice, a shield against further warming, would begin to disappear.” (Mufson, Mooney, Eilperin and Muyskens, 2019). Furthermore, we can expect heatwaves, higher intensity storms, floods, pests overpopulating, more frequent wildfires and droughts. This is distressing for vegetation and subsequently agricultural operations around the world, going into the future. The climate will no longer offer consistency,

Carbon Dioxide Emissions



Global Average Temperature

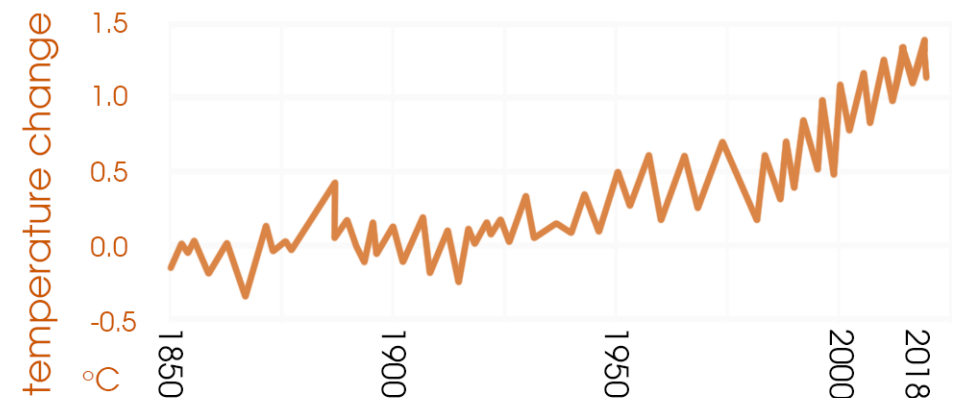


Fig 2 - Global temperatures have consistently risen with the rise in carbon dioxide emissions. (Gates, 2021)

making it difficult to find crops that can endure such dramatically varying conditions. Additionally, “Extra heat won’t be good for the animals we eat and get milk from, it will make them less productive and more prone to dying young.” (Gates, 2021). Food security is at risk with these changes to our climatic conditions.

Resulting Natural Disasters in Los Angeles

In California, annual rainfall is decreasing. The state has been in stages of drought for the past decade, leading to extended periods of wildfires in the region (Lloyd, 2021). Los Angeles was once absorbent and fertile, prime land to farm. It even had natural flooding and marshlands in places. As concrete and tar transformed the city into the metropolis we see today, stormwater was channelled into concrete arteries. The issue that arises when the earth is deprived of moisture because it is controlled and redirected, is dry and cracking soil, trees dying and subsequent erosion (KCET (3), 2019). “We paved the river... so we could have a stable real estate landscape. The irony is, of course, that when you pave the ground, the water runs off and you have an even bigger flood threat - you have to pour more concrete. Also, you dry out that ground.” (KCET (1), 2019).

“By the end of the century, soils in the southwestern United States will have 10-20% less moisture, and the risk of drought there will go up by 20%... Droughts will also threaten the Colorado River, which supplies drinking water for nearly 40 million people and irrigation for more than one-seventh of all American crops.” (Gates, 2021). This suggests an urgent shift to independence from the traditional agricultural practices in the region and an effort to reduce the need for freshwater for these practices.

As temperatures rise and foliage dries out, the threat and extent of wildfires in Southern California have been unforgiving and immediate to residents. With higher temperatures, lightning is a more common occurrence, igniting blazes. The dried-out trees become vulnerable to bark beetle infestations which further dry out the timber becoming a hazardous fuel for wildfires. On top of the effects of global warming, human negligence is also contributing to the issue in California as the necessary practice of controlled burning, to clean up excess dried out and dead foliage on forest floors, has not been implemented. Wildfires that used to be seasonal have become a year-round battle in recent years. The area effected yearly has statistically doubled since the 1980s. Evidence shows that 5 of the 10 biggest wildfires in the history of the region were recorded in 2020 (The Daily Show, 2021).

Average Temperature & Rainfall Per Decade in Downtown Los Angeles

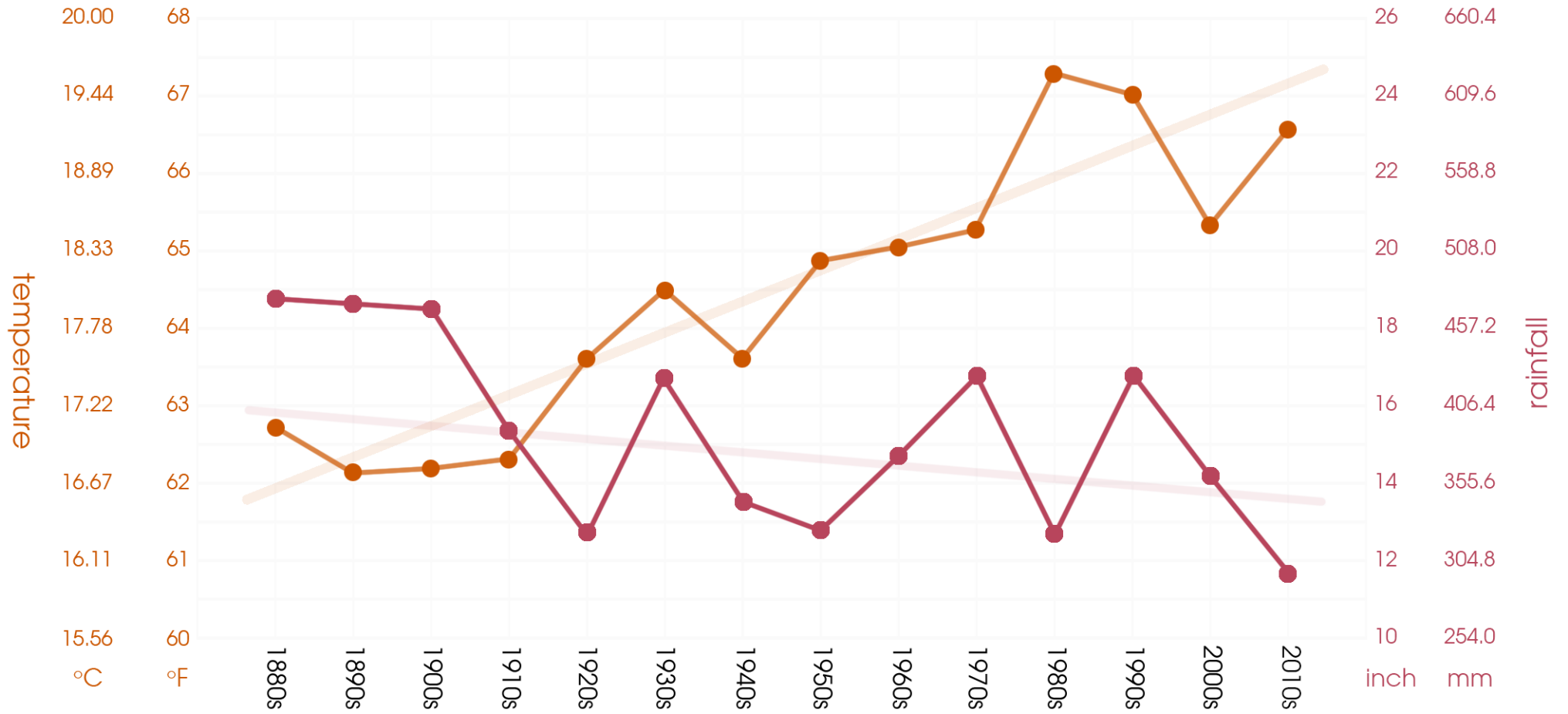


Fig 3 - Los Angeles has seen a rise in temperatures and a decline in rainfall over the past 14 decades. (LA Almanac, 2020), (LA Almanac 2021)

A positive finding in data by Los Angeles Almanac (2020), shows that regulations put in place around carbon emissions in Los Angeles has seen to a steady improvement in the region's air quality. This is vital for the overall health of the population.

According to data from the Franchise Tax Board for The State of California (2021), the most regular declared disasters are wildfires, extreme wind and fire conditions and earthquakes, along with rarely occasional severe storms, in the Los Angeles region. Although earthquakes are not a result of climate change in any way, the events are to be considered deeply for any project in the region as it is a common occurrence. According to data of the Los Angeles region, these seismic events have, inexplicably, been occurring more frequently and with higher magnitudes up until about 1999 – since then there has been a pause in activity eluding to the ominous build-up of pressure in the earth's crust.

'The Big One'

Residents of California are living in anticipation of the infamous "Big One", which is expected to be a devastating earthquake along the southern San Andreas fault line. Extreme quakes like these occur here every 45-230 years and there has not been one in 161 years. The devastation is initially caused by the quake but the aftermath is just as catastrophic.

After the event, fires and explosions will break out across the city. This is expected due to the complex network of municipal gas lines to each household at risk of being disrupted and igniting. In a similar way, the water supply pipes will be damaged and tap water will be deemed unsafe to consume for approximately 18 months after the event. In precedent, there may be looting and violence as desperation and shock is characterised.

On top of these factors, major roadways out of the city may be damaged and residents may not be able to leave the region for months (Champion-Nicks, Euceph and Knaufl, no date).

Any building introduced in the area must structurally consider the event of 'The Big One'. The urban farm will also secure food production within the city that can sustain the community in the case of road closures.

Disaster Frequency on record in Los Angeles

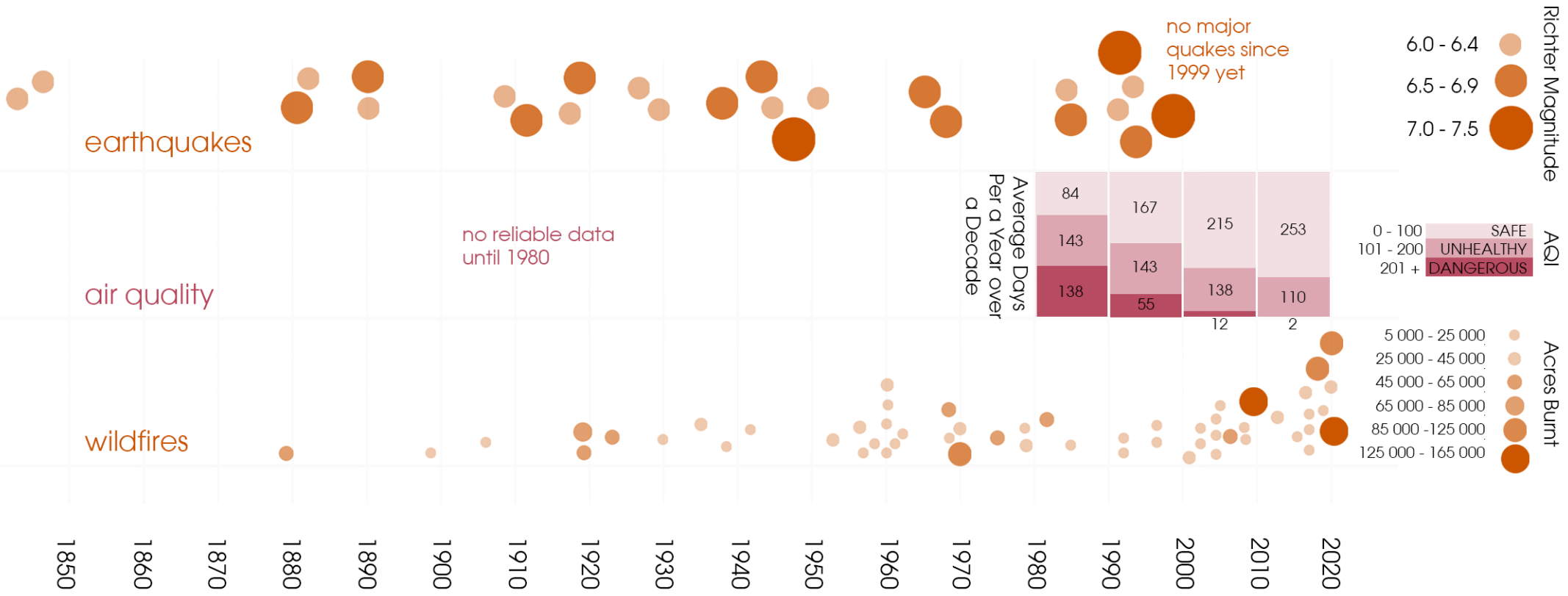


Fig 4 - Data showing the increase in frequency and magnitude of earthquakes up until a sudden stop elluding to an ominous predicted release of pressure in the near future. Air quality improving over the last 50 years thanks to regulations around air pollution. Increasing wildfires in size and frequency as region gets more dry. (LA Almanac, 2019), (LA Almanac, 2021), (USGS, 2020)

Commercial Farming

'Commercial farming' is the label given to the farming of animals or crops at a large scale for food or goods, for a profit. This industry is particularly wasteful.

The practice of arable agriculture takes up a massive extent of land which encourages deforestation, soil erosion and contamination of soil and water sources (Conserve Energy Future, 2021). In this farming method, a lot of water and many chemicals are used to make the plants grow faster and resistant to pests. Despite all of these negative attributes, the arable commercial farming industry is still a somewhat natural method of growing and one of the great benefits is that the crops use energy from the sun, which is free and frequent, so no further energy is required. The scale of these farms have forced these practices to move to the outskirts of major cities or to regions that are not urbanised at all, causing a need for large-scale distribution of goods back into the urban settlements.

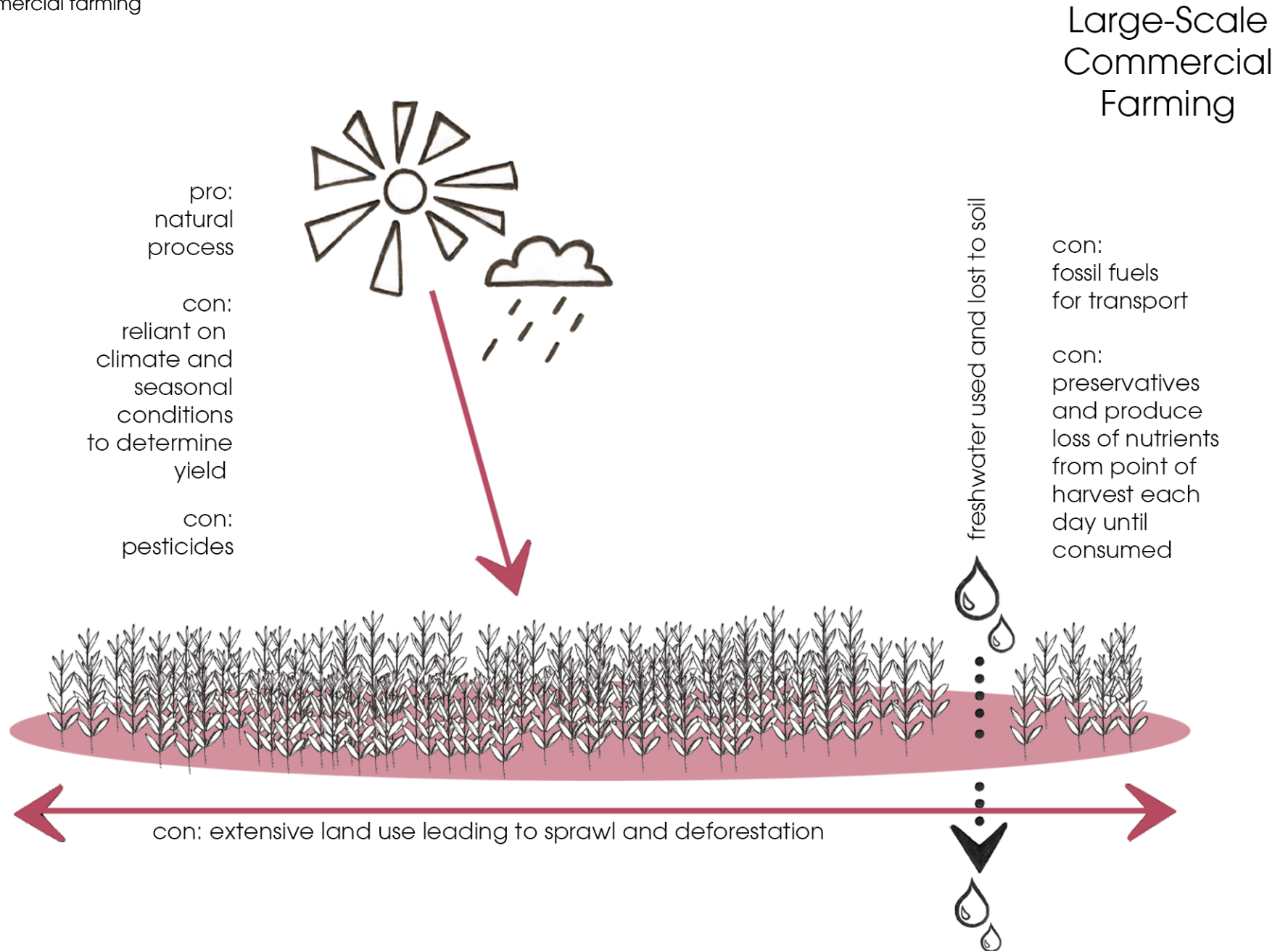
Urbanisation + Distribution

Not only is agriculture having to move further away from the city, the fertile farmable land is being occupied by urban growth. "We are in direct competition with our vegetables. People and vegetables like the same kind of climate. We thrive in the same places."

(KCET(1), 2019). The land to farm on is physically disappearing under the concrete of our cities. A perfect example is in Los Angeles where the region used to be an abundant agricultural landscape. "(H)ere we have the most urban county in the nation that was once the most agricultural county in the nation." (KCET(1), 2019). So, the area that once supplied fresh produce to other states across the nation, now imports produce to feed its population.

The Central Wholesale Produce Market had initially been developed when Los Angeles was primarily agricultural landscape, to help local farmers to distribute their produce. Now a few more wholesalers exist to keep up with higher demand for fresh produce in the densely populated city (KCET(2), 2019). Today these wholesale markets are used as a link in a far more complicated distribution process. Farms are harvested far away, the produce is brought into the city with trucks and sorted, packaged, labelled at the wholesale market. It is then distributed further to public markets and grocers where it is bought by consumers and taken to their residences or restaurants where it is finally consumed. The wholesale markets do aspire to reduce as much waste as possible but unfortunately the waste in such a long distribution process is still substantial. "You have millions of tonnes of fresh produce coming through our city every single day and right here in our midst we have people who are hungry, people who don't have access to healthy food. So, we have the infrastructure, the infrastructure is there

Fig 1 - Pros and cons of large-scale commercial farming



to feed everybody. It's a question of distribution and allocation of resources. And our priorities." (KCET(2), 2019). Food Forward is a company that collects goods that are due to be discarded. "There is always a surplus of food, especially perishable products." (KCET(2), 2019). This company will fetch the produce, inspect it and redistribute the food that is still edible to the less affluent areas and food banks of Los Angeles to ensure it does not go to waste and this

demographic is also receiving nutrient sustenance. The rest is discarded.

When food is discarded it is not just the edible product that is wasted but the fossil fuels used to deliver it, the pollutants put into the soil by growing it with pesticides and fertilisers, the packaging and the large amount of water that goes into the food through the duration of its growth.

Fig 2 - Los Angeles agricultural landscape prior to urban development from Fort Moore Hill. (Anon., circa 1862)



Agriculture & Urbanisation

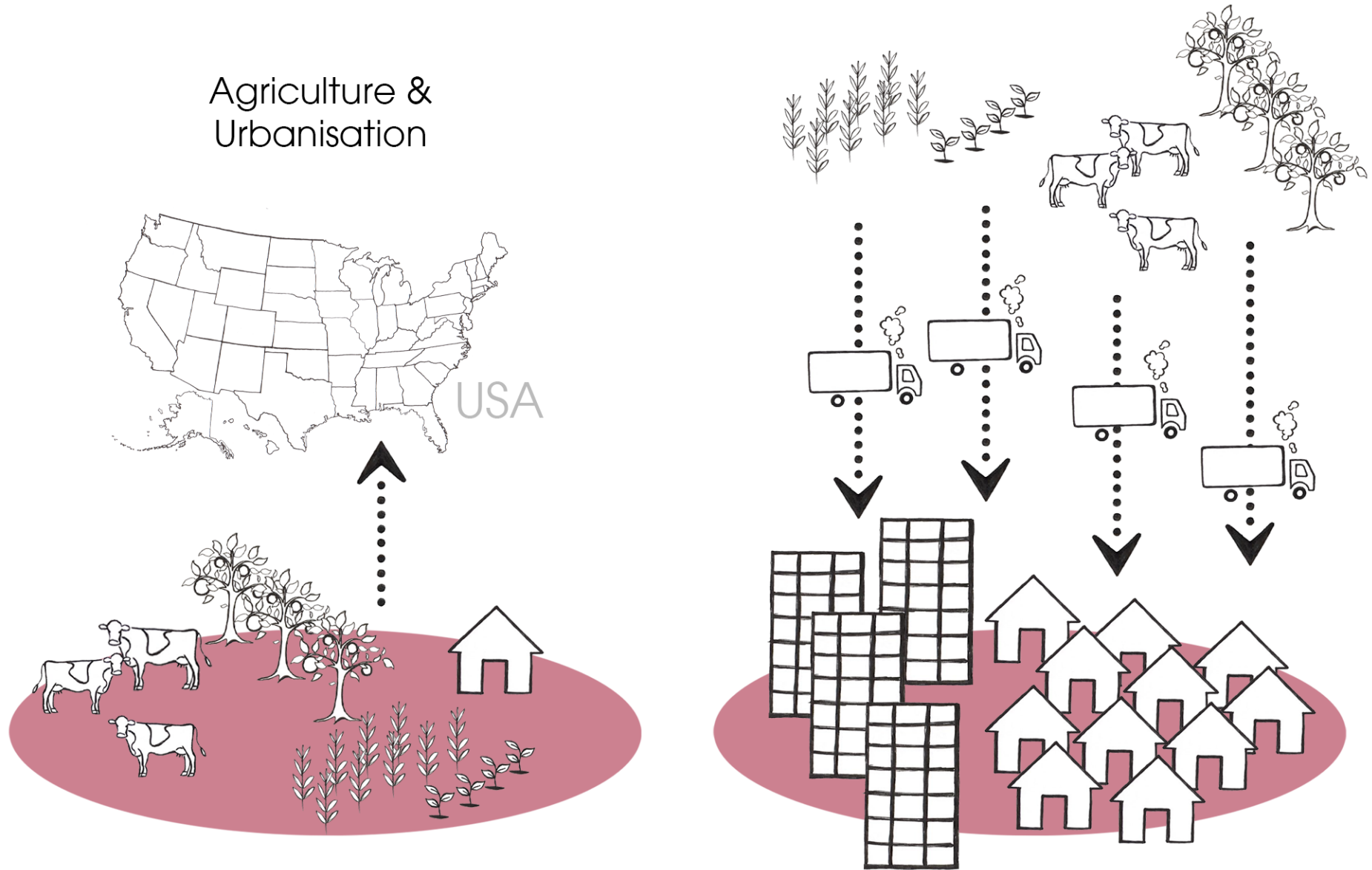


Fig 3 - left: represents historical agricultural export out of Los Angeles
right: represents urbanisation of Los Angeles and the subsequent need to import agricultural goods.

Issues in Large-Scale Produce Distribution

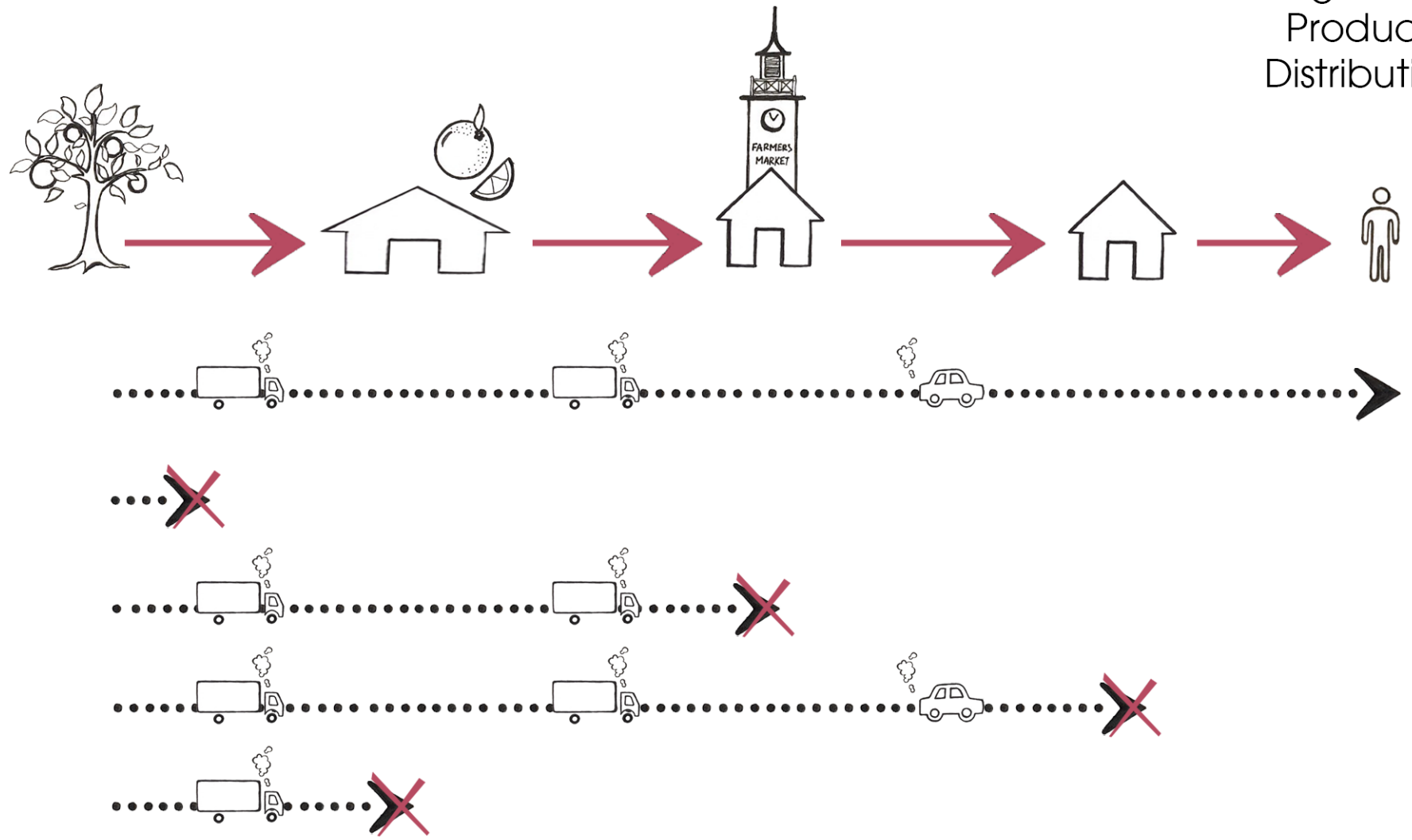


Fig 4 - Diagram showing that produce does not always get to the consumer because a lot of food is wasted along the lengthy distribution process due to expiry and damage.

Water

Agriculture contributes to about 70% of freshwater usage in most countries, this does include both crop and livestock farming combined though (Khokhar, 2017). This is a distressing statistic when taken into account the limited global freshwater resource our planet has to offer.

All the water on earth covers 71% of the surface and these bodies are shallow. The oceans make up 97% of this source. Only 3% of this water is fresh and a substantial amount of that is held up in icebergs, glaciers, the soil, the atmosphere or is highly polluted. That leaves us with just 0.5% freshwater for humans to farm with, use in industry and consume (Bureau of Reclamation, 2020). So, considering the agriculture industry is using up approximately 70% of this small amount of consumable water, a rapid change is imperative.

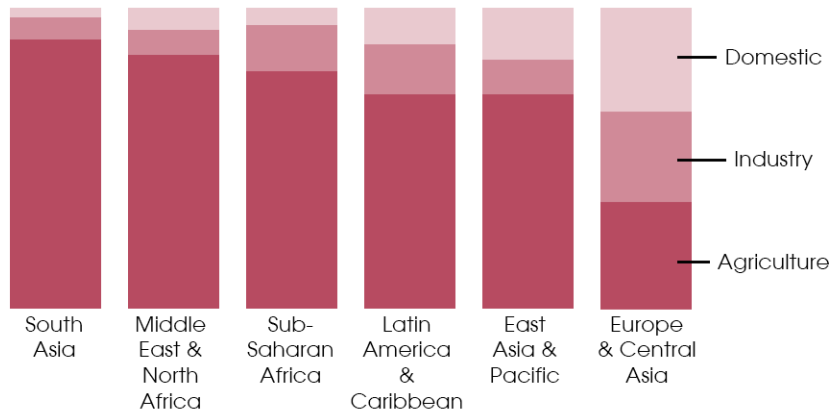
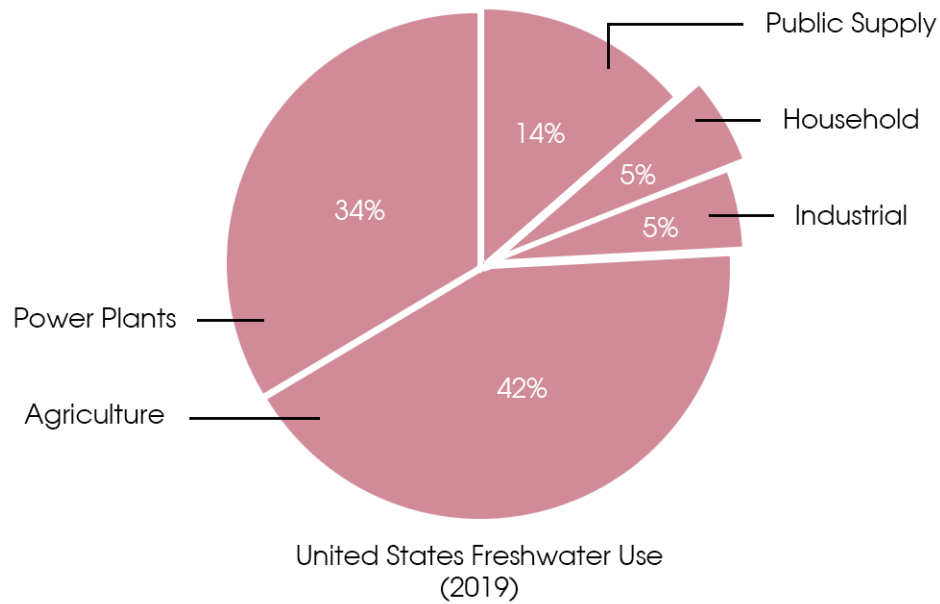
The conclusion is that agriculture is using too much of our water supply for the planet to sustain and replenish its sources, and the practice must be redesigned to accommodate a sustainable approach. A similar approach must be considered in the greenhouse emissions caused by global agricultural practices.

Emissions

The agricultural sector emits 10% of America's annual greenhouse emissions, according to the United States Environmental Protection Agency (2019). There are various ways agriculture can emit greenhouse gases thus contributing to the climate crisis.

Soil management releases nitrous oxide and other gases - which accounts for over half of the total greenhouse gases emitted by the agriculture sector. Livestock is the second largest contributor, producing methane in enteric fermentation processes - making up a quarter of emissions. Livestock manure management and burning crop excess also contributes to methane and nitrous oxide emissions. Different treatment and storage methods can affect how much of these gases are produced. This accounts for about 12% of the total greenhouse gas emissions (United States Environmental Protection Agency, 2019).

As discussed in *Climate + Imminent Disaster: Understanding the Climate Crisis*, these harmful gases must be reduced to protect our future growing and living capabilities. There are many changes to our agriculture and consumer habits that can be made to assist in limiting the effects of climate change.



Global Freshwater Resource and Use in Agricultural Sector



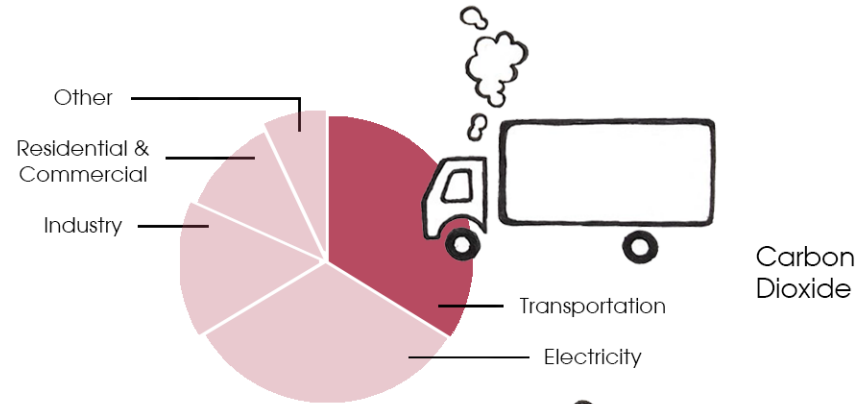
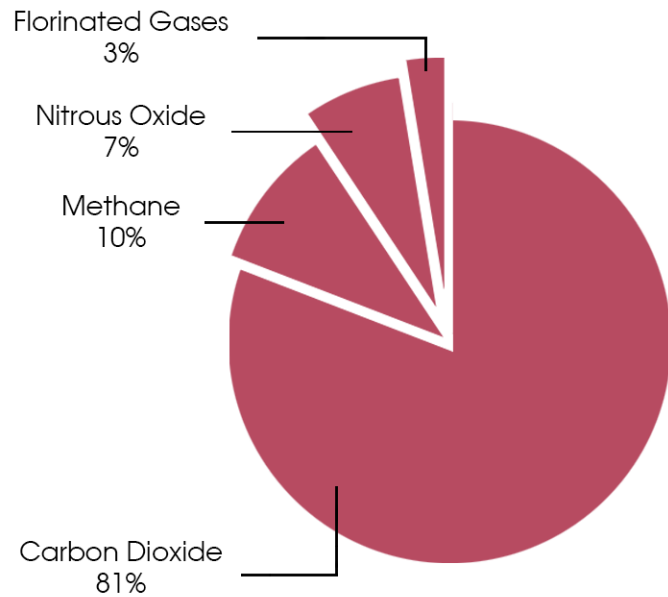
71% of Earth's surface is covered in water

2.5% of this water is suitable for human consumption

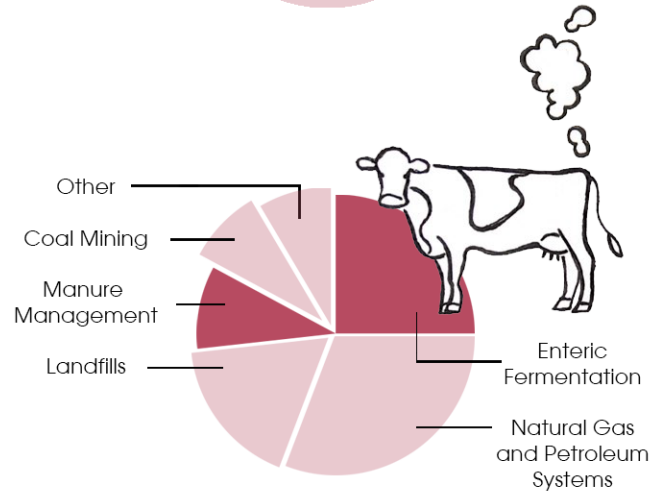
<1% of that water is accessible to us

Fig 5 - The limited freshwater resource we have left on the planet is improporionately being used in the agriculture sector. (Climate Central, 2019), (Mann, 2020), World Bank Blog, 2014)

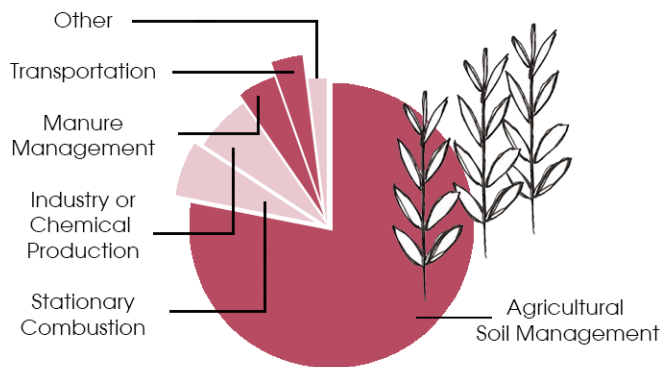
Contribution of the Agriculture Industry to Global Greenhouse Gas Emissions (as of 2018)



Carbon Dioxide

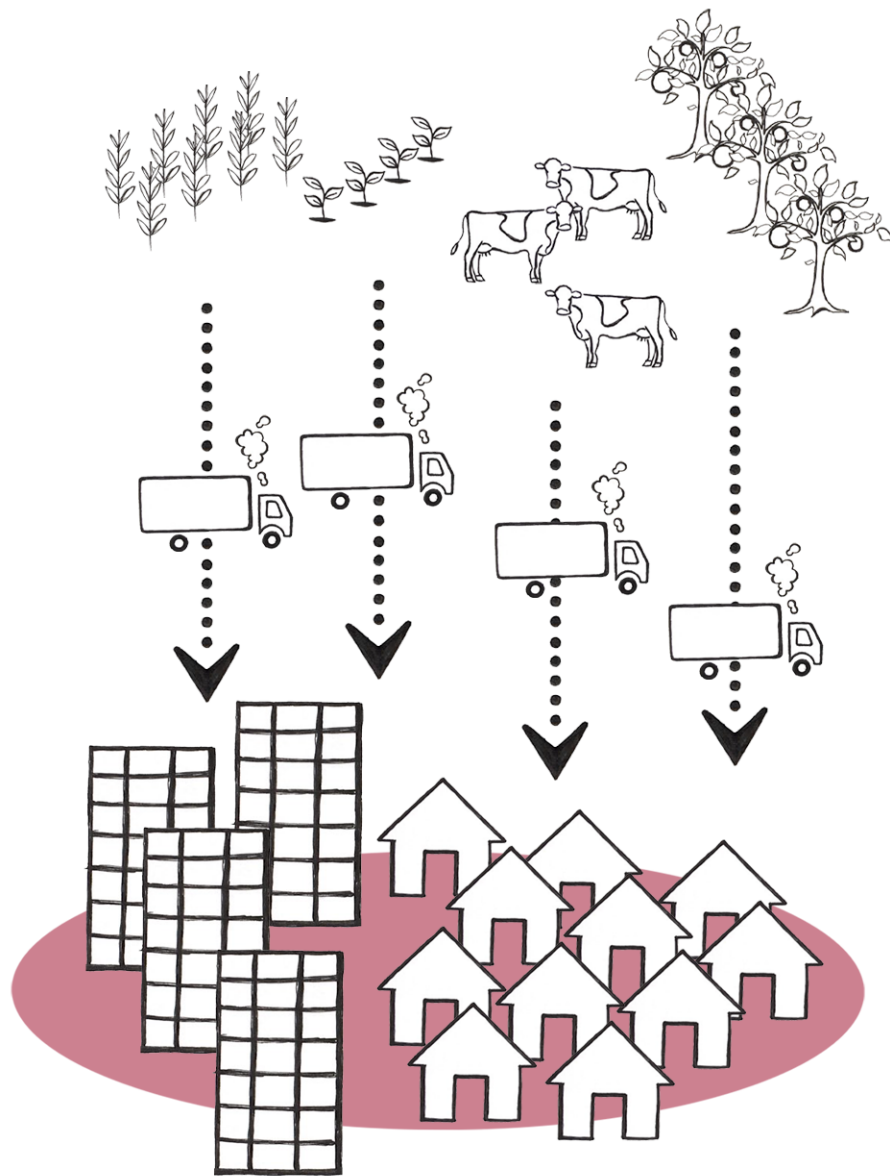


Methane



Nitrous Oxide

Fig 6 - The agriculture industry is a major greenhouse gas emitter. (United States EPA, 2019), (United States EPA, 2018)



Urban Farming/ Agrihood

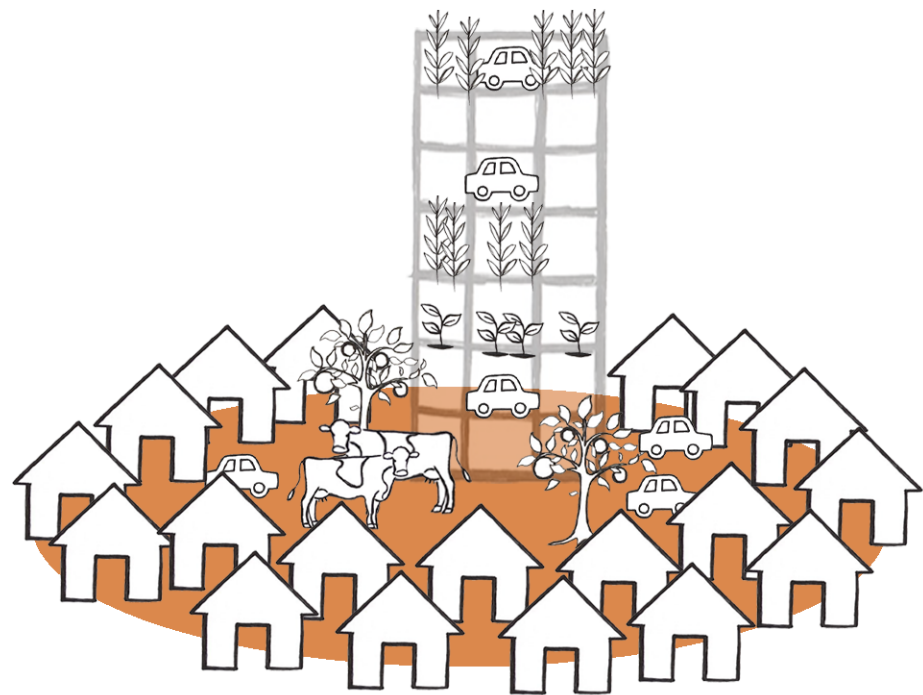


Fig 1 - left: represents urbanisation of Los Angeles and the subsequent need to import agricultural goods.
right: a future vision of bringing agriculture back into the urban environment for proximity, food security and sustainability.

Urban Farming

As the inevitable effects of the Climate Crisis set in, food and water will become the most precious commodity to the human race. The lives we lead in urban settlements today, removes us from the skill, knowledge, space, and equipment we would need as individuals to sustain ourselves if the agriculture landscapes and food supply networks had to fail abruptly. It is time to start learning and testing new methods of food production and distribution to avoid global starvation.

Although we cannot humanely stack livestock farming, we can stack plant-based produce growing facilities. Vertical farming can be achieved with a number of systems including hydroponics, soil-based, aquaponic, aeroponics and more. The environment built to house the system would typically be a greenhouse or a controlled environment agriculture (CEA) unit – which is a sterile enclosed unit. Any of these combinations allow for more control over growing methods used. Everything can be controlled and adjusted including temperatures, seasons, water usage, humidity and more, resulting in less waste of water and much greater yields. Most importantly, the smaller footprint of the farming practices allow agriculture to return into the urban environment.

The urbanisation of Los Angeles that had previously expelled agricultural facilities to the outskirts of the city and to other regions in the nation, can now benefit from raw food production brought back into the city. The placement disrupts trends of long-distance distribution and the food is delivered to the customer while is it far fresher and more nutrient rich. There is more ability to succeed in container-less grocery store concepts or allow for less durable but more sustainable packaging options to be implemented thus reducing single-use plastic production.

The placement of the farm allows transparency with consumers because they are more directly connected with the food they are eating and the processes that would usually go unseen. This forces the farm into sustainable and responsible practice through theory of surveillance. The proximity also promotes farming as an “urban job”, raising wages for employees and encouraging the youth to learn more and contribute more to the food production industry.

Right now, controlled environment agriculture is still too expensive to set up for the concept to rapidly catch on to global markets. The cost comes from setting up the expensive equipment, which is a once off payment, and the energy consumption of the farms in operational costs. The water and distribution

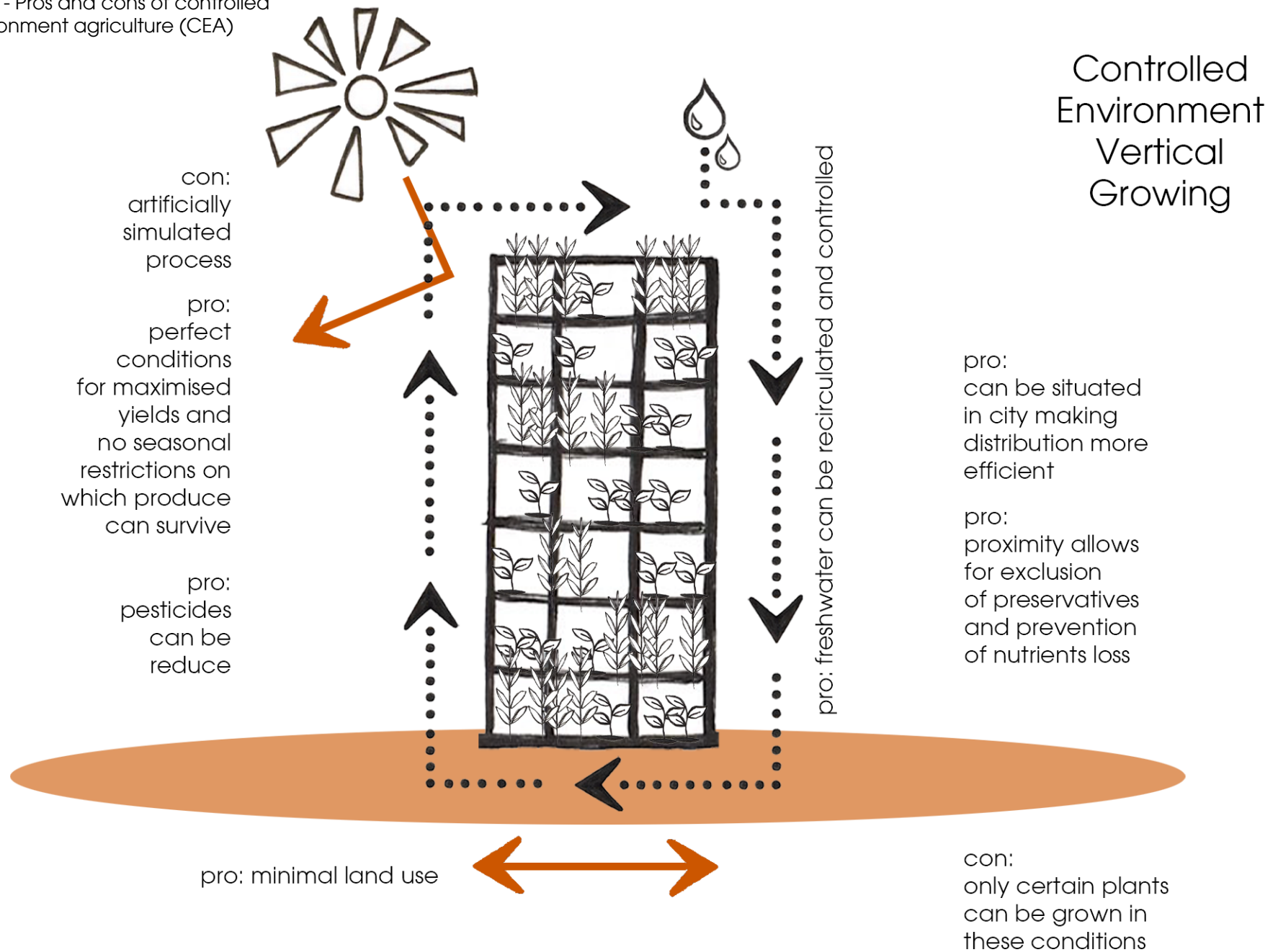
costs are far lower than traditional farming and the produce is sold at competitive prices to traditionally grown produce in stores. As the world sees an added pressure to change to clean energy and the equipment to do so becomes commercialised - costs will fall. The electricity costs will fall too as technology advances in the sustainable energy industry.

I was interested to find, via interviews with Emma Coz and Anya Rosen who are Urban Growers at SquareRoots, about the types of plants that thrive in these conditions, the turn-around time of specific plants and the processes and equipment involved. They brought to my attention the spatial needs of an urban farm. For further control of temperatures and prevention of contamination, compartmentalisation of the farm is a key design consideration. In terms of my proposed urban farm produce grocery, I was enthusiastic to learn about how the carbon emissions from the fossil-fuel-run cars may affect the urban farm. As explained by Coz, carbon dioxide is a valuable gas when it comes to farming. The controlled environment farms require carbon dioxide, which is currently bought in tanks, to be pumped into the containers. This allows an opportunity for me to further consider a design that hosts the symbiotic relationship between the car culture in Los Angeles and the introduction of the urban farm. I have been able to understand the reticulation of water, air, gases, electricity, produce,

waste, staff and customers required for my design to operate through consultation with the experts interviewed in this section.

The controlled environment agriculture building is the future of sustainable produce and food security. Once tried and tested methods have evolved it will likely become the most viable option for commercial agriculture in many instances which will make a positive impact on the fight against the hold of the 'climate crisis'. The success of such a farming method is reliant on successful architecture that can practically host the necessary programme while understanding the factors of efficiency required.

Fig 2 - Pros and cons of controlled environment agriculture (CEA)



Agrihood Produce Distribution

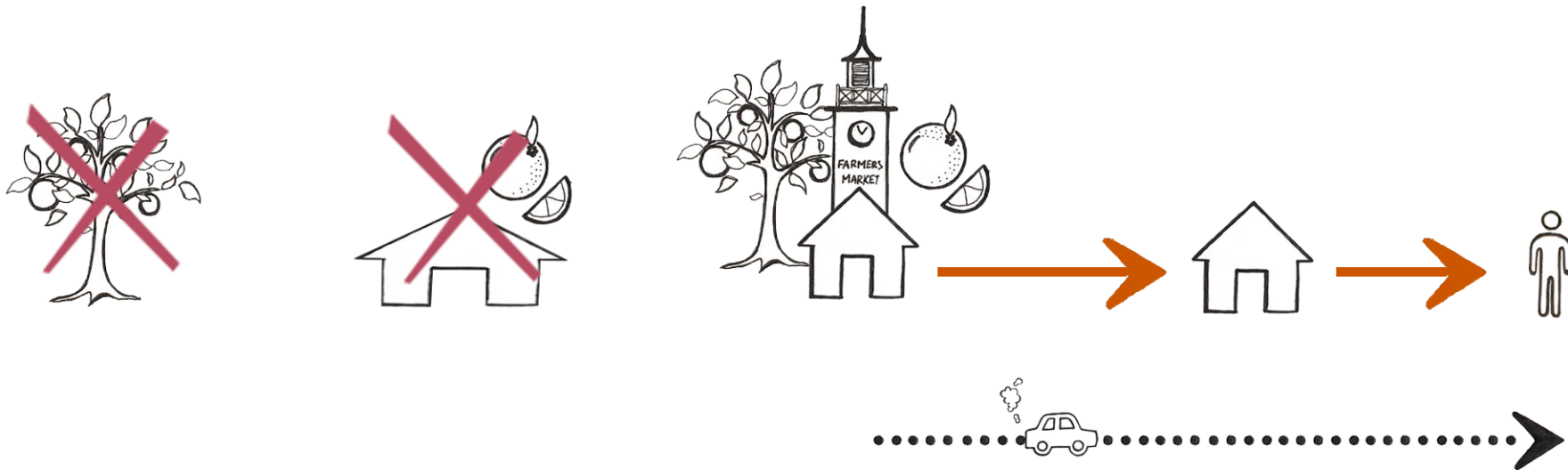


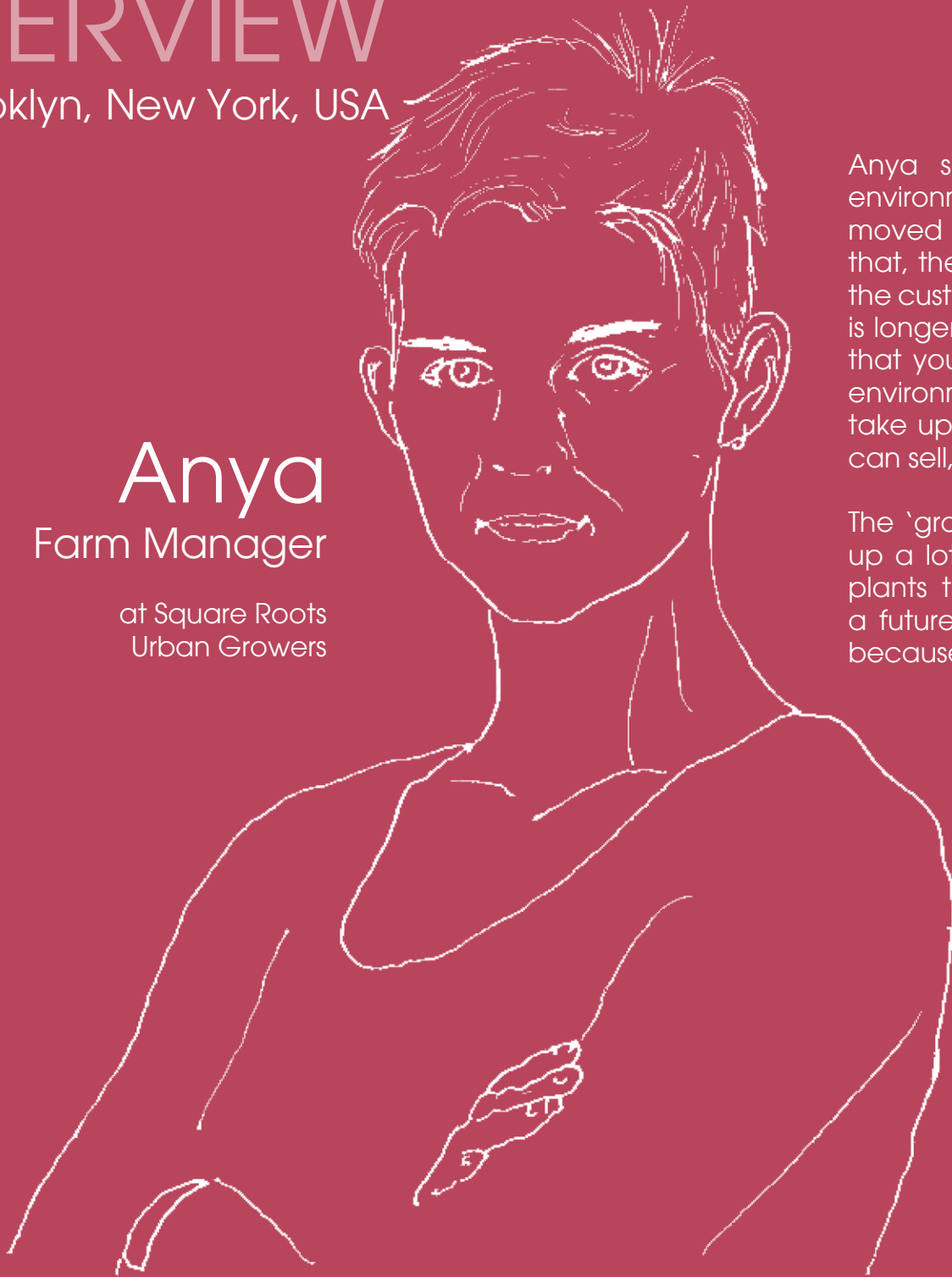
Fig 3 - Diagram showing that by moving farms into the city, produce can get to the consumer because food is not wasted along the lengthy distribution process due to expiry and damage.

INTERVIEW

Brooklyn, New York, USA

Anya Farm Manager

at Square Roots
Urban Growers



Anya says that one of the pros of controlled environment agriculture (CEA) is that “(it) can be moved into urban environments and because of that, the distance the food needs to travel to where the customers purchase it is very short. So, the shelf life is longer, the food can be fresher.”. Anya explained that you are limited in what you can grow in these environments and plants with large fruit or crops that take up a large amount of space per produce you can sell, should be avoided.

The ‘grow lights’ used in this method of farming use up a lot of energy and cause a great expense, so plants that grow quickly are preferred. Anya sees a future with both CEA farms and traditional farms because the expense of starting a CEA farm is still very expensive. “(N)ot everybody can just plop a farm down in the middle of a parking lot, and say “here we go, this is the farm.”, you know. It’s expensive, it’s just as expensive as running an outdoor operation. There’s still a barriered entry.”.

Anya explains that for CEA, you need a structure like a closed room or a greenhouse. If it is completely closed and well-insulated, it will be easier to control the heat but still take a lot of energy. If you use a greenhouse, the sun is doing a lot of the

work so you don't have to have the lights on as often but you may have to have more A/C intervention in the summer. So, there are pros and cons for both. Different plants require different and climates.

Square Roots saves water by recirculating water through the system for 2 weeks before flushing it out and introducing fresh water. There are filtering processes in place.

Anya talks about pests as a great threat. Compartmentalisation and constant cleaning are methods to help mitigate them. "At the end of the day, it's more expensive to create a facility that can really protect you from the outside. It's cheaper to create a facility that's vulnerable but if you create a facility that's vulnerable, then you're going to pay for it eventually down the line."

Anya says that there are perennial and annual crops, meaning some plants live and provide produce for a year and others keep on giving for many seasons.

Square Roots uses a vertical plane system that saves a lot of space but makes it more challenging to grow some plants that have weight. On this plane, you have to provide a structure that holds the plant and delivers water and nutrients. "The nutrients come from mineral salts. There's no soil." These systems are called

"grow media". "In outdoor growing you have soil ... (which is) organic matter (and) has density, volume and structure... part of the design of the growing system has to consider (this)."

Anya grew up in California. From her experience she has noted that "(One) can see exactly where there are irrigation systems set up... it's very green and everything else around it where there's no irrigation is brown and dead. There's just not much water there anymore." Ironically there are still fruit trees being grown in the region despite water shortages, just because it is economically viable, which she views as irresponsible.

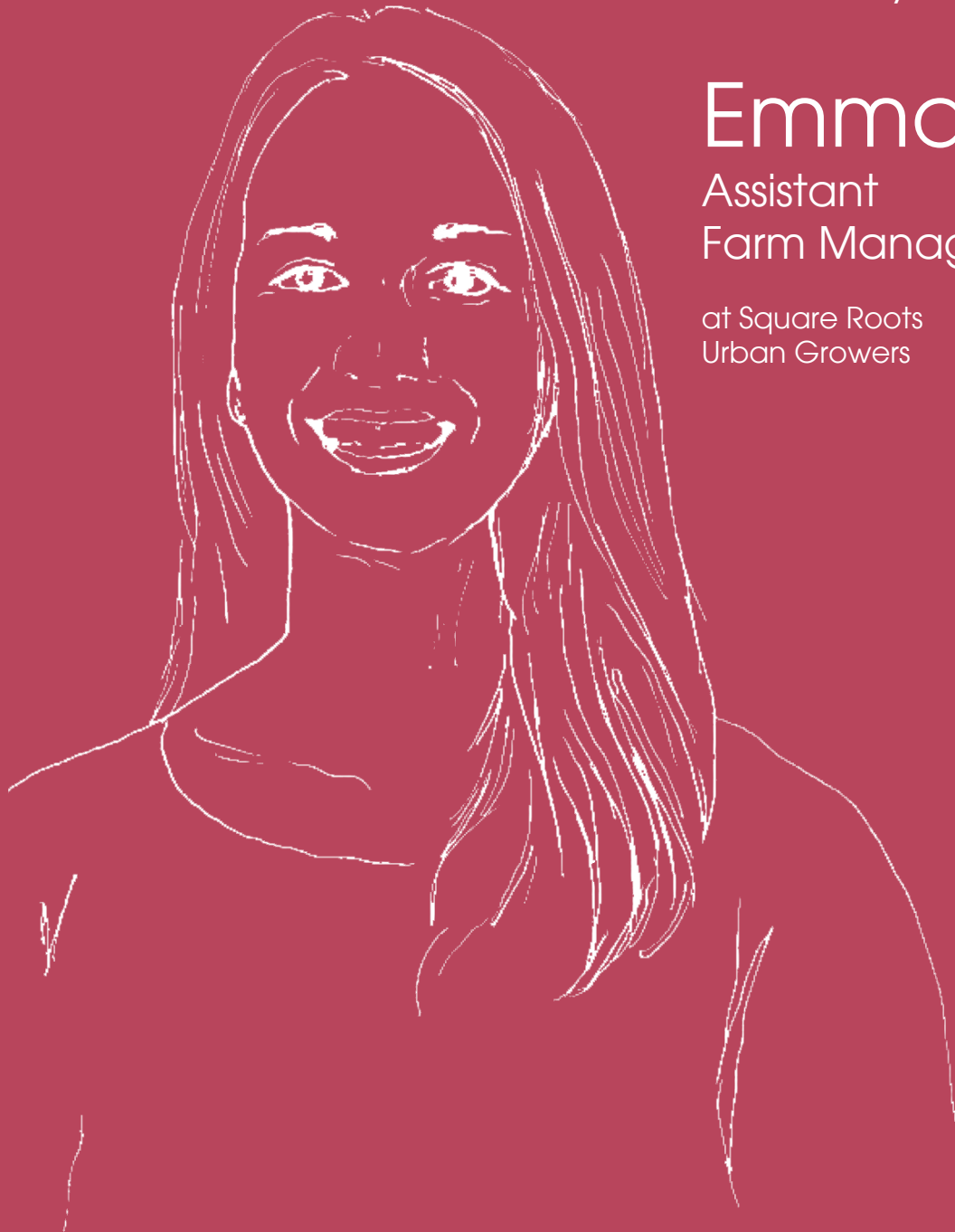
When asked about community engagement within the farm, Anya suggests that the experience for the public and the CEA farm have an element of separation because the farm must be kept sterile.



(full Interviews found in Appendix i)

INTERVIEW

Brooklyn, New York, USA



Emma

Assistant
Farm Manager

at Square Roots
Urban Growers

I spoke to Emma about the relationship between the carbon dioxide emitted by the cars in the urban farm that I am designing, and the plants. She says that Square Roots usually has to buy CO₂ to put into the containers. So, the extra CO₂ from the cars that interact in the proposed space for my design can actually be seen as a positive. The gas helps the plants photosynthesise faster.

Emma explained that CO₂ is heavy and so it sinks. It is also still safe for the farmers to work in the farms where the CO₂ levels are high.

Square Roots is able to farm without pesticides. Their modular approach to the layout ensures that an entire yield is not wasted if a pest gets in because they can just clean out one container to solve the problem.

Emma says that every space where you are manipulating the environment, to achieve a specific climate, is extremely expensive. Especially in larger urban metropolises because real-estate, electricity and labour are more expensive. This is why urban farmers prefer to grow crops that have a higher turnover. "If you can turn over one pound of anything in seven days and then you can sell it, you're not going to want to turnover one pound of another crop in 28 days. So, microgreens are really cost effective

because they grow so quickly, they have a high price point and you can get more money out of a container over time.”.

When considering which plants to grow, Emma suggests that you remember that “anything that’s heavy, all that mass has to come from somewhere.”, this means you need to feed the plant more nutrients and let it grow for longer in an energy intensive system to achieve that mass.

The nutrient solution they use is a salt solution which is not the best option in terms of sustainable acquisition. Organic alternatives, however, usually come from animal byproducts but Emma says that they “cannot put those fertilisers into our system because you would be putting in an unregulated biological factor that could have a negative impact”. Controlled Environment Agriculture needs to be quite a sterile process.

Another wasteful factor is “overproduction” which is never the intention but can often occur. But Square Roots does try to donate and compost the excess where possible.

The water that recirculates through the farm eventually gets flushed from the system. Emma explains that you can make this water into a usable grey water by

putting it into a ‘bioswale’. “You could put it into a mass of land that is made to absorb the waste, which is what a bioswale is.”. Square Roots tries not to put any harsh chemicals into the system in the first place.

The air-conditioners and dehumidifiers can be associated with Legionnaires Disease, a bacterial illness that can be treated with antibiotics. To avoid this from being contracted through the plant produce, the ‘condensate lines’ are controlled so that this water does not re-enter the circulating water system. It can be treated and reintroduced later.

Emma advised that my design considered a modular approach and the filtering systems discussed including separating the cleaning and plant supply water sources. She suggests I use a ‘nutrient film system’ (NFT).



(full Interviews found in Appendix I)

INTERVIEW

Johannesburg + Mossel Bay
, South Africa

Gilbert
Independant



When asked about urban farming in the South African context, Gilbert said, "It's definitely something we're going to be looking at, I think, as a community or as a country in the future... the expansion of urban development is gaining momentum.". He talks about the issues around implementation in this country being primarily around high energy costs and the lack of sustainable electricity. He also notes that we have the technology to address this but we need to start using it on a broader scale.

Gilbert has designed a few prototypes based on the urban farm concept in containers. "The production that comes out of that little 12m or 20m container will provide a whole estate with produce. It takes up minimal space.". He says that it is a financially viable option when you consider that the system is "...a once off purchase. Everything is recyclable. Your water saving is phenomenal."

Gilbert also believes the timeline of implementation in South Africa will depend on the skill factor in technology surrounding the practice. But he says that when the parameters are already set up, the system is relatively self-sustaining.

In discussion about future opportunities, Gilbert points out that "with this whole move to work-from-home, we're going to have a lot of redundant

buildings.”. He goes further by explaining his personal imagined concepts where abandoned shopping mall infrastructure could be reused in an efficient aquaponic farm scheme. He talks about redundant office blocks and the opportunities available if a verticality in town planning is considered. He proposed 3 storey townships. The ground level for shop interfaces, the middle for residential use and the top for production of food and product. “I mean, if we look at what we are spending now and the corruption to be solved, if that all went into proper development of these townships, we would have a massive turnaround on the economy. In this concept, there’s no transport costs for the residents - they work from home and business comes to them.”.

In his farms, Gilbert uses natural substitutes for nutrient inputs and pesticides. He sprays the plants with a chillie and onion spray in cases of infestation - he says that this does not affect the taste of the produce because a minimal amount is used and it has time to dissipate before consumption.

Gilbert is interested in aquaponics specifically. This is based on a relationship between the fresh produce farm and fish farming. “...(I)t’s totally added nutrient free. In hydroponics, you have to add the nutrient mix to the water to provide feed to the plant, but in aquaponics, you grow fish in a tank and you feed them and the fish create a nutrient mix for the plants. So, you feed the pond water into the plants and while

it’s there it gets filtered by the plants and comes back to the fish again as clean water. The growth rate, because it’s in a controlled environment and there are no predators, is phenomenal. You can sell the fish too. You’re getting your fish and your fresh vegetables out of one system. It’s fantastic. It is so simple and yet so effective.”.

He has grown a range of fruits and vegetables in these systems. He mentioned peas, tomatoes, spinach and even produce as large as pumpkins.

Automation in the urban farming industry is becoming a popular topic of research. “I’ve been working on a system where everything will be controlled by solenoids and you control anything anywhere from your phone or your tablet through an app. I can just see the whole world moving that way.”.

As we discussed mushrooms and how they differ in controlled environment requirements, I learned that used coffee grounds are a well pH balanced nutrient for mycelium growth. This introduces an interesting prospect for the introduction of coffee growth and a cafe at the proposed interactive farm.

Gilbert believes it will still take about another 10 years for urban farming practices to become common place in the South African context.

(full Interviews found in Appendix i)

Energy Source Capabilities

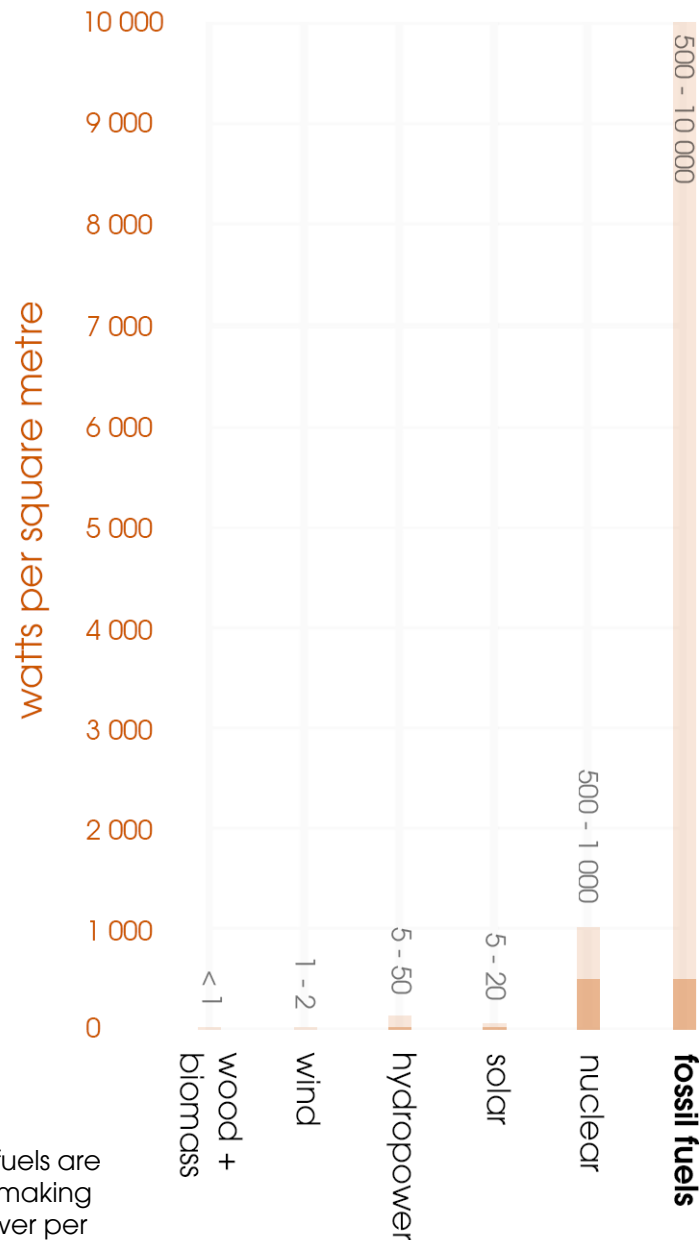


Fig 1 - Fossil fuels are currently still making the most power per square metre by far. (Gates, 2021)

Sustainable Building Practices

The base rule for understanding how to build sustainably is to accumulate knowledge of each design element and ensure the most responsibly sourced, long lasting but natural products are used. The aim is to reduce as much waste, distribution emissions, and future residue as possible. Consideration for human safety and the ecological environment are a priority.

To do this, we need to start building more conservative footprints that can reduce the amount of materials and energy consumption of unsustainably sourced energy. "In America, buildings consume a significant amount of natural resources and therefore contribute to approximately 73% of overall electricity consumption, and 38% of CO2 emissions.", according to the Earthava Team (2021). Although, in the words of Bill Gates (2021), "There is nothing wrong with using more energy as long as it's carbon free.". (To understand the methods of energy production and their supply per spatial requirement as of 2021, see diagram).

Elements of building that help reduce, absorb and store carbon could be mechanical interventions like a direct air capture system (DAC), that allows you to capture carbon dioxide from the air and store it. Naturally, trees can be used in the same way.

Materials that are locally sourced and renewable are better for distribution and sustainability purposes. Building in the existing urban environment reduces sprawl and means that resources and infrastructure are often readily available and so, negating the need to introduce more from elsewhere. Sustainable material is often dependant on the site-specific availability and regional resources. So, what materials would be considered in a sustainable approach to building in the Los Angeles context?

Materials + Sustainability Rating

Timber

mass timber 7/10
orange tree 10/10

The California Building Standards Commission (CBSC) has recently adjusted regulation to allow for, and encourage, widespread mass timber multi-storey construction. The new regulations would allow construction of timber buildings of 9 to 12 storeys (Pacheco, 2020). California does have a logging industry that provides the region with local timber

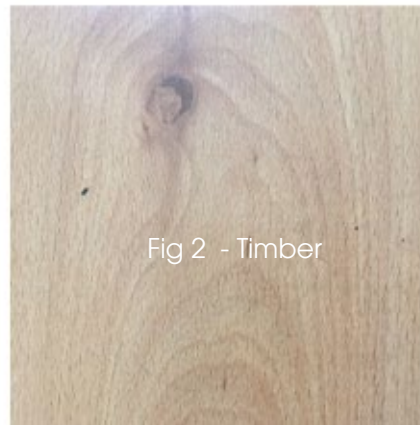
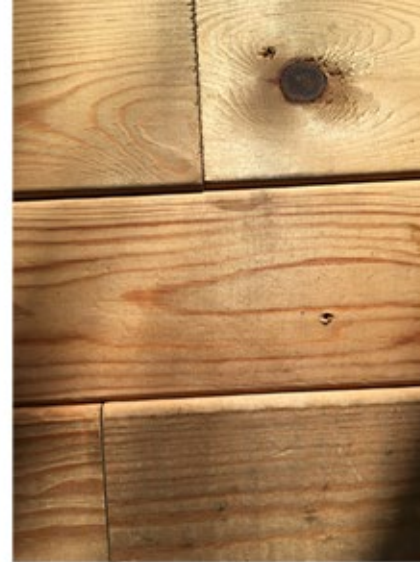


Fig 2 - Timber

options. Timber is renewable but in this context, is an industry based in a region with water shortages. On the other hand, the industry is seen as an opportunity for timber forests to replace some of the wild forests thus cleaning up the forest floors and reducing fuel for wildfires to occur (Daniels, 2018). Building with timber rather than burning it can reduce carbon emissions by storing carbon in the structure. Building with timber in large-scale buildings will shift the demand and therefore encourage this market to thrive – reducing the use of the higher carbon footprints of concrete and steel construction (Pacheco, 2020). The discarded mature orange trees from the many groves in the area, generally go to little use and are put into piles in the desert and left to dry out or rot away. Using these redundant trees and storing their carbon would make a positive environmental impact. The orange tree provides a good quality hardwood but is often looked over for building purposes because the trunks are relatively small and so produce small timber members. The wood could be manufactured into laminated beams and used in construction. The timber is light in colour and the detailed wood lends to a fascinating patterned surface. The factors that affect the mass-timber sustainability rating negatively, is the land and water this industry requirements.

Bamboo

9/10

Bamboo is technically not a timber but rather a fibrous material that belongs to the grass family. “Bamboo just might be the perfect sustainable alternative to wood... In fact, bamboo is one of the fastest-growing plants on the planet... It’s not just the speedy growth rate that makes bamboo sustainable. For construction purposes, bamboo can be harvested up to every 3 years; in contrast, trees can only be harvested every 25-50 years (depending on the tree species). The rise in popularity of bamboo has helped allow forests to regenerate, and will continue to do so.” (Elemental Green, 2021).

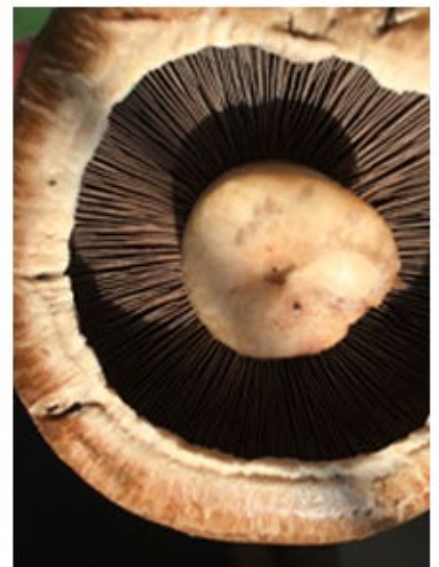
Biocomposites + Agricultural Waste

most agro-waste 10/10

A new trend in construction and materiality has been finding use in the excesses and waste products from the agricultural industry. This usually includes some form of offcut or by-product of these industries. Experimentation includes a multitude of materials, even crushed egg shells in masonry and biofuels made from redundant plant-matter, that could allow the damaging agricultural industry to contribute



Fig 3 - Plants and potential bio-materials



positively to sustainable practice.

Insulation is usually made of fibre glass or other such synthetic material. Sheep wool offers a natural alternative, "... (it) has a 10% greater insulating factor and is able to absorb, retain and release moisture and still keep its thermal properties. You will be warmer in winter and cooler in summer." (Elemental Green, 2021). It has also been said that sheep wool has properties that improve air quality by absorbing harmful chemicals out of the air. "Wool is also naturally flame resistant, sound deadening, non-toxic, and biodegradable at (the) end of (its) life.". This is a sustainable process as sheep need to be regularly sheared anyway. Another alternative is 'mycelium' which is the vegetative underground network associated with mushrooms. This product has been introduced as a building material option "that (is) stronger than concrete, more insulated than fiberglass, and completely compostable... Plus, mycelium grows without light underground, meaning no external energy source is needed for growth." (Elemental Green, 2021). The mycelium products can also be used as chipboard/ particleboard. "Not only are these boards cheaper, stronger, and lighter than traditional particleboard, they're also completely compostable - and they can be modified to repel invasive pests and molds... (and) they contain no harmful chemicals." (Elemental Green, 2021).



Concrete

new concrete 5/10
recycled aggregate 6/10

Concrete is commonly used in construction and its presence is not always replaceable. The materials it is made up of are plentiful but “the production of portland cement, an essential constituent of concrete, leads to the release of significant amounts of CO₂, a greenhouse gas. (P)roduction of one ton of portland cement produces about one ton of CO₂ and other GHGs.” (Naik,2008). Due to this and the water usage in concrete construction, the material must be used sparingly. In the proposed design, concrete that is carved away from the existing structure will be processed and reused to act as an aggregate where new concrete may be necessary.

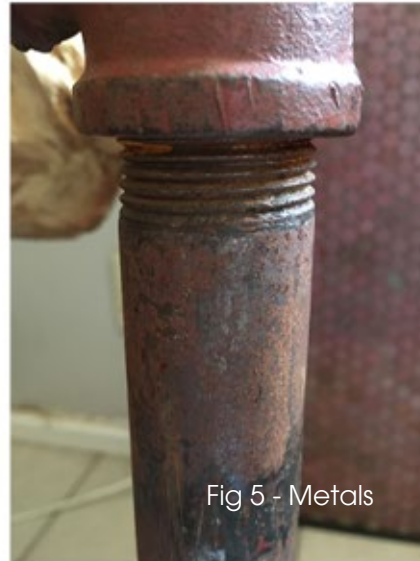
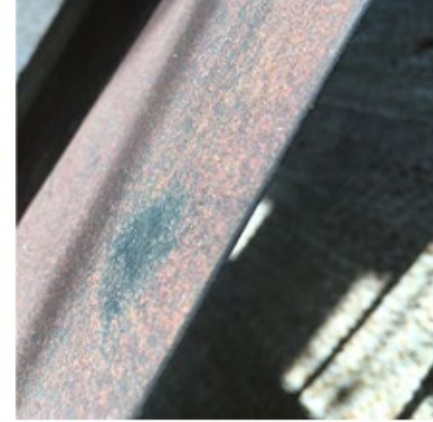


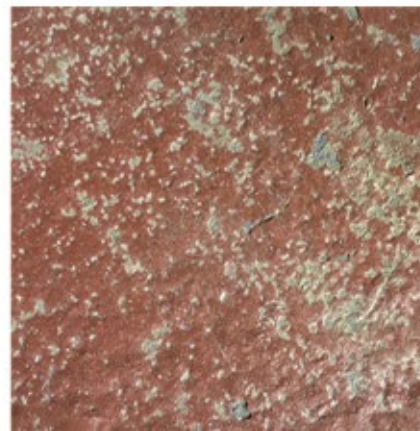
Fig 5 - Metals



Steel

7/10

Steel is not a renewable source but it is sustainable in terms of its lifespan. “Steel can be recycled an infinite amount of times and be used with NO downgrading in quality. The non-renewable resources used to make steel, like minerals and fossil fuels, are not wasted



because the steel will be used forever.” (Kathy, 2020). The strength of steel allows it to be used sparingly. Again, it’s the carbon emissions that bring down the sustainability rating. “On average, 1.9 tonnes of CO2 are emitted for every tonne of steel produced.” (Bellona, 2019). This material will only be used for structural support in the proposed design as it would be unnecessarily wasteful to use steel for aesthetic purposes.

Rammed Earth

9/10

This technique is not new but it is making a trendy comeback with the rise of sustainable design. It gives a beautiful feature sediment giving it an aesthetic allure. The material is sustainable in terms of the use of, usually, locally-sourced earth. Then with added applied pressure a durable, hard surface is created. A minimal amount of binder or cement is used and so, rammed earth is not a carbon intensive process. “Rammed earth walls (or even floors) can be used as thermal storage, allowing the sun to warm them in the day and then slowly release the warmth in the cool evenings.” (Elemental Green, 2021). The same rammed earth technique has now been incorporated into a modular masonry option. “These blocks use waste materials from quarries to create a low or even zero cement blocks which can be installed by any

mason.” (Elemental Green, 2021).

Masonry

earth pressed 9/10

clay energy storage (long-term) 9/10

Pressed earth bricks are popular as a sustainable building material because they use natural abundant resources and do not require baking which incurs an energy consumption impact. An alternative in a sustainable approach would be to use red bricks, which are usually made of clay and are some of the most commonly used bricks globally. These bricks need to be baked but offer a future sustainable incentive. It has recently been discovered that these clay bricks, after being mildly modified, can become energy storage units like batteries. Solar energy charges them up in the day and the retained energy can be transferred into use in lighting and devices. The red pigment is crucial to the success of this theory. The modified brick is called a “capacitor brick” or a “smart brick”. “(T)he proposed method could generate substantial amounts of renewable energy. Researchers estimated that 50 capacitor bricks would take 13 minutes to charge and could provide enough energy to power the emergency lighting of a building for at least 50 minutes.” (TheCivilEngineer.org, 2020).

Glass

8/10

Glass can be fully recycled indefinitely, its contents are easily sourced and non-toxic, therefore it is a sustainable building material. The downside comes in with the rate at which we are using sand that makes up glass because it is generally not desert sand but rather riverbed and seabed sand that is being collected for glass production. This disrupts ecosystems and could potentially cause erosion and shoreline flooding (Kellogg, 2020). "Glass is heavier than plastic, and breaks much easier during transit. This means it produces more emissions in transportation than plastic, and costs more to transport." (Kellogg, 2020). Additional issues include the energy needed to produce the extreme heat used to turn the sand and other contents into glass. Overall glass does not have a major chemical or permanent impact on the environment but, like all other materials in sustainable building practices, moderation is key.

In summary, all materials and space should be considered invaluable and respected in the design process. We can make more informed choices about the materials we used, how they were produced and where they come from.

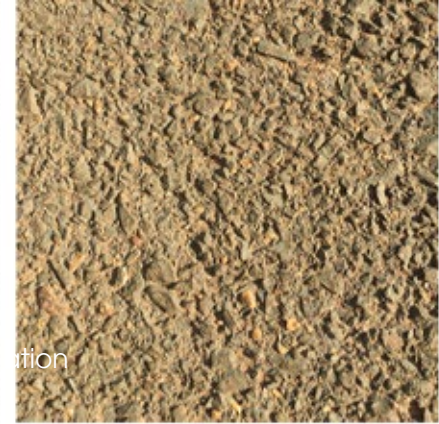


Fig 6 - Combination of Materials including glass, fabric, brick, tile, plaster and stones





Valuable lessons are learned from other design interventions that address urban farming, growing systems, community impact, building methods, logistics and aesthetics.


PART 01A research

AGRICULTURAL

Square Roots Urban Growers

 Brooklyn, New York, USA +
Grand Rapids, Michigan, USA

 Unknown

 Vertical Hydroponic Farm,
Commercial and Experimental

 founded 2016

 Focus : Working Vertical
Farming

I have personally visited the Square Roots Brooklyn Campus Farm through a guided tour in 2019. The farm is set up in an unassuming parking lot in Bedford-Stuyvesant, Brooklyn, New York. Upon arrival the shipping containers seemed like a storage facility but as I approached, I was met with a luminescent pink glow through the window of one of the farms. The farmers were all young, in their 20s which made them relatable. They were passionate about the work they

are doing to bring fresh greens through sustainable practice into their city.

The tour sparked my interest in the effects of agriculture in the climate crisis as I was informed of the wastefulness in the traditional agricultural industry. The controlled environment vertical hydroponic farming methods used at Square Roots allows produce to be stacked and take up far less land. Water can be recirculated and so uses far less water. The environment can be heated, cooled and lit as necessary so the plants can grow all year round. Another major benefit was that the encapsulated farming activities allows the farm to omit pesticides from the operation. The proximity to the client base means the produce truly is fresh and full of nutrients.

The modular approach gives these farmers great control over each individual farm in their operation. More can be added or moved at any time and if one module is contaminated, only one container's yield will be affected.

Outcome

From a design point of view, the most powerful tool this farm uses for security, control and productivity is compartmentalisation. I appreciate their transparency, allowing the public to visit their facilities.

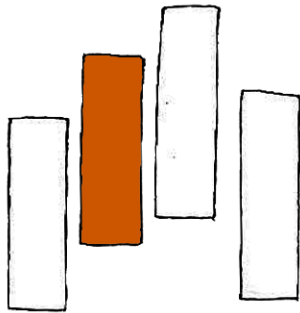


Fig 2 - Square Roots Farms are scalable, resilient, smart, and can be built fast. (Square Roots, 2019), (Image: Via Chicago Architects + Diseñadores)



Fig 3 - Produce at more than 200 stores across the Midwest and New York City. (Square Roots, 2019)

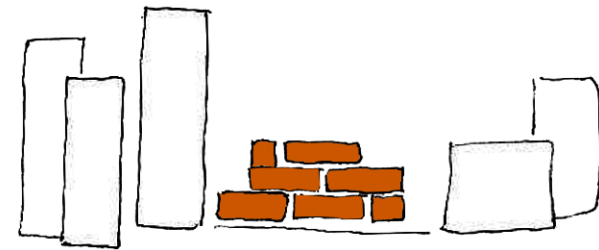
Fig 1 - Square Roots Brooklyn Campus. (Square Roots, 2019)



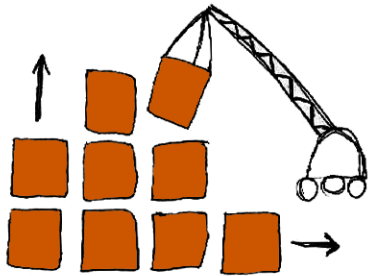
the farm is set into
320sqft shipping
containers - the
modular structure
means there are
actually many
separate farms



glass windows allow
members of the
public to interact
with the farm,
boosting interest
in the concept,
with no threat of
contaminating the
farm



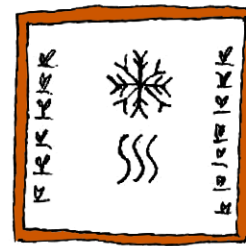
the modular structure
allows the project to
become a prototype that
can easily fit into the urban
landscape - for example, in
open parking lots or even
stacked into alley-ways



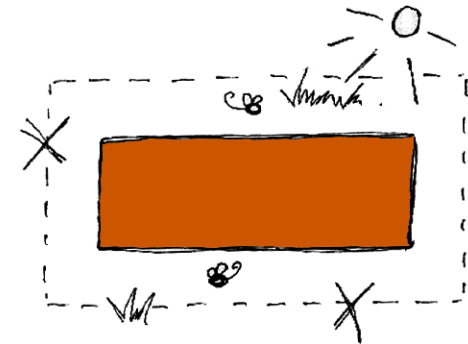
the farm is easily
scaleable and
re-locateable



the shipping
container
walls must
be used to
optimise
the growing
space and
so, vertical
hydroponic
systems are
used



having smaller
separate contained
farms makes it easy
to maintain many
different growing
environments at
the same time,
increasing the
diversity of the
plants that can be
grown



a noted issue of this layout
is the lack of an interim
space between the
controlled environment
farm and surrounding
natural environment which
could be a cause for
contaminants and pests
entering the farm


Gotham Greens

On Top of WholeFoods

 Brooklyn, New York, USA

 Unknown

 Commercial Scale Urban Greenhouse

 20 000 ft²

 2013

 Focus : Working Vertical Farming

The structure of this greenhouse is traditional and simple. It is simply constructed and replicable. The form could be adjusted to suit many urban settings. The rooftops in New York City alone provide abundant opportunity for this intervention. This greenhouse above a WholeFoods, is located in Gowanus on the same street I lived in for a year in 2019. Although I had visited the grocery store, the

greenhouse was somewhat disconnected from the experience. Its height above the ground and the opaque facade means that the public cannot see in. The farm does however provide an online virtual tour (found at: gothamgreens.com/journal/virtual-tour/).Pre-recorded video explain the operation, including their planting, technically advanced climate control, hydroponics, harvesting, packaging, pest management and delivery processes. Gotham Greens says they own 11 acres of greenhouses across the United States and produce the same yield as 400 acres. This farm, in particular, has a relationship with the store below. The farm supplies some fresh produce directly from the plant straight onto the shelves where consumers can retrieve it in a timely process. The farm consists of one large controlled environment so the area takes longer to heat/cool and all plants grown need to be equipped to grow in the set climate.

Outcome

The simple replicable structure is a positive. The farm having a direct relationship with the store below removes many wasteful steps in the distribution procedure. The greenhouse was not capturing to the public because customers could not interact with the farm in any way and this should be addressed. Not compartmentalising the farming operation could jeopardise the entire crop.



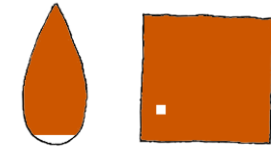
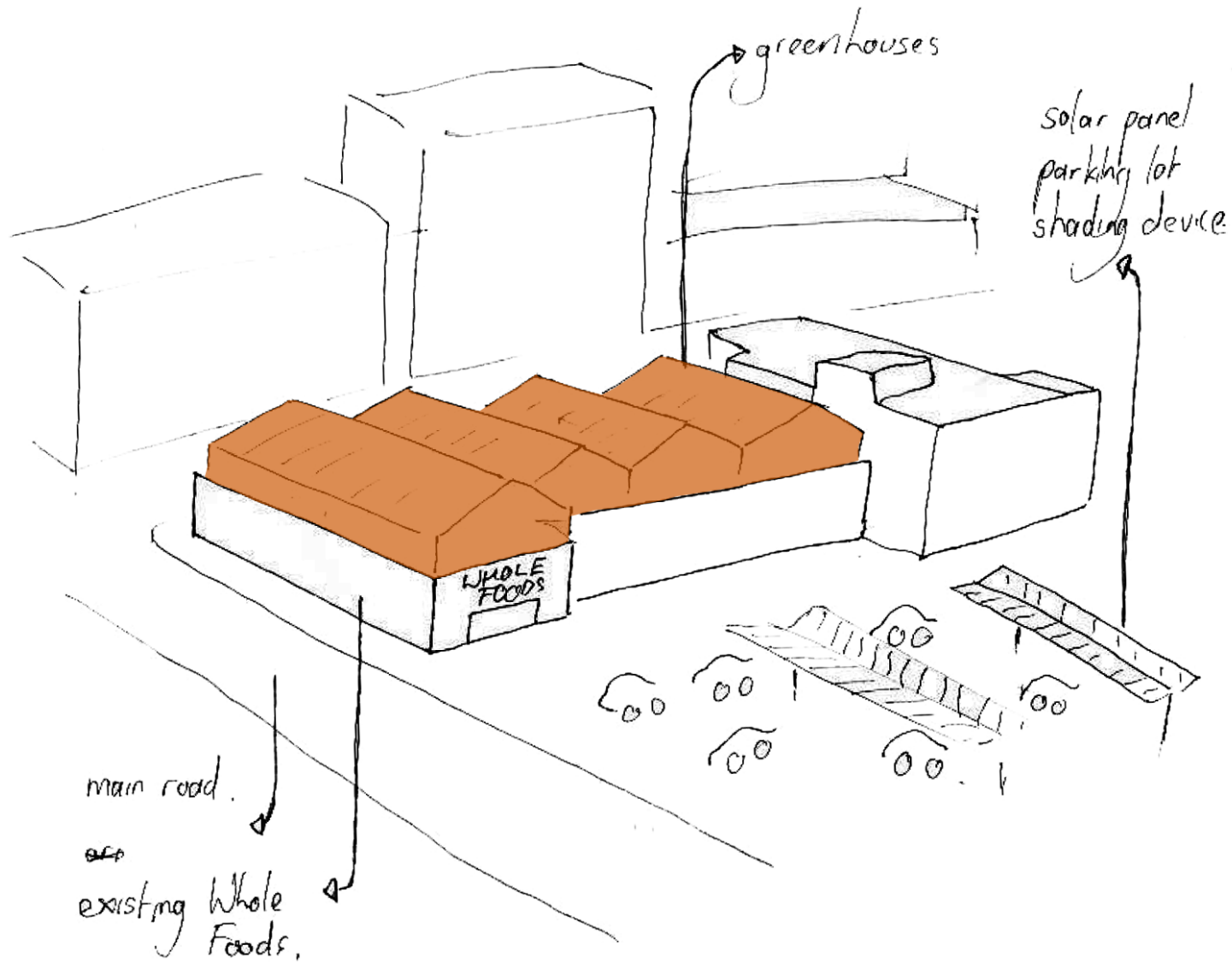
Fig 4 - Gotham Greens Greenhouse. (Gotham Greens, 2020)



Fig 6 - Various Gotham Greens Packaged Products. (Gotham Greens, 2020)



Fig 5 - Greenhouse Above WholeFoods in Relation to NYC Skyline. (Gotham Greens, 2020)



the system uses
95% less water
and 97% less land
than traditional
farms

the Gotham Greens
greenhouse sits
above WholeFoods,
to whom they sell
a large amount of
their produce



greenhouses can be built on top of most urban flat rooftops or within existing structures

a nutrient film technique (NFT) is used to get nutrients into the plants through the water they absorb



the farm consists of one large controlled environment so the area takes longer to heat/cool and all plants grown need to be equipt to grow in the set climate.



greenhouse structures trap warm air inside the farm but if the temperatures increase above the requirement, ventilation windows are opened



this farm is horizontal, although real estate is saved by building above other buildings as well as increasing the yield per farm footprint through efficient growing methods




one large controlled environment also means that the entry of a pests or contaminants could jeopardise the entire yield

Ilimelgo Reimagines Future of Urban Agriculture

 Romainville, Paris, France

 ilimelgo SARL d'architecture

 Vertical Urban Farm Concept

 1 000 m²

 2017

 Focus : Vertical Farming
Concept and Layout

This project was a conceptual design for a competition and so, conclusions cannot be drawn about the success of the urban farm operation itself. The building, however, is modern and more permanent than a traditional greenhouse structure. With a footprint of only 1 000m², the building can integrate seamlessly with its urban context. According to Zorn,

A (2017), the pitched roof is designed to match the architecture in the area. Organic building materials, such as straw bale and wood fibre insulation, have added to the sustainability of the project. Large steel I-beams create a frame for the structure and concrete slabs are set to create levels to stack agricultural efforts. "The building is split into two wings to aid crop growth..." (Zorn, 2017). The verticality and central void through the centre of this building allows it to act as a single space in terms of natural ventilation and natural light.

Zorn, A (2017) says that the ground floor of the building is for interactive and educational workshops as well as a market to sell the produce from the farm. The upper floors are organised using troughs to house different species of plants. There is also a henhouse and laboratories that experiment with seed germination in the building.

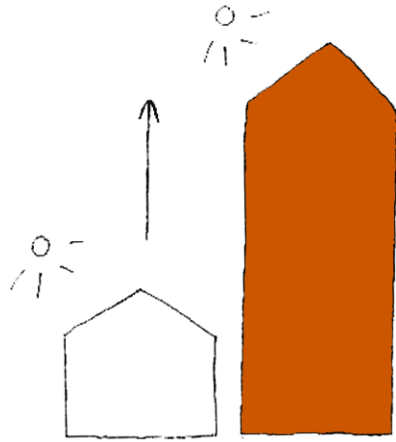
Outcome

Unlike the previous case studies, this farm does not have a high-tech climate control system but works with natural elements which is intriguing. The use of natural materials such as straw bale and wood in the design is unique and resourceful. The mixed agricultural activities in the building shows the range of agricultural activity that can co-exist.

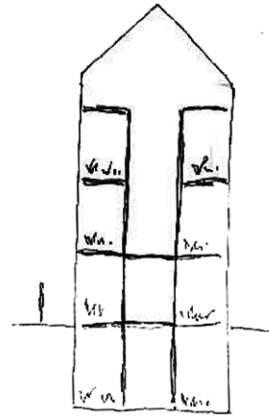


Fig 8 - Interior Concept for Vertical Urban Farm. (Ilimelgo Architects, 2017)

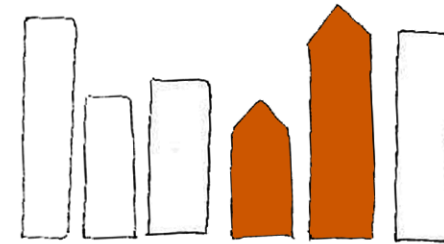
Fig 7 - Greenhouse Exterior Casing for Urban Farm Concept. (Ilimelgo Architects, 2017)



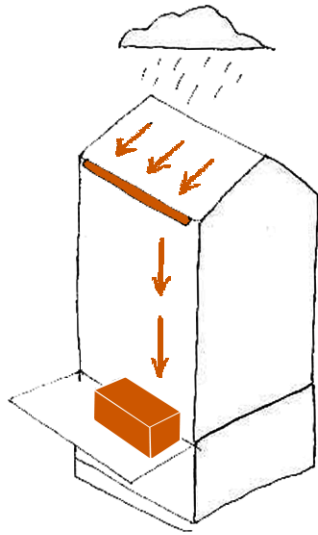
the form of this urban farm mimics that of a traditional greenhouse but stretched up to provide a commercial scale growing device



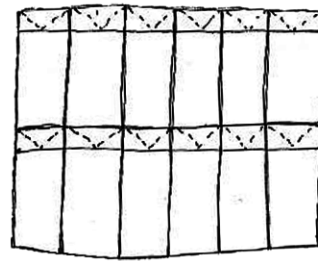
the structure is simple and symmetrical, using steel I-beams to house the floor structures for growing and the glazed exterior to create the greenhouse effect



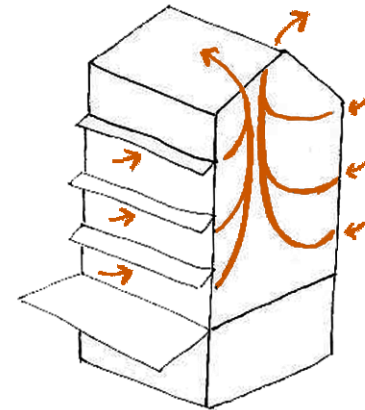
the form blends into the urban landscape through verticality and modern design



the roof is sloped
to direct rainwater
into catchment
devices to aid in the
water supply to the
hydroponic systems
the building hosts



smaller openable
panels are
incorporated into
the glass facade ...



... this is to
encourage the use
of natural ventilation
to cool the farm
when necessary

HomeFarm for Aging Population

 Singapore

 SPARK Architects

 Vertical Farming and Residential Complex Concept

 2014

 Focus : Vertical Farming Concept and Layout

In another conceptual example, this project shows a plan for a large-scale mixed-use residential, commercial and agricultural centre for an urban retirement population in Singapore. The design layout highlights the use of the vertical planes of the architectural landscape as usable growing space. The residents are encouraged to interact directly with and consume the produce from the farming systems. The design shows 3 types of farming - traditional (on

the ground), aquaponic (stacked in water systems with live fish to provide nutrients) and linear (soil-based planters stacked against the building and on top of balustrades). The plan explains further activities and amenities in the compound including a health centre, an organic supermarket, a library and more.

“The architecture has been conceived for economic construction using simple materials and modular parts. The concept offers multi-dimensional benefits related to economics, food security and quality, social engagement, health, sustainability, place making, and healthcare provision.” (Rosenfield, 2014).

Outcome

The building was designed out of a necessity for food production in the urban environment as my own project proposes. The architects went about this by using the vertical planes the urban built environment provides as the structural base for sustenance for this community. This scenario shows how an agricultural project can be used to improve the lives of the immediate surrounding community if given the opportunity to interact with the farm. The form promotes a courtyard concept layout, enclosing and securing the lot as this is still considered a private operation which could, too, be considered in my design approach.



