WATER MEMORY & CONTROL

VAALHARTS CANAL MUSEUM AND EDUCATION CENTRE

Dené de Bruyn | 2018169843

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I would like to thank my family and fellow Cubicle students and friends,
for all their support, love, and understanding.

Most importantly, thank you God, for always being there and giving me the
strenght to stay strong.

PRETEXT AND DECLARATION:

All the work contained in this document is my own except where otherwise acknowledged.

The following document contains the needed information for the requirement to fulfil a Master's Degree in Architecture. Department of Architecture, Faculty of Natural and Agricultural Sciences, University of the Free State.

Supervisors:

Prof. Jan Smit - Cell no:083 500 6979 | smitarg@telkomsa.net |Department of Architecture | 051 401 2332

Petria Smit - Cell no:083 477 6468 | smitarg@telkomsa.net | Department of Architecture| 051 401 2332

Martie Bitzer - Cell no:083 281 6806| BitzerMM@u fs.ac.za | Department of Architecture | 051 401 2332

Co-supervisor:
Prof Dr Gerhard Bosman Cell no:083 441 3775 | BosmanG@ufs.ac.za | Department of Architecture

Dené de Bruyn | denedeb@gmail.com | 2018169843

FIGURE 2: Canal split way (Author, 2023).

ABSTRACT:

In the following dissertation, the education, influence, and importance of water a on the existing waterway systems and area will be discussed.

The main research question was: How can an educational waterway exhibition centre of an integrated canal waterway hold the memory and phenomenology of a place in order for growth in Hartswater in the Northern Cape (Fig. 4)?

Previous attempts to keep the history and educational moments separate in the form of a museum in close proximity, did not successfully maintain the space and create multiple opportunities. That is why this dissertation will focus on the history and impact of the canal, but creating an educational opportunity and space to learn and develop the current systems and knowledge.

Analysing different case studies and precedents led me to research the influence of water and the canal waterway on the cultural significance of the design of a museum and education centre. The proposed design creates a collective space for teaching about water conservation and different learning opportunities about agriculture and water, through the unique use of a Water Memory & Control Museum that is supported by the community and supports the community, in return.

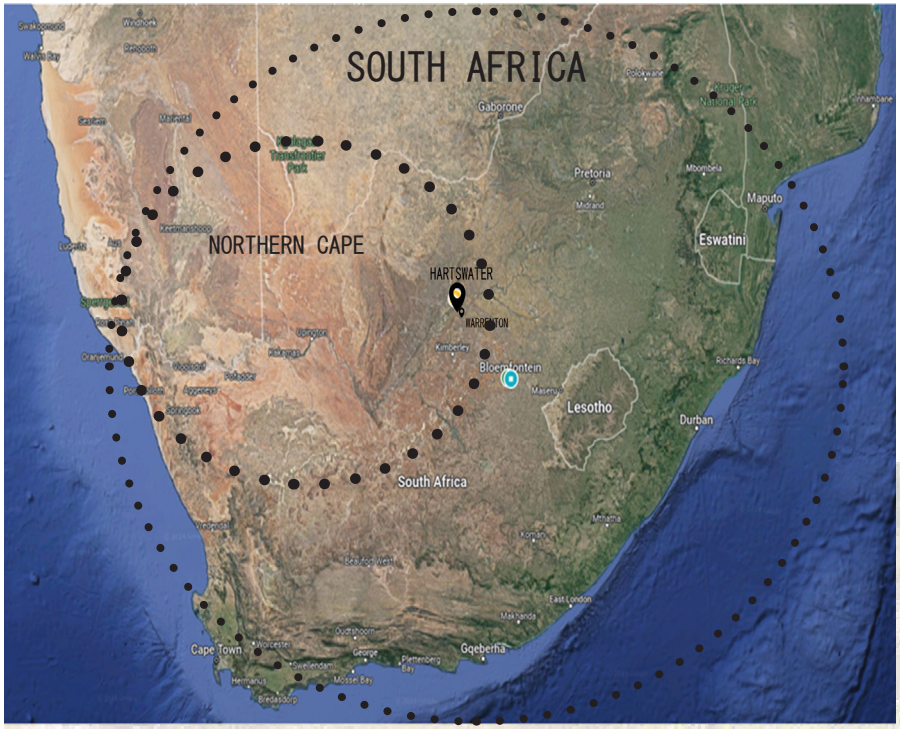

FIGURE 3: Aerial view of South Africa, indicating the location of the Northern Cape (Google maps, edited by Author, 2023).