Fig 9 - Concept and Form in Urban Context. (ArchDaily, 2014), (Via: SPARK)

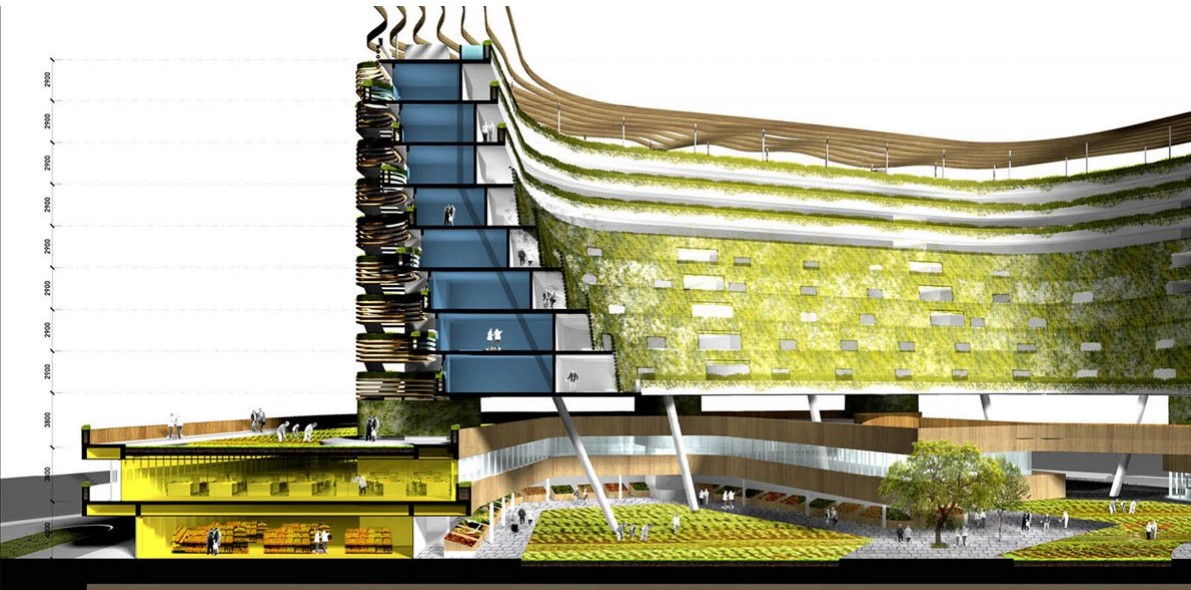
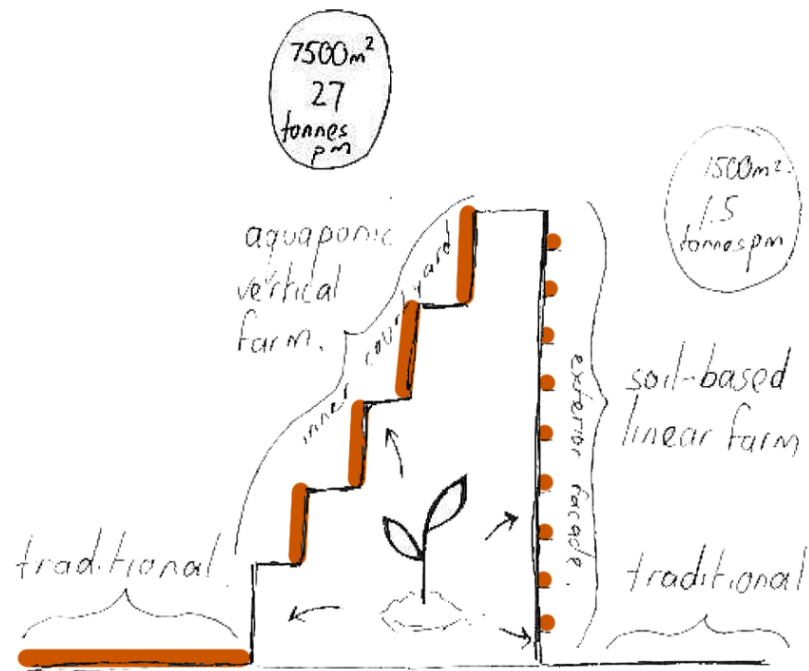


Fig 10 - Section Showing Programmatic Spatial Layout. (ArchDaily, 2014), (Via: SPARK)

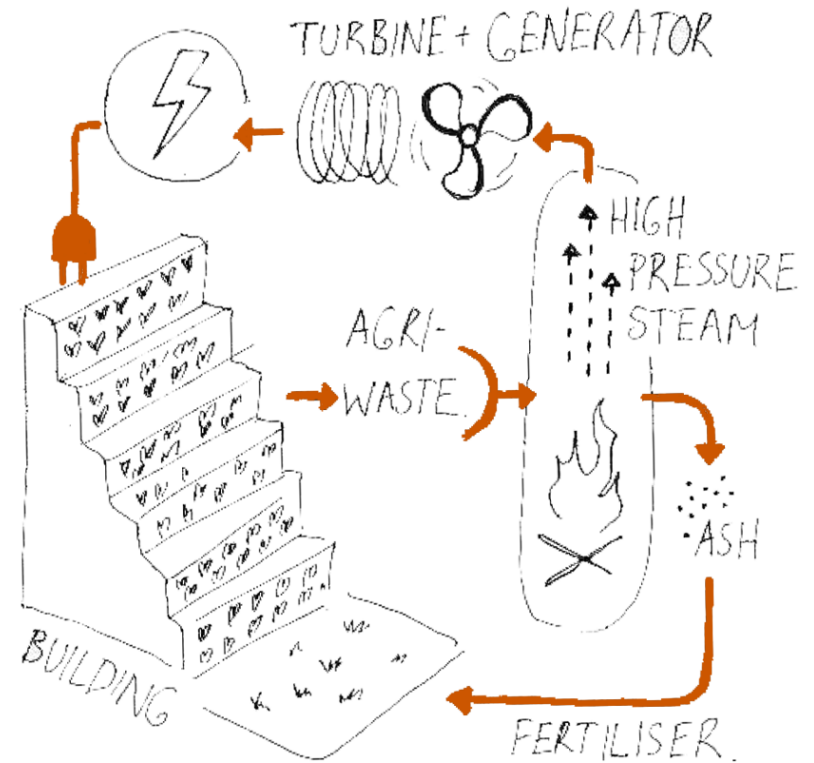


Fig 11 - Community Interaction with Urban Growing Facilities. (ArchDaily, 2014), (Via: SPARK)



5800m²
6.4 tonnes per...

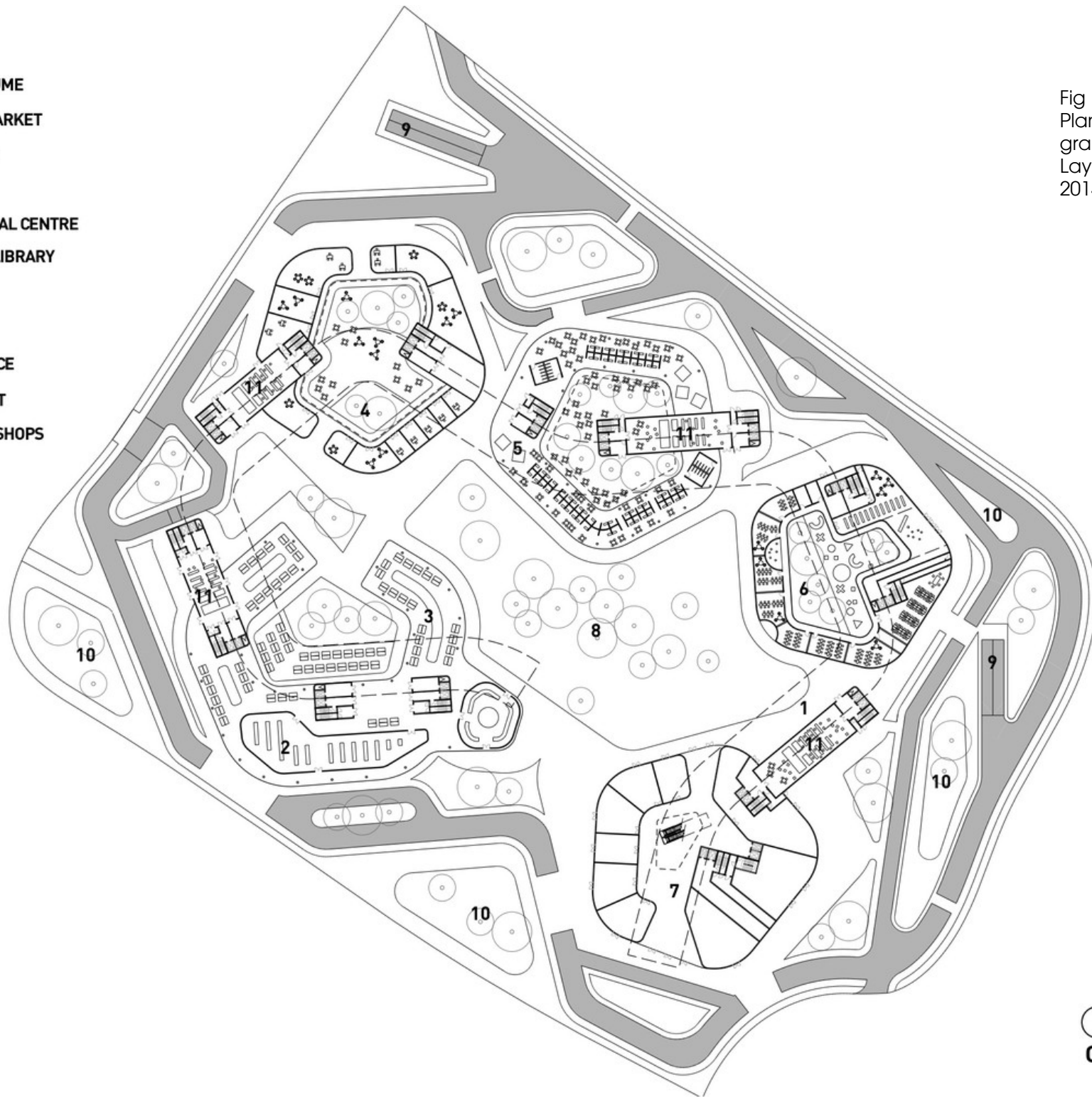
the form of the building creates a major interior courtyard where stepped storeys allow residents to have personal balconies equipt with aquaponic growing systems, on the vertical exterior, soil-based linear farms line the walls - ensuring all real-estate is being agriculturally optimised



agricultural waste is used to create energy as well fertiliser, ensuring the sustainable reuse

- 1 RESIDENTIAL VOLUME
- 2 ORGANIC SUPERMARKET
- 3 PRODUCE MARKET
- 4 HEALTH CENTRE
- 5 FOOD COURT / SOCIAL CENTRE
- 6 KINDERGARTEN / LIBRARY
- 7 SENIORS' MALL
- 8 CENTRAL PLAZA
- 9 CARPARK ENTRANCE
- 10 WATER CATCHMENT
- 11 PACKAGING WORKSHOPS

Fig 12 - Ground Floor Plan Showing Programmatic Spatial Layout. (ArchDaily, 2014), (Via: SPARK)



The Living Skyscraper

 Lake Michigan, USA

 Blake Kurasek

 Vertical Farm (Thesis Project)

 2010

 Focus : Vertical Farming
Concept ,Layout and Structure

This is a conceptual student thesis project set in Lake Michigan where water is abundant. Kurasek, B (2010), explains how he designed the tower around a structural service core to keep the outer spaces, in the form of staggered boxes spiralling down the core, open for productive agricultural use so that natural sunlight can efficiently penetrate the building without structure and services obstructing. The building spirals downward in a coil to move with the flow of water

reticulation through the hydroponic systems. The water can then be collected and filtered at the base of the building and then pumped back up into the system. This form also encourages the flow of air into and through the building. In this utopian agricultural concept, the building has an exaggerated verticality to minimise the footprint but increase the production capacity of the structure.

Voids are adjusted within the space for areas allocated to larger plant species and trees so the farm is not limited to small leaf/fruit plants. The other spaces leave vertical voids to form open-air growing balconies.

Outcome

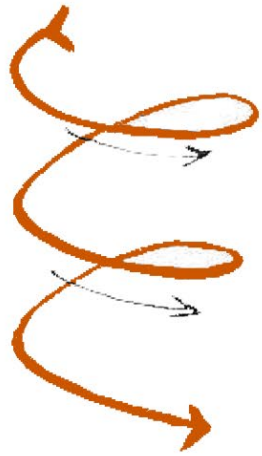
The form changed to match the service reticulation of the water grid, an important element in vertical agriculture. The ability to host larger plants and root structures is not regularly achieved in urban farming projects and would be a point to consider. Placement of the services and structural elements were key informants on the layout of the building. Unlike this project, my design will have to deeply consider a sustainable source of water for the agricultural operation. The integrated open air growing systems add another important element of agriculture I will include.



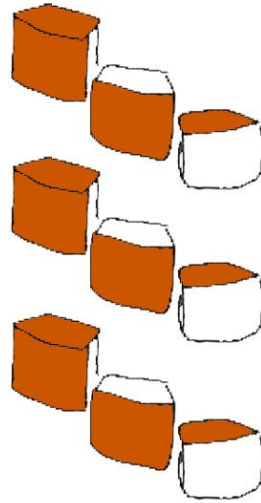
Fig 13 - Render showing Extreme Verticality and Spiralling Form. (Kurasek, 2009)



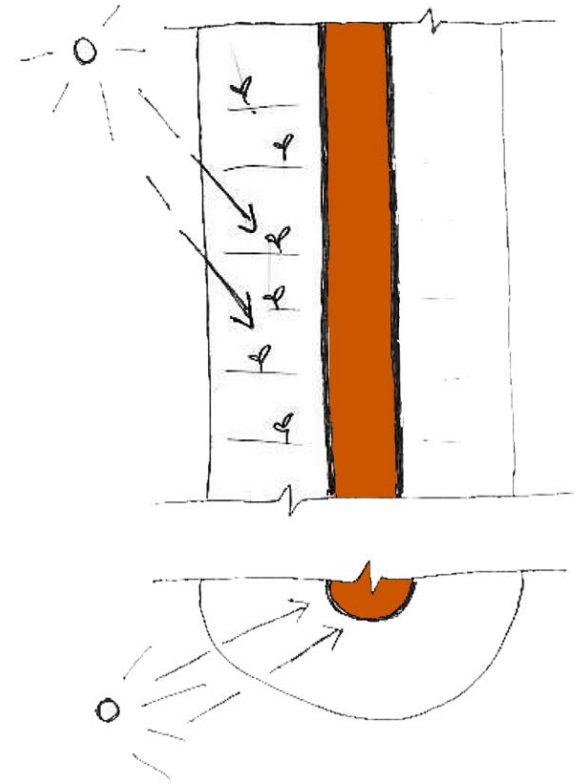
Fig 14 - Proposed Produce Distribution by Plant Type. (Kurasek, 2009)



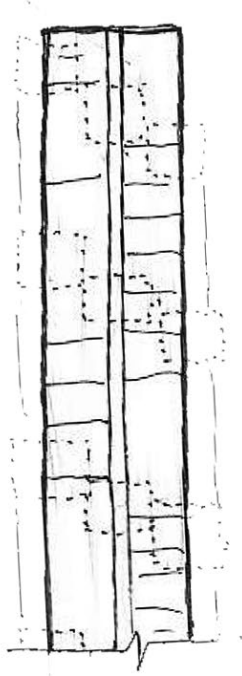
the coil form is for efficiency of service reticulation and pedestrian movement



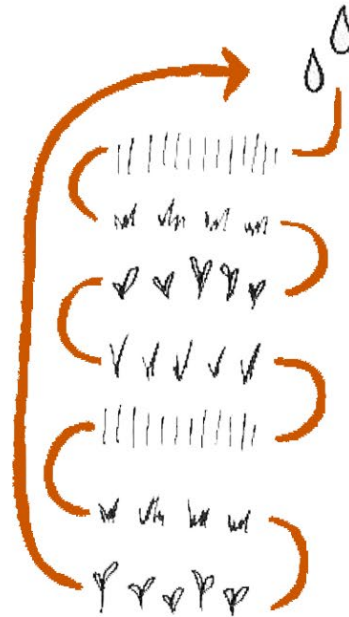
horizontal floors stagger up the coil to allow for flat growing surfaces along this coil



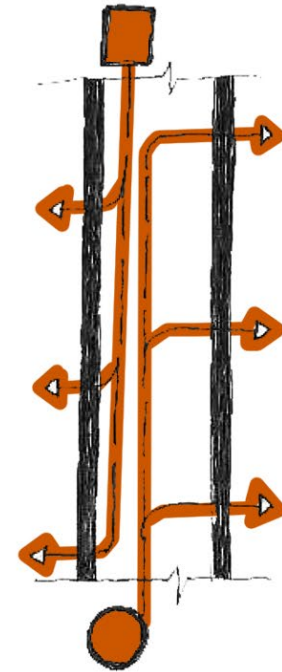
the structure of this tower is primarily in the core of the cylindrical form to promote natural sunlight flow into the outer spaces



the form of this vertical farm tower exaggerates verticality and experiments with the pros and cons of this



momentum and a closed loop system means the farm can recirculate water through the structure multiple times before flushing it out and replacing it



services run through a service duct set in the core structure of the tower, giving way for more space dedicated to growing activities

Michigan Urban Framing Initiative, the “Agrihood”



Detroit, Michigan, USA



Tyson Gersh (Co-founder)



Community Garden, officially designated “agrihood”



3 acre



2016



Focus : Community Impact

This project, the Michigan Urban Farming Initiative, shows how an agricultural re-introduction into the urban landscape can impact a community. The term is “ ‘agrihood’, short for agricultural neighbourhood.”

(Adams, 2019). According to Adams, B (2019), they have large swaths of green space, orchards, hoop houses and greenhouses, and some with barns, outdoor community kitchens, and environmentally sustainable homes decked with solar panels and composting. This farm is in Detroit, otherwise known as a “food desert”. It started as a basic community garden providing fresh produce for its surrounding residents but has now become a diverse agricultural campus that is attracting new residents and investors, some corporate, to the area. In their attempt to address food insecurity by expanding this initiative, there are plans to open “a Community Resource Center with educational programs and meeting space across from the garden, a café, and two commercial kitchens.” (Adams, 2019). The community thrives on this fresh and affordable option for food. The community often volunteers at the farm and the surrounding neighbourhoods have shown an improvement in neatness and image since the farm has been implemented.

Outcome

An agricultural intervention in an urban setting does not need to be high-tech or expensive to start. The open-air traditional farming methods look approachable and the community feels compelled to interact and contribute.

Fig 15 - Michigan Urban Farming Initiative Community Garden. (Gerard, 2019)



DESIGN

Transforming Parking Garages



United States



Gensler + LMN



Future of Parking Structures
Concept



2018



Focus : Parking Structure Future

It is difficult to predict the future of the personal automobile. Some believe it will begin to disappear with the introduction of services such as “Uber” or improving public transport networks. Others believe the car is here to stay, it may just become more sustainably designed over time. But if cars do disappear, what will happen to the millions of parking

structures across the globe. Ridgeway (2018), an architect, writes that this “will result in a permanent paradigm shift in urban planning.” She says that the key is to design “future-proof” parking structures that can easily be re-developed for a new use if and when the time comes. This entails designs with flat or level floors instead of ramped floors and sufficient space between the floors to make the building habitable for multiple uses. If the car-culture did not subside but grew, “those high ceilings could be converted into a double-stacked parking floor.” (Ridgeway, 2018). Another element that supports adaptive reuse is ensuring services are placed with intention and space for added services later on.

This future-proof method is actually economical. The buildings are somewhat recycled, omitting many of the costs a brand-new office block, for example, would incur and in far less time.

Outcome

The urban farm concept will be implemented upon and in an existing parking structure. Perhaps, if cars started to become less of a priority, the agricultural activities could expand, absorbing more of the space. The future of the building will need to be maintained in the case of an unexpected programmatic need for the space in years to come.

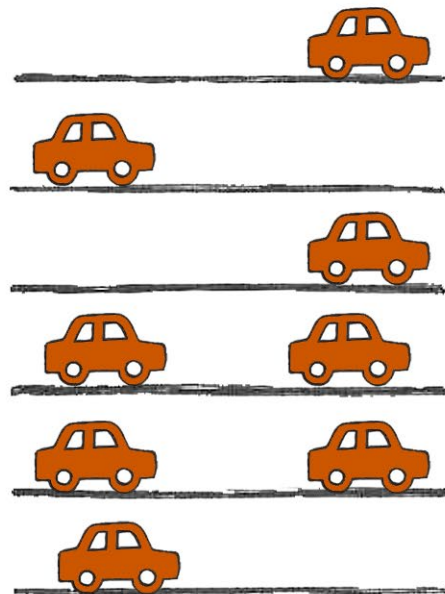


Fig 16- Gensler's Vision of Re-use of the Parking Garage. (Arch-Daily, 2018), (Via: Gensler)

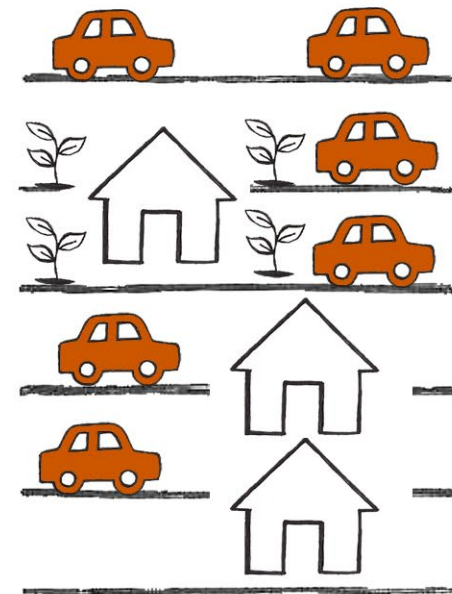


Fig 17 - LMN's Vision of Re-use of the Parking Garage. (Arch-Daily, 2018), (Via: LMN)

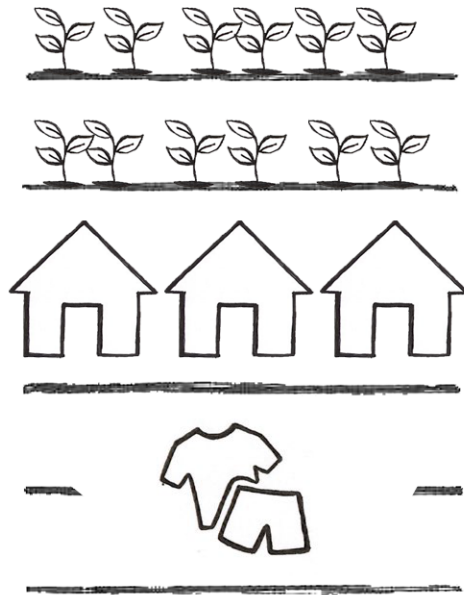
multi-storey parking structures are a common urban element globally but as trends around the automobile change, what will the future hold for these megastructures



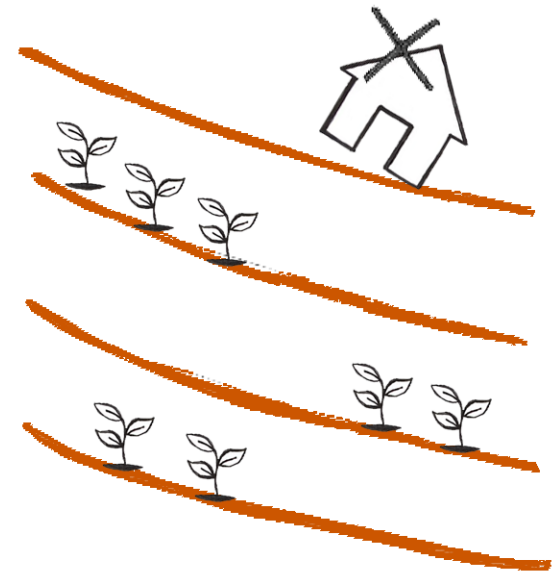
as the needs of populations shift toward food security and housing, parking structures may become viable structures to host such activities



the demand will guide the change in the ratio of programme to fill these gaps depending on the region and its needs - for some regions, the car may disappear entirely



as a designer, it is important to design structures now that have the ability to morph with new programmatic needs in the future



Smaller Footprint, More Drive-Thru



Cincinnati, United States



FRCH NELSON design firm



Fast Food Restaurant Future
Concept



1 500- 2 000 ft²



2020



Focus : Drive-Thru Logistics

Pogacar (2020), writes about the future trends of fast-food restaurant drive-thru services - where COVID-19

has fast-tracked a revolution towards amped up delivery, online ordering and smaller physical buildings. The idea is to “facilitate off-premises transactions”. It is not a viable option to design sit-in quick-serve restaurants where tables need to be 2m apart, instead, seating areas could be removed altogether, halving the building footprint requirement and encouraging customers to make use of the optimised drive-thru experience.

The optimisation of the drive-thru is based both on flow or time spent at each point and food preparation speed. In the modern quick-serve restaurant, the only waiting point is usually at the initial “order” window. So, to learn from these observations, drive-thru’s will begin to add more “order” points before the window point to keep the flow of traffic seamless.

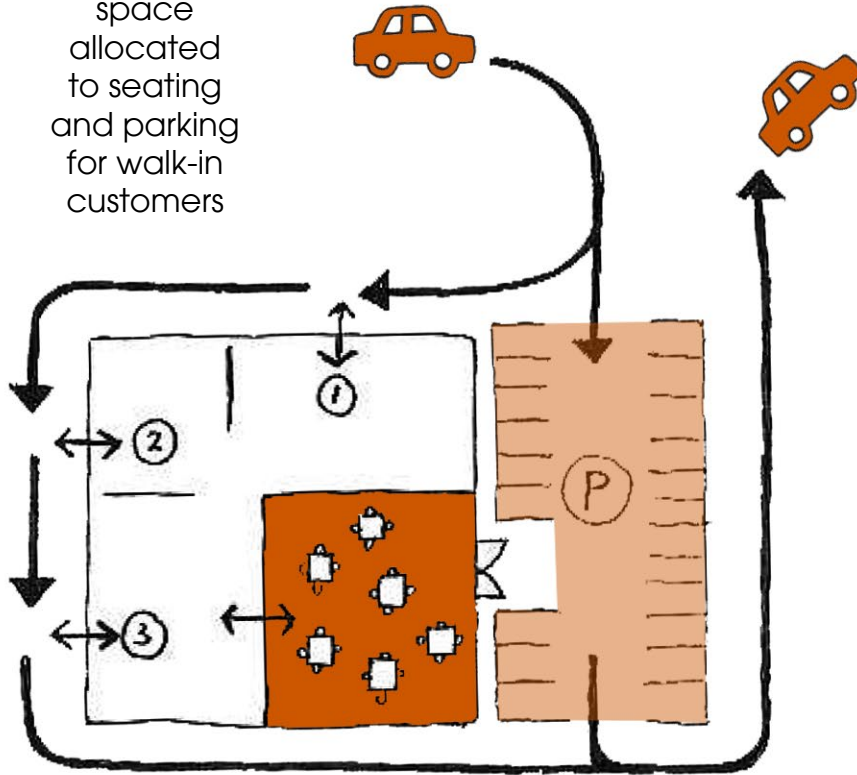
Outcome

In my design of a produce grocery drive-thru, the logistics and movement of traffic will be key to the convenience and prosperity of the design. By viewing fast-food drive-thru’s as a precedent, I can observe previously successful and unsuccessful adaptations to the sequence. The produce harvesting, packaging, vehicular movement and the customer interaction with the service are the logistical aspects that need to be considered.

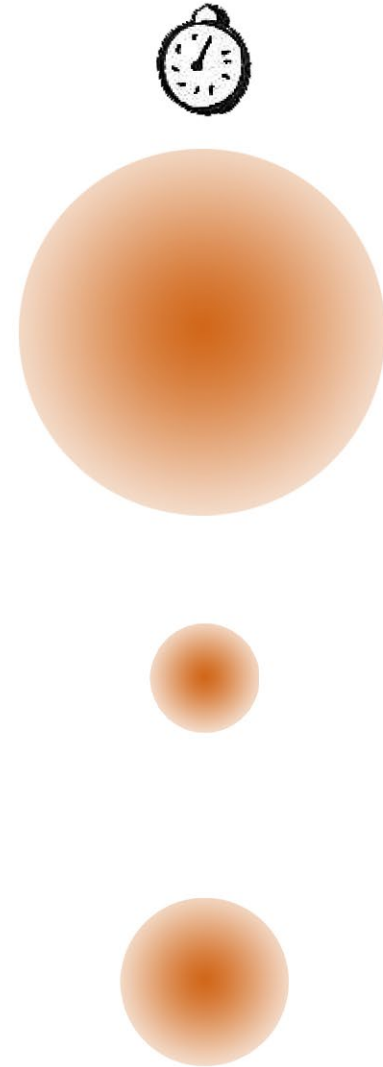


Fig 18 - Drive-Thru
Concept. (KFC
SOPAC, 2020)

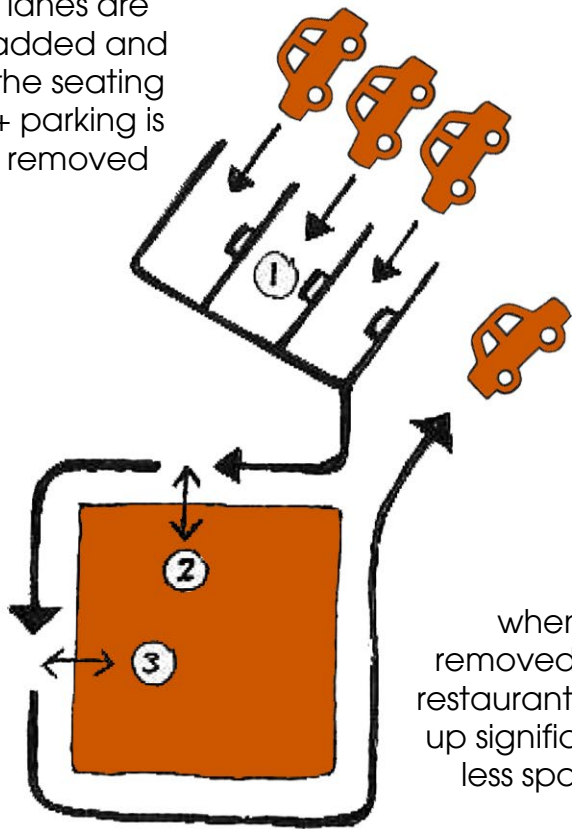
a drive-thru set up in 2021 with significant space allocated to seating and parking for walk-in customers



with just one "order" window, the drive-thru line is slowed



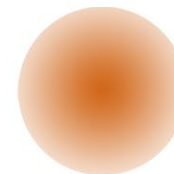
more "order"
lanes are
added and
the seating
+ parking is
removed



when
removed, the
restaurant takes
up significantly
less space



the efficiency
of this drive-
thru means
customers
keep moving
through
without traffic
back-ups



In Harmony with Nature Cafe

 New York, United States

 Reutov Design

 Café

 46 m²

 2020

 Focus : Services as an aesthetic

The designers of this café describe it as “an oasis in the midst of a raging stream” to get away from the “endless movement of millions of people and cars”. They promote this design by saying users can “get

in touch with nature”. Although I would agree that it might be a quiet oasis, I do not think there is anything natural about this space.

The bright colour that highlights the services and furnishings against the raw concrete is somewhat abstract and urban in my view. I appreciate the reuse of an existing structure and giving it a new life through simple intervention. The harsh thick concrete is softened dramatically by the curving ventilation pipes, furniture, arching windows and the calming turquoise colour.

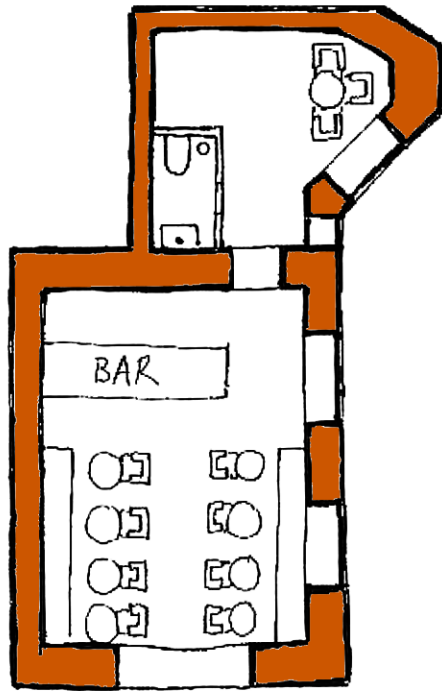
The use of translucent elements gives a sense of depth and increases the perception of space in the café.

Outcome

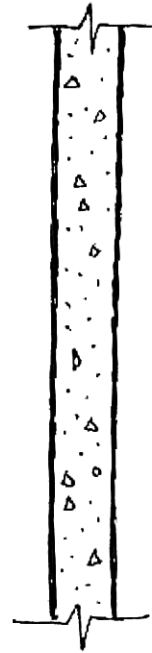
My design will take a similar approach in terms of respecting the existing conditions of the building with which my design will merge, and finding beauty in the rawest forms of materiality. I am inspired by the decision to highlight the services instead of hide them. As my design will have a complex service requirement, I will consider this approach. Lighting and colour are used to soften the structure and I am inspired to do the same. The idea of the oasis also applies to my intervention which finds itself, too, in a bustling urban environment.



Fig 19 - In Harmony
with Nature Café.
(Reutov Design, 2021)



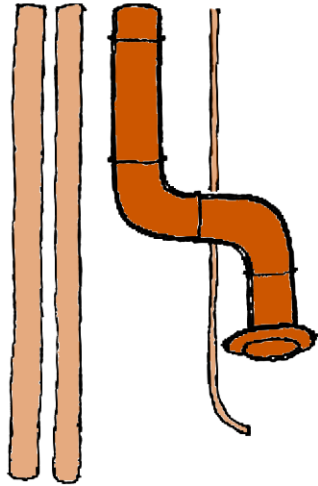
the café is set in an existing New York highrise. the space is small and the furniture layout ensures the tight space is used efficiently



the existing walls are thick and structural and there has been an effort by the designer to promote the concrete material as an intentional aesthetic



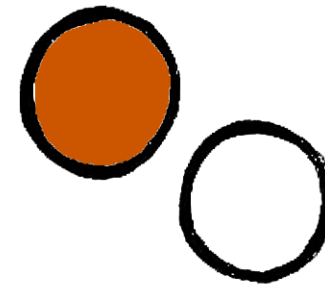
the right angles and exposed concrete, which could be considered "harsh", are broken up by arched windows and doors, which also happen to flood the room with light



services are not only exposed but celebrated in brightly coloured paint, becoming a key design aesthetic



these services were inspired by the idea of a beautiful bamboo plant sprouting up through the concrete bringing colour, life and nature into the room



the simple two tone approach, made up by the raw concrete and the colourful turquoise elements, would presumably be too simple but infact introduces a stark contrast that is interesting and inviting

Suspended Boxes



Islamic Republic of Iran



Masoud Abedimoghadam
(Thesis Project)



Residential Compartments



450 m²



2020



Focus : Structure and aesthetic

Although conceptual, this project transcends architectural ideals around the relationship between the building and nature. The building does not have a solid footprint but rather suspends its solid components above the ground, allowing the ecosystems on the

forest floor to remain. Trees grow up through the borders of the building's structure.

The prime structure makes use of exposed timber members and each box is considered its own modular house. The boxes are pre-fabricated and then fixed into the frame on site.

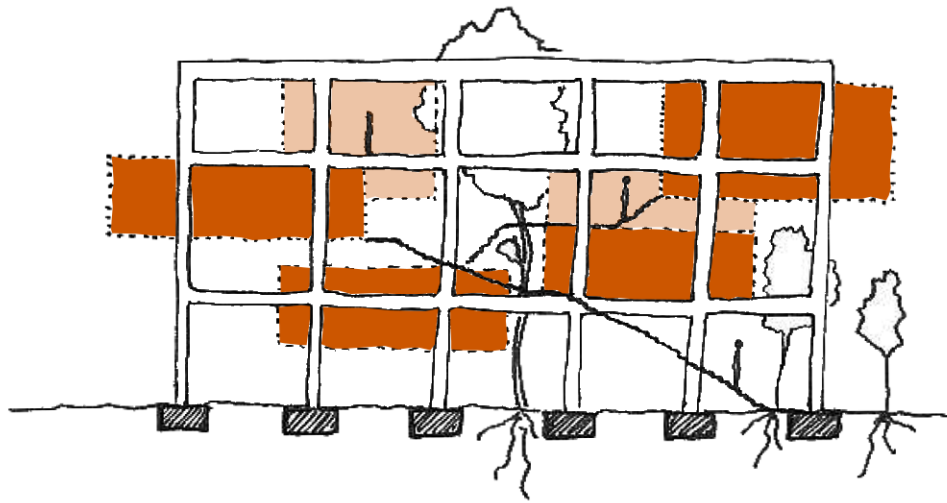
The aim is to submerge with the environment, forging a respect between man and the forest inhabitants. The boxes are stepped to create interesting roofs and balconies for outdoor spaces.

Outcome

I am interested in the frame structure that suggests a form but does not exclude external factors from entering. The use of raw timber is aesthetically pleasing and allows for a sustainable material to be used to create a large-scale structure which can be incorporated in my own design. The natural environment being able to live intertwined with the building suits my own narrative where the plants from the farm meet the concrete and the cars from the urban landscape. I will also consider a pre-fabricated modular method, that still shows originality and aesthetic appeal, in my design to try lower the expense of construction and negative ecological impact.

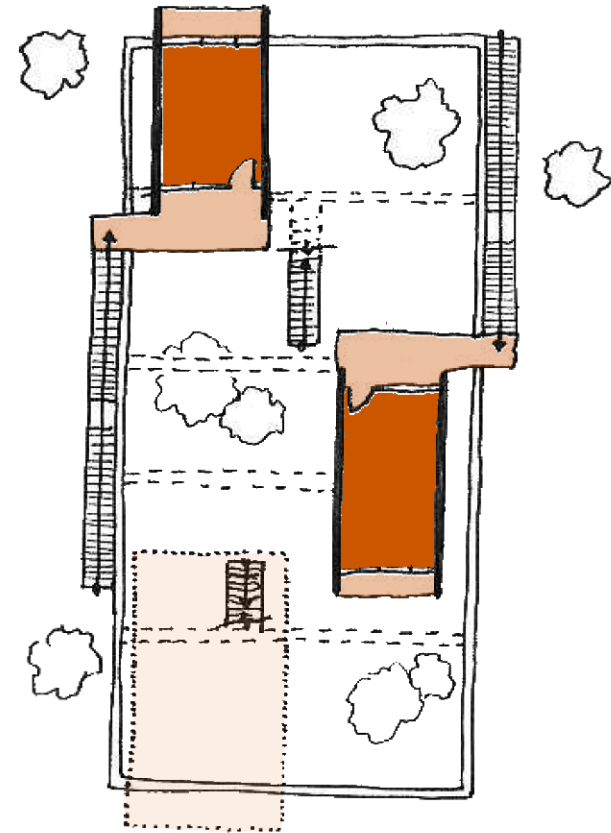


Fig 20 - Suspended
Boxes Concept.
(Abedimoghdom,
2020)

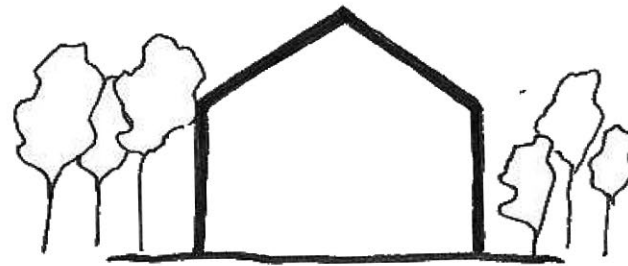
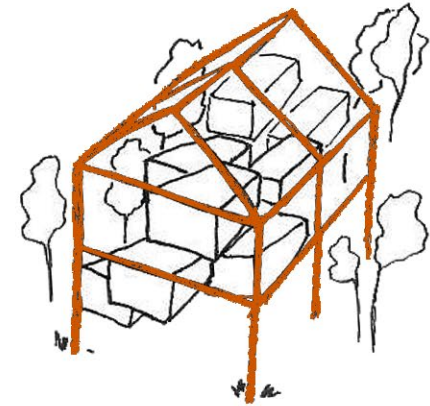
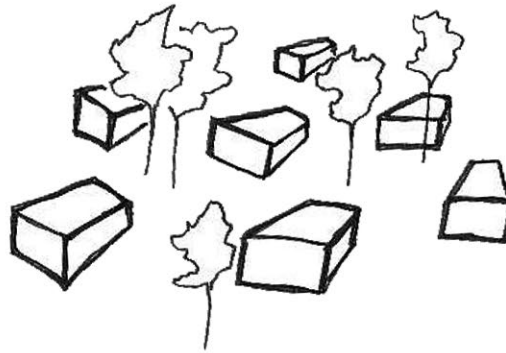


the suspended boxes are set at different levels,
increasing a valued sense of privacy and
individualism of each unit in the community
structure.

each structure has its own staircase but I would
have to wonder how the servicing and utility
reticulation of these module's is achieved because
there is no visible infrastructure for such



each module can perform with its unique function but is linked together by a common structure. The compartmentalisation and fractured approach allows air and rays of sun to flow through the arrangement as well as trees and plants to find their own space within the building aswell.



In Ruins - Various Interpretations

 Focus : Structure and aesthetic

Finding beauty in the afterlife of a structure has relevance in the reusing and optimising use of existing structures. My design proposes the re-use of an existing structure, and although it is not considered a ruin - I have proposed a design that requires the intentional breaking apart of the building to retrieve material that can be reformed and reintroduced to house new programme on the new site. This results in calculated ruin. I find aesthetic value in this broken architecture juxtaposed with modern inputs and the visual outcome matches the narrative for my design.

Outcome

These projects achieve beauty and stability in existing structures giving them a new meaning but retaining their age in aesthetic. I would like to celebrate the deconstruction of the existing building by leaving it visible and allowing the reformed inputs to stand out as a modern insertion against this backdrop.



 Sabugo, Spain

 Tagarro-De Miguel Arquitectos

 2013



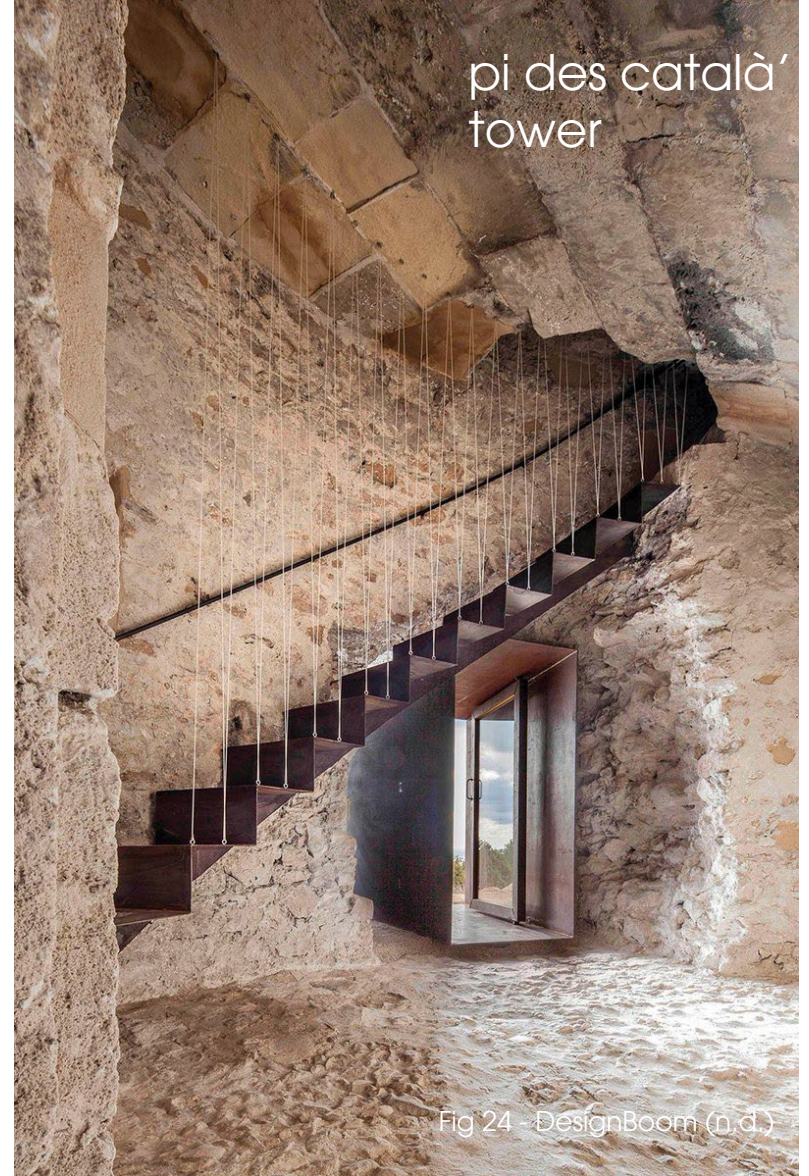
St. Miquel 19
Reforma
de
vivienda

Fig 22-23 - Archdaily (2016)

📍 Palma, Spain

👷 Carles Oliver

📅 2016



pi des català'
tower

Fig 24 - DesignBoom (n.d.)

📍 island in the Mediterranean

👷 Marià Castelló Martínez

📅 2017

Outcome Summary of Chapters 05, 06 and 07

Through aspects pulled from Chapters 05: Future of Farming: Concepts + Interviews, 06: Sustainable Building Practices, 07: Case studies - a conceptual base for my design was fabricated.

Areas of urban farming were deeply explored to understand the productive requirements around indoor growing like the need to compartmentalise and create sterile environments. I learned about the pros and cons of such practices and asked questions to extend my knowledge of the viability associated. Talking to three different representatives clearly sparked ideas in my design process along the guidelines of those experienced in the nuances of the industry. I noted the importance of bringing farming back into the city and the benefits of shorter distribution links, recycling of our precious water resources and psychological/phenomenological experience of reconnecting the human to their source of sustenance.

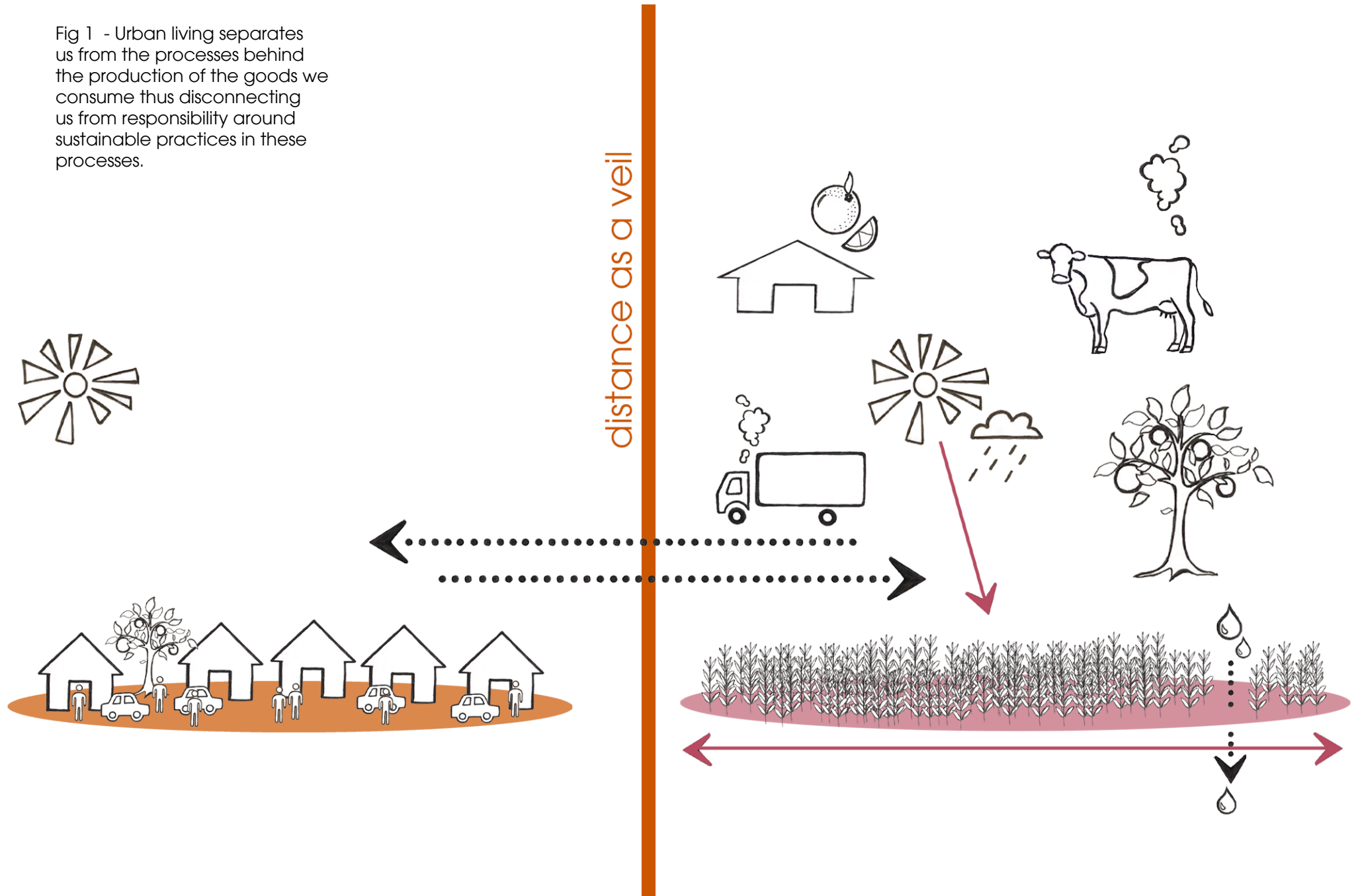
Materiality is a vital element of sustainable design, although the pivotal influential point for me was in material re-use. The circular economy becoming a key priority for my design. To harvest materials from the existing site became an exciting prospective through this study of materials. Understanding the individual impact of each material in its present and future form will directly affect design decisions moving forward.

Each case study was chosen and explored to answer a question I had had about a specific topic. Seeing how other buildings have responded to the urban farm typology, although some still very much theoretical, set a decent precedent for understanding what components my design should include to function as such. I noted how passive lighting, heating and cooling were often incorporated to aid the controlled environments for sustainable impact. I researched the consistent resources valued throughout the examples. In the design exploration I pulled case studies of interest based on reuse of existing structure (the parking lot), movement (vehicular drive-thru), service reticulation (and the celebration of such) and structural value (frame structures and "ruins").

Overall, all of these components have informed a process to move forward with a well-researched and considered design that addresses the key issues posed in my brief.

So, if we have the science,
the technology and the will,
why is the change so slow?

Fig 1 - Urban living separates us from the processes behind the production of the goods we consume thus disconnecting us from responsibility around sustainable practices in these processes.



Disconnection

With urbanisation came a separation of living and the processes behind it. Modern society experiences a lapse in phenomenological connection with our food. When it comes to where the food comes from, the processes behind getting/making the food, how responsible these processes are, and our waste disposal - thus removing us from any sense of responsibility connected to these processes. Today we eat with knives and forks, separating the hand from the food we eat and wear shoes to separate our bodies from connecting with the ground beneath our feet. Restoring interaction with the planet is a key part of ensuring the general population forges a respect for the earth and our impact on it. This leads to a second part of the design intervention.

I would like to introduce an interactive element where an outdoor open traditional farm is brought into the city. This would allow the public to get involved, through programmes, to plant and harvest fresh produce and interact with a selected few farm animals in real life, - that they, perhaps, have never had the opportunity to see. The interactive farm will not contribute to the grocery drive-thru or pedestrian store in terms of produce, but the two elements will lend to one another. The interactive farm will benefit from water excesses from the controlled

environment farm. The manure from the few cows in the interactive farm will be treated for E.coli and other pathogens, and then put into the nutrient film system in the hydroponics that service the CEA farm, as a responsible alternative to imported silts.

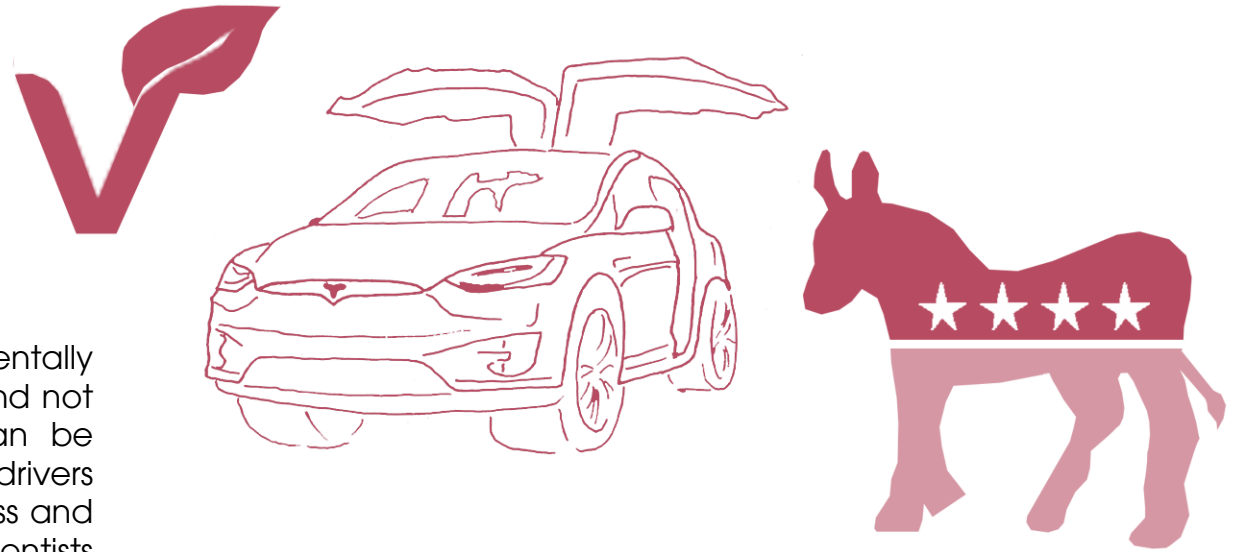
Money + Politics

In a response to the climate crisis, the mass shift will only occur in a similar pattern as major shifts before it. "We're using more natural gas and less coal to generate electricity. Why? Because new drilling techniques made it much cheaper. It was a matter of economics, not the environment.". With this concept of economic viability presiding, I approach my project's course of implementation.

For a project with a novel concept to be considered implementable, three factors must have been considered. The environmental impact, the social aspects and the economic viability. Named the 'Triple Bottom Line' or Planet, People and Profit. Capitalism runs on a concept of supply and demand where demand shifts the trends of what is available and the supply naturally increases to accommodate that. For as long as the cheaper option is not sustainable, sustainable practices will not be implemented. For the public to make use of this grocery concept, the

produce prices must be competitive with other grocers in the region.

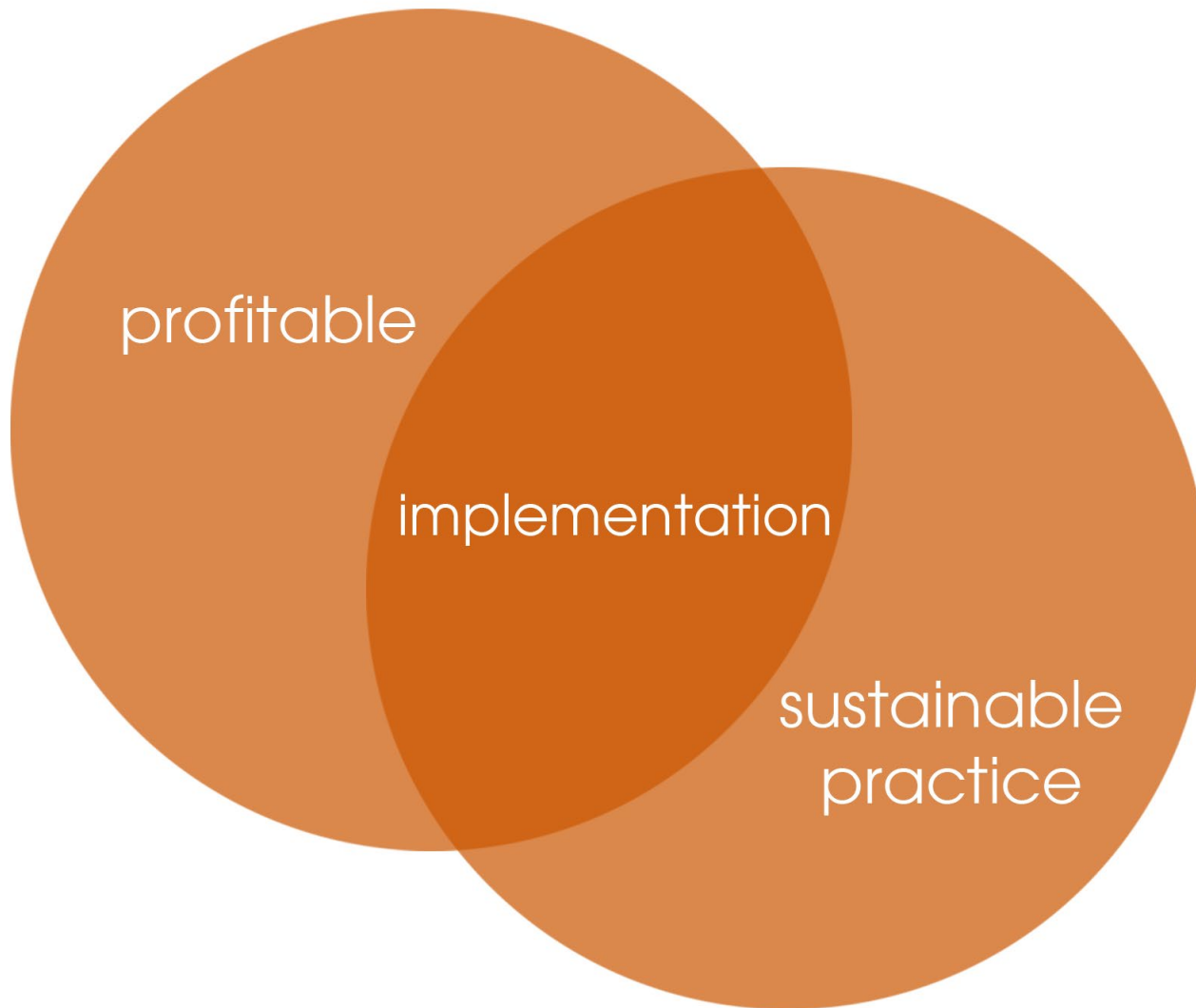
Unfortunately, politics are also money driven at times. Although Californians have voted for the Democrats, the liberal and environmentally conscious party, politics is dirtied by money and not all environmentally sustainable intentions can be followed through. Sometimes opposing political drivers block sustainable practices to prioritise business and the economy of the country. "Environmental scientists and policy experts around the country agree that the massive wildfires are just the latest indicator that climate change has thrust the U.S., and the world, into a dangerous new era. But it's far from certain that the growing recognition of that threat can break the stalemate over climate policy in Washington. The accumulating evidence about climate change's destructive power represents an irresistible force for action. But it's colliding with an immovable object: the unbreakable resistance to any response among both Republican voters and elected officials.", said Brownstein (2020). In an unfortunate end to this, failure to limit the effects of the climate crisis could potentially be far more harmful to the economy in the long run than these actors realise. Again, for the project to be politically viable, it must be sustainable and economically beneficial, in terms of new technology, job creation and a new market of



agricultural business. The site at The Grove Shopping Mall was chosen to gain from political and economic placement. Unfortunately, it is true that the initial testing of a concept that shifts consumption habits is best tested on an economy that allows a buffer for failures. And, "(r)ich countries are best suited to develop innovative climate solutions; they're the ones with government funding, research universities, national labs, and start-up companies that draw talent from all over the world, so they'll lead the way." (Gates, 2021).

Regulations are put into place by governments all the time without much impactful change in habit - but policies that affect tax or income in any way, usually successfully and quickly change the way individuals and companies behave. Regulations already in

Fig 2 - For businesses to implement sustainable practice, it must be the profitable choice.



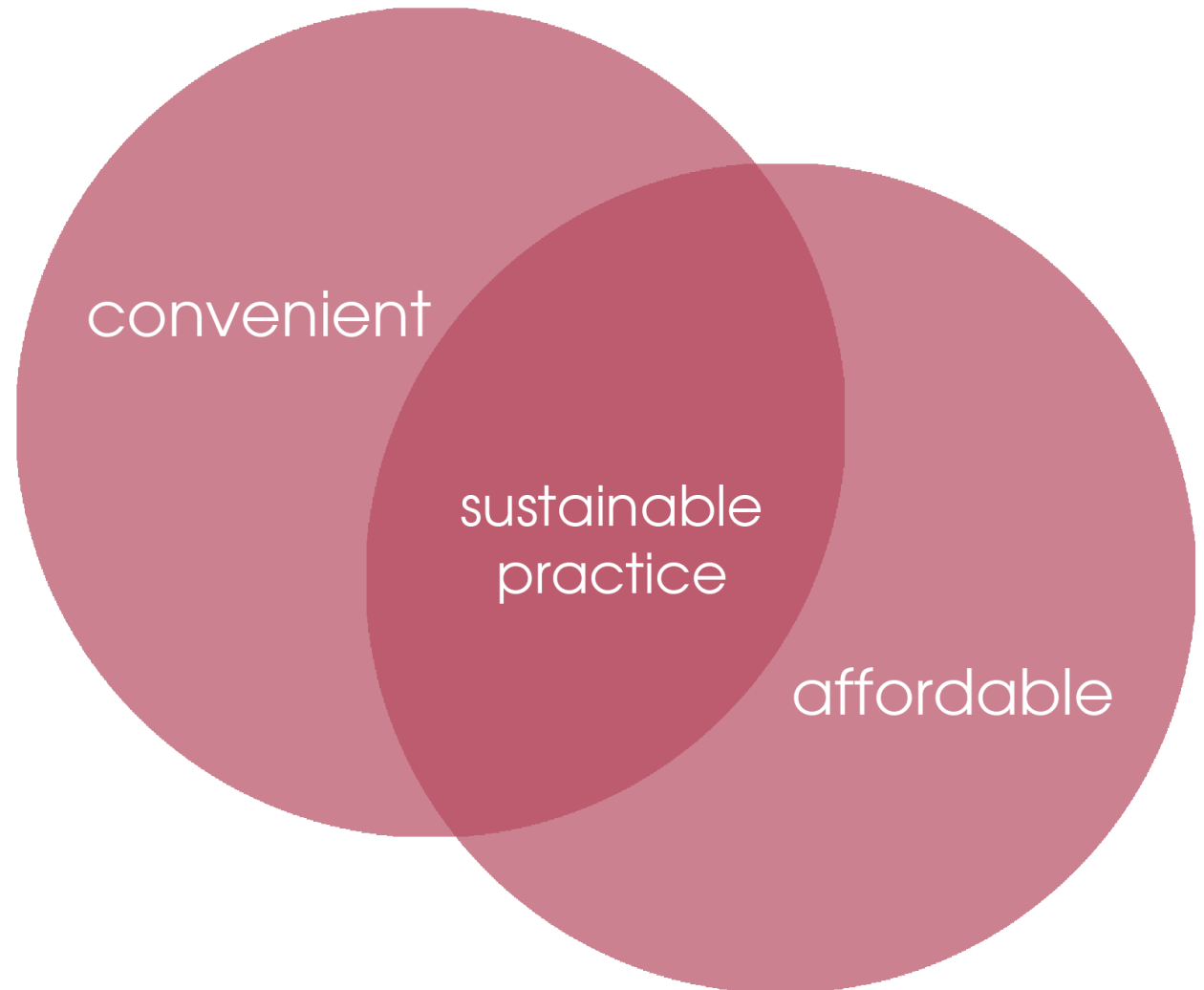
place in the United States surrounding climate response are outdated, designed to improve air quality but not adapted to the more recently identified goals of reducing the rising temperatures caused by greenhouse gas emissions. In addition to outdated policies, the four to eight-year election cycle in the US is damaging to the execution of a climate crisis response (Gates, 2021). The opposing parties disagree on the mere existence of the problem and so a stagnation has been set around the topic. Each time progress is made by one political party, it is undone by the other. Each time the administration is handed over to the opposing party, grant money for climate crisis and response research, and tax incentives for businesses addressing the issue are discontinued. With America seen as a super power, this is extremely damaging to a global response. Unfortunately, time is

crucial in this response.

Building a global consensus amongst all or most of the countries in the world, to combat the crisis via reduction of emissions is a challenge. Specifically, because it will cost money. No country wants to take the blame or responsibility, especially if some of the others aren't prepared to admit their faults in this sector. This is why 190 countries have signed the Paris Agreement which regularly sets goals for response.

In conclusion, a design that disrupts a habit of consumption must consider economic viability as a priority. The politics will follow the course of profit. This is the key to large-scale cooperation. To get customers to choose the sustainable option, the concept must become relatable, convenient and well-integrated into the habits of the consumers.

Fig 3 - For individuals to engage in sustainable practice, it must be the convenient and affordable choice.



An Essay

PHENOMENOLOGY IN THE REFORM OF THE MODERN DAY DISCONNECT

Original Work (Burkimsher, 2020)

Adapted from submission for course

Contemporary Architectural Theory ARPL4002_2020

as a part of BASHons Degree at the University of the Witwatersrand

guided by Diaan Van der Westhuizen

“

Brief Definition

Architectural phenomenology is the essence of the human experience theorised in an attempt to understand its influence in the built environment. Otero-Pailos, J (2010) frames architectural phenomenology as “the study of architecture as it presents itself to consciousness...”, referring to the human experience of the spaces around us through our bodily senses and orientation. As almost all architecture is made for human habitation, it is assumed the human experience is considered but phenomenology pays careful consideration to the use of psychology, philosophy and physiology to further understand what our human experience is made up of in carefully considered components - usually bringing together our physical vessels and emotional responses through the understanding of embodiment. Phenomenology in architecture needs to be considered in two parts. The first is in finding the common aspects of human sensual experiences and the second, respecting the perspective of the individual which is shaped by personal previous experiences. There are some assumptions we can make. The average human being can see, hear, smell, touch, taste, and not to be omitted, experience emotion through consciousness. Furthermore, the concept of embodiment must be extensively interrogated to understand the power the theory of phenomenology has to manipulate an action, desire or emotion.

(Burkimsher, 2020) ”

In my design proposal, the building will be designed through architectural, material and detailed elements to encourage the users' senses to see, smell, touch and taste the farm in order to forge a psychological link to positivity around food production. Texture will play an important role in sparking natural association with our instinct as human beings. These aspects focus on answering to the “common aspects of human sensual experiences”. The users will too, bring with them their own backgrounds of previous experiences. Although these cannot be entirely predicted, there are some contextual cues that can be drawn from. For example, Los Angeles is an urban landscape surrounded by other metropolises, mountainous terrain and desert – to see a cow, for example, in this urban context might excite the senses thus holding attention. Asking the human body to perform a motion that it does not do regularly perform like scale a ramp or bend down to plant/pick a vegetable is subliminally challenging the habits of the consumer - to change the rules and patterns of behaviour to create new connections with other behaviours. The concept of presenting a Controlled Environment Agriculture (CEA) farm alone in an urban context where residents are not conditioned to seeing farms could be problematic. This is because you are replacing one form of disconnection from food production (distance away from the city) with another (in the city but in enclosed capsules that cannot be entered). This is why I have paired the CEA farm, for commercial production capabilities, with the interactive open-air farm where

visitors can pick, plant, eat and wander through the plants in an urban landscape. This is in an attempt to connect the Angelenos with the food they consume so that they feel more closely responsible for the usage, wastage and production processes behind the products they consume.

and in came the sense that architectural history was driven by the search for authentic, original human experiences.”, Otero-Pailos (2010). Architectural culture was deliberately disrupted by some key figures in the field that turned the theory of phenomenology into a language that facilitated the reintroduction of historical architecture as an influence to modern and now postmodern architecture. The movement was challenged on its ambiguity at the time but has come to be a widely considered theory used in architectural practice today. The study of history in architectural theory was to set a standard for the “intellectual architect”. This put the initiators in a position of being advocates for the intellectualisation of the theory of anti-intellectualisation of architectural theory, which is direct a conflict of intention.

This intellectualisation of the concept of phenomenology suggested a structured set of rules to adhere to when applying such a theory in architectural design, but in actuality, it is linked to something humans have not being able to conclusively comprehend yet - the human consciousness. Therefore, the theory of phenomenology relies solely on the human experience and this cannot every be conclusively determined before a design becomes a building, a building becomes a space and that space is occupied by humans - and even then, we cannot record what each individual will experience. The aim of this concept is to not understand why and what we are experiencing but internally, organically and quite

“ Rise of Postmodern

Phenomenology can be considered a contributing factor in the rise of architectural post modernism. When phenomenology came to be recognised as an architectural theory of experiencing space, ‘human sensation’ was argued to be an unreliable and intangible set of rules to design around. Perhaps the individual may perceive spaces based on more than obvious senses, as the modernist architecture may have primarily suggested, but too, past experiences and emotion. Therefore, Otero-Pailos (2010) draws that freedom of modernism lies in observing wholesome and natural experiences of pre-modernism, combining these aspects with new technical advances and allowing architecture to move forward into postmodernism where the past and the present can be analysed to form a new future. “Out went conviction that technology drove history,

unintentionally just allow our senses, emotions and intuitions to lead. As designers in our built environment, the most genuine effort we can make in creating a phenomenologically considerate and meaningful space is to mimic our own perceptions of the human experience.

(Burkimsher,2020) ”

I have concluded that ‘human sensation’ is, in fact, a tangible set of rules, reliable to use for the base of design. With the concept of accepting “the human consciousness” and the subsequent experiences that come with embodiment – I use my own instincts in my design to evoke emotions that stir up in the human being when surrounded by natural elements and stark contrasts in contextual placements. I trust my own conclusions connecting senses and feelings to colours, materials, textures, light, shadows and motions.

In the present times considering the climate crisis, it is only sustainable choices around materiality and necessity that sway my experiential design process.

“

Expression in Phenomenology

By translating the theory into spatial concepts, many architects have interpreted phenomenology – some with intentional planning and carefully crafted elements, others accidentally, by following intuition and instinct without formal knowledge of the theory behind it.

The work of Peter Zumthor collects theory from formal architectural training and supplements it heavily with his own experiences of the world around him. He observes his intuitions, made up of human consciousness, past emotions in connection to physical objects and spaces, and lets his senses lead design. This results in experientially rich designs that surround the senses using devices of texture, light, shadow and even smell and echoing sounds. His work is inspired through the craft and “hand touched” design. Involvement in the architecture is personal and physical. The guests of his creations might find their senses responding to the stimuli set out for them but in relation to their own perceptions, built upon the separate lives they each lead. Zumthor, P (2010) communicates how light, scale, and practically any architectural device that plays with the human senses can be used to draw on our instincts, automatically convincing the subconscious human mind to perceive a space in the way suggested by the architect through physical arrangement and detail

of space. The architect could influence feelings of safety, freedom, playfulness or even discomfort and more with visual clues like changes in scale, proportion and colours to trigger associative moods. Zumthor's Bruder Klaus Field Chapel, completed in 2007, owes the construction of such a sensuous space to the respect for materiality which taps into the grounding sensation one gets when encountering built form designed using natural components. In this case, the energy achieved through using a timber frame that is then dissolved by fire, an energetic and destructive element claims the primary appeal. "The interior of the chapel is a black cavity left behind by 112 tree trunks burnt out of the cast concrete walls.", Zilliacus, A (2016). The end result is a dark conical sculpted void lined with rough ridges set into a smooth rigid and perhaps brutal rectangular box, visible from the exterior. Light seeps in through small holes, manipulating light to create "an effect reminiscent of the night sky", Zilliacus, A (2016). The added essence of a spiritual building may mean something to some but the cool, calm, dark space with a charred wood smell and ash-lined walls is bound to get the senses roaming for meaning by all.

Steven Holl is another prominent figure in the implementation of phenomenological architecture. Holl's vision is that "architecture is made of time, light and matter", (Mino Caggiula Architects, 2020). His work was intentionally influenced by external factors that could seem unrelated to architecture like music,

performing arts, science and physics, showing a further interest in understanding human experiences of the world and then connecting that back into built form. In Steven Holl's Y House is representative of his belief that a building should be built upon a leading concept to add symbolic and metaphoric meaning. The house was designed to split creating two points to view the surrounding outdoor environment, embracing it and pulling it into the interior space. This may be a clue to his consideration for how that might make a person feel in this environment. Holl famously sculpts with voids and light with respect for a range of influences to our experiences of life. This starts to culminate in examples of a theory that devices of sensual manipulation could be used to our advantage in modern application.

(Burkimsher,2020) 

Zumthor is inspired by the human touch to both craft and experience architecture through detail and texture. Holl aims to pull the outside in, showing an instinct for a preference to the outdoor sensations of light and matter.

“Modern Relevance in Societal Conformity and Environmental Sustainability

The global population is currently facing an environmental crisis of extreme proportions. Architectural phenomenology is critical in the movement toward sustainable architecture and the lack thereof could be a leading cause in the disconnect our society expresses toward the issues that are detrimental to our future existence.

Pallasmaa, J (2009) observes Western philosophy as built on the premise that the body and mind can be divided into two separate entities for the sake of categorization. The body is seen as a physical objectified identity and the mind is the intelligence and sensation centre, but in reality, the two must be considered as integrated for the mind needs the body to experience senses through stimuli and the body needs the mind to comprehend them and most critically, a clear line cannot be drawn between the two. Pallasmaa, J (2009) suggests that a combination of mental and physical aspects of a human interaction with the environment, is what teaches us of beauty and ethical judgement. With this in mind, Pallasmaa, J (2009) brings forth a modern-day dilemma where our disconnect from the natural world and our own sense of embodiment has reached an excessive level.

“In our age of massive industrial production, surreal consumption, euphoric communication and fictitious digital environments, we continue to live in our bodies in the same way that we inhabit our houses, because we have sadly forgotten that we do not live in our bodies but are ourselves embodied constitutions. Embodiment is not a secondary experience; the human existence is fundamentally an embodied condition. Today, our senses and bodies are objects of ceaseless commercial manipulation and exploitation.”, (Pallasmaa.J , 2009). ‘Embodiment’ is the closest we come to understanding the base of our existence and existential connection to our human body vessels that house our conscious beings by means of a physical and tangible representation of meaning all through sensory experience. By making, touching, doing, crafting, ritualistic embodied experiences reinforce our own sense of being and self.

In the rapidly industrialised and technically advanced world we find ourselves a part of, it is important to note the severe implications our technological growth has forced upon our natural beings. Modern way of life comes with a distance from some of the activities we, as humans, used to prioritise to survive. Many of us have no concept of where the food on our plates specifically comes from, the practices used to produce it or where our waste goes – completely removing our sense of responsibility toward the outcome and environmental impact of our consumerism. Above

that, we have had to put trust in third parties to supply our medications and nutrition and find ourselves generally unaware of the true content and effects of the substances we are putting into our bodies. Our food endures lengthy travel before reaching us, losing natural nutrition and increasing the need for the use of harmful preservatives. We eat with knives and forks, physically removing the experience of touch from the eating experience and wear shoes everywhere we go, physically disconnecting our bodies from the natural vibrations of the earth we rely on. Today, we will switch on a light without having to consider the consequential use of unrenovable resources and our own contribution to the pollutants that have put our planet in this fragile state. Factories produce products for money, a made-up currency, but ignore the long-term cost on our futures when considering the reckless production processes, destructive waste, pollutants and later, the inevitable disposal of such products after it is no longer useful but continues to live on as a space consuming and damaging object. We willingly purchase such products and support the market because we are, once again, disconnected from such consequences and absorbed by unbridled consumerism. We have been taught to expect fast and perfect production but never warned of the consequences.

In an interesting response to the realisation by humankind that the ramifications of our actions are resulting in real and visibly catastrophic environmental

events like extinction of multiple species, increased extreme climatic events and economic tumbles, efforts have been made to change some patterns in our societal rules. There is an increased consciousness around responsible consumerism, seen in examples like produce as the shift toward vegan and vegetarian lifestyles becomes prominent. Responsible disposal and recycling of waste, and in some cases, an effort to end support for products and businesses who do not respect these initiatives, shows a promising support for change. Living in smaller houses with energy conscious designs and supplementation of electricity with renewable energy sources has started to become increasingly cost effective and sought-after. There has been a shift back toward individuals growing their own produce in their backyards and collecting water from their rooftops – omitting costs in the long run, reliance on third parties and really enjoying the experience of consuming something they have nurtured into fruition. Amidst the COVID-19 Pandemic, many people are starting to reconsider their “work-life balance” and quality of lives when spending 8 or more per day working for somebody else’s company when they could learn to be self-sufficient and free themselves of that unnatural societal norm. The link to phenomenology is both the answer and the result. These practices are essentially reverting back to the basics of nature whilst taking a step forward in the advancement of our kind. In respecting our senses and involvement to every aspect of our lives, we are achieving a healthier planet and a more holistic

embodiment of ourselves. The movement toward sustainable living provides us with the opportunity to reconnect with our pre-modern instincts, knowledge and prioritisation of our embodied sensual needs that have been secondary to the industrialised lives we lead.

Moving forward with architectural interventions to match this notion means taking time to consider what it is that space could facilitate in order to connect us back to our “inner human selves” through the use of the very thing quality we have possessed all along, the ability to experience through consciousness. Phenomenology could contribute to this shift in mentality by exploring further the connections between the natural environment we so closely rely on and the consciousness connected to our experiences of spaces. One of the most promising fields for the change between human connectivity with our surrounding environments and sustainability is in agriculture and, more specifically, the generation of the urbanisation of agriculture through new technical advances that allow for vertical farming in controlled environments... I learned of the great benefits of hydroponic vertical urban farming. Some of many that stood out include far greater yields, recirculation and conservation of water, omitting the need for unnatural pesticides. The distance of travel between the farm and the store shelves are dramatically decreased, ensuring higher nutrition in products and reducing the need for preservatives. Most importantly, the product is grown by the community for the community, truly connecting the consumer to their food source and respecting its value at a different level. This is an

extraordinary intervention but subtle buildings can, too, play the part of reassociating human beings with their senses and extent of meaningful experiences we may underappreciate today.

The human population has reached a point in time where information is free-flowing and abundant. This leaves less room for personal experimentation and discovery. Forming an individual opinion is more challenging than ever. An element that coaxes an expression of emotion and encourages an embodied experience is at the root of the solution to the destructive ways our kind have embraced at the mercy of greed. Phenomenology is the artwork of theory that blends the beauty of an organic moment with a physical manifestation that is about interaction to remind the inner human about what it means to be human.

(Burkimsher, 2020)



“ A Modern Example Explored through Phenomenology

CASE STUDY: Antinori Winery by Archea Associati in Bargino, Italy, 2012

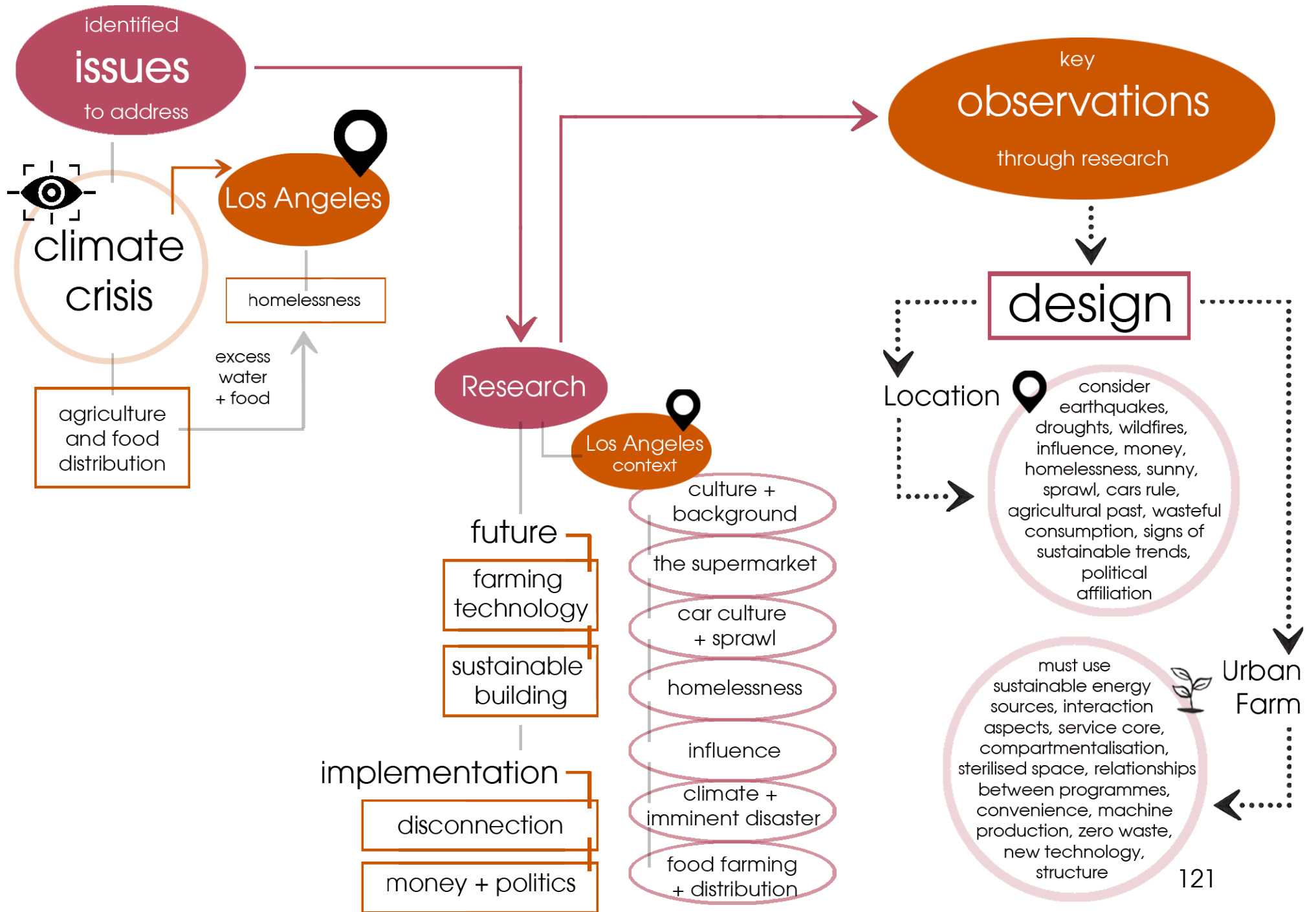
This building is programmed to serve as a winery - a productive landscape where grape vines grow and can then be processed on site and stored to develop a wine. This means that, although it is an elegantly thought-out landscape typology structure, it is man-made and its existence is essentially driven by consumerism and capitalist theory. The design choices to enhance the physical interaction of the customer with the space, textures and active agricultural processes this building encapsulates, is that of a phenomenological approach. One is truly immersed with the process associated with the product through the use of human sensation. The Antinori Winery is designed with movement and motion in mind, mimicking that of the true surrounding landscapes and persuading the users movement. The ascent up to the structure can be interpreted as empowering and descents as humbling. Textures are primarily natural and speak to the primal human instinct we possess around our organic environment, connecting us deeper to the experience and embodied sense of belonging. Lighting, too, is designed around nature's process as natural sunlight is manipulated to fill even the depths of the wine cellars. As the elements are each separately observed, it is clear that the phenomenological approach is what successfully draws the user to feel a sense of personal belonging and self-awareness - important for reconnecting each person with the roots of their being and embodied experience of the physical realm and, consequently, our responsibility to it.

(Burkimsher,2020) 

I will use objects of design that guide motion in my design. The gardens will make people bend and crouch, the cascading landscapes will make them climb and descend. Rough concrete will ask to be touched by the users and soil mounds mimicking a natural terrain will attract attention to their feet. Towering but light structures will force the eye upward and the smells, tastes and look of the growing edible plants will stand out against this urban backdrop. I intend on making the user acutely aware of themselves in scale and then aim this focus on the food processes on site to forge a relationship that promotes responsibility around what they are putting into their bodies and what this food is made up of, where it comes from and the procedure behind it.

References

- Archea Associati. (2012). Antinori Winery : Archea Associati. ArchDaily. Retrieved at URL: https://www.archdaily.com/371521/antinori-winery-archea-associati?ad_source=search&ad_medium=search_result_all
- Mino Caggiula Architects. (2020). Steven Holl : Great contemporary architects. Retrieved at URL: <https://www.minocaggiula.ch/en/steven-holl/>
- Oferio-Pailos, J. (2010). Sage Handbook. Chap.7. Architectural Phenomenology and the Rise of the Postmodern, pp.136-51. SAGE Publications.
- Pallasmaa, J. (2009). The Thinking Hand : Embodied and Existential Wisdom in Architecture. Architectural Design Primer. Wiley.
- Zilliacus, A. (2016). Peter Zumthor's Bruder Klaus Field Chapel Through the Lens of Aldo Amoretti. ArchDaily. Retrieved at URL: <https://www.archdaily.com/798340/peter-zumthors-bruder-klaus-field-chapel-through-the-lens-of-aldo-amoretti#:~:text=The%20Bruder%20Klaus%20Field%20Chapel,of%20the%20cast%20concrete%20walls.>
- Zumthor, P. (2010). Thinking Architecture. Basel, Boston, Berlin: Birkhauser - Publishers for Architecture.





Site Context

09



Site Specific

10



Charette

11



Viability + Feasibility + Programme

12



Programme

13

PART 01B

analysis

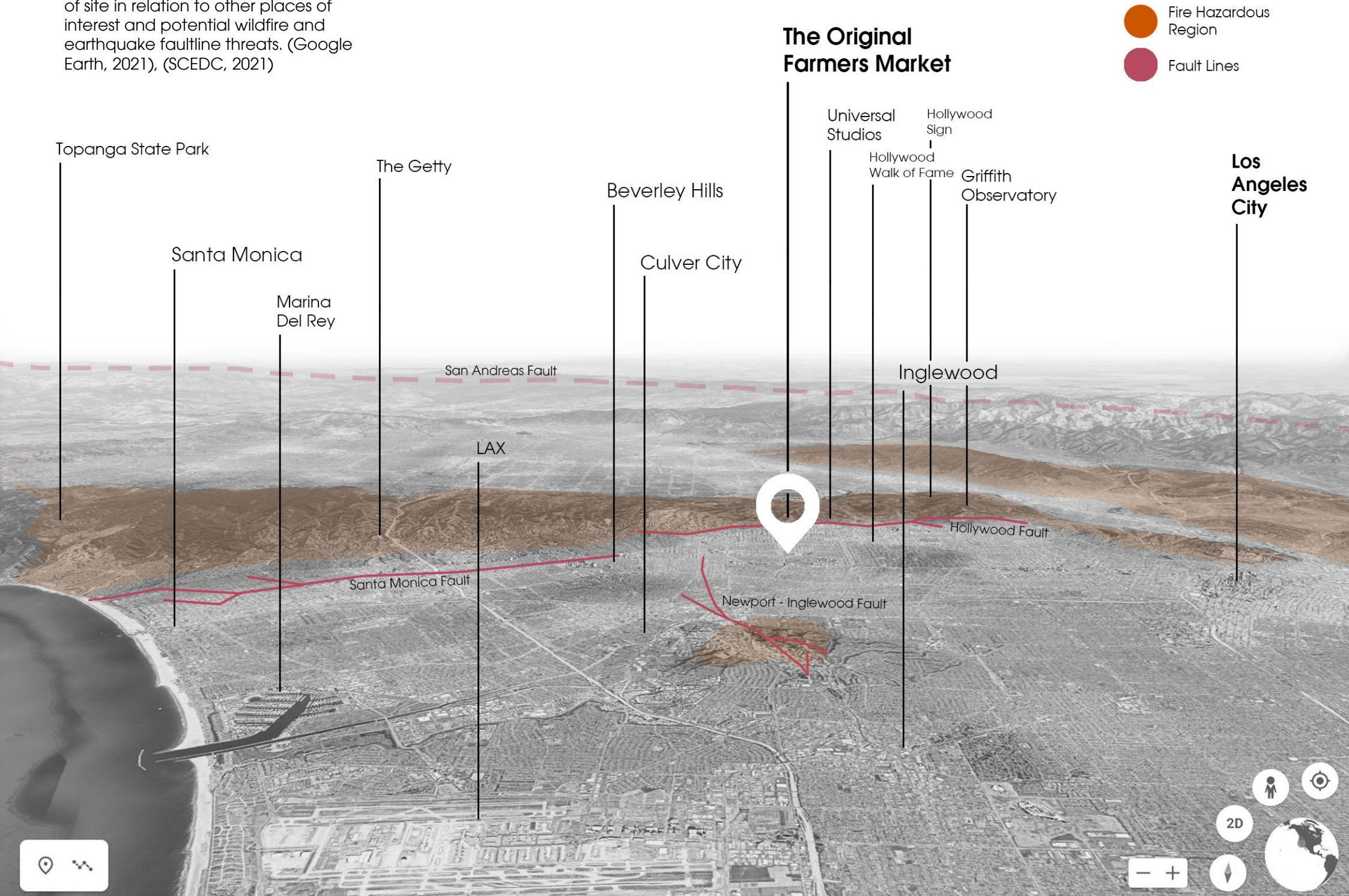


The geographical placement of the proposed design will affect conceptual informants. Climate, community and specific challenges surrounding the region around homelessness natural disasters and traffic congestion will need to be considered. Next, the relevance of the specific site will be made through reference to its agricultural background and aspects of its current layout.

PART 01B analysis

GEOGRAPHY

Fig 1 - View highlighting orientation of site in relation to other places of interest and potential wildfire and earthquake faultline threats. (Google Earth, 2021), (SCEDC, 2021)



Orientation

The site will form part of the complex at The Original Farmers Market due to its strong agricultural background merged with its ability to adjust with modern times and the new needs of the city. It is located in the heart of Los Angeles, between the CBD and Beverly Hills, making it a popular retail destination well known throughout the city. It is vital to remember, that like the city of Johannesburg, contrasting areas can share borders, meaning it cannot be assumed that all surrounding areas are nearly as affluent as Beverley Hills.

The location of focus has been chosen with the aim to persuade the movement of a city. Choosing a site is choosing the point of collection and gathering around a specific activity. In this case, an urban farm should be placed where it is easily accessible to as many residents as possible and a notable established social gathering space. It should be beneficial to a range of consumers from the affluent individuals in Beverly Hills mansions to those living in their cars across the city.

Disaster Informants

The distant proximity to the hilly terrain, which is often

the landscape prone to wildfires, means that the site is not at high risk of exposure to wildfires. The smoke, however, could affect the air quality in the area on occasion. The close-by Hollywood Fault is sure to cause minor earthquakes in the region from time to time but according to Property Research (2021), the site is out of range of the possible resulting landslides. The San Andreas Fault poses a larger threat, upon realisation of "The Big One" (See Climate & Imminent Disaster 03). The design application of this site must be considerate of seismic activity.

The Community

Security of fresh produce in the future as we move into the climate crisis would benefit any community. It is challenging to understand a community from a distance but based on prior knowledge, information from property websites, menus from surrounding restaurants, Google Street Views of surrounding neighbourhoods, a representative taking me on a virtual tour, and other 21st century resources - a site-specific picture has been deducted.

This lively surrounding community involves residents from all walks of life, restaurants and grocers who would benefit from having a healthy food source that is easily accessible, reliable and without the costs of

major distribution networks and packaging. Another important benefit is the transparency of the process. Residents and commercial clients are able to see, visit and directly interact with the farm. This will form a strong tangible connection between the consumer and their sustenance.

In my research I am also addressing the global community. My intention is to design a vertical farming typology that encourages a conceptual shift in the agricultural industry and consumption. The typology explores the integration of agricultural practice back into the urban environment by incorporating theory of phenomenological design, convenience and economic opportunity. If the vertical urban farming building typology can be established as a tool in the fight against the climate crisis and the roll out of initiatives like it is significant, the benefit will come back to many individual communities including these in Los Angeles. I believe that the vertical farm approach is particularly efficient in an area of such high density. With density comes a prosperous consumer base.

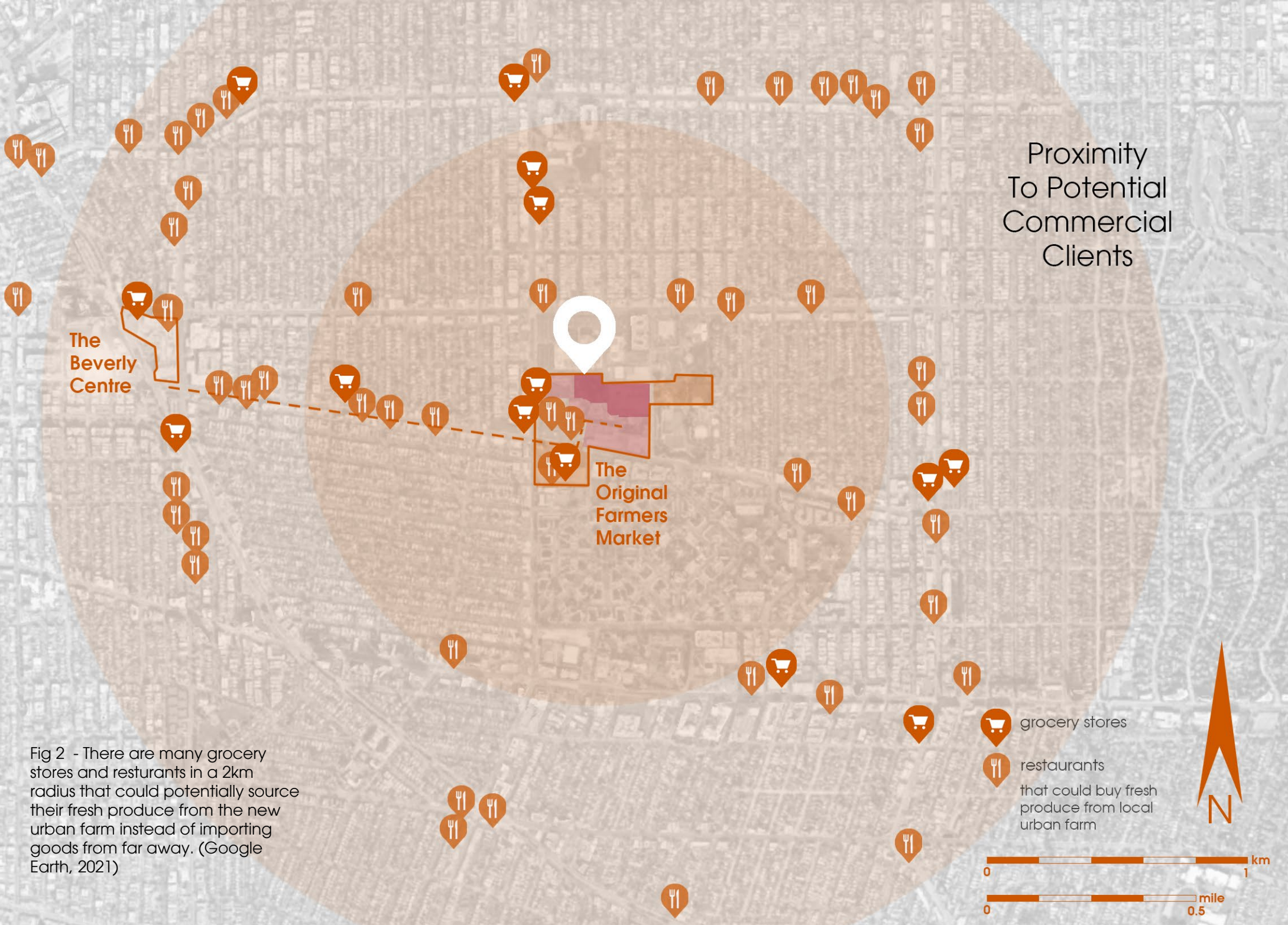
The Commercial Community

The diagram (*Fig. 2*) shows some of the prominent restaurants and grocery stores, in a 2km radius of the planned site for the urban farm. These are

potential consumers that might source their fresh sustainable produce here instead of using the large-scale distribution methods they are reliant on today. The commercial aspect of clientele will ensure a consistence in sales and help sustain large-scale funding for the project.

Distribution from urban farm to commercial customers will also be of a limited radius, which will result in less fuel consumption, change packaging requirements and reduce the use of preservatives. This may encourage more urban farms set up on an urban scale, servicing areas that are farther away. The diagram shows some of the prominent restaurants and grocery stores, in a 2km radius of the planned site for the urban farm. These are potential consumers that might source their fresh sustainable produce here instead of using the large-scale distribution methods they are reliant on today. The commercial aspect of clientele will ensure a consistence in sales and help sustain large-scale funding for the project.

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Proximity
To Potential
Commercial
Clients

The
Beverly
Centre

The
Original
Farmers
Market

-  grocery stores
-  restaurants
that could buy fresh
produce from local
urban farm

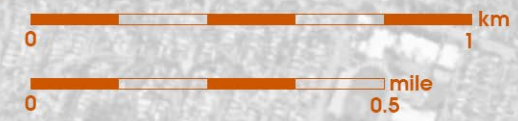
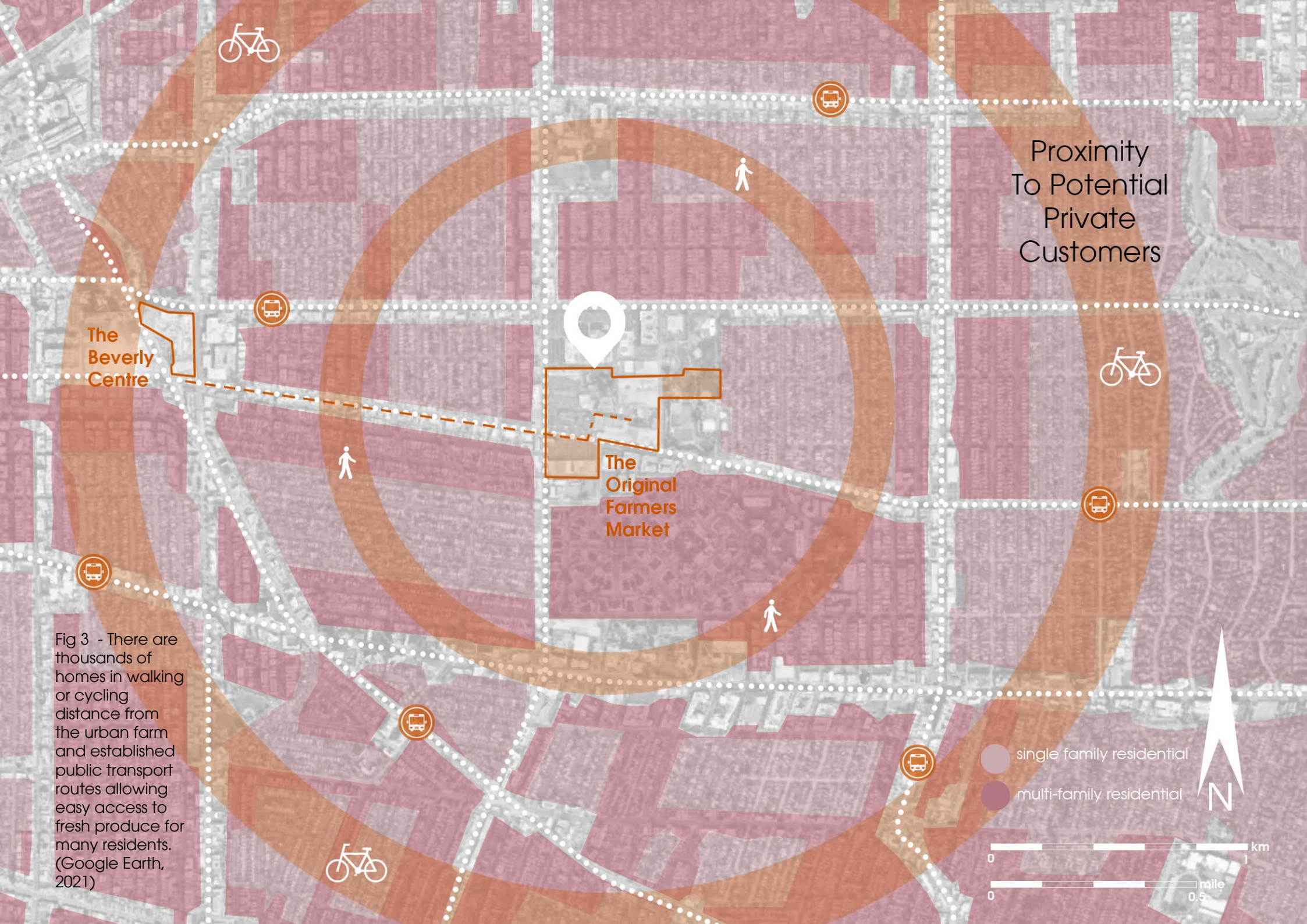


Fig 2 - There are many grocery stores and restaurants in a 2km radius that could potentially source their fresh produce from the new urban farm instead of importing goods from far away. (Google Earth, 2021)



Proximity
To Potential
Private
Customers

The
Beverly
Centre

The
Original
Farmers
Market

Fig 3 - There are thousands of homes in walking or cycling distance from the urban farm and established public transport routes allowing easy access to fresh produce for many residents. (Google Earth, 2021)

- single family residential
- multi-family residential



The Residential Community

The surrounding residents will have access to a grocery store that embodies the farm-to-table approach in a modern urban context. This surrounding community is a diverse mix of homeless, middle-class to upper class residents. All equally deserving of the sustenance we equally require, grounding a base point for the aim of this design.

As seen in the diagram (*Fig. 3*), there are hundreds of thousands of residents in a 2km proximity to the site. Each surrounding neighbourhood within vastly different economic brackets. For that reason, the design approach should cater for those who would like to enter the grocery drive-thru in a car or on foot or by a bicycle. The majority of residents visiting the site will presumably have car, as the car culture persists in this sprawling city. Those millions of residents across the Los Angeles County will be catered for in terms of parking and ease of movement with motor vehicles through the urban farm structure. There are also existing bus and train routes connecting most of the region to the site.

The Homeless Community

The Original Farmers Market is in a location that is easily accessible via public transport. This allows the

project to be inclusive of those who do not necessarily have access to their own vehicles. Saying that, in an interesting spill-over of the car culture in Los Angeles, according to the data recorded in the diagram on the left, almost half of the homeless population live in their cars.

Although the site is set in a middle to high income area, the farm aims to use this as an opportunity to help lower income areas, and particularly the homeless people in the region, gain access to food and hygienic sanitation. (See *Homelessness in Culture & Background 01*).

To incorporate a zero-waste approach, my design proposal must ensure a sustainable outcome and the homeless community may benefit from excess produce and ablution facilities serviced with the treated greywater outputs from the farm. The homeless relief centre will be designed with a guided one-way process in mind. Homeless or needy visitors will be led through the building with an expected exit that discourages lingering. The centre offers a facility to be used for grooming and sustenance, not shelter.

It should also provide the homeless with opportunities. There will be programmes to learn self-sustainable behaviours, receive training in sustainable agricultural practices and create jobs that do not require prior experience. Most of the work required at the urban farm can be considered friendly to those with mental

Fig 4 - Los Angeles has homeless populations spread across the city with no shelter, living in tents and living in cars. (Google Earth, 2021), (Los Angeles Times, 2015)

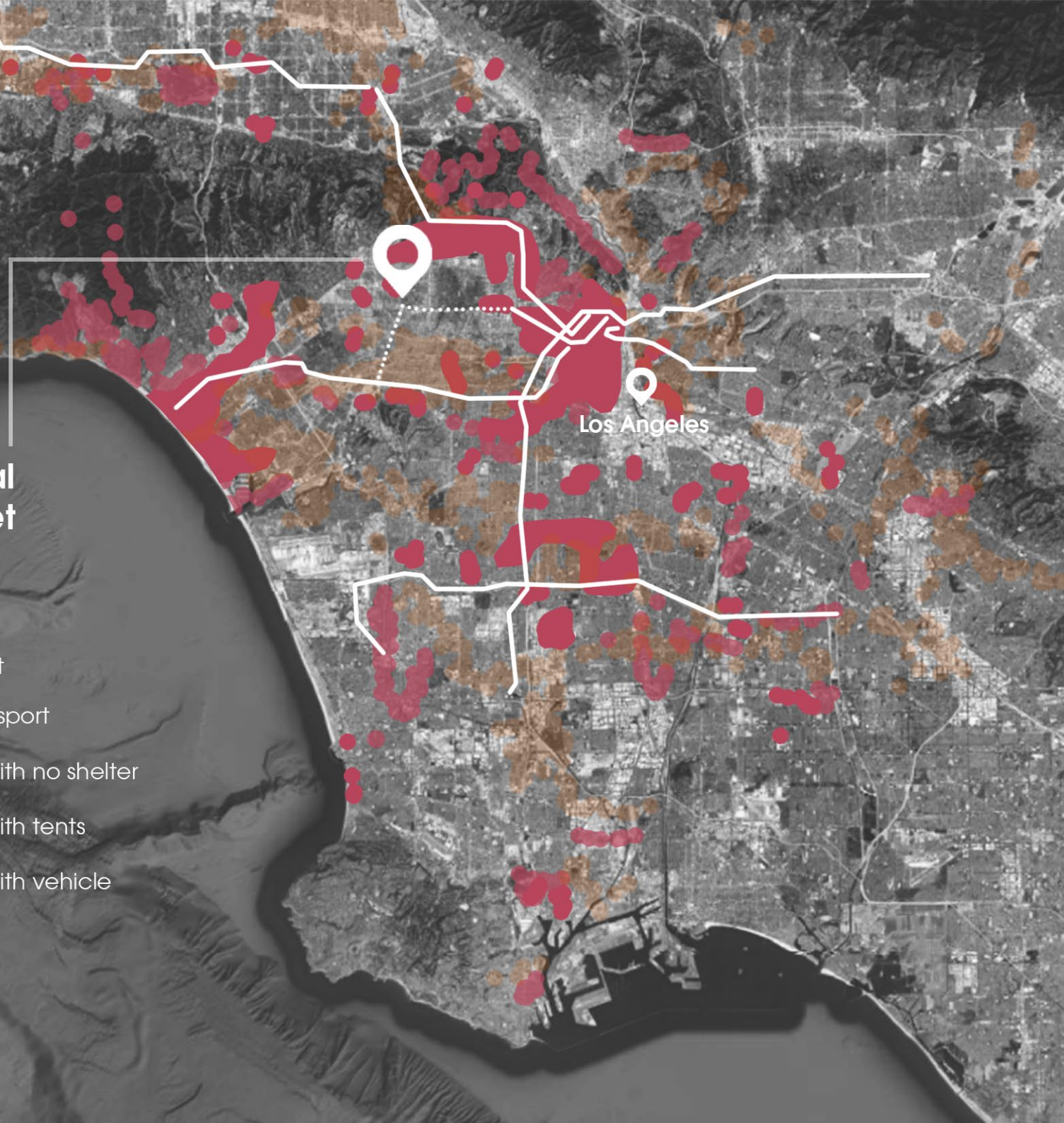
The Original Farmers Market

- public bus transport
- public railroad transport
- homeless people with no shelter
- homeless people with tents
- homeless people with vehicle



0 15 km

0 10 miles



illness and does not require a formal education, giving opportunity for employment to people with these issues.

The benefits surrounding the urban farm may draw some homeless people to the immediate area which the more affluent population may discourage. I personally see it as an opportunity to provide a controlled safer environment for the homeless, that subsequently boosts the production and function of the urban farm thus servicing the middle to affluent residents too. The site is situated in an upper-middle class region but is close enough to service the extremely affluent city of Beverly Hills that forms part of Los Angeles County. The residents are commonly known to be A-list celebrities and successful business tycoons and the area is generally discouraging of homeless encampments because, perhaps insensitively, the residents pay to live a life of luxury and this is a popular tourist destination. The affluent and influential demographic of this region introduce another aspect to the project. Conversely, the other neighbouring suburbs are not as well off and lead an average American lifestyle.

With provided ablutions and access to produce, the desired effect is that the homeless people have the opportunity to keep up higher hygiene standards as well as focus on further levels on the hierarchy of needs once hunger is addressed. The control comes from a system of exchange and

reward. The urban farm needs workers to tend to the farm. Training programmes will need to be set up because the 'urban farmer' is not yet a mainstream profession. The homeless people that are capable of working at the farm may get the opportunity to do so with a paying job, which would hopefully result in a step toward exiting homelessness. Those that are not able to work anymore could be rewarded with fresh produce in exchange for entering a valid homeless programme provided by the city. This means that only homeless people that work for the farm or have entered programmes will be in the area.

Vehicular Traffic Congestion

Los Angeles is notorious for its excessive traffic congestion and sprawling interwoven multi-lane freeways. The diagram presents the areas of the city that are most congested in peak traffic times. This is important to understand when designing an aspect of a building around an activity that could be reliant on traffic. The drive-thru grocery is designed as a tool of convenience for motorists who do not have time to park their cars and walk into a grocery store but may also work all day and so cannot be around to retrieve grocery deliveries. The idea is proposed around making the sustainable option 'convenient.

Fig 5 - Areas of vehicular traffic congestion in Los Angeles. (Google Earth, 2021), (SigAlert.com, 2021)



CLIMATE

Climate

The vertical farm concept is one that is designed to streamline agriculture into a productive machine. The benefits, as discussed previously, are boundless but for a community in Los Angeles, the priority is in educational, sustainable and community value.

Vertical farming, or controlled environment agriculture, as indicated in previous chapters, is a vital tool in the movement toward global food security for our current population and in the eventual challenges the planet will face as the effects of the climate crisis take hold.

The most wasteful factor in controlled environment agriculture is in the extreme volumes of energy required to heat, cool and light up the interior environment for growing. In my opinion, The Original Farmers Market site is a destination that has the perfect conditions to test the concept in terms of weather, climate and socio-economic and political aspects. At the chosen site, the weather and climate are close to perfect growing conditions naturally. Warm, long sunny days and mild winters promote less artificial intervention. Natural ventilation is achievable by the use of the wind predominant directions and solar energy collection is largely successful in the region.

With my design based on these informants, the building

that hosts the vertical urban farm can enhance the community through the supply of truly organic fresh produce straight from the source, while adding little to no addition to the fossil-fuel-energy-run grid. I consider car culture as a symbiotic element of my design approach. Carbon emissions and sources of energy using the motion of the car will be considered.

If there was a commercial farm of a similar capacity to the proposed vertical urban farm in the middle of Los Angeles, water would have had to be brought in with aqueducts. This is how agriculture was formally sustained when Los Angeles was a farmland. Although the vertical farm may rely on the same infrastructure at times, the recirculation of the water in the system reduces the requirement drastically. This means that any rainwater that would have otherwise gone into stormwater systems can now be collected and make a significant contribution to the growth of produce for the community. The rainwater collection process is relatively simple given that the site is a somewhat impermeable surface and storm-water drains have already been established.

Clean energy, a sustainable water source and working with the natural and existing environment instead of against it, are the rules for implementation of this project.

Average Temperature & Solar Effect in Los Angeles

Although the diagram in Climate & Imminent Disaster 03 shows that the temperature over the last 14 decades on record have shown that the average temperatures in Los Angeles are rising and the average rainfall is dropping, the region still has an ideal growing climate.

According to J du Plessis (2003), the optimum temperature for maize germination is between 20°C to 30°C. "Maize is a warm weather crop and is not grown in areas where the mean daily temperature is less than 19 °C or where the mean of the summer months is less than 23 °C... The critical temperature detrimentally affecting yield is approximately 32 °C." (J du Plessis, 2003). Maize is representative of an average bulk crop for food purposes in this example. Los Angeles stays within the required daily temperatures to produce an abundant yield but if temperatures continue to rise in the region, it will soon become too hot for the crops to survive.

Comparatively, Los Angeles is, on average, 3-5°C warmer than Johannesburg and has about 1 more hour of sunlight per day - both great regions for prosperous agricultural activity.

Average Rainfall, Humidity and Sea Level Rise in Los Angeles

As stated by J du Plessis (2003), "A yield of 3 152 kg/ha requires between 350 and 450 mm of rain per annum.". The average rainfall in Los Angeles is at about 206-379mm per annum (Weather Atlas, 2021), enough to uphold a successful agricultural environment although the area is prone to drought. In Climate & Imminent Disaster 03, it can be seen that the average rainfall per annum is dropping over the decades. As the globe's atmosphere begins to warm, this could result in an environment that is too arid to grow crops in the Los Angeles region in the near future.

According to an interactive map by Floodmap.net (2020), the rise in sea level could see damaging flooding of the major agricultural landscape of California at just 10m of rise. Between 1880 to 2020, the sea level has risen by 0.4m, as illustrated in data written by Kimberly Amadeo (2021), but the sea level is rising at an increasing rate along with the melting icebergs due to climate causing change, making this a substantial threat. "Even if we significantly curb emissions in the coming decades, more than a third of the world's remaining glaciers will melt before the year 2100... if emissions continue to rise unchecked, the Arctic could be ice free in the summer as soon as the year 2040."(L.Hancock, 2021).

Sun & Wind Informants

0-20 km/h



PROJECT SITE

Beverly Blvd

McCoy Drive

Fairfax Ave
Farmers Market Pl

W 3rd St



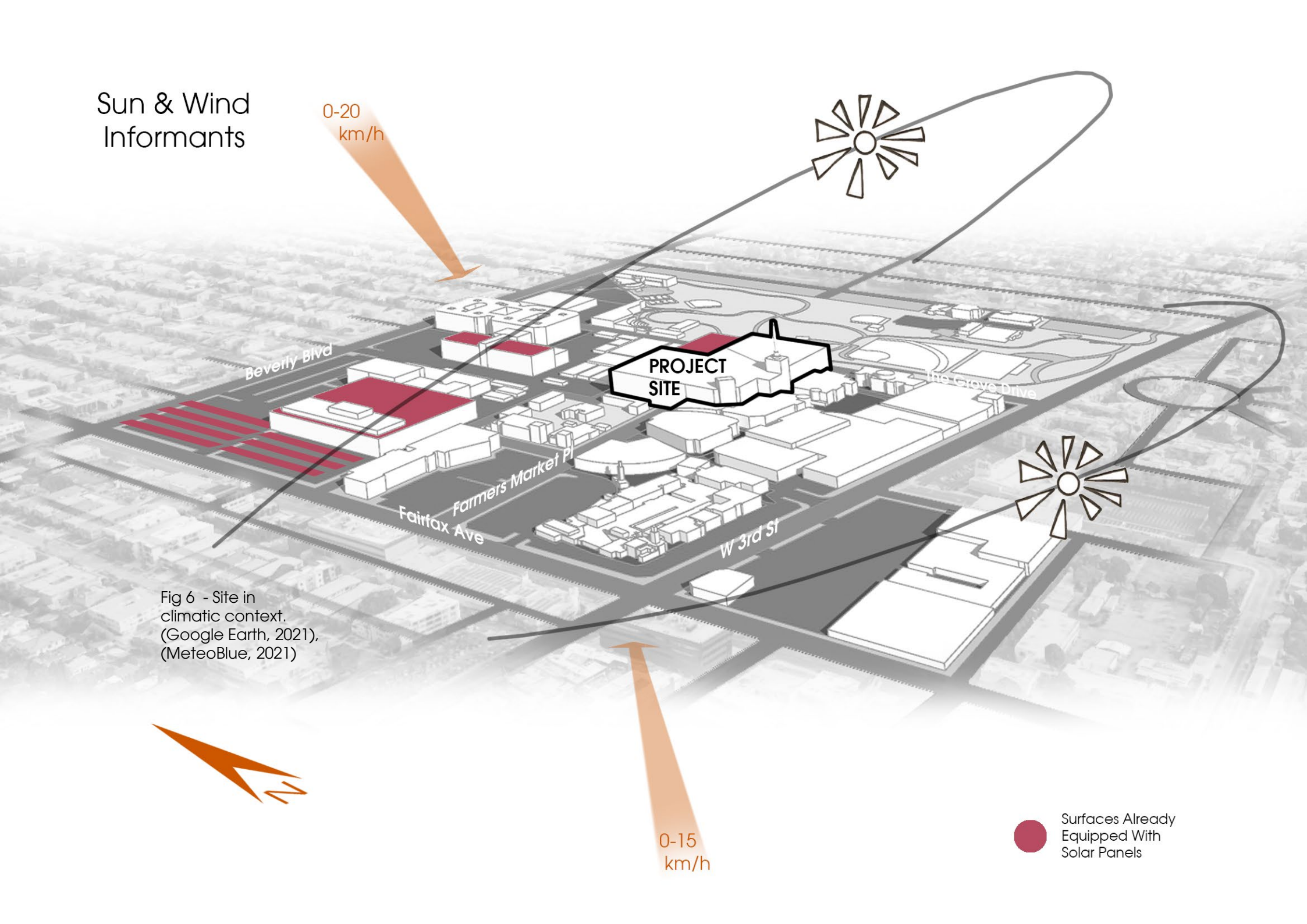
Fig 6 - Site in climatic context. (Google Earth, 2021), (MeteoBlue, 2021)



0-15 km/h



Surfaces Already Equipped With Solar Panels



Average Temperature & Solar Effect in Los Angeles

Fig 7 - average temperatures in Los Angeles. (Weather Atlas, 2021)

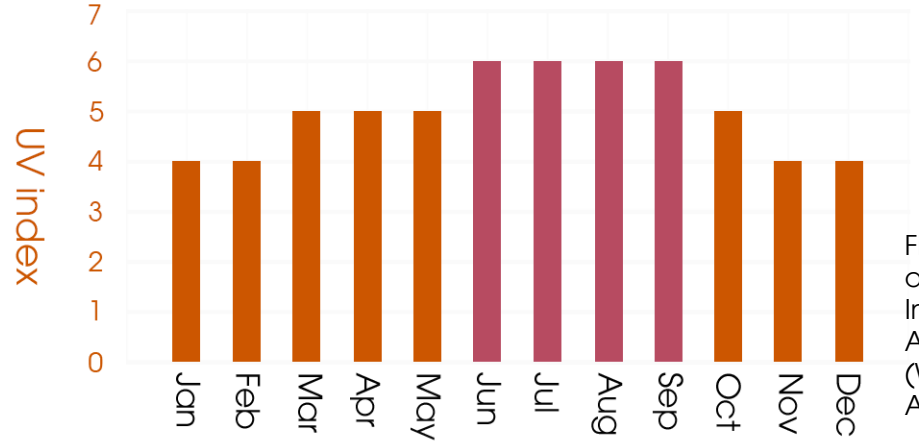
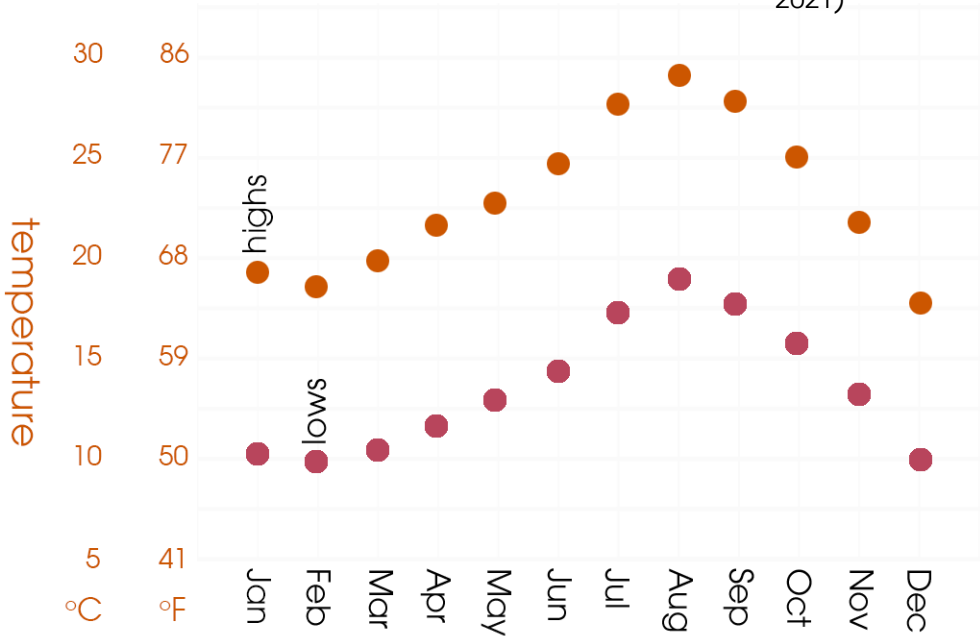
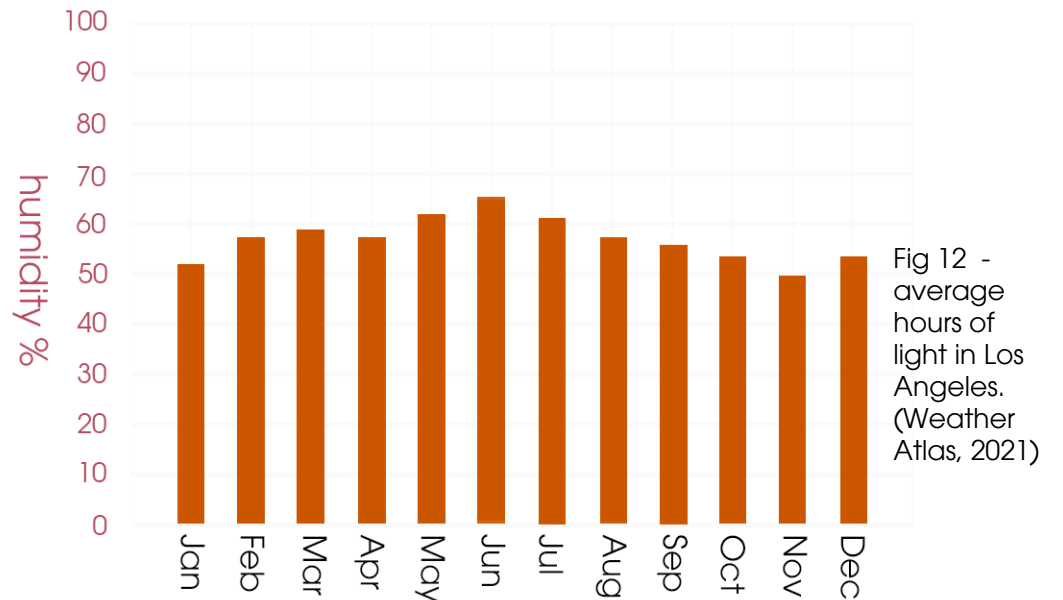
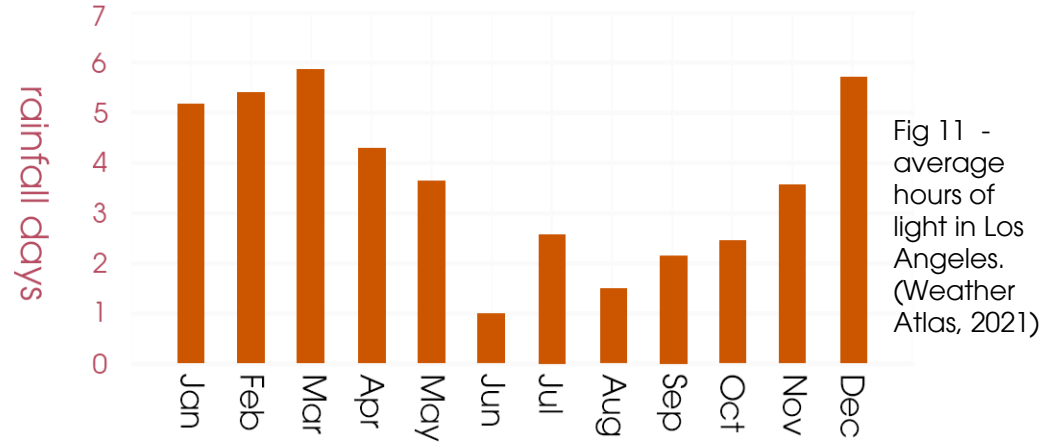
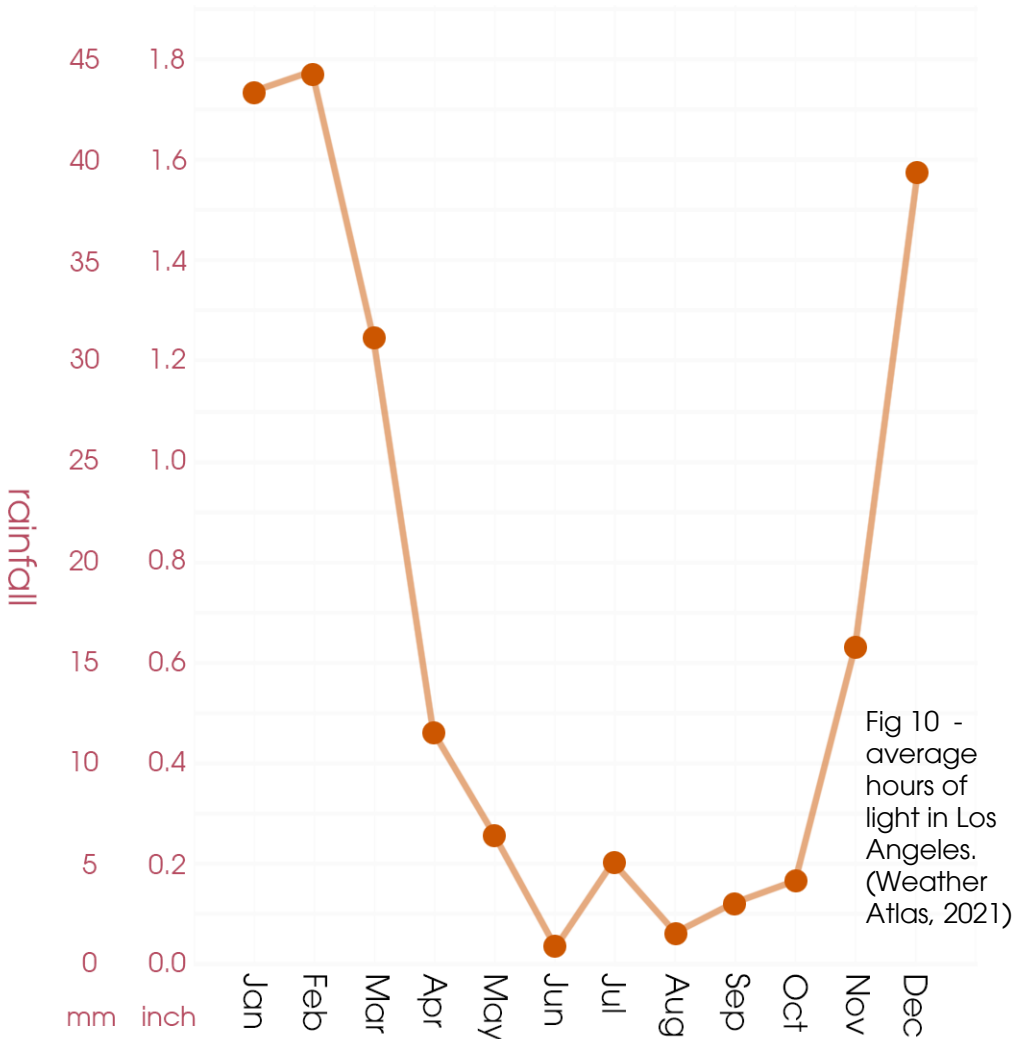


Fig 8 - average UV Index in Los Angeles. (Weather Atlas, 2021)



Fig 9 - average hours of light in Los Angeles. (Weather Atlas, 2021)

Average Rainfall & Humidity in Los Angeles



THE PAST

The Original Farmers Market Background and Relevance

The Original Farmers Market is a site that draws on many aspects of relevance to the research of climate, agriculture, produce distribution, food insecurity and car culture. The site is arguably a micro symbol, representative of the historic narrative and development of Los Angeles as the city we see today.

The land has a rich agricultural history as a dairy farmland. Later, as a prime site on the busy intersection of Fairfax Ave and 6333 W 3rd Street, a farmer's market where farmers in the area once returned weekly to sell their fresh produce from the trunks of their automobiles.

This leads into the relevance of the car in this narrative. Before the market even began, oil was discovered here, the cows were sold off and the site developed quickly into a field of oil rigs (AF Gilmore Co, 2020). Gilmore Oil, became the number one supplier of oil to Los Angeles for some time. It was from this point that the car took precedence on this site and many others sites across Los Angeles as land was tarred and parking bays demarcated. Furthermore, a stadium was built on the property that hosted many sporting and entertainment events, car racing was a popular event (AF Gilmore Co, 2020).

The car is a multitude of things - a distribution tool, a storage compartment, a connector of the sprawling city and a contributor to the climate crisis. This site is located in an easily accessible region of Los Angeles, surrounded by public transport routes and popular attractions. Despite this, the car still rules the land and parking absorbs an exorbitant area.

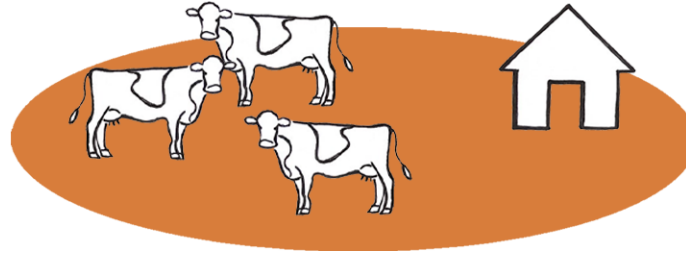
The Farmers Market culture that has culminated over the years in this location should be difficult to forget but, unfortunately, concrete and tar have seeped so far and wide over Los Angeles that not even this significant farmland remains. Only the timber farmers market stalls set on a concrete base and a few looked over gimmicks as reminders of its past can be seen today.

The stalls that were first set out to link the farms to consumers in a 'farm-to-table' approach, now provide a different food service. The food offered now is predominantly prepared/ready-to-eat food. Processed and packaged rather than fresh and raw. Today, hundreds of cars fill the lots surrounding the stalls and trucks bring food in from far away. Along with this modern approach to food, the market also hosts the sale of commercial products like clothing, toys, furniture and more, as the space for fresh produce is slowly diminished.

The Original Farmers Market History

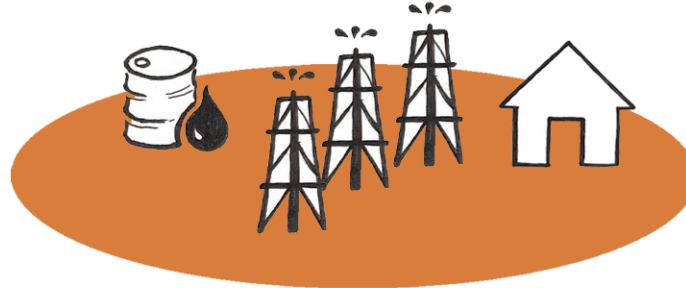
1880

Arthur F Gilmore bought a dairy farm, a 256 acre ranch in the Los Angeles area. The surrounding area was largely open grassland and other farms for citrus etc. He continued use of the farm as a dairy.



1900

In expansion of the dairy farm, drilling for new water wells commenced. This led to the discovery of oil on the property and the cows were replaced by a field of oil rigs.



1934

The stadium was built just before the market. It was a central point for sport in LA at the time, hosting rodeos, boxing matches, motorcycle races, swim exhibitions and more.



1934

Two entrepreneurs had approached Mr Gilmore with "an idea". The busy intersection and growing use of the automobile in LA set the perfect opportunity to create a market for farmers of LA to come and sell their produce



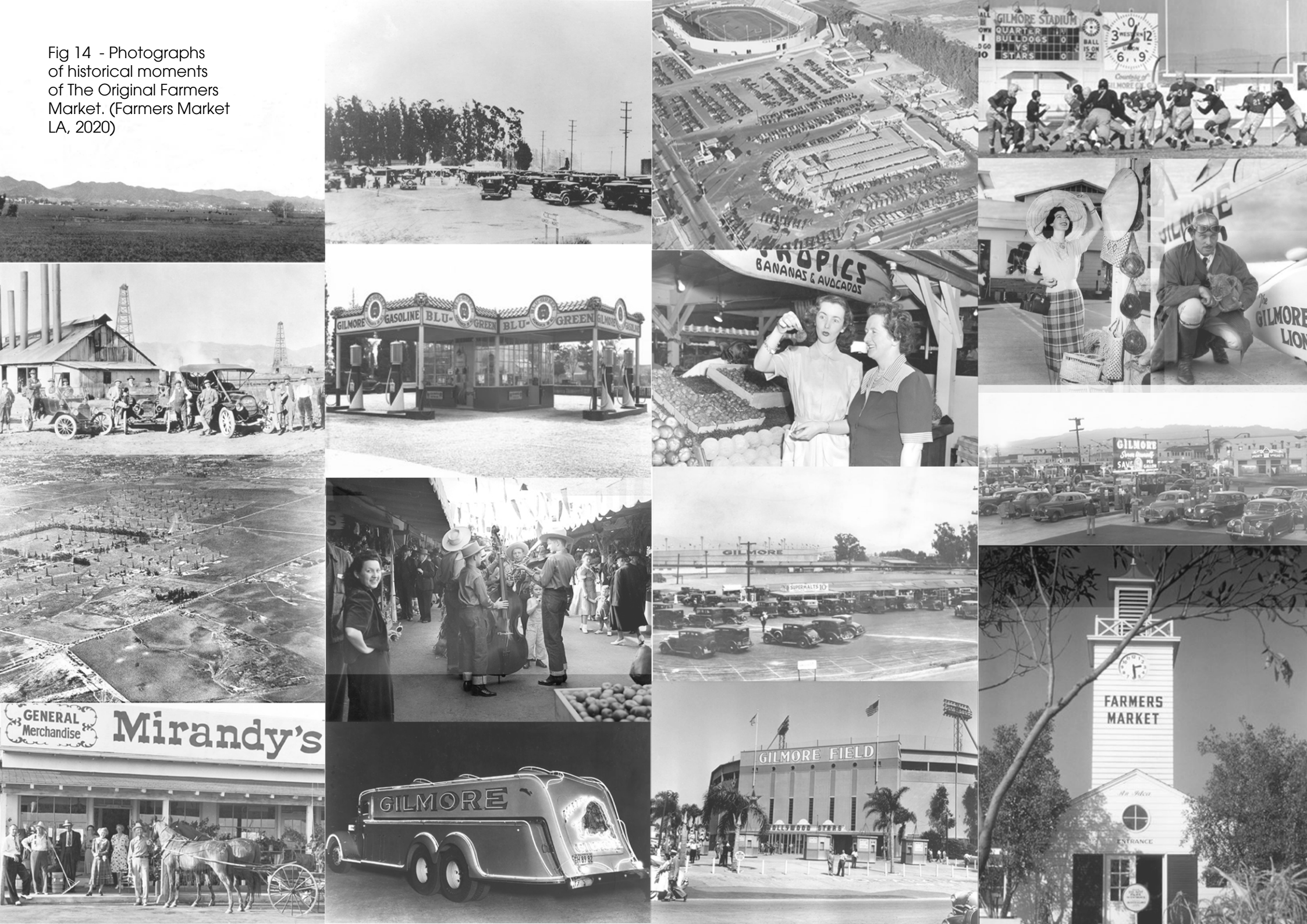
today

Now the farm is covered up by roads, concrete and parking lots but the market has grown. It now sells produce along with commercial products and prepared food at stalls.

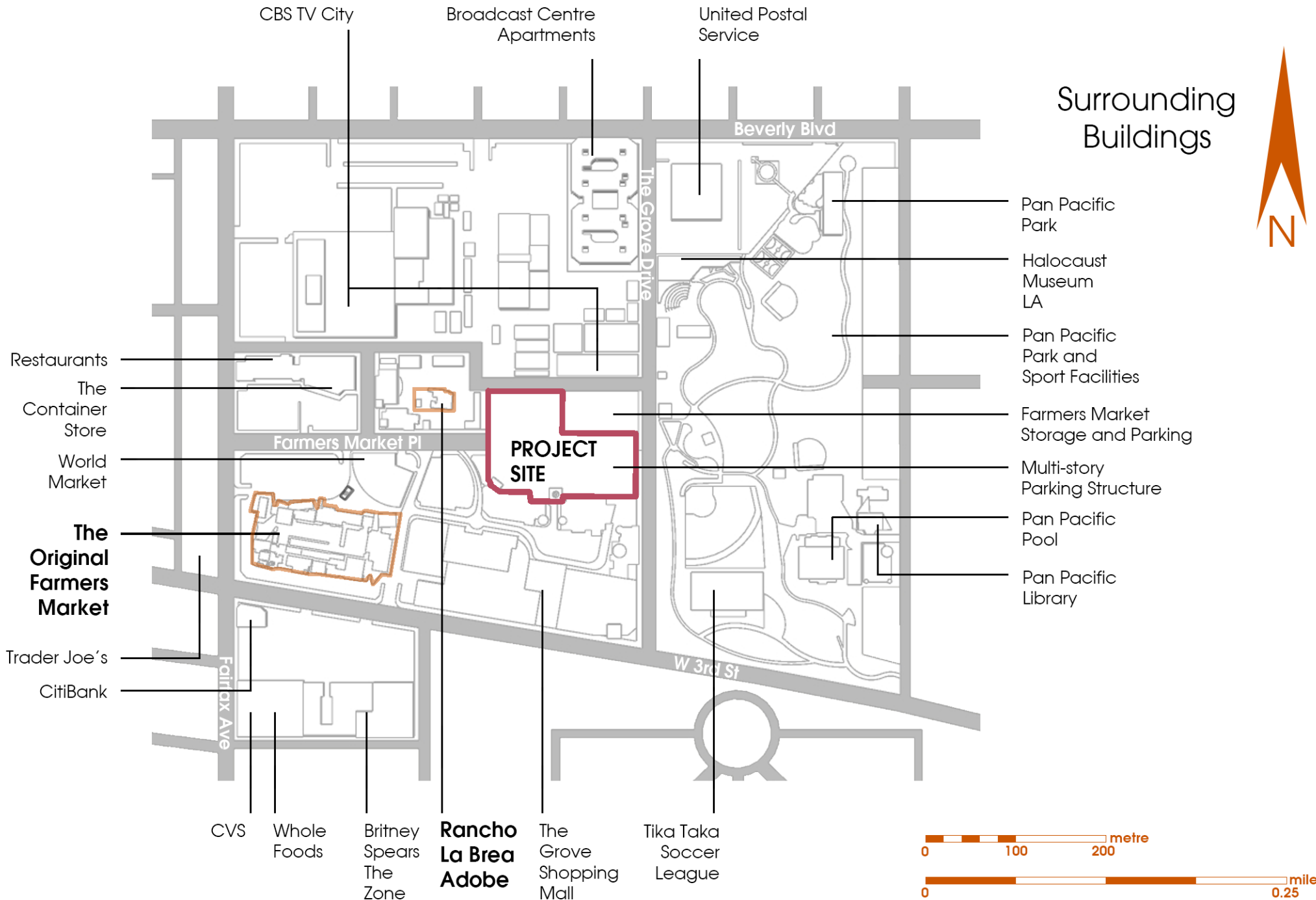


Fig 13 - Timeline of land use on The Original Farmers market property. (Farmers Market LA, 2020)

Fig 14 - Photographs of historical moments of The Original Farmers Market. (Farmers Market LA, 2020)



THE PRESENT



Surrounding Buildings

The Rancho La Brea Adobe is the complex inclusive of the original farmhouse that previously belonged to Mr Gilmore from 1880. The house is preserved as a Historical Landmark today, although tours of the property are not available for the public.

The Original Farmers Market, as discussed previously, was the eventual culmination of a mass of stalls erected to host the sale of fresh produce from surrounding local farms on a weekly basis. Today, the stalls remain but without the agricultural landscape or strong affiliation with fresh local produce.

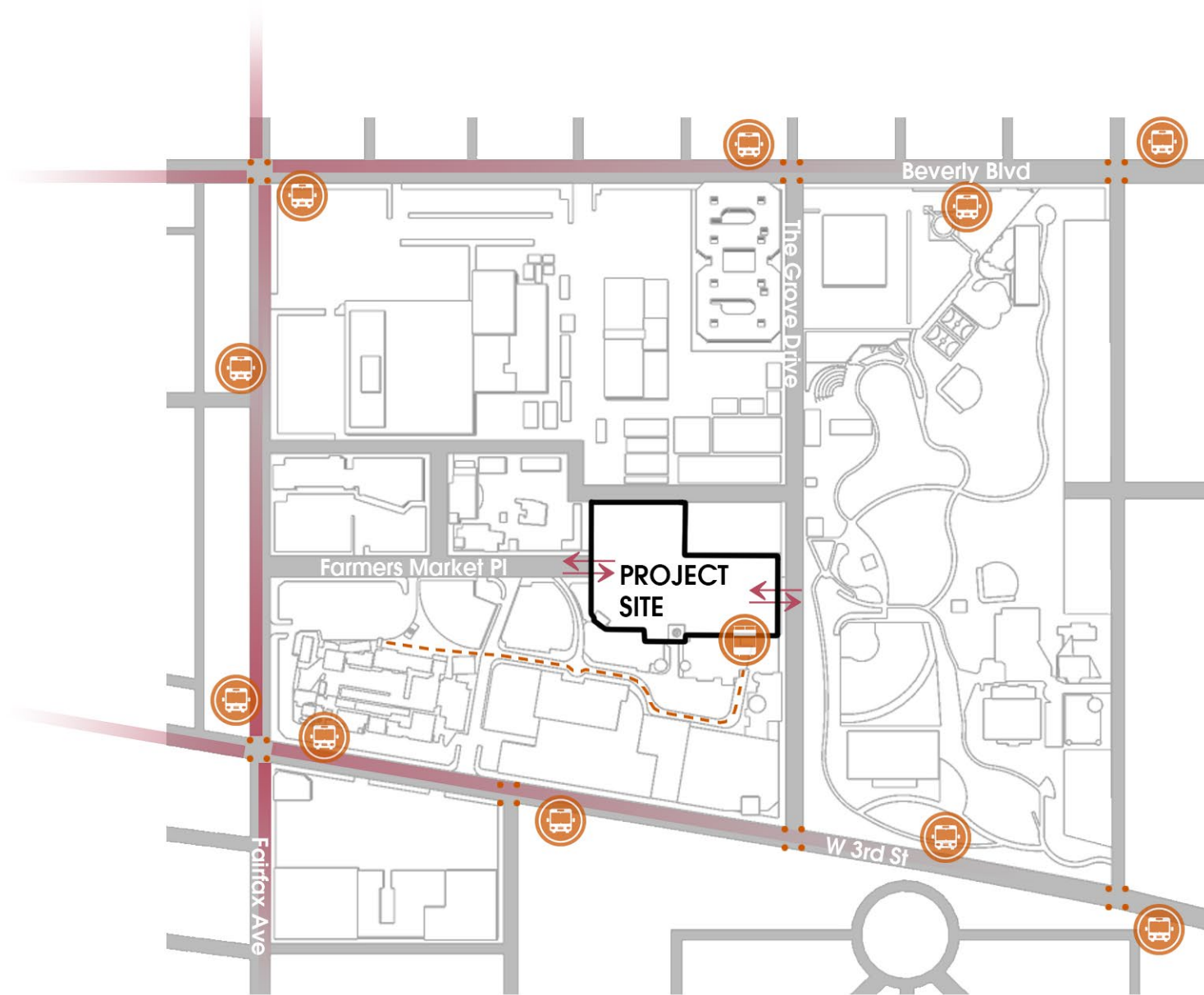
Two notable large-scale grocers have stores adjacent to the site. Whole Foods and Trader Joe's. Although these stores both provide fresh produce and follow policies of 'organic' produce, their distribution methods and commercial farming methods may challenge their integrity going into the future of the climate crisis. This is discussed in previous chapters. You could say that these two grocers came in with better prices and corporate marketing skills and forced the programme of the Original Farmers Market to shift into a commercial retail centre. I plan to design an intervention that does the same to the large-scale grocers, to force them to adjust with the consumerism trend of urban farming one-stop grocers.

In consequence, shift to a greener approach to the food supply network.

The Farmers Market performs more as entertainment, 'a day out', rather than a fresh produce grocery in 2021. The site has developed as such and the surrounding developments have followed in name of capitalist consumerism and demand.




The Grove is a shopping mall that was established in 2002 and has become a highly popular retail destination in the city despite the 1982 Beverley Center that offers similar stores just over 1 mile to the west of the site. This shows the demand for this type of service and lends to the stereotypical capitalist-led American consumer pattern in the area. Attached to the Grove is a multi-story parking structure that can host approximately 6900 cars and has a 360 degree view of Los Angeles from the top. This will be the base structure into which my proposed design will be integrated. The structure does not often reach full capacity which makes its necessity on the site debatable. There have been drive-in movies and events alike on the open-air top level of the structure at times which draw more of a crowd than the daily shoppers from The Grove.

Behind The Grove parking structure is a service alley that separates the structure from the CBS Television



Vehicular Routes



-  Public Transport / Bus Stop
-  The Grove Trolley / Depot and Line
-  Vehicular Access To Project Site
-  Vehicular Congestion

0 100 200 metre

0 0.25 mile

Broadcasting Company. The CBS lot does not directly interact with the activity of the market or the mall although there is an apartment block on the lot with residents that are likely customers of the surrounding grocers.

Across the road, The Grove Drive, is the Pan Pacific Park. It offers public sports facilities, libraries, a swimming pool, community centre and the Holocaust Museum LA. The park is one of the larger open green spaces left in Los Angeles and provides a further future opportunity for a reintroduction of the agricultural culture Los Angeles was built upon.

Vehicular Routes

The Project Site is surrounded by an extensive network of bus routes and stops. These bus stops bridge the gap between the site and the existing railroad network that operates in Los Angeles. However, the use of the individual automobile is still the primary means of transportation in the region.

The diagram describes the surrounding bus network, the most congested intersections in the immediate area and the vehicular entrances into the project site. It should be noted that The Grove Drive to the East of the Project Site is an underutilised street amongst many other congested intersecting streets. The highly

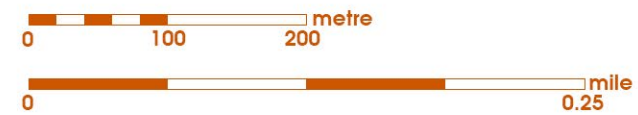
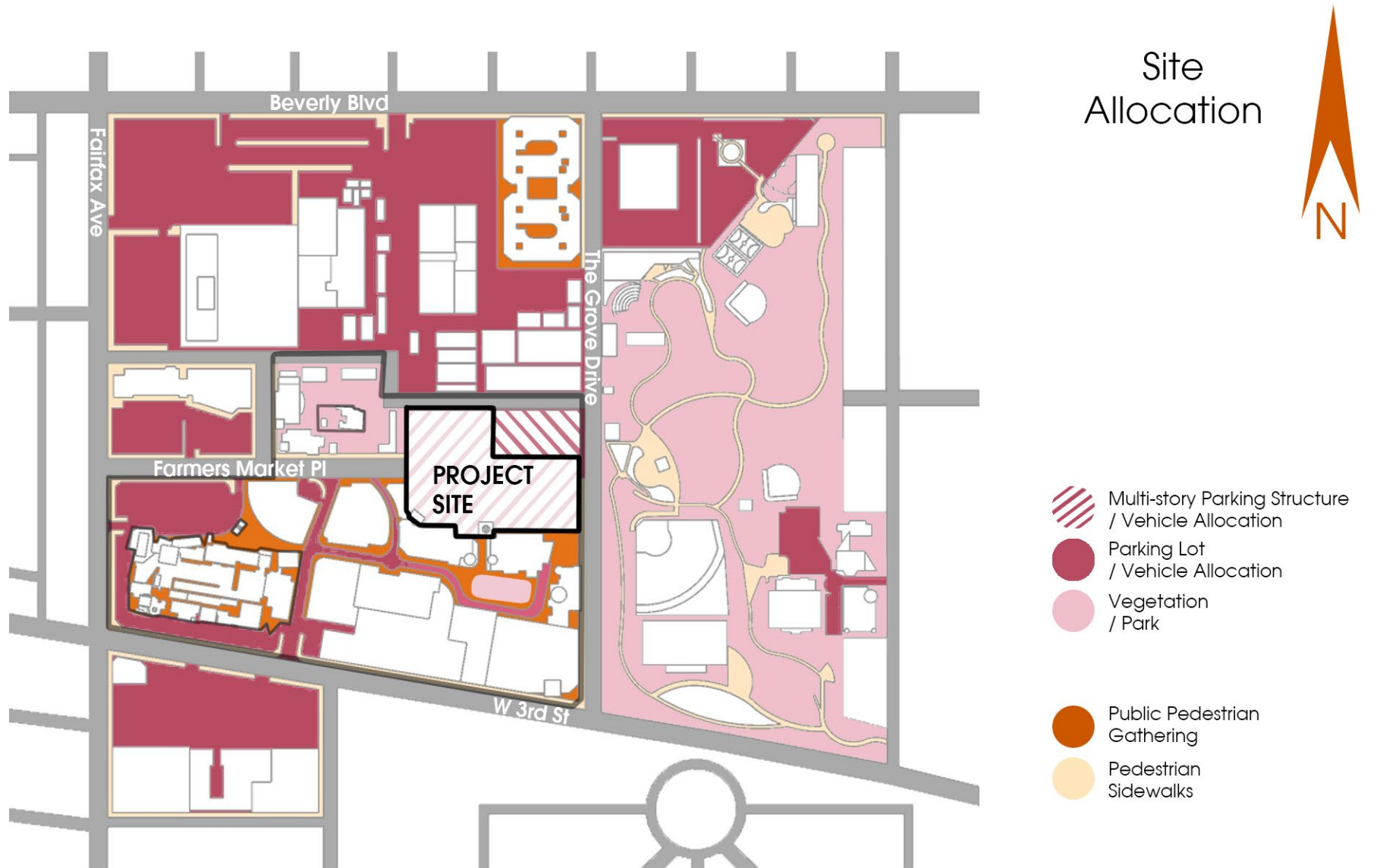
congested intersections indicated to the West of the site should inform a solution to reroute customer traffic created by the design implementation away from these intersections.

Site Allocation

The site plan displayed in the diagram shows a large area of the site is tarred for vehicular use. In addition to this vehicular allocation on the ground level, a multi-story parking structure further emphasises the car parking capacity necessary in LA to cater for the robust car culture.

By comparing the vehicular representation (dark pink) with the pedestrian representation (light and dark orange), it is clear that the pedestrian is a secondary consideration. The approach to the site has become dangerous for pedestrians due to busy surrounding roads. The internal courtyard spaces that connect The Original Farmers Market and The Grove shopping mall are seemingly more pedestrian friendly although the trolley that runs back and forth between the two could be considered an aid to pedestrian movement, in terms of speed and ease for those on the trolley, or an obstacle for those not on board the trolley.

The Pan Pacific Park shows a significant green space



Present Site Allocation in The Original Farmers Market Complex

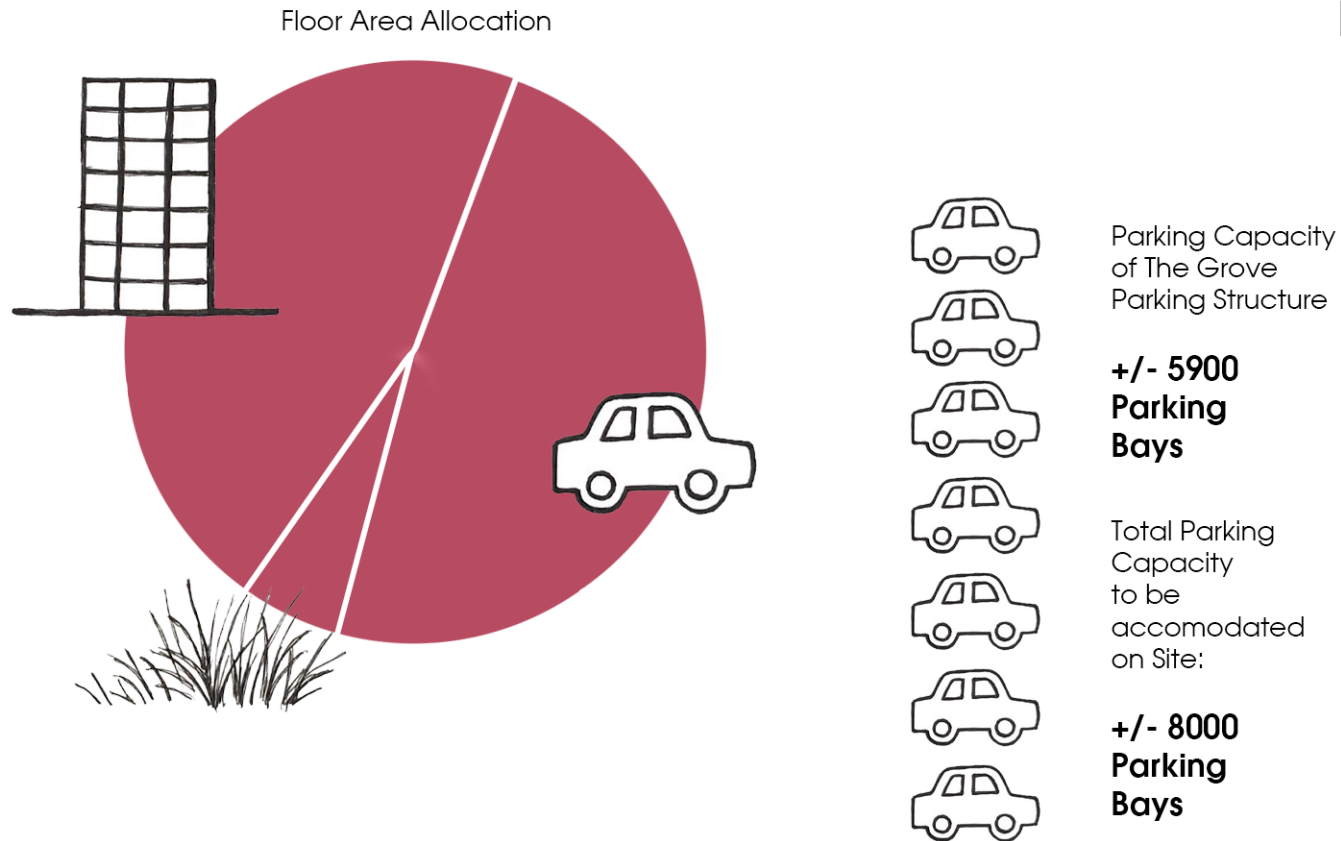


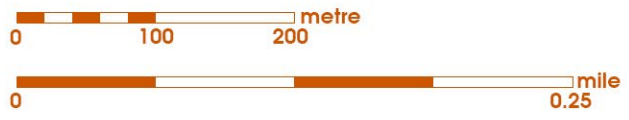
Fig 15 - Diagram showing proportional use of land in The Original Farmers Market complex



Existing Foliage



-  Palm Trees
-  Other Trees



allocated to the site but this is not a fair representation of the broader Los Angeles land allocation. A satellite map showing an aerial view of Los Angeles today will reveal the park to be one of few green relief spaces across the city. This is reason to conserve the area and promote its use in an efficient way that accentuates the human/pedestrian experience of the site to counteract the strong car presence, dangerous high-speed edges and noise pollution from the vehicles making use of the retail area.

Existing Foliage

In the previous exploration on Palm Trees (Culture & Background 01), this foliage is seen as decorative. A symbolic icon of a hot, sunny and luxurious lifestyle. Lining the site along the busy West 3rd Street and Fairfax Avenue, shows an effort to build an image of luxury around visiting this site. The palm trees guide a draw to the site and line important vehicular paths into the retail centre as a tool of persuasion.

These palm trees do not, however, render much service in terms of shading. For that, other wider structured trees are placed to create shade in social areas within the Farmers Market and in the open courtyards of The Grove.

The Pan Pacific Park does maintain a good variety of tree species, promoting an oasis of lush green and shaded spaces for the public to escape from the hard-scape surrounding environment.

Scenes on Site

Each selected scene represents an important informant for future design on this site. The analysis to follow shows the merged culture of the old and new aspects of the Original Farmers Market complex and the pros and cons of the existing built environment thus re-framing the narrative for the design process to follow in line with the newest needs of the site.

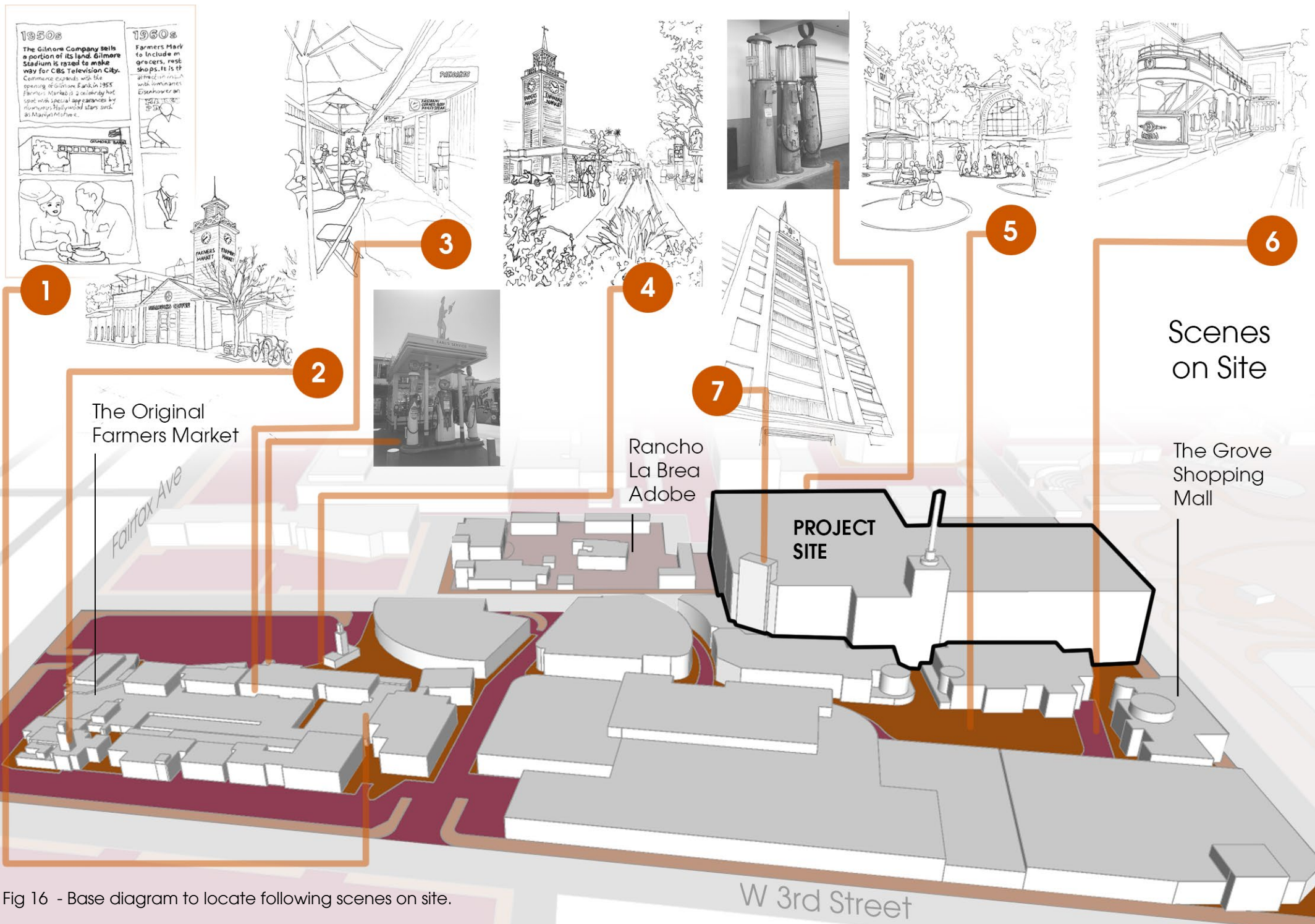


Fig 16 - Base diagram to locate following scenes on site.

Historical Markers at the Farmers Market

Signboards with the historical timeline of iconic moments of the Original Farmers Market line the passageway leading into the market to give visitors an overview of its relevance. Unfortunately, there is little reminiscence left of the farm that once existed here. The property is tarred and built-up and the only significant monument of its past is a recreated pump station gimmick that does not get much attention from passers-by, while the genuine original pumps stand unpreserved and away from the public eye in the service alley of the centre.

Fig 17 - Photographs of gas pumps on site



gimmick pumps in
The Farmers Market



original pumps in
the service alley

1950s

The Gilmore Company sells a portion of its land. Gilmore Stadium is razed to make way for CBS Television City. Commerce expands with the opening of Gilmore Bank in 1955. Farmers Market is a celebrity hot spot with special appearances by numerous Hollywood stars such as Marilyn Monroe.



1960s

Farmers Market to include m grocers, rest shops. It is th attraction in L.A with luminaries Eisenhower an



2



Tar parking lot all the way up to the door of the Starbucks

Farmers Market Iconic Tower

The iconic Farmers Market Tower has become a global symbol for produce markets. It is a beacon from the busy intersection of Fairfax Ave and 6333 W 3rd Street.

Bicycle racks, in use, shows that there is a need to maintain safe cycle lanes and perhaps expand on this culture in the new designed intervention

Starbucks is a widespread coffee shop franchise and in this placement is representative of a shift from the historical culture of the site from fresh produce sale to the modern culture of convenient, packaged and prepared food and drink

Fig 18 - Starbucks
in clock tower



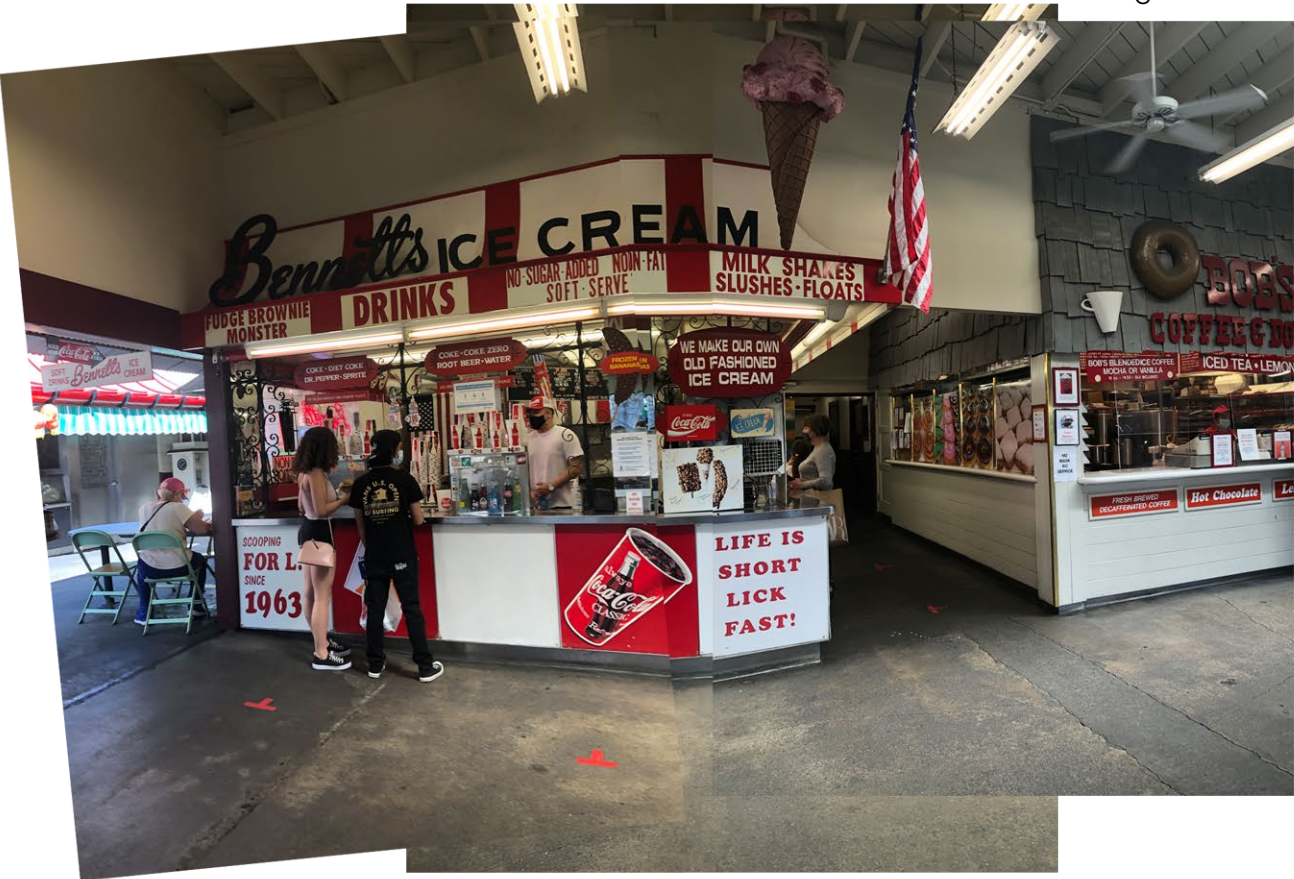
The Farmers Market

Fig 19 - Main
entrance to The
Grove with Iconic
Original Farmers
Market clock
tower.



The Farmers Market Interior

Figs 20-22 - Interior scenes at The Original Farmers.



Farmers Market Between Stalls

Courtyard spaces between stalls allow fresh air and sunlight to filter into the Farmers market

There is a noticeable presence of the cellular device in the social setting in between the stalls



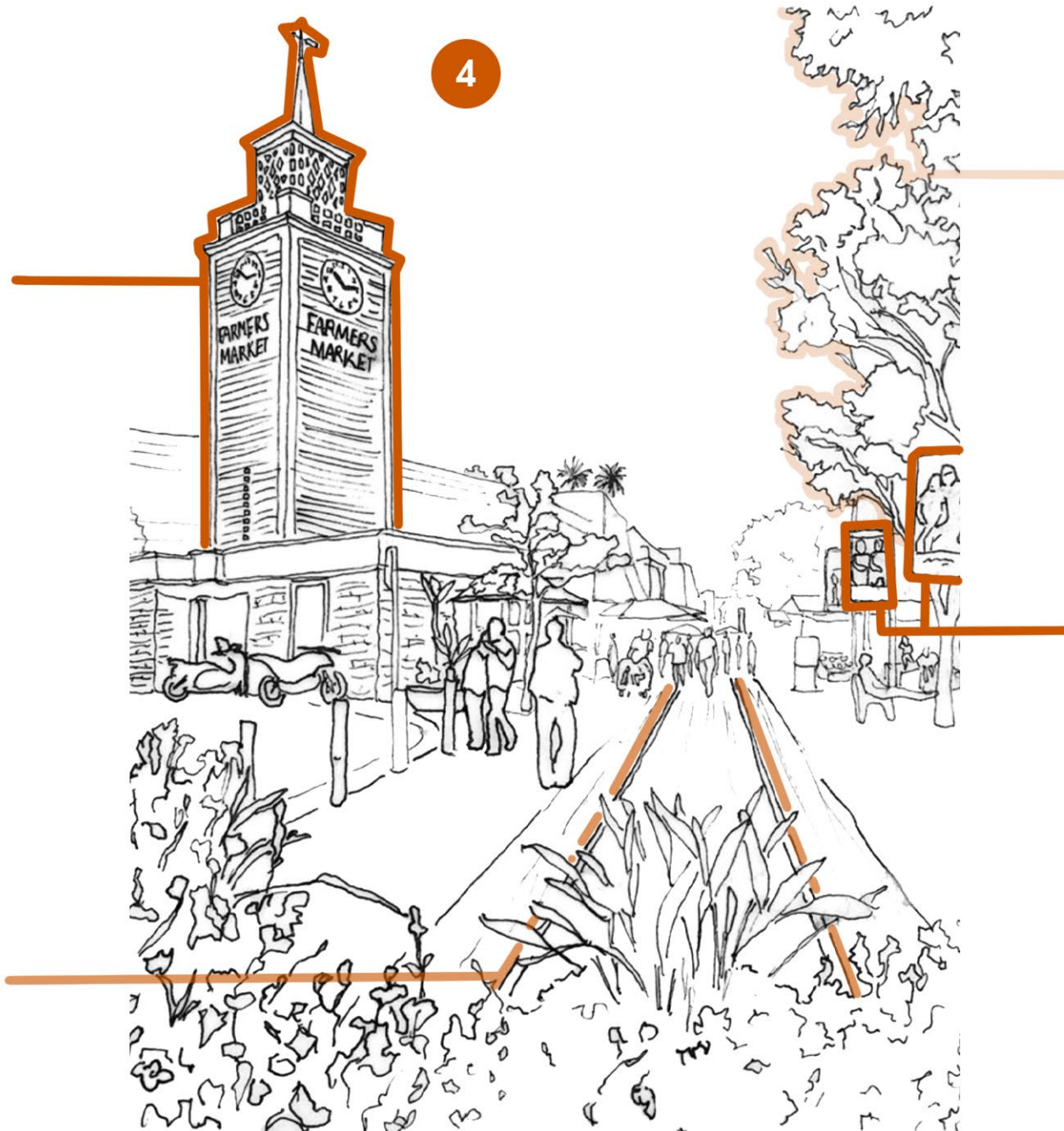
Food stalls today primarily offer prepared/ready-to-eat food'. Unlike the 'farmers market' name suggests, only 3 stalls out of more than 100 still sells fresh produce

The stalls have been set onto a concrete base and the Market is surrounded by tar. The stalls are made from timber which provides some soft aesthetic but the area is largely made up of a hardscape environment, contributing to the noise levels and the fabricated feeling of the space

Farmers Market Outdoor Space

The main entrance is marked by the tallest Farmers Market tower with a wind direction dial, signature clock and logo as a threshold into the setting of the market space.

The rail hosts a trolley which acts as the connection between The Farmers Market and the popular Grove shopping mall by carting passengers back and forth



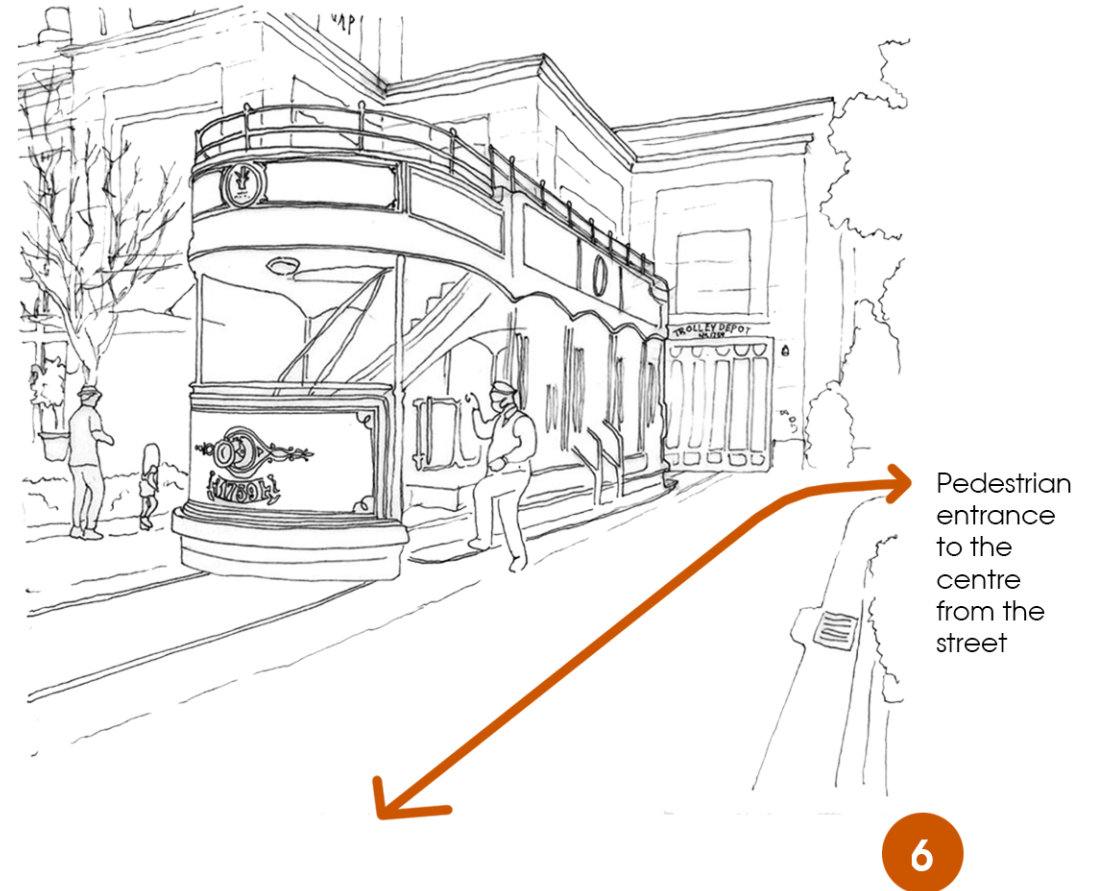
4

This primary public space shows elements of greenery which softens the hardscape surrounding environment

Advertising is a reminder of the consumer culture that leads the growth of the market

The Grove Courtyard

The Grove shopping mall is made up of stores surrounding the pedestrian walkways and courtyard spaces. The space created is socially vibrant and active and needs to be preserved in future design. The COVID-19 pandemic has presented new challenges but the space is naturally well equipped to provide sunlight, good ventilation and a presence of social distancing techniques



The trolley is not of historical relevance to this site, it was brought in with transportation in mind as a connector for passengers to move easily between The Grove and The Farmers Market. This element of ease of motion on the site is one that is going to be considered in the design intervention to come.

The Grove/ Farmers Market Trolley

Fig 23 - Aerial view of The Grove shopping mall.



Fig 24 - Outdoor café in The Grove shopping mall courtyard.



The Grove Mall



Fig 25 - Outdoor lawns in The Grove shopping mall courtyard.

Site Analysis Summary

The site is a popular centre for the citizens of Los Angeles to visit for the many retail stores, grocery options and social gathering spaces. The collective site of the Farmers Market, The Grove and the connected Grove parking structure displays a strong connection. The process of arriving in a car, leaving it amongst hundreds of others to enter the retail/market space on foot and then using a trolley rail to transport from one side to the other is a narrative of convenience and motion. This is a narrative popular in the Western culture of excess and sprawl.

The site is surrounded by busy roads. The high-pace vehicular movement is cause for pedestrian access to be obstructed and the sounds of the intersection are met with hard surfaces. This collective immediate site is made up of hard materials like concrete, tar, masonry and timber, with the exception of a small lawn near The Grove as a break-out space. The Farmers Market stalls are timber structures, The Grove is predominantly masonry and the multi-story parking structure is constructed using a reinforced concrete building system.

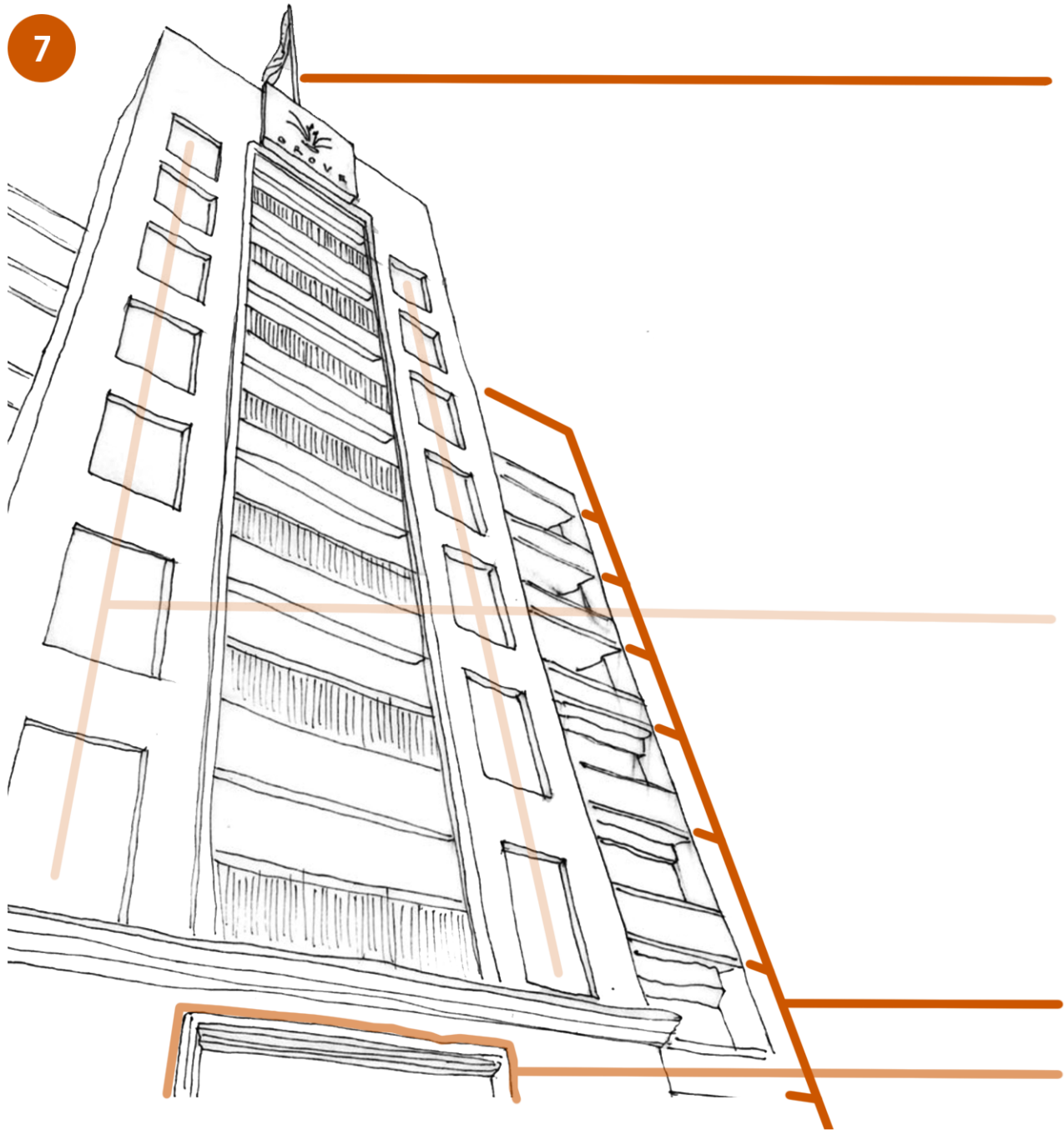
Where the motor vehicles park, which is the majority area of the site, are dead spaces in terms of human use. Although the site is particularly popular, the activity in internal, between the stalls of the market or between the stores at the mall. The development of this site has removed the pure agricultural roots of its past thus creating another commercial hub for capitalist consumerism. The key leading factor being convenience.

The car's predominant presence in the area is directly due to the necessity for access to resources in this sprawling city. If this could be considered as an aiding tool in a future design rather than a flaw in the programmatic distribution of the site, space could be efficiently reallocated to preserve the convenient aspects of car culture to reintroduce the sustainable and convenient agricultural practice back into the site.

The Grove Multi-storey Parking Lot Structure as the **Project Site**

In an attempt to implement a new building typology around urban agriculture and sustainable consumption convenience, a net zero-waste building concept will be explored. The chosen project site is the existing reinforced concrete multi-storey parking structure. The structure was built in 2002 along with The Grove shopping mall development. It will act as the base structure for the design. The aim is to use an existing structure but include an additional built element which accommodates a new sustainable habit in everyday consumerism. The building will become multi-use. Parking below and growing up to an urban farm grocery. The parking structure will only lose partial parking capacity and will provide the new building with existing servicing where possible.

7



USA patriotic reference to achievement and pride and below, The Grove logo showing that this point has a visual hierarchy

The Grove Multi-story Parking Lot Project Site

Lift shafts for passengers access to the parking structure

The 8-story high parking structure holds approximately 6900 parking bays and a spiraling ramp in the centre

Pedestrian entrance from The Grove

The Grove Parking Structure

Fig 26-27 - The
Grove parking
structure.



W 3rd Street



Fig 28 - West 3rd Street is the main roadway to the Original Farmers Market complex.




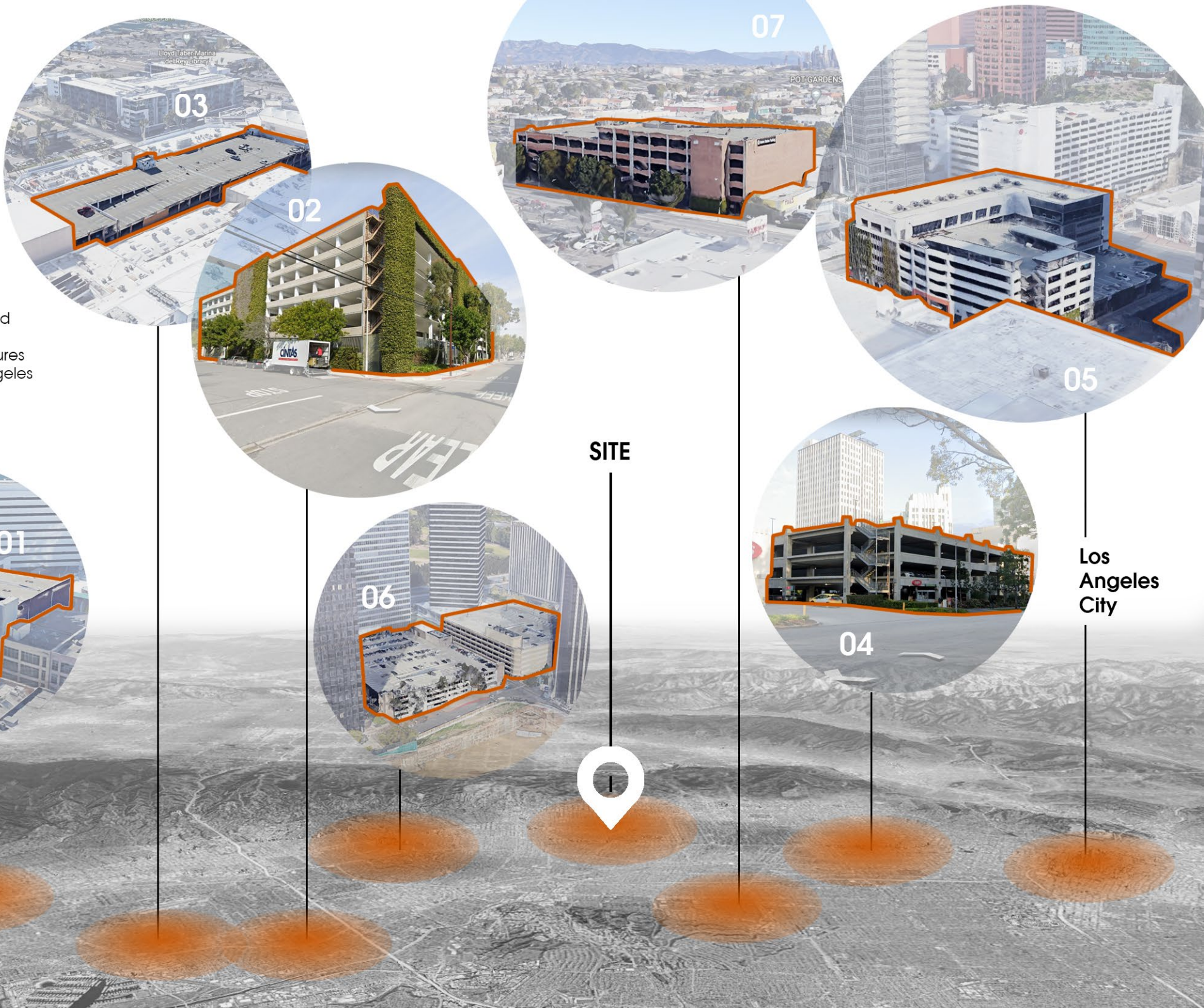
Pan Pacific Park & Sport Facility

Fig 29 - Aerial view from top of parking structure of Pan Pacific Park & Sport Facilities

URBAN POTENTIAL

Fig 30 - The many existing parking structures across Los Angeles represent a typology into which my design concept can be hosted and repeated

 a few identified underutilised parking structures across Los Angeles



Parking structures across Los Angeles

To test the availability for using the concrete multilevel parking structure as the building typology in which my design is hosted, I have identified a handful of parking structures across the city that are either already underutilised or could be in a future where transport takes on a different model in this city. If each farm identified could produce enough food for a 5km radius, the city could become self-sustaining. It is not important for all of these farms to have interactive elements, just that they are producing enough on a commercial scale. The entire city would have disrupted wasteful distribution processes, reduced water usage and created a food security for the population. The agricultural land needed would be reduced greatly and harm to soil, water, air and the human body through pesticides and other chemicals can be largely avoided.

This can be achieved with the same principles throughout all major cities, thus targeting change at the source of the most substantial contributors.

Generic?

Although using a parking structure can seem like a generic approach - there are layers to this decision.

It is highly intentional that the theory put forward

in this design is to be easily replicated - somewhat generic - as part of a typology. This is to promote the design research as a global approach to a global problem around urban sprawl and development and sustainable practice in food security.

However, this exact site was chosen as a preferred example and testing point for this design. The connection to The Original Farmer's Market informed its initial position within the context of Los Angeles. The aim was to explore a set of conditions and how the generic theory may be refined to react to specific conditions. In this case, my design addresses a sprawling, vehicular city under direct threat due to climate change and resulting food insecurity. The specific site requires a design that incorporates the diverse population it caters for - from the homeless community to the upper-class residents of Beverley Hills alike. Specific sun and weather conditions inform specific elements of design. The existing residential and commercial programming of the surrounding context directly affects characteristics of the space.

In summary, this typological approach does require vigorous site-specific adjustments, which I have considered deeply in my design. Although the theory is transferrable, this design would change programmatically, aesthetically and in form with each new context it is placed in.

Exploded Axo of Existing Project Site

-  Vehicular Access To Project Site
-  Pedestrian Access To Project Site



ornamental



ornamental



vehicle ramps

pedestrian lift shaft

pedestrian lift shaft

emergency pedestrian stairs

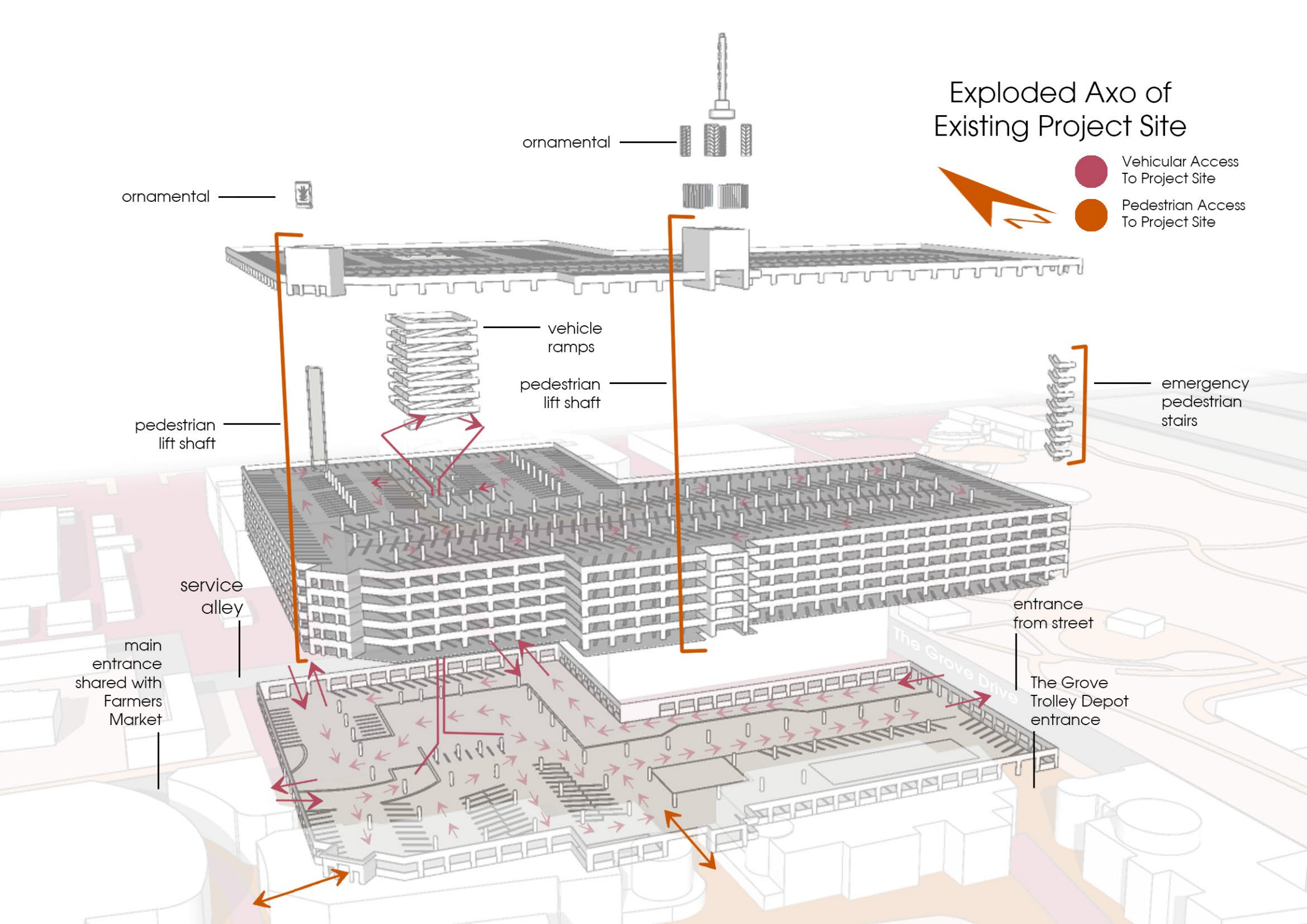
service alley

main entrance shared with Farmers Market

entrance from street

The Grove Trolley Depot entrance

The Grove Drive



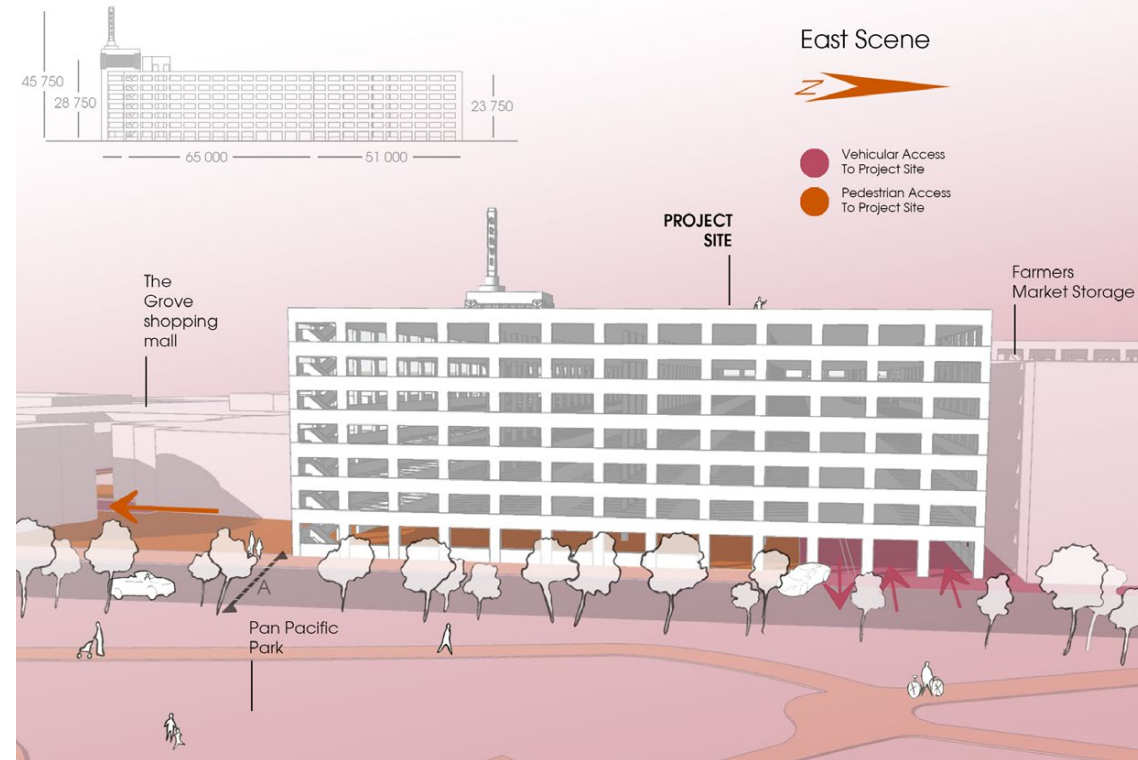
Exploded Axo of Existing Project Site

The existing structure is made up of 8 levels. There is no basement and the building is made up of a reinforced concrete system. The existing ramps, emergency stairs and elevators will be preserved and considered as part of servicing the new design intervention.

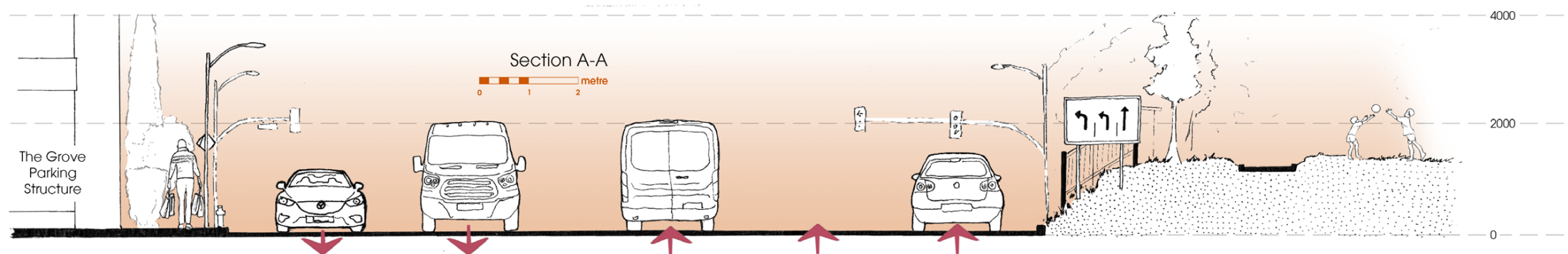
There is access into the parking structure through vehicular entrances on the North, East and West where roadways meet the building. Pedestrian entrances are all leading from The Grove open air courtyard space into the East, South and West of the structure.

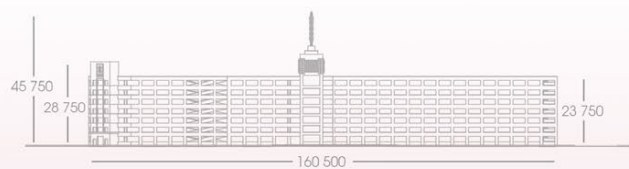
Section A-A + East Scene

To the East of the parking structure, a multi-lane roadway separates the site from the neighbouring Pan Pacific Park. Additionally, there are no pedestrian crosswalks and there is a fence between the park and street. This is a harsh barrier between two public spaces that needs to be addressed.



The street seems underutilised at the moment and so, this would be a good entry point into the new designed building to help redirect traffic off of the surrounding congested roadways.

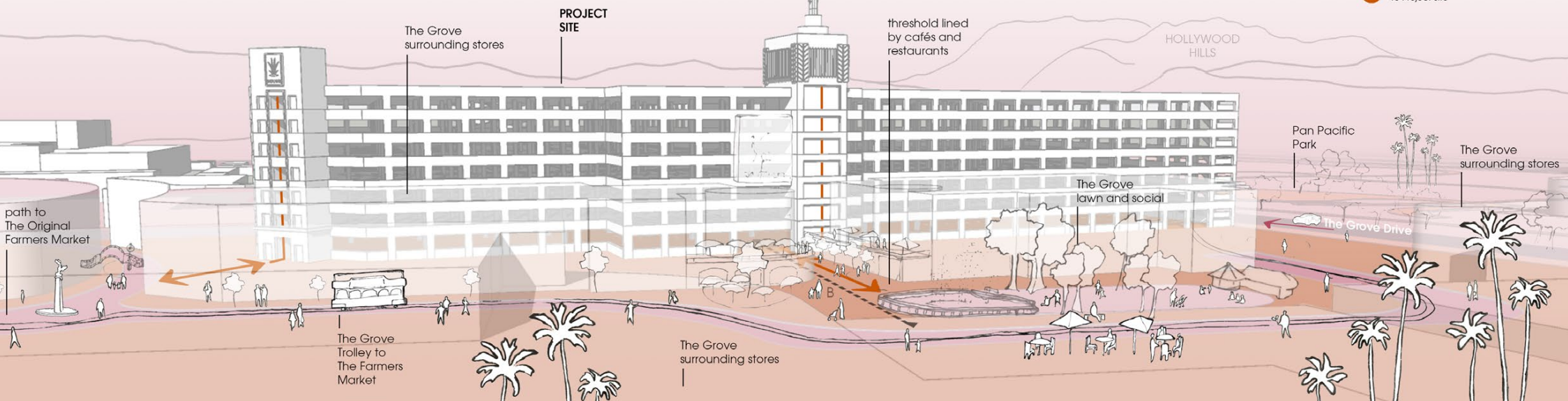




South Scene



- Vehicular Access To Project Site
- Pedestrian Access To Project Site

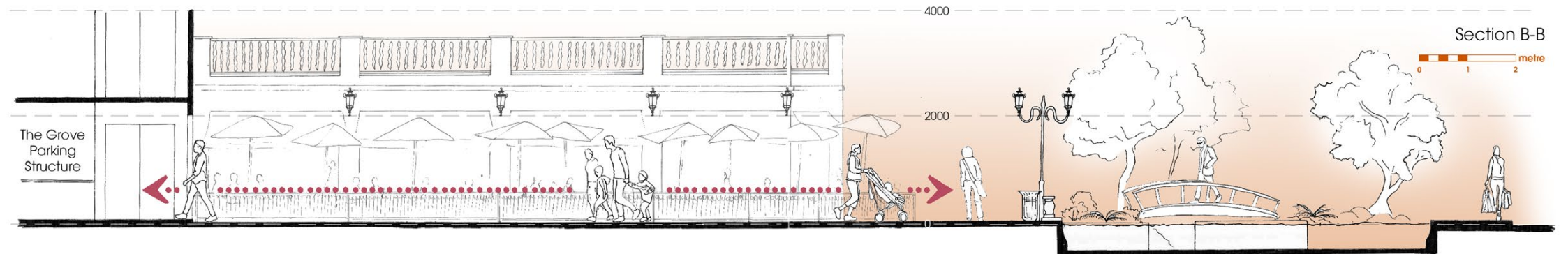


South Scene

The southern facade of the parking structure is met with the active outdoor courtyards of The Grove shopping mall. This space is busy with restaurants, shops, leisure lawns and people. As the site is positioned in the Northern Hemisphere, this is the facade that receives direct sunlight.