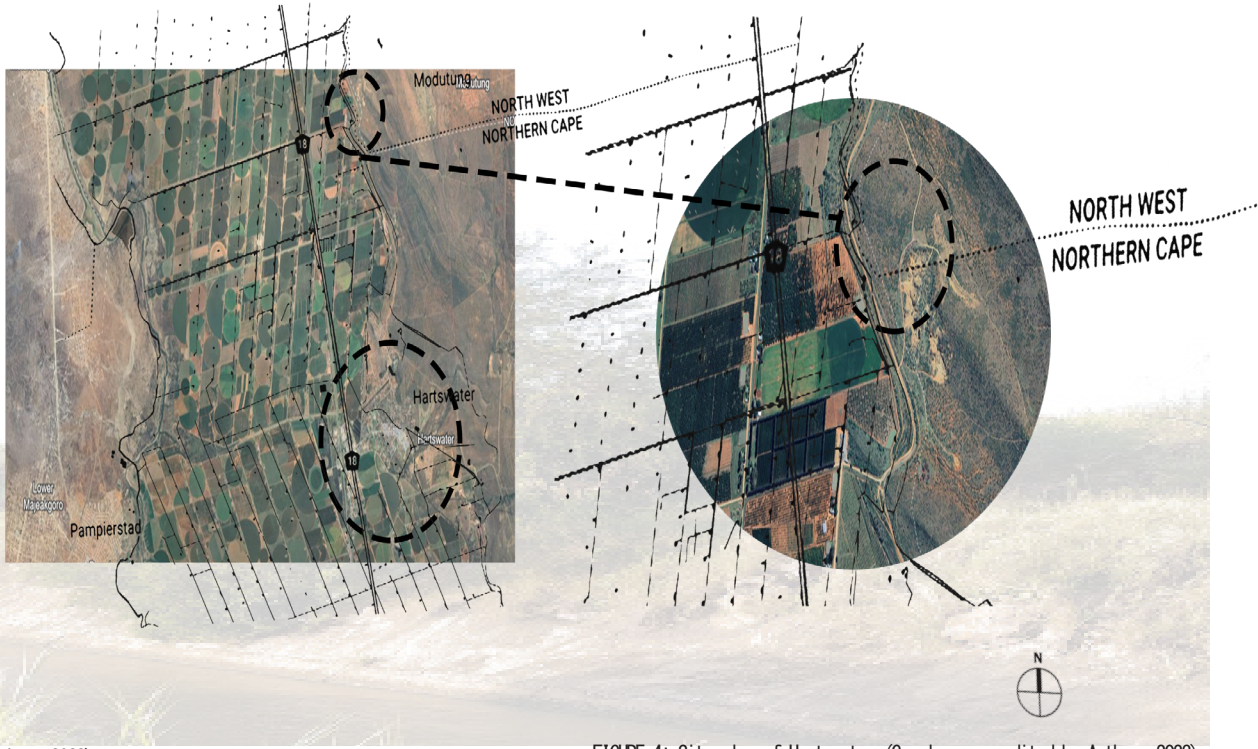

FIGURE 4: Site plan of Hartswater (Google maps, edited by Author, 2023).

INTRODUCTION:

Water plays a crucial role in our everyday lives and in our relationship towards nature, as our body and existence are dependent on water.

For this reason, this dissertation focuses on the growth, knowledge, and memory of water and the influence it has on space. This led to water and its distribution as the main topics of this research project, as both are symbolic of the focus points of this dissertation.

This large-scale project may include a brand-new idea for a waterway museum and educational exhibition centre that elaborates and illustrates the agricultural significance, social influence, integrated processes, and impact on the lives of the people living in the Vaalharts Irrigation Scheme area and community (Fig. 6), specifically the central town of Hartswater, next to this complex canal waterway system.

THE MAIN OUTCOMES OF THIS DISSERTATION ARE (Fig.5):

- The rejuvenation of the knowledge of the watering systems used in the area.
- Understanding the impact of water on economic and agricultural growth and importance.
- The relationship between water, man, new and existing, between the existing canal and systems used, and the users.
- Creating a space to experiment and develop the current water systems in order to understand how they work and impact other components, such as elements within the canal waterway, to control the amount of water that is distributed.
- Create a space to spark an interest in the different systems and methods of waterways to encourage the questioning and development of the waterways and systems currently used.
- To create a space to honour the growth of the area and its surroundings in the form of an educational museum by illustrating the growth by reflecting on the history and the development of the systems.