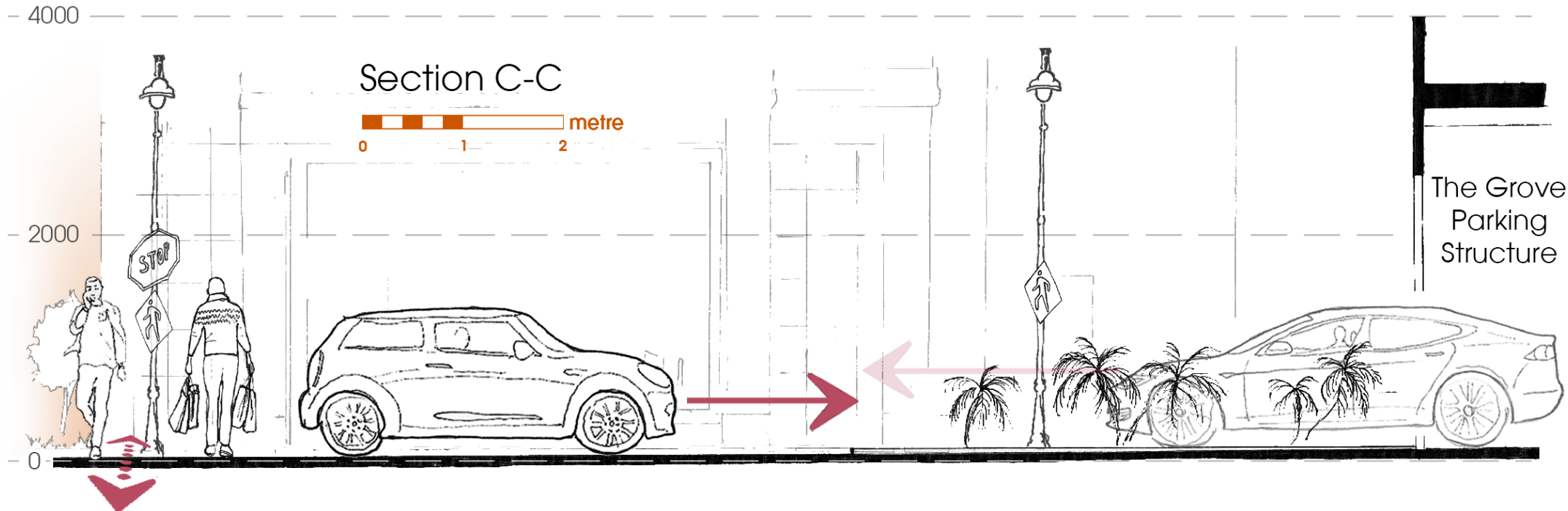
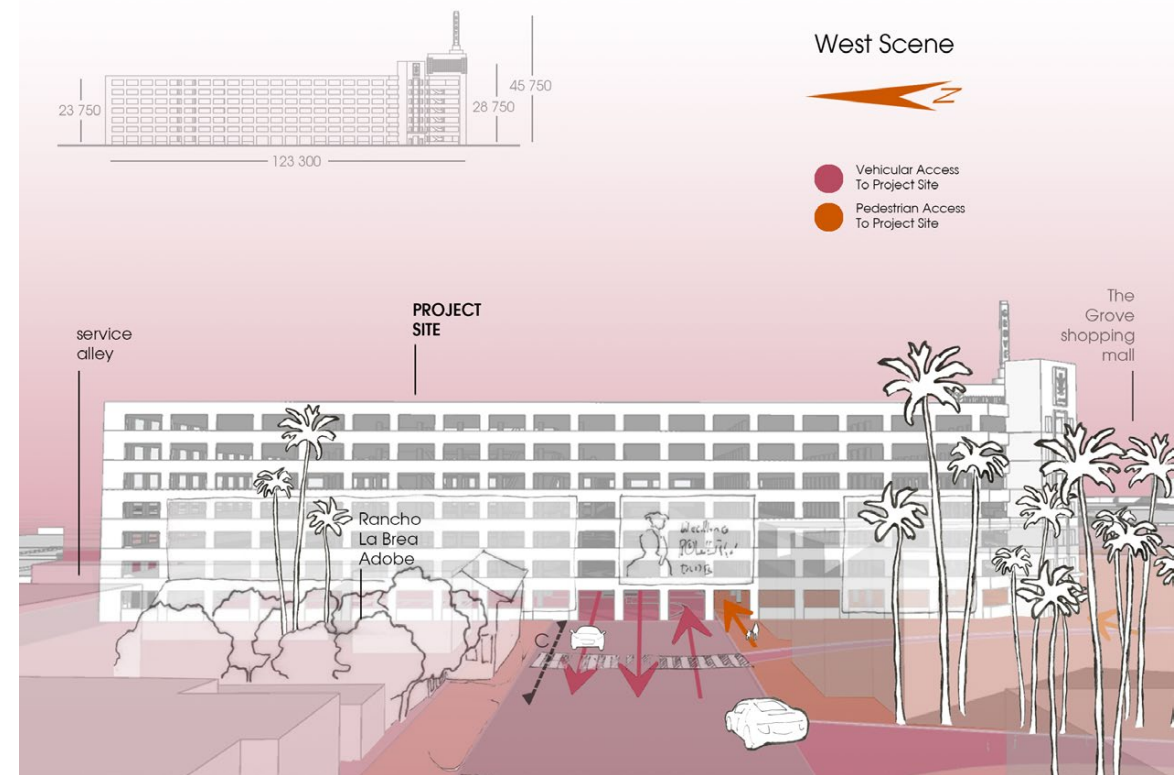
Section B-B

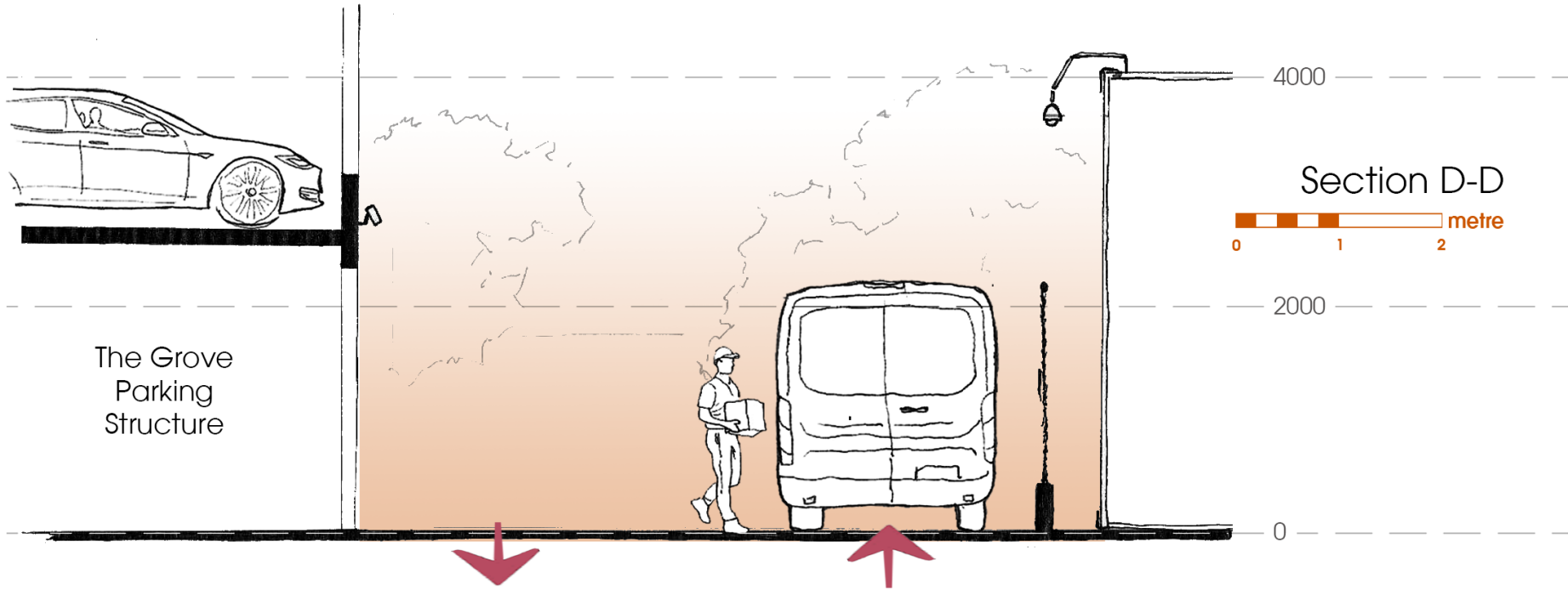
The main pedestrian connection between The Grove and the parking structure is lined with cafés and restaurants - successfully avoiding a 'dead space'. The corridor between the two opens up into The Grove's public space where a pond, lawn and trees form an oasis amongst the concrete landscape.



Section C-C + West Scene

This vehicular and pedestrian entrance is adjacent to the original farm house from the original farm. The Rancho La Brea Adobe. The house is unfortunately not available for public viewing. This entrance is on the side of The Original Farmers Market making it the most popular point of entry into the parking structure.





The Grove
Parking
Structure

4000

2000

0

0

1

2

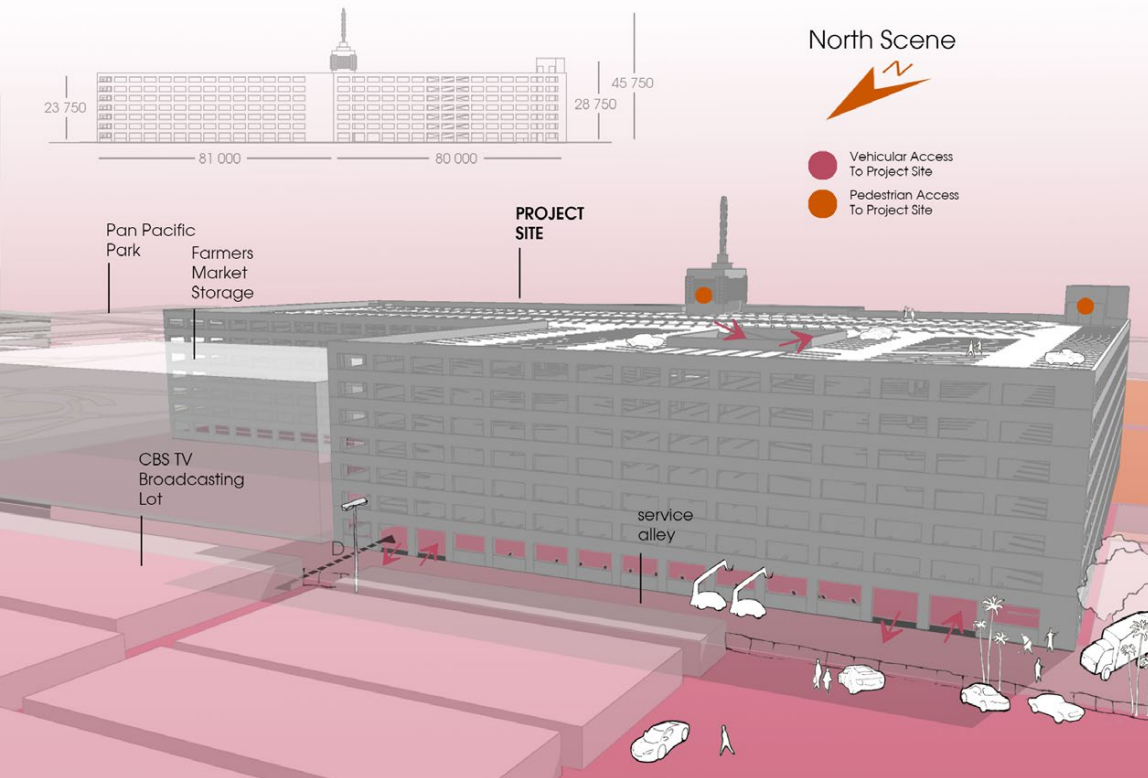
metre

Section D-D

Section D-D + North Scene

This is the back-of-house facade where deliveries and maintenance crews operate. There are entrance points into the parking structure here that are closest to the ramps that service the multi-level building.

There is a fence separating the CBS TV Broadcasting Lot from The Grove/Original Farmers Market complex.



North Scene



- Vehicular Access To Project Site
- Pedestrian Access To Project Site

PROJECT SITE

Pan Pacific Park
Farmers Market Storage

CBS TV Broadcasting Lot

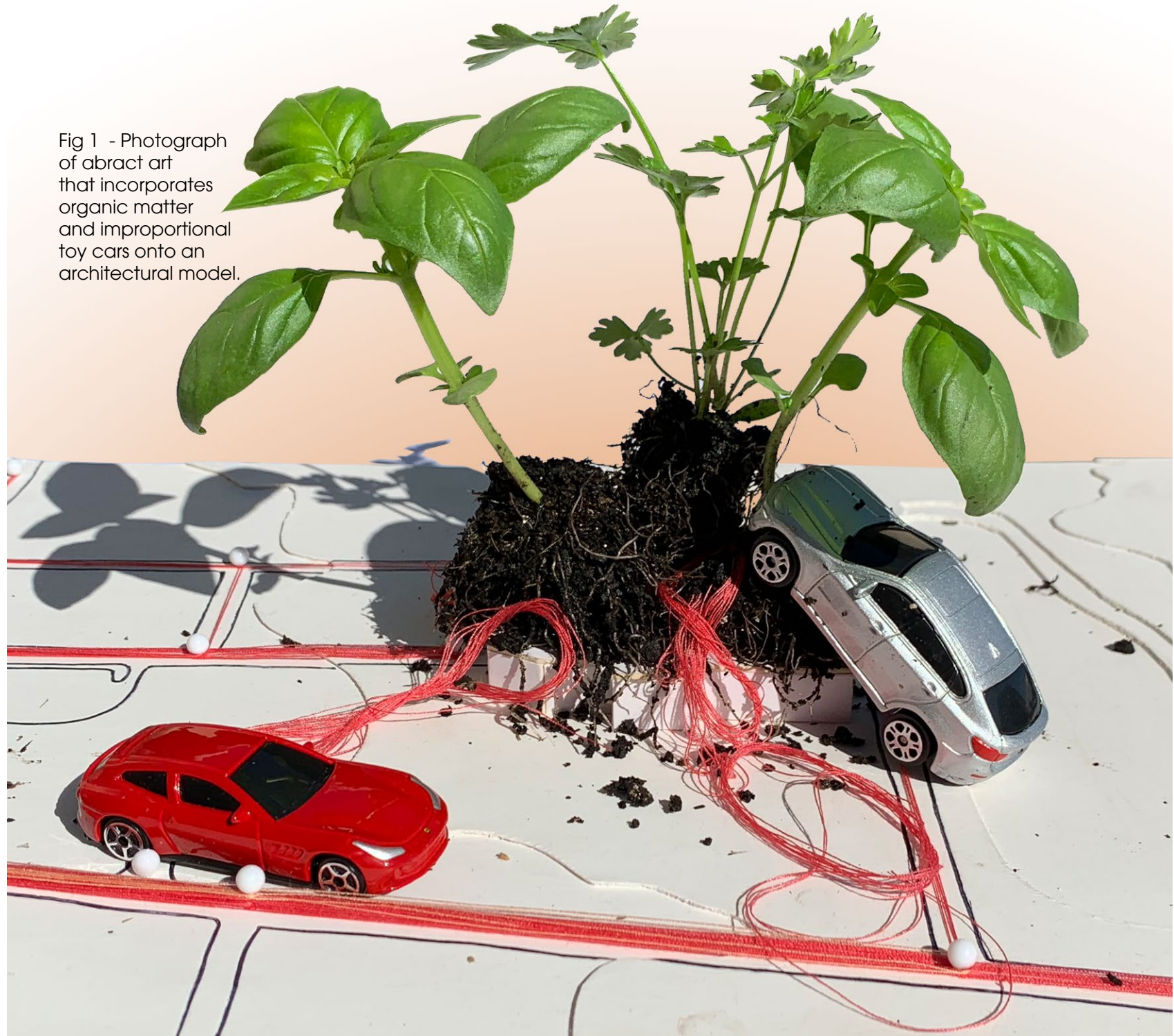
service alley

Abstract Elemental Compilation

As a starting point to the charette, this physical collage of elements helped frame my goal. The design must learn from the site, the existing structure, plants and their structures/roots, cars and their movements/routes.

The disproportional culmination of elements was made as art. Identified key factors like car culture and agriculture was personified by the use of representative objects and applied at random to the site to spark the imagination. To feel awkward and uncomfortable to give a base from which to sculpt from and think beyond the parameters of reality and physics.

Fig 1 - Photograph of abstract art that incorporates organic matter and impropotional toy cars onto an architectural model.



Vehicular Movement

Inspired by the way plants on the side of the road are swept into motion by vehicles passing by, I considered the form of the design being moulded by the motion of the passing cars on the busiest roads surrounding the site. Using layered colourful cotton thread to represent roadway frequency of use and clay moulded in explorative play.

With paint and toy cars, the movement of the car becomes a driving force for layout and design. The car is a major user of the building proposal to follow and so, turning circles, ramps and width requirements differ from buildings with only pedestrian users.

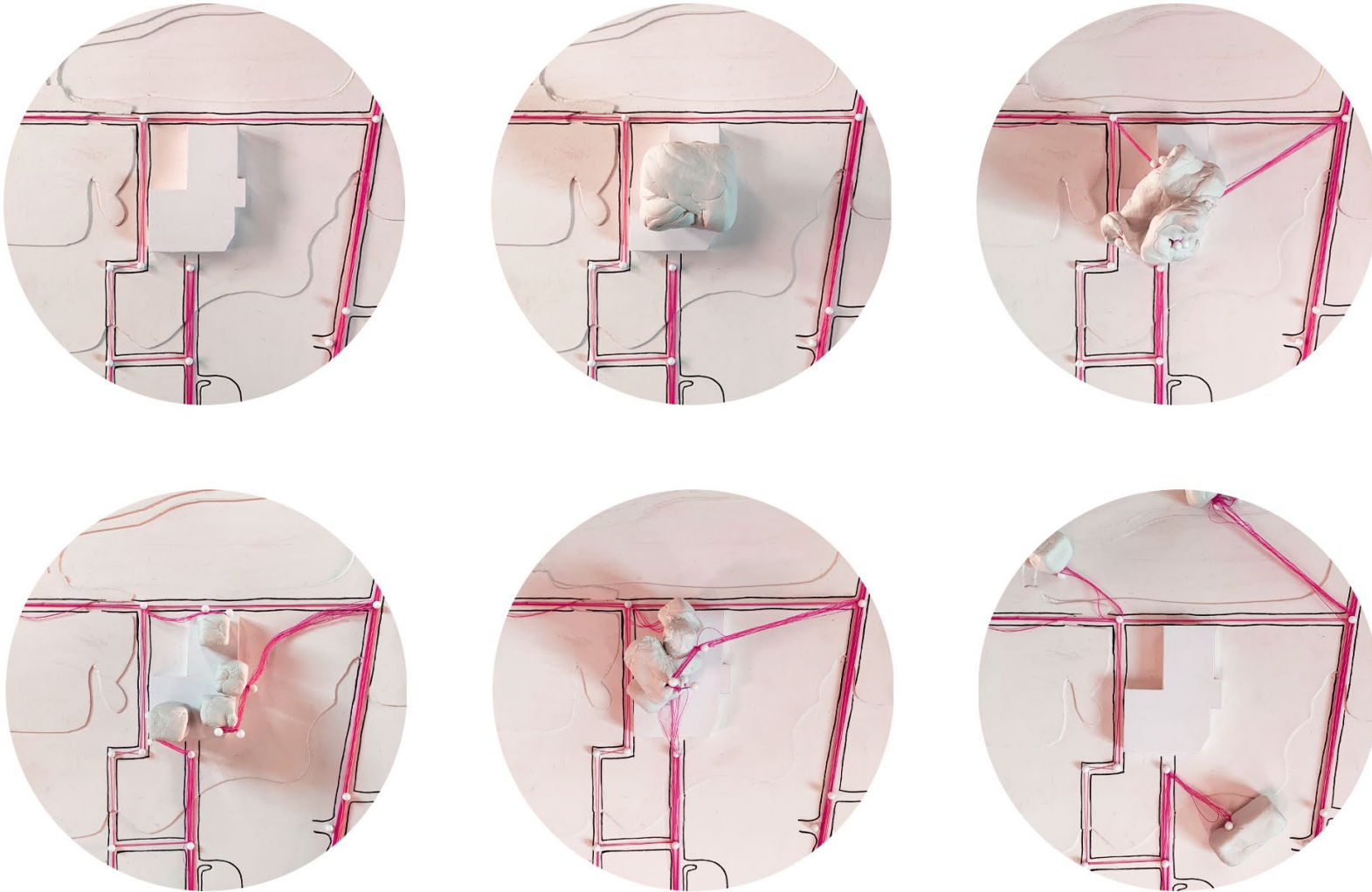
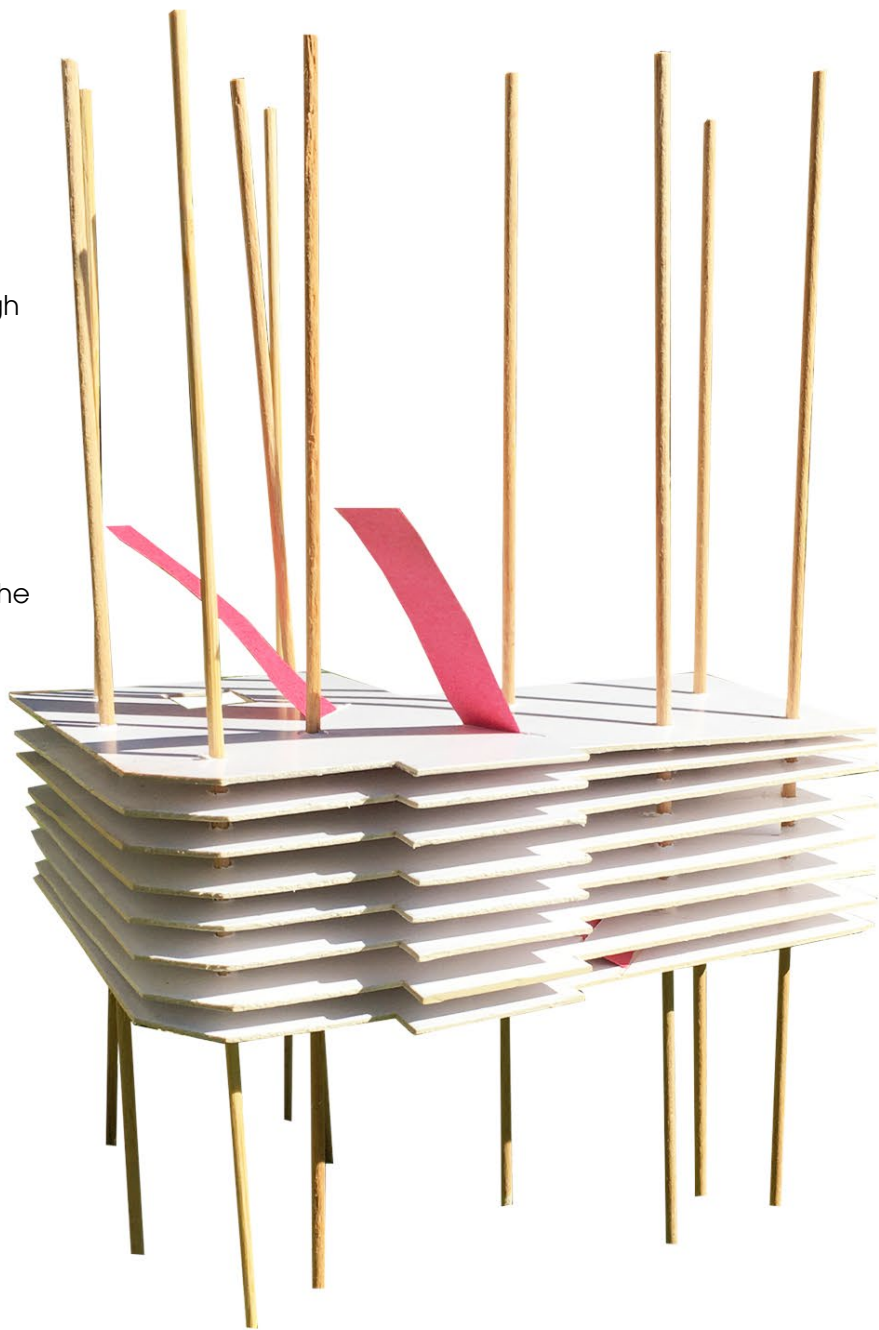


Fig 2 - Thread layered and pinned to architectural model to represent traffic frequency. Prestik form warped by imagined motion from passing cars.



Fig 3 - Using toy cars run through paint to find pattern in the tracks they create.

Fig 4 -
Architectural
concept model
with sticks
puncturing through
it to represent the
concrete building
being punctured
by a growing
element. Like a
plant, the new
building will grow
up through and
then up beyond the
structure.



Structure + Sustenance

This layered existing parking structure presents a set of rules. Grid systems of beams, columns and slabs make up its immediate presence but underneath, this building has invisible layers. Just like a plant, the structure has foundations/roots. The building would not function without its users - vehicles or people - as the plant would not survive without nutrients moving up into its system. In this way the roadways around

the site are the roots and pathways pulling users up into the building.

But now the building is being given a further purpose. The structure will host an urban farm which, like the basil plant, allows the building to improve air quality and provide sustenance for the surrounding areas. As cars enter the structure, the carbon dioxide will feed the plants that sustain the neighbourhood. The building and plants both need a water supply, sunlight/energy and carbon dioxide to prosper.

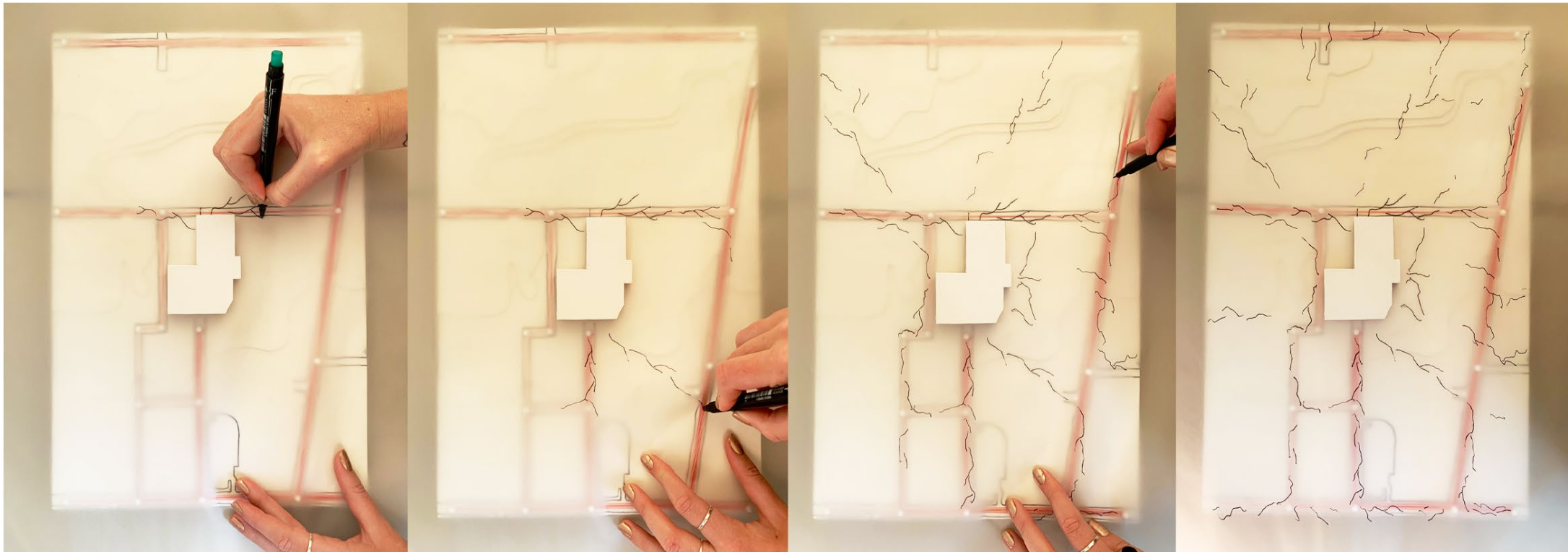
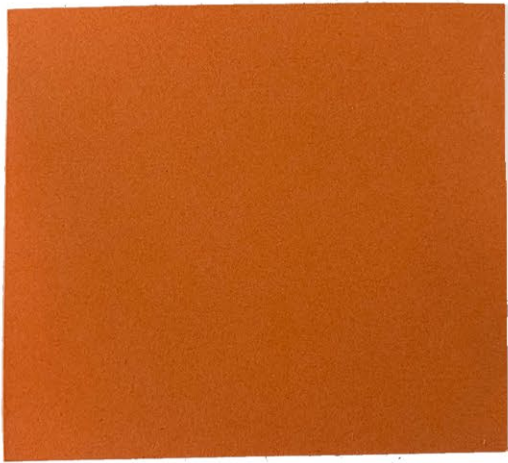


Fig 5 - Still frames of a timelapse showing the building's roots spreading far and wide, almost like the roads that sprawl out and draw cars and people up into the building.

re-use, reduce, re-cycle architecture



1 existing structure as a base



2 break away but keep material



3 to reform and put back in

Taking a square of paper, representative of the existing structure and breaking it apart in places in an effort to make the structure my own. The aim was to ignore preservation and prioritise the new design. Breaking through the concrete like a persistent sidewalk plant. The leftover pieces revealed that this subtraction to the existing form could leave plenty of material to waste. So, what if this were to be re-used? (see *Design Development 12* and *Technical Aspects 13*)

Charette Outcomes

This process has solidified a narrative of 'nature fighting back'. The abstract, and sometimes awkward

compilations, were used to analyse elements that have been established through my research and can now be used visually to inspire my design going forward.

I particularly find the idea of the building being compared to a plant - with roots, circulation of sustenance and need for sunlight, water, carbon dioxide etc. to function, in return providing oxygen and food - interesting. I also find the idea of concrete been broken apart by a new growing programme but saved and repurposed for sustainable outcomes to be an element I would like to follow through with.

Project Viability + Feasibility

The building design will be an 'urban farm produce grocery' with additional functional aspects like a drive-thru option for motorists, an interactive farm for reconnecting consumers with food production processes, allotments for individuals looking for space to have their own productive gardens and a homeless relief aspect.

The idea came about through an attempt to find an affordable and convenient way to change human habits around food consumption to achieve a more sustainable outcome. To summarise the research to date, my topic of interest is in food security and distribution challenges in the climate crisis.

As discussed in *Phenomenology + Implementation 08*, for my proposed design to be well-received and implementable, it must carefully consider these three factors:

1.planet the primary objective is to have an overall positive impact on the environment

2.people secondarily, the design must be beneficial to the surrounding and global community - the social impact must be considered

3.profit the building must be financially acquirable and profitable into the future

Once the 'Triple Bottom Line' has been considered and addressed in the proposed design, some practical factors must be seen to within various stages of design. These are factors that could potentially change the way the design is approached.

Site + Context

The site is located in Los Angeles. As specified in my previous research, the top concerns for the region's geographic placement is that it has a dry and warm climate, prone to disasters such as raging wildfires, droughts and potentially devastating earthquakes. Soon, low-lying parts of California, which happen to be where the current core agricultural practice in the state is situated, will be subjected to flooding with the sea-level rising due to global warming. With threat to a major and densely populated sprawling metropolis increasing, subsequent to this civilisation's wastefulness and overuse of resources, a change must occur. A key contributor to the problem, as discussed in *Food as a Contributor to the Crisis 04*, is the inefficient food production and produce distribution systems in place. This has become the starting point of my research in finding an impactful aim for my project.

Being placed in the Entertainment Capital of the World will hopefully result in recognition and resulting global influence that pushes the proposed design idea forward. The target market is the middle to high-income residents of Wilshire and Beverly Hills who represent a large community that already shows interest in spending more for the sustainable

option which is important for the initial stages of the design. This is not to say that these residents will be the only people to benefit, as discussed in “The Homeless Community” in *Site Context 09, GEOGRAPHY*. There is a strong argument - around gentrification, Maslow’s hierarchy of needs and considering appropriateness of a project for the individual community - that the first few times this concept is tested, it should be in more affluent areas. After that, the aim is to have the concept become more commercialised and obtainable for the less affluent areas across the world and implementable in ways that are sensitive and specific to more vulnerable groups of people.

The specific site of the building will be in a complex that already includes popular commercial and heritage locations such as The Grove Shopping Mall and The Original Farmers Market. The building will occupy and re-purpose parts of the existing Grove 8-storey reinforced concrete parking structure by turning it into the ‘urban farm produce grocery’. This will be part of the crucial movement toward sustainable reuse of material and repurposing of buildings.

The Original Farmers Market, and the hidden away, original farmhouse called the Rancho La Brea Adobe, are ‘landmarks’ and will need to be dealt with delicately.

Town Planning

The building will be placed on a lot that is already zoned for commercial use, zoned as C2 (PropertyShark, 2020). The unusual aspect of this project is that it is both commercial

and agricultural. The appropriate zoning will become ‘mixed use’ until such a time when another zoning option is created to account for this new building typology. This new zone would need to account for the requirements for customer interaction in terms of commercial zoning. For example, road requirements for vehicles, capacities, restroom facilities, etc. As well as the requirements for agricultural zoning. For example, water infrastructure, farm worker safety, food safety conditions, etc.

The state of California has made provisions for, and encourages, urban agricultural practice. “The Urban Agriculture Incentive Zone (UAIZ) is a relatively new state program (AB551) adopted by the California State Legislature in 2013. This program aims to incentivize urban agriculture in urbanized areas in California by offering reduced property tax assessments in exchange for converting vacant or unimproved property to an agricultural use..” (lacounty.gov, n.d.).

The Grove Shopping Mall, and the parking structure that will be the base of my design, were built in 2002 - meaning that these are not landmark structures and plans do not need to be run through a heritage council.

The Client

The Grove already owns the parking structure building and surrounding shopping mall development, so the project might consider The Grove to be a potential client.

In terms of a user, which may be more relevant for my project, based on previous urban farm establishments in the United States like Square Roots and Gotham Greens, information has been found on the main distributors. I have reason to believe that WholeFoods and Trader Joe's may be interested in a project like this. Both are major franchises with capital to pursue new ventures at a larger scale and both advertise themselves to have sustainable and organic values behind the food they provide.

Urban farming companies and produce stores may partner up to implement a building with this business model because expertise are needed in both the technical aspects of running the urban farm as well as expertise in products, packaging and customer service for this concept to operate.

WholeFoods already has a partnership with Gotham Greens at their store in Gowanus, Brooklyn, New York. (See Case Studies 07). Gotham Greens runs an urban farm in the form of a greenhouse on the roof the WholeFoods store. The produce is directly available to consumers, eliminating a major part of the distribution process.

Square Roots Urban Growers (See Case Studies 07) is another urban farm. Situated in Bedford-Stuyvesant. The main difference to the Gotham Greens farms, is that they grow their plants in shipping containers - along the walls on a vertical plane, saving a lot of space. Square Roots and Gotham Greens are direct competitors. As Trader Joe's and WholeFoods are competitors.

Both Trader Joe's and WholeFoods already have stores

adjacent to my proposed site in Los Angeles and I believe that both would find benefit in taking on an urban farm produce grocery to expand their businesses' scopes as well as safeguard their companies in the event of food shortages due to the evident potential extent of the climate crisis.

If they do not take interest in the concept, their businesses could be in direct competition with this innovative grocery experience next door, putting their future success at risk. If they do take an interest in pursuing this opportunity they will be in competition and drive offers for investment up.

Technical Aspects

The following information has been arranged into programme allocation for the building design seen in the following section "*Programme*".

A positive aspect of positioning this farm in the urban environment is the availability of existing water, electricity and roadway infrastructure. Physically the building process may require cranes to move materials to various levels due to the scale of the project but materials can be locally sourced quite easily.

An urban farm must run like a machine. This is not just an urban farm proposal but it includes a controlled environment agriculture (CEA) system. The system relies on a modular approach to design. Compartmentalisation

allows farmers to create many different climates within each cell to best suit the plants growing inside. The other up-side to this approach is that pesticides can be omitted from the process because each cell is somewhat sterile. If a pest does succeed in entering a cell, the farmers will remove that crop and clean out the cell. The point is that only one cell is lost and the farm as a whole has hardly been affected by the infestation. I get this knowledge from interviews I have conducted with Emma Coz (assistant farm manager) and Anya Rosen (farm manager), who both work at Square Roots Urban Growers co-ordinating the farms and the next-gen farmers. (Please see attached appendix, *Full Interviews ii*)

The CEA farm requires extensive servicing. There is an artificial structure set up to hold the plants, no soil is used. Nutrients is inserted into the water that is then delivered to the plants via a channel that their roots can reach into. This system is called a 'nutrient film system' (NFT) (Rosen, 2021).

There need to be air-conditioners, de-humidifiers and UV grow lights, all of which are highly energy intensive, to control the climate within each cell. All condensate and used water needs to be filtered before reuse, suggesting filtration rooms are necessary. The plants need multiple components to photosynthesise. One important factor is carbon dioxide (CO₂). Square Roots have to buy tanks of it to feed their plants. In my project this gas will be retrieved from the cars driving through the urban farm structure and on the adjacent busy roadway. CO₂ is heavier than oxygen and will sink to the base of the structure (Coz, 2021), where it will then be drawn through a direct air capture (DAC)

system. The car emits multiple gases but the DAC system only stores CO₂ (Gates, 2021). Additionally, there will need to be tanks to store the gas and a system to distribute it into each cell as needed.

Ultimately, the urban farm will be the area in which the most technical aspects will need to be addressed. In terms of the grocery side of the project, the logistics of the drive-thru, packaging and customer interface will be technically challenging to resolve but can be considered via a more standard design approach than the technically challenging requirements of the farm set up.

If I am going to achieve a sustainable building approach to match the sustainable programme, clean energy must be largely considered. The large area of the existing base building, spatial ability for large battery units and climatic solar availability allows for solar panels, inverters, batteries and distribution systems to be set up efficiently.

The Project Team

The team of professionals to construct the building that houses this concept will be a large team of a project managers, architects and engineers. The abnormal expertise that might be required will be urban farming engineers, logistical designers, sustainable building specialists, engineers trained in seismology responses and science professionals that can advise on filtration and

toxicity prevention in the farming processes. The contractors and construction related labour force is readily available and plentiful in this urban landscape.

Financial Viability

This project is extremely cost intensive, but it does have great potential for success in terms of profits down the line. The initial set up is the major expense.

In terms of programme, the new building will be made up of the following approximate allocations:

CEA Growing Spaces
(Productive for Commercial Use)
= 7 800 sqm (84 000 sqft)

Allotments (To rent out)
= 1 960 sqm (21 000 sqft)

Other Enclosed Spaces
= 12 000 sqm (130 000 sqft)

Outdoor Allocated Space
= 18 240 sqm (200 000 sqft)

TOTAL SPACE IN STRUCTURE
= 40 000 sqm (440 000 sqft)

The basic costs that need to be considered is the initial land acquisition, the construction costs and the operating costs. It is helpful to determine the rate at which the farm may make money and when it might pay itself off by looking at the potential income. The following information is based on factual evidence but there are so many variables that the project would need to be assessed by a professional to retrieve a valid estimation. This is a rough calculation only intended for educational purposes.

1. Land Acquisition Costs

The building will be built into an existing parking structure owned by The Grove. If The Grove happens to be the client, the land acquisition can be avoided altogether. If not, someone might have to buy a part of the parking structure from The Grove. Due to the lack of examples of partial building acquisitions, an estimate was drawn from other local building sales. A rough estimate for the price to buy a part of the parking garage might come to around \$9 million for the space required to achieve this urban farm produce grocery.

2. Construction Costs

The construction costs will include an initial building and then the further cost of setting up the farm infrastructure within it. The initial building should not be too cost intensive because it is based within an existing structure which lends existing infrastructure and framing to the design. Floors and ceilings are already in place.

Based on averages for prices of construction per square foot in the Western United States, "High-rise buildings cost an average of \$730 on the high end", states Scalisi (2020). For this very simple structure and reuse of the existing parking structure, this has been reduced to an approximate \$370, based on further research. According to Tasgal (2019), vertical farm start-up fees, including infrastructure and equipment, cost an approximate average of \$565.22 per square foot to construct. Due to the outer structure being provided in the initial build, I have decreased this figure to \$400.

The approximate square footage of the proposed construction is around 235,550 sqft (approx 21 760 sqm). The growing spaces for commercial produce will be 84 000 sqft of this allocation. This equates to the following estimated overall costs:

initial building = **\$87 153 500**

urban farm set up = **\$33 600 600**

CONSTRUCTION COST TOTAL = +/- \$121 million (ROUGH ESTIMATE) this does include design and project management costs but not potential rezoning or marketing.

3. Operating Costs

The prime operating costs are in the form of water, electricity and in most cases, rent. The operational costs

of a commercial vertical farm are estimated to be \$3.07 per pound of greens produced (Tasgal, 2019). Stated above, this farm of 84,000 sqft can be expected to produce around 2.43 million lbs per annum and so, cost about \$7.5 million annually to produce - not considering increasing costs with inflation (Tasgal, 2019). This sounds extreme because it is, but the market for fresh produce in urban Los Angeles is extensive and growing. Although this calculation covers the farm costs, the budget will have to be further considered to account for other aspects like packaging, labour, and the minimal water and electricity for non-plant-related activities.

AeroFarms' staff receive an average yearly salary of \$40,000 each. Adjusted to my vertical farm, and considering the grocery store side of the project, the number of staff required for my project would be around 15 people, bringing the cost on staff annually to about \$600 000. The farm itself runs on finely tuned systems that can be adjusted in a control room thus allowing for a lower staff requirement in this area.

The user will then need to pay the client who owns the building in a rental fee. In the neighbourhood, commercial/retail space of this type goes for about \$10.40 per sqft/year, the urban farmer (the user) will pay around \$34 700 monthly rent for the 40 000 sqft used.

ANNUAL OPERATING COST TOTAL (incl. rent) = +/- \$ 8.5 million (ROUGH ESTIMATE)

4. Potential Income

In an existing example stated by Tasgal (2019), AeroFarms' 69,000 sqft vertical farm produces around 2,000,000 lbs of produce annually. My farm produces about 2.43 million lbs per year at an estimated price point taken from the WholeFoods adjacent to the proposed site, of \$5 per lbs (WholeFoods, 2021). Tax would have already been considered in the initial calculation of the cost of production. It is important to note, according to Rosen (2021), the urban farm usually takes about 5 years to test and work out the optimal environments and systems to use in each circumstance - resulting in a lower produce and income for that period.

The allotments can also be rented for about \$100 a month. There are 28 of them bring the total annual income to \$33 600

ANNUAL POTENTIAL INCOME OF THE FARM (incl. Allotments)
= +/- \$12.3 million (ROUGH ESTIMATE)

The annual INCOME - OPERATING COST = **PROFIT = \$3.8 million (ROUGH ESTIMATE)**. This is the user's income.

The owner of the building (the client) can then pay off the building construction cost with rent received and benefit from an increase of consumer traffic being drawn to their other commercial assets in the complex. Also, to be considered is interest on loans, inflation and unexpected

costs. In this projection, the urban farm produce grocery should break even easily within the 25-year loan period.

In conclusion, a project like this has an extremely high operating cost. The profits are considerable once you have established a larger scale operation which is what I will be attempting to propose.

From my calculations I learned that the project is more profitable when the ratio of farm space is higher than other admin and service spaces because the spaces that are not producing food are not making money. I have had to rearrange the programmatic requirements as such. If the farm needs to be more profitable to cover the expenses of the project, more farm compartments can be added to increase the income stream. The design has been made to grow horizontally into the structure or up above it to allow for this.

A major starting capital is required. There will be unexpected costs. The above calculations are not to be taken as secure knowledge because the urban farming industry is still so new and there are so many unknown variables.

On the face of it, the urban vertical farm may be more expensive than a traditional soil farm. The viability of a project like this only becomes apparent in a region like Los Angeles, a large sprawling metropolis with fast-diminishing agricultural land left in the vicinity. In this case, imports and distribution processes around pesticides, packaging, fossil fuels used, etc. end up making the traditional farming process the less desirable option up against the productive

urban farm proposal. This makes the proposal viable contextually.

Development Plan + Implementation

This project can be seen as an investment opportunity that takes advantage of an expected food revolution as we move into the era of the climate crisis. An expected shift in food consumerism toward plant-based products increase the commodity value of a project like this.

Although the operation is financially viable, it does require major investment for the initial construction and first produce yields. The project can, however be split into parts. Due to the site being an existing structure that will only be mildly renovated, the initial start-up could be a smaller farm that just uses the existing structure with added equipment. Later, once that is successfully running, the building can adapt to host a larger programme and build add-ons in parts. Then aim to include more public space and aspects of commercial function later on.

Summary

In this novel urban farm meets produce grocery design, the viability becomes complicated and therefore it does carry a notable risk.

This report does, however, outline what is required to establish the urban farm, how it might financially perform based on existing urban farm examples and what project team may be appointed due to the complexity and regional challenges that come with this project, amongst other elements.

The design, in my opinion, will be capable of optimising yields while streamlining the farm-to-table concept which will save greatly on costs in the long-run, and successfully introduce a sustainable option (once we have a reliable source of clean energy) for food security and convenience in the industry.

The viability of this proposal will increase over time as more technology and need arises. As the concept becomes commercialised, the set-up should become easier and more affordably obtained.

I believe that this is a viable proposal, with great potential to become even more beneficial - financially and socially - going forward.

Programme Requirements

For the sake of my project design process, I will be desiging using the meyric system. The following section lays out my process in understanding what my proposed building requires in order to function at its desired affect.

The parts of the project include:

1. An Urban Farm

This is based on a controlled environment agriculture (CEA) system that presents as sterile modules that house the majority of food production in the building. This will feed into the traditional pedestrian-friendly store that is accessed through the interface at The Grove shopping mall. It will also feed into the drive-thru store which adds an element of convenience for motorists. The produce that will be grown in these spaces have been chosen and researched to determine spatial and climatic requirements as seen in the tables to follow.

2. An Interactive Farm

This part of the design will be interwoven with the urban farm so that the public can see into and interact with the processes of the produce production at the farm. It will allow cascading walkways to house experiential processes around food. Guests can pick fruit and vegetables from the outdoor gardens which will be paid for by weight. This is imagined as purely experiential and differs from the

weekly grocery shop that customers may prefer to visit the store at The Grove store for. There will be spaces for picnics, cafes and leisure with a view out into the Los Angeles sprawling landscape. This experiential approach is aimed at a phenomenological reconnection between the urban human and our responsibility connected to consumption.

3. Allotments

Concrete has seeped across this city, eliminating agricultural land and solidifying the reliance residents have on major distribution processes. Allotments arranged to benefit from verticality will allow residents to rent their own piece of productive land. They can use it however they please. Perhaps for personal use or contribute in farmers markets and on site sales at the stores.

4. Homeless Relief Centre

As discussed in my previous research, homelessness is an ongoing major problem in Los Angeles. The farm can offer excess produce and greywater outputs as a zero-waste initiative into a designed centre that provides a food bank and sanitation services for the homeless population to mutually benefit from.

There will be subtle elements of recognition of the agricultural past associated with this land and the Gilmore family. Not a museum as such but subtle connections around the oil mining, dairy farm and farmers market roots.

Programme Table

Urban Farm

CEA Pods	no.	sqm
vegetables	9	2700
fruits	3	900
legumes	3	900
herbs + spices	3	900
mushrooms	2	600
research pod	1	300
cow feed	1	300
mini fruit tree pods	4	1200
TOTAL	26	7800

Interactive Farm

Open Spaces	sqm
harvesting patches	2000
walkways	600
picnic areas	1000
pond (for aquaponics)	300
cow meadow (2 cows)	2000
exhibition spaces	600
outdoor mini fruit forest	2000
cafe/deli with food grown on site/kitchen	1600
farmer's market	900
TOTAL	11000

Allotments

Allotments	sqm
CEA (closed) pods (70sqm each)	980
open plots (70sqm each)	980
service reticulation	240
TOTAL	2200

Timber Addition

Exhibition pods	1500
Platform Gardens	2500
TOTAL	4000

Homeless Relief Centre

Homeless Relief Centre	sqm
food bank/kitchen	300
dining	100
showers/grooming facilities	200
toilets	100
TOTAL	700

Services

water reticulation, storage		300
electricity reticulation, production, storage		600
CO2 management, storage and reticulation		300
produce movement/ delivery + cooled storage		600
temperature/ climate control devices, mechanical rooms and reticulation		200
cleaning/ decontamination spaces		100
waste disposal/ composting room		200
food processing washing, roasting, de-shelling		300
storage for equipment		300
lifts for goods, customers, staff		100
TOTAL		3000

Admin + Utilities

customer service		30
production management		30
financial department		30
marketing		30
tills and ticket offices		40
office staff break/kitchen		300
staff restroom		40
customer restroom		500
parking/deliveries		8000
TOTAL		9000

Stores

roadway		150
drive-thru stalls/ tills		50
store + back of shop		400
TOTAL		600

TOTAL (Preliminary)

+/- 40 000 sqm

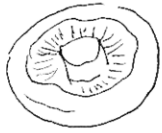
mushrooms

hydroponics



white and brown mushrooms

farm
requirement
200m²



portobello mushrooms

farm
requirement
100m²



oyster mushrooms

farm
requirement
50m²



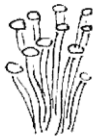
maitake mushrooms

farm
requirement
50m²



shiitake mushrooms

farm
requirement
50m²



enoki mushrooms

farm
requirement
50m²



king oyster mushrooms

farm
requirement
50m²



chanterelle mushrooms

farm
requirement
50m²

TOTAL
600m²
(2 pods)

all mushrooms need
similar conditions

preferred conditions: 7-16°C, cooler
don't need sun
water need: kept moist
nutrient: need organic matter
to feed off of
growth period: 24 to 60 days
type: annual

CEA Pod Allocation

7200m²
(24 pods)



lettuce varieties

preferred conditions: 15-20°C, up to 28°C, hotter
 water need: regular
 growth period: 45 to 55 days
 type: annual

farm
 requirement
 300m²



spinach

preferred conditions: 10-16°C, cooler,
 full or partial sun
 water need: plenty
 growth period: 42 days
 type: annual

farm
 requirement
 150m²



cabbage

preferred conditions: 10-20°C, cooler,
 6 hours full sun daily
 water need: moderate
 growth period: 80-180 days
 type: biennial

farm
 requirement
 50m²



cauliflower

preferred conditions: 10-18°C, cooler,
 6 hours full sun daily
 water need: moderate
 growth period: 50-100 days
 type: annual

farm
 requirement
 150m²



broccoli

preferred conditions: 5-20°C, cooler, full sun
 water need: regular
 growth period: 75-100 days
 type: annual or perennial types

farm
 requirement
 150m²



brussel sprouts

preferred conditions: 7-20°C, cooler, full sun
 water need: regular
 growth period: 26-31 days for plant
 to mature before crop
 type: biennial

farm
 requirement
 100m²



asparagus

preferred conditions: 20-30°C, full sun
 water need: regular
 growth period: one year to sprout then
 produce for 10-15 years
 type: perennial

farm
 requirement
 100m²



celery

preferred conditions: 15-20°C, cool and cloudy
 water need: regular
 growth period: 21-28 days
 type: annual or perennial types

farm
 requirement
 50m²



spring onions

preferred conditions: 20-26°C, hotter, full sun
 water need: minimal
 growth period: 56 days
 type: perennial

farm
 requirement
 100m²



green beans

preferred conditions: 18-27°C, hotter,
 6 hours full sun daily
 water need: moderate
 growth period: 50-60 days
 type: annual

farm
 requirement
 100m²



peas

preferred conditions: 10-20°C, cooler,
 6 hours full sun daily
 water need: moderate
 growth period: 60-70 days
 type: annual

farm
 requirement
 300m²



baby potatoes

preferred conditions: 16-21°C, hotter,
 6 hours full sun daily
 water need: moderate
 growth period: 80-100 days
 type: annual

farm
 requirement
 300m²



tomatoes

preferred conditions: 13-30°C, hotter,
 6 hours full sun daily
 water need: regular
 growth period: 50-60 days
 type: perennial in tropics

farm
 requirement
 300m²



cucumbers

preferred conditions: 21°C or higher, hotter,
 5 hours full sun min daily
 water need: moderate
 growth period: 50-70 days
 type: annual

farm
 requirement
 150m²



zucchini

preferred conditions: 21°C or higher, hotter,
 6 hours full sun min daily
 water need: moderate
 growth period: 35-55 days
 type: annual

farm
 requirement
 150m²



bell pepper

preferred conditions: 21-27°C, hotter, full sun
 water need: moderate
 growth period: 60-90 days
 type: perennial

farm
 requirement
 150m²

squash soil farming



squash varieties

preferred conditions: 16-30°C, hotter
full sun
water need: regular
growth period: 50 to 65 days
type: annual

farm
requirement
100m²

TOTAL
2700m²
(9 pods)

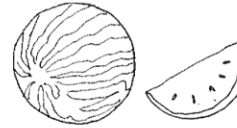
melon soil farming



cantaloupe

preferred conditions: 18-35°C, hotter
full sun
water need: regular
growth period: 45 to 60 days from flower
type: annual

farm
requirement
100m²



watermelon

preferred conditions: 18-35°C, hotter, full sun
water need: regular
growth period: 65 to 95 days from planting
45 days from flower
type: annual

farm
requirement
100m²

TOTAL
900m²
(3 pods)

small fruit hydroponics



strawberries

preferred conditions: 16-27°C, hotter
full sun for 10 hours daily
water need: regular
growth period: 120 days for first fruit
type: perennial

farm
requirement
200m²



grapes

preferred conditions: 25-32°C, hotter
full sun for 7 hours daily
water need: regular
growth period: Up to 3 years for first fruit
type: perennial

farm
requirement
200m²



blueberries

preferred conditions: 2-13°C, cooler
full sun or partial
water need: moderate
growth period: Up to 4 years for first fruit
type: perennial

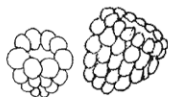
farm
requirement
100m²



cranberries

preferred conditions: 0-13°C, cooler
full sun
water need: moderate
growth period: Up to 4 years for first fruit
type: perennial

farm
requirement
100m²



raspberries

preferred conditions: 21-23°C, cooler
full sun, 6-8 hours daily
water need: moderate
growth period: Up to 2 years for first fruit
type: perennial

farm
requirement
100m²

dwarf/mini tree garden soil farming



cherries

preferred conditions: need cold winters,
full or partial sun
water need: moderate
growth period: 3 years until fruit
type: perennial

farm
requirement
300m²



lemons

preferred conditions: 10-30°C, full sun
8 or more hours daily
water need: moderate
growth period: 4 years from seed to fruit
type: perennial

farm
requirement
300m²



bananas

preferred conditions: 24-32°C, full sun
4-6 hours daily
water need: moderate
growth period: 15 months to fruit
type: perennial

farm
requirement
300m²



apples

preferred conditions: needs cold winter,
very hardy, full sun
water need: moderate
growth period: 2-3 years to fruit
type: perennial

farm
requirement
300m²

TOTAL
1200m²
(4 pods)

legumes



chickpeas

preferred conditions: 21-27°C, hotter full or partial sun
 water need: regular
 growth period: 100 to 130 days
 type: annual

farm requirement
 150m²



lentil varieties

preferred conditions: 18-30°C, hotter with cold winter, full sun
 water need: moderate
 growth period: 80 to 100 days
 type: annual

farm requirement
 150m²



bean varieties

preferred conditions: 15-21°C, hotter, full sun 8-10 hours daily
 water need: moderate
 growth period: 50 to 60 days
 type: annual

farm requirement
 500m²



peanuts

preferred conditions: 20-30°C, hotter, full sun 8-10 hours daily
 water need: regular
 growth period: 100 to 120 days
 type: annual or perennial

farm requirement
 100m²

TOTAL
900m²
(3 pods)

hydroponics



sage

preferred conditions: 16-21°C, hotter full or partial sun
 water need: moderate
 growth period: 75 days to harvest, 2 years to full size
 type: perennial

farm requirement
 50m²



oregano

preferred conditions: 18-21°C, hotter full sun
 water need: minimal
 growth period: 45 days to harvest
 type: perennial

farm requirement
 100m²



thyme

preferred conditions: 20-30°C, hotter full sun
 water need: minimal
 growth period: 45 days to harvest
 type: perennial

farm requirement
 50m²



chives

preferred conditions: 4-30°C, hardy full sun
 water need: regular
 growth period: 60 days to harvest
 type: perennial

farm requirement
 100m²



chillies

preferred conditions: 25-31°C, hotter full sun
 water need: moderate
 growth period: 60-150 days to harvest
 type: perennial in correct condition

farm requirement
 200m²

herbs and spices



parsley

preferred conditions: 15-18°C, morning sun or partial sun
 water need: regular
 growth period: 70 days from seed
 type: biennial

farm requirement
 100m²



basil

preferred conditions: 27-32°C, full sun, 8 hours
 water need: regular
 growth period: 21 to 28 days from seed
 type: annual or perennial

farm requirement
 100m²



mint

preferred conditions: 13-21°C, full sun
 water need: moderate
 growth period: 90 days from seed
 type: perennial

farm requirement
 50m²

hydroponics



ginger

preferred conditions: 25°C, hotter and humid full sun, 2-5 hours direct
 water need: moderate
 growth period: 60 days to harvest
 type: perennial

farm requirement
 50m²



garlic

preferred conditions: 0-10°C, cooler loose soil full sun, 6-8 hours direct
 water need: moderate
 growth period: 120-150 days to harvest
 type: annual or perennial

farm requirement
 50m²



rosemary

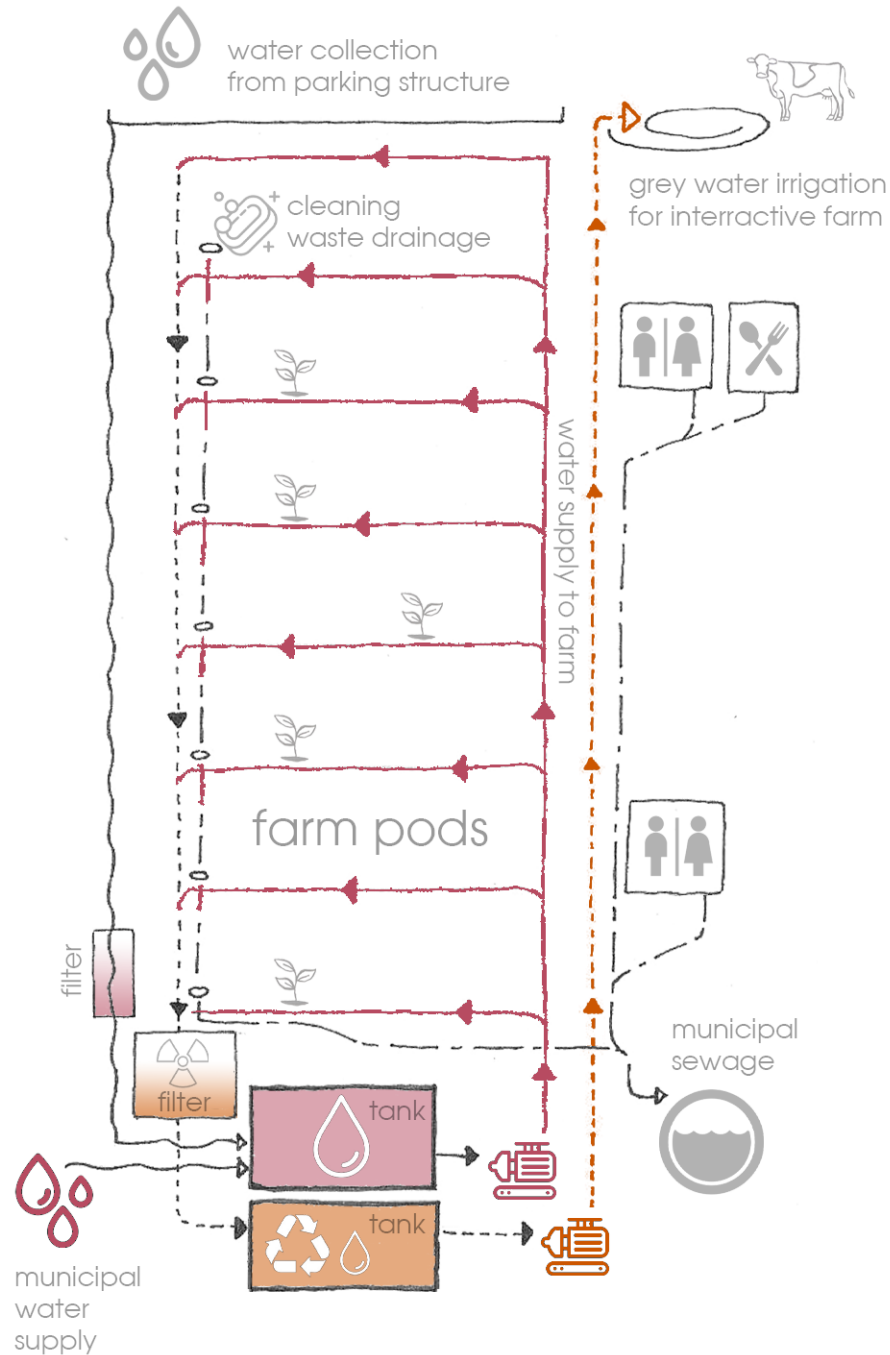
preferred conditions: 0-30°C, hotter, hardy full sun, 6-8 hours direct
 water need: minimal
 growth period: 42 days to harvest
 type: perennial

farm requirement
 50m²

TOTAL
900m²
(3 pods)

Fig 1 - Water and drainage reticulation

Water + Waste



Service Reticulation Diagrams

The large surface area of the parking structure and surrounding hardscape allows opportunity to collect stormwater. This water will be filtered, stored and then pumped into the CEA Pod's hydroponic systems. Once circulation has occurred for 2 weeks, the water is flushed from the system and stored in a greywater tank. This grey water is treated then used to water the lawns, non-edible plants and service toilets and showers in the restrooms on site. Eventually, after the water has been recycled multiple times, it will then join municipal sewage lines.

Electricity + Lighting

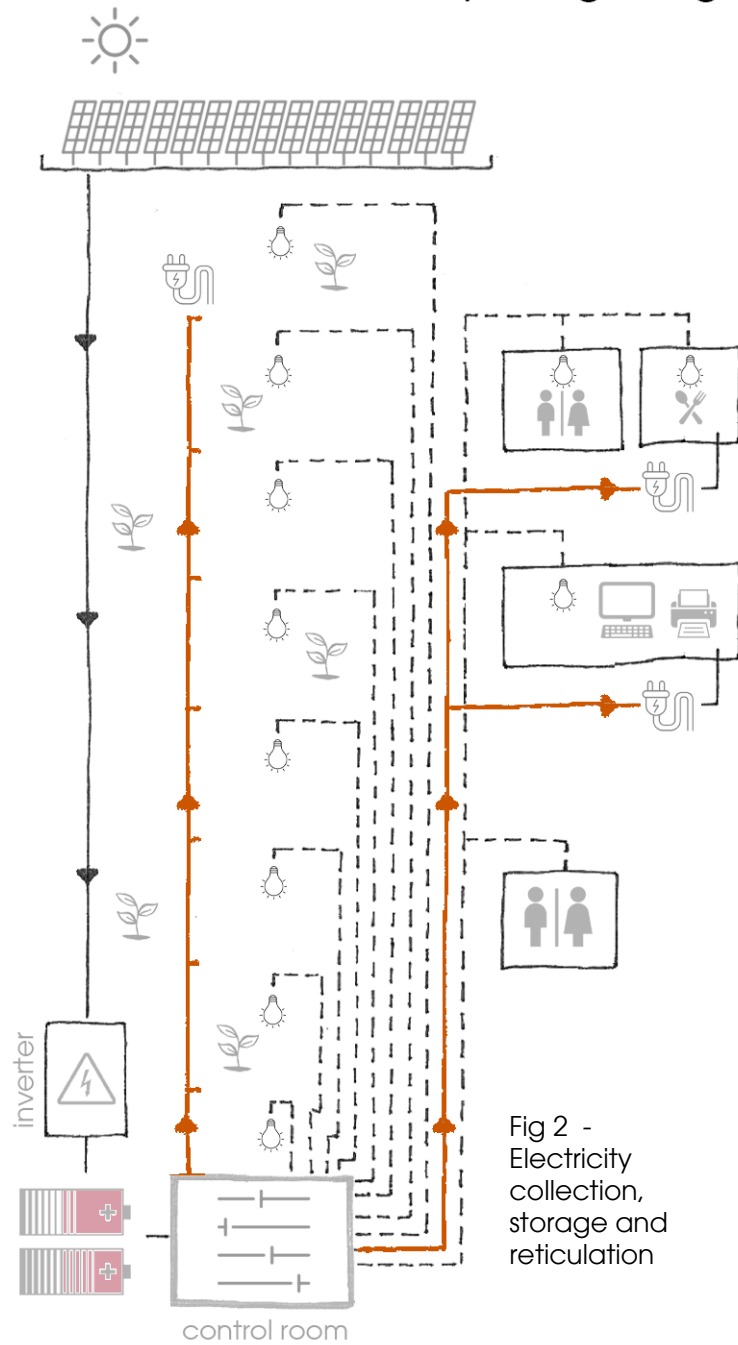
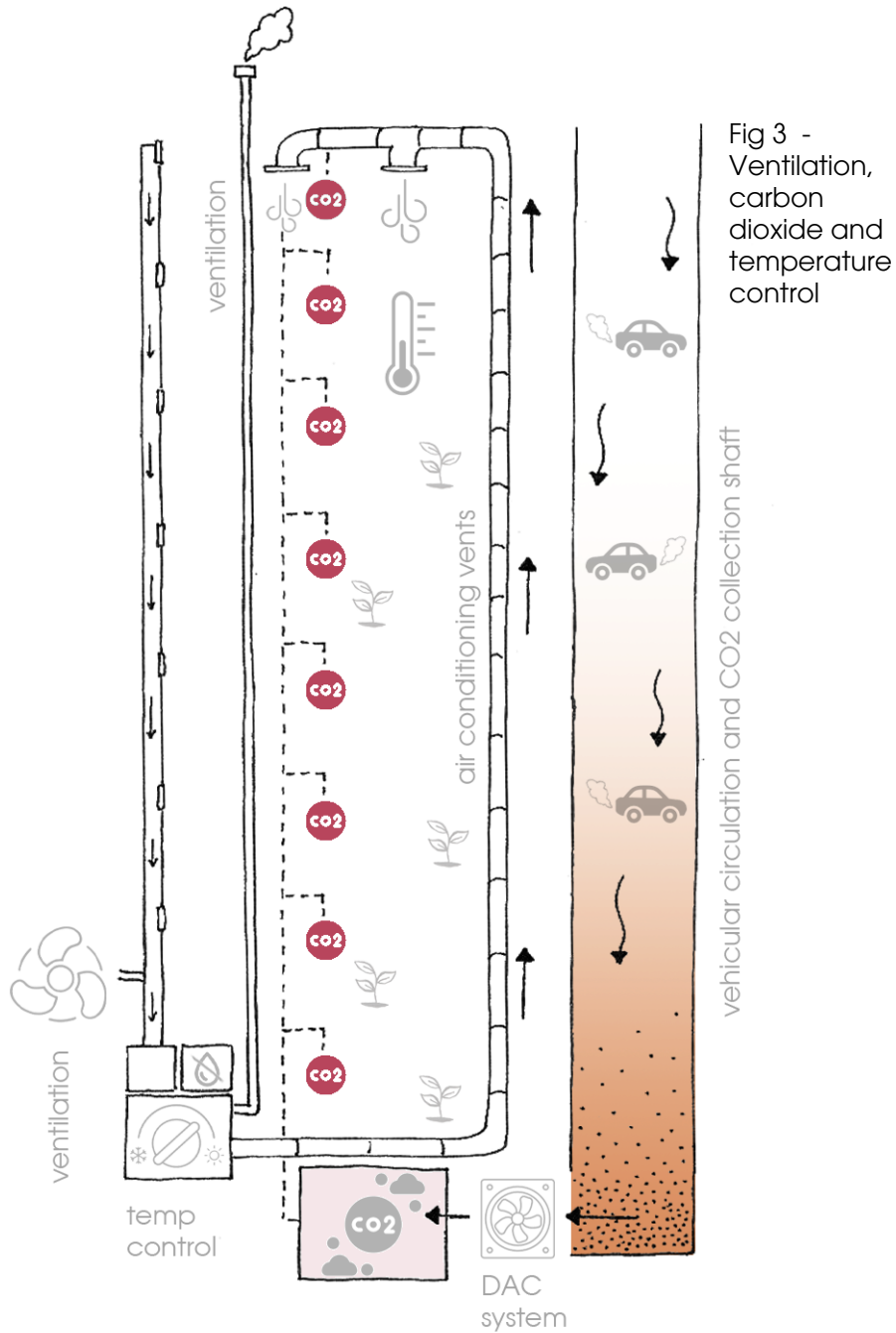


Fig 2 - Electricity collection, storage and reticulation

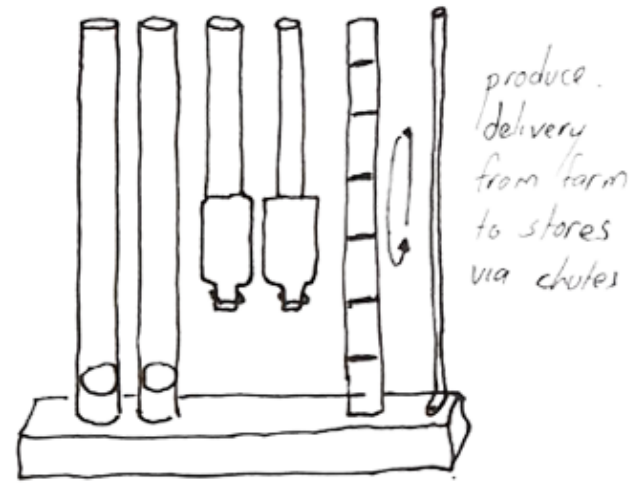
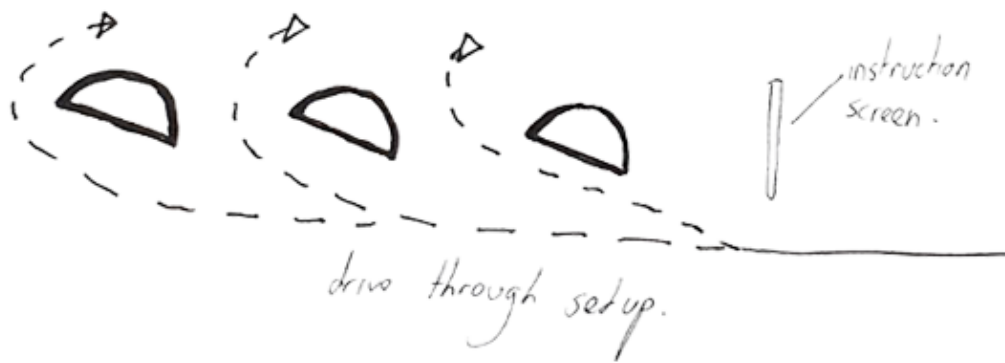
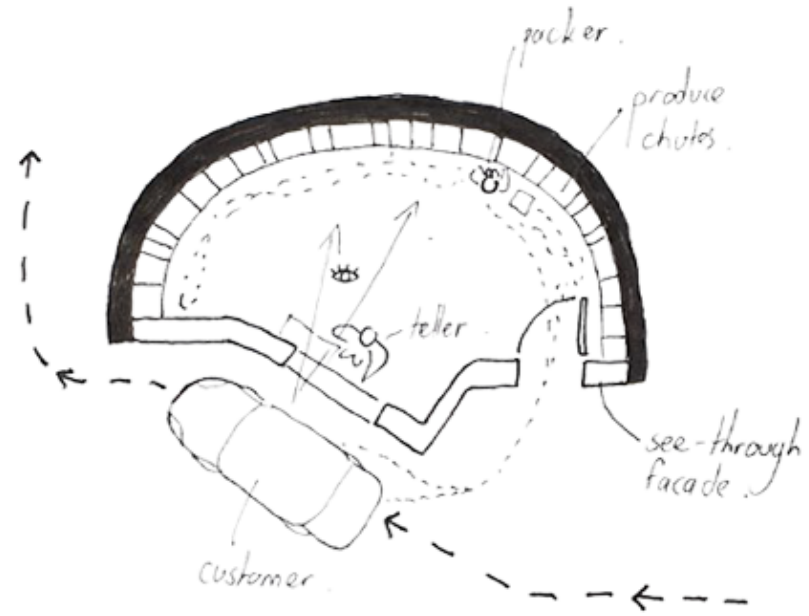
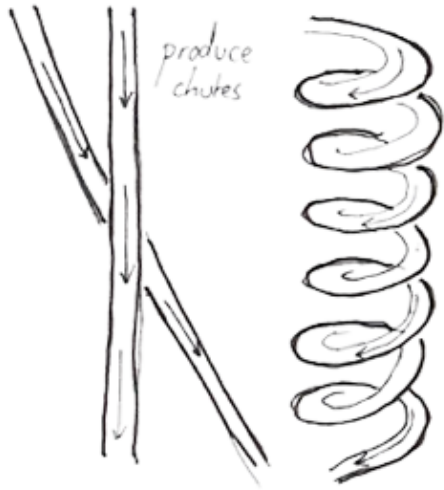
The generous sunshine in the region and the considerable surface area of the parking structure makes this a perfect place to make use of solar panels. The harnessed energy will be collected, inverted and stored. A control room will direct this electricity into the heating, cooling, lighting and powering of the building.

Air + Gas + Temperature Control



The car culture in Los Angeles presents an issue of high carbon emissions. With a Direct Air Capture system in the building, car fumes can be collected and separated so that carbon dioxide can be stored and then pumped into the CEA pods to assist the plants in a faster photosynthesis process thus reducing the carbon dioxide in the air outside.

Fig 4 -
Beginning
sketches of
how product
circulation
and sales
might work



Rough Drive-Thru Diagrams



Design Development

14



Technical Aspects

15



Design Progression

16

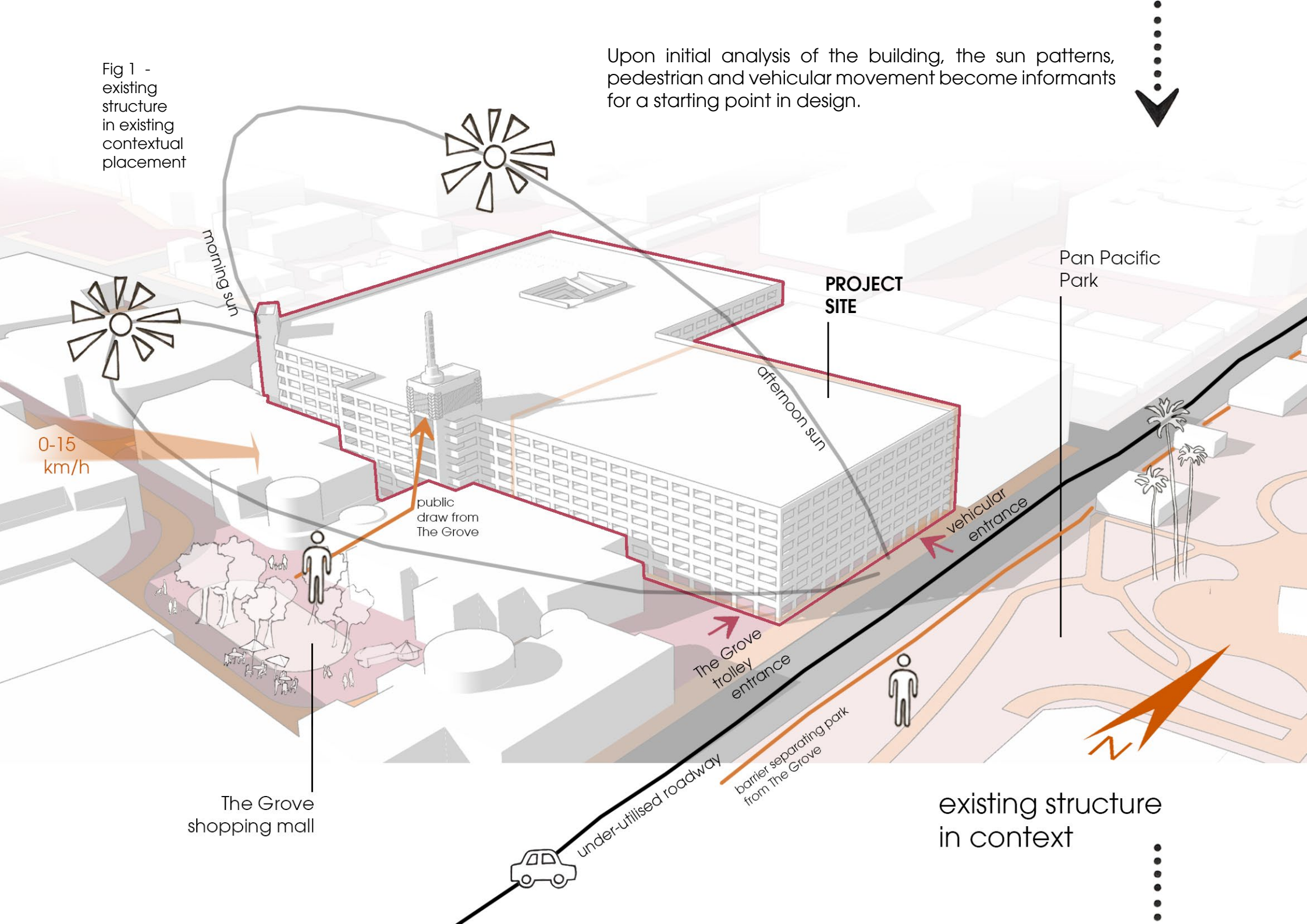
PART 02

design process

FIRST ITERATIONS

Fig 1 - existing structure in existing contextual placement

Upon initial analysis of the building, the sun patterns, pedestrian and vehicular movement become informants for a starting point in design.



0-15 km/h

morning sun

afternoon sun

PROJECT SITE

Pan Pacific Park

public draw from The Grove

vehicular entrance

The Grove trolley entrance

The Grove shopping mall

under-utilised roadway

barrier separating park from The Grove

existing structure in context

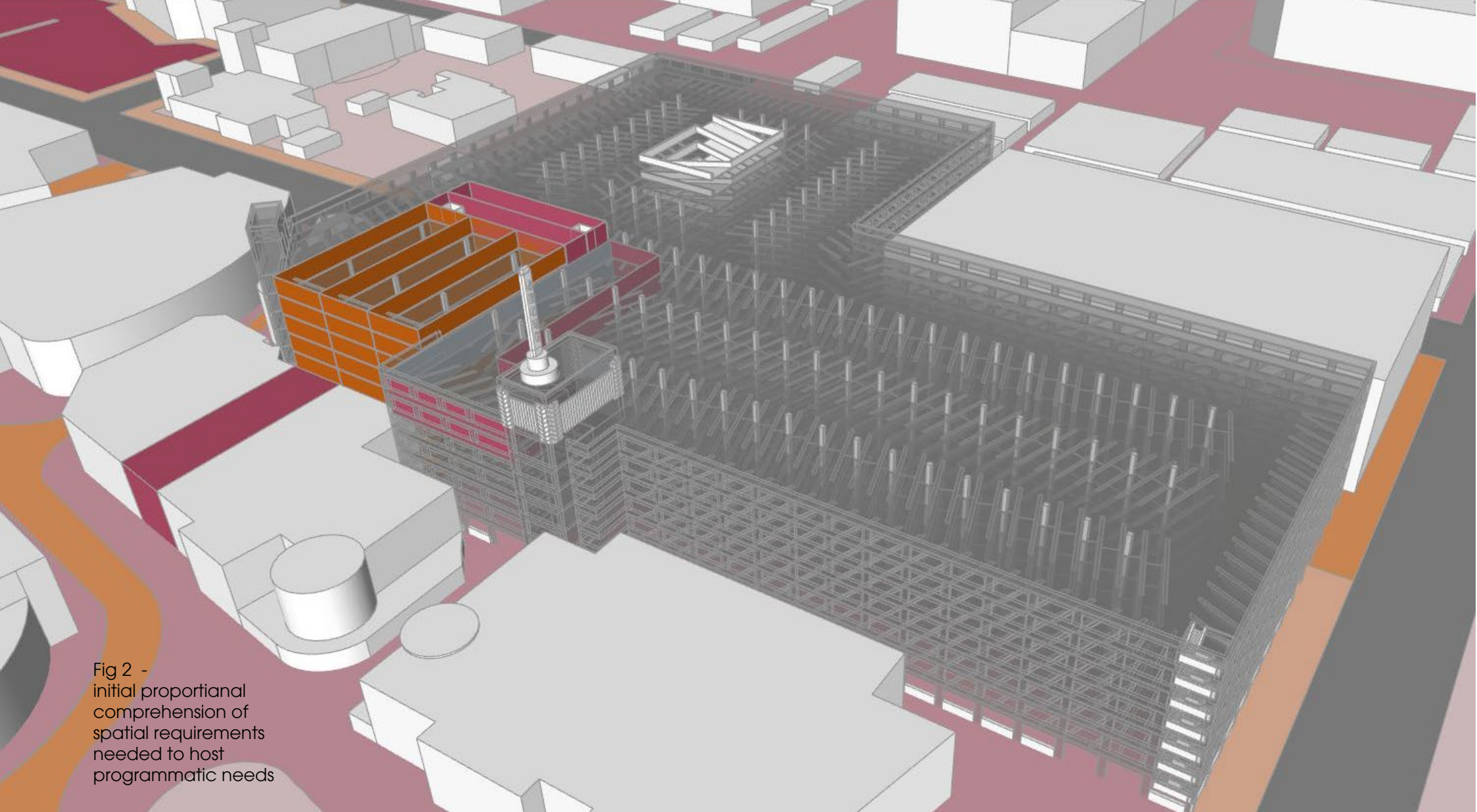


Fig 2 -
initial proportional
comprehension of
spatial requirements
needed to host
programmatic needs

Iteration 01

A humble hidden approach was initially tested. One that situated itself based on the existing movement reticulation and infrastructure - the vehicular ramps and the pedestrian

lift shafts. The building was somewhat practical and showed no desire to be celebrated, exposed and advertised. It was more of a machine than a public interactive experience.

The growing pods were neatly organised to the South of the building to make use of natural light, slotting into

Spatial Allocation



-  Vehicular Access To Project Site
-  Controlled Environment Agricultural Pods

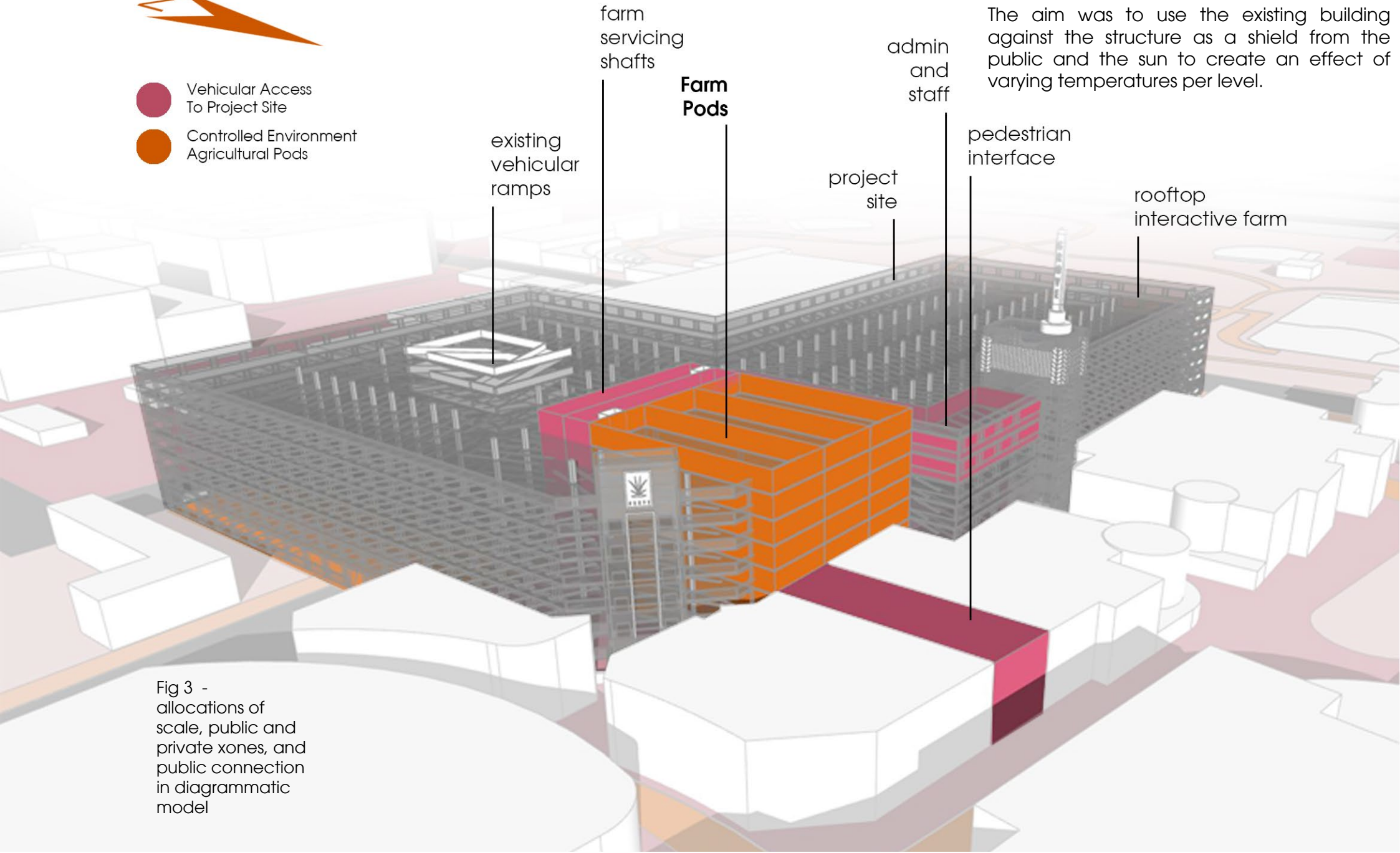


Fig 3 - allocations of scale, public and private zones, and public connection in diagrammatic model

the existing building with little change to the structure. The service shaft sat behind the pods, hidden away but also acting as the link between the farm and the predominant vehicular use I was prioritising in this iteration.

The aim was to use the existing building against the structure as a shield from the public and the sun to create an effect of varying temperatures per level.

Spatial Allocation



- Vehicular Access To Project Site
- Controlled Environment Agricultural Pods

This created a programmatic hierarchy as a set of rules for design. There would be a clear connection through the Grove Shopping Mall into the open-air strip mall as a pedestrian interface.

The downfall to this iteration comes in its rigidity and inability to adjust with movement. Pedestrian access into the farm is limited whereas the vehicular use is too extensive, asking the drive-thru to span all levels to fulfil a function of carbon dioxide collection on the ramps - perhaps being unnecessarily wasteful. This approach further activates the edge of the site that is already the most active.

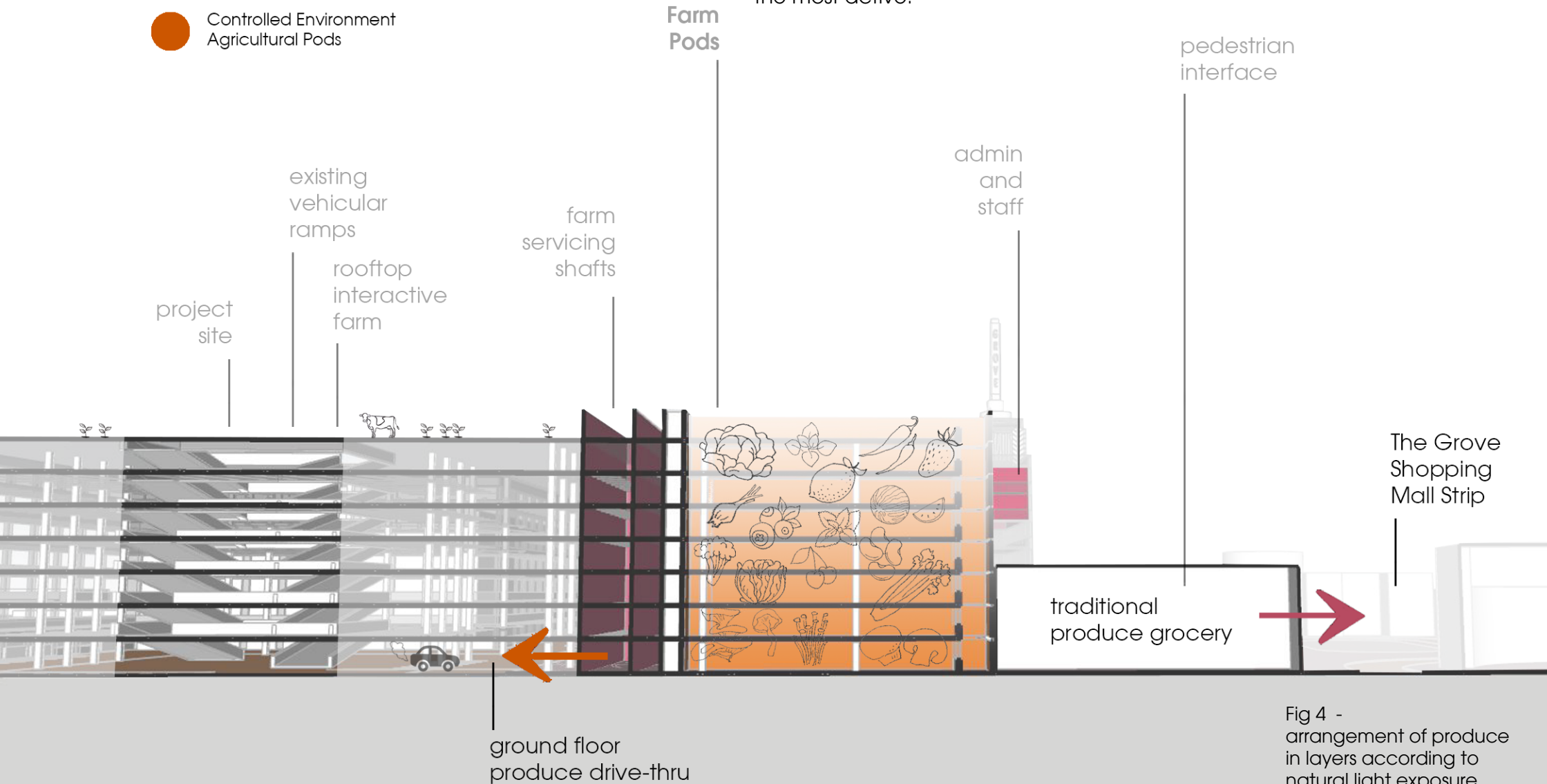
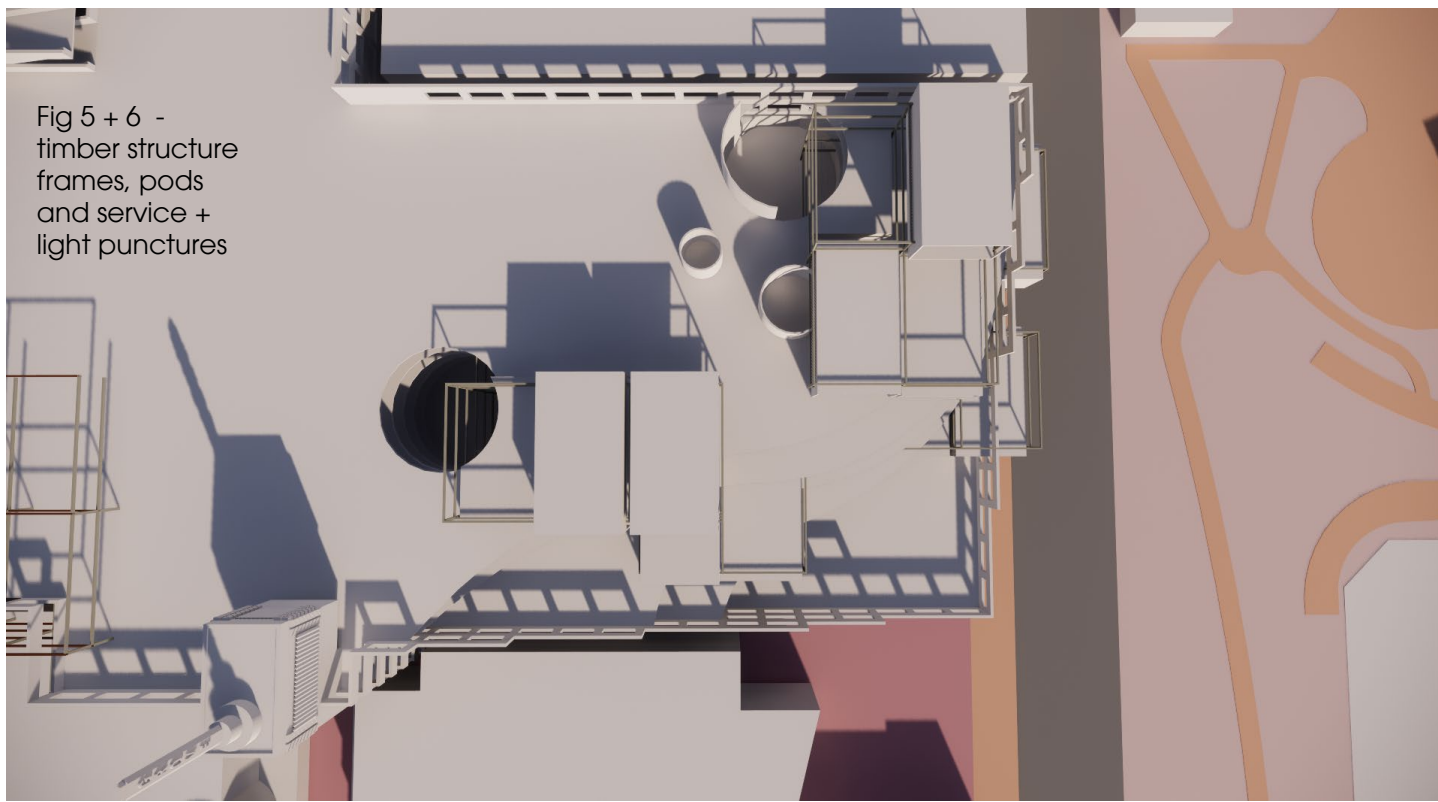


Fig 4 - arrangement of produce in layers according to natural light exposure

Fig 5 + 6 -
timber structure
frames, pods
and service +
light punctures

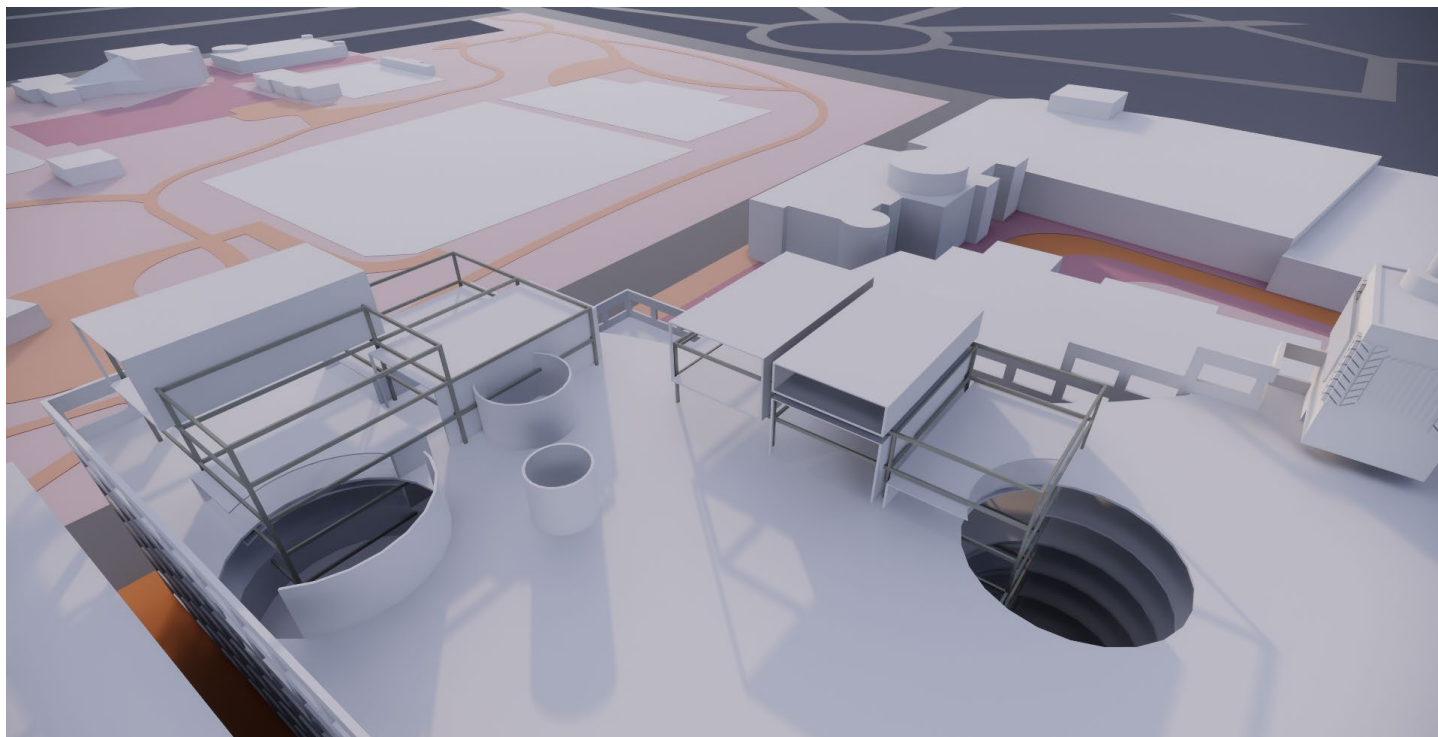


Iteration 02

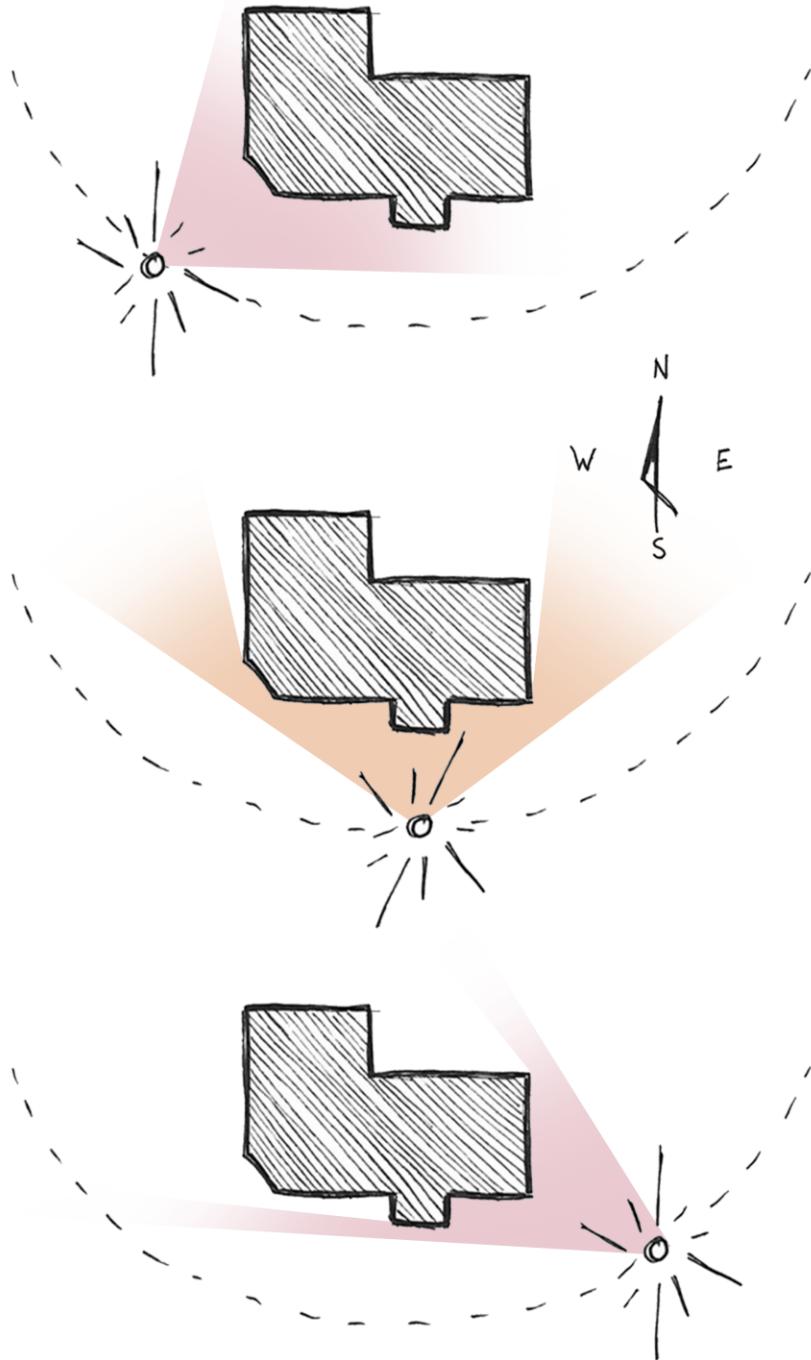
In progression on the previous option, this iteration moves to break away from the confines of the grid, spreading the programme out into other parts of the existing structure that are more likely to be under-used.

This design concept lacked natural light and sufficient space for new service reticulation for such a service intensive programme - so, I experimented with punching holes, creating vertical shafts. These would be structurally neat in terms of keeping integrity within the existing structure but the natural light was not substantial enough for the outdoor growing requirements of the building.

A timber structure that allows growth beyond the confines of the building was first introduced here. Unfortunately, clashing languages were observed and my thought process moved toward a more intentionally juxtaposed but congruent approach that took cues from the climate to enhance passive energy/heating/cooling properties.



Natural Light Optimisation

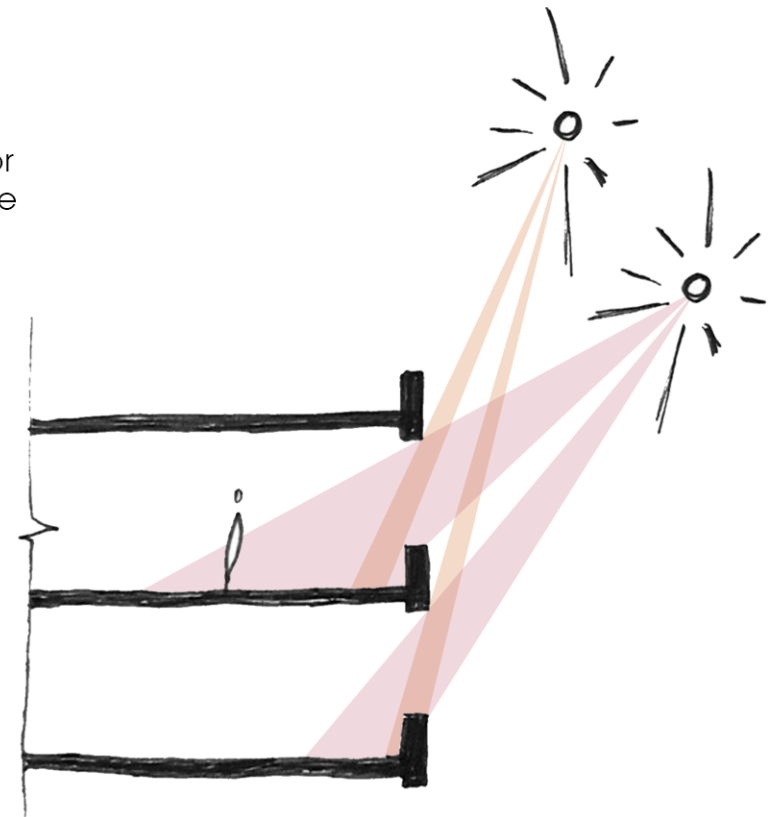


morning sunlight is low enough to penetrate building for a short amount of time

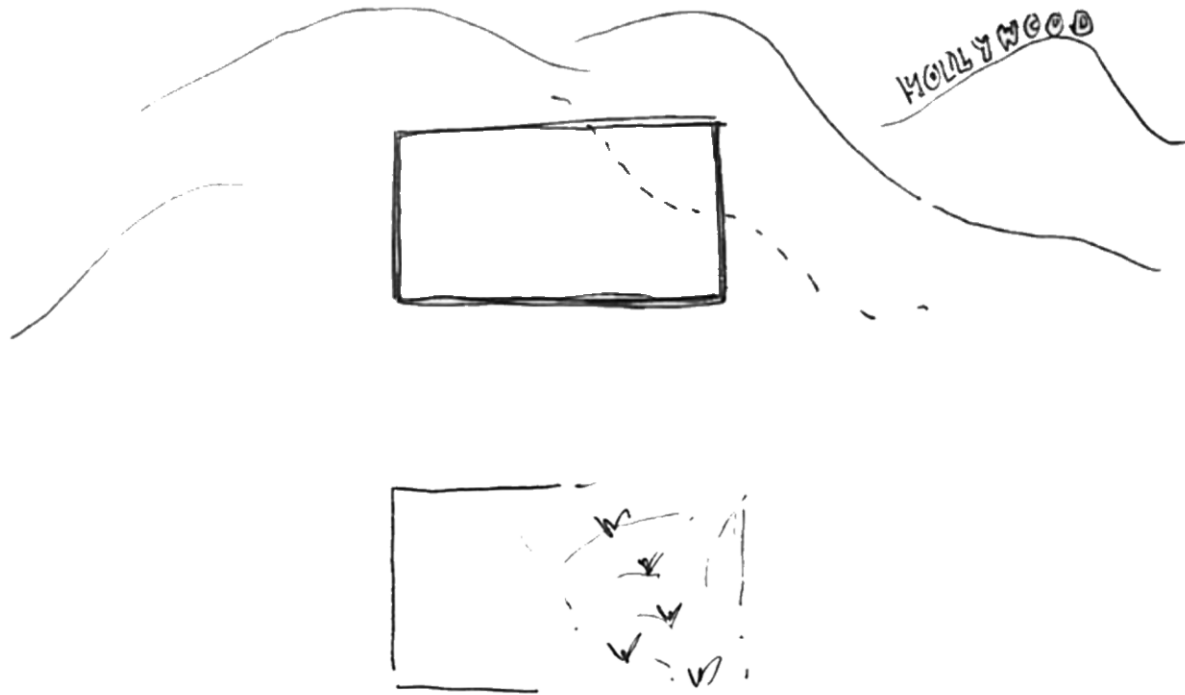
midday sunlight is overhead and does not penetrate the building sufficiently for proposed programme

afternoon sunlight is low enough to penetrate building for a short amount of time

- morning + afternoon sunlight
- midday sunlight



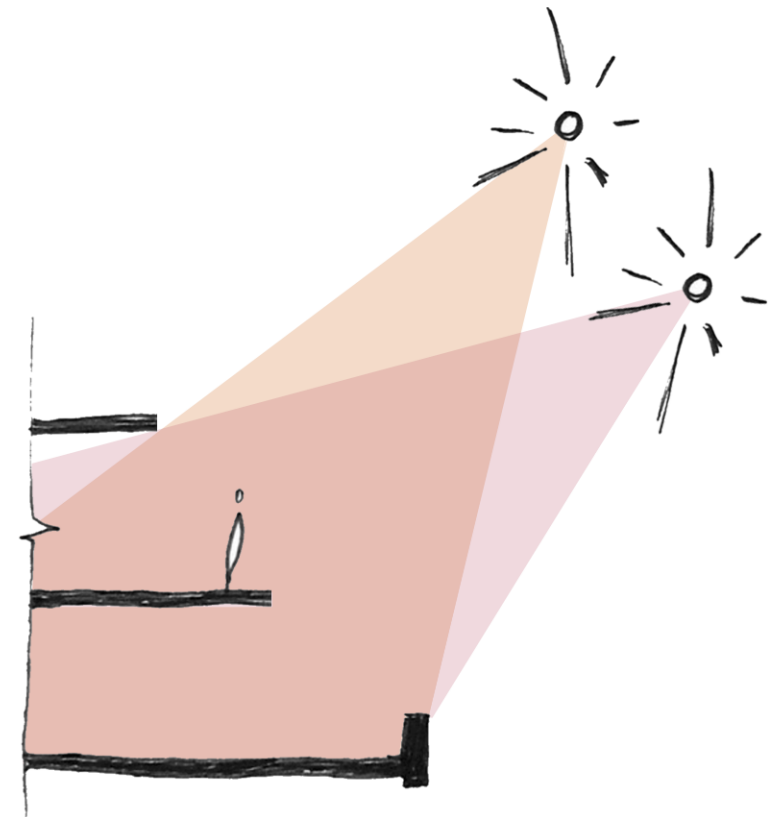
Natural Light Optimisation



● morning
+ afternoon
sunlight

● midday
sunlight

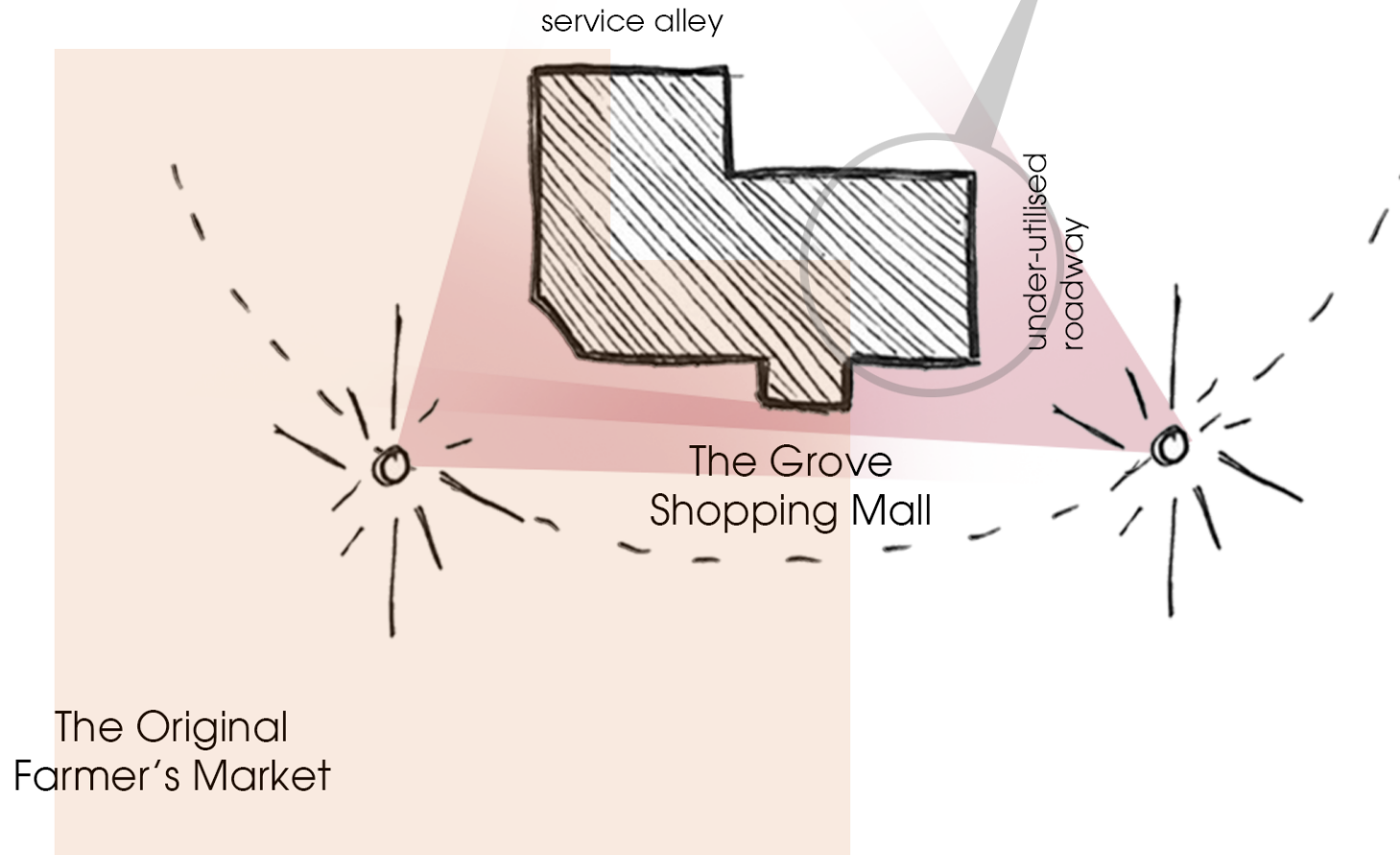
If the building is carved away - to harvest material, mimic the natural elements of the landscape and deconstruct barriers of natural throughways for ventilation - the structure should open up in cascading ledges, allowing natural sunlight into the building to become optimised for passive heating and to support the growth of fruits and vegetables in the interactive open-air gardens.



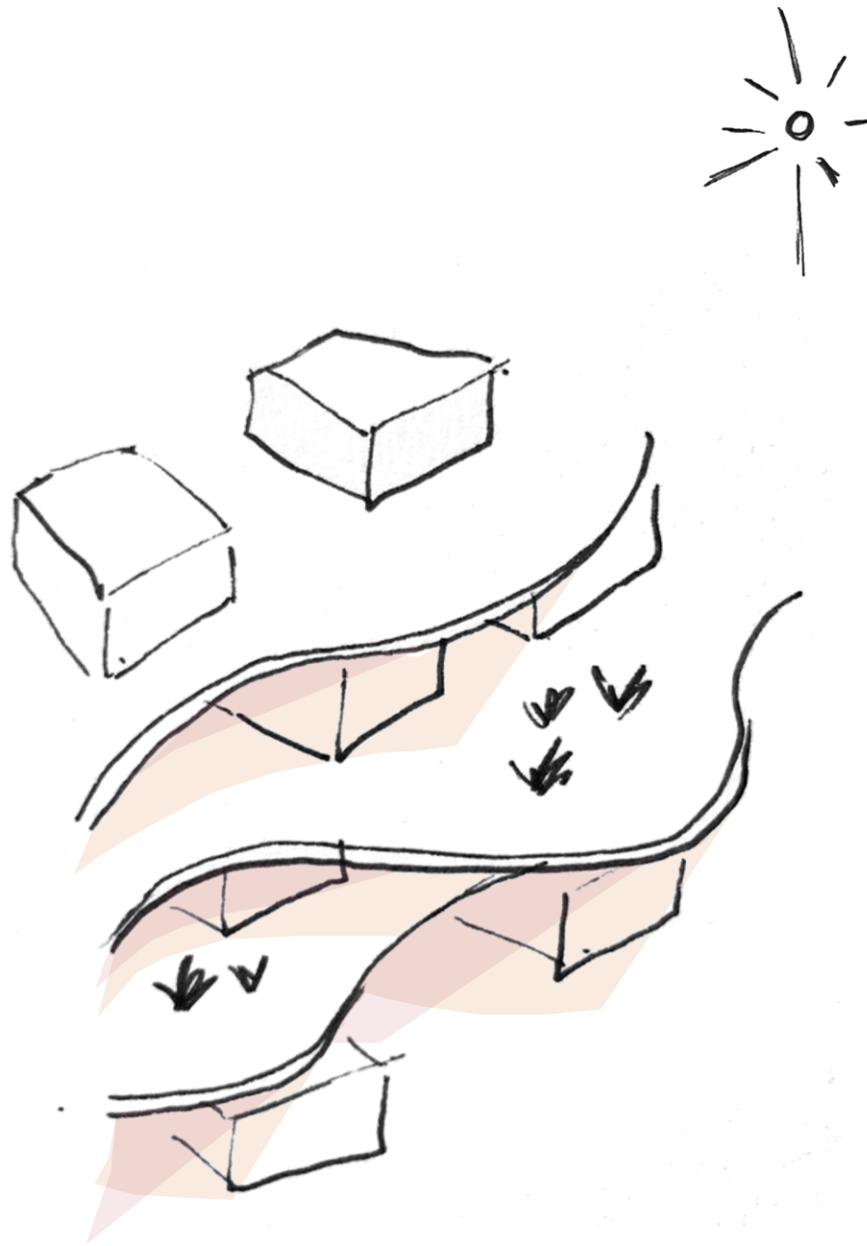
Selecting Portion of Existing Structure for Proposed New Intervention

- Morning + afternoon sunlight
- Existing Areas of Major Activity

optimal portion of the existing parking lot structure for proposed new construction based on sunlight and site activation



Controlling Light Through Form



● morning
+ afternoon
sunlight

● midday
sunlight



The curved cut-outs of the slabs were worked out to assist in controlling the passive heating/cooling and lighting of the areas that are in shadow or fully exposed to sunlight based on programmatic needs in different parts of the day.

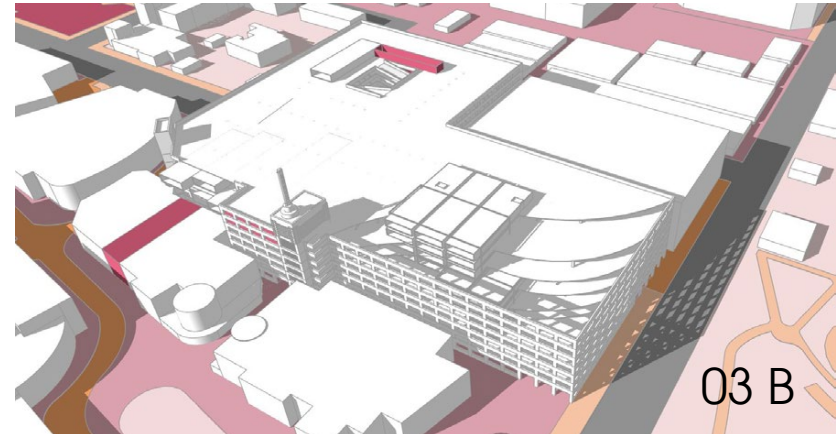
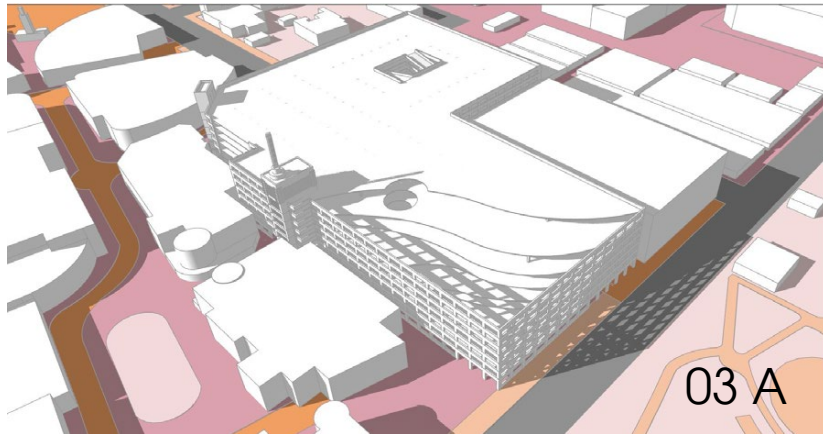
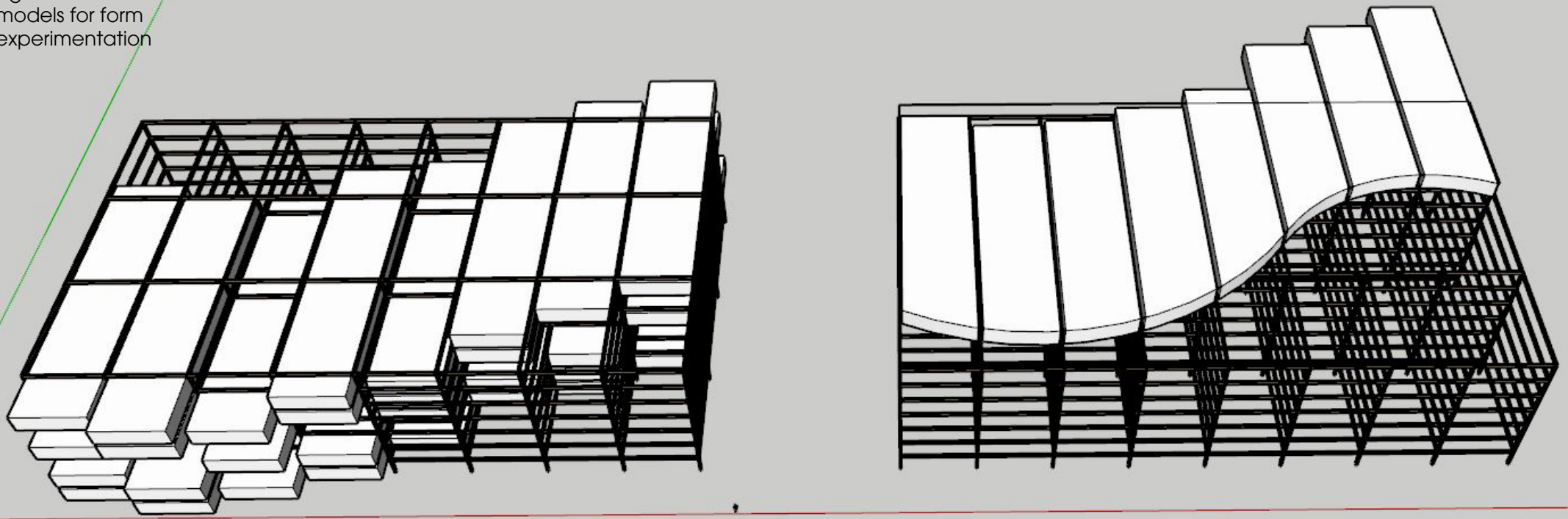


Fig 7 + 8 -
sketch models
for form
experimentation

Iteration 03

With a further refined set of informants including sun, shadows, landscape mimicry and identified edges to be activated, these sub-iterations were experimented with. A series of programmatic arrangements that cut away slabs to carve out intentional space for natural light and ventilation to bring the space to life and connect vertical levels.

Fig 9 - sketch
models for form
experimentation

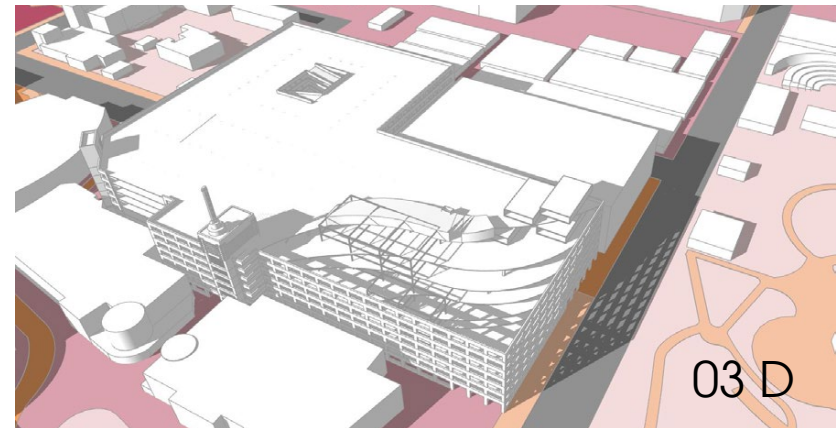


Initially the programme was set in rigid placement to understand the size ratio of the growing pod requirements to the existing structure. This was separated from the site for a moment to understand how pods may shift within the grid or morph to allow for an organic nature to enter the aesthetic.



Fig 10 + 11 -
sketch models
for form
experimentation

The art became understanding the relationship between the grid and the organic nature of the programme that begs to spill over the edges and grow in patterns, to express an anti-synthetic feeling while maintaining practicality. A building that wants to form part of nature and crumble into a natural state, a landscape.



The facade stays intact in this iteration, allowing the building to maintain its identity but giving it inner detail. An internal wonderland of growth. This proved to be too subtle and the facade would need additional material for reinforcement while also casting substantial shadows through the growing spaces.



Iteration 04

The facade becomes an element that can fall away in parts. It can break and warp to allow the building to open up and welcome views, sunlight and ventilation from the optimal South-Eastern edge.

This design style, and the iterations before it, had a structural frame independent from the existing structure, bringing forward a question of viability. If the infill structure has its own structure, why put it into the parking structure and not out in a field on its own? What about the extra material this would require? There were also discussions about dust collection and practicality of this merged double structure approach.

This led me to explore the integrated relationship between the existing structure and the new structure in depth. Understanding how one could borrow from the other to avoid wasted materials.

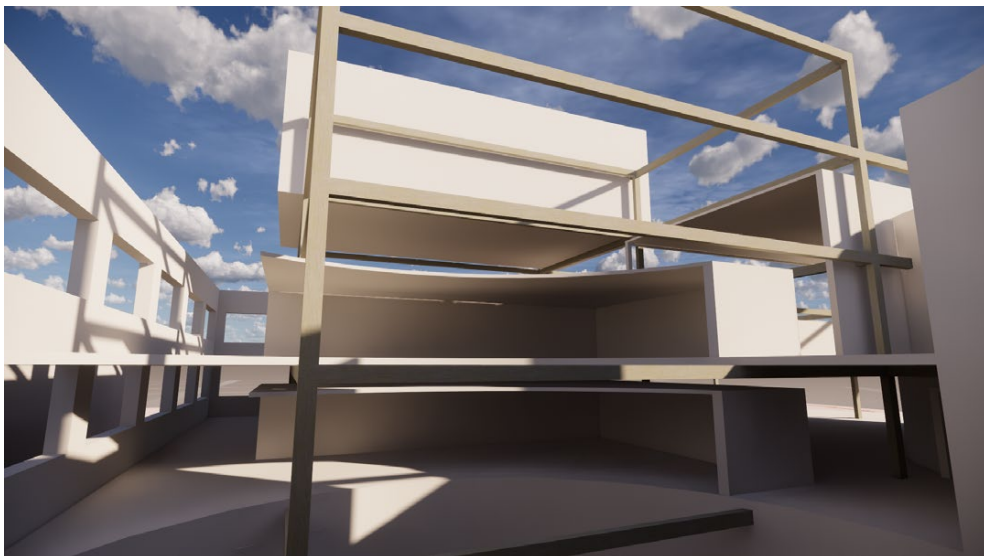
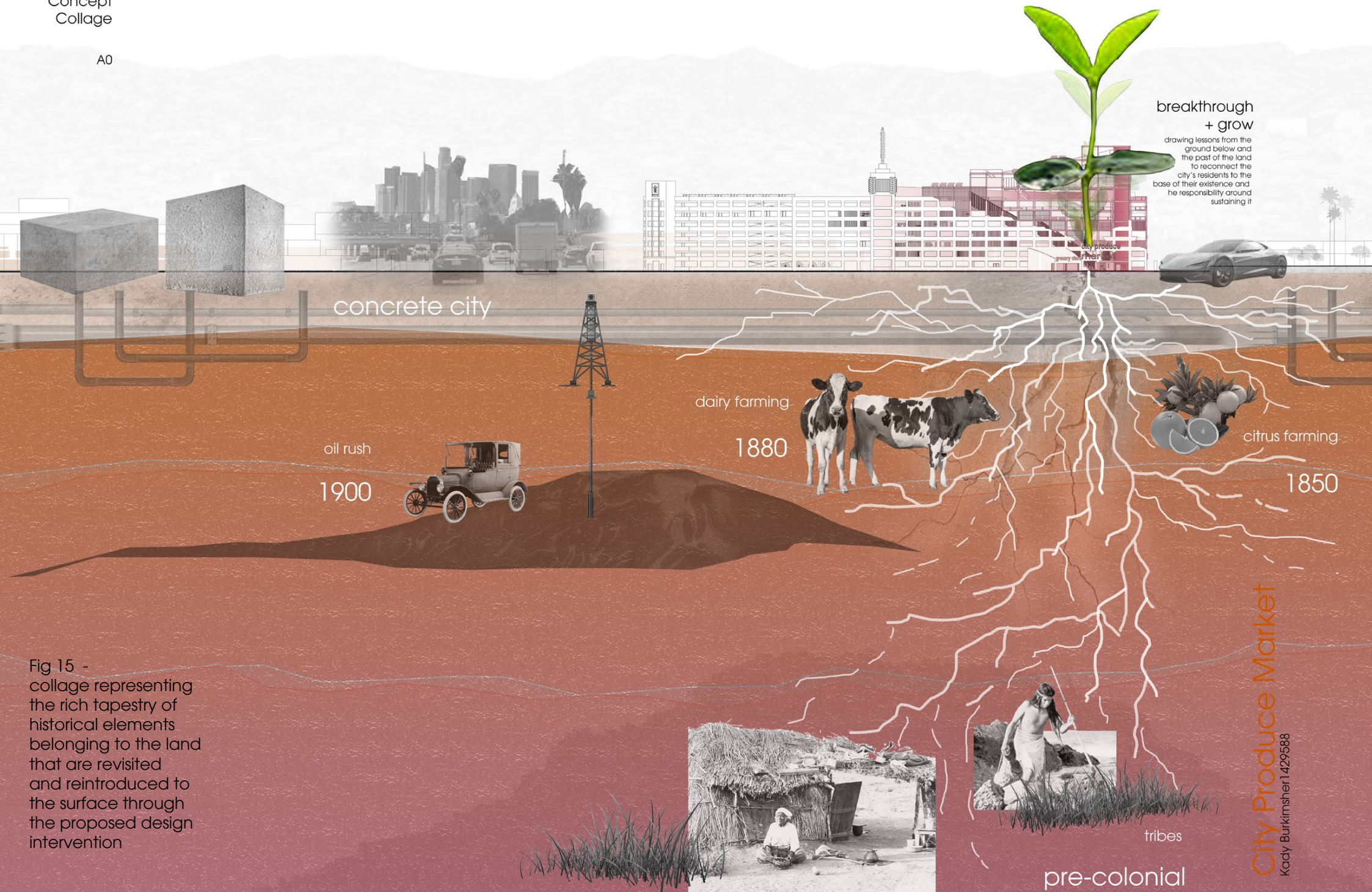


Fig 12 - 14 -
timber frames,
pods and facade
deconstruction

REFINED ITERATION



breakthrough
+ grow

drawing lessons from the ground below and the past of the land to reconnect the city's residents to the base of their existence and the responsibility around sustaining it

concrete city

oil rush
1900

dairy farming
1880

citrus farming
1850

tribes
pre-colonial

City Produce Market

Kody Burkimsher 1429588

Fig 15 - collage representing the rich tapestry of historical elements belonging to the land that are revisited and reintroduced to the surface through the proposed design intervention

Concept

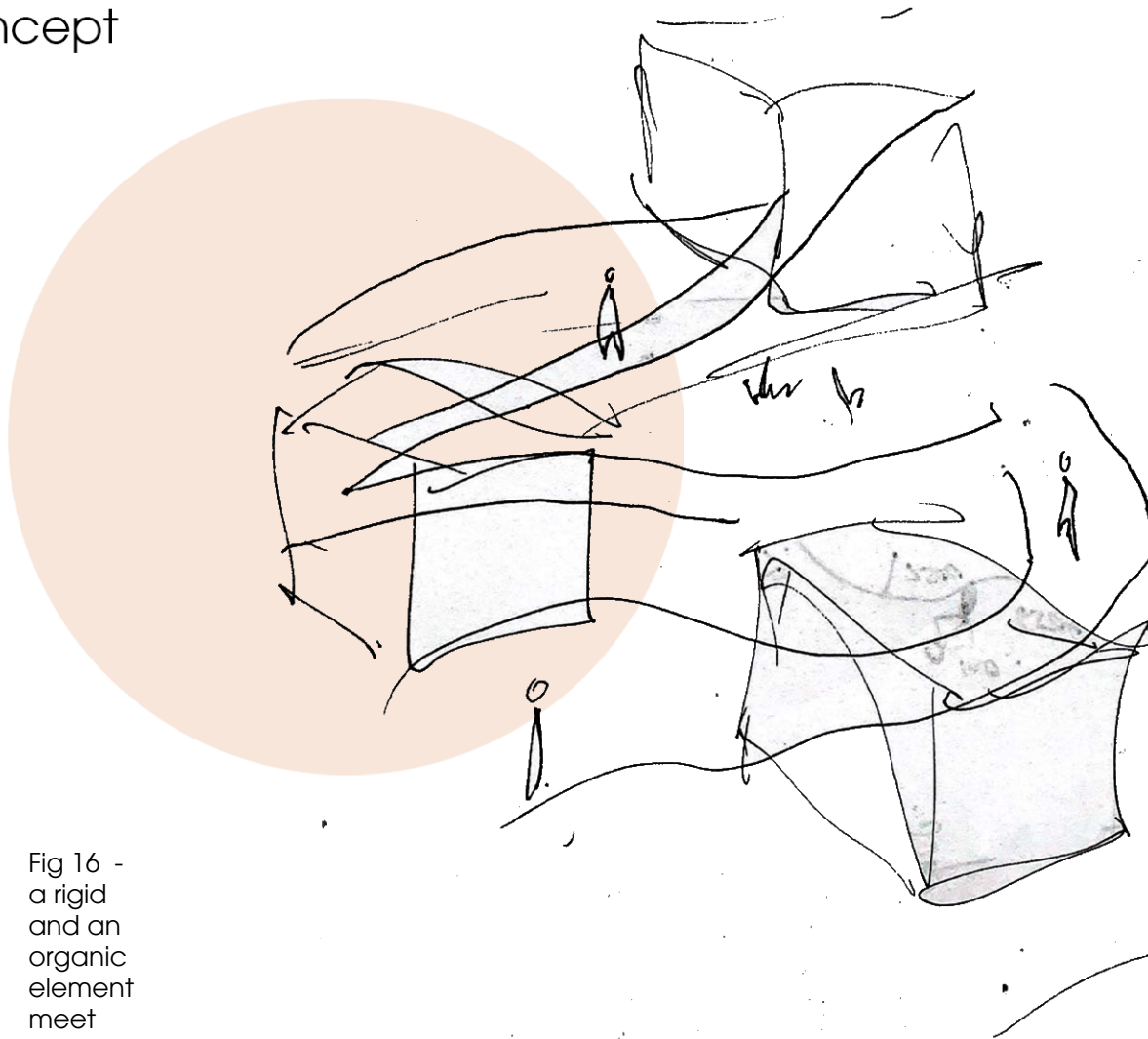


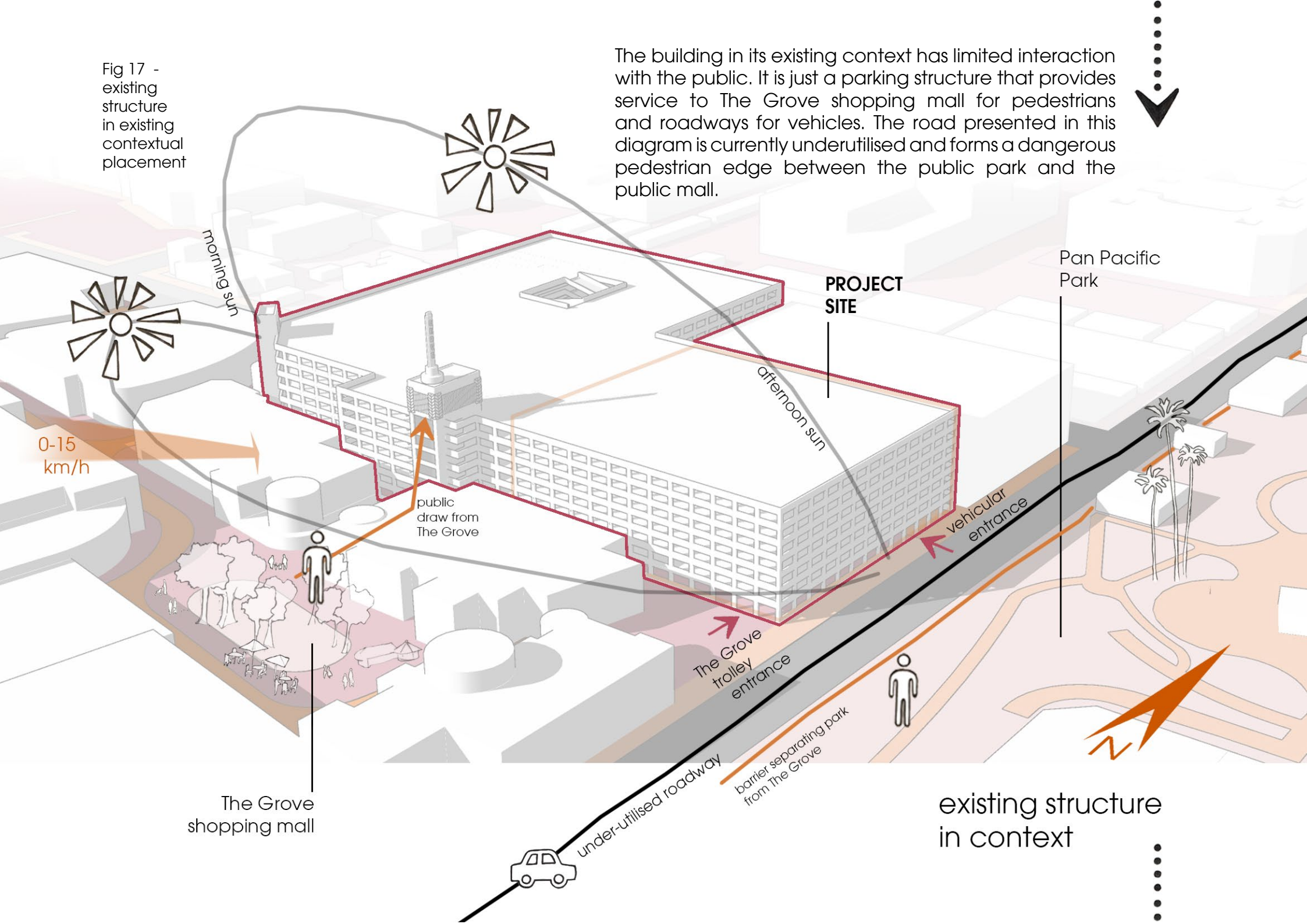
Fig 16 -
a rigid
and an
organic
element
meet

The enclosed growing spaces can become rigid in form due to their need for solid wall members and efficiency of space. This form can be softened by the relationship with the interactive farm landscape that will organically flow through the cascading levels of the form, connecting the old and new structure through an agricultural approach.



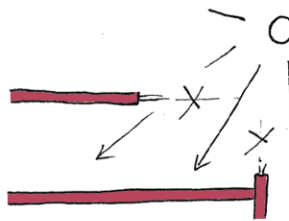
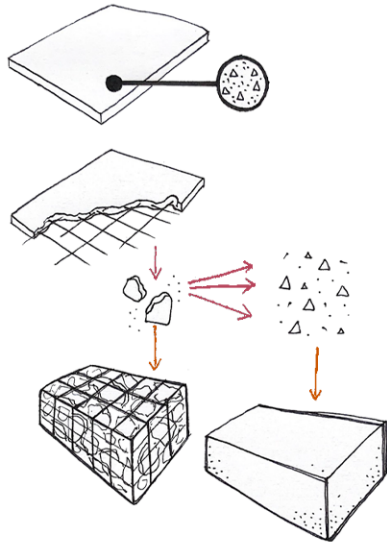
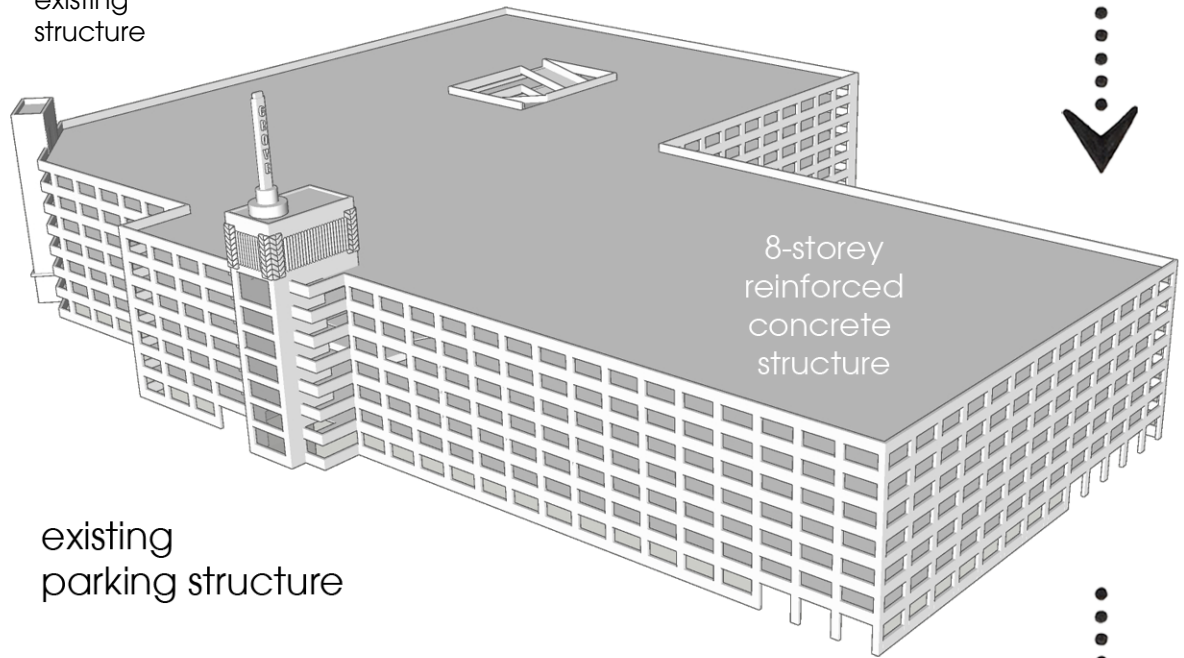
Fig 17 - existing structure in existing contextual placement

The building in its existing context has limited interaction with the public. It is just a parking structure that provides service to The Grove shopping mall for pedestrians and roadways for vehicles. The road presented in this diagram is currently underutilised and forms a dangerous pedestrian edge between the public park and the public mall.



Transformation of Existing Structure

Fig18 - existing structure



aim

Fig 19 - conceptual informants for design

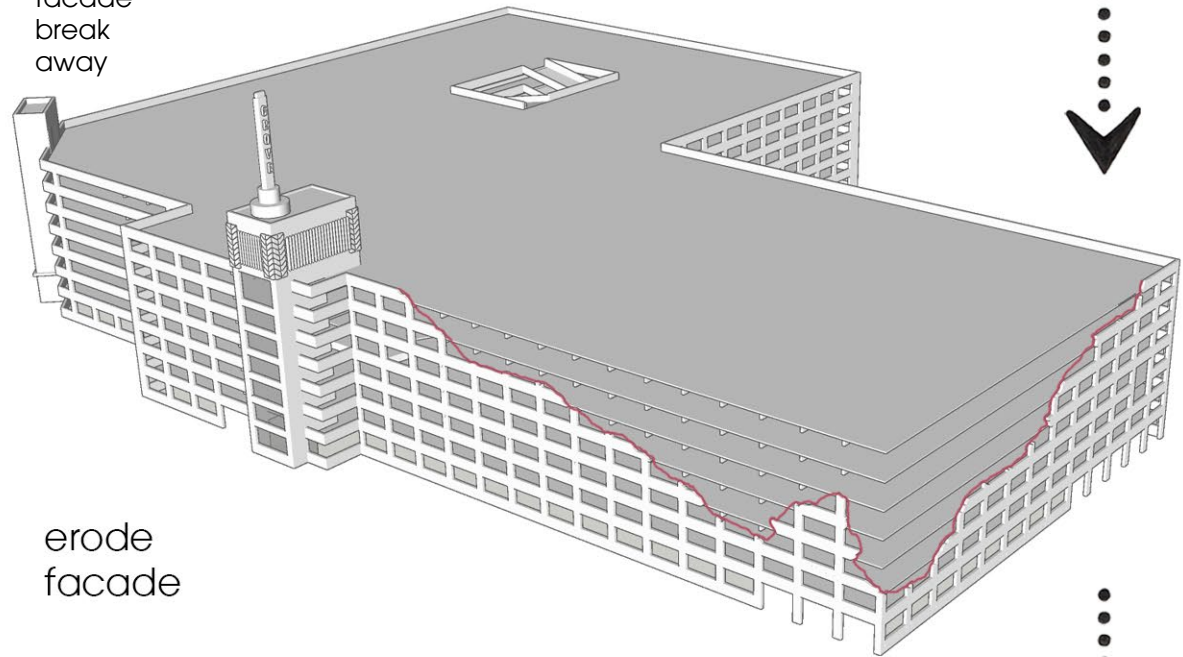


subtraction

As portions of the existing concrete are removed from the structure, it is carefully collected. This erosion of the concrete structure is intentional in the name of re-use. The material is removed from its existing position only to go back into the same structure in a rearranged form to serve a new purpose. This largely eliminates the need for new material to be introduced to the project thus cutting down on production waste, emissions and distribution processes.

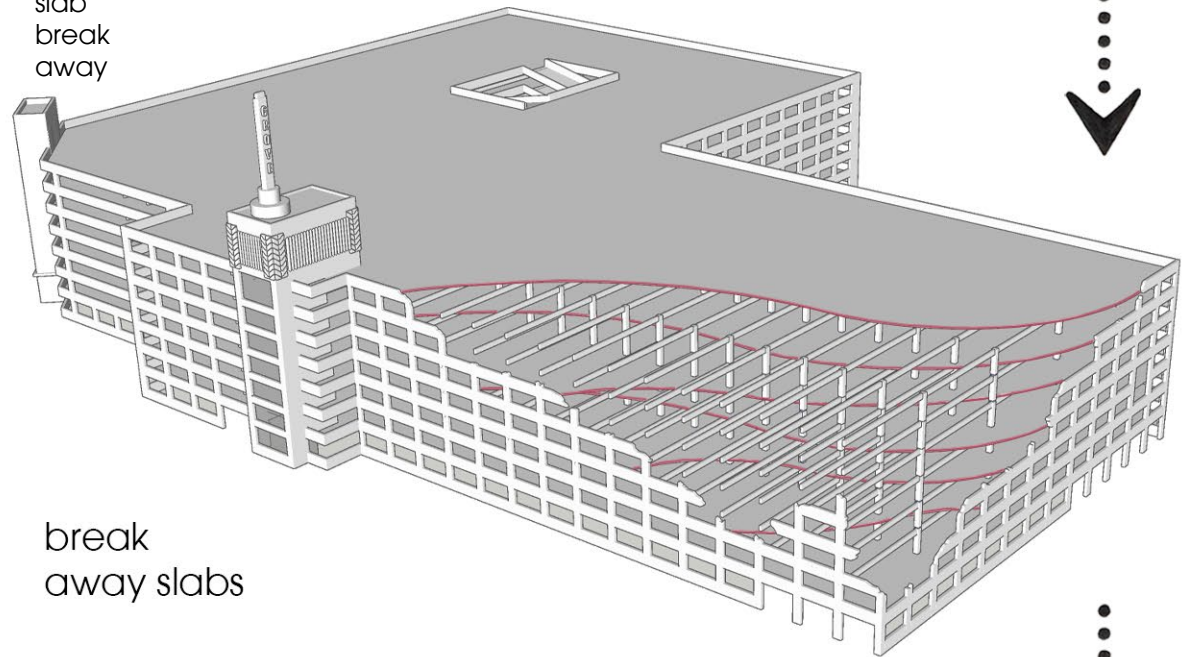
In choosing which parts of the structure should be broken away to be reformed, natural light and ventilation were the guiding factors. Along with a decision to mimic the surrounding mountainous landscapes of the Hollywood Hills. This is in an effort to visually represent the natural landscape breaking through the concrete it has been subdued by for over a century.

Fig 20 -
facade
break
away



erode
facade

Fig 21 -
slab
break
away



break
away
slabs

● subtraction

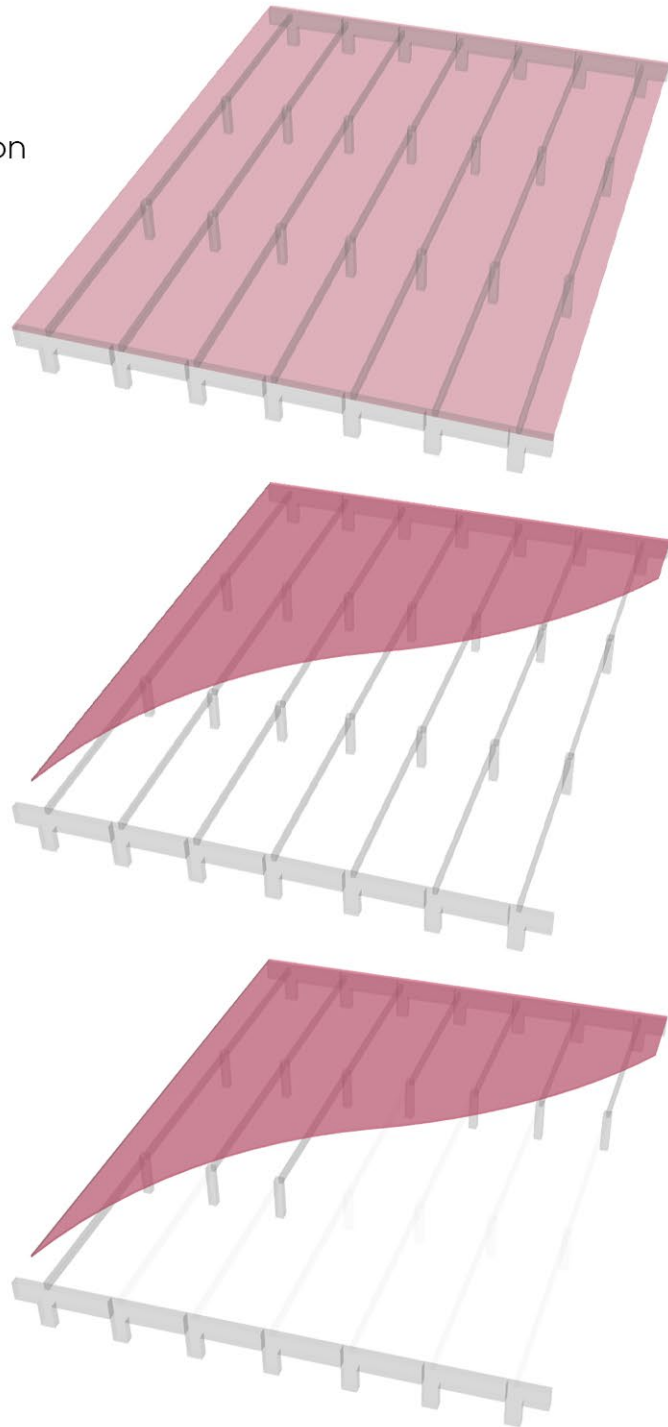


Fig 22 - slab break away method

The erosion of the slabs follows a method. Each curve is carefully placed and geometrically recorded. The columns and beams that are no longer necessary to the structure can be removed too.

As seen in the diagram, some column and beam structural elements that protrude beyond the edge of the cut slab remain. These are determined by a rule of thirds. Where the slab cantilevers more than a third past the last structural member, the next structural member should remain.

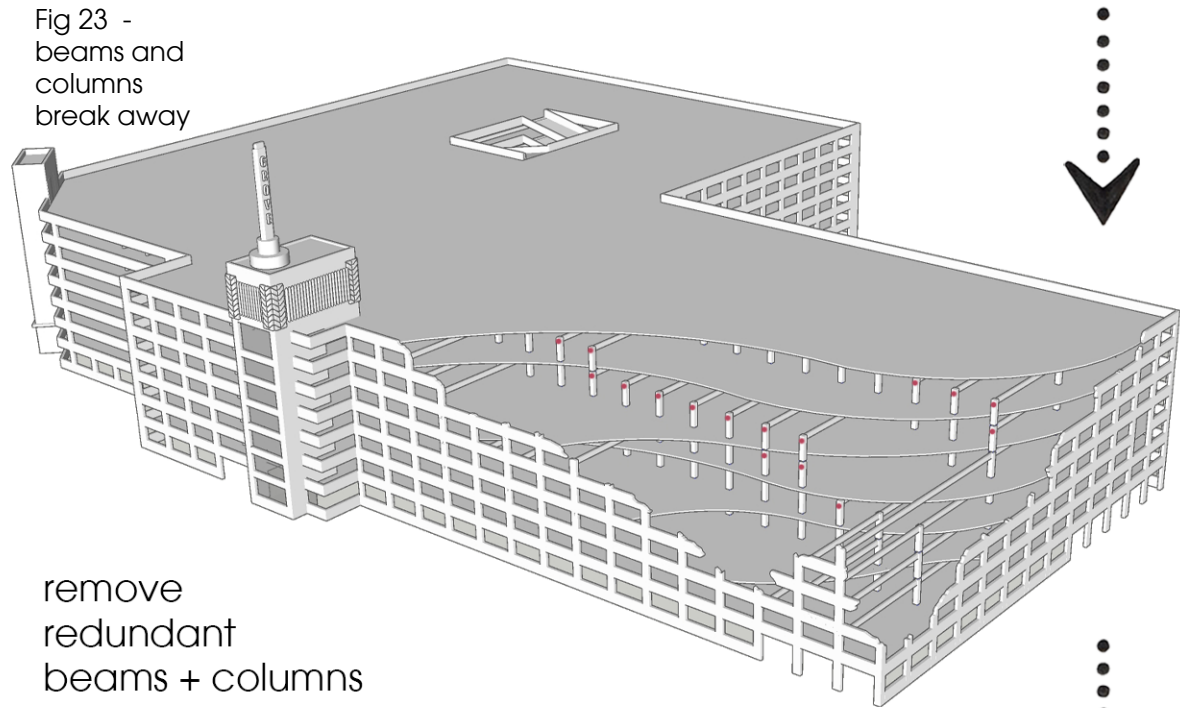
The existing reinforcing steel members in the slabs, beams and columns will be revealed but will have lost structural integrity.

slab, column + beam subtraction



Where this element protrudes in lengths that allow for sagging and deformation, it will be trimmed.

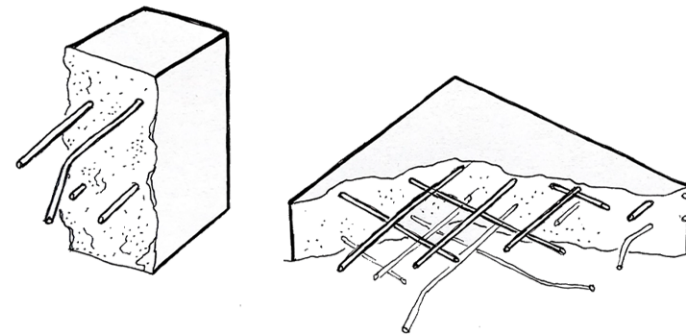
In other areas the protruding rebar will be supported with new reinforcement and act as shading devices for walkways below.



The remaining structure which has been subtracted from will form the base and is now equipped to host the new form that will be made from the excess material borrowed.

The beauty of this building comes from its raw honesty around what it used to be and so edges of brittle concrete and protruding rebar will be treated to be made safe but remain a visible aspect of the aesthetic in this design.

Fig 24 - aesthetic from breaking away facade, beam, columns and slabs





● addition

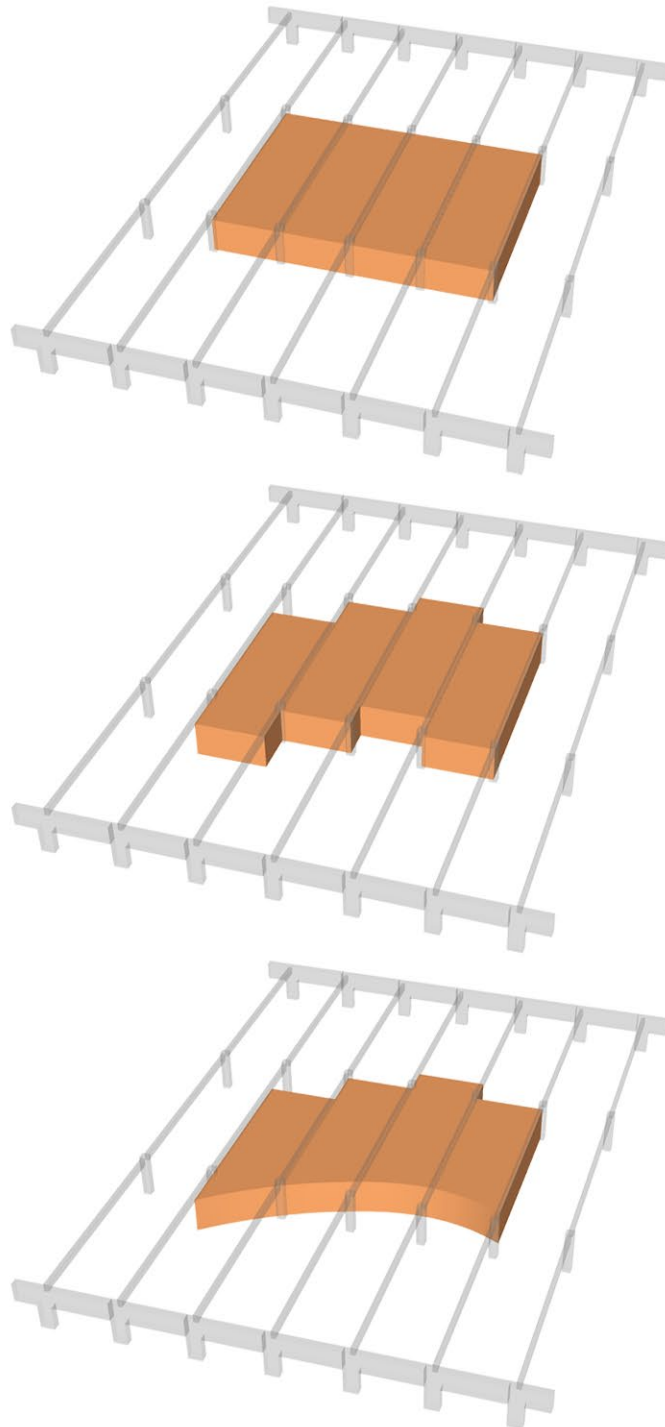


Fig 25 -
new
design
infill
method

Now the materials harvested from the existing structure must be reformed to house the new programmatic requirements of the building. The new building requires two types of structures; permeable and entirely enclosed.

Both forms will need to work with the existing grid of the parking structure. The enclosed structures need to be airtight to ensure the urban farm production is kept within a controlled environment. For efficiency of spatial layout, these farms are usually in the form of modular compartments.

To avoid being restricted by the grid and the modular form, I have started with a regulated layout that gives method and then added and changed the rules to allow freedom in a design that celebrates the organic narrative of the project.

module in grid



Concept

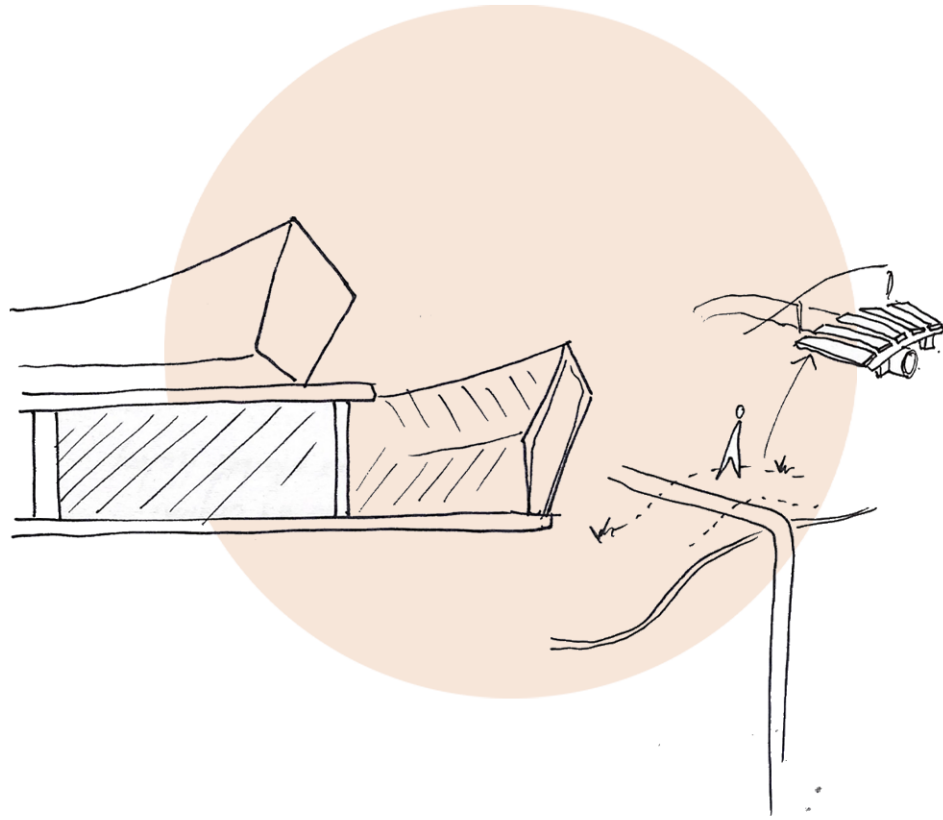
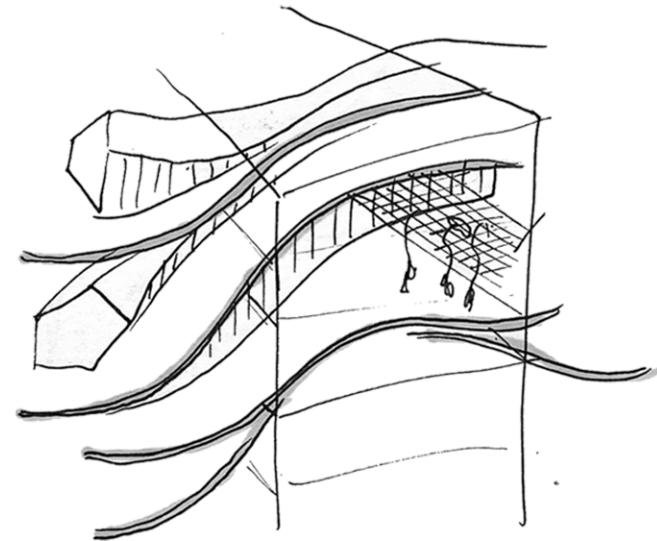


Fig 26 - function meets form



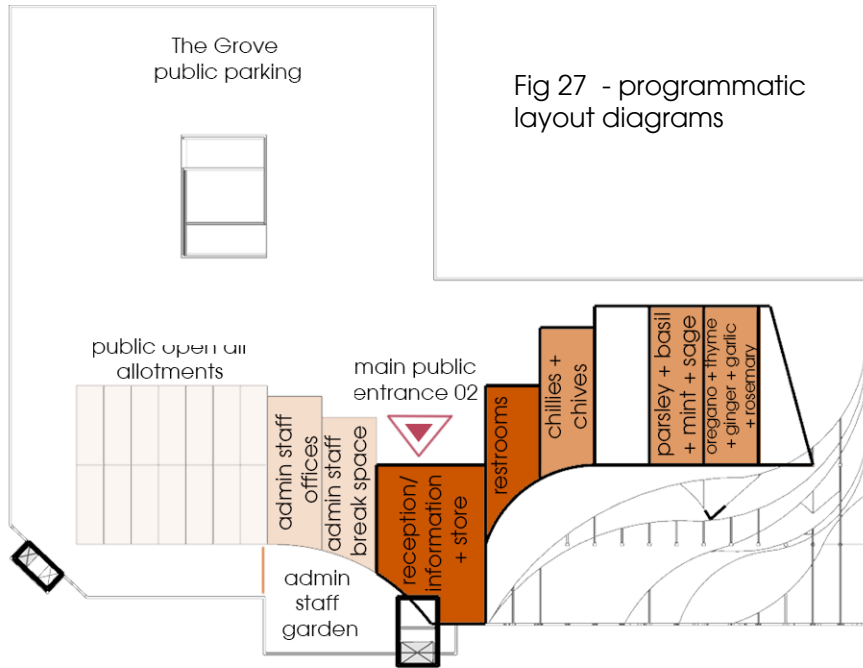
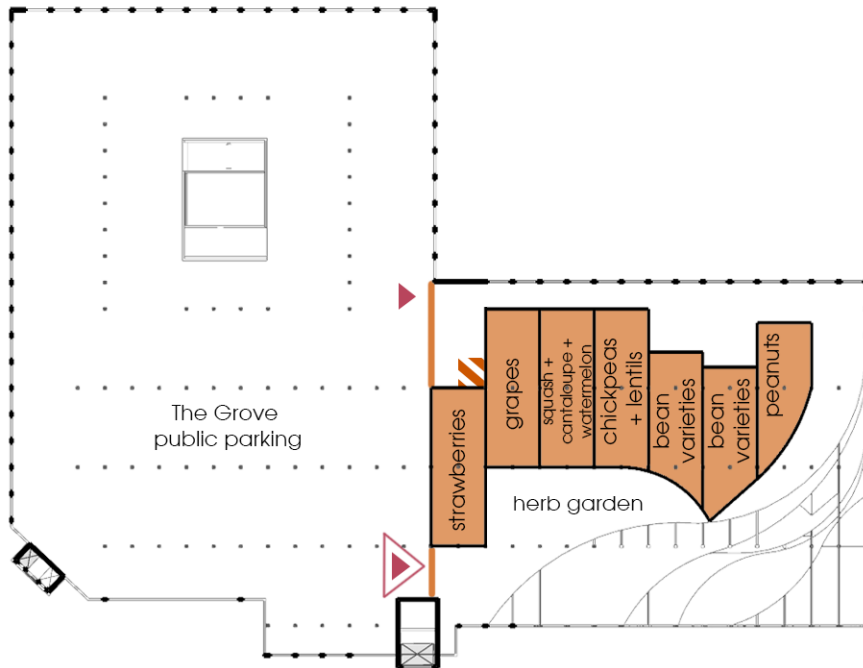


Fig 27 - programmatic layout diagrams

Using these rules, inserting and arranging the programme, and allowing the existing grid to guide but not to restrict, a layout for the building design has been deduced.

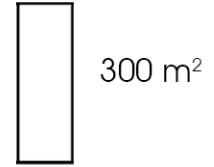


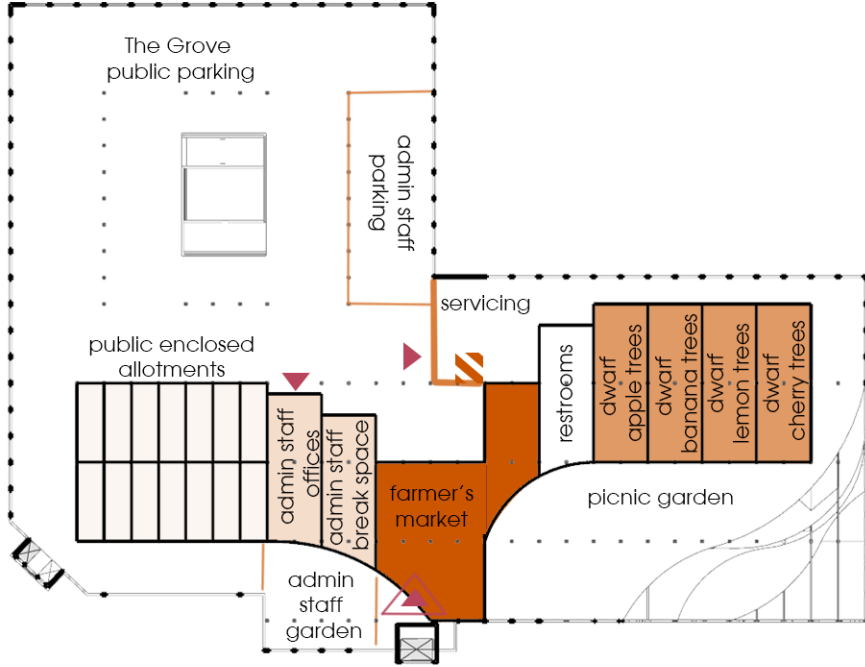
07 roof



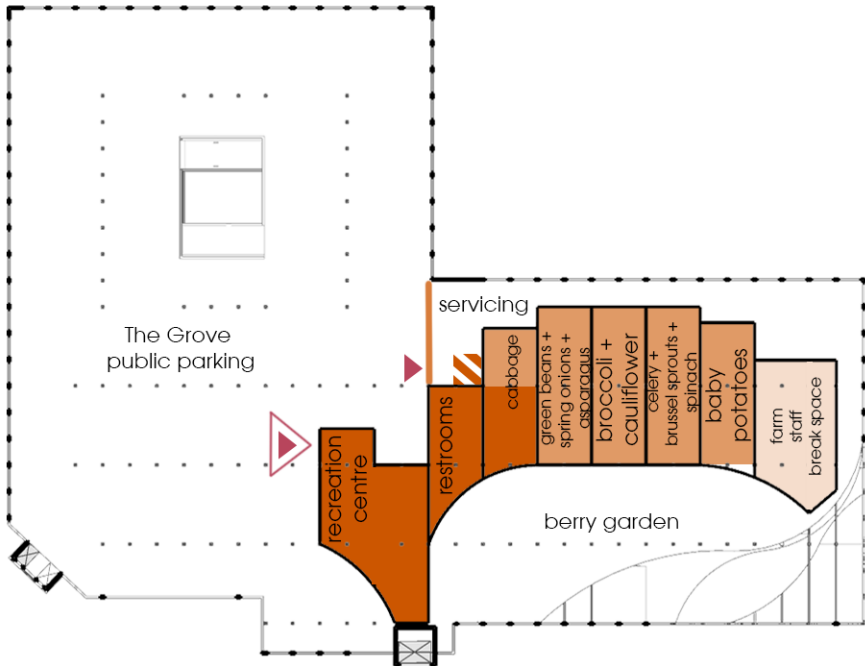
06

-  public
-  enclosed growing
-  food processes
-  admin/staff
-  allotments
-  homeless relief centre
-  services
-  staff entrance/exit into/out of farm
-  public entrance/exit into/out of farm



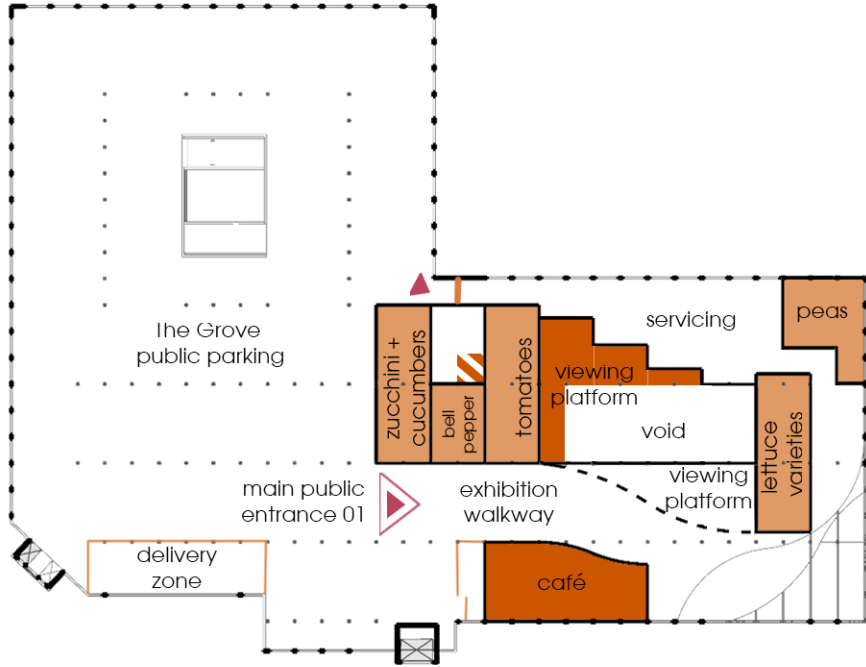


05

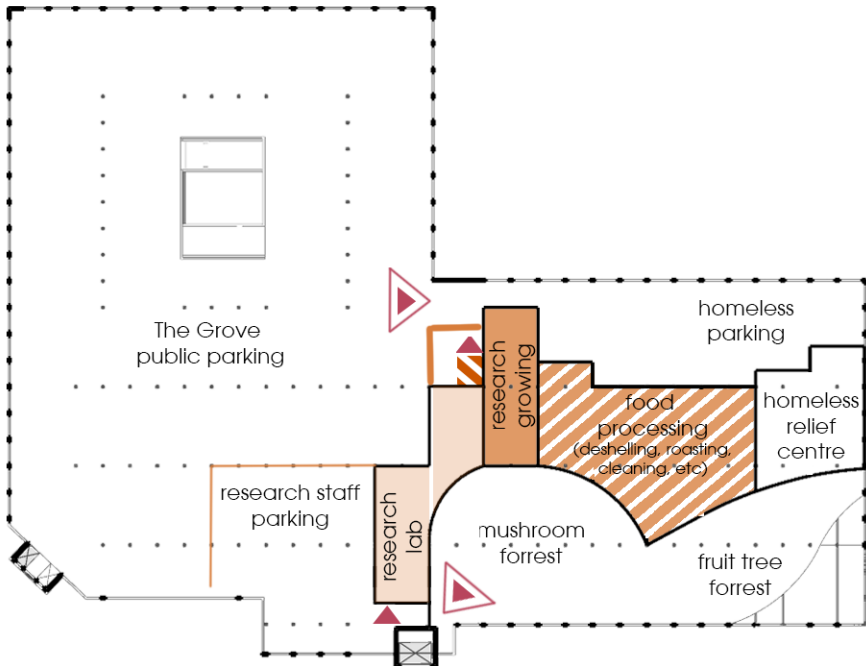


04



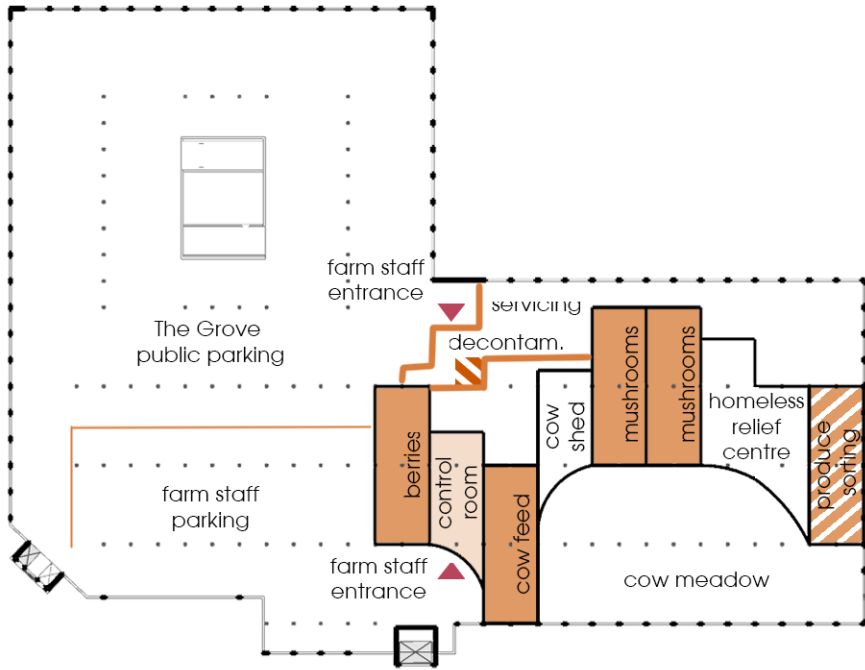


03

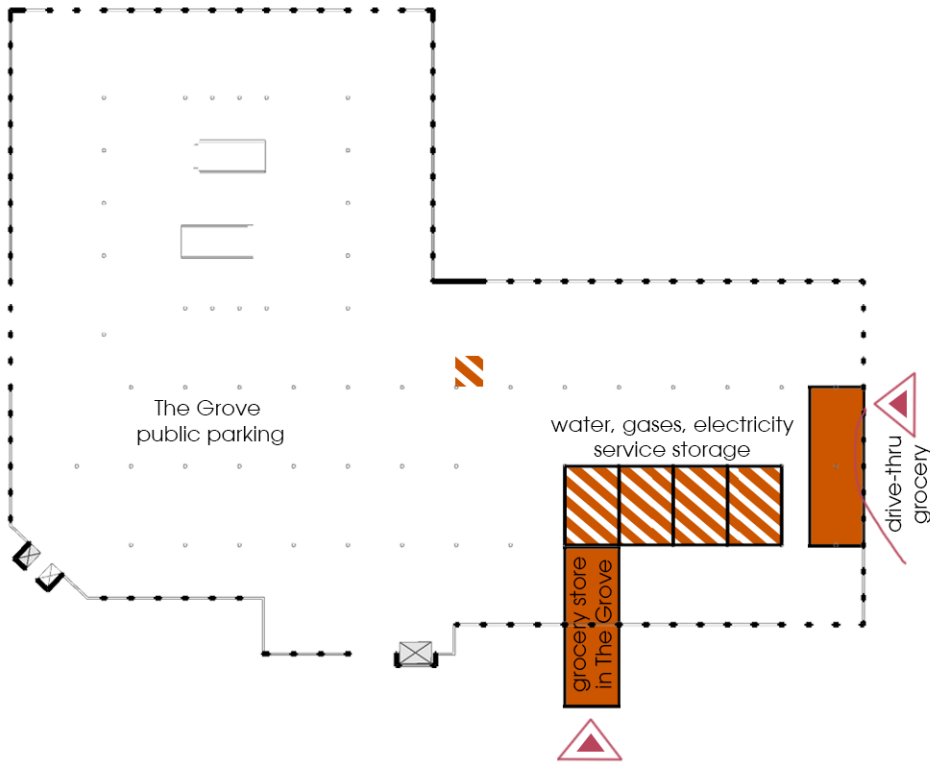


02





01



00 ground

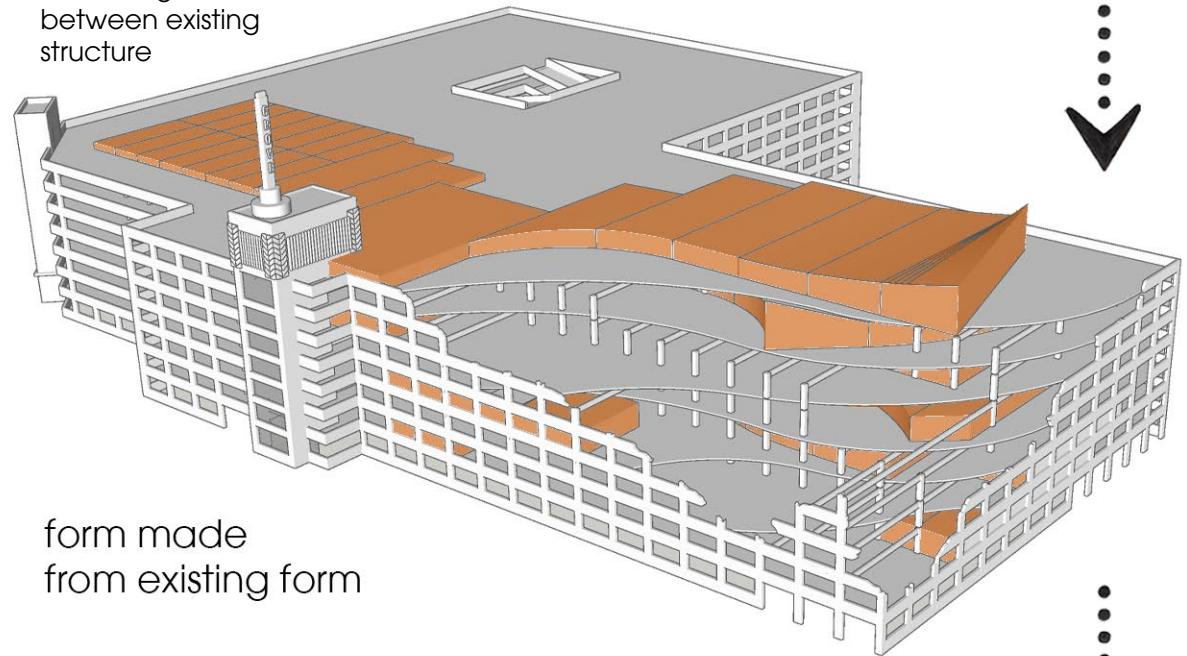


The new form will borrow from the floors and ceilings of the existing slabs for basic support and shelter. The urban farm will be enclosed with concrete walls that uses aggregate collected from the existing structure. The rest of the buildings - for example the admin offices, restrooms, etc. - will be formed from gabion walls made from the larger broken concrete material from the existing structure. These walls will be partially permeable but carefully designed for their appropriate placements.

The resulting form slips between the existing layers of the parking structure, emerging into the created void to seek light and visual presence like a plant that finds the sun.

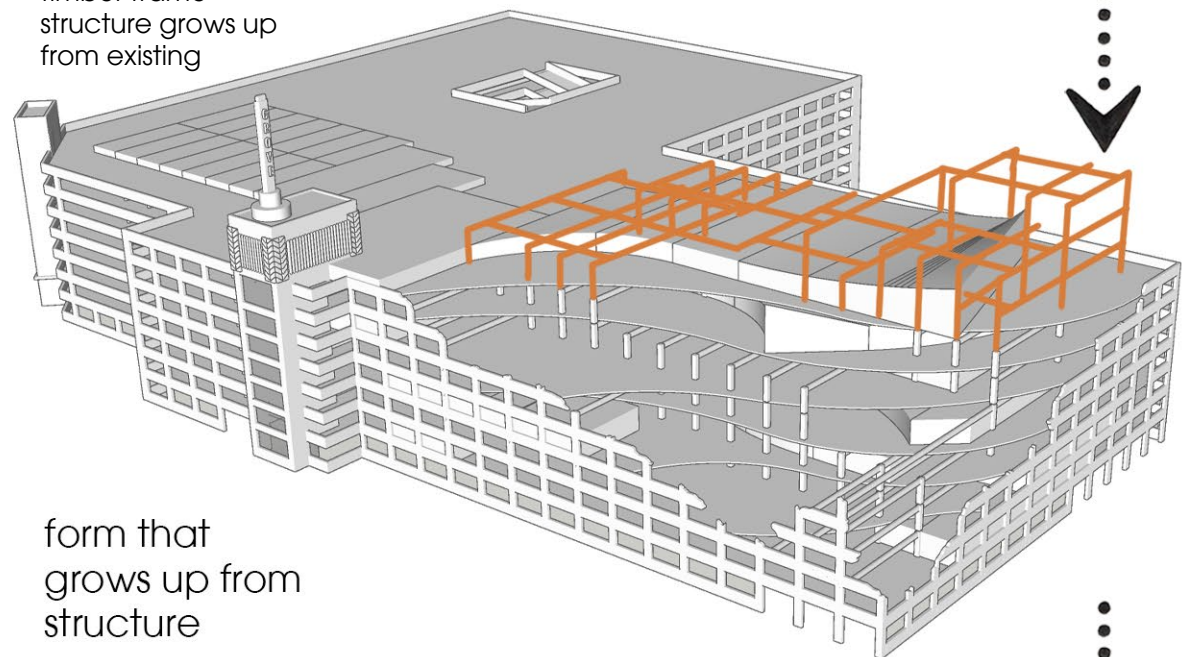
As noted in the Charette, the building operates much like a plant structure and sustenance has become a vital theme in design. This is a further effort for transparency, showing consumers what resources go into the food they consume. Giving thought to waste and processes behind the scenes to spark a sense of responsibility (as discussed in Phenomenology + Implementation 07).

Fig 28 -
new design slides
between existing
structure

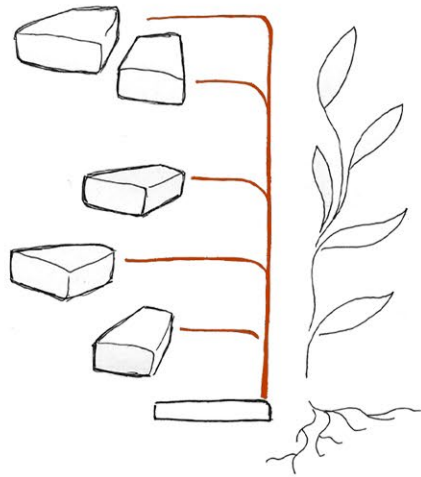


form made
from existing form

Fig 29 -
timber frame
structure grows up
from existing



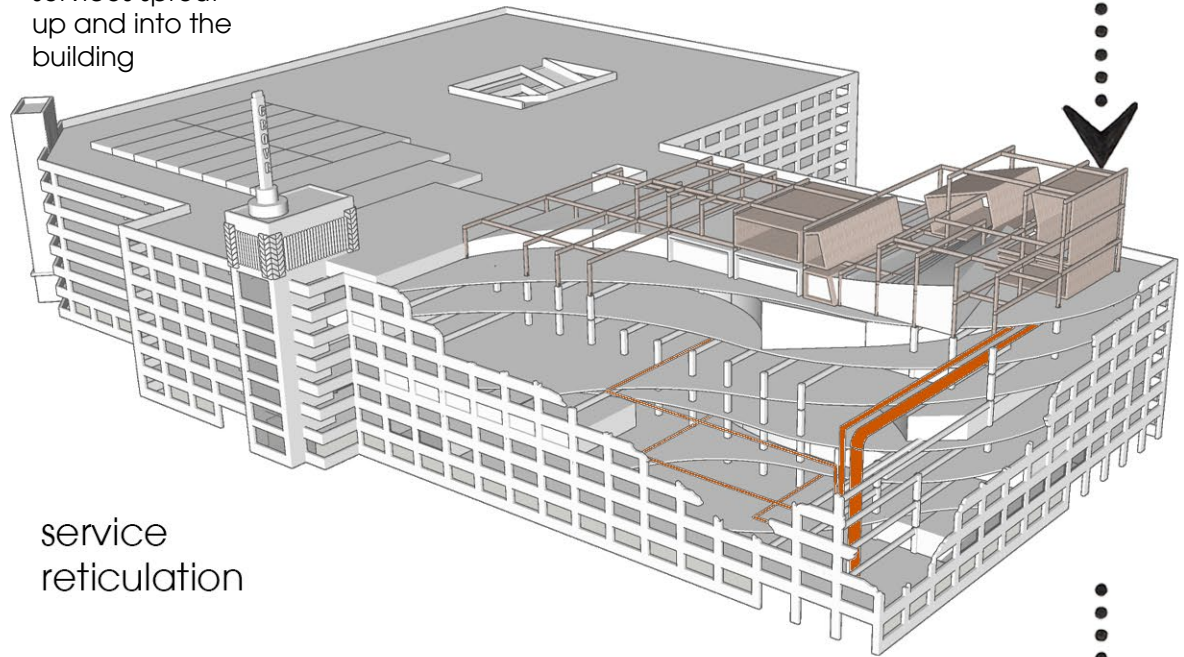
form that
grows up from
structure



The building is reliant on an intricate and considerable servicing component. There will need to be collection, storage and reticulation of electricity, water, air and product. Customer, admin staff and farm staff circulation. The services will be arranged in a visible core that pumps resources up through the floors like a tree.

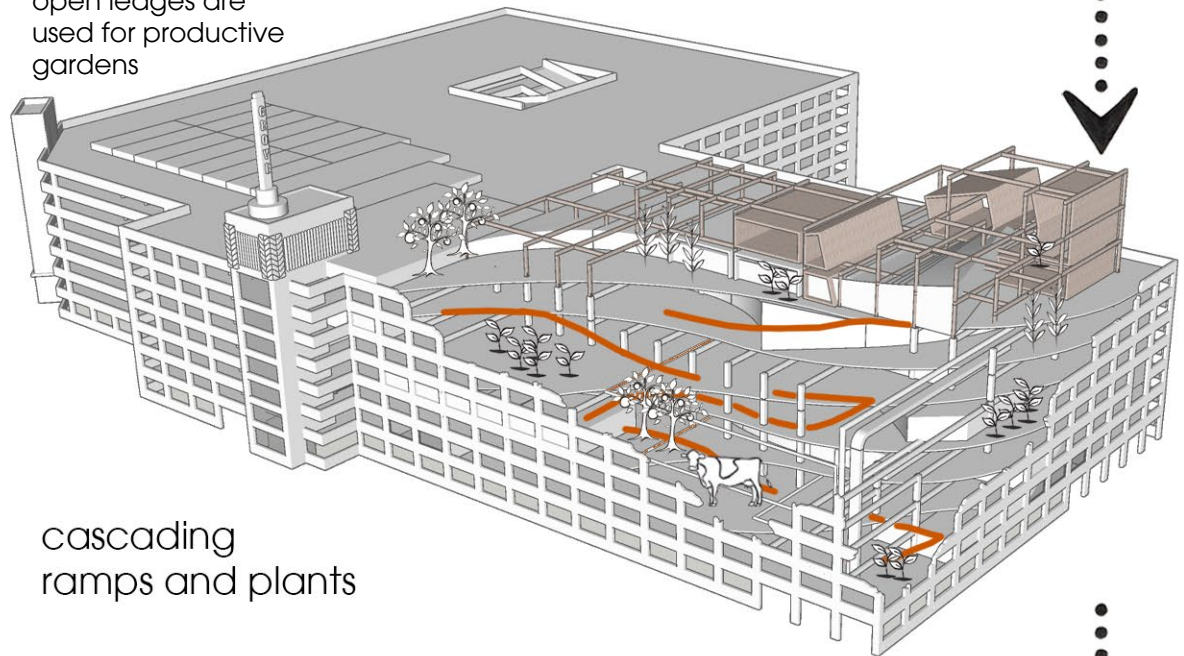
Now each floor can be connected via cascading ramps that allow for visitors to access the building like a landscape and gather fresh fruit and veg from the open-air interactive farm. Each level presents a different garden, experience or window into the enclosed farms that aims to reconnect the visitors with the food they consume.

Fig 30 - services sprout up and into the building



service reticulation

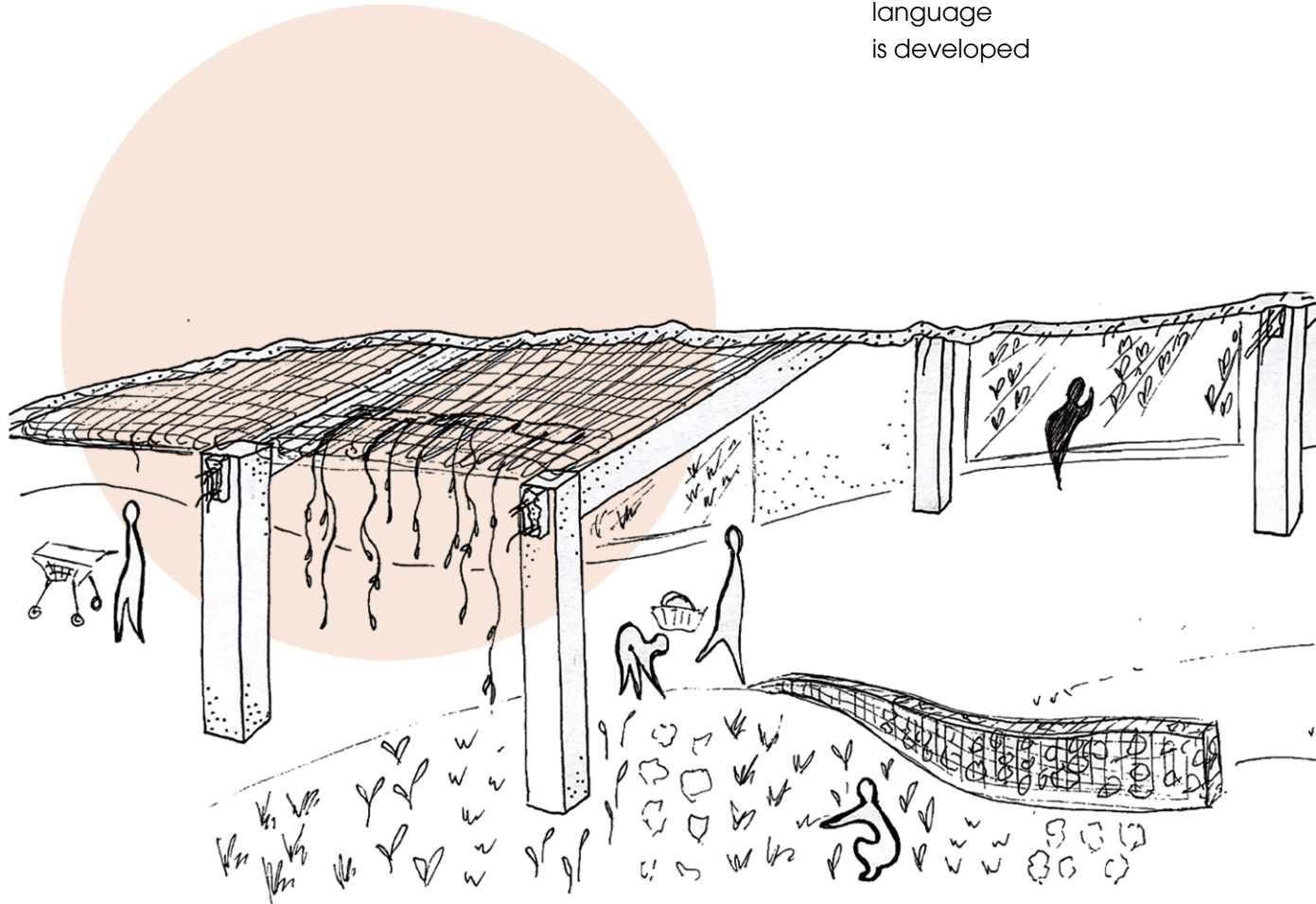
Fig 31 - open ledges are used for productive gardens



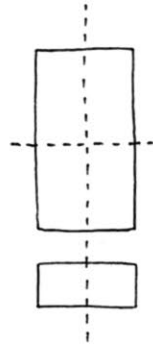
cascading ramps and plants

Concept

Fig 32 - an architectural language is developed



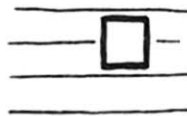
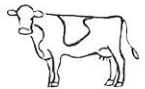
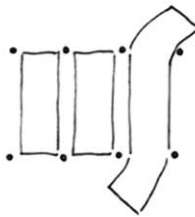
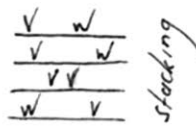
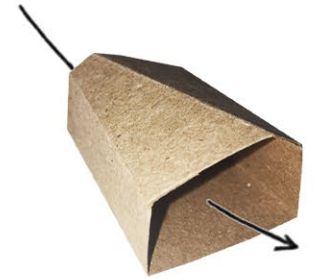
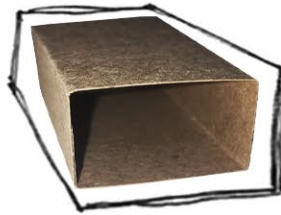
On a vertical plane, the module can also change its rules. This may be for symbolic reference to an agricultural past, or practically to search for natural light, to collect rainwater or make spatial use of double volumes, etc.



start with 'the module'
then warp the rules



the module



change the rules



Fig 33 - a module is explored



Concept

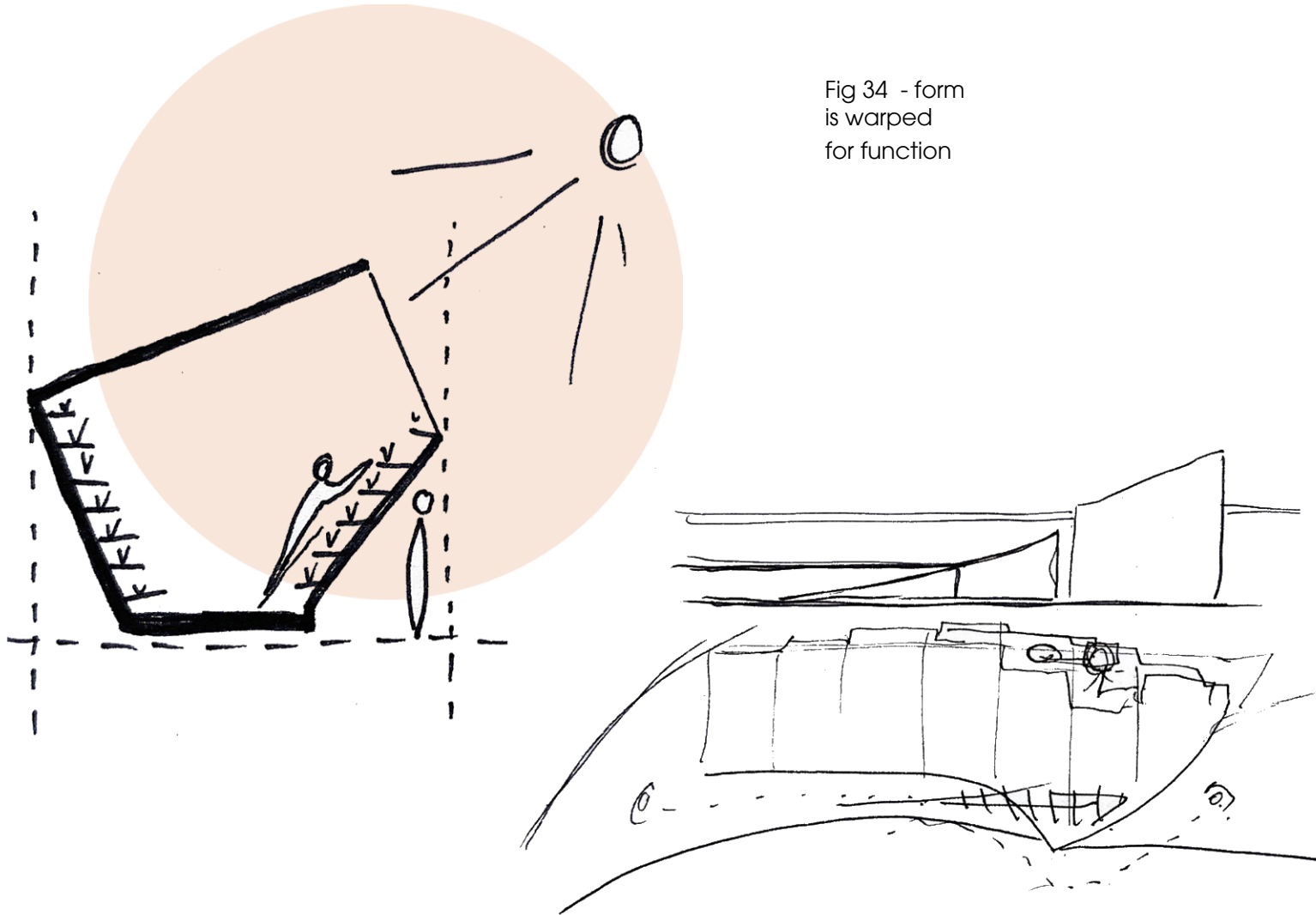
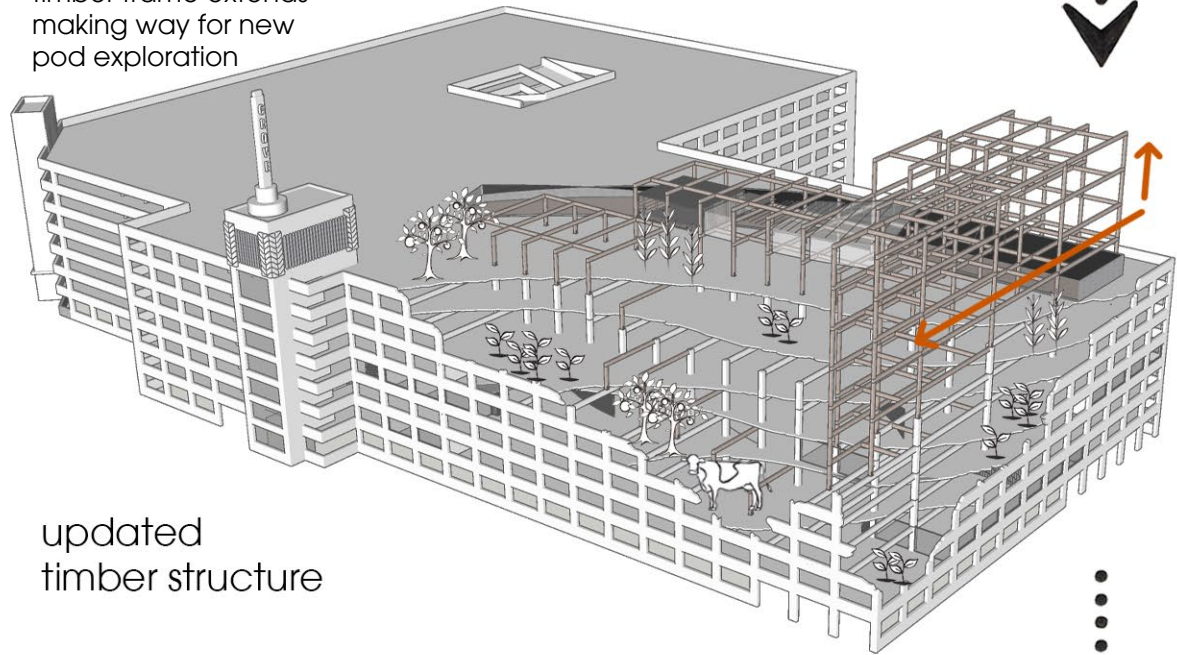


Fig 34 - form
is warped
for function



In the progression of my design, the timber frame structure has been extended to take on various roles in my design. It now hosts more space for vertical extension, as well as providing service and core structural support, and walkways. The way it was extended gives a clean facade visual from the east while the south (front) facade sweeps upward symbolising growth.