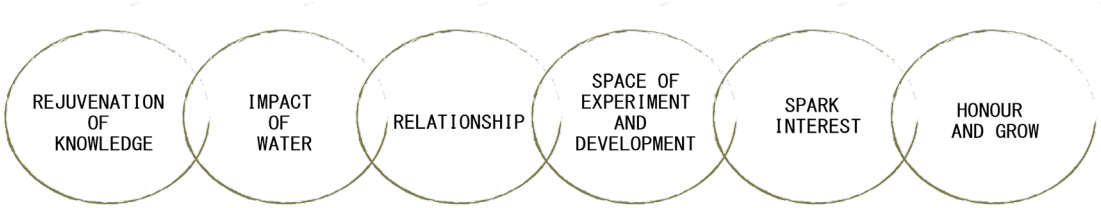

FIGURE 5: Syntax of the Dissertation (Author, 2023).

FIGURE 6: Location map of Vaalharts area, zooming in on Vaalharts Dam (Author, 2023).

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FIGURE 7: PHOTO OF THE SURROUNDING PLANTS (AUTHOR, 2023).

1.1. THEORY

The main theory discussions are focused on water memory, the mind, and phenomenology. Together they form a narrative of the past, present, and future, each one flowing into the next, creating an ever-continuing cycle (Fig.8).

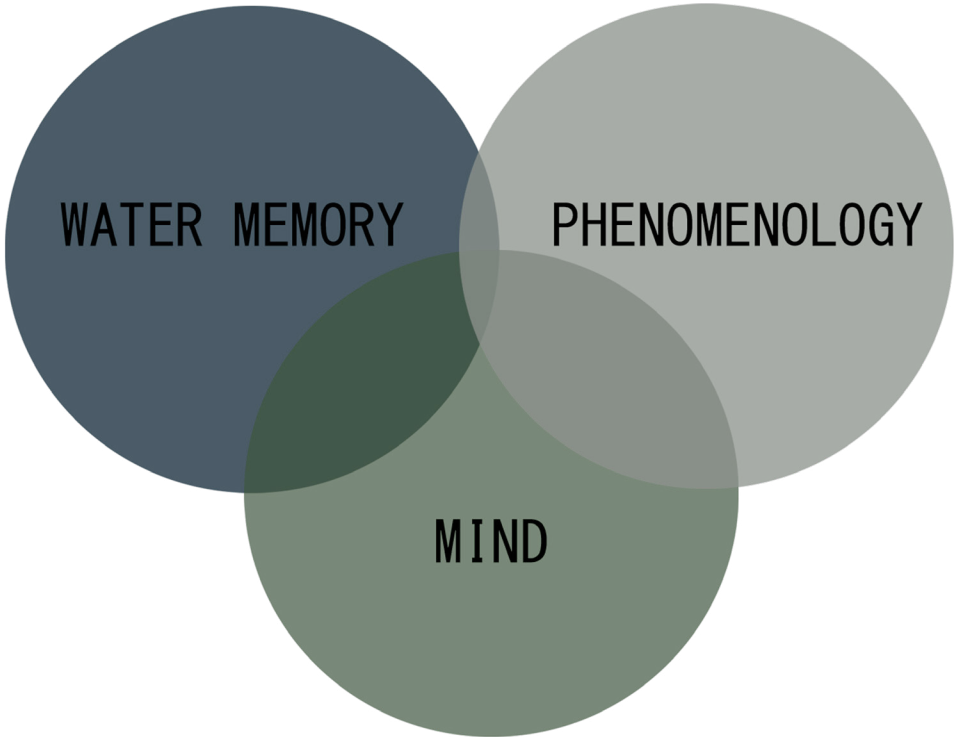
Water memory focuses on the possibility of water to remember where it has been and what it has been in contact with.

The theory of the mind looks at different minds, 'brains' and beliefs that influence our everyday lives, linking our thoughts and actions.

Phenomenology is the experience of a specific moment, and the experience is dependent on the person experiencing it in that current space and time.

The importance of remembrance and place of WATER MEMORY impacts the MIND through thoughts and actions that are made at a particular place, for example, negative or positive thoughts and actions, will impact how a place will be remembered by each person.

This can cause a ripple effect on the surrounding people.



The importance of remembrance and place of WATER MEMORY, influences the EXPERIENCE of each person, as each one has a connection they make to their experience.

This experience can be shared with others, by experiencing it in a group or by sharing it with others by telling a story.

The first experience always has an impact on the following experience as it will always be compared to the first.

FIGURE 8: Diagram of the relationship between the theories (Author, 2023).

1.1.1. WATER MEMORY

The research regarding water memory started in 1988, with Jacques Benveniste as the best-known person to study this theory. Water memory is a theory that focuses on the ability of water to keep an imprint, a ‘memory’, of that to which it has been exposed (Dunning,2011:3).

The entire theoretical concept of water memory is based on experiments. When John Maddox visited Benveniste’s laboratory, he brought along a magician, James Randi, and a debunker of fraud within science, Walter Steward (