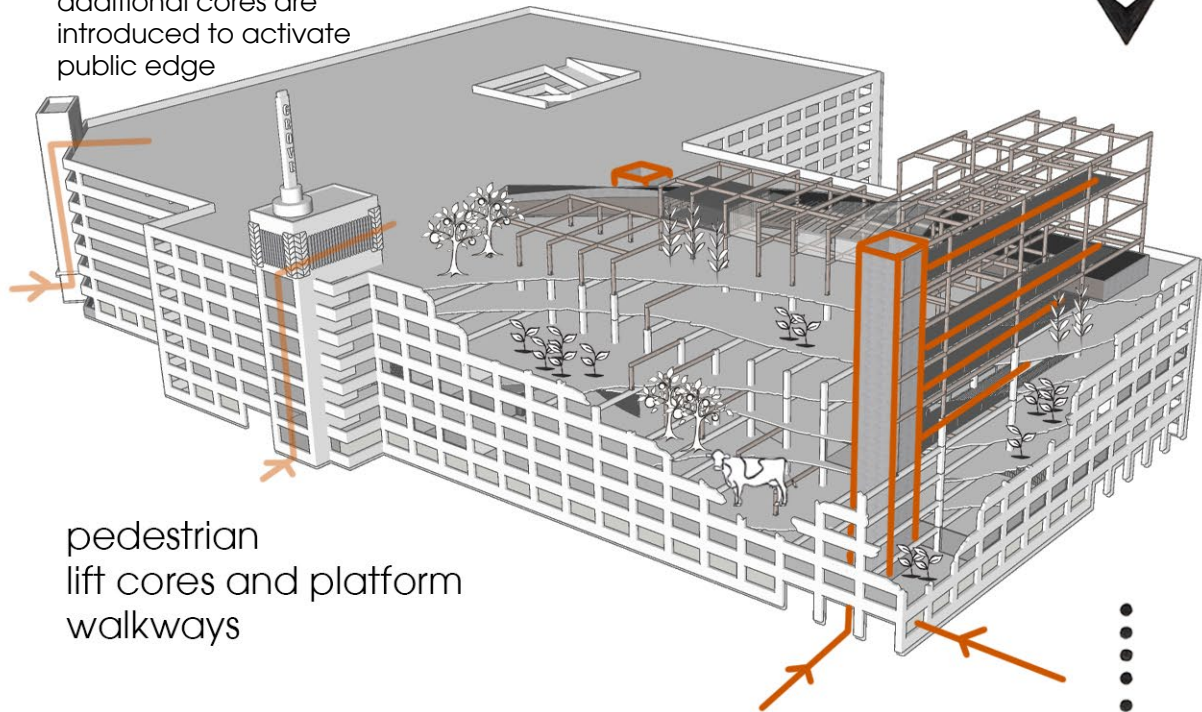
Fig 35 -
timber frame extends
making way for new
pod exploration



updated
timber structure

Along with existing cores that draw customers up into the structure from the mall, I feel it is necessary to introduce two new cores. The first is centred to the building, allowing staff to gain service access to farm operations. The second, prominent in this view is an iconic focal point that draws pedestrians up from the neighbouring public park, the mall and sidewalks.

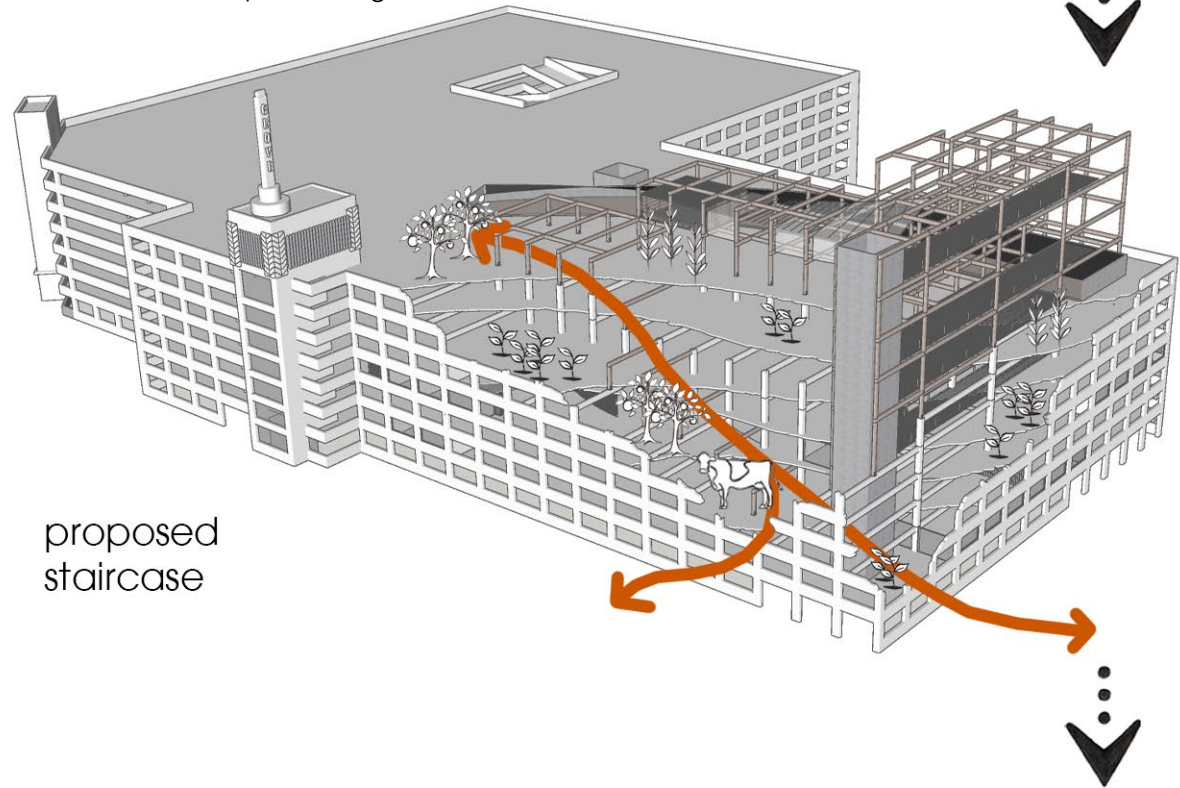
Fig 36 -
additional cores are
introduced to activate
public edge



pedestrian
lift cores and platform
walkways

Fig 37 -
bold cascading walkway
completes connection between
farm levels and public edge

Lastly, a bold sweeping element will be placed as a pedestrian staircase that connects the landscape to the ground level public interface.



The diagrams to date are conclusive of a process to understand the form of the design in relation to the many informants that have come to define

the project's success. Now with further refining and detailing these broad concepts into concise applications, an architectural composition will arise.





Natural Disaster Considerations

As discussed in *Climate + Imminent Disaster 03, Resulting Natural Disasters in Los Angeles*, the region is prone to various natural disasters. The building houses an urban farm which aims to grow food in an enclosed environment that is not directly affected by the exterior environment thus providing an opportunity to protect food production from harsh effects of climate like damaging UV, droughts, floods, pests, and due to its urban surroundings, wildfires. The building's placement and programmatic allocation is already geared toward preparing for these events as they occur more frequently and intensely going into the future.

Earthquakes, on the other hand, cannot be avoided by building in this way. To protect the building, its productive contents and its users – the design proposal

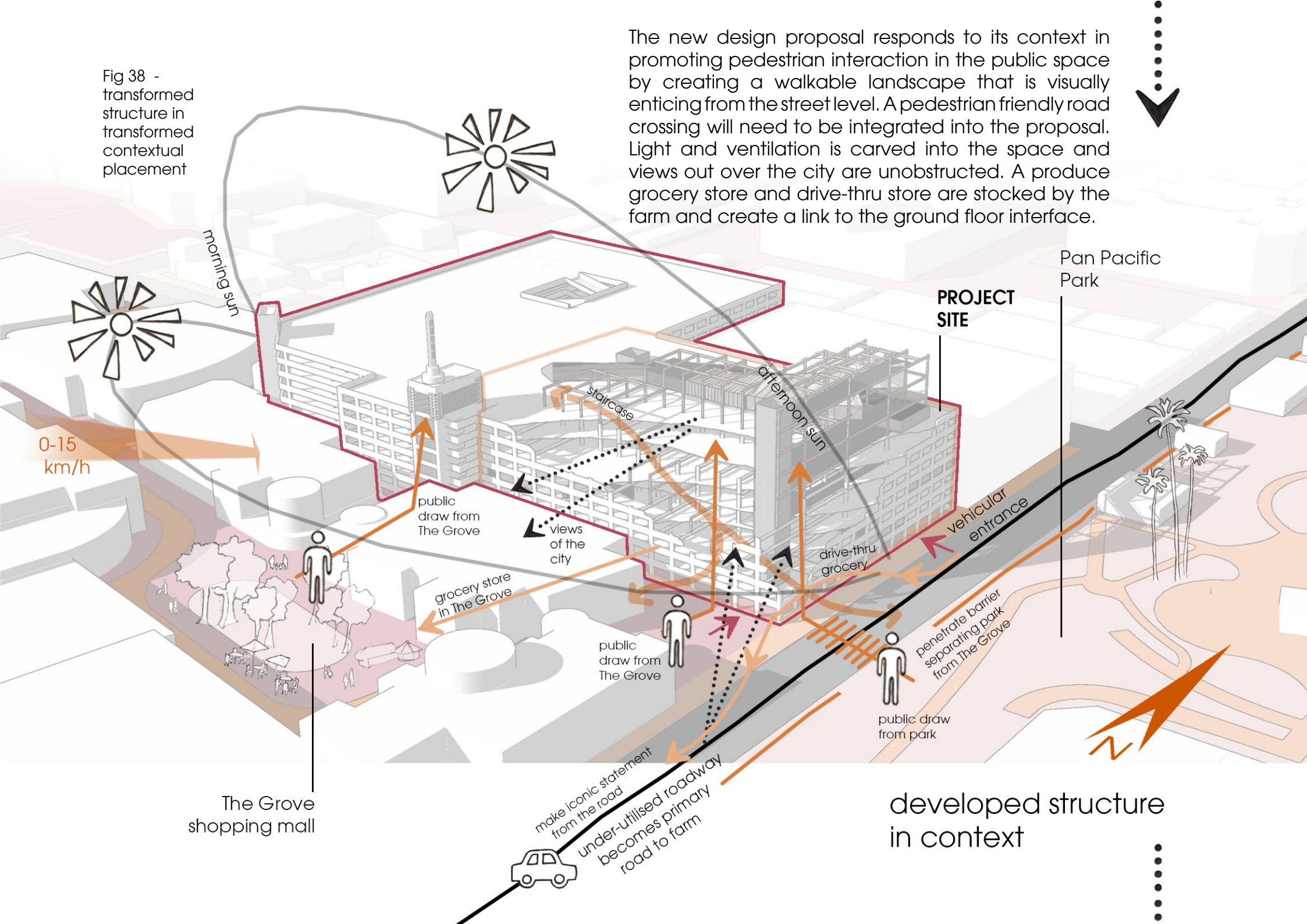
must consider security measures in the event of an earthquake by securing loose material, reinforcing weakened joints and points, and bracing in multi-directional sections.

In the event of 'The Big One' (see *Climate + Imminent Disaster 03, The Big One*), roadways in and out of Los Angeles could be obstructed and those that are open will be congested with emergency personnel and those trying to evacuate the area. Getting food supplies into Los Angeles for its millions of residents may present a major issue. Having a food supply resource, or multiple, within the city could help prepare for such a case.

The proposed design will designate safety points for people to gather and brace in for the duration of the predicted quake. Saferooms will be allocated to store food supplies for the surrounding neighbourhoods for the recovery period.

Fig 38 - transformed structure in transformed contextual placement

The new design proposal responds to its context in promoting pedestrian interaction in the public space by creating a walkable landscape that is visually enticing from the street level. A pedestrian friendly road crossing will need to be integrated into the proposal. Light and ventilation is carved into the space and views out over the city are unobstructed. A produce grocery store and drive-thru store are stocked by the farm and create a link to the ground floor interface.



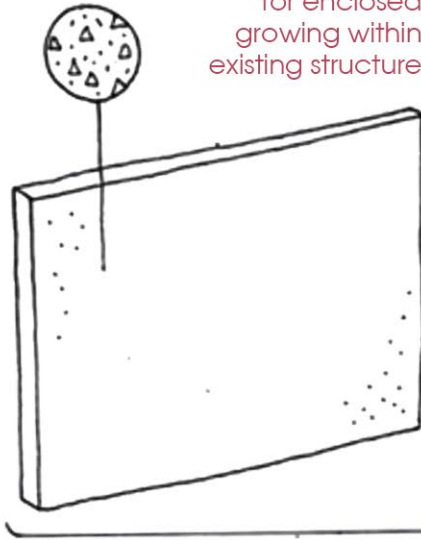
The Grove shopping mall

make iconic statement from the road
under-utilised roadway becomes primary road to farm

developed structure in context

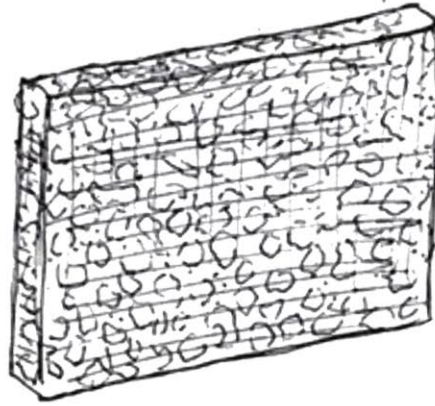
Fig 1 - wall member compositions for infill into existing structure

concrete wall



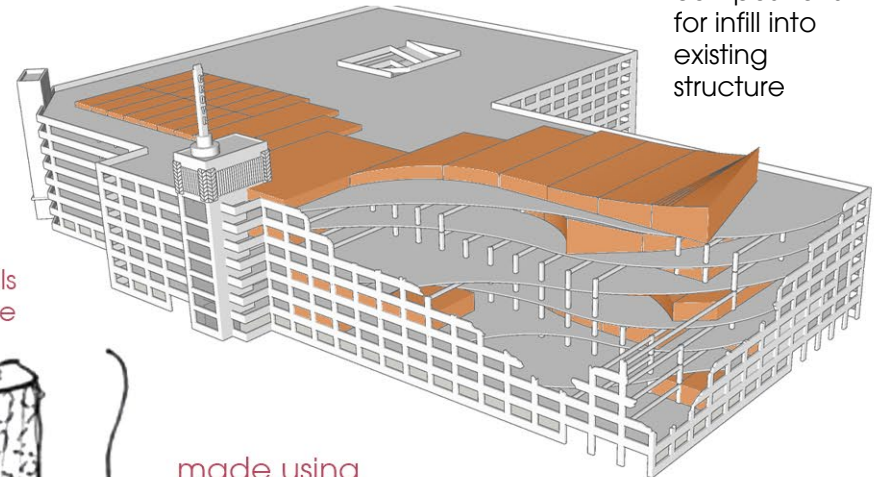
for enclosed growing within existing structure

gabion wall

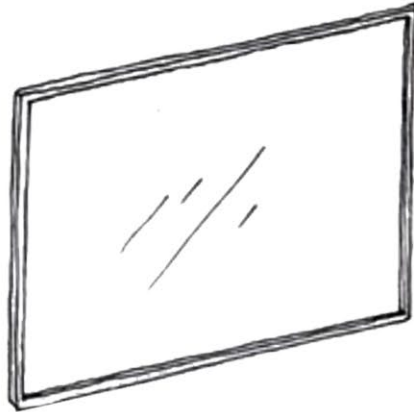


for straight walls that can be permeable

made using aggregate that has been broken away from existing structure

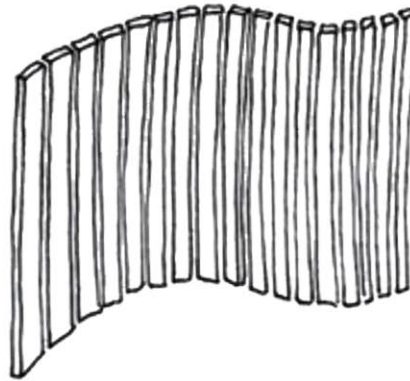


glazing



where natural sunlight and viewing portals are necessary

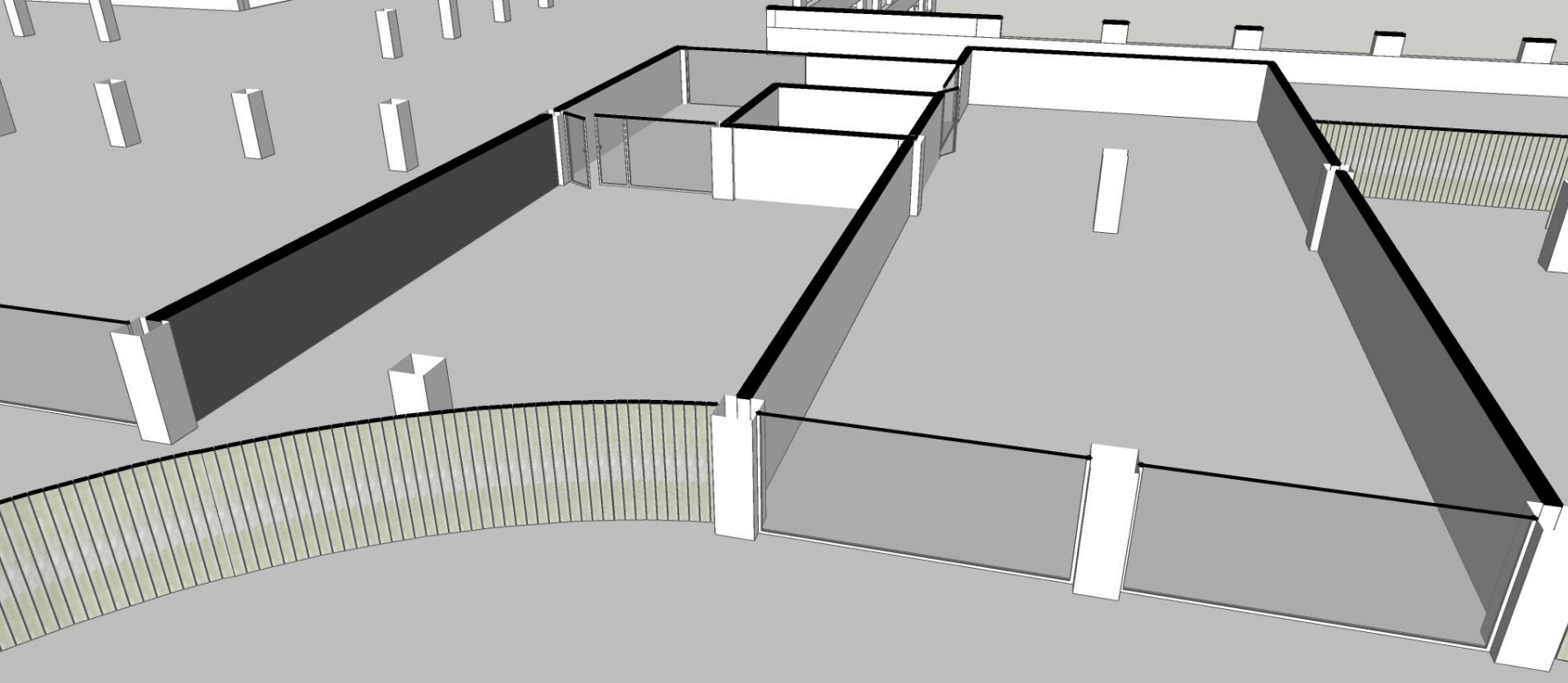
timber slats



where design does not require solid walls or where it makes use of organic curves

reclaimed timber from the food distribution industry





Basic start to visualising how the designed wall members will interact and fit into the existing grid layout of the concrete structure's column and beams.

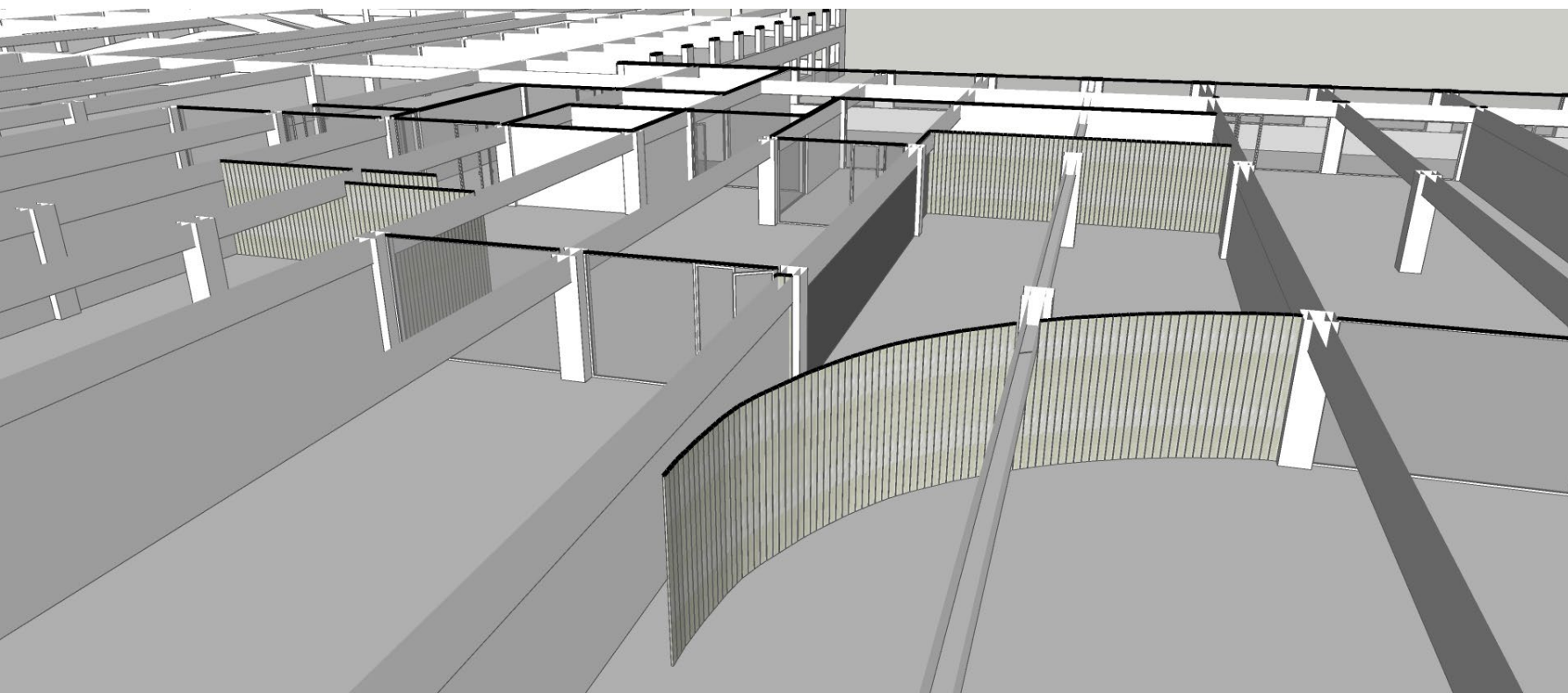


Fig 2 - wall member compositions for infill into existing structure in placed example

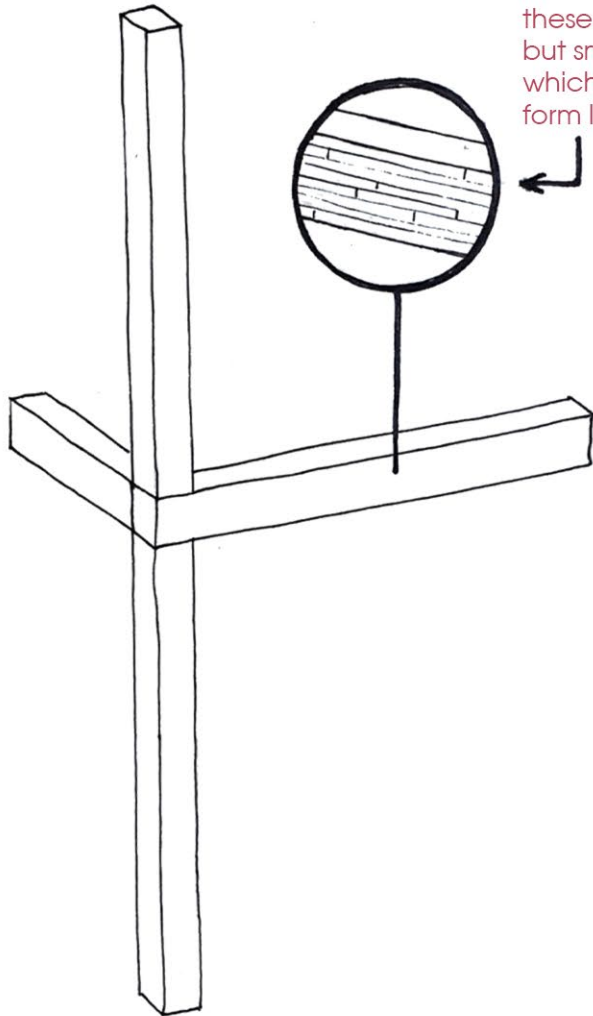


Fig 3 -
timber frame
composition

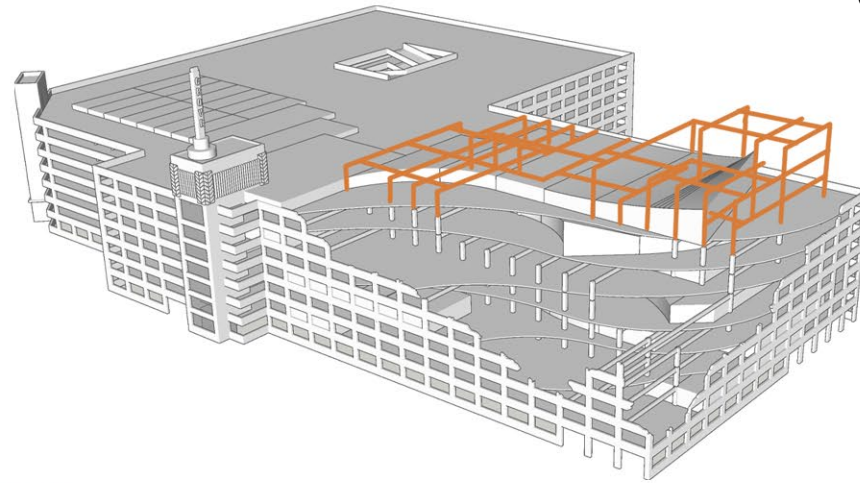


mature and
disposed of
orange trees
from California
groves

these provide a hardwood
but small members
which can be joined to
form laminated beams



timber
frame



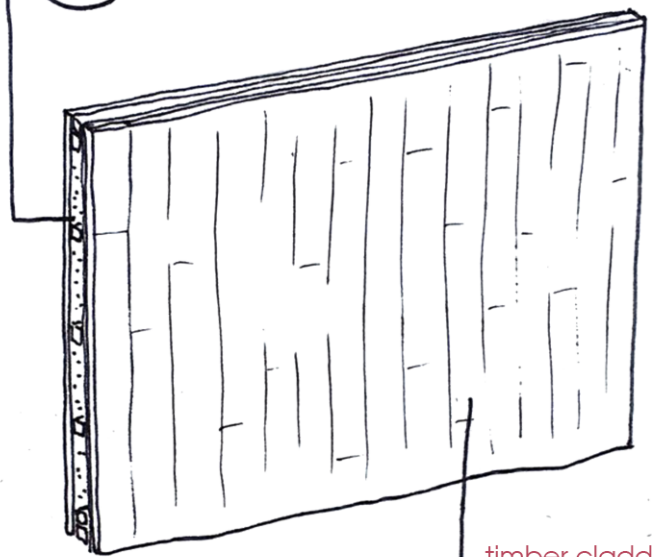
for the
form that
grows up
from the
structure



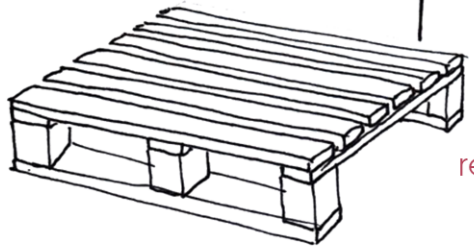


sheep wool
excess from
agriculture
industry

timber unitized wall panel



timber cladding
is reclaimed from
the food distribution
industry



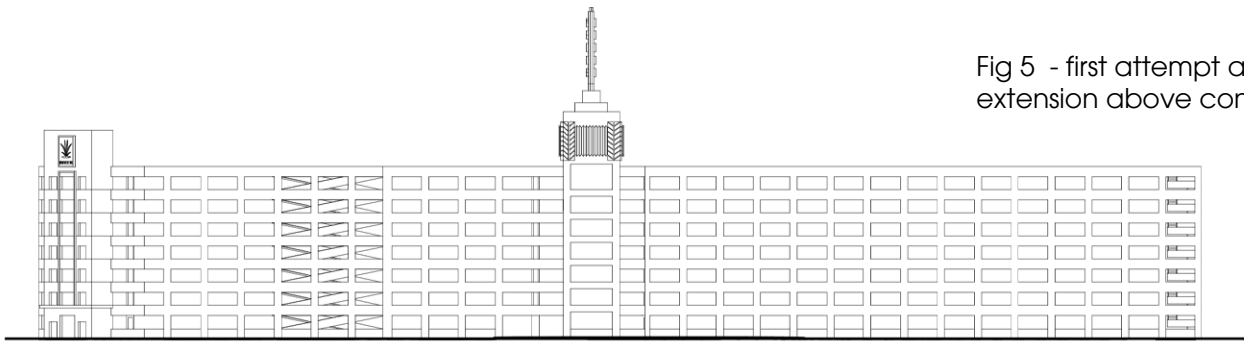
retired palets

Fig 4 -
unitized
wall panels
for pods in
timber frame
composition

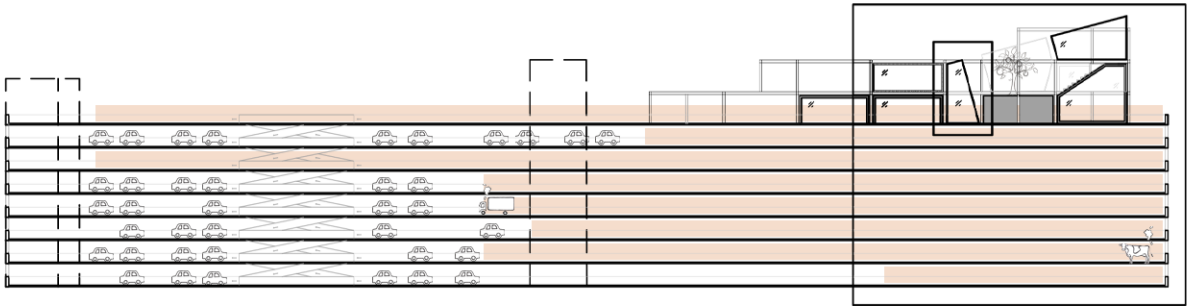
for the
unitized
panels
that
create
modules
which fit
into form
that
grows up
from the
structure



Fig 5 - first attempt at design for timber extension above concrete structure



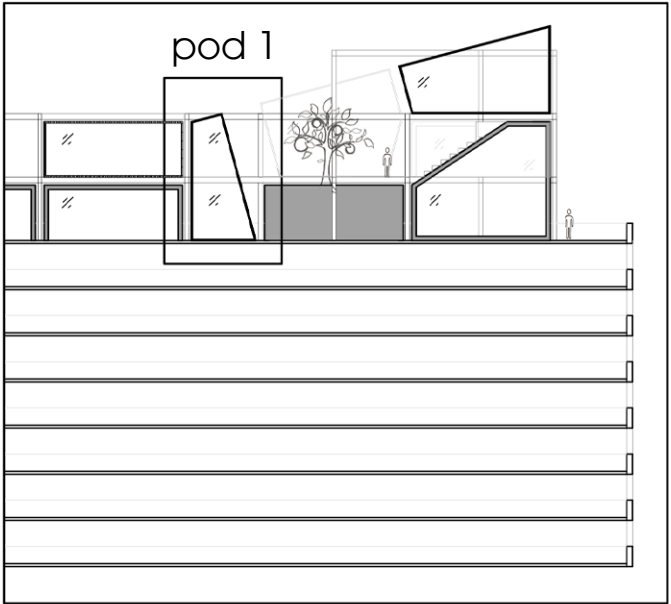
existing elevation



proposed sectional layout

As represented in orange, the programme will occupy a large portion of the South and East of the existing structure. This will still allow the parking lot to operate as before just with less capacity which is viable in terms of its current daily usage. The building will now become a hybrid, sharing programmatic value. As need for one over the other changes, the programme can easily be shifted within the structure. If both programmes find higher demand, the timber structure above can find a vertical trajectory.

There are hundreds of orange groves in the Southern California region. Currently, matured redundant trees



are disposed of in heaps in the desert or burned, releasing CO2. To repurpose these trees, the hardwood will be harvested and



reformed into laminate beams for the timber structure frame in my design, feeding into the narrative of reuse within the agriculture industry.





Two modules are considered in testing the technical aspects of the timber design.

Pod 2 uses a modular approach which prioritises a unitized panel system resulting in uniform modules that all take the same form and make this construction efficient both in cost and sustainability.

Pod 1 uses the same material combinations but the abstract arrangement means that panels will each need to be customised. Although aesthetically intriguing and more sensible in harnessing the natural elements, this may be slightly less sustainable as each new module would take a different form and require customisation.

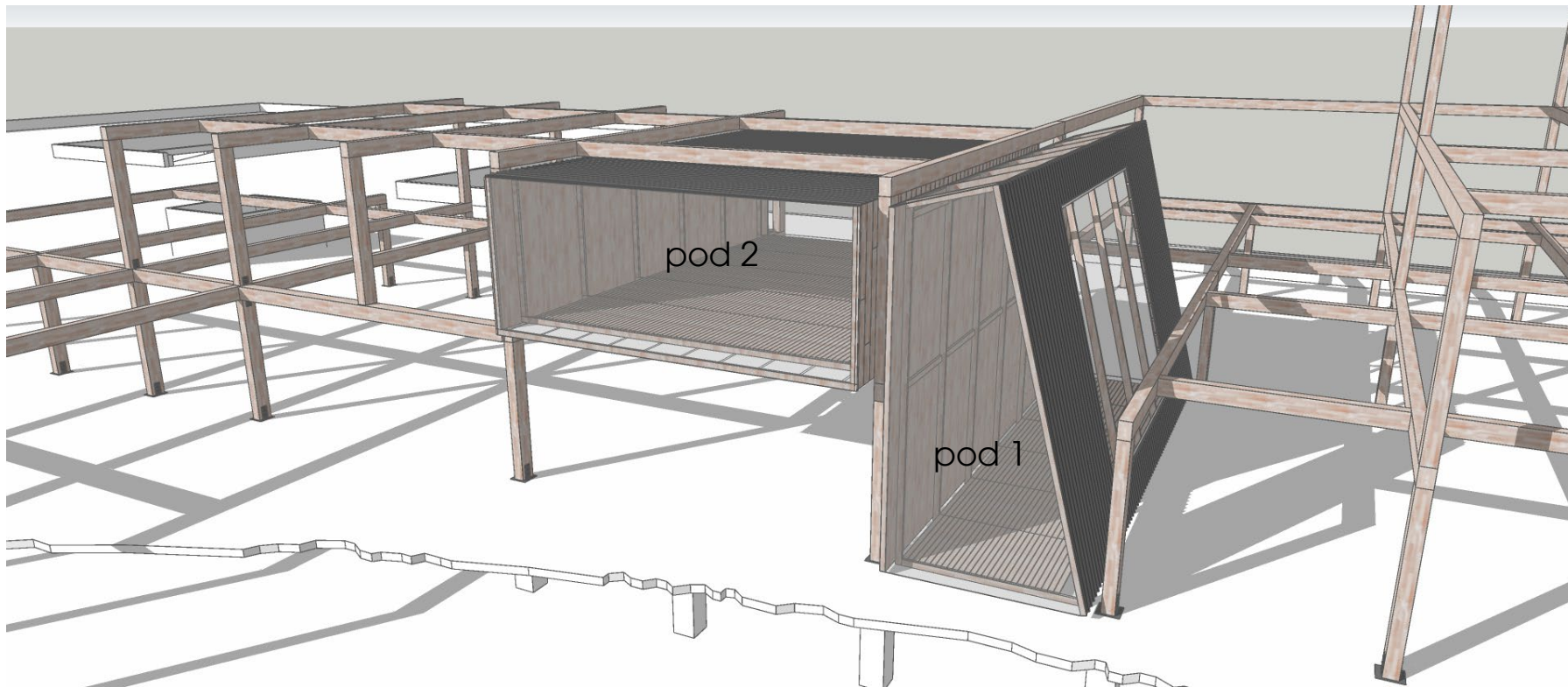
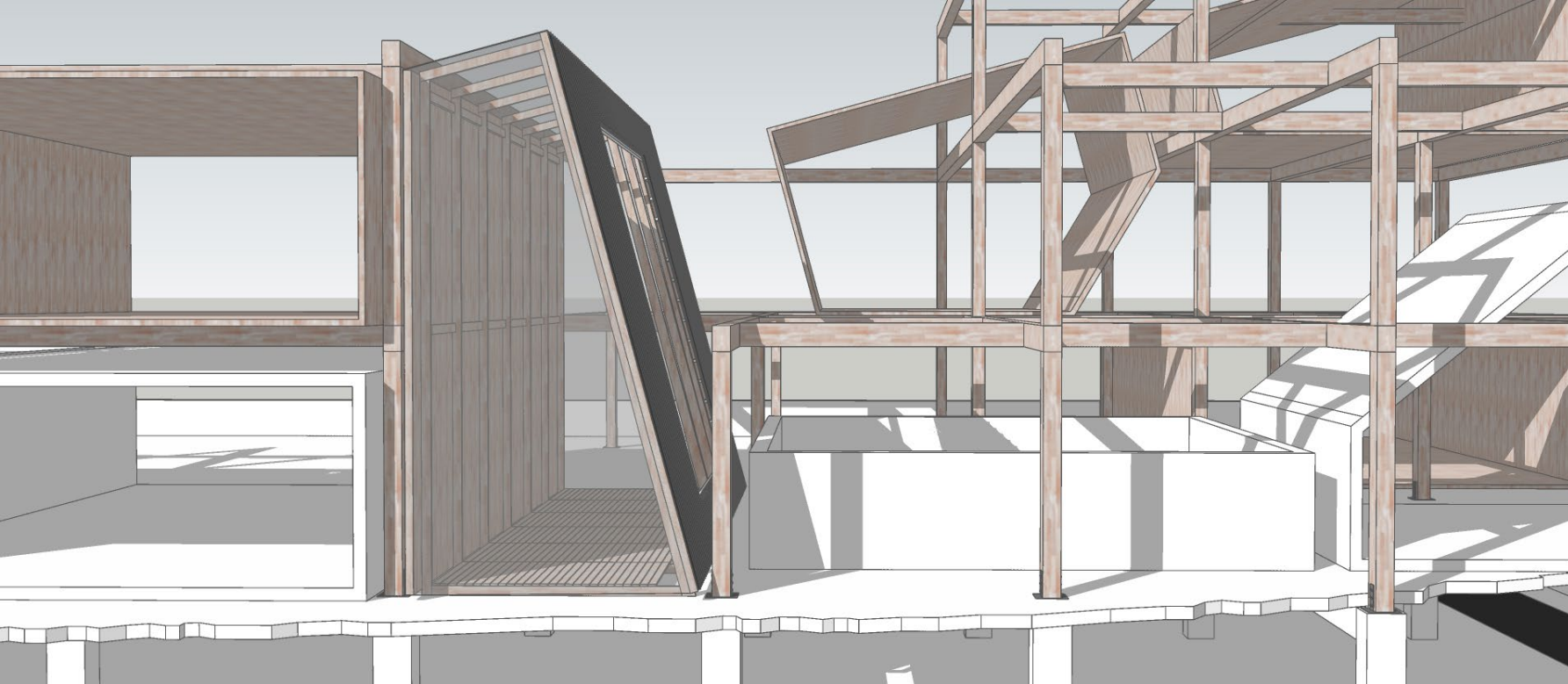


Fig 6 - unitized panel application of timber construction methodology tested on two different forms





pod 1

Basic start to visualising how the orange tree laminate beam members will be arranged to respond to the existing grid but become unique. The construction of an example timber module is explored in a 3D model.

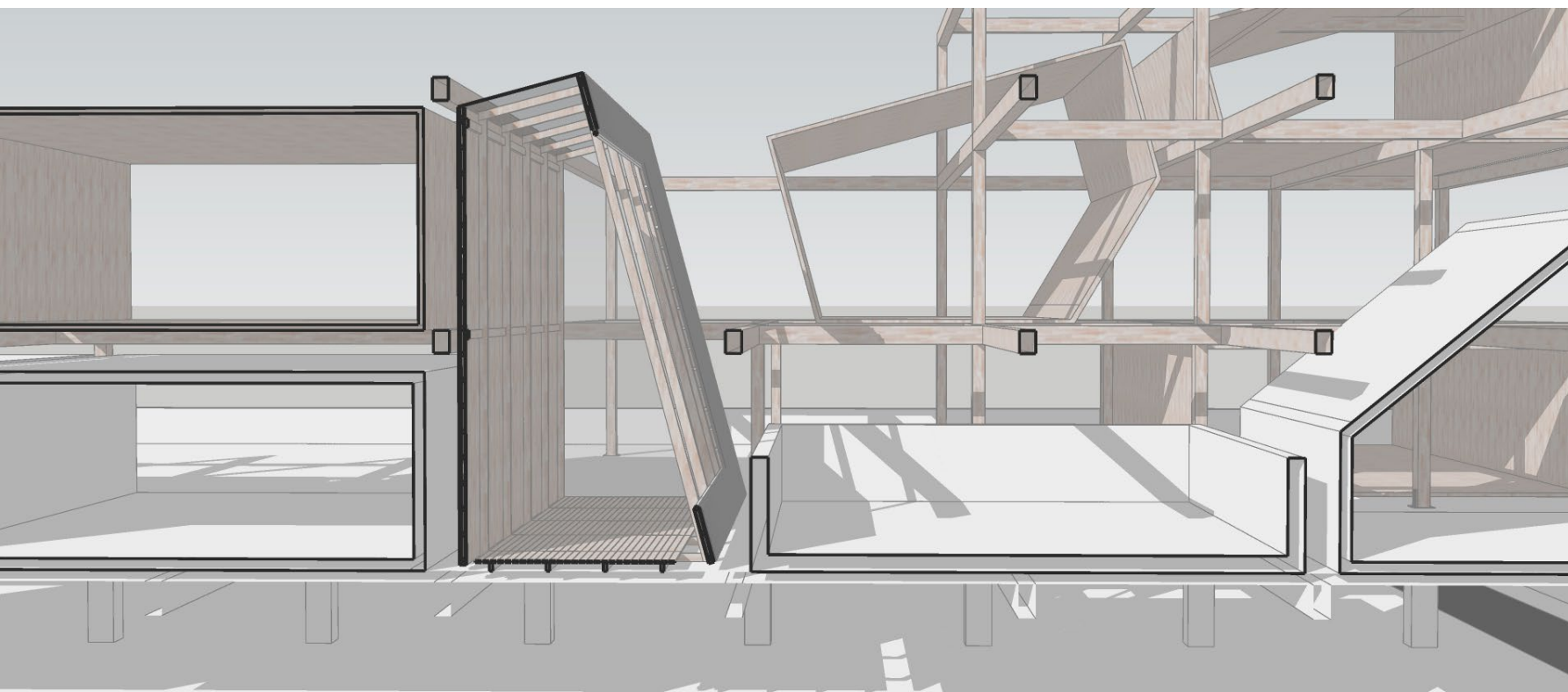


Fig 7 - pod 1 close-up



Fig 8 - pod 1
exploded
axonometric

pod 1



abstract
timber
pod

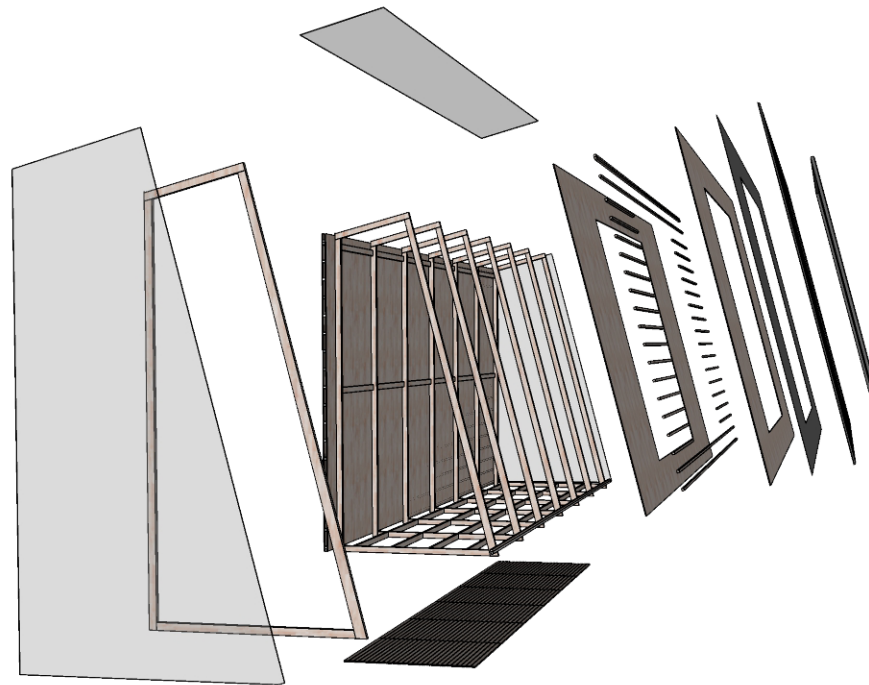
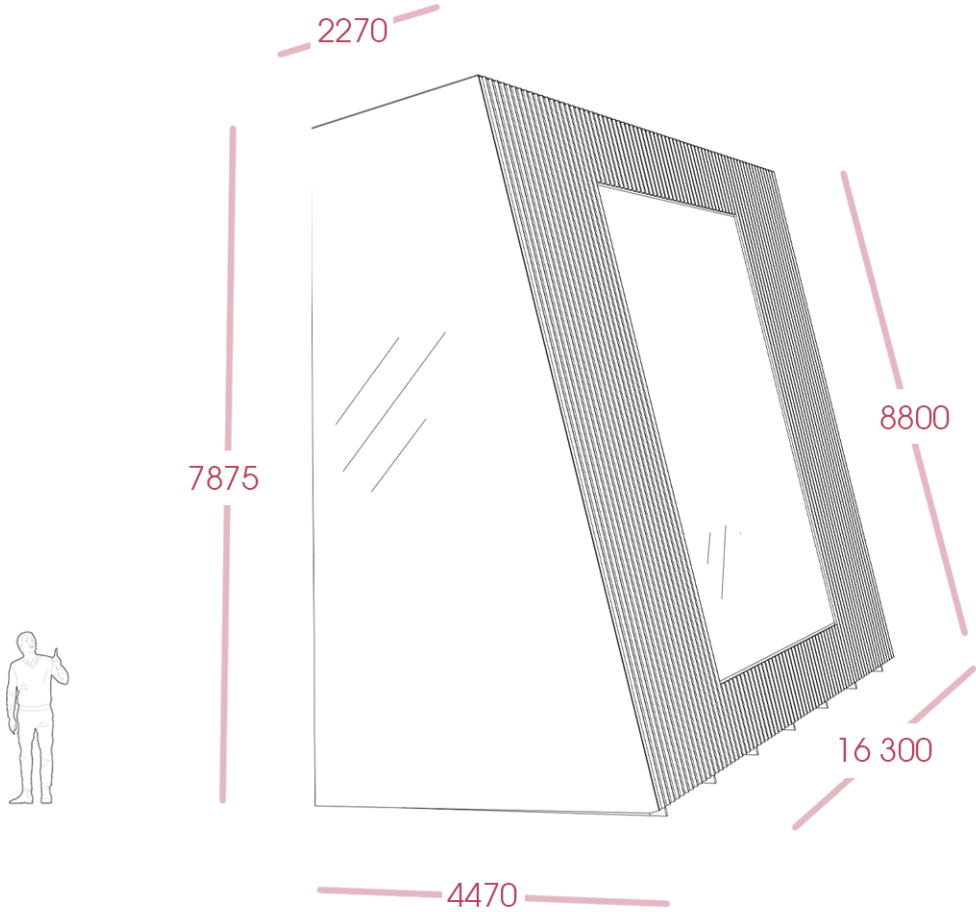


Fig 9 - Pod 1 scale

pod 1



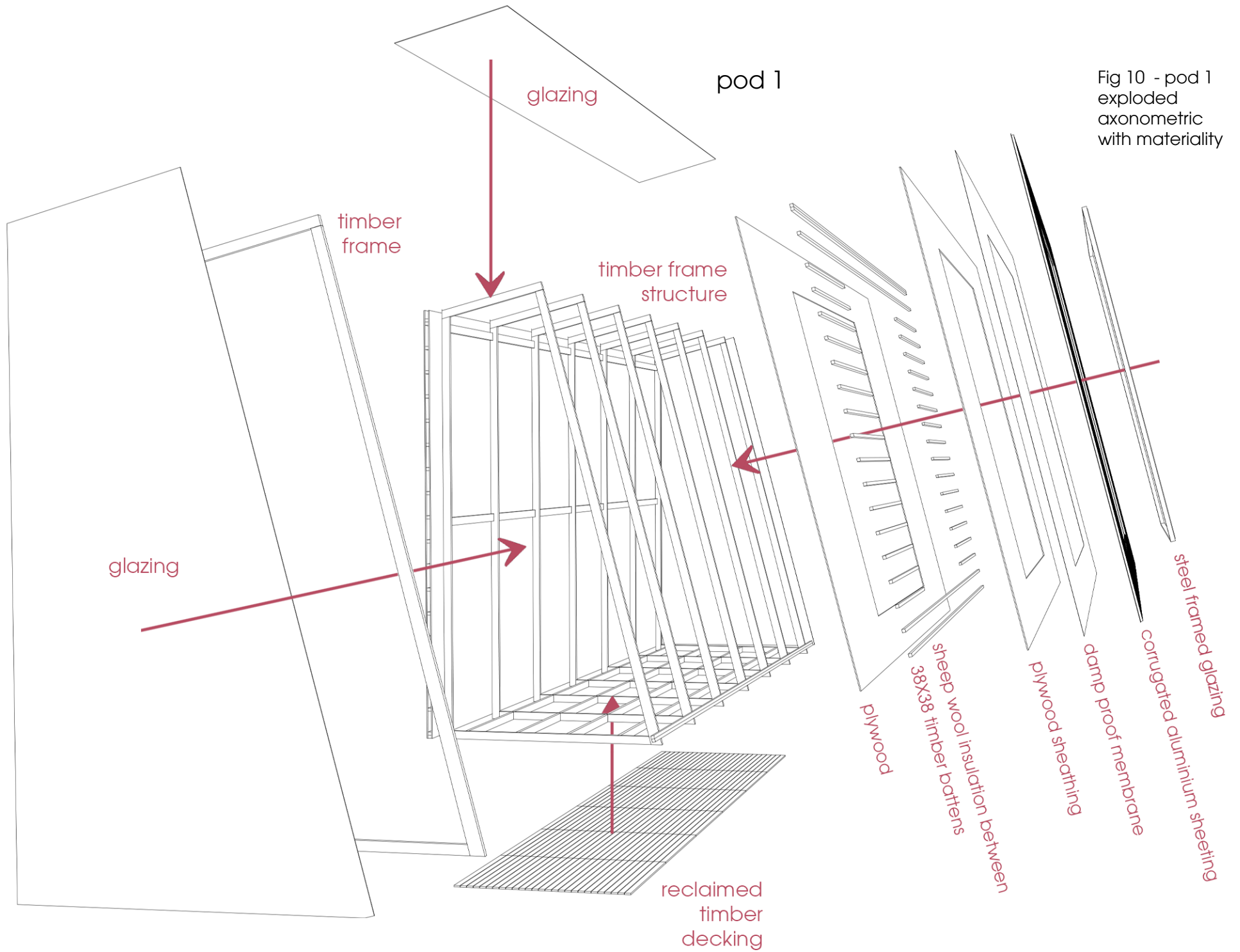
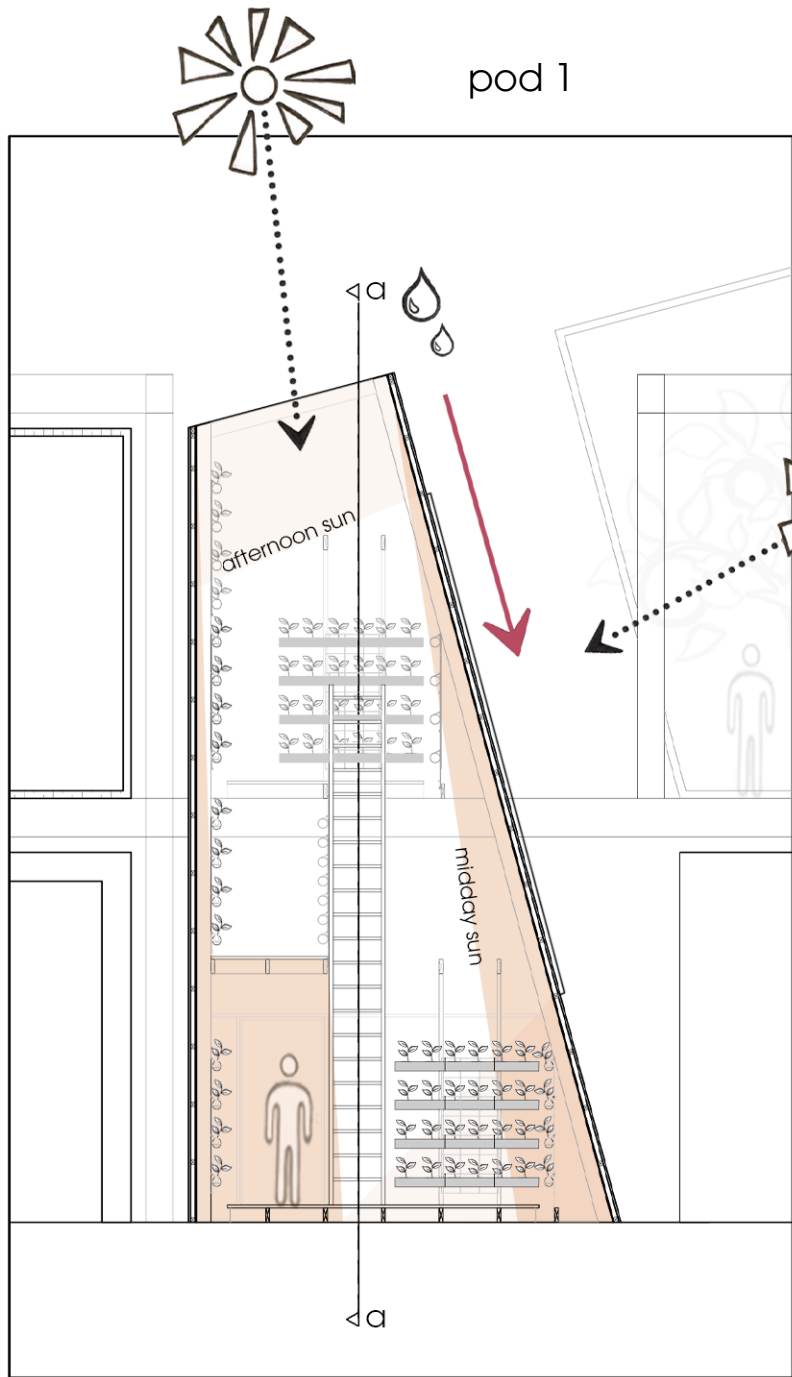


Fig 10 - pod 1 exploded axonometric with materiality



Diagrams made for exploration of timber construction, other sustainable materiality, natural light control, water collection, spatial efficiency, detailing of grow media and circulation of this space.

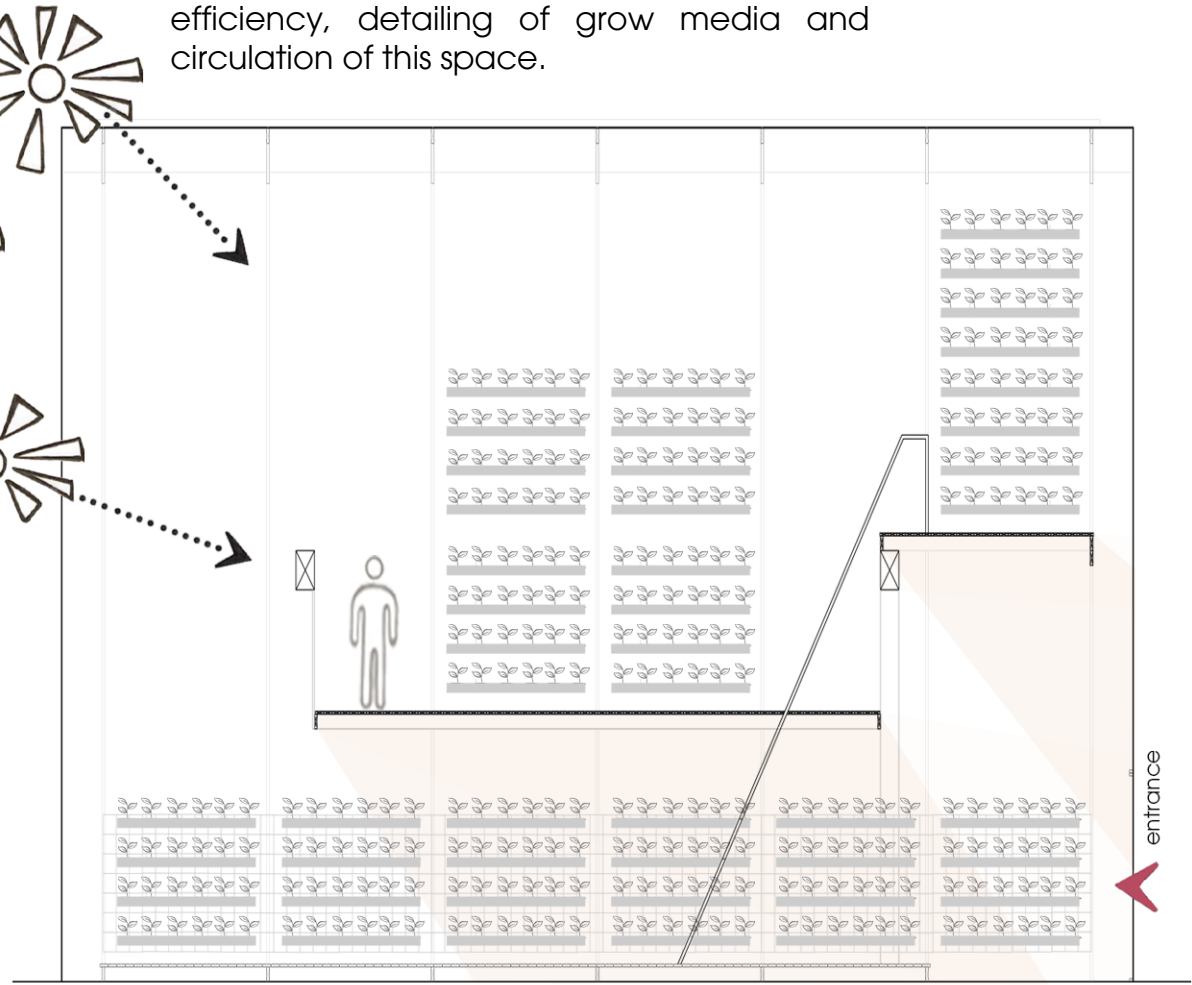
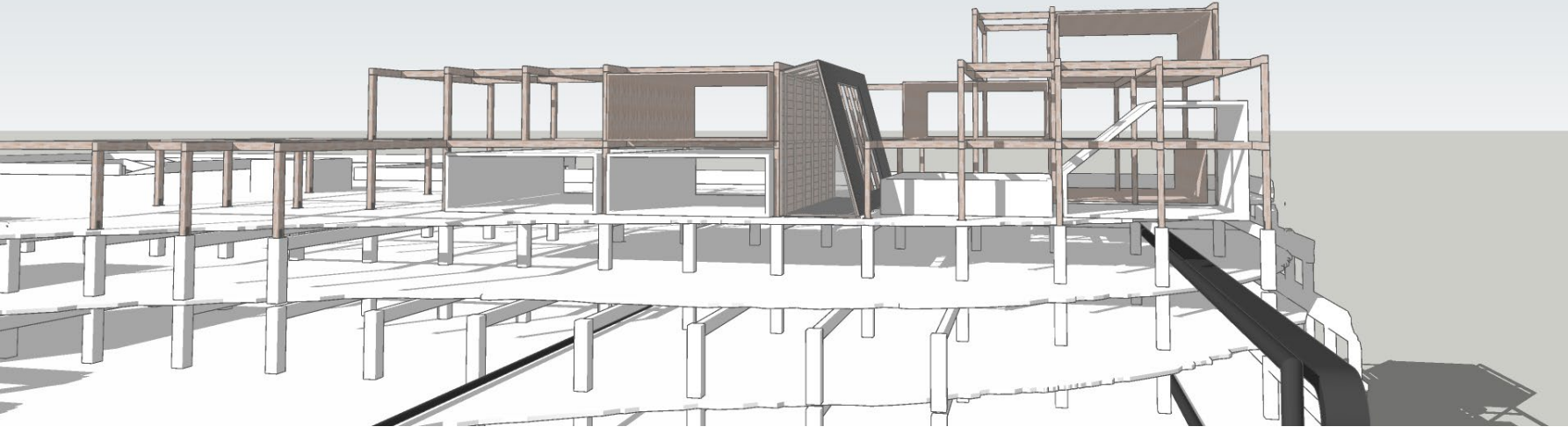


Fig 11 - pod 1 sections with layout and light explorations

section a-a



showing ability
for future vertical
extension

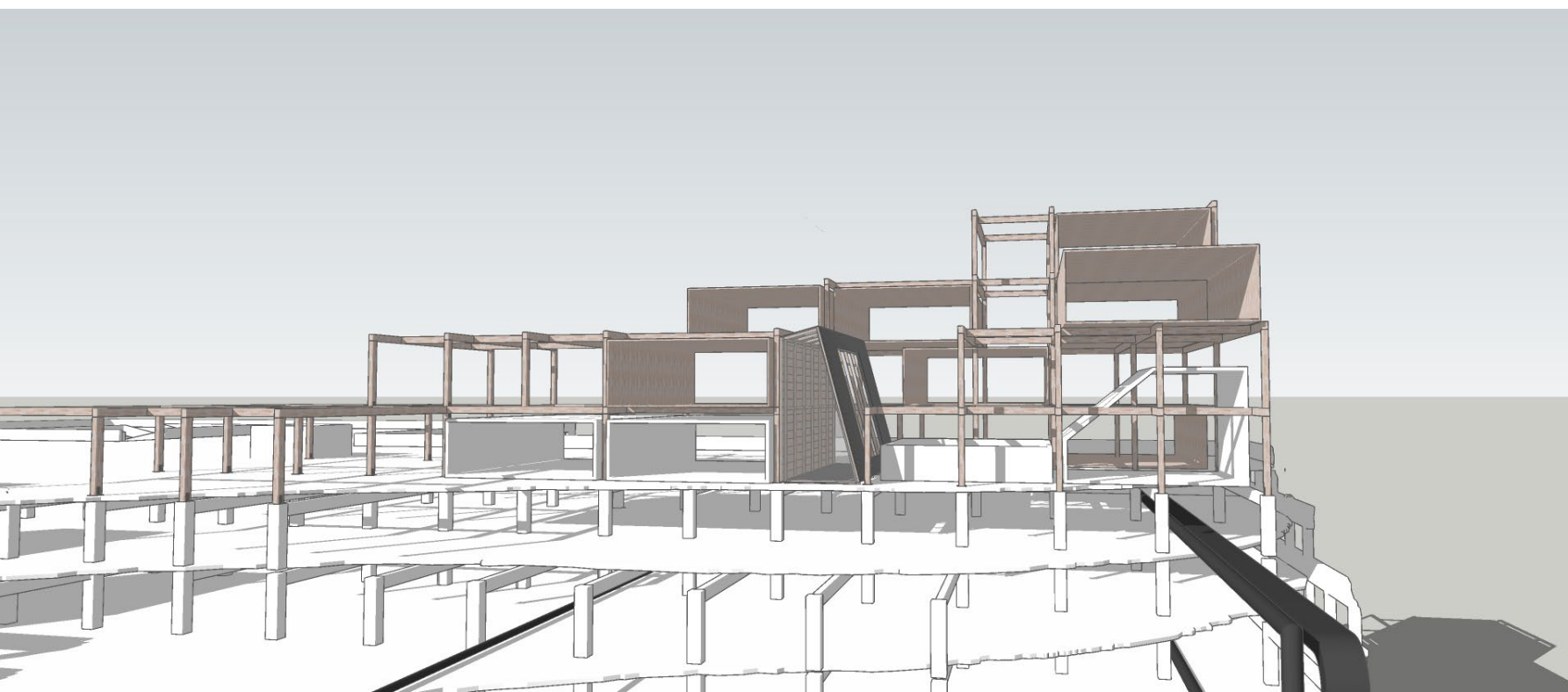


Fig 12 -
timber
structure
extension
capabilities

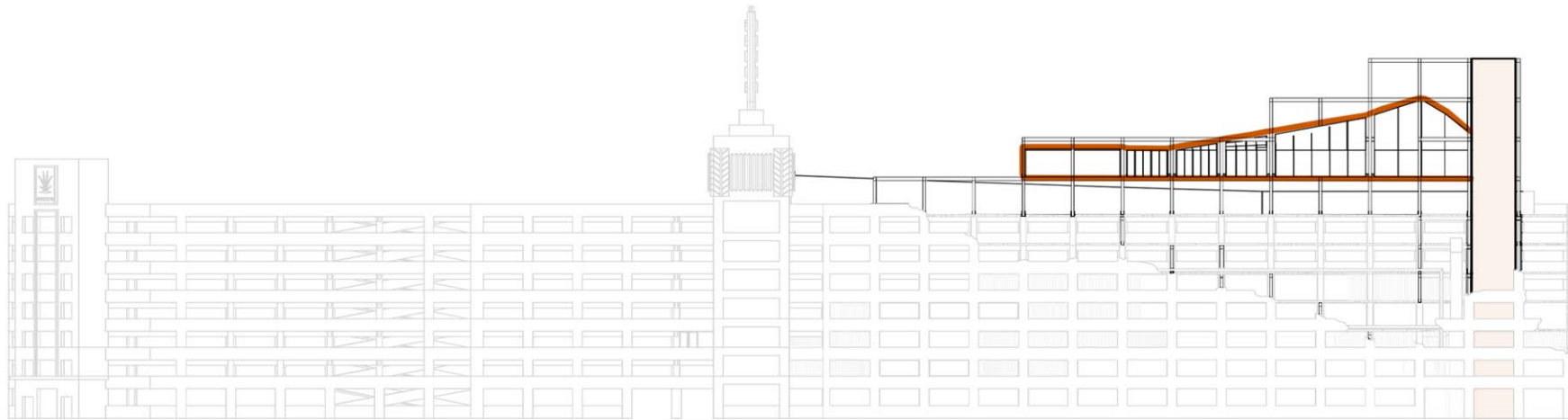


pod 3

After some progression in the design process and the lessons learned from the other pod designs, a third pod has been proposed. It borrows the building methodology already explored but introduces a more organic and sprawling form.

Fig 13 - Pod 3 in context of structure

east elevation



south elevation

Fig 14 - plan of Pod 3 in context of structure

la
Brea
Adobe

The structures above the concrete that rely on the timber frame can break the rules. They are less restrained by the existing grid structure and can be molded to fit the motion, aesthetic and the natural elements aiding farm processes.

Two new lifts have been established. The one on the left is for staff to move around and service the farm. The one on the right introduces a core that hosts services as well as provides a pedestrian lift that creates access from the ground level up to each floor of the design, separate from the mall.

The Grove Drive

roof plan

The Grove

The Grove

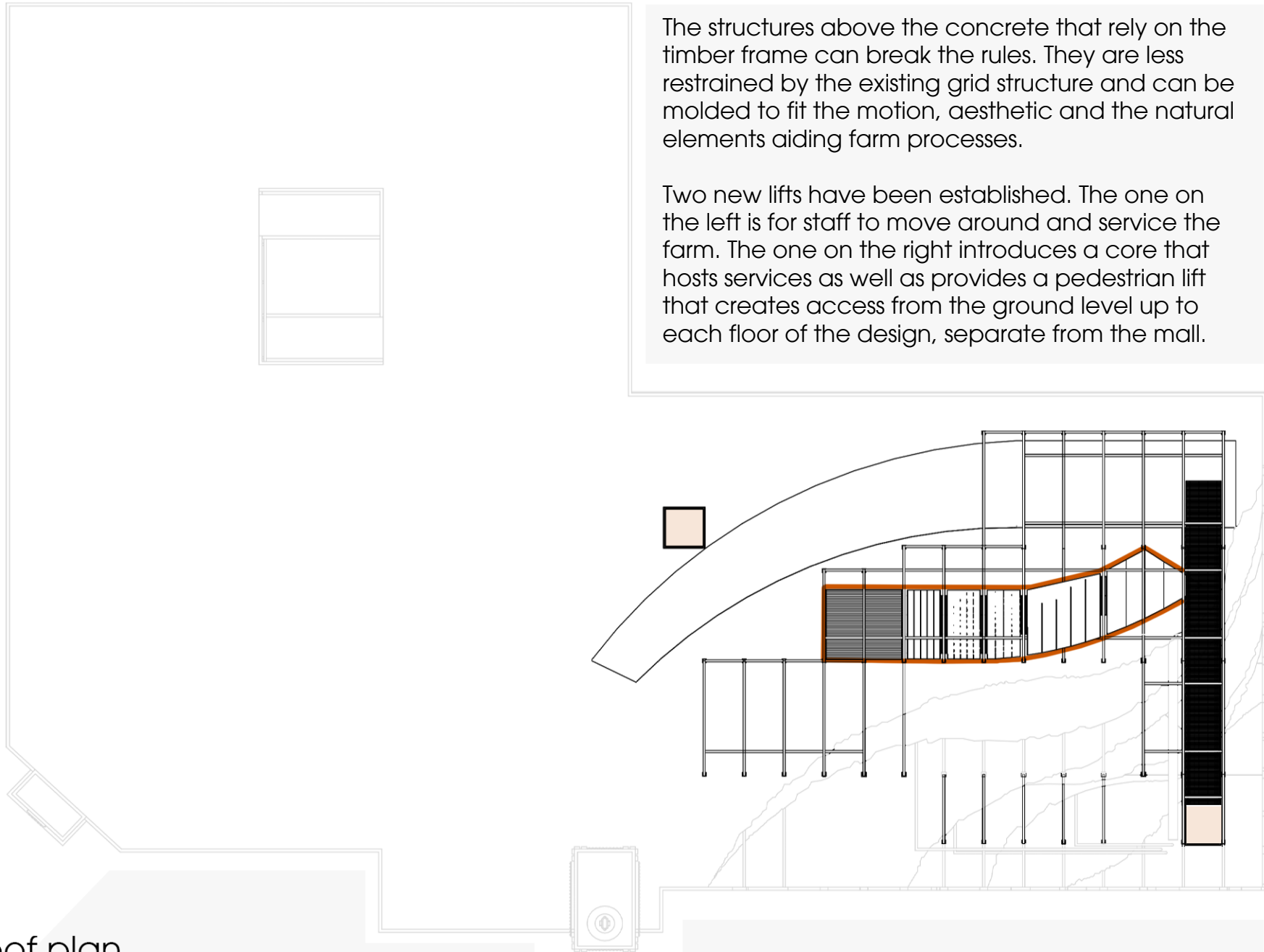
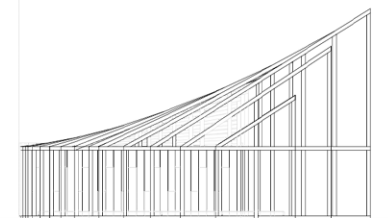
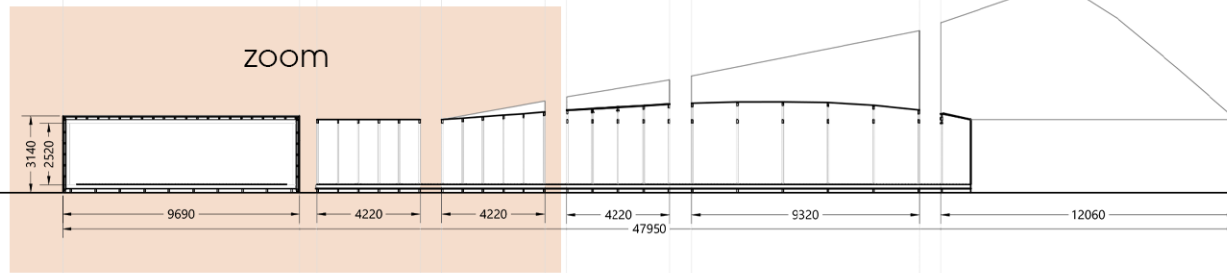
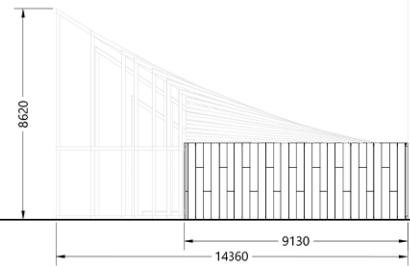
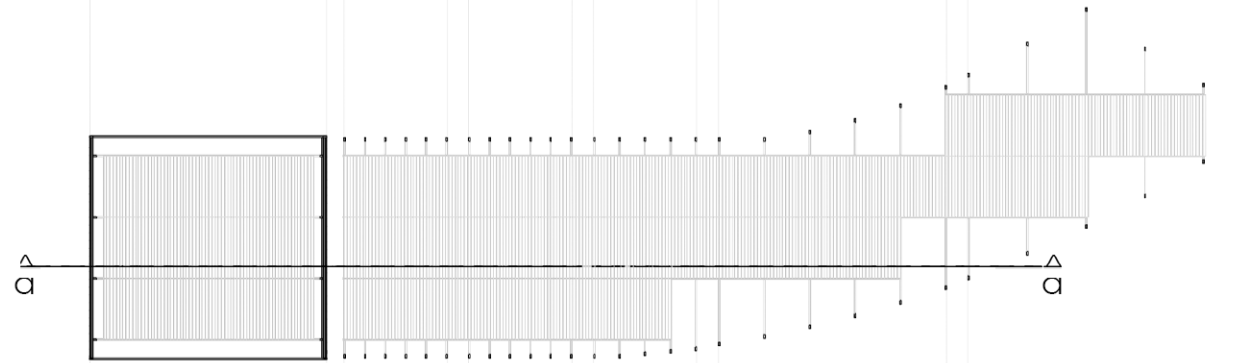
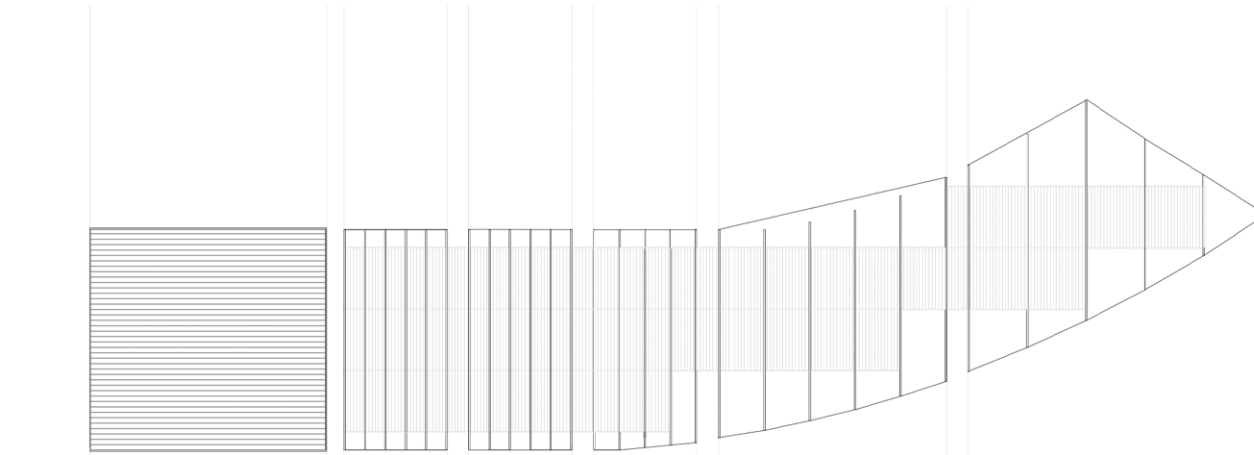


Fig 15 - Pod 3

Pod 3 is made up of pod 2 and an added 5-part organic form greenhouse



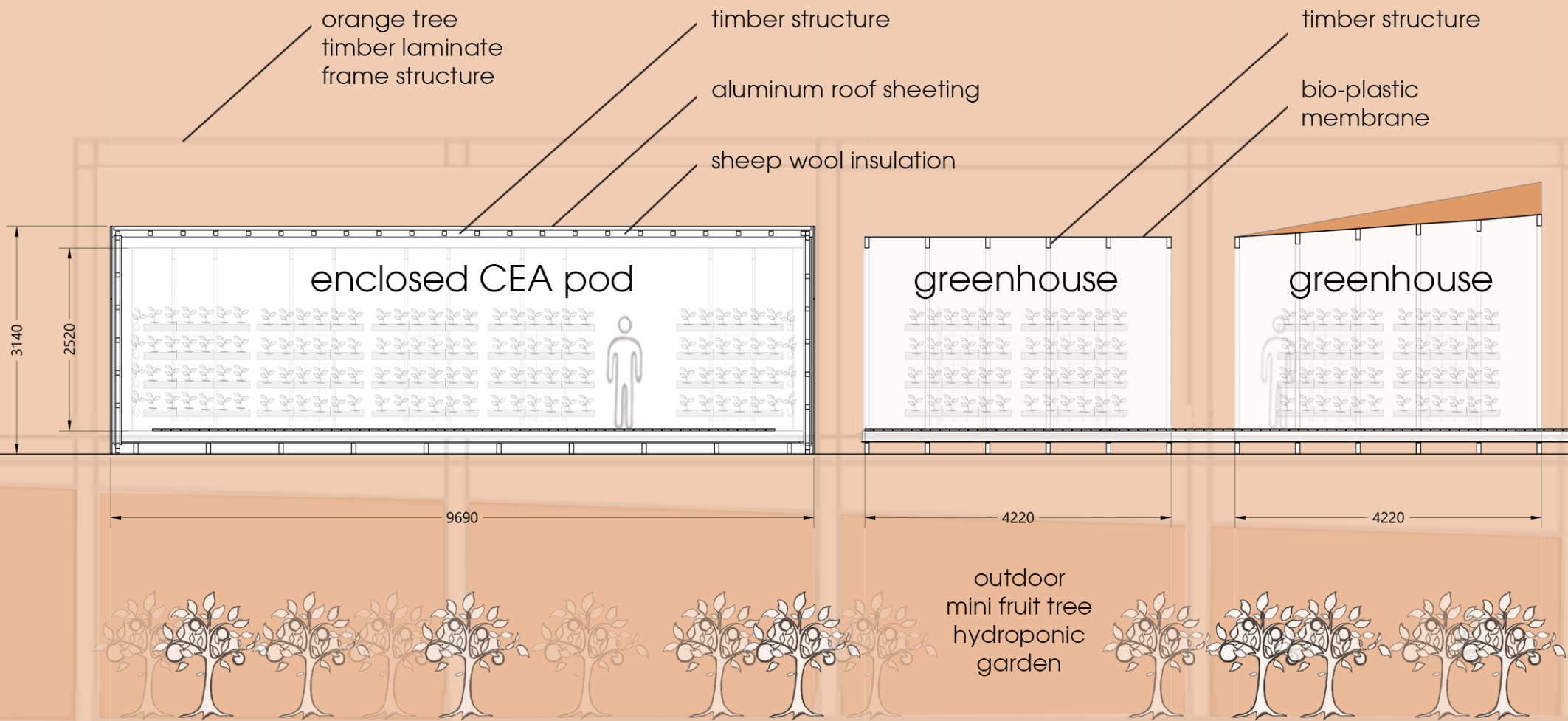


Fig 16 - Zoomed in diagrammatic section of the proposed Pod 3

The design has reached a point where it is a shell ready to host the extensive programme of my vision. As seen in *Design Development 14*, the programme, layout, materiality and plan for execution is all resolved and now documentation and refining must take place.

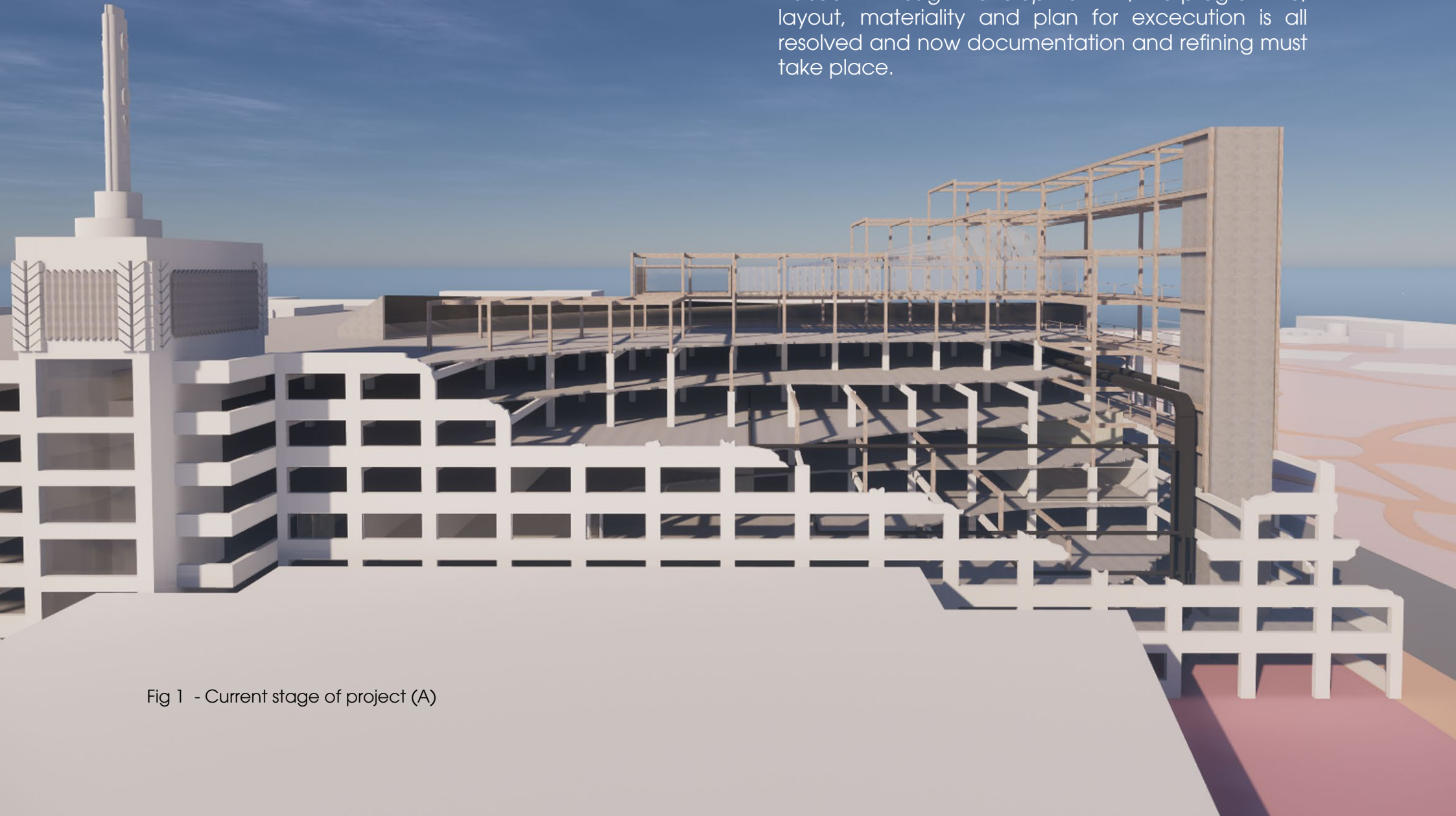


Fig 1 - Current stage of project (A)

Vision for Design Progression

In the next steps of this design I would like to focus on connection. Currently each element has a narrative and a purpose but now these need to be organised into one coherent building. I will start this process by physically connecting all the levels and ground floor public interface by means of an elevator core and a sweeping walkway proposed in the sketch below. As each floor is designed, the infill pods will become visible, giving clear thresholds of enclosure to an otherwise 'non-building' concept. Trees and gardens will begin to populate the cascading landscape carved away from this concrete mass.

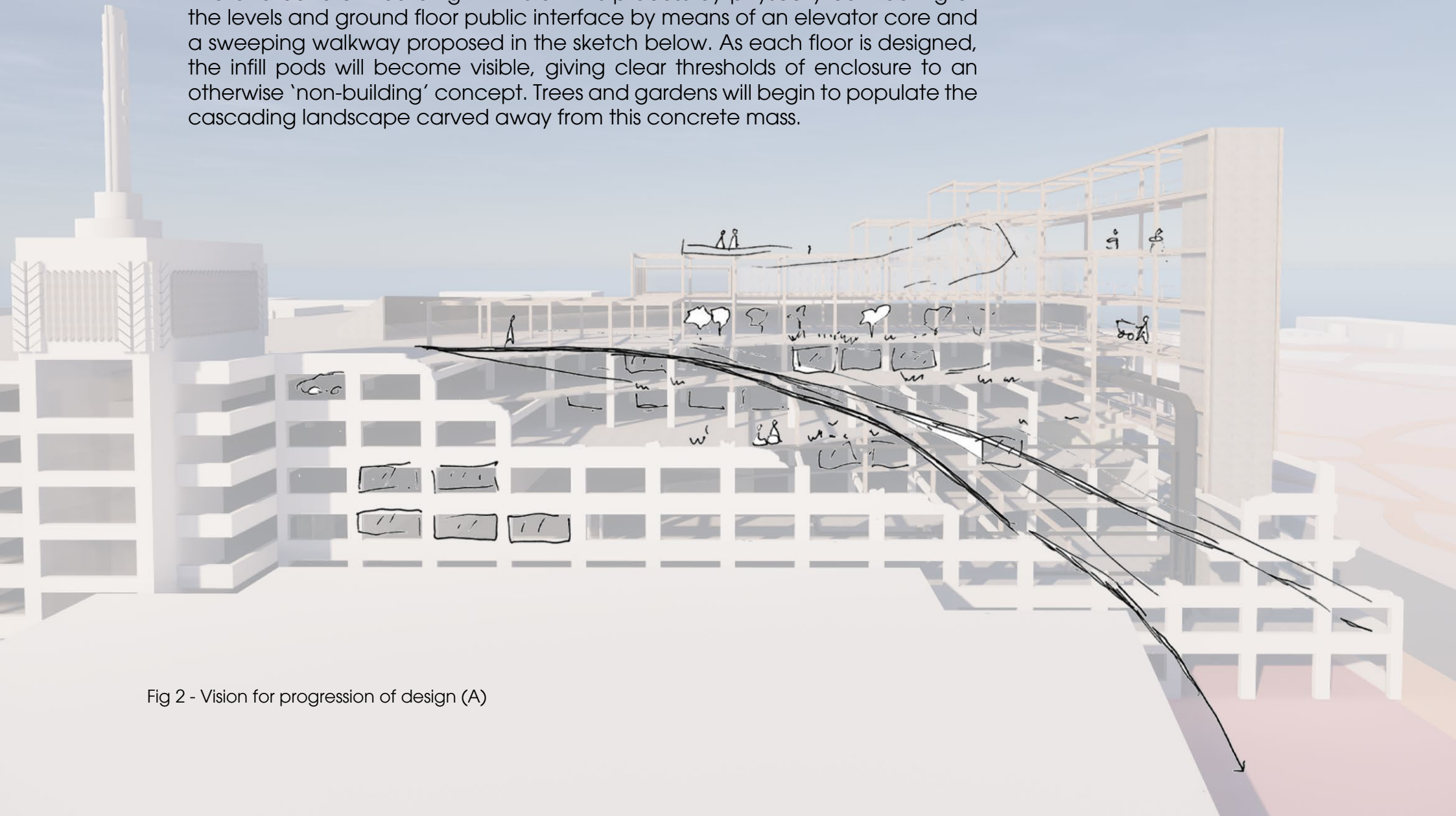


Fig 2 - Vision for progression of design (A)

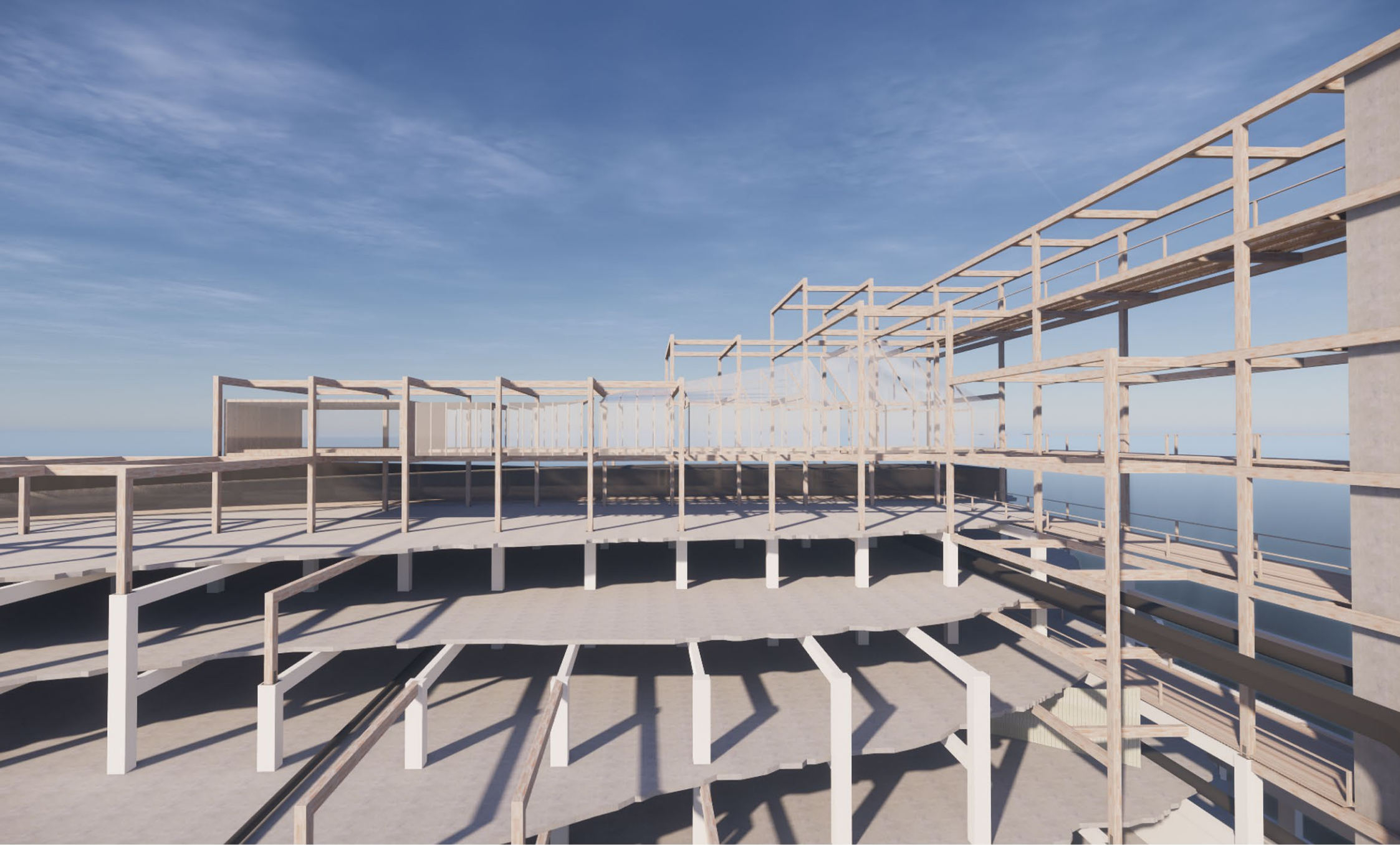


Fig 3 - Current stage of project (A)

Hydroponic systems will be used to achieve these gardens, that would usually require deep and heavy soil pockets to be considered in the design. This method allows for an elegant and efficient application of an urban farm. The pods and interactive farm will be populated by designed equipment. Then the commercial design will take place including the produce store connecting to The Grove, the produce grocery drive-thru, a restaurant, a bar and lookout platforms. All public facilities like restrooms and the Homeless Relief Centre will be planned out in the design process to follow. This marks the point where research, analysis and design exploration will move forward into a finalisation and documentation process.

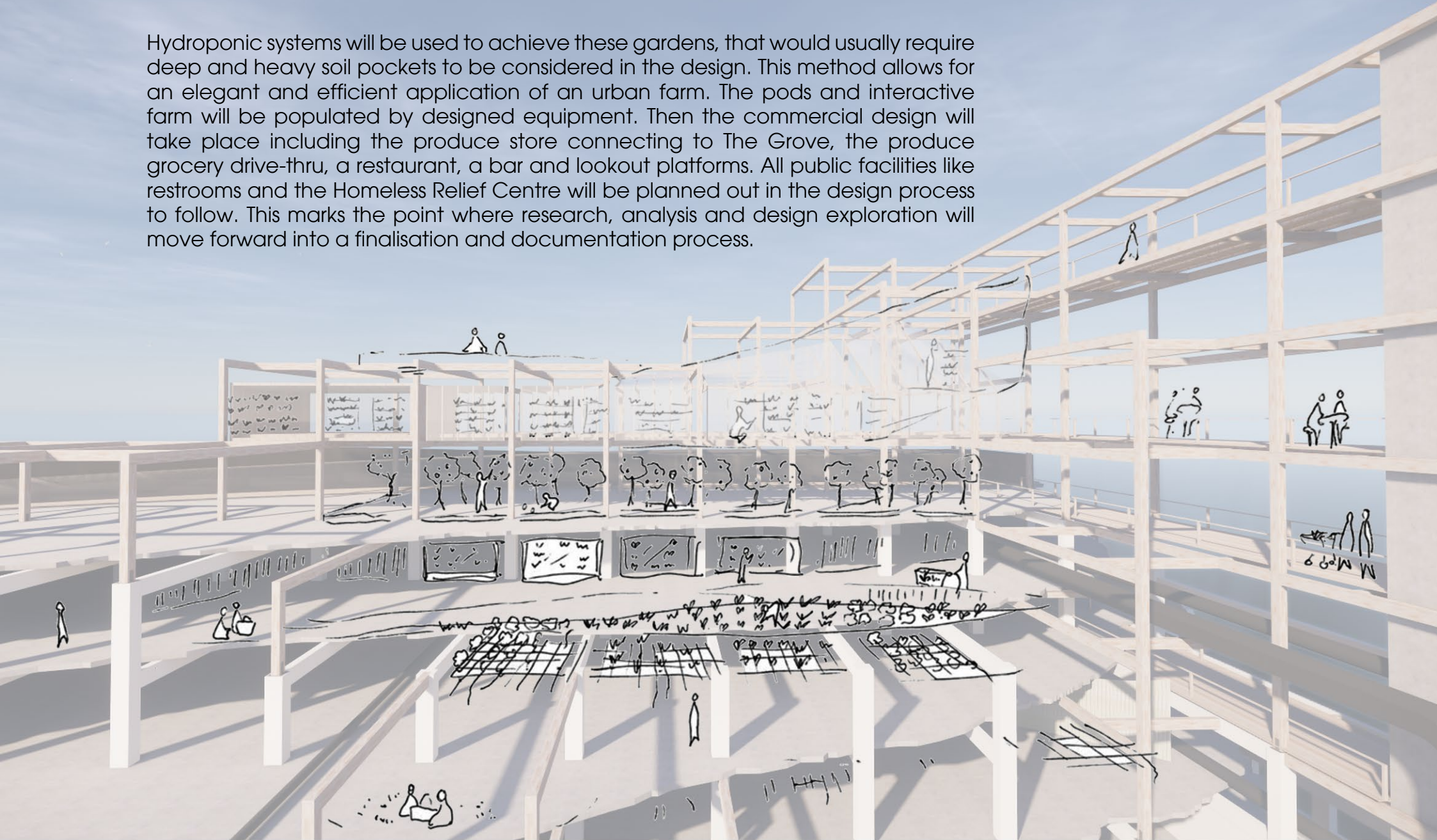
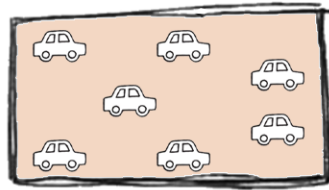
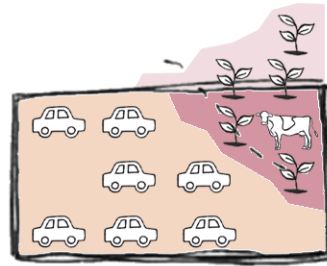


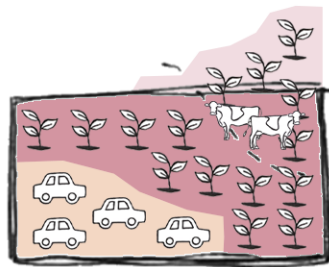
Fig 4 - Vision for progression of design (B)



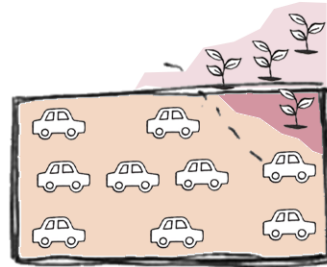
existing



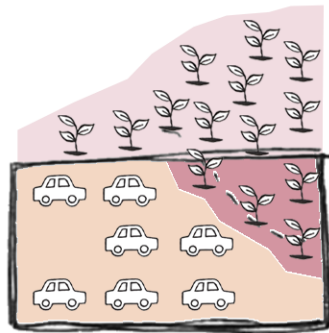
proposed



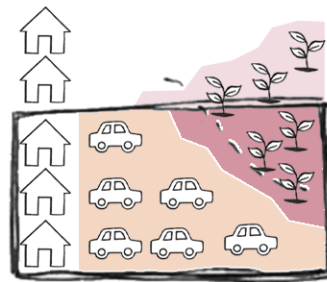
scenario A



scenario B



scenario C



scenario D



Future Scenarios + Growth

The existing parking structure is becoming a mixed-use building with the addition of this public urban farm concept. Although a set allocation of these two programmes are proposed in my design, the intention is that the building has the ability to adapt to the needs of this city. Right now, with a rise in online shopping and the COVID-19 pandemic, the parking structure is largely under-utilised and the urban farming concept is on the rise due to climate threats and sustainable planning thus setting the allocation per programme in the proposed design. However, if vehicle use decreases further and the demand for the urban farm facilities increase, the allocation will adjust with the scenario. The opposite could happen or the farm may need to grow although there is no available space in the parking structure to do so - in which case the farm could grow upward. There is also possibility for a third use to be introduced in a future scenario when another programme is in high demand in the area.

The designers of our urban landscape hold great responsibility in the Climate Crisis. As an aspiring architect, I have found my own significance in the field to be linked tightly to my responsibility around sustainable outcomes and I aim to respect the power I have through informing myself of the consequences behind my actions.

This research and design process has allowed me to explore the issues the globe faces through the lense of Los Angeles. A city that shows so many contradictory faces and also faces inevitable threat to its ongoing existence. This will be the reality most urban environments will face in the years to come as the climate warps to extremes. I found that an urban agricultural intervention - that relies on an architectural approach - introduces, in part, a solution in both the prevention and reaction to disasters that effect food security.

I have explored the relationship between the environment we have created for ourselves, in the form of concrete landscapes, and the natural environment that persists beneath it. I have used my design as a metaphor for the regrowth of this pure habitat. My design aims to allow humans to quench the ever-present need we have to create more and grow, but refocus the priority on future-conscious concepts. In my research I have recognised that the reason we have found ourselves at the doorstep of a climate disaster is due to our obsession with money. I have concluded that the suitable response is to avoid

challenging this and, instead, find ways for sustainable choices to become profitable and thus the desirable option.

The information surrounding the climate issues we face, and the solutions being tested, is overwhelmingly abundant. I found myself fascinated and excited but terrified at both the prospect of organising this information into a succinct argument as well as my insatiable desire to solve all the problems at once. In architectural experience, I have found relevance in finding connection between what I am creating and the narrative that drives its personality. This process was not straightforward but rather a tumultuous thought pattern that threw me in multiple directions before settling. Personally, this project has been a lesson about realising the scope of my ability, compartmentalising and finding my own process amongst the pressures that be.

Overall, I feel satisfied that I have brought forward a design that not only considers the environment in the use of sustainable materials, energy and efficiency as many 'green buildings' do, but goes further by considering food productivity, protection, sustainable distribution, air clarification, recycling materials, product and many more aspects collected throughout my research. I believe that my design has carefully drawn elements of its contextual placement to enhance the social, economic and environmental as well as encourage a shift in consumerism that can ripple into applications of a similar concept globally.

Research Conclusion 00

SITE DOCUMENTATION

Description of Site Documentation

Site Plan

of Project Site in relation to The Original Farmer's Market, highlighting the relationship between the market, the Grove Mall and the parking structure - and the link via the existing trolley rail. Also seen is the location of the original farmhouse (La Brea Adobe) and the adjacent television studios, park and commercial zoned areas.

Site Section

reveals the height of the parking structure in context and the sectioned route of the trolley rail. It also shows the orientation and placement of the new design on the eastern edge of the site and its connection to the street and the park.

Axonometric

transforms the relationship between the site and the eastern edge into a strong pedestrian connection from the street and the Grove Shopping Mall. Additionally, activating this street and side of the parking structure which was previously the under-utilised portion of the overall site.

Site Plan



A0
1 : 500

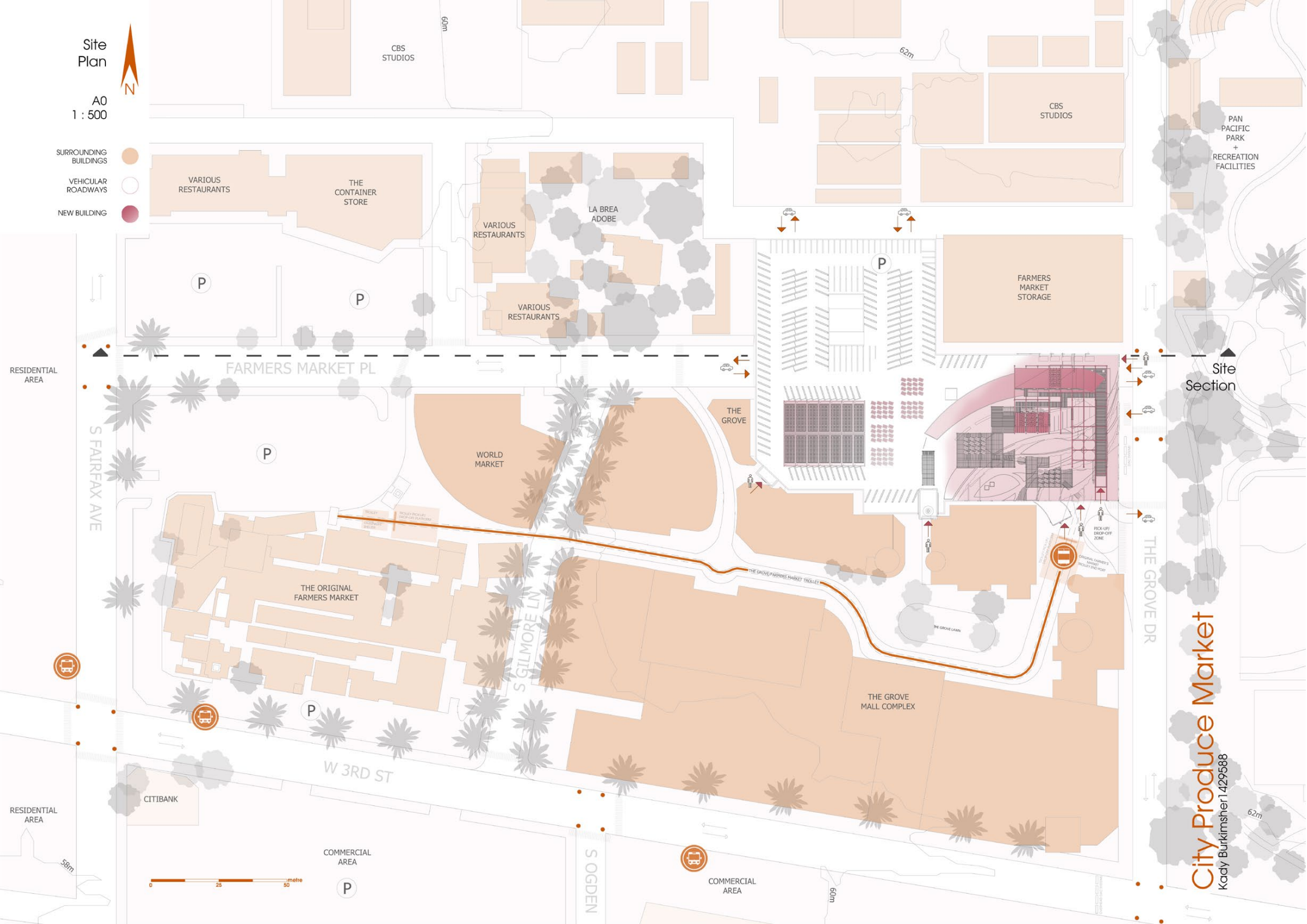
SURROUNDING BUILDINGS



VEHICULAR ROADWAYS

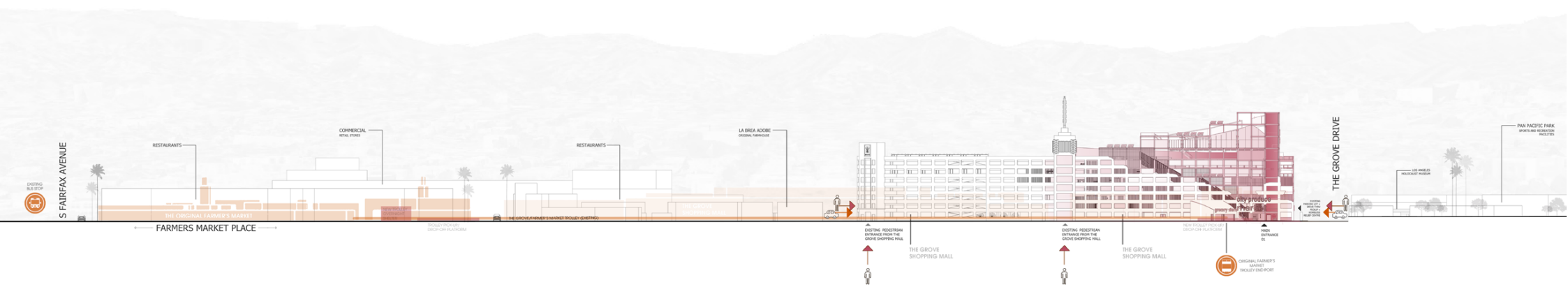


NEW BUILDING



City Produce Market

Kady Burkimsher 1429588

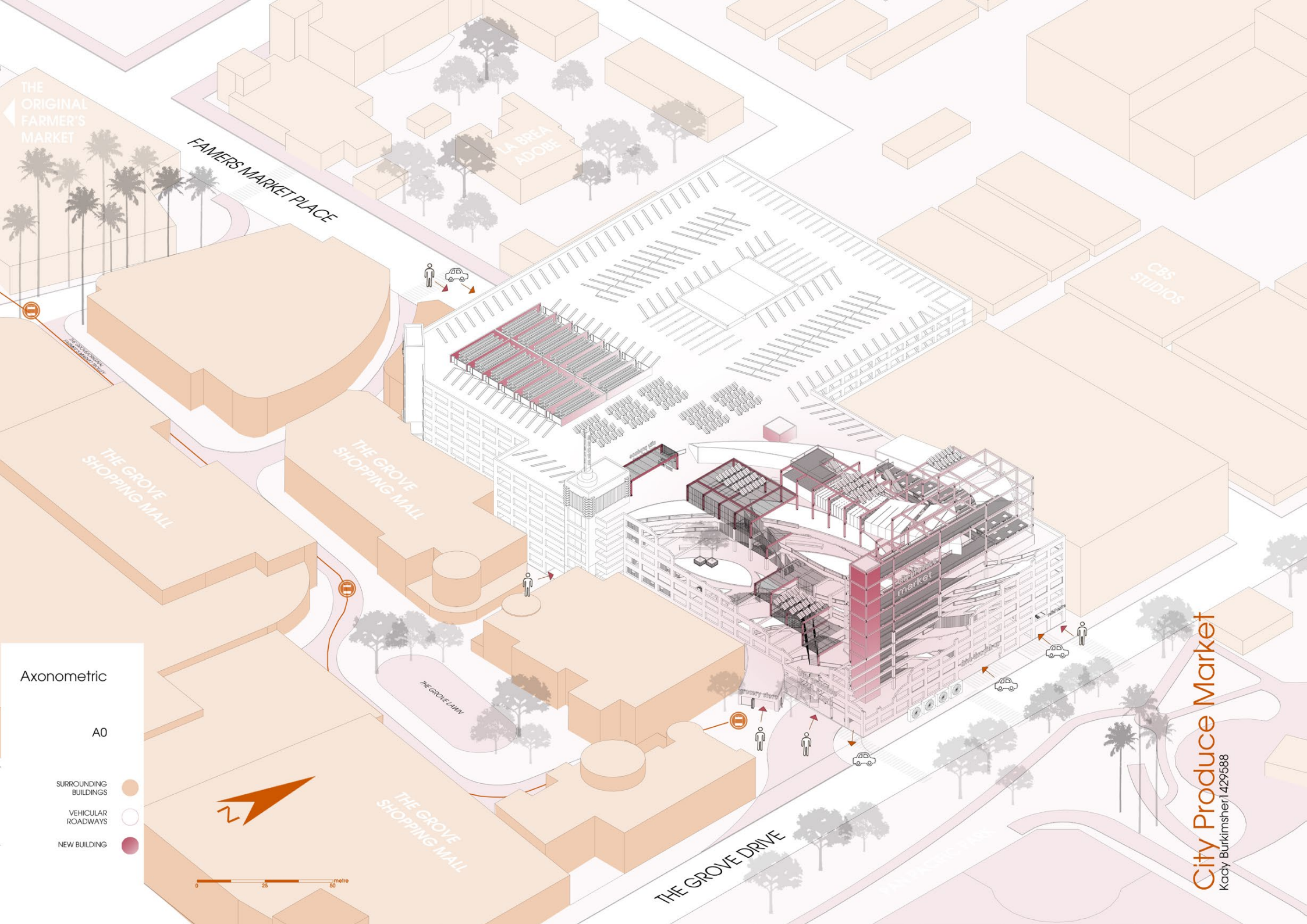


Site Section
 A0
 1 : 500



- SURROUNDING BUILDINGS
- VEHICULAR ROADWAYS
- NEW BUILDING





THE ORIGINAL FARMER'S MARKET

FARMERS MARKET PLACE

LA BREA ADOBE

CBS STUDIOS

THE GROVE SHOPPING MALL

THE GROVE SHOPPING MALL

THE GROVE LAWN

THE GROVE SHOPPING MALL

THE GROVE DRIVE

WILSON AVENUE

Axonometric

A0

- SURROUNDING BUILDINGS
- VEHICULAR ROADWAYS
- NEW BUILDING



City Produce Market
Kody Burkimsher 1429588

DETAIL DOCUMENTATION

Description of Detail Documentation

a Typical CEA Pod example where harvested concrete is transformed into a new aggregate and reformed into infill walls to slot into the existing grid to make enclosed growing pods. Concrete infill walls are only placed in North to South openings to allow glazing panels to act as the transparent infills from East to West for natural light and vision through-ways throughout the structure.

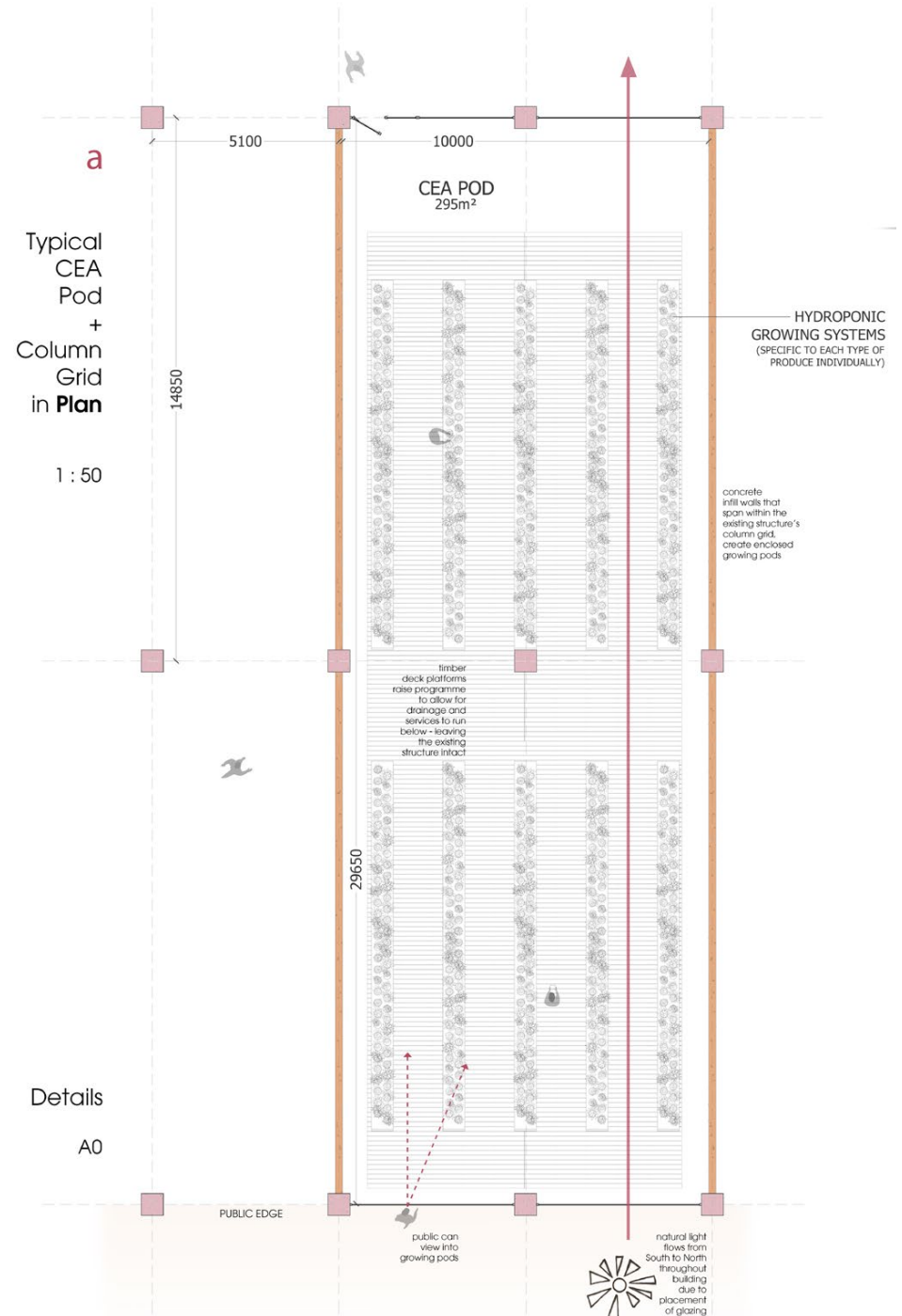
b Detail demonstrating how the enclosed pods are fitted with the necessary growing equipment and how timber platforms, made from reclaimed pallettes from the food distribution industry, to aid the existing structure in hosting service reticulation.

c Orange tree laminate timber frame joining lift core structure to the building.

d Example stair detail with timber slat screening.

e Resulting aesthetic methodology when facade is broken away for material harvesting and form carving. Options for dealing with exposed rebar.

f Greenhouse and timber pod details to understand how structures above the constraining existing grid may warp to different constraints based on different, more natural informants and resulting in a more organic form.



b



GABION WALL

(MADE FROM CONCRETE PIECES BROKEN AWAY FROM EXISTING STRUCTURE)

EXISTING SCREED (TO BE POLISHED IN INDICATED AREAS)

250mm EXISTING REINFORCED CONCRETE SLAB

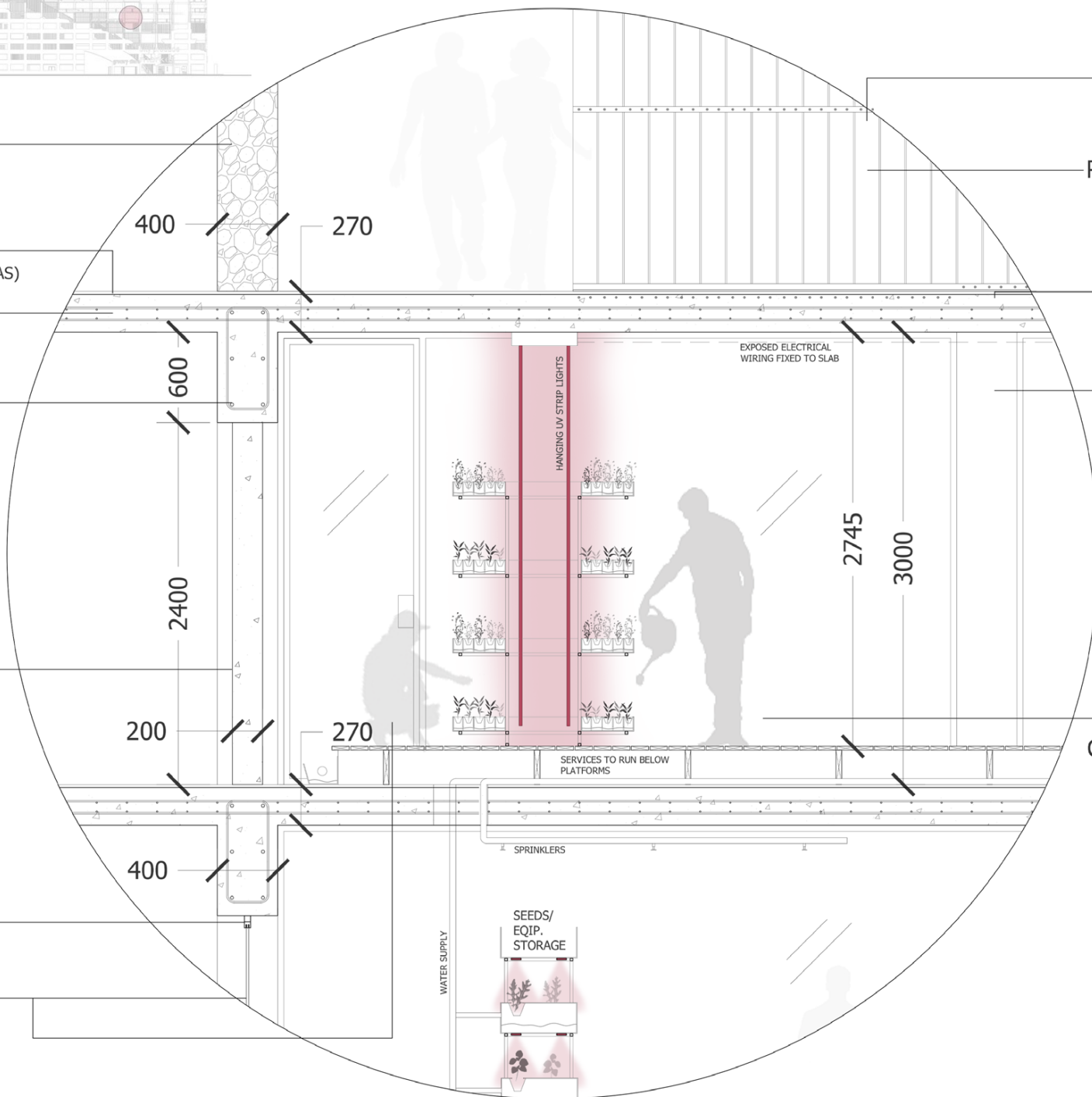
400 X 600mm EXISTING REINFORCED CONCRETE BEAM

CONCRETE WALL INFILLS

(MADE FROM CONCRETE AGGREGATE RETRIEVED FROM BROKEN AWAY EXISTING STRUCTURE)

40mm WHITE ALUMINIUM WINDOW AND DOOR FRAMES

10mm PANES DOUBLE GLAZED WINDOW AND DOORS



MATT BLACK BOLTED STEEL BRACKET

RECLAIMED TIMBER SLATTED SCREEN (DISTRIBUTION PALLET RE-USE)

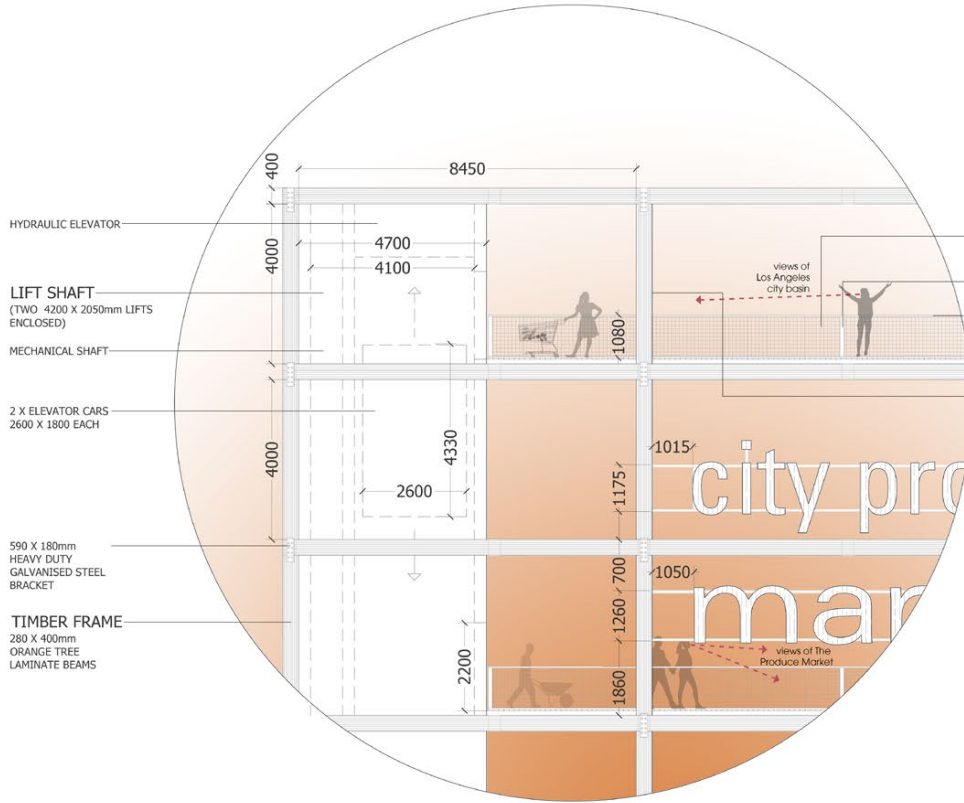
MATT BLACK BOLTED STEEL BRACKET

EXISTING REINFORCED CONCRETE COLUMN

HYDROPONIC GROWING SYSTEMS (SPECIFIC TO EACH TYPE OF PRODUCE INDIVIDUALLY)

b

Existing Structure + Infill Material and Growing Equipment in **Section**



C

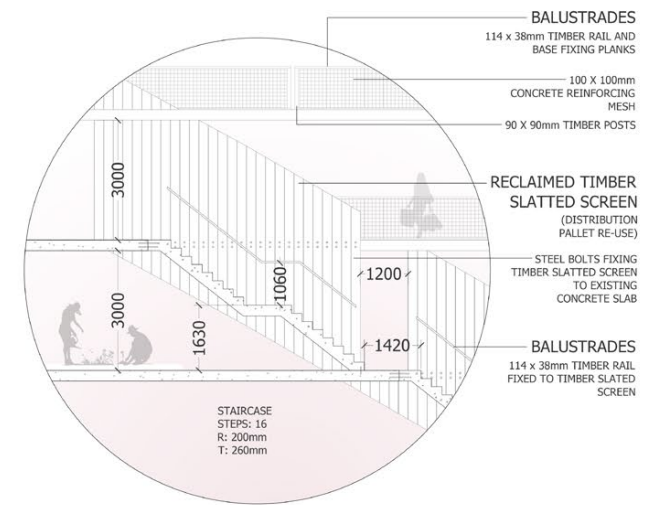
Timber Frame Platform + Lift Core in **Elevation**

1 : 50

d

Cascading Staircase + Timber Screen Placement in **Section**

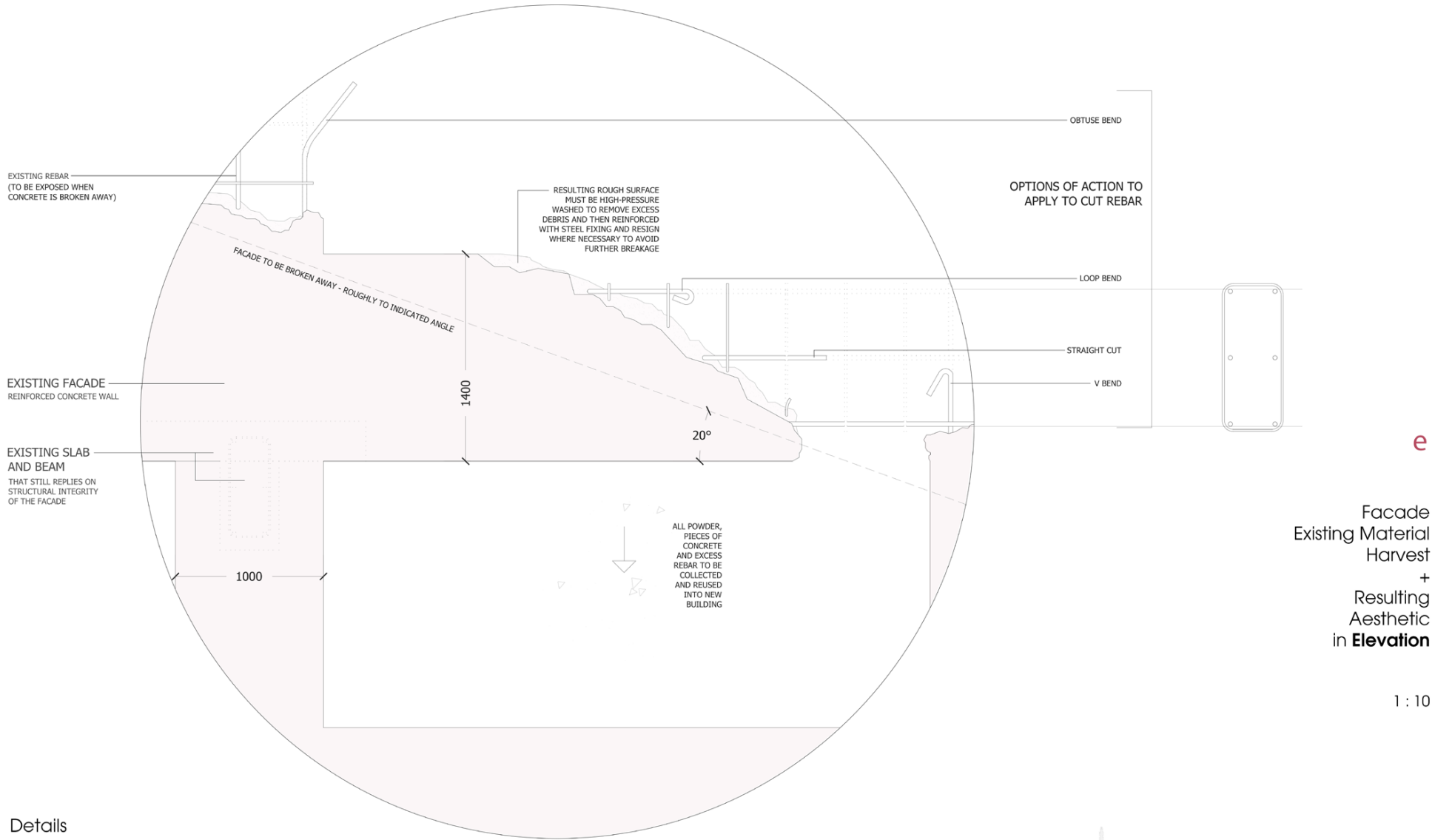
1 : 20



Details

A0





Facade
Existing Material
Harvest
+
Resulting
Aesthetic
in **Elevation**

1 : 10

Details
A0

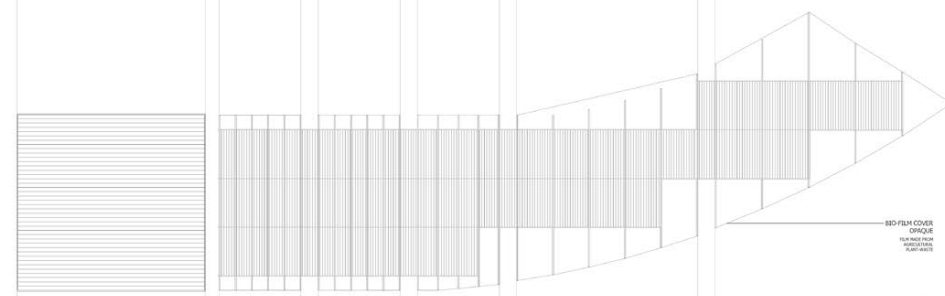


f

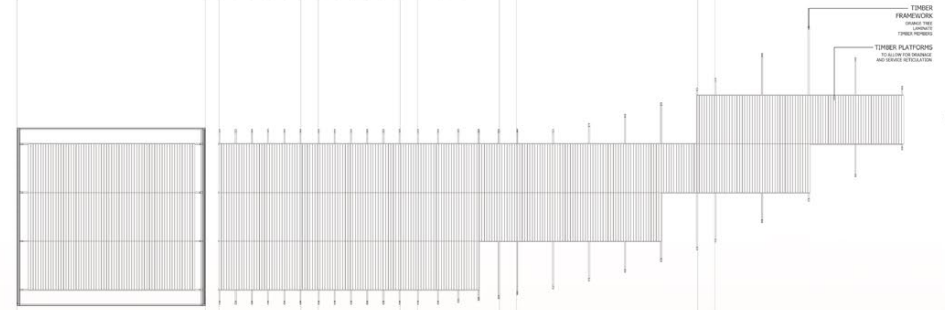
Greenhouse + Timber Pod Structures in Plan, Section and Elevation

1 : 100

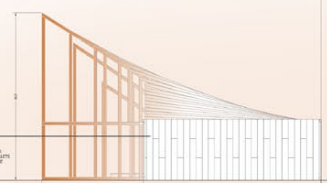
Roof Plan



Floor Plan



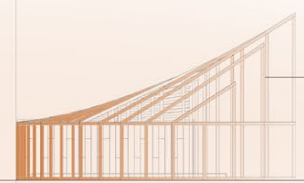
West Elevation



Section



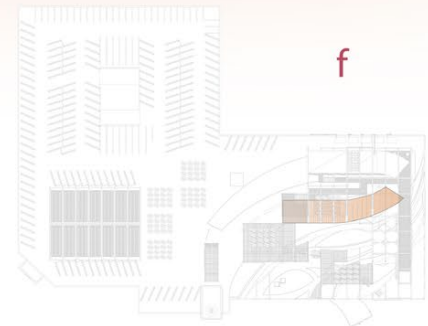
East Elevation



Details

A0

Context Plan



Context Elevation



ELEVATIONS + SECTIONS

Description of Elevation + Section Documentation

South Facade

is the primary facade that directly connects to the Grove Shopping Mall. From this side I wanted to visually express the symbolism in breaking down the concrete block in a downward slope from left to right and then building the new organic material structure in a upward swoop from left to right to represent the regrowth and persistence of nature in reclaiming its space.

East Facade

, in a similar fashion to the South facade, has had its heavy concrete elements deconstructed. Although, this time the organic material (timber frame) aims to re-complete the previous facade's visual parameters. This is to show a respect to the understanding that this is not a wild nature but one that is in harmony with and respectful of the presence the city has grown to hold in this area.

Section 01

demonstrates the mixed use of the building and how the parking allocation of the structure has not been replaced but rather minimised to match its demand for use. It also reveals the double-volume processing, exhibition and viewing platform which has become the core of the building where the public and private programmes collide.

Section 02

allows one to see how public programme + natural open-air growing is shuffled toward the open and sunny Southern portion of the space whereas the private programme + enclosed controlled growing is situated toward the northern more concealed areas of the structure.

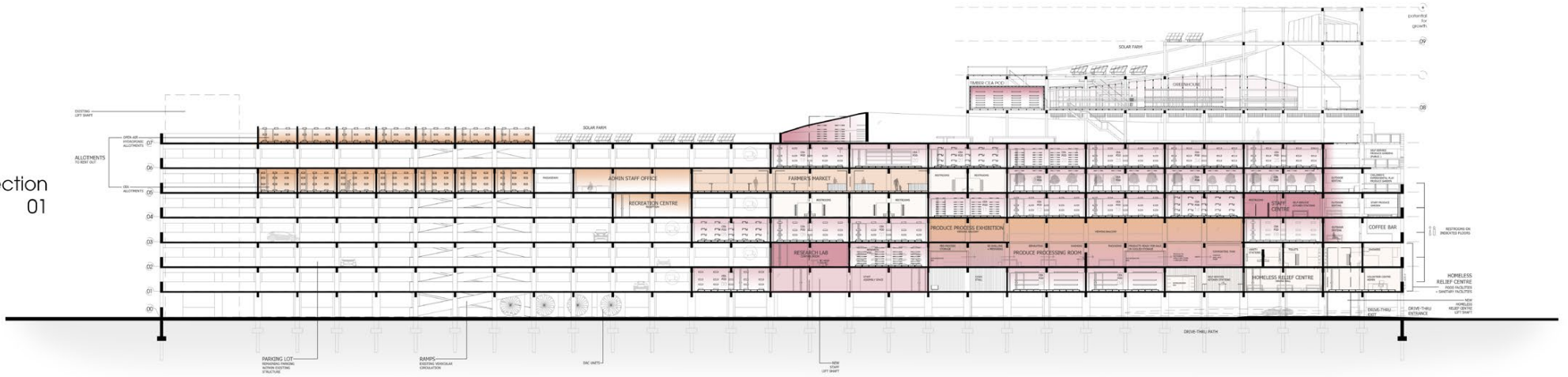
North Facade

highlights the celebration of service reticulation as an intentional design element to encourage users of the urban farm to physically witness the extensive resources used in an attempt at transparency.

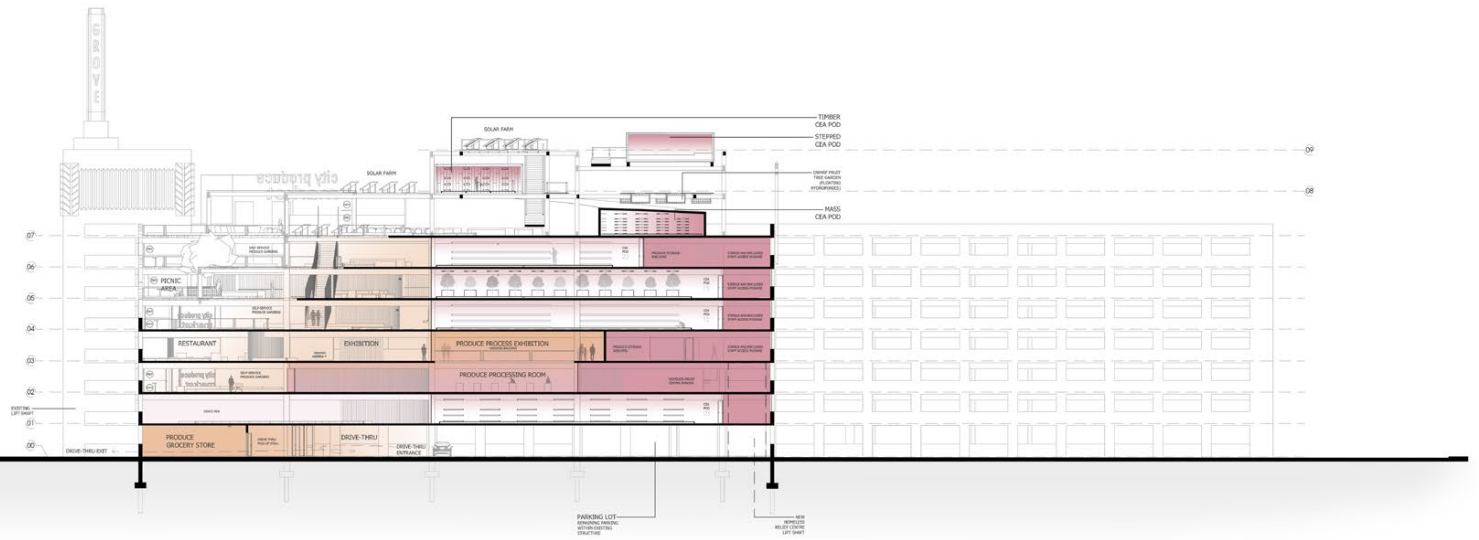
West Facade

shows the portion of the building that predominantly services the existing Grove Shopping Mall and Original Farmer's Market with their parking lot requirements.

Section 01

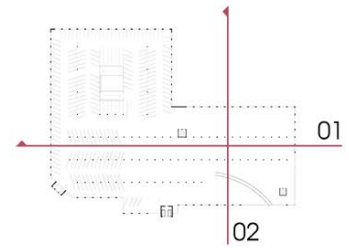


Section 02



A0
1 : 200

- CITY PRODUCE MARKET INFILL ●
- EXISTING SURROUNDING BUILDINGS ●



PLAN DOCUMENTATION

Description of Plan Documentation

1 + 2

The programme of the farm is organised into two key elements. 1) The Controlled Environment Agriculture Farm which is stacked to optimise space, enclosed, avoids pesticides because it is not exposed to pests, requires artificial lighting and hydroponic equipment. This is for private use by farm staff as these spaces should remain food-safe sterile environments. 2) The Interactive Farm is soil based and relies on the natural climate of the region. It is open-air and the public have access to these spaces.

Diagrams

explain the allocation of the above two key spatial elements in a plan. Then the existing grid is defined as the base for the design, and the movement and reticulation of people and produce in a generic layout is applied to confirm the layout concept for the following plans.

Ground 00 Floor Plan

represents direct contact with street edge and the point of transfer of produce to vehicular users. Additionally, the active pedestrian edge that meets the Grove Shopping Mall and the newly-made pedestrian-friendly street which originally separated the park from the Original Farmer's Market. This is the main entrance. There is also a pedestrian grocery store to interact with the mall consumer base or quick-stop visitors.

First 01 Floor Plan

hosts the first level of the homeless relief centre (food facilities where excess produce is available and paired with self-service

kitchen facilities and a dining area) , a cow's pen (the cow's have sufficient space and can easily be taken to the adjacent park of onto the rooftop at times when the caretakers so decide as seen in diagrams in the next chapter, these cows form an important part of the urban farm's ecosystem) , the control room and the first CEA growing pods (for cow feed and mycelium which requires little natural light and so can be placed in darker/lower parts of the structure. On this floor, the decontamination and changing room type is introduced as a threshold between the public parking lot and the sterile environments for staff access. Note 2 lift cores within new structure and 2 external existing lift cores.

Second 02 Floor Plan

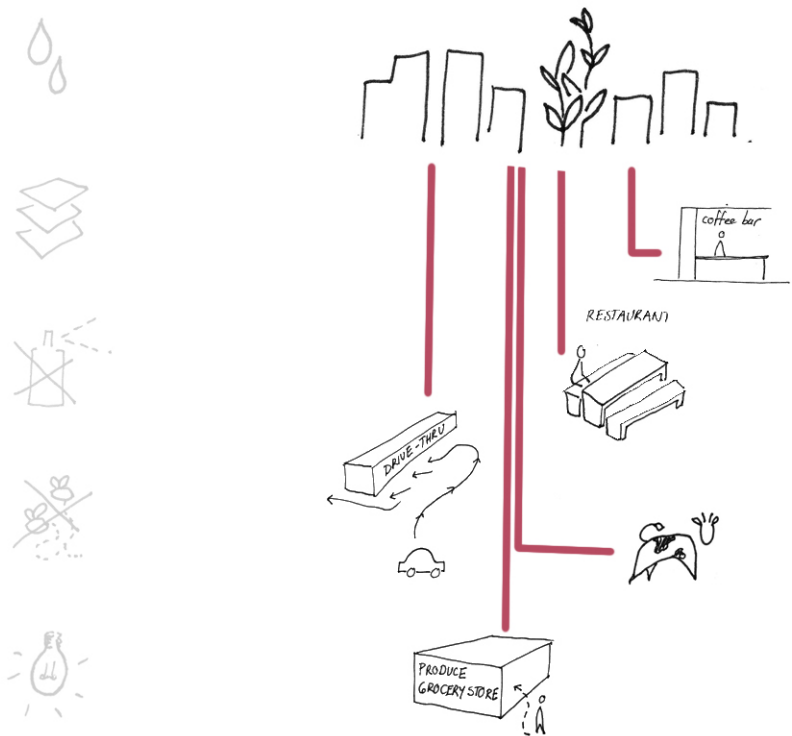
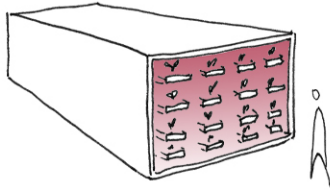
includes the second level of the homeless relief centre (which is a sanitary facility that reuses the farms grey water for users to bath, it also allows users to with cars to park), the research centre for experimentation in the industry of urban farming and the lower level of the processing room (where produce is sorted, washed, de-shelled, etc.). This is the first level that includes an open-air soil based interactive garden (where customers can retrieve their own produce from the source).

Third 03 Floor Plan

Apart from growing pods, this floor is the second main entrance that leads into an exhibition space (which leads you through the history of the site, the theory about traditional and urban farming and ends on the viewing platform within the processing room. There is also a restaurant and coffee shop with food/products sourced from the farm.

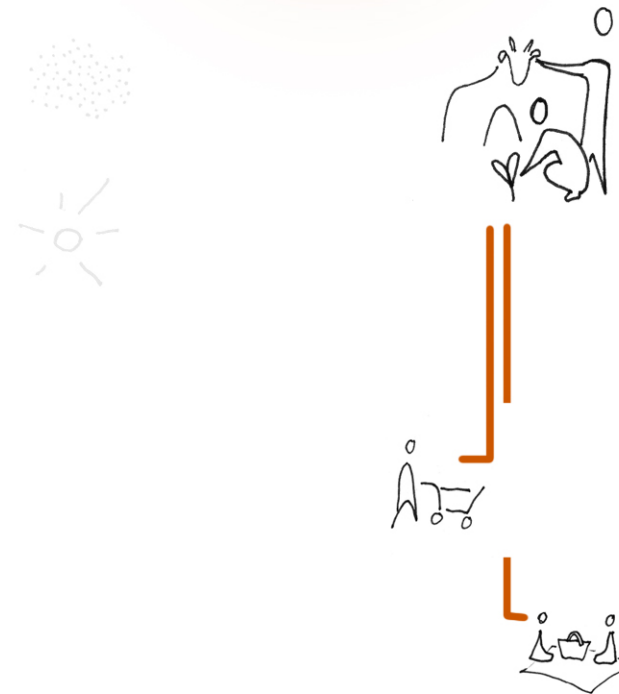
1

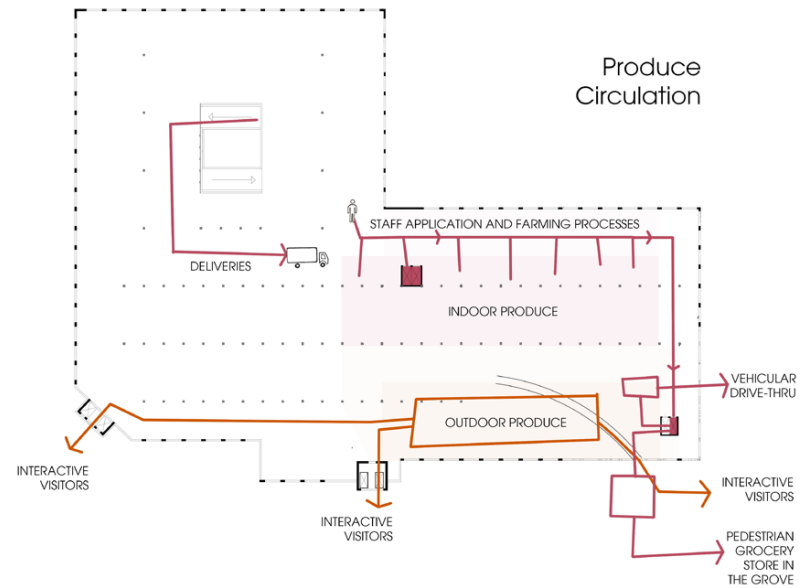
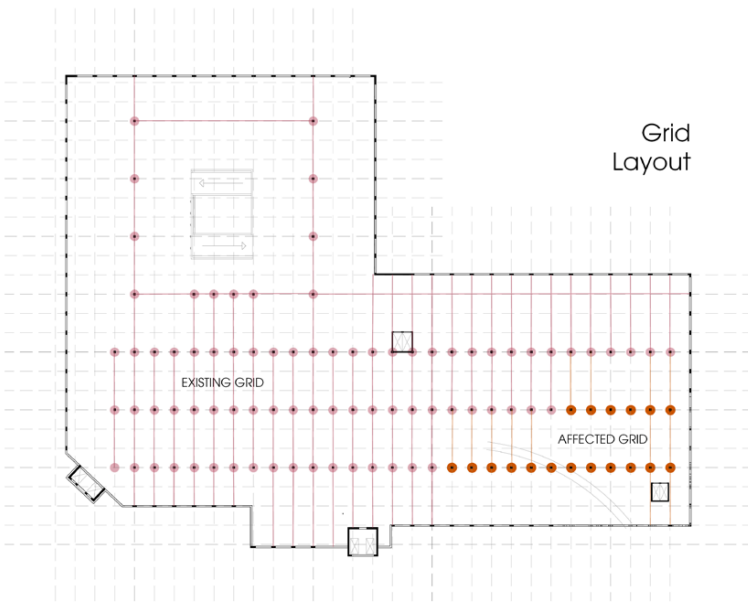
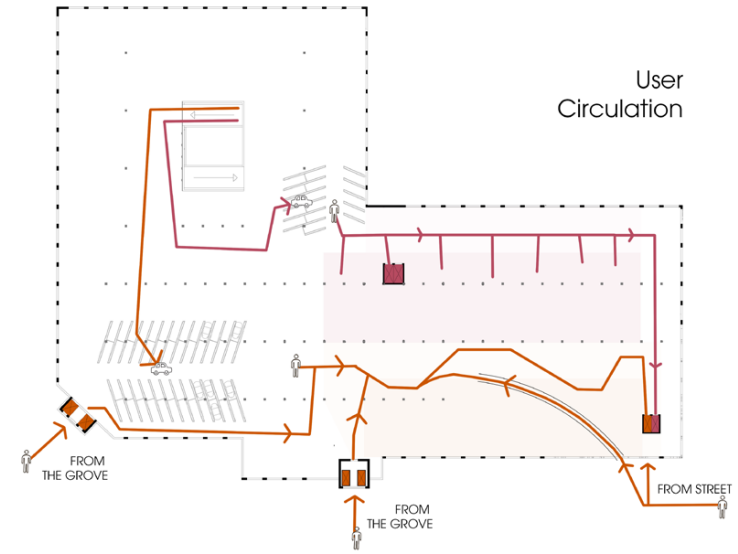
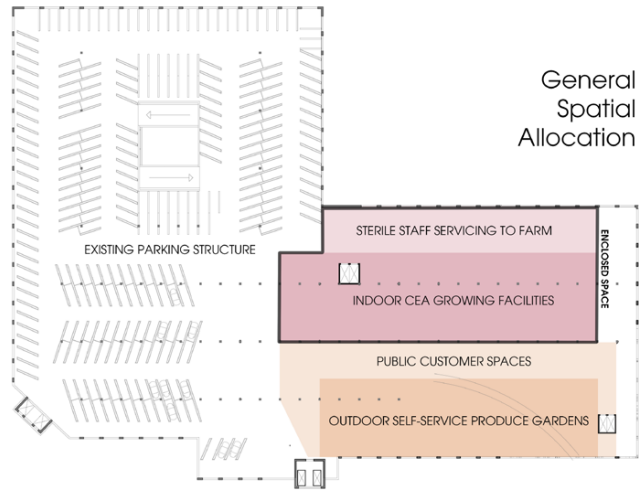
CEA Farm



2

Interactive Farm



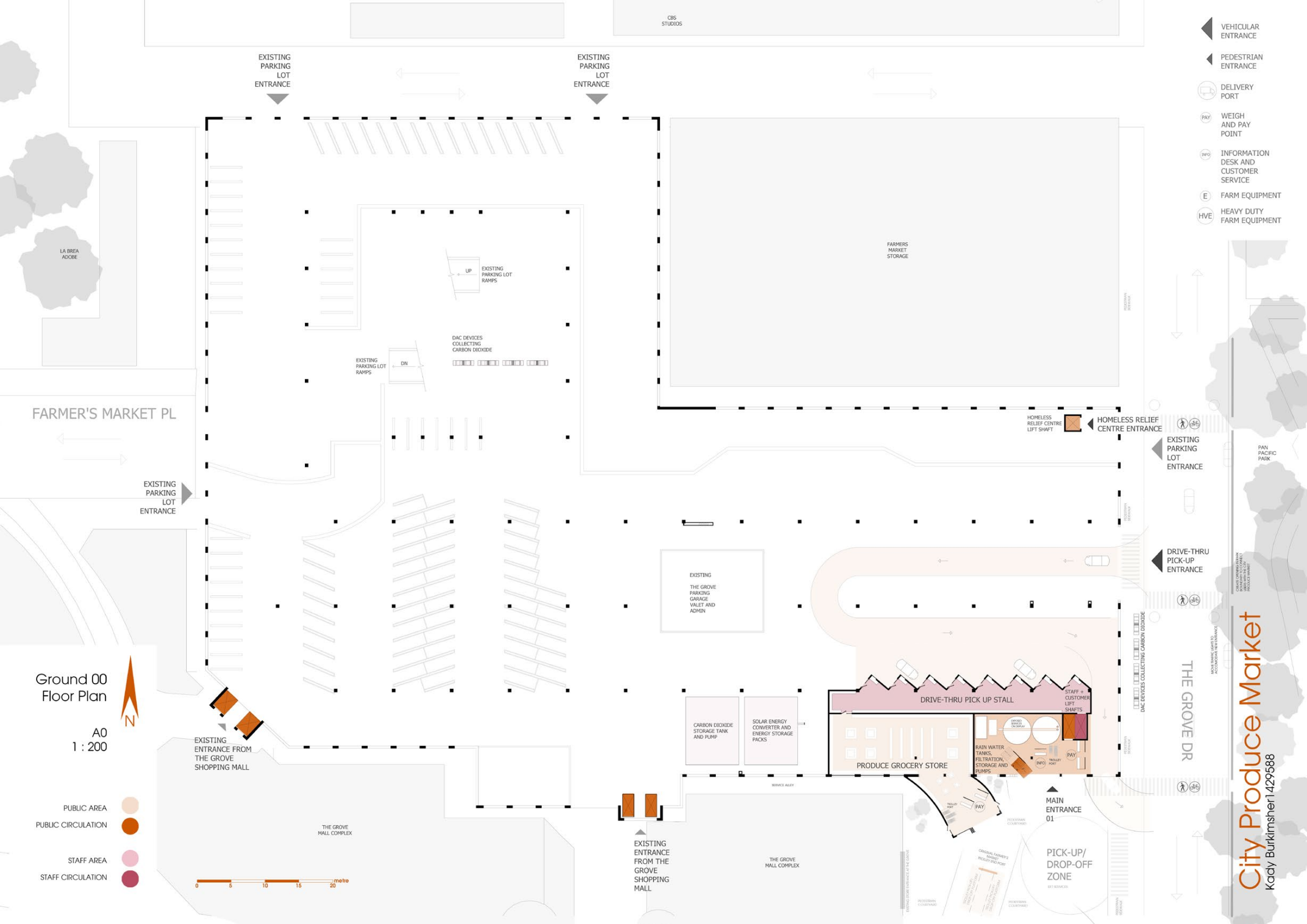


Diagrams

A0
1 : 500

- PUBLIC AREA
- PUBLIC CIRCULATION
- STAFF AREA
- STAFF CIRCULATION





- VEHICULAR ENTRANCE
- PEDESTRIAN ENTRANCE
- DELIVERY PORT
- WEIGH AND PAY POINT
- INFORMATION DESK AND CUSTOMER SERVICE
- FARM EQUIPMENT
- HEAVY DUTY FARM EQUIPMENT

Ground 00
Floor Plan

A0
1 : 200

- PUBLIC AREA
- PUBLIC CIRCULATION
- STAFF AREA
- STAFF CIRCULATION

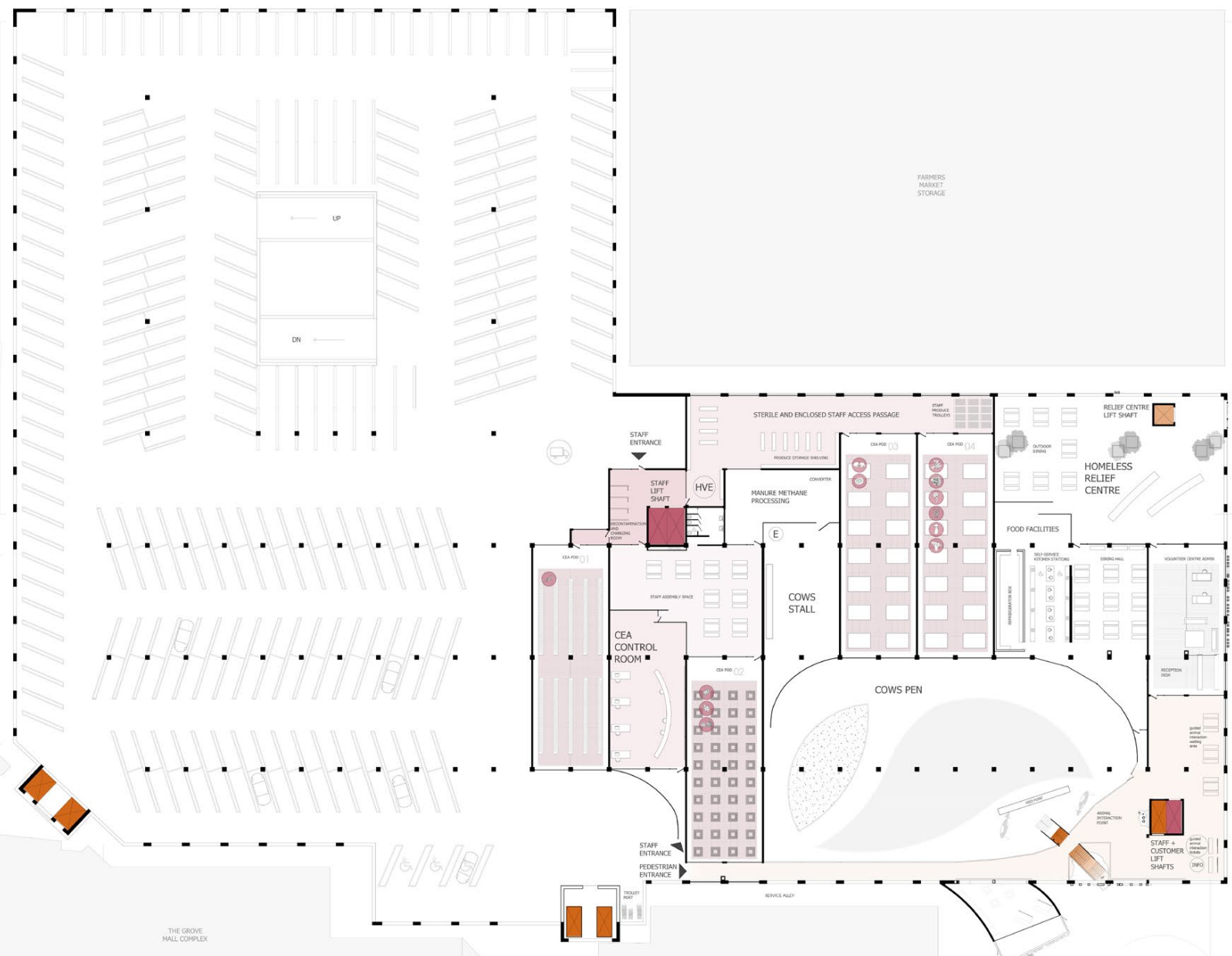


- fruits
- 01 cow feed
- 02 blueberries
- cranberries
- raspberries
- 03 white + brown mushrooms
- portobello mushrooms
- 04 oyster mushrooms
- shiitake mushrooms
- enoki mushrooms
- king oyster mushrooms
- chanterelle mushrooms
- mushrooms

- VEHICULAR ENTRANCE
- PEDESTRIAN ENTRANCE
- DELIVERY PORT
- PAY WEIGH AND PAY POINT
- INFO INFORMATION DESK AND CUSTOMER SERVICE
- E FARM EQUIPMENT
- HVE HEAVY DUTY FARM EQUIPMENT

First 01 Floor Plan
A0
1 : 200

- PUBLIC AREA
- PUBLIC CIRCULATION
- STAFF AREA
- STAFF CIRCULATION

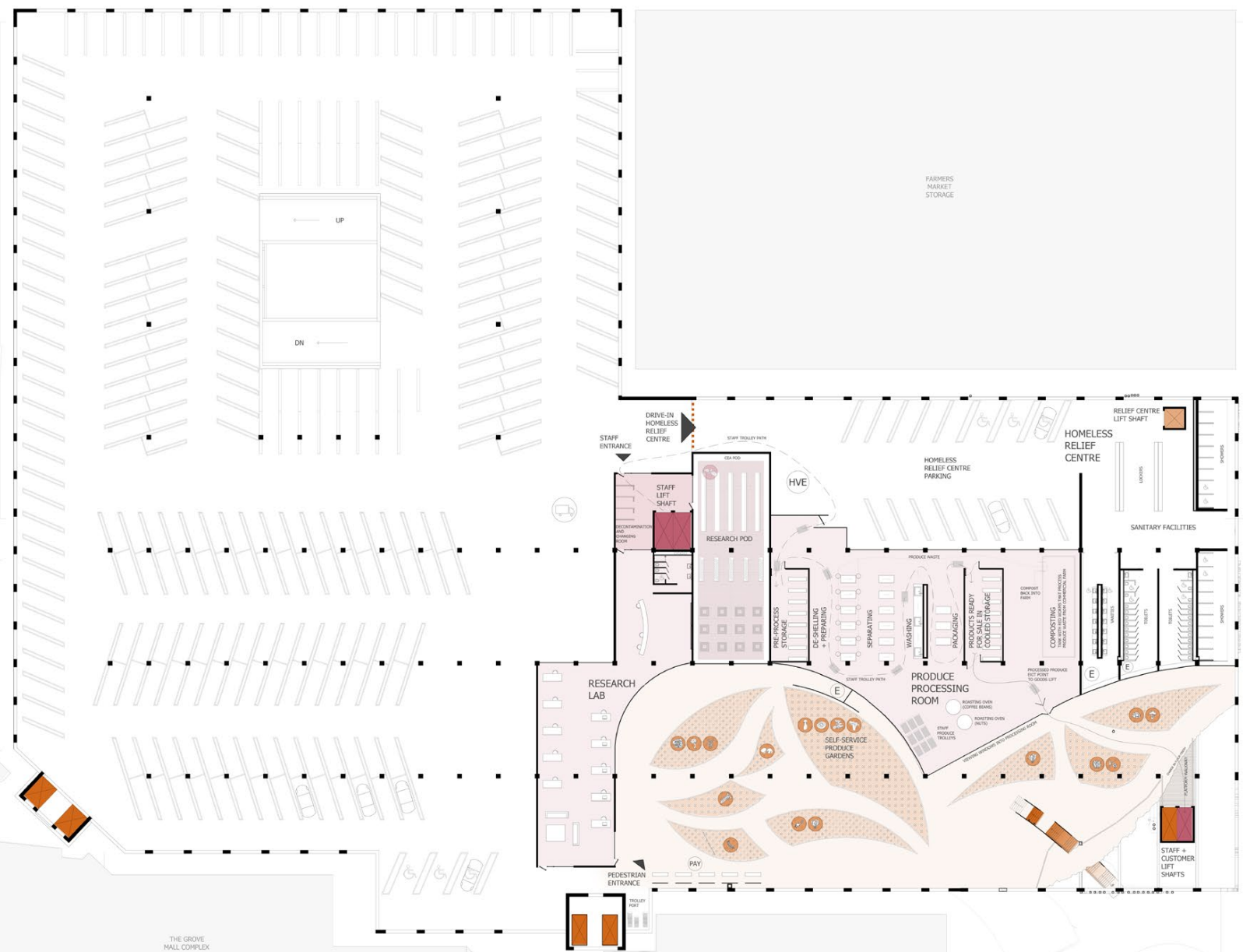


THE GROVE DR

- research pod
- various experimental crops/produce
- self-service produce gardens
- white + brown mushrooms
- portobello mushrooms
- oyster mushrooms
- maitake mushrooms
- shiitake mushrooms
- enoki mushrooms
- king oyster mushrooms
- chanterelle mushrooms
- peas
- celery
- garlic cloves
- asparagus
- brussels sprouts
- cauliflower
- broccoli

Second 02
Floor Plan
A0
1 : 200

- PUBLIC AREA
- PUBLIC CIRCULATION
- STAFF AREA
- STAFF CIRCULATION



- VEHICULAR ENTRANCE
- PEDESTRIAN ENTRANCE
- DELIVERY PORT
- WEIGH AND PAY POINT
- INFORMATION DESK AND CUSTOMER SERVICE
- FARM EQUIPMENT
- HEAVY DUTY FARM EQUIPMENT

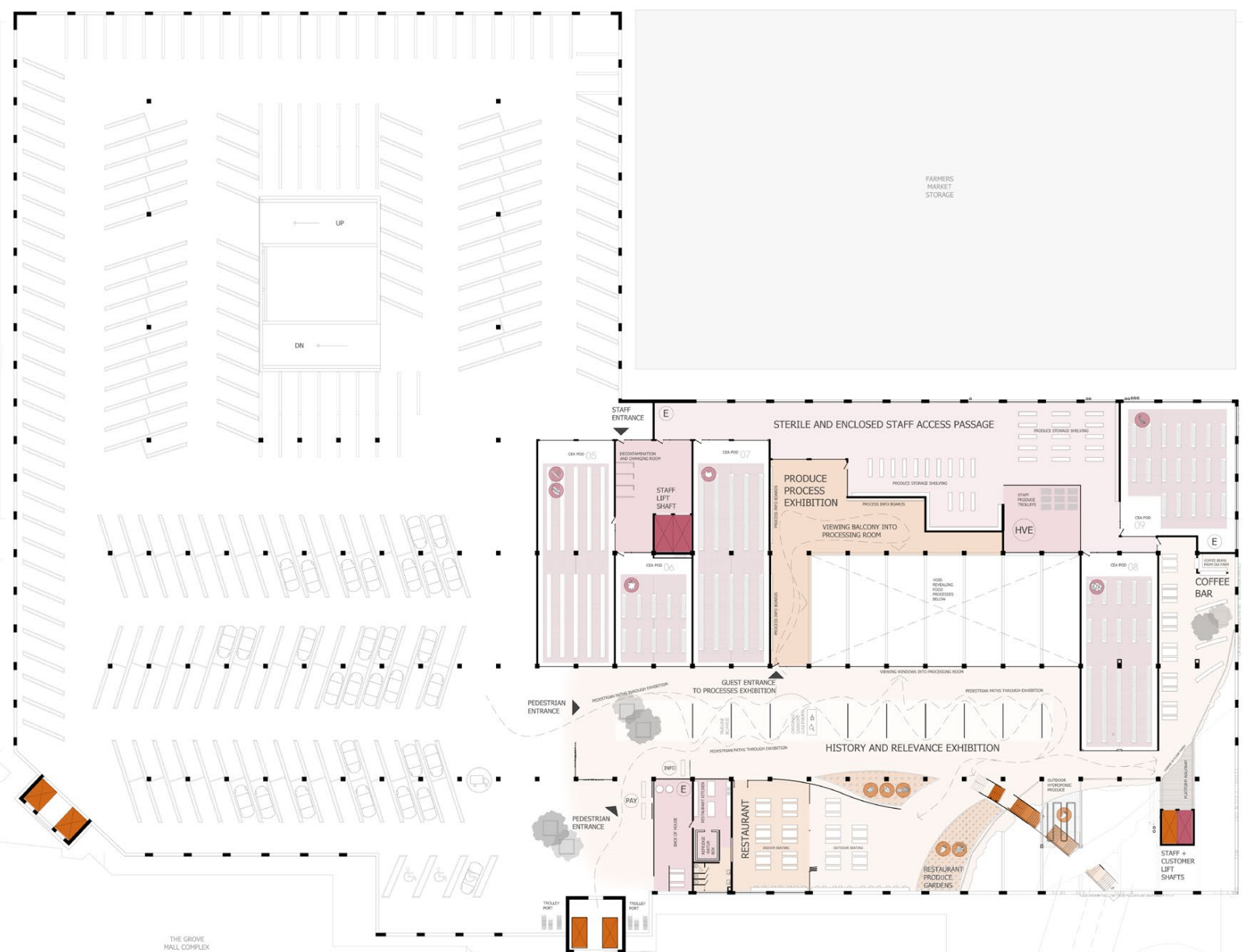
THE GROVE DR

- vegetables:
 - 05 cucumbers
 - 06 zucchini
 - 06 bell peppers
 - 07 tomatoes
 - 08 lettuce varieties
 - 09 peas
- self-service produce gardens
- fruits:
 - blueberries
 - cranberries
 - raspberries
 - strawberries
 - grape varieties

- VEHICULAR ENTRANCE
- PEDESTRIAN ENTRANCE
- DELIVERY PORT
- WEIGH AND PAY POINT
- INFORMATION DESK AND CUSTOMER SERVICE
- FARM EQUIPMENT
- HEAVY DUTY FARM EQUIPMENT

LA BREA ADOBE

FARMER'S MARKET PL



Third 03
Floor Plan

A0
1 : 200

- PUBLIC AREA
- PUBLIC CIRCULATION
- STAFF AREA
- STAFF CIRCULATION



THE GROVE DR

PICK-UP/
DROP-OFF
ZONE

Fourth 04 Floor Plan

has a recreation centre (where residents can come enjoy classes aimed at agricultural education or even yoga or dance, dependant on demand). There is also a staff centre on this level (with its own access to productive gardens and self-service kitchen facilities).

Fifth 05 Floor Plan

holds the event spaces including a picnic area and a farmers' market. There are allotments that reach into the western portion of the structure where anyone can rent out controlled growing spaces for their own fresh produce with an accessible option to sell some of it directly at the market if so desired. The admin offices and children's experimental gardens also reside on this floor.

Sixth 06 Floor Plan

is primarily made up of the two key components - the CEA farming and the interactive farming.

Seventh 07 Floor Plan

is the roof-top level of the existing concrete structure and is therefore the first level to host organic form that can defy the constraints of the existing grid. This is also the last level of parking and so the third main entrance is located here. There are more allotments here although these are open-air hydroponic pods available to rent out to the public.

Eighth 08 Floor Plan

provides a hydroponic dwarf fruit tree garden that seemingly floats suspended as a beacon seen from far away. The timber platform creates interlinking walk-ways and soft connections to the pedestrian core lifts. There is one enclosed timber pod on this level as well as a breezy open greenhouse-like structure.

Ninth 09 Floor Plan

has a viewing deck that looks out over Los Angeles, a bar with seating along the platform and access to the stepped enclosed timber pod.

- 10 cabbage
- 11 green beans
- spring onions
- asparagus
- 12 broccoli
- cauliflower
- 13 celery
- brussel sprouts
- spinach
- 14 baby potatoes
- self-service produce gardens
- bellpeppers
- tomatoes
- zucchini
- cucumbers
- spring onions
- lettuce varieties
- asparagus

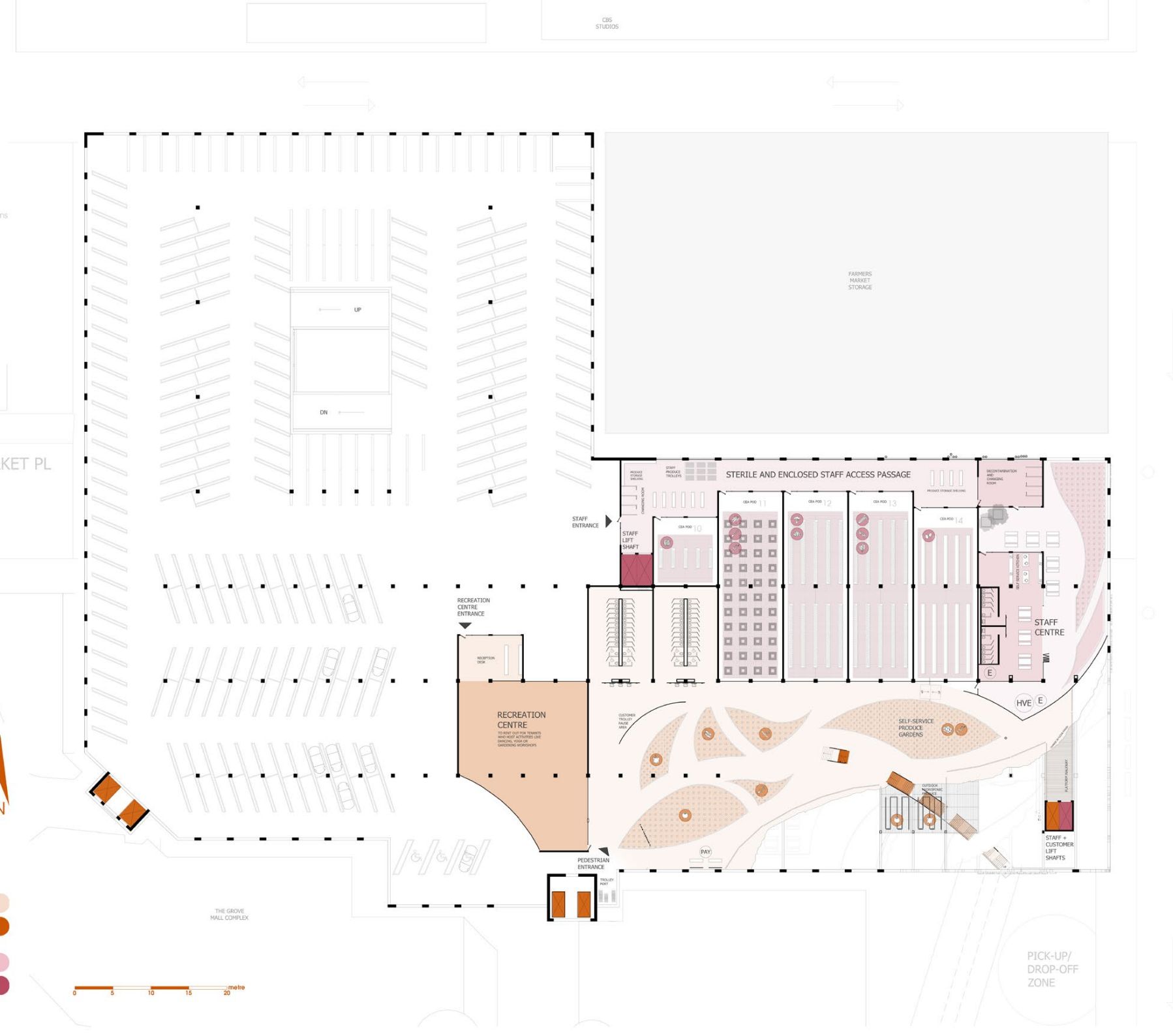
- VEHICULAR ENTRANCE
- PEDESTRIAN ENTRANCE
- DELIVERY PORT
- WEIGH AND PAY POINT
- INFORMATION DESK AND CUSTOMER SERVICE
- FARM EQUIPMENT
- HEAVY DUTY FARM EQUIPMENT

FARMER'S MARKET PL

Fourth 04 Floor Plan

A0
1 : 200

- PUBLIC AREA
- PUBLIC CIRCULATION
- STAFF AREA
- STAFF CIRCULATION

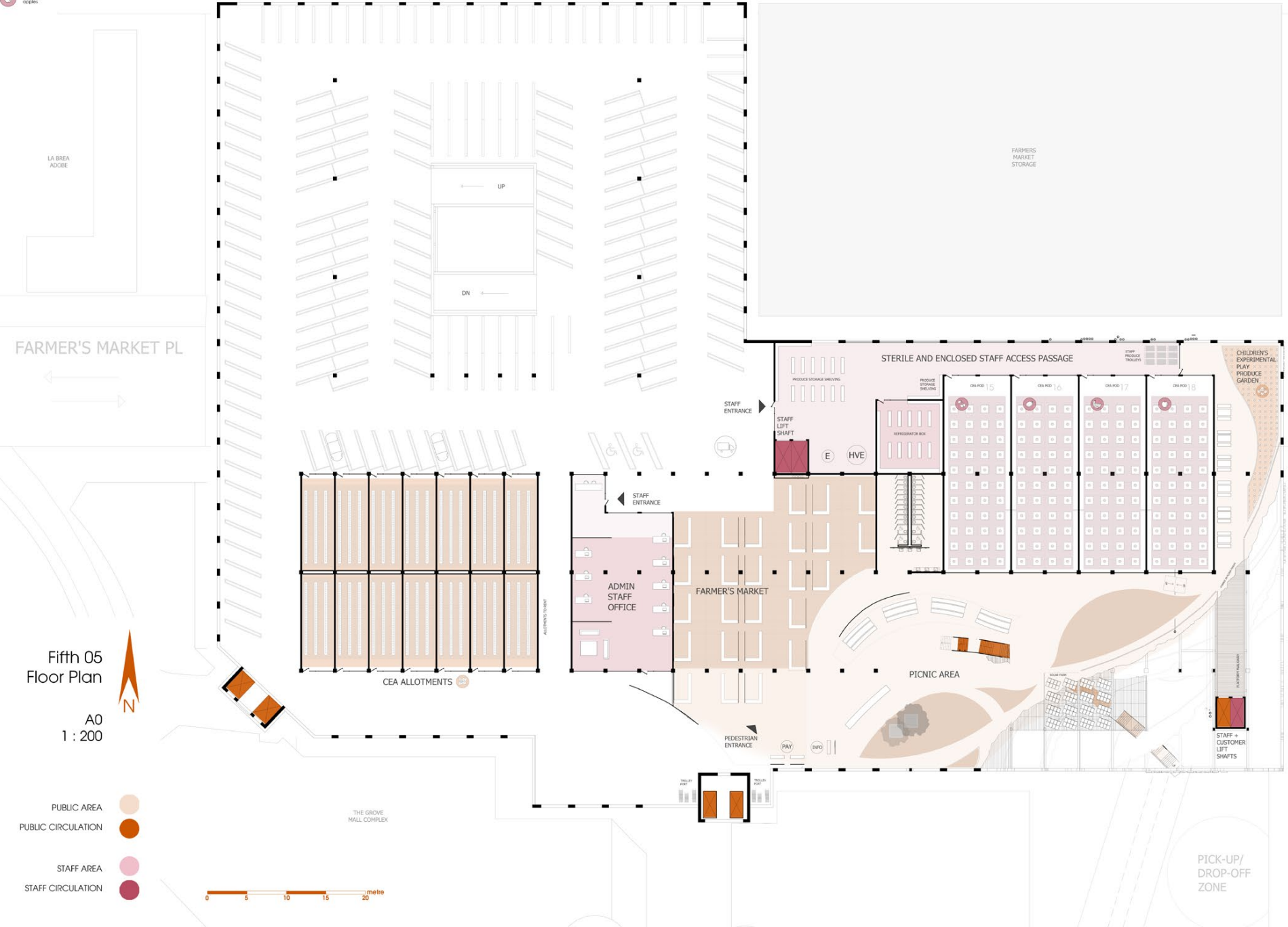


THE GROVE DR

PICK-UP/
DROP-OFF
ZONE

- CEA allotments
- growing pods to rent
- children's experimental play produce garden
- 15 cherries
- 16 lemons
- 17 bananas
- 18 apples

- VEHICULAR ENTRANCE
- PEDESTRIAN ENTRANCE
- DELIVERY PORT
- WEIGH AND PAY POINT
- INFORMATION DESK AND CUSTOMER SERVICE
- FARM EQUIPMENT
- HEAVY DUTY FARM EQUIPMENT



Fifth 05
Floor Plan
A0
1 : 200

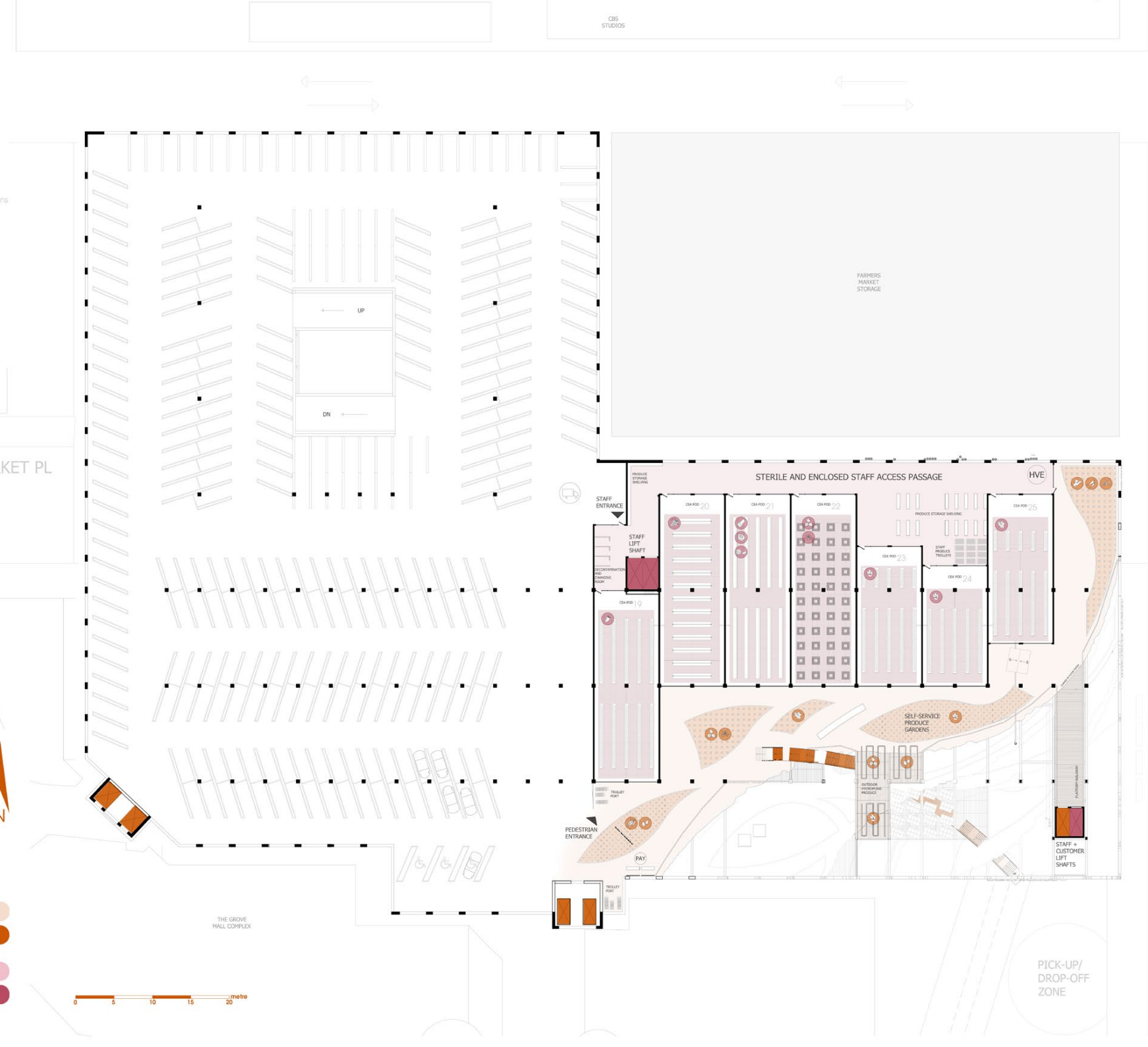
- PUBLIC AREA
- PUBLIC CIRCULATION
- STAFF AREA
- STAFF CIRCULATION



THE GROVE DR

PICK-UP/
DROP-OFF
ZONE

- fruits
 - 19 strawberries
 - 20 grape varieties
 - 21 squash
 - cantaloupe
 - watermelon
- legumes
 - 22 chickpeas
 - lentils
 - 23 + 24 bean varieties
 - 25 peanuts
- veg
 - self-service produce gardens
 - greenbeans
 - baby potatoes
 - chickpeas
 - lentils
 - peanuts
 - bean varieties
- spices
 - ginger
 - chilies
 - chives



- VEHICULAR ENTRANCE
- PEDESTRIAN ENTRANCE
- DELIVERY PORT
- PAY WEIGH AND PAY POINT
- INFO INFORMATION DESK AND CUSTOMER SERVICE
- E FARM EQUIPMENT
- HVE HEAVY DUTY FARM EQUIPMENT

FARMER'S MARKET PL

Sixth 06
Floor Plan
A0
1 : 200

- PUBLIC AREA
- PUBLIC CIRCULATION
- STAFF AREA
- STAFF CIRCULATION



THE GROVE DR

PICK-UP/
DROP-OFF
ZONE

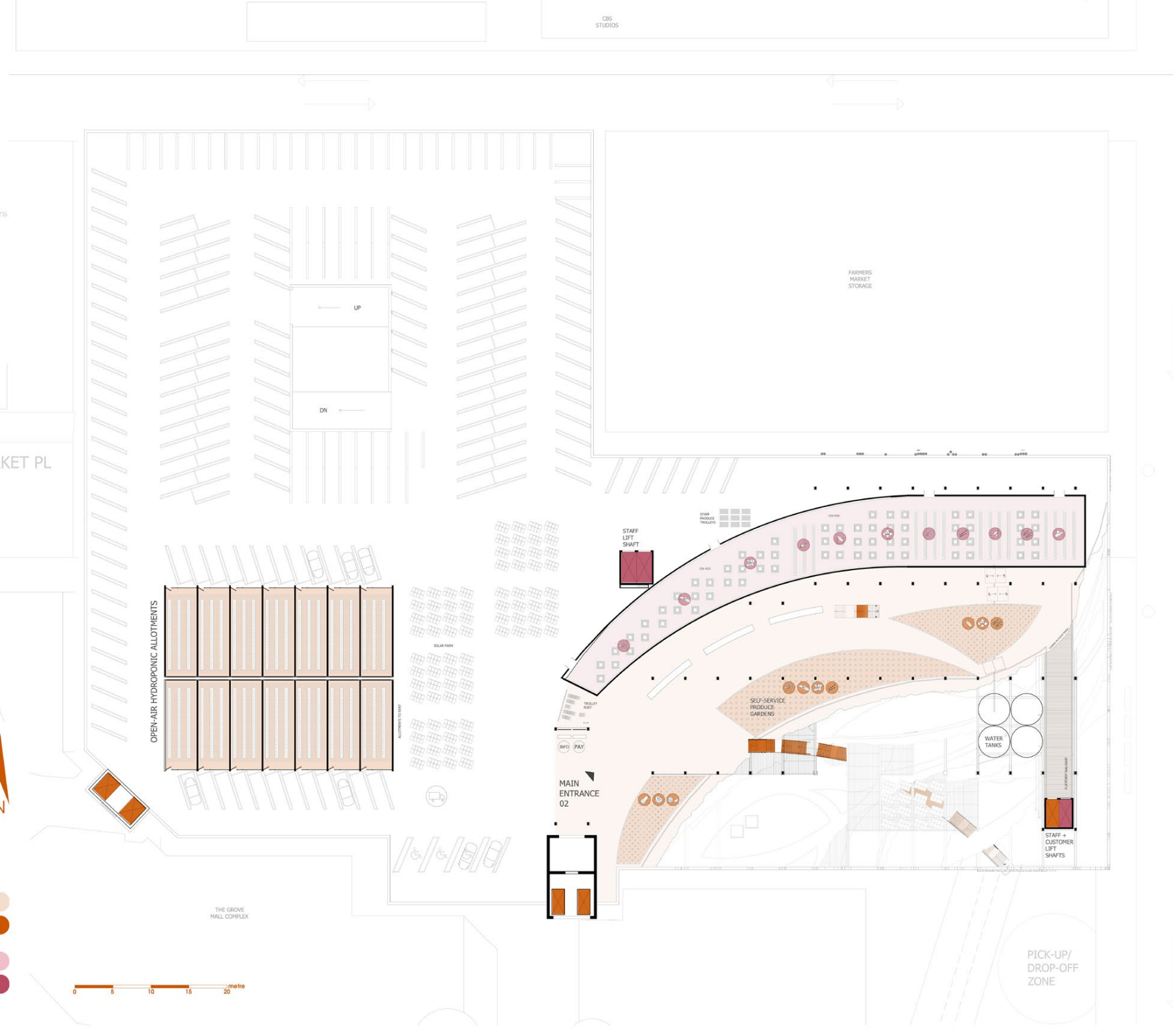
- mass CEA pod
- basil
- mint
- garlic chives
- sage
- oregano
- chives
- thyme
- chilies
- rosemary
- ginger
- self-service produce gardens
- squash
- cornish cobbler
- watermelon
- basil
- mint
- thyme
- sage
- oregano
- rosemary

- VEHICULAR ENTRANCE
- PEDESTRIAN ENTRANCE
- DELIVERY PORT
- PAY WEIGH AND PAY POINT
- INFO INFORMATION DESK AND CUSTOMER SERVICE
- E FARM EQUIPMENT
- HVE HEAVY DUTY FARM EQUIPMENT

Seventh 07 Floor Plan

A0
1 : 200

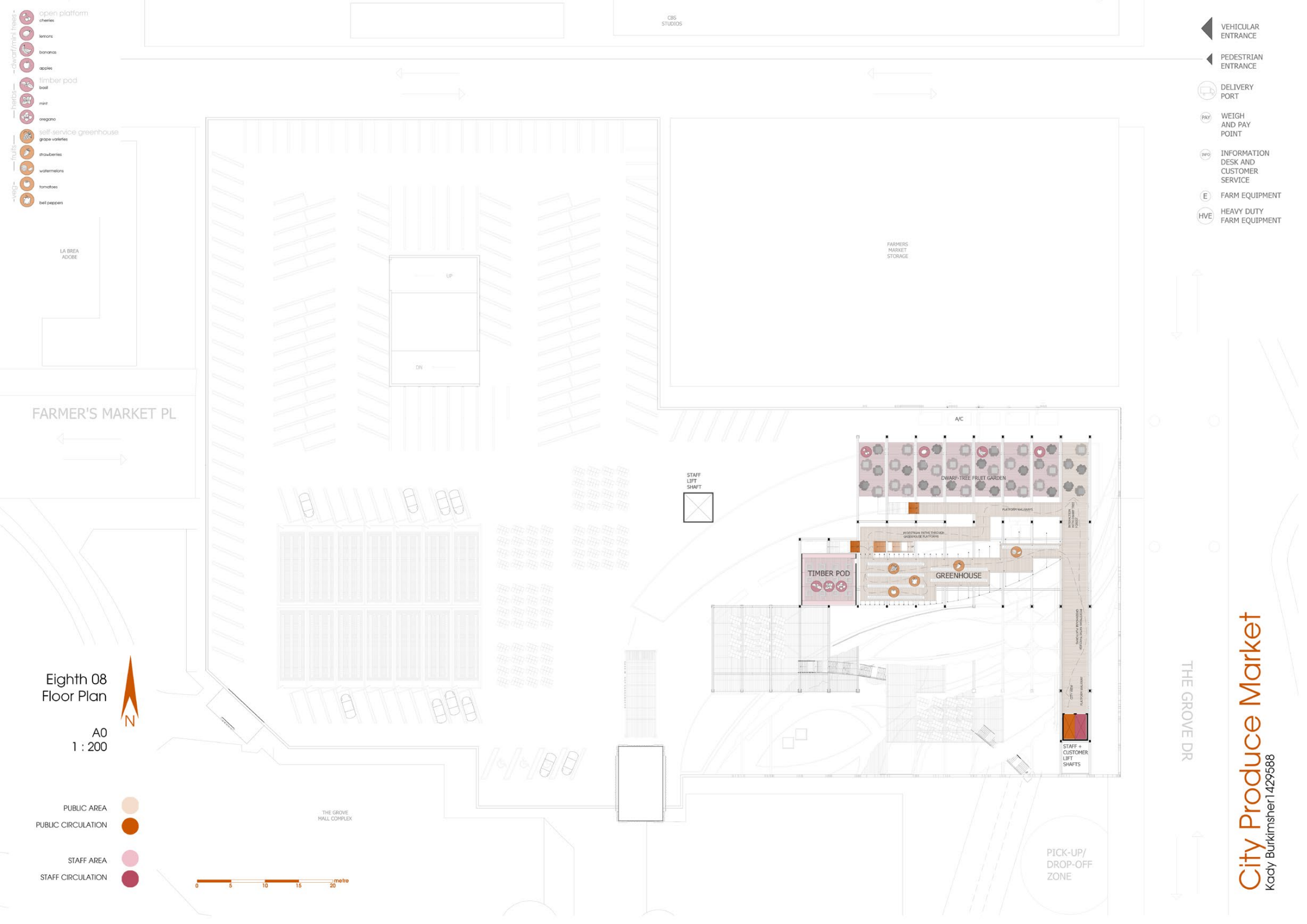
- PUBLIC AREA
- PUBLIC CIRCULATION
- STAFF AREA
- STAFF CIRCULATION



THE GROVE DR

- open platform
- cherries
- lemons
- bananas
- apples
- timber pod
- basil
- mint
- oregano
- self-service greenhouse
- grape varieties
- strawberries
- watermelons
- tomatoes
- bell peppers

- VEHICULAR ENTRANCE
- PEDESTRIAN ENTRANCE
- DELIVERY PORT
- WEIGH AND PAY POINT
- INFORMATION DESK AND CUSTOMER SERVICE
- FARM EQUIPMENT
- HEAVY DUTY FARM EQUIPMENT



FARMER'S MARKET PL

Eighth 08 Floor Plan

A0
1 : 200

- PUBLIC AREA
- PUBLIC CIRCULATION
- STAFF AREA
- STAFF CIRCULATION



THE GROVE DR

City Produce Market
Kody Burkimsher 1429588

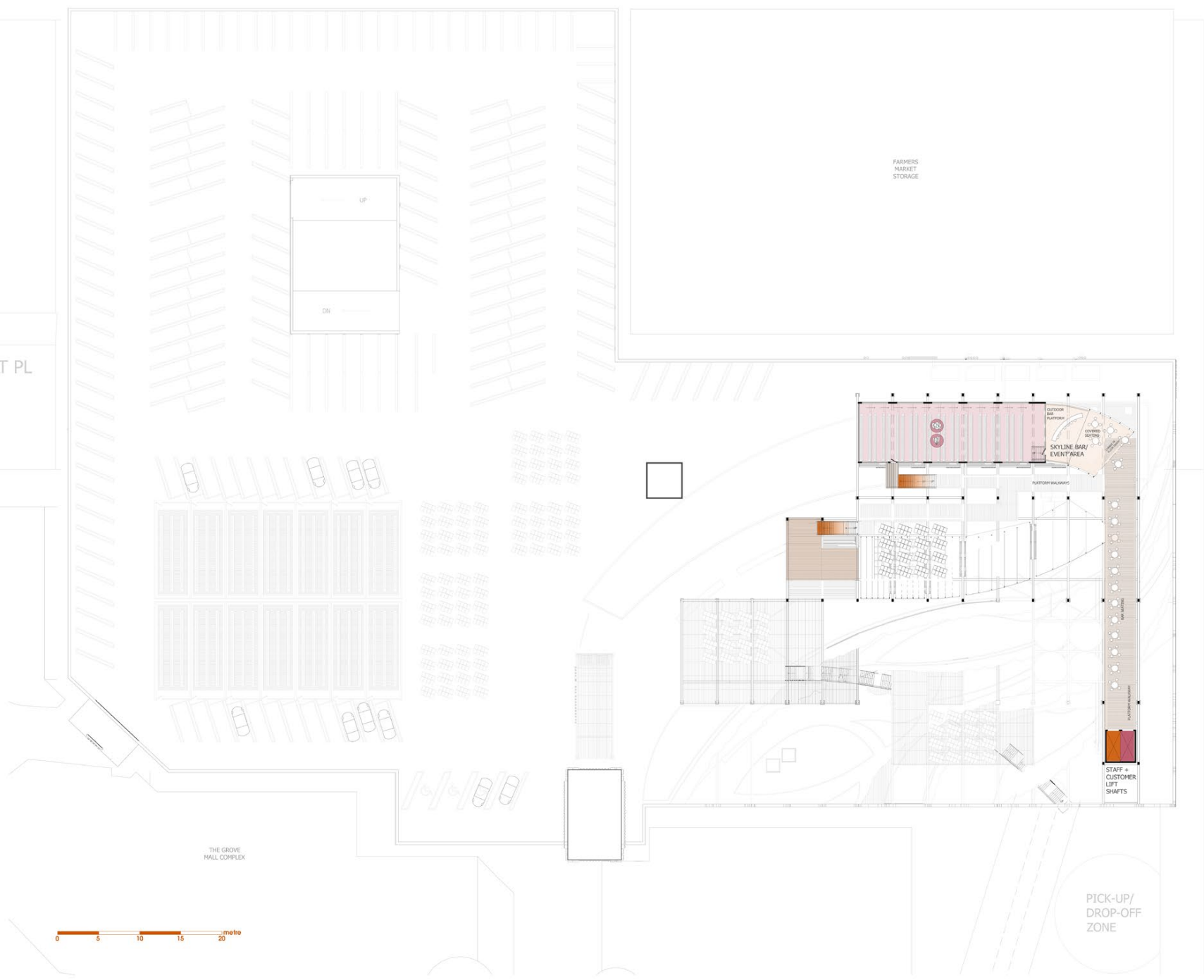
PICK-UP/
DROP-OFF
ZONE

-  VEHICULAR ENTRANCE
-  PEDESTRIAN ENTRANCE
-  DELIVERY PORT
-  WEIGH AND PAY POINT
-  INFORMATION DESK AND CUSTOMER SERVICE
-  FARM EQUIPMENT
-  HEAVY DUTY FARM EQUIPMENT

Ninth 09
 Floor Plan
 A0
 1 : 200



-  PUBLIC AREA
-  PUBLIC CIRCULATION
-  STAFF AREA
-  STAFF CIRCULATION

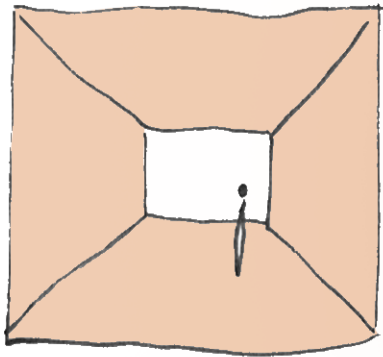


THE GROVE DR

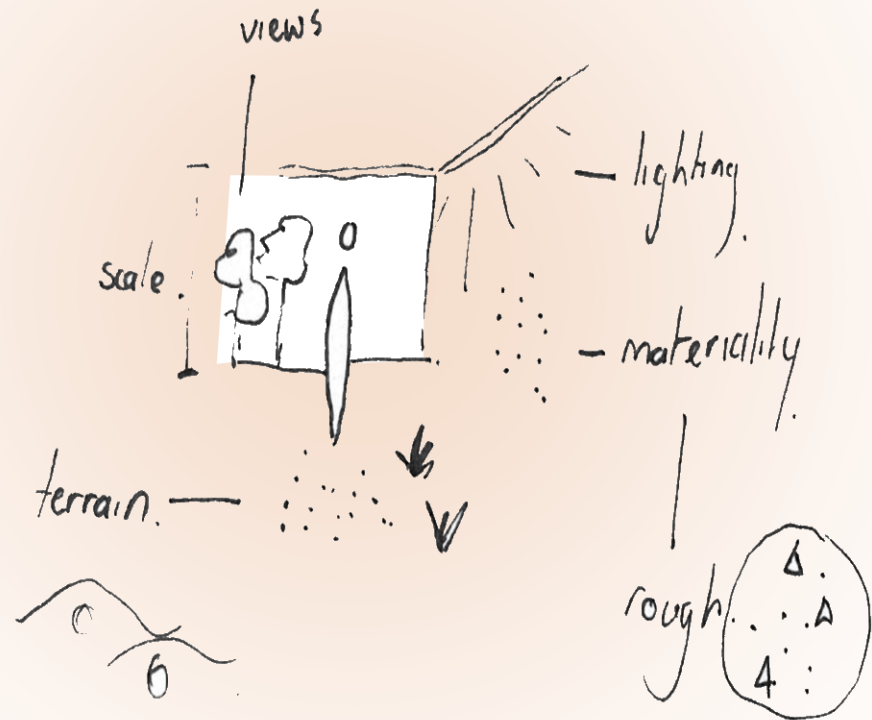
ELEMENT LINKS

Phenomenological / Experiential Approach

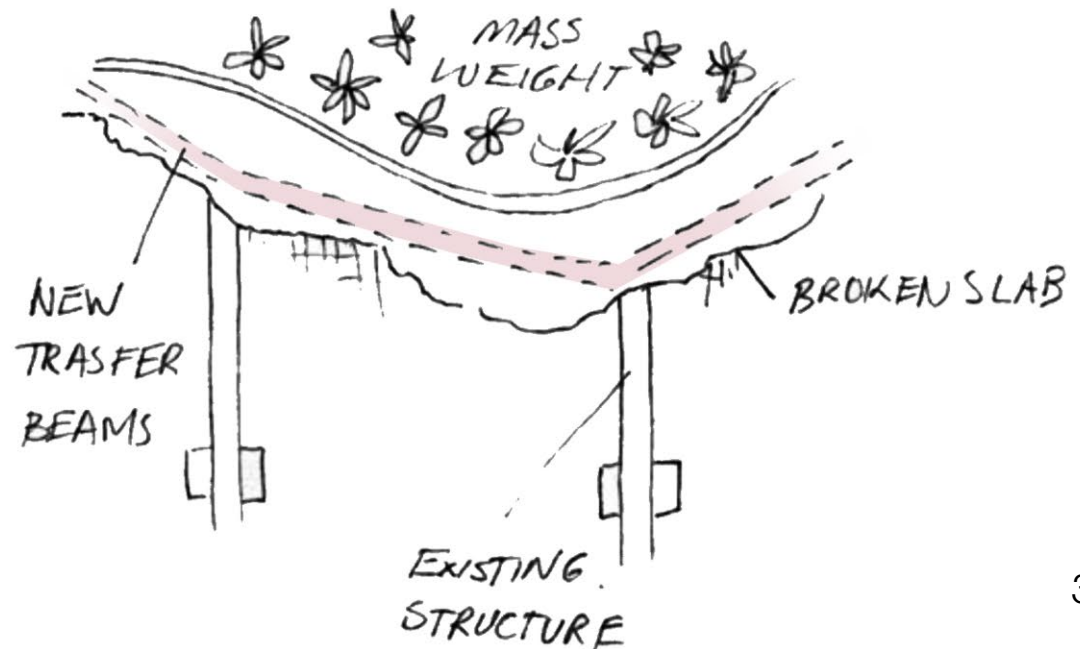
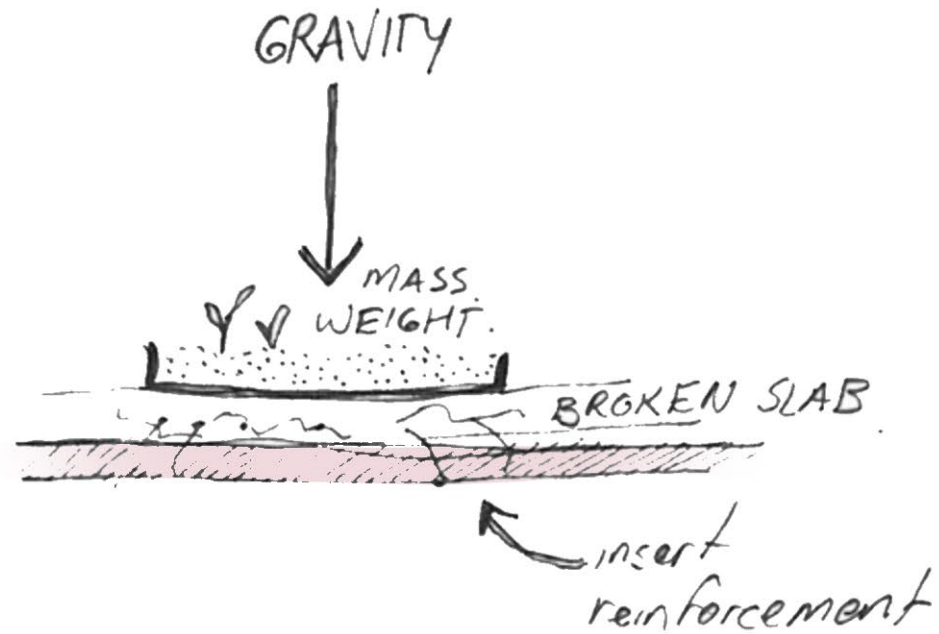
The existing parking structure is vast in nature, this is intentionally retained in the design. The infill structure starts to ground the spaces and soil, plants, rough/raw concrete, reflective glass elements give the building a texture, smell, tastes and sound qualities.



Both the natural lighting and the artificial magenta UV lights dance through the space bouncing off some surfaces and settling on others, guiding walkways and introducing an energy associated with waking up, movement and activity. Changes in levels and mounds that allow one to gradually move over horizontal surfaces, begin to mimic natural terrain as if moving through this structure activates that same limb movements and senses as a hiking trail in the Hollywood Hills.

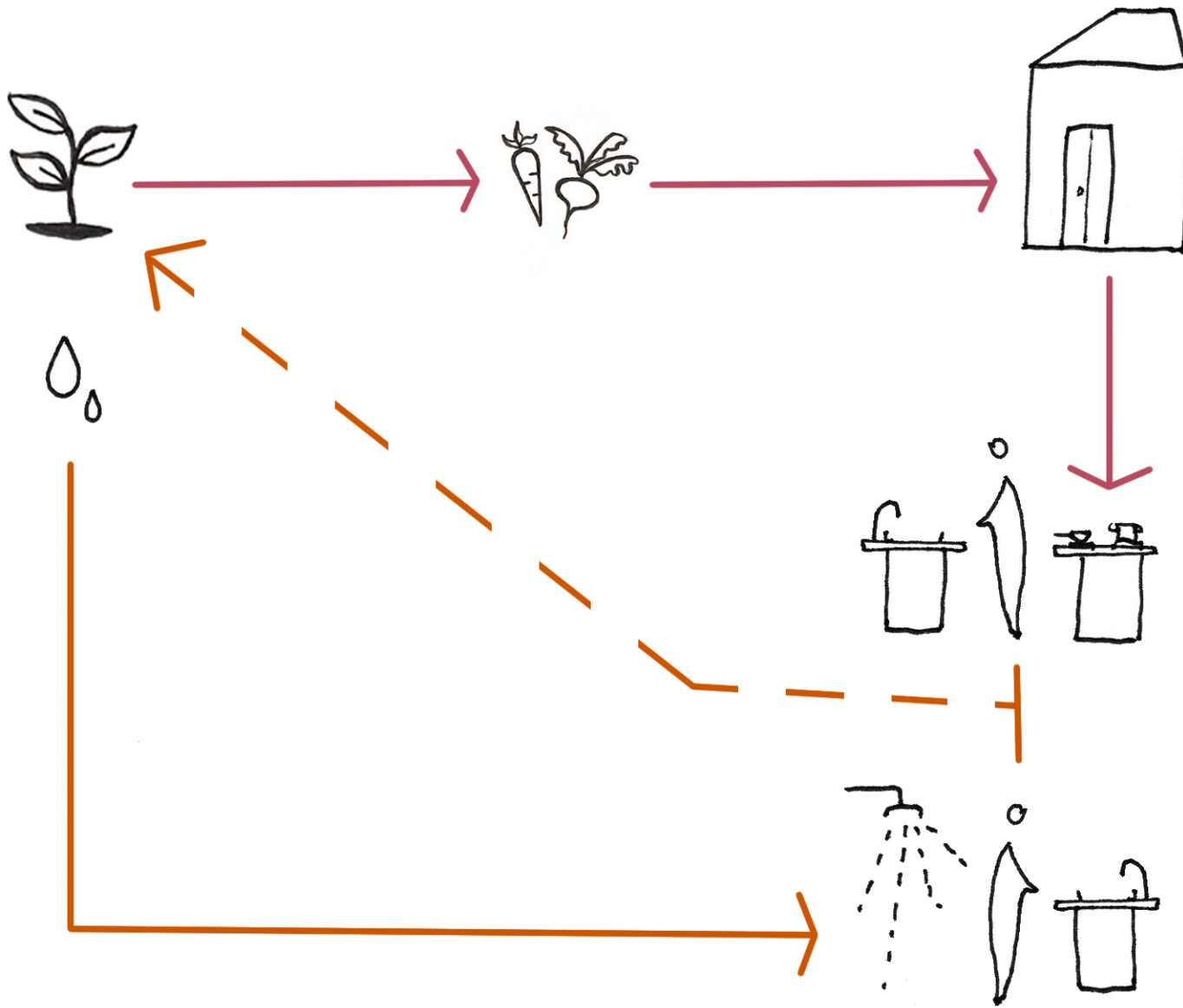


When breaking does the existing structure, a rule of thirds was used deciphering where curves would lie on the existing structure and so the existing material should be secure enough for little support. In some places, however, hidden under the slabs, new steel re-inforcement transfer beam will need to be installed to support cantilevering forms.



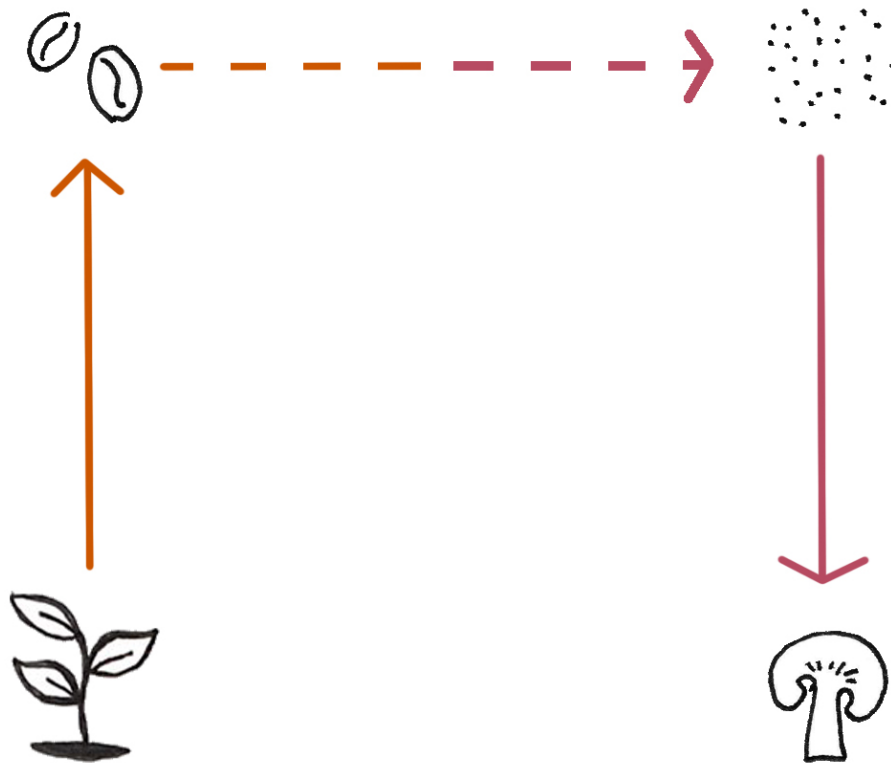
● New Steel Re-inforcement Beams

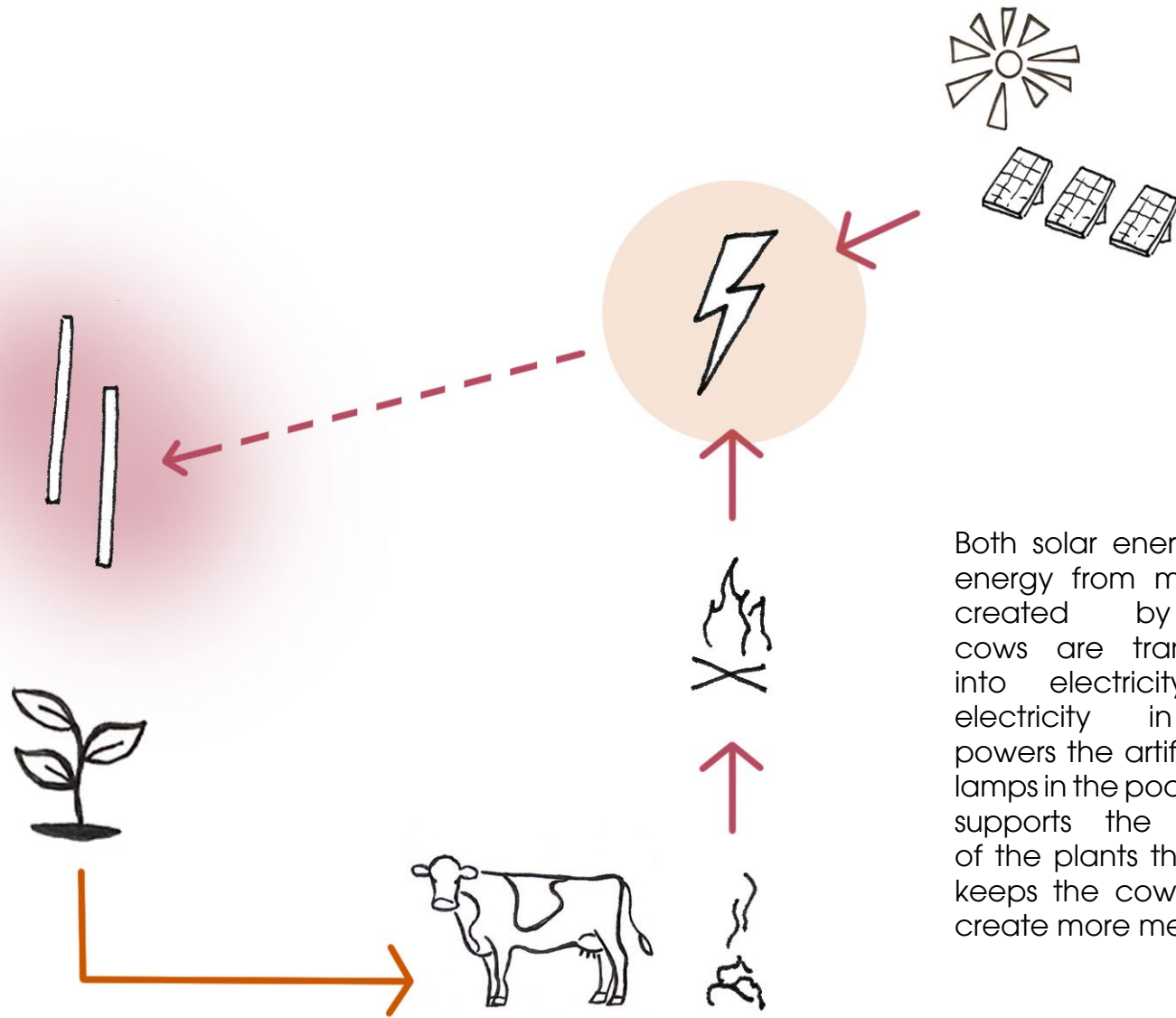
Re-inforcement



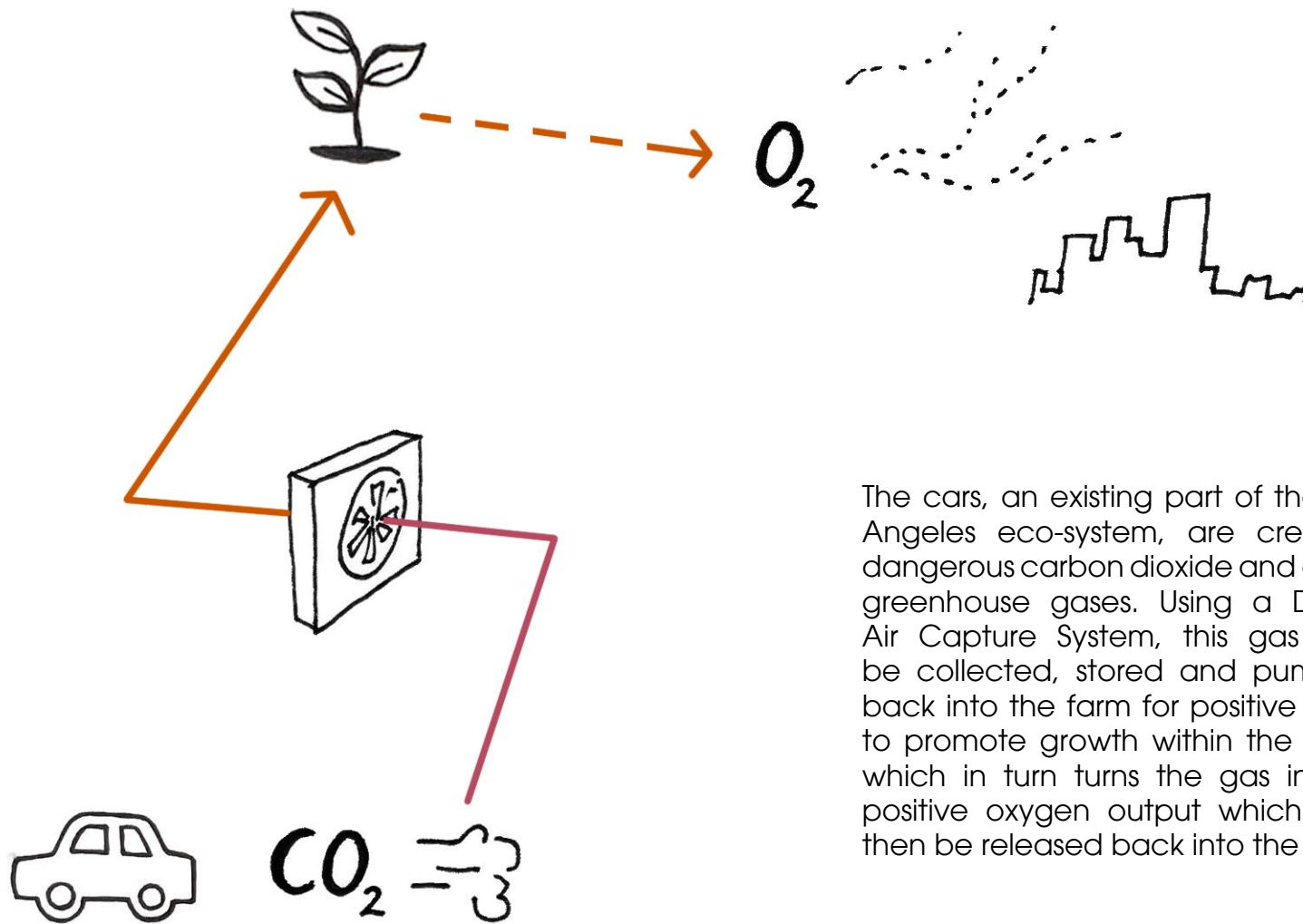
Excess produce from the farm fills refrigerator boxes in the homeless relief centre where users can use self-service kitchen facilities to prepare meals while grey water from the farm feeds into the sanitary facilities for the relief centre so that users can have a dignified bathing/grooming experience.

Coffee beans are grown on plants within the CEA growing system and used in the coffee shop in The City Produce Market. Grounds are collected and reused in the farm as fertiliser for growing the mushroom varieties.





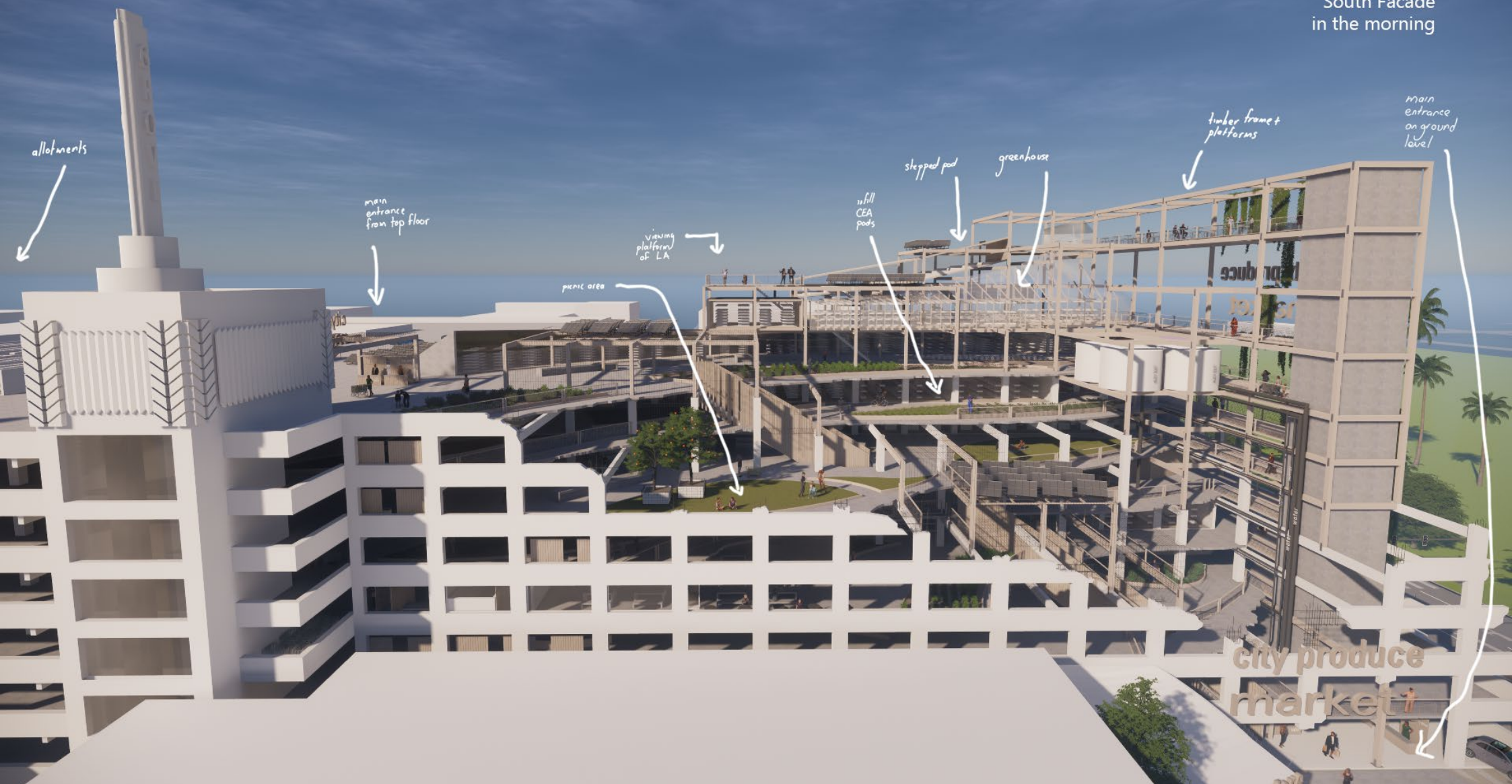
Both solar energy and energy from methane created by the cows are transferred into electricity. This electricity in turn powers the artificial UV lamps in the pods which supports the growth of the plants that then keeps the cow fed to create more methane.



The cars, an existing part of the Los Angeles eco-system, are creating dangerous carbon dioxide and other greenhouse gases. Using a Direct Air Capture System, this gas can be collected, stored and pumped back into the farm for positive use - to promote growth within the pods which in turn turns the gas into a positive oxygen output which can then be released back into the city.

RENDERED VIEWS

South Facade
in the morning



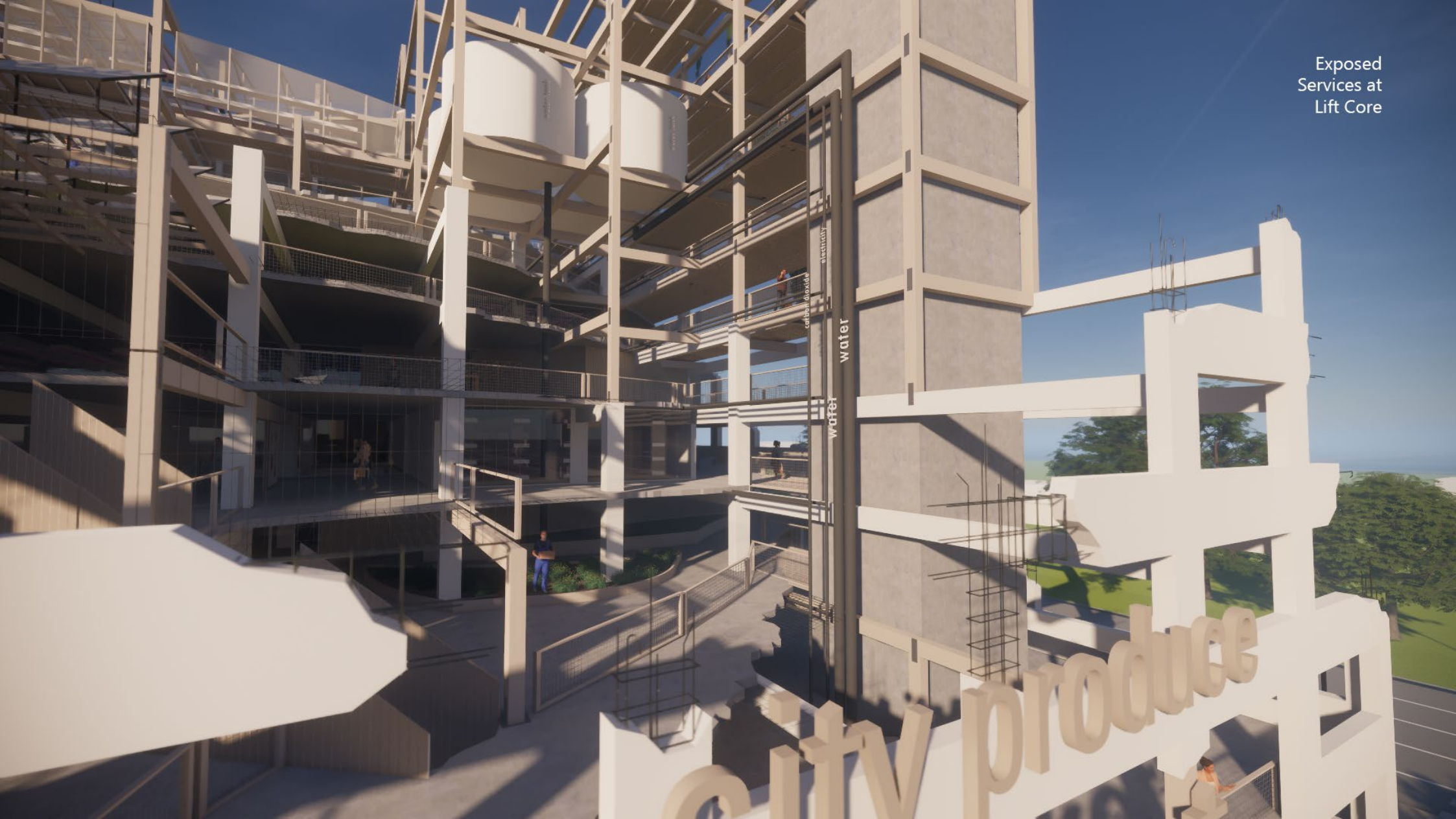
Late Morning View of the
City Produce Market



Evening View of the
City Produce Market

UV lights in the
growing pods give
pink glow

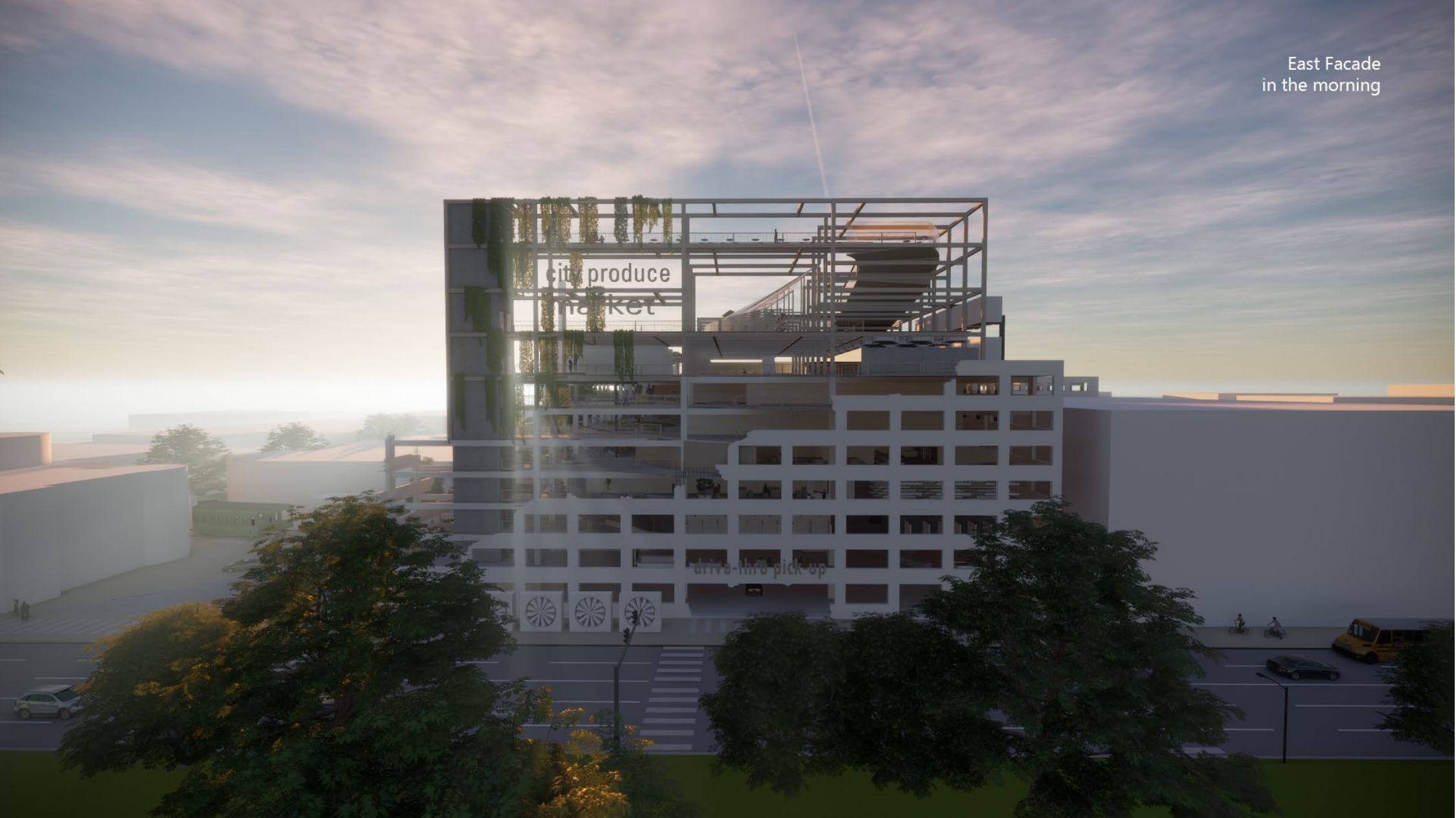




Entrance Courtyard +
Primary View of
City Produce Market
from Grove Drive



East Facade
in the morning



Grove Drive
North East of Site
in the afternoon sun



Drive-Thru Pick-Up
+ DAC Systems
on Grove Drive





CEA Growing Pod

Main Entrance
on Restaurant +
Exhibition Level



parking lot
orange trees



exhibition information boards

Walk-through
Exhibition

history +
information

1900 In expansion of the dairy farm, drilling for new water wells commenced. This led to the discovery of oil on the property and the cows were replaced by a field of oil rigs.



1934

The creation with built gas pumps for the property of LA at the time, including the building, the gas pumps, and the house.



old
gas pumps
from archives

restaurant





Main Entrance
on Restaurant +
Exhibition Level



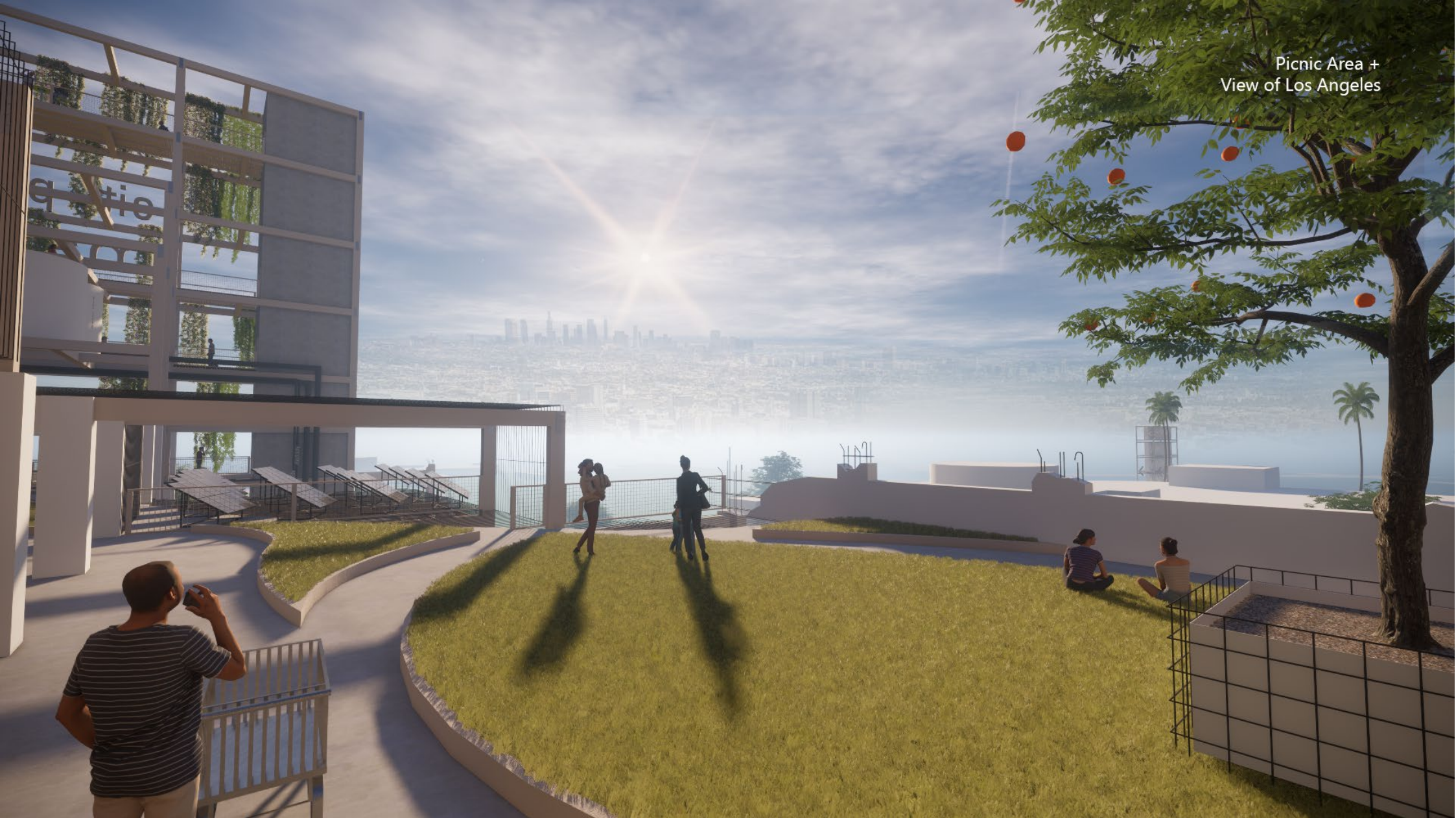


Shopper Entrance Point





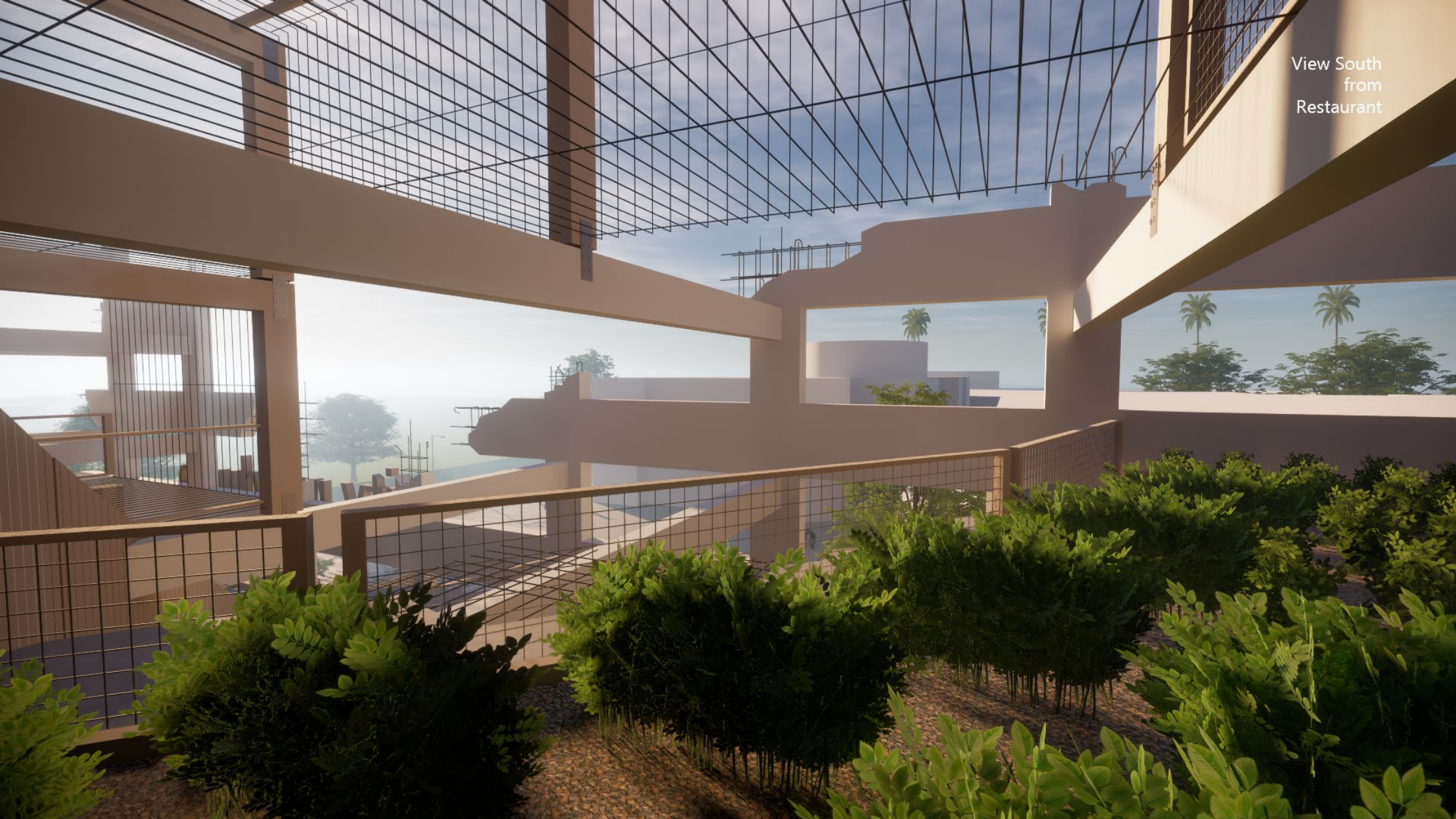
Farmer's Market +
Picnic Area





Aerial of Restaurant

View South
from
Restaurant



Coffee
Bar



Timber Frame +
Platform Walkways

exposed
services

views of LA
+ City Produce
Market



Greenhouse Frame +
Timber Platforms

greenhouse timber
frame + bio-film cover



floating
dwarf tree
garden



Main Entrance
on top level of
existing
parking structure

existing
pedestrian
lift from
The Grove

solar
farms

city produce
market

Main
Entrance

existing
parking





The building was formed based on research before aesthetic, bringing forward an interesting spatial layout that avoided enclosure where possible in an inside-out effect.

I had particular interest in the urban farming theory and the application of these concepts because there is still bountiful room for invention in such a new industry. There are base principles with plenty of room for exploration. The use of an existing structure became a clear necessity from the start. When I stopped trying to stay within the parameters of the grid and boundaries, and push the limits of what the structure could become - I realised that not only can I add, grow and seep into this existing form, I can break away, collect and harvest from it too. This started a blend between unitised elements and custom characteristics. The existing prescribed set of materials that already exist on the site were the base to expand from.

Although there is an abundance of information available to aid the topics of issue I had identified, when I started the design process, my building became organised and detailed through this information as I refined physical elements that could realise it.

When planning my floor plan layouts, the growing pods, which are most efficient when modular and square/rectangular, proved to be a difficult element to place in a space that requires flow and organic movement for its programme. I tested ideas of reform, rearrangement, addition and subtraction to arrive at a clear plan. Each floor was allocated to a produce group based on the available sunlight and needs of the group to encourage passive heating and lighting.

Vertical connection of these horizontal planes inspired core elements of the design in the south-eastern lift core that draws parts of the structure (the timber platforms) out to meet it. The lift core and the cascading staircase were designed to bring movement straight from the street level, where these two elements meet, up to disperse it amongst the areas of use across the building.

I believe that the resulting building I have proposed was a great culmination of my research realised into physical form and elements of feeling, texture and growth both literally and in sustainable practice. I have come out of this research with a more developed interest in the circular economy, re-use and urban agriculture- in relation to the built environment.

Text References

PART 01A research

Los Angeles Culture + Background 01

Arcadia (2017). *10 Celebrities Leading Hollywood's Fight Against Climate Change*. Available at: <https://blog.arcadia.com/10-celebrities-leading-hollywoods-fight-climate-change/> (Accessed: 26 May 2021).

Arrive Alive (2017). *You'll never guess how many vehicles are registered in SA*. Available at: https://www.news24.com/wheels/news/industry_news/youll-never-guess-how-many-vehicles-are-registered-in-sa-20170328 (Accessed: 25 May 2021).

Beverly Press (2020). *Beverly Hills completes 2020 homeless count*. Available at: <https://beverlypress.com/2020/01/beverly-hills-completes-2020-homeless-count/#:~:text=The%202019%20homeless%20count%20found,the%20West-side%20of%20Los%20Angeles.> (Accessed: 26 May 2021).

Crabbe, M. (2020). *Gas stations of the future could look very different than they do today*. Available at: <https://dornsife.usc.edu/news/stories/3366/3rd-la-project-looks-at-future-gas-stations-pump-to-plug/#:~:text=L.A.%20County%20currently%20claims%20nearly,business%20owners%20make%20the%20transition.> Accessed: 25 May 2021).

Davison, B. (2015). *WHY THE SUPERMARKET WAS BORN IN LOS ANGELES: The City Has Long Been a Diverse Laboratory Where Retailers Study Consumer Behavior*. Available at: <https://www.zocalopublicsquare.org/2015/11/17/why-the-supermarket-was-born-in-los-angeles/ideas/nexus/> (Accessed: 23 May 2021).

Dhaliwal, J. (2018). *Smart Solutions to Los Angeles Traffic Problems*. Available at: <https://www.linkedin.com/pulse/smart-solutions-los-angeles-traffic-problems-jagjit-dhaliwal/> (accessed 25 May, 2021).

Farrell, K. (2020). *How we wound up with supermarkets: A history of the grocery store*. Available at: <https://www.10best.com/interests/food-culture/10-points-grocery-store-history-supermarkets-changed-how-we-shop/> (Accessed: 14 May 2021).

Kraidy, M. (2002). *Globalization of culture through the media*. In J. R. Schement (Ed.), *Encyclopedia of communication and information* (Vol. 2, pp. 359-363). New York, NY: Macmillan Reference USA. Retrieved from http://repository.upenn.edu/asc_papers/325 (Accessed: 26 May 2021).

LA Almanac (2020). *Homelessness in Los Angeles County 2020*. Available at: <http://www.laalmanac.com/social/so14.php> (Accessed: 26 May 2021).

LA Almanac (2020). *Vehicle Registrations Los Angeles County*. Available at: <http://www.laalmanac.com/transport/tr02.php> (Accessed: 25 May 2021).

Los Angeles Magazine (2018) *These 13 Innovations Changed the World—and They All Originated in L.A.: From fast food and gangster rap to skateboarding and the internet, these origin stories are set in SoCal*. Available at: <https://www.lamag.com/culturefiles/la-origins-cover/> (Accessed: 14 May 2021).

McCarty, M. (2018). *How California Car Culture Killed The Promise Of A 20-Minute Commute*. Available at: <https://www.kpbs.org/news/2018/apr/16/how-california-car-culture-killed-promise-20-minut/> (Accessed: 25 May 2021).

National Alliance to End Homelessness (2020). *What Causes Homelessness?*. Available at: <https://endhomelessness.org/homelessness-in-america/what-causes-homelessness/> (Accessed: 26 May 2021).

Nosowitz, D. (2018). *Why Are There Palm Trees in Los Angeles? : Turns out it's an image thing*. Available at: <https://www.atlasobscura.com/articles/why-are-there-palm-trees-in-los-angeles> (Accessed: 22 July 2021).

Novak, M. (2013). *Nobody Walks in L.A.: The Rise of Cars and the Monorails That Never Were*. Available at: <https://www.smithsonianmag.com/history/nobody-walks-in-la-the-rise-of-cars-and-the-monorails-that-never-were-43267593/> (Accessed: 25 May 2021).

Plugshare (2021). *Best EV Charging Stations in Los Angeles*. Available at: <https://www.plugshare.com/directory/us/california/los-angeles/#:~:text=California%20is%20the%20leader%20in,that%20can%20charge%20a%20Tesla> (Accessed: 25 May 2021).

The Boring Company (2020). *Why Tunnels?*. Available at: <https://www.boring-company.com/> (Accessed: 25 May 2021).

Los Angeles + Johannesburg 02

Hodgson, T. (2018). *INFORMAL TRADE IN SOUTH AFRICA: Legislation, Case Law and Recommendations for Local Government*. Socio-Economic Rights Institute of South Africa (SERI), in collaboration with the South African Local Government Association (SALGA). Available at: <http://www.salga.org.za/Documents/Knowledge%20Hub/Publications/Research%20Projects%20and%20Results/SERI-SALGA%20Informal%20Trade%20Jurisprudence.pdf> (Accessed: 07 Sep 2021).

Climate + Imminent Disaster

03

Champion-Nicks, Euceph and Knauf (no date). *The Big One Is Coming To Southern California: This Is Your Survival Guide*. Available at: <https://the-big-one.scpr.org/stories/> (Accessed: 27 May 2021).

Franchise Tax Board for The State of California (2021). *List of disasters: Disaster Loss*. Available at: <https://www.ftb.ca.gov/file/business/deductions/disaster-codes.html> (Accessed: 27 May 2021).

Gates, B (2021). *How to avoid a climate disaster: The solutions we have and the breakthroughs we need*. Great Britain: Penguin Random House.

KCET(1) (2019). *The Paving of Paradise: LA Foodways. Season 1, Episode 1*. Available at: <https://youtu.be/cyrTzJ3dH0U> (Accessed: 28 May 2021).

KCET (3) (2019). *Farm to Freeway*. Available at YouTube URL: https://www.youtube.com/watch?v=9eAeQzWuPkU&ab_channel=KCET (Accessed: 23 July 2021).

LA Almanac (2020). *Annual Air Quality Los Angeles County: Air Quality Days by Year, 1980 - 2019*. Available at: <http://www.laalmanac.com/environment/ev01b.php> (Accessed: 26 May 2021).

Lloyd, J (2021). *Map: See Where Drought Conditions Have Expanded in California: This week's Drought Monitor report shows a dramatic difference between April 2020 and current conditions after another dry winter in California*. Available at: <https://www.nbclosangeles.com/news/california-news/map-drought-california-water-supply-gavin-newsom/2584619/> (Accessed: 27 May 2021).

Mann, C. (2020). *The Wizard and the Prophet*. Long Now Foundation. Available at: https://www.youtube.com/watch?v=wOCDYe39-QU&ab_channel=Long-NowFoundation (Accessed: 27 May 2021).

Mufson, Mooney, Eilperin and Muyskens (2019). *2°C: BEYOND THE LIMIT: Extreme climate change has arrived in America*. Available at: <https://www.washingtonpost.com/graphics/2019/national/climate-environment/climate-change-america/> (Accessed: 27 May 2021).

The Daily Show with Trevor Noah. (2021). *What the F**k Is Happening with Climate Change?*. Available at YouTube URL: https://www.youtube.com/watch?v=H-7JoKnlgfbE&ab_channel=TheDailyShowwithTrevorNoah (Accessed: 23 July 2021).

Food as a Contributor to the Crisis

04

Bureau of Reclamation (2020). *Water Facts - Worldwide Water Supply*. Available at: <https://www.usbr.gov/mp/arwec/water-facts-ww-water-sup.html#:~:text=0.5%25%20of%20the%20earth's%20water,for%20each%20person%20on%20earth.> (Accessed: 28 May 2021).

Conserve Energy Future (2021). *Characteristics of Commercial Farming*. Available at <https://www.conserve-energy-future.com/commercial-farming.php> (Accessed: 28 May 2021).

KCET(1) (2019). *The Paving of Paradise: LA Foodways. Season 1, Episode 1*. Available at: <https://youtu.be/cyrTzJ3dH0U> (Accessed: 28 May 2021).

KCET(2) (2019). *The Central Wholesale Produce Market: LA Foodways. Season 1, Episode 1*. Available at: https://www.youtube.com/watch?v=XBVV_2XET-Jg&ab_channel=KCET (Accessed: 28 May 2021).

Khokhar, T. (2017). *Chart: Globally, 70% of Freshwater is Used for Agriculture*. Available at: <https://blogs.worldbank.org/opendata/chart-globally-70-freshwater-used-agriculture> (Accessed: 28 May 2021).

United States Environmental Protection Agency (2019). *Sources of Greenhouse Gas Emissions*. Available at: <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions> (Accessed: 28 May 2021).

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Coz, E. (2021). Interviewed by Kady Burkimsher - full interview attached in (ii)

Davies, G. (2021). Interviewed by Kady Burkimsher - full interview attached in (ii)

Rosen, A. (2021). Interviewed by Kady Burkimsher - full interview attached in (ii)

Sustainable Building Practices

06

Bellona Europa (2019). *Steel and emissions: How can we break the link?*. Available at: <https://bellona.org/news/ccs/2019-03-is-steel-stealing-our-future> (Accessed: 30 May 2021).

Daniels, J. (2018). *POLITICS: California timber industry may be a 'piece of the puzzle' to help reduce state's raging wildfires*. CNBC. Available at: <https://www.>

cnbc.com/2018/08/03/california-timber-firms-maybe-piece-of-the-puzzle-to-cut-fire-risk.html (Accessed: 30 May 2021).

Earthava Team (2021). *5 STUNNING GREEN BUILDINGS IN SOUTHERN CALIFORNIA*. Available at: <https://www.earthava.com/5-stunning-green-buildings-in-southern-california/> (Accessed: 30 May 2021).

Elemental Green. (2021). *10 ECO BUILDING MATERIALS REVOLUTIONIZING HOME CONSTRUCTION*. Available at: <https://elemental.green/10-eco-building-materials-revolutionizing-home-construction/> (Accessed: 27 July 2021).

Gates, B (2021). *How to avoid a climate disaster: The solutions we have and the breakthroughs we need*. Great Britain: Penguin Random House.

Gates, B (2021). *How to avoid a climate disaster: The solutions we have and the breakthroughs we need*. Great Britain: Penguin Random House.

Kellogg, K (2020). *Which is Better For The Environment? Glass or Plastic?: Is it really eco friendly?*. Available at: <https://www.goingzerowaste.com/blog/which-is-better-for-the-environment-glass-or-plastic/> (Accessed: 4 August 2021).

Naik, T. (2008). *Sustainability of Concrete Construction*. Vol. 13, Issue 2. ASCE. Available at: [https://doi.org/10.1061/\(ASCE\)1084-0680\(2008\)13:2\(98\)](https://doi.org/10.1061/(ASCE)1084-0680(2008)13:2(98)) (Accessed: 30 May 2021).

Pacheco, A. (2020). *California adopts suite of high-rise timber regulations*. Available at: <https://archinect.com/news/article/150218387/california-adopts-suite-of-high-rise-timber-regulations> (Accessed: 30 May 2021).

TheCivilEngineer.org. (2020). *Bricks turned into energy storing devices*. Available at: <https://www.thecivilengineer.org/news-center/latest-news/item/2317-bricks-turned-into-energy-storing-devices>. (Accessed: 30 May 2021).

Case Studies **07**

Phenomenology + Implementation **08**

Brownstein, R. (2020). *POLITICS: Why Republicans Still Don't Care About Climate Change: Extreme-weather events represent an irresistible force for action. But an immovable object is in the way*. The Atlantic. Available at: <https://www.theatlantic.com/politics/archive/2020/09/california-wildfires-and-politics-cli->

[mate-change/616380/](https://www.theatlantic.com/politics/archive/2020/09/california-wildfires-and-politics-cli-mate-change/616380/) (Accessed: 30 May 2021).

Gates, B (2021). *How to avoid a climate disaster: The solutions we have and the breakthroughs we need*. Great Britain: Penguin Random House.

Burkimsher, K. (2020). *PHENOMENOLOGY IN THE REFORM OF THE MODERN DAY DISCONNECT*. Adapted from essay form Contemporary Architectural Theory ARPL4002_2020 as a part of BASHons Degree. University of the Witwatersrand. Guided by Diaan Van der Westhuizen.

PART 01B analysis

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Coz, E. (2021). Attached Interview.

Gates, B. (2021). *How to avoid a climate disaster: The solutions we have and the breakthroughs we need*. Great Britain: Penguin Random House.

lacounty.gov (n.d.). *Update- Extension of UAIZ Program*. Available at: <https://planning.lacounty.gov/uaiz> (Accessed 11 June 2021).

Scalisi, T. (2020). *2020 Guide to US Building Commercial Construction Cost per Square Foot*. Available at: https://www.levelset.com/blog/commercial-construction-cost-per-square-foot/#Commercial_costs_per_square_foot_in_the_Western_US (Accessed 11 June 2021).

ParkMe. (2019). *The Grove*. Available at <https://www.parkme.com/lot/39512/the-grove-los-angeles-ca> (Accessed 17 June 2021).

PropertyShark. (2020). *Farmers Market - 6333 West 3rd Street, Los Angeles, CA 90036*. Available at: https://www.propertyshark.com/mason/Property/16423119/6333-W-3-St-Los-Angeles-CA-90036/#section_risk (Accessed 13 June 2021).

Rosen, A. (2021). Attached Interview.

Tasgal, P. (2019). *The economics of local vertical & greenhouse farming are getting competitive*. AgFunder Network Partners. Available at: <https://agfundernews.com/the-economics-of-local-vertical-and-greenhouse-farming-are-getting-competitive.html> (Accessed 11 June 2021).

WholeFoods. (2021). Organic Spring Mix, 16 oz. Available at: <https://products.wholefoodsmarket.com/product/365-everyday-value-organic-spring-mix-a8d921>(Accessed 13 June 2021).

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Los Angeles Culture + Background 01

Fig 1 - Anon. (n.d.). *Los Angeles: Water Makes All the Difference (Los Angeles Department of Water and Power, 1950). Fine+. Municipal Poster (21" X 11")*. Available at: Heritage Auctions. URL: <https://movieposters.ha.com/itm/miscellaneous/los-angeles-water-makes-all-the-difference-los-angeles-department-of-water-and-power-1950-fine-municipal-poster-21-/a/162115-52275.s?ic4=GalleryView-BidNow-071515> (Accessed 14 May 2021).

Fig 2 - David Boulé California Orange Collection. (n.d.). *Railroad Ads 1908*. Available at: <https://www.lamag.com/photo-essays-2/main-squeeze-orange-revolutionized-california/> (Accessed 14 May 2021).

Fig 3 - original diagram made up from images of various sources

Fig 4 - Shulman, J. (1956). *Panorama Market, 1956*. J. Paul Getty Trust, Getty Research Institute. Available at: <https://www.lamag.com/culturefiles/la-origins-cover/> (Accessed 14 May 2021).

Fig 5 - Ralston, M. (2014). *US-LIFESTYLE-TRAFFIC-LABOR DAY: Heavy traffic clogs the 101 Freeway as people leave work for the Labor Day holiday in Los Angeles on August 29, 2014*. AFP/Getty Images. Available at: <https://fortune.com/2016/01/28/xerox-los-angeles-traffic/> (Accessed 14 May 2021).

Fig 6 - The Boring Company (2020). *Why Tunnels?*. Available at: <https://www.boringcompany.com/> (Accessed: 25 May 2021).

Fig 7 - Sinco, L. (2021). *Entire blocks were packed with homeless encampments on skid row in downtown Los Angeles on Wednesday*. Los Angeles Times via Getty Images 2021. Available at <https://www.nbcnews.com/news/us-news/federal-judge-orders-los-angeles-shelter-homeless-people-skid-row-n1265005/> (Accessed: 24 May 2021).

Fig 8 - 11 - original photographs

Los Angeles + Johannesburg

02

Fig 1 - (1) Beedy, K. (2015). *WHY POVERTY PERSISTS IN JOHANNESBURG*. Available at: <https://borgenproject.org/poverty-persists-johannesburg/> (Accessed: 24 April 2021). (2) Discover Los Angeles. (2020). *HISTORICAL TIMELINE OF LOS ANGELES*. Available at: <https://www.discoverlosangeles.com/things-to-do/historical-timeline-of-los-angeles> (Accessed: 24 April 2021). (3) World Population Review. (2021). *Johannesburg Population 2021*. Available at: <https://worldpopulationreview.com/world-cities/johannesburg-population> (Accessed: 24 April 2021).

Fig 2 -Google Earth (2021). Data SIO, NOAA, U.S. Navy, NGA, GEBCO. Data USGS,. Data LDEO-Columbia, NSF, NOAA. Available at: <https://earth.google.com/web/@33.84113279,-118.13338598,32.18446172a,36217.56151502d,60y,-0.00000159h,0.21590216t,-0r> (Accessed: 26 April 2021).

Fig 3 - Google Earth (2021). Landsat/Copernicus. AfriGIS (Pty) Ltd. Available at: <https://earth.google.com/web/@-26.08758531,28.23588812,1725.7969699a,102033.37873941d,60y,0h,0.98812602t,0r> (Accessed: 26 April 2021).

Fig 4 - OurWorldinData (2016). *Land requirements by national diets*. Available at: <https://ourworldindata.org/agricultural-land-by-global-diets> (Accessed: 27 May 2021).

Fig 5 - (1) Daily Maverick (2020). *Understanding South Africa's agriculture trade patterns*. Available at: <https://www.dailymaverick.co.za/opinionista/2020-02-17-understanding-south-africas-agriculture-trade-patterns/> (Accessed: 27 May 2021). (2) USDA (2015). *Top 30 U.S Agricultural Import Sources, 2013-15 average*. Available at: <https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/agricultural-trade/> (Accessed: 27 May 2021).

Fig 6 - Union of Concerned Scientists (2020). *Each Country's Share of CO2 Emissions*. Available at: <https://www.ucsusa.org/resources/each-countrys-share-co2-emissions> (Accessed: 26 April 2021).

Climate + Imminent Disaster

03

Fig 1 - Mann, C. (2020). *The Wizard and the Prophet*. Long Now Foundation. Available at: https://www.youtube.com/watch?v=wOCDYe39-QU&ab_channel=LongNowFoundation (Accessed: 27 May 2021).

Fig 2 - Gates, B (2021). *How to avoid a climate disaster: The solutions we have and the breakthroughs we need*. Great Britain: Penguin Random House

Fig 3 - (1) LA Almanac (2020). *The Warming of Los Angeles*. Available at: <http://www.laalmanac.com/weather/we05.php> (Accessed: 26 May 2021). (2) LA Almanac (2021). *Total Seasonal Rainfall (Precipitation): Downtown Los Angeles (USC Campus) 1877-2021*. Available at: <http://www.laalmanac.com/weather/we13.php> (Accessed: 26 May 2021).

Fig 4 - (1) LA Almanac (2019). *Annual Air Quality Los Angeles County: Air Quality Days by Year, 1980 - 2019*. Available at: <http://www.laalmanac.com/environment/ev01b.php> (Accessed: 26 May 2021). (2) LA Almanac (2021). *Wildfires in Los Angeles County*. Available at: <http://www.laalmanac.com/fire/fi07.php> (Accessed: 26 May 2021). (3) USGS (2020). *Earthquake Hazards: Information by Region- California*. Available at: https://www.usgs.gov/natural-hazards/earthquake-hazards/science/information-region-california?qt-science_center_objects=0#qt-science_center_objects (Accessed: 26 May 2021).

Food as a Contributor to the Crisis

04

Fig 1 - *original diagram*

Fig 2 - Anon. (circa 1862). *When L.A. Was Empty: Wide-Open SoCal Landscapes: Fort Moore Hill*. Available at: <https://www.kcet.org/shows/lost-la/when-la-was-empty-wide-open-socal-landscapes> (Accessed: 14 June 2021).

Fig 3-4 - *original diagrams*

Fig 5 - (1) Climate Central(2019). *Top US Freshwater Use*. Available at: <https://www.climatecentral.org/gallery/graphics/climate-change-water-use> (Accessed: 26 May 2021). (2) Mann, C. (2020). *The Wizard and the Prophet*. Long Now Foundation. Available at: https://www.youtube.com/watch?v=wOCDYe39-QU&ab_channel=LongNowFoundation (Accessed: 27 May 2021). (3) World Bank Blogs (2014). *Chart: Globally, 70% of Freshwater is Used for Agriculture*. Available at: <https://blogs.worldbank.org/opendata/chart-globally-70-freshwater-used-agriculture> (Accessed: 27 May 2021).

Fig 6 - (1) United States EPA. (2019). *Overview of U.S. Greenhouse Gas Emissions in 2019*. Available at: <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks> (Accessed: 28 May 2021). (2) United States EPA. (2018). *2018 U.S. Carbon Dioxide Emissions*. Available at: https://19january2021snapshot.epa.gov/ghgemissions/overview-greenhouse-gases_.html#carbon-dioxide (Accessed: 28 May 2021). (3) United States EPA. (2018). *2018 U.S. Methane Emissions*. Available at: https://19january2021snapshot.epa.gov/ghgemissions/overview-greenhouse-gases_.html#methane (Accessed: 28 May 2021). (4) United States EPA. (2018). *2018 U.S. Nitrous Oxide Emissions*. Available at: https://19january2021snapshot.epa.gov/ghgemissions/overview-greenhouse-gases_.html#nitrous-oxide (Accessed: 28 May 2021).

Future of Farming: Concepts + Interviews 05

Fig 1-3 - original diagrams

Sustainable Building Practices 06

Fig 1 - Gates, B (2021). *How to avoid a climate disaster: The solutions we have and the breakthroughs we need*. Great Britain: Penguin Random House.

Fig 2-6 - original photographs

Case Studies 07

Fig 1 - Square Roots. (2019). *Brooklyn Campus*. Available at: https://sqrerootsgrow.com/about_us/ (Accessed: 04 June 2021).

Fig 2 - Square Roots. (2019). *Square Roots Super Farms are scalable, resilient and smart, and can be built fast*. (Image: Via Chicago Architects + Diseñadores). Available at: <https://sqrerootsgrow.com/2020/03/05/10-Ways-Square-Roots-Farm-Tech-Platform-Empowers-the-Next-Generation-of-Farmers.html> (Accessed: 04 June 2021).

Fig 3 - Square Roots. (2019). *Our produce can be found at more than 200 stores across the Midwest and New York City area*. Available at: <https://sqrerootsgrow.com/2021/04/14/How-Square-Roots-is-meeting-unprecedented-post-pandemic-demand-for-fresh,-healthy,-locally-grown-food/html> (Accessed: 04 June 2021).

Fig 4-6 - Gotham Greens. (2020). *We grow incredibly fresh produce*. Available at: <https://www.gothamgreens.com/> (Accessed: 04 June 2021).

Fig 7-8 - Ilimelgo Architects (2017). *Vertical Urban Farm*. Available at: <http://ilimelgo.com/en/projects/vertical-farm.html> (Accessed: 06 June 2021).

Fig 9-12 - ArchDaily (2014). *SPARK: Proposes Vertical Farming Hybrid to House Singapore's Aging Population*. Available at: https://www.archdaily.com/573783/spark-proposes-vertical-farming-hybrid-to-house-singapore-s-aging-population-2?ad_medium=gallery (Accessed: 06 June 2021).

Fig 13-14 - Kurasek, B. (2009). *The Living Skyscraper*. Available at: <https://www.esquire.com/news-politics/g545/vertical-farms/?slide=4> (Accessed: 06 June 2021).

Fig 15 - M, Gerard. (2019). *The Michigan Urban Farming Initiative is focusing on*

food insecurity and community investment. Available at: <https://www.yesmagazine.org/social-justice/2019/11/05/food-community-detroit-garden-agriculture> (Accessed: 08 June 2021).

Fig 16 - Archdaily (2018). *Transforming the Parking Garages of Today Into the Housing of Tomorrow*. Gensler via LA Times. Available at: <https://www.archdaily.com/899598/transforming-the-parking-garages-of-today-into-the-housing-of-tomorrow/5b65d62ef197ccef0000005-transforming-the-parking-garages-of-today-into-the-housing-of-tomorrow-photo> (Accessed: 08 June 2021).

Fig 17 - Archdaily (2018). *Transforming the Parking Garages of Today Into the Housing of Tomorrow*. LMN via Wired. Available at: <https://www.archdaily.com/899598/transforming-the-parking-garages-of-today-into-the-housing-of-tomorrow/5b65d626f197ccd41d000008-transforming-the-parking-garages-of-today-into-the-housing-of-tomorrow-photo> (Accessed: 08 June 2021).

Fig 18 - KFC SOPAC (2020). *Cincinnati-based design firm FRCH NELSON predicts that, in the future, more quick serves will focus on smaller buildouts with amped-up delivery, takeout, and drive-thru operations*. Available at: <https://www.qsr-magazine.com/drive-thru/smaller-footprints-more-drive-thru-restaurant-design-covid-world> (Accessed: 08 June 2021).

Fig 19 - Reutov Design (2021). *In Harmony with Nature Café*. Available at: https://www.archdaily.com/962176/in-harmony-with-nature-cafe-reutov-design/60aaa7fff91c81e4a5000007-in-harmony-with-nature-cafe-reutov-design-photo?next_project=no (Accessed: 08 June 2021).

Fig 20 - Abedimoghdam, M. (2020). *Suspended Boxes*. Available at: <https://amazingarchitecture.com/students/suspended-boxes-by-masoud-abedimoghdam> (Accessed: 12 June 2021).

Fig 21 - Architizer (n.d.). *In Ruins: 6 Projects That Breathe New Life Into Dilapidated Buildings: Ruins have the potential to become a historic frame for a contemporary space. Project: Casa Sabugo by Tagarro-De Miguel Arquitectos, Sabugo, Spain (2013)*. Photograph by David Cabrera. Available at: <https://architizer.com/blog/inspiration/collections/in-ruins/> (Accessed: 20 Sep 2021).

Fig 22-23 - Archdaily (2016). *St. Miquel 19 Reforma de vivienda / Carles Oliver*. Photography by Jose Hevia. Available at: <https://www.plataformaarquitectura.cl/cl/882011/st-miquel-19-reforma-de-vivienda-carles-oliver> (Accessed: 20 Sep 2021).

Fig 24 - DesignBoom (n.d.) *Modern relics: a retrospective of ruin interventions. Designed and photographed by Marià Castelló Marínez*. Available at: <https://www.designboom.com/architecture/ruin-renovation-intervention-architecture-08-26-18/> (Accessed: 20 Sep 2021).

Phenomenology + Implementation

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Fig 1-3 - *original diagrams*

PART 01B analysis

Site Context

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Geography

Fig 1 - (1) Google Earth (2021). Data SIO, NOAA, U.S. Navy, NGA, GEBCO. Data USGS. Data LDEO-Columbia, NSF, NOAA. Available at: <https://earth.google.com/web/@34.26616513,-118.43858966,313.35978615a,38708.58160847d,60y,-1.05424072h,87.25422t,0r> (Accessed: 02 June 2021). (2) SCEDC (2021). *Faults of Southern California: Los Angeles Region*. Caltech. Southern California Earthquake Data Center. Available at: <https://scedc.caltech.edu/earthquake/losangeles.html> (Accessed: 06 June 2021).

Fig 2 - Google Earth (2021). Available at: <https://earth.google.com/web/@34.07080169,-118.35176376,61.05866502a,2378.08696243d,60y,359.99991705h,0t,0r> (Accessed: 02 June 2021).

Fig 3 - Google Earth (2021). Available at: <https://earth.google.com/web/@34.07080169,-118.35176376,61.05866502a,2378.08696243d,60y,359.99991705h,0t,0r> (Accessed: 02 June 2021).

Fig 4 - (1) Google Earth (2021). Data SIO, NOAA, U.S. Navy, NGA, GEBCO. Data USGS. Data LDEO-Columbia, NSF, NOAA. Available at: <https://earth.google.com/web/@33.86993975,-118.26369532,38.8741364a,50203.64440139d,60y,359.9991677h,0t,0r> (Accessed: 02 June 2021). (2) Los Angeles Times (2015). *Where are L.A. County's homeless?*. Available at: <https://graphics.latimes.com/homeless-los-angeles-2015/> (Accessed: 06 June 2021).

Fig 5 - (1) Google Earth (2021). Data SIO, NOAA, U.S. Navy, NGA, GEBCO. Data USGS. Data LDEO-Columbia, NSF, NOAA. Available at: <https://earth.google.com/web/@33.86993975,-118.26369532,38.8741364a,50203.64440139d,60y,359.9991677h,0t,0r> (Accessed: 02 June 2021).

<https://earth.google.com/web/@33.86993975,-118.26369532,38.8741364a,50203.64440139d,60y,359.9991677h,0t,0r> (Accessed: 02 June 2021). (2) SigAlert.com (2021). *Los Angeles Traffic Report*. Available at: <https://www.sigalert.com/map.asp?lat=33.96131&lon=-118.16142&z=2> (Accessed: 10 Sep 2021).

Climate

Fig 6 - (1) Google Earth (2021). Data Landsat/ Copernicus. Data SIO, NOAA, U.S. Navy, NGA, INEGI. Available at: <https://earth.google.com/web/@34.07310345,-118.36100016,54.89966916a,700.00369062d,60y,40.30526019h,60.51295807t,-0r> (Accessed: 10 March 2021). (2) MeteoBlue. (2021). *Wind Rose Los Angeles*. Available at: https://www.meteoblue.com/en/weather/archive/windrose/los-angeles_united-states-of-america_5368361 (Accessed: 14 March 2021)

Fig 7-12 - Weather Atlas. (2021). *Monthly weather forecast and climate Los Angeles, CA*. Available at: <https://www.weather-atlas.com/en/california-usa/los-angeles-climate> (Accessed: 16 June 2021).

Past

Fig 13-14 - Farmers Market L.A. (2020). *The Original Farmers Market: Our History*. Available at: <https://farmersmarketla.com/history> (Accessed: 5 June 2021).

Present

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Urban Potential

Fig 30 - (1) Google Earth (2021). Data SIO, NOAA, U.S. Navy, NGA, GEBCO. Data USGS. Data LDEO-Columbia, NSF, NOAA. Available at: <https://earth.google.com/web/@34.26616513,-118.43858966,313.35978615a,38708.58160847d,60y,-1.05424072h,87.25422t,0r> (Accessed: 02 June 2021). Images from Google Earth (2021): (01) <https://earth.google.com/web/search/parking+structure/@34.016>

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Anya Rosen

Farm Manager

at Square Roots Urban Growers, Brooklyn



13 May 2021

I would like to find out about the pros and cons, the process and maybe what is not being spoken about surrounding controlled environment growing.

Some of the pros of controlled environmental agriculture is that we can really do it in a lot of different places. It can be moved into urban environments and because of that, the distance the food needs to travel to where the customers purchase it is very short. So, the shelf life is longer, the food can be fresher - there a lot of different things you can play with there. One of the limitations is that you are limited in some capacity with what you can grow. Some crops take up a lot of space, let's take for example pumpkins. A pumpkin plant is really big. The pumpkin itself is a very big fruit. When you grow pumpkins, typically in an outdoor environment, you would grow a big field full of pumpkins. They also take an incredibly long time to develop, it's not a very quick turnaround. So, if you're growing in a controlled environment and you're using grow lights and those grow lights cost a lot of money, because its energy, and you have nothing to sell until 90 days after you put the seed into the little pot, then that might not look very good in terms of revenue. and your expenditures. Generally speaking, a lot of controlled environmental agriculture companies do things like lettuce, cut greens, basil or herbs just because they grow really fast.

Do you mind giving a list of plants that would work and wouldn't work in CEA, based on your experience?

Yeah definitely. I think it depends on the system, right? Like Square Roots has a specific system and certain things grow well in it and certain things don't. The system is that it is a vertical growing plane. There are other companies that don't have that system, that grow horizontally, which is more similar to your traditional outdoor soil farming. Anything that has heavy fruit, so, like melons, pumpkin, squash, even things like tomatoes and cucumbers. The fruit has weight and it's going to pull that plant. If you're growing something vertically and it's all weighted down because the fruit is heavy, it might pose a challenge to success - whereas if you have a supportive surface beneath, that could be better. Something like strawberries which is a very small light plant might be easier to grow in a system like this. You might not need to grow it horizontally but then there is the other part of the equation which is about the time it takes to grow. Anything that fruits is going to take a long time whereas things that are just greens are going to be much quicker, so generally speaking, a lot of indoor farming companies go for things like greens because the turnaround time is very quick. It just means you are going to be making money.

Do you think that controlled environment growing will ever replace traditional commercial farms?

My feeling is that it will be some combination of the two in the future. There is a place for both types of farming. There are a lot of expenses an indoor farming, the actual infrastructure and then the 'how do we get the resources?' - by the resources I mean the energy and the water that is needed. How do you tap into those resources? Especially in a city like New York, or any big city, there are always going to be roadblocks and hoops you need to jump through to have access to those resources. So, not everybody can just plop a farm down in the middle of a parking lot, and say "here we go, this is the farm.", you know. It's expensive, it's just as expensive as running an outdoor operation. There's still a barriered entry.

Do you have an idea of how much the energy costs are or the amount of energy necessary?

It really depends on how efficient your lights are. Some lights are more efficient than others. I don't actually have a number for you but I could look that up and get back to you on that.

What resources or equipment do you need? What is necessary to start up an urban farm?

Well, you need some type of structure. So, if you go with a more traditional style farm, that would be like a greenhouse and a greenhouse has a transparent roof that also insulates and protects so you can create a climate. You can control the climate inside but you're still using sunlight, that might be a way where you don't actually have to use grow lights, at least during the summer. You could install grow lights that you use only during the winter.

So, you can mix the two? A controlled environment growing system doesn't necessarily have to be blocked off from the elements, it can borrow from the elements?

Yes, that's correct. Either you can use a greenhouse or you're in a warehouse. Those are two options. If you want to control the environment you need to have some type of cooling system or AC unit. In a greenhouse it's going to get incredibly hot very quickly, that's why they call it the greenhouse effect. You need to have a way to cool the system and then in the winter you need a way to heat the system. For us, our lights actually create so much heat that we don't need to heat the system and the lights do that for us. But in a system where it's just a sheet of plastic over a greenhouse, it's probably going to be much less

insulated than if you're in a building.

In Summer, does the system get too hot if the lights are also radiating heat? Is there an optimal temperature or range of temperatures?

No, the system does not overheat because of the cooling system we have. The range of temperature does really vary per plant but I would say it is anywhere between 65 degrees to about 90 degrees or 95 degrees Fahrenheit. Some plants really like it hot, you know, so in an outdoor growing season you plan for that. You plant the things that like it hot when it's hot and so that they are just maturing at the right time. In outdoor growing you try to avoid lettuce in the Summer because it really doesn't like it. It really likes the Spring and the Fall but not in the Summer. But melons, cucumbers, tomatoes or peppers like it hot. When I was down in Virginia, it was about 100 degrees and they seemed to be fine.

I would like to know about water. From what I understand, because you have more control over the water than in a traditional farming situation, you are able to recirculate that water? How many times can you recirculate and what process does it go through?

It does have a filtration process. It's a closed loop system with a reservoir. The water gets pumped through in a circle, that for us happens for about 2 weeks and then it gets drained and cleaned. There is also an inline filter that filters the water so while it's running, if there's debris or anything, it will get filtered out.

Is there anything unexpected that you would suggest being considered in my design? What would you do better if you were starting fresh knowing what you know now?

Well, I think pests are definitely a problem and one of the vulnerable parts of our system is that there is no real barrier between the growing space and the outside world. So, I think that, generally speaking, especially because there's no real microbiome, there's no biology happening in there - it's a pretty sterile environment - there isn't anything to protect the plants really, you know. So, if there's a pest in there and the pest decides "hey man, this is pretty delicious, I'm going to go for it", then it's pretty much the end of that game. The pest wins. At a certain point there's not much you can do except for release a pesticide or like I was saying, we clean the system every two weeks. That's very helpful. It's very helpful to basically drain everything, clean everything and it's another reason why crops that take a smaller amount of time to grow help you strategize with pest management. At the end of the day, it's more expensive to create a facility that can really protect you from the outside. It's cheaper to create a

facility that's vulnerable but if you create a facility that's vulnerable, then you're going to pay for it eventually down the line. Part of the strategy of growing in a vulnerable system is "let's grow stuff that we can grow fast and then we can cut it out and then even it does start to get a little pest pressure it won't be a big deal", it's not a big problem. But, the longer something is in there, the more of a chance those pests really get to make themselves at home and cause damage. Then your risk of failure is way higher and you will have all your eggs in this one basket. For example, if you don't get these pumpkins then you do not have anything and then you have just wasted the last three months trying something that eventually got infested.

So maybe an approach would be to compartmentalise? Like Square Roots have achieved with the containers, so if one container gets infested it doesn't mean that all of them are gone. You're talking about cleansing, is there any soil involved at all or how do you get nutrients to the plants?

The nutrients come from mineral salts. There's no soil. The nutrients are mixed into certain dilution rates. You do the calculations beforehand like "okay, we want this amount of nitrogen compared to this amount of potassium, compared to this amount of magnesium - we're going to mix those rates", then they get dosed into the main reservoir, basically through a computer system.

You are from California, what is your experience of the agricultural practices and landscape there?

A lot of it is becoming very much desert. Especially Los Angeles and the Central Valley now too. There used to be water from the San Francisco, Sacramento area. There's a river delta up there that flows to the Central Valley which was notoriously known for agriculture for a very long time, still is. But if you drive through the Central Valley now, you can see exactly where there are irrigation systems set up and where there are irrigation systems it's very green and everything else around it where there's no irrigation is brown and dead. There's just not much water there anymore. The irony of it is that, in California, the industry used to have a lot of vegetable farming, now it's predominantly tree farming. So, like nuts (almonds, walnuts, pistachios), oranges, olives. All these things come from trees and if you think about how long it takes for a tree to grow and how much water each individual tree might need to be healthy and produce fruit, it's a lot more water than lettuce, I'll tell you that. Lettuce is pretty fast. The irony of the situation is that there's less water but we're growing things that use more and that is basically just because of the economics. You would make a lot of money on almonds; you would make a lot on walnuts. Maybe in the Netherlands or regions like that, it would be profitable for them to have things like trees growing

indoors.

Is it possible to grow trees in controlled environment? If a tree is producing many nuts every year whereas a lettuce plant only gives once in its lifespan, how is lettuce more profitable?

Yeah, why not? I think anything is possible. It depends on if they are a perennial or an annual crop. Most vegetables are annual crops. So, tomatoes and peppers grow and they produce and then when the Winter comes, they are done. What we used to do when I was working in Virginia, is we would literally pull the whole plant out of the ground. We would create these big piles and come in with a tractor, the front-end loader, load all the dead plants and dump them into big compost piles. When I was in California, I was driving to San Francisco from LA. I was driving down the highway and I was looking into the desert and I saw these big piles of stuff. I said "what is that?", they were huge, they were like mountains, they were giant. Finally, I realised that they were trees. Basically, the nut trees, when they are past their peak of production, get ripped out of the ground because everything has its peak of productivity and then they're not worth it anymore. Not worth the money, not worth the energy. Then you have to deal with all of this waste which they used to basically burn wood for energy but now it's actually more expensive than solar so they don't even really have any use for it anymore. So, there are just these giant piles of wood. California is supposed to be a very liberal state but the politics around the agricultural industry are actually mostly conservative.

(Interviewer explains project concept), is there anything you can assist with in terms of advice on community involvement?

Do you know what the CSA model of farming is? CSA stands for Community Supported Agriculture and it's a business model that a lot of small organic farms use. There's also sometimes a cooperative where people will do it together. But basically, the idea is that the farm package is a box of food or vegetables and then people invest financially in the season upfront. So, the farm gets a down payment of 'whatever', maybe \$1000 from each family and then every week from May to November the family comes and they pick up a box of produce from the farm. It's a similar idea to this drive thru grocery store you are talking about, where the farmers are doing the growing, the packaging and they are also the customer service and the point of contact. The farm I worked on in Virginia was a farm that was built in the middle of a neighbourhood and it was designed by the neighbourhood. The housing development designed the farm. It's called Willowsford. The area where people came to pick up produce was also a market, so you didn't have to join the programme you could also just come and get just a head of lettuce or one thing. Part of the problem with that is that there's no guarantee whereas with the CSA model you have buy-in right

away. For the first 5 years that a farm is open, it can be expected that they will be in the red so having that buy-in off the bat kind of guarantees some revenue. Then also having the market on top of that allows for a little extra here and there. But I think something that most farmers that have a farm-to-market or a CSA business model learn very quickly is that there needs to be a separate space for packaging that needs to be food safe and needs to be partitioned from farming space. Then the person managing the customer service should not be a farmer! It should be somebody else. There should be a packaging department. There should be a farming department. And there should be a marketing department. Then all three departments will work together but they will not be managed by the same person and they will not have the same team. At the end of the day, there's too much work on the farming side. Maybe the farming and the packaging sides can go together but the market side is its own thing.

Would an interactive farm make a difference to the perception of the consumers about their sustenance, sustainability and their role in responsibility surrounding it?

It's a very challenging thing to get people engaged with food. It costs a lot of money to facilitate and you don't get a lot of money in return to run a programme like that which is why a lot of programmes like that are non-profit programmes. If this hypothetical business were to have a non-profit part of it that was more about community engagement, I think that would be feasible but I think it's a 'big ask' to have the part of the business that's responsible for revenue also be responsible for community engagement. It puts a lot of pressure on the individuals who are responsible for revenue because those two things don't align. At the end of the day, it is kind of like factory work. You have to be on a schedule, things have got to be clean, you have to have policies, its clock-in-clock-out, everything runs like a tight ship. Community engagement is just not like that. I think there are ways to do it, especially in outdoor farming. I think it's a little easier, like we used to have volunteer days when we did something like harvest potatoes. Everyone comes out gets a bucket and we all harvest potatoes together. It's easy. But in an indoor space the food safety regulations are very extreme, it's a tight space, there's a lot of equipment and you don't want kids around and breaking stuff. I would say that, generally speaking, anytime there is community engagement it's good to have somebody who's a professional that can put a programme together and that it doesn't really rely on the farm. It has to be a separate element. Maybe it can be set up so that you come take a tour of the facility and you can ask your questions. You can take a tour with a farm manager and then you go to the 'play garden' on the side and practise harvesting or something. At our facility in Brooklyn, we have a window so that you can see into the farm. A window like that is always good

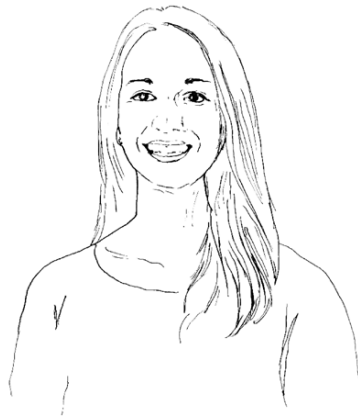
for that type of community engagement. People look in and all of a sudden, they're interested and sometimes that is even enough just to get people to be like "wow, that's cool. I want to buy from here".

I asked you earlier about the equipment you need for the farm and you were speaking about the structure. Can you be more specific?

Well, you do need a system that holds the actual plants. In outdoor growing you have soil and soil is made of organic matter which has density and volume and structure. It can hold moisture and roots can grow in it and then absorb the moisture and nutrients. They have structural support, so part of the design of the growing system has to consider the structural support for the plants and how the root systems can absorb water. If you just have all root systems sitting in water all the time, it's a different system than if you have them in some type of mesh. So, you can do it multiple ways but either way there needs to be a container, channel, surface or a tray where the plants can live. There's a lot of different types of hydroponic growing systems with a lot of different ideas and they all work. You should look up different types of "grow media".

Emma Coz

Assistant Farm Manager
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18 May 2021

(Interviewer explains project concept), is there an issue with having cars that produce carbon dioxide inside my urban farm?

That's a really good question. No, I do not believe that the cars will have the capacity to produce too much CO₂. We actually have a carbon dioxide input, and we set the ppm (parts per million) to 1100. For reference the atmospheric ppm just outside of our farms is about 480-500 CO₂, it helps the plants grow faster and you can't really have an excess of it for the plants - it would have to be extremely high. There is CO₂ in the environment, always, and the plant is not going to die if it has a low level either, but they will not photosynthesise as quickly. We input CO₂ because we want to create the optimal environment for plant growth. So, what we're doing in our containers is getting it up to almost 1100 parts per million. That is a lot of CO₂, but that is only during its growth period. I wouldn't be concerned with the plant having access to CO₂ because in nature, they have access to 480 parts per million at any given time. We're just increasing CO₂ as well as the other components it needs for growth (water and sunlight). They can handle a lot more than we can.

So, it's actually a positive? What does CO₂ actually do to a plant?

Yeah. We even buy it. To make this concept a little more tangible, people sell CO₂ in lbs and it comes in big gas tanks. So, a 20 container, shipping container farm in Grand Rapids, has a supply of 1500lbs of CO₂ for 20 shipping containers per month - almost 1 US ton of gas. It helps the plants grow. The plant needs to intake CO₂ for photosynthesis to occur. It also needs sunlight which is in the form of photons and then the plant produces oxygen and glucose which is plant tissue, basically - in an over-simplified version.

When you're using this carbon dioxide are you just putting it into the air in the container?

CO₂ is very heavy, so it sinks to the bottom. We have a drain on the floor that we have to plug up so that the CO₂ does not escape and is wasted. In an open parking garage, I would imagine that a lot of the CO₂ sinks to the lowest level. It's a much heavier gas than oxygen so it's going to fall to the base.

Is CO₂ of any danger to the farmers?

Not really, you would have to get to a very high amount of parts per million before you start getting a headache. Arguably we're getting less oxygen because there's more CO₂ in the container and less oxygen than in the atmosphere, so I don't think it's great but yeah, I wouldn't say anyone has had any long-term effects. No one is worried about it in terms of worker safety and all that because

we have already looked into the dangers and found that they are not of major concern.

Can you do controlled environment growing without pesticides?

Yeah, we are doing it. If you think about controlled environmental agriculture from a real estate perspective, every space that you're 'controlling the environment' in is very expensive because you're inputting a lot of energy toward controlling it. You're not using any passive control, right? You're saying "I want it to be this temperature, so I'm going to install an AC unit that creates this temperature". Then you say, "I want it to have this amount of light", so then you set it for an 18-hour photoperiod where you turn your lights on. Every environmental climate manipulation consumes energy. It's a very cost intensive process to control the environment. It's cost intensive to purchase the container that is well enough insulated to control the environment. So, because of that, every space in there has to produce a certain amount in order for the container to make money. When you have a pest in a container, the non-pesticidal solution is to remove all the product in that container because otherwise you risk spreading the pest. So, in our case, we have been able to overcome multiple pest threats to our crops without harmful pesticides because we use shipping containers. The system is completely modular and if you think of each one like a cell, we can say, "Okay, take all the plants out of that cell", and then once empty, we do something where we heat the container up to 110 degrees and we run soap through it. We use a soap at times but we don't put it on our plants. In the time that we're spending killing these bugs, it's time that we're not growing plants - "wasted real estate", but very necessary if you want to avoid using pesticides. It's very expensive. If you use pesticides, you never have to stop growing. In urban farming, even though we are inside and it's a very mechanical and technical process, we are doing something traditional soil farmers would call 'leaving their fields to lay fallow'. We are doing this and increasing the temperature to ensure that we kill the bugs.

Would you have any idea of the costs and finances involved in all of this? And how long it takes for a container and the equipment to pay itself off?

That's a tough one. It depends where you are. From my experience - In New York, where the electricity is more expensive, the real estate, where we put the containers, is more expensive and the labour is more expensive because you need to pay the farmers more so that they can live here. All of the expenses are high. The market is more saturated here. The more urban you get, you get more competition in the economy and the more expensive all the land and inputs

like the energy become, the less likely you are to break even sooner rather than later. You have to be even more successful at meeting yield targets and sales targets than in a lot of other cities. I would imagine that's why, essentially, people grow things that grow very quickly in these containers. If you can turnover one pound of anything in seven days and then you can sell it, you're not going to want to turnover one pound of another crop in 28 days. So, microgreens are really cost effective because they grow so quickly, they have a high price point and you can get more money out of a container over time. For example, you could get 100 pounds out of a week.

What type of plants are the most successful in these urban growing environments?

Leafy greens. Anything that doesn't have to go through a flowering process which means to produce a fruit. Anything that has extra pieces you can't sell, think about it, you are wasting energy. Think about the energy as a major cost. Anything that you grow that doesn't end up getting put into a package and sold, you're throwing out money. If you have a tree of oranges, you have to grow the tree. Even if you sell the oranges, you had to spend a lot of time and money growing that tree first.

The tree will live for years and years, and provide fruit over and over again, whereas the smaller plants might die after a year? What about plants like carrots or potatoes or those sorts of things where you eat the root?

Yeah right - the tree will live and be fruitful but the cost of getting it to that point is just too high currently, with the cost of energy. As far as carrots or potatoes go, or anything that's heavy, all that mass has to come from somewhere. If you think of it as a closed loop system, that carrot is way heavier than basil. On top of that, a pound of basil is about \$36. A pound of carrots is about \$5. You're putting that resource in with your money and it costs the same amount of money to buy the nutrients to produce a pound of carrots and then it takes more time because the carrot takes longer to grow. If you could get cheap clean nutrients, that would help toward solving the problem of expense in controlled environment agriculture.

What is the nutrient? Where do you get it?

We use a very common nutrient solution called Jacks. It's a two-part solution and it's just salt. Where it comes from may be the most unsustainable part of this entire process because it comes from far away.

Are there alternatives?

There are. But you come into a different problem with organic alternatives. One alternative suggestion I have gotten before is to use ground feathers for soil farming, right? You've probably seen people in their gardens using ground chicken feathers and bone meal. Or people use composted cow manure for fertiliser. We cannot put those fertilisers into our system because you would be putting in an unregulated biological factor that could have a negative impact. In the cow manure you could get E. coli or whatever and then you're not putting in any other factors to control it. So, there's only so far you can get. CEA is a very sterile process, in my opinion. You're monitoring every single thing you input and you're trying to control it with another equaliser. Think about it like balancing a chemical equation. If you add another variable, you need to balance it.

If this nutrient that's going in is a silt or even a salt, from a riverbed, when water starts to dry up in the environment surely there should be more and more. What is not sustainable in this process?

In my opinion, it's the acquisition inputs that are irresponsible. It's irresponsibly acquiring water, disposing of the waste water and acquiring energy. Overproducing when you do not have anywhere to sell the produce is a huge waste, but never the intention. The fluctuation in sales often leaves us with excess product. When we overproduce a lot, we throw it out, compost it or donate. Because the industry is so new, we're still figuring a lot of things out and the last thing you want to do is tell a store that you can give them 100 pounds of basil and then you only produce 20 because you made a production plan that is bad. You're obviously going to air on the side of 'more' because part of the selling point for us is that we can get it to you whenever you need it because we control everything. The truth is that it's still not fully controlled. We don't have the answers to everything so we can't really control it. I do feel that this wastefulness is exacerbated in large soil farming operations or monoculture operations in general.

You spoke about water. When the water recirculating through the system is cleaned out, is it toxic or what is the state of it and why is it thrown out? Can it go, for example, into watering the park next door?

No, not directly out of our container. I would say that that would be irresponsible but I think you could maybe put it into a bioswale. You could put it into a mass of land that is made to absorb the waste, which is what a bioswale is. We try not to put chemicals into the system. The harshest chemical we use is peroxyacetic acid (a natural compound) which is, basically, hydrogen peroxide which will dry

and evaporate into the air and become hydrogen and oxygen. It's not toxic but an abundance of hydrogen peroxide in water, when it is that molecule, can kill things. It's an acid so if it's not disposed of properly, it can kill things but you can neutralise it with other things before you put it out there - which is the responsible thing to do. When there are no plants in there, we use a cleaning agent to keep the container safe for human consumption purposes, so that people don't get any type of sickness. For cleaning agents, we use a sulphuric acid based cleaner. Then we use a basic cleaner. It (the water) can be fixed, you can't just throw it out of the container but there's a lot of things you can do to make it usable water - but not drinkable. It is basically grey water.

I had heard that air conditioners could introduce another toxic factor into the urban farm. Do you know about this issue?

There is a specific disease called Legionnaires Disease and it is a bacteria that can get you really sick. Not deathly ill if you have proper meds, you need to take antibiotics if you get this illness. It comes from water, it is water borne and it can be given to people in an AC condensation line so that's something that we consider as a company to try to control our condensate lines. The condensate is collected out of the air on cold objects and it drips back into the tanks. Our de-humidifiers do the same thing. So, we are determining how safe it is through water quality monitoring and exploring alternative options. Plant pathogens can be in there too, there are a lot of waterborne plant diseases that are difficult to control once they get into the system.

One of the things I keep picking up on is that it helps to have the spatial layout be modular - so that one yield gone wrong for whatever reason, does not affect another.

Yes, it's really important to ensure that you make enough money to be able to compartmentalise because otherwise you put yourself into a scenario where you might not achieve the proper planning. You don't have to compartmentalise the water source, by any means, but you should be able at all times to clean something with another external source of water. So maybe, you have one big source of water that's for the plants and then an external source that's for cleaning - this is common practice in brewing and a large area of focus for us. You can have valves that shut on and off to each modular part.

The beauty of the water from the humidifiers and the AC going back into the tank means that it's creating a closed-loop system. All the water entering the

system, the plant is sucking up and then the plant is pushing it out and the dehumidifier is taking it back. That's why I think the engineers love it so much. In theory you could have really big UV lights to sanitise it or you have a filtration system. You just have a system dedicated to reusing the dehumidifier and AC condensation water.

Is the Grand Rapids facility similar in size? Do they have shipping containers?

It's definitely bigger because there are two farms, but it's the same scenario with about 10 containers per farm producing and then two nurseries for the younger plants. One of the farms is stacked and the other has its containers set side by side. If you saw it, you could have an understanding of what the shared workspace looks like because we don't really have that in Brooklyn. Brooklyn started with no indoor shared work space, it was only planned to grow plants inside the farms.

Do you use a standard growing structure?

Yeah, I would look up a 'NFT system'. A nutrient film technique system.

Gilbert Davies

Independent
Johannesburg + Mossel Bay,
South Africa



29 June 2021

(Interviewer explains project concept). You have been looking into urban farming and hydroponics, is this something that is going to be a prominent industry in the South African context soon?

The urban farm I looked at when I was on Cradlewood Farm (Krugersdorp, Johannesburg) was interesting. It's definitely something we're going to be looking at, I think, as a community or as a country in the future. Although we have got land, the expansion of urban development is gaining momentum. Just looking down south at the Garden Route, you see farm land, almost monthly, being taken up by development. A farmer can get more money for his land than he can on the produce, at the moment. It's all about money. So, we're going to run into the same problem eventually in many more areas across South Africa.

Is this something the average South African can go into?

It's a skill factor. I mean, you need to be able to implement and understand the whole concept of timed planting and how the nutrients works and all that. Aquaponics is the direction I want to go in. It's basically self-sustaining. You just do the monitoring. In a controlled environment, once those parameters are set, you just need one or two people to monitor it. Then you have a system that is much more efficient than in massive farming production. This is where the skill level is going to be lacking right now as we slowly start moving everybody onto the technology needed.

What have you been doing in this industry?

So, I have designed a few prototypes based on the urban farm concept in containers. Then my own little units for residential areas and for townhouses. The production that comes out of that little 12m or 20m container will provide a whole estate with produce. It takes up minimal space. It can be used in, maybe, a retirement village where people now have time to take an interest in this sort of thing. One of the later ones that I'm looking at is, with this whole move to work-from-home, we're going to have a lot of redundant buildings. I looked at the Township development in Gauteng and had meetings with relevant officials. My concept would be that instead of building single-storey townships, you build a three-storey thing on the same square meterage. The ground floor becomes a selling area, the middle floor is where they stay and the top floor is for all the production. In my sight, this would be hydroponics or aquaponics. But they can do other things like wire work and you know, that type of concept. Then have the bottom areas become a retail area and maybe become a tourist attraction.

Financially, is the average person able to set up their own hydroponic system?

Definitely, I mean it's a once off purchase. Everything is recyclable. Your water

saving is phenomenal. The only downside at the moment, which we've got the technology for, is the lighting and the pumping. It needs electricity. If we go through solar panels – every new building now going up – I look at these estates and I say it should be illegal to put on roof tiles. Every house should have solar panels, all the tiles converted into solar panels. We have got the technology. And yet still, old technology is being used, it blows my mind. I mean, if we look at what we are spending now and the corruption to be solved, if that all went into proper development of these townships, we would have a massive turnaround on the economy. In this concept, there's no transport costs for the residents they work from home and business comes to them.

Can you tell me a bit about the nutrients and the water processes you use in the farm?

The water that is flushed out of the system at the end is high in nitrates and it becomes acidic. You can maintain it but again I used a natural product. Instead of shifting the pH down or pH up with products people are selling, I use bicarb and vinegar which is all natural. Everything I've done is natural. Even the insecticide, which is a chillie and onion spray that kills the aphids. There are no added chemicals, apart from the nutrient mix, which are all base materials anyway. When I first looked at nutrient mixes, they gave this breakdown – that you need 2% of this and 5% of that and I thought "wow man that's going to blow people's minds", especially when you are working on the small levels of home production. People aren't interested in that scientific scenario. It almost puts you off. Each plant uses a different mix but when you plant them in the ground, the plant itself takes the nutrients it needs out of the soil. So, I took all the specs each plant required and put it into a spreadsheet. Then I took an average of the whole lot and I used that mix to grow everything and it was perfect. Now the only thing that needs to be controlled is your pH level. If you move away from the hydroponics side and go toward aquaponics, it's totally added nutrient free. In hydroponics, you have to add the nutrient mix to the water to provide feed to the plant, but in aquaponics, you grow fish in a tank and you feed them and the fish create a nutrient mix for the plants. So, you feed the pond water into the plants and while it's there it gets filtered by the plants and comes back to the fish again as clean water. The growth rate, because it's in a controlled environment and there are no predators, is phenomenal. You can sell the fish too. You're getting your fish and your fresh vegetables out of one system. It's fantastic. It is so simple and yet so effective.

What have you grown in hydroponics and aquaponics?

I grew basically everything. Peas, tomatoes, all leaf-based. I even grew pumpkins in hydroponics. The roots are in the water. The biggest growth factor is when the system has got exposure to oxygen. I grew spinach in the same system. The original system I had was manual. It was totally automatic in terms of pumping and the timing. The only thing I had to control were the lights and the

temperature. I've been working on a system where everything will be controlled by solenoids and you control anything anywhere from your phone or your tablet through an app. I can just see the whole world moving that way.

What do you expect to see in the future of this industry?

In the refurbishing of the buildings, in the centre of town there are these massive office blocks that you could make into a residential as well as aquaponic combination. So, every third floor converts into this hydroponic floor and another three floors, the same thing. The sustainability of the production out of there is phenomenal. I had a 2m X 1m pipe system and what I got out of there was unbelievable. Then obviously the water savings and the reuse of that water once you turn it over into the gardens and that type of thing. It was unbelievable. So, that's what got my spark going. If you take a shopping mall like Cradlestone, it's a massive place that is just expanding. You just think, what is going to happen with all these buildings now with all the working from home and the convenience of grocery and tech deliveries like Checkers Sixty60 and Takealot? A lot of people eventually won't even make the effort to go to these malls. Some few people like the experience of them but there may not be enough of a presence to justify keeping them open in that form. Imagine if each one of those retail stores becomes a hydroponic or aquaponic production system. Then you have a rail in the middle that channels the water and nutrients to the plants. Then in the centre court of the mall, you create a pond for all the fish which feeds all the retail store farms. To go one step further and it is a little bit hard to envisage it but I believe the parking lots might become drone zones for pick-up and delivery.

What do you think we can do to make the hydroponic system more attainable?

Energy is the biggest factor. I think solar power will be taking off now because now the government legislation is changing to allow for it. They're opening that up now. At George airport there is about half of a kilometre of solar panels as shading in the parking lots, so the whole airport could eventually run off this solar panel farm. I have seen a couple of wind farms too. Overseas there are plenty of those offshore wind farms which is really where they work the best. Solar power can be used pretty much anywhere and everywhere.

How does the pollination of the plants happen in the controlled environment?

The insects would come in, it's not a completely sealed environment, in this case. Where you don't have enough insects to do the pollination, you just take a little paintbrush and paint all over them once or twice at the pollination stage - that's what I do for the pumpkins. For the rest of the plants, I didn't need to do anything. I took ladybug larvae and put them into the farm and they run

around and eat aphids. The more natural it is the better it is and the insects can be controlled organically, you don't have to have pesticides. If you do get an infestation of grey mould or something, you can control it with your natural sprays from plant-based products.

The chillie and onion spray you spoke about, does it affect the taste of the produce?

No, it's not intense. You don't spray a lot and the spray has time to dissipate before you eat the produce. The only unnatural thing you may use is a drop of dishwashing liquid just to break the surface tension of the leaf - but only if you get a serious infestation.

Are you growing mushrooms? How do those react differently to other plants in the controlled environment?

Yes, I have grown a couple of different types of them. You can grow them in a dark environment. You need a little bit of light but not intense. They need natural oxygen and prefers dark damp areas, so, if you can create that environment, it would be ideal. They are actually quite simple to grow. There is a man I know, down here in Mossel Bay, who has a coffee shop. His son grows and sells mycelium and he uses the coffee grounds from the coffee shop as nutrients because it has a perfect pH balance for the mushrooms.

If you have to predict a timeline for this controlled agriculture to become common place in South Africa, how long do you think that might take?

In my opinion, it could be another 10 years. If we are up and running, progressive and we sort out the issues that hold us back as a nation it could be sooner but I believe 10 years, as of the situation now, before it becomes a widely viable option. If you look at China, they've been going with these systems for a long time. I started researching hydroponics in 2002. At that stage there were only two sites on the internet about hydroponic systems. It has since completely taken off. Worldwide it is becoming a pretty sought-after and viable option. Implementing it in the way you are talking about, in South Africa, will still take a while. We need to sort out other basic infrastructure first. The electrical grid, housing, clean water. However, soon after that we should look at food sustainability as one of those critical factors. Food, water and a roof over each head. The climate crisis poses a threat that will force us to speed up efforts.



21 September 2021

Faculty of Engineering and the Built Environment:

Ethics clearance letter:

Dear Kady Burkimsher (1429588), this letter confirms that your ethics application has been cleared.
Your clearance/protocol number is SOAP05/2021

Yours sincerely

Lerato Nkosi

A handwritten signature in black ink, appearing to read 'Lerato Nkosi'.

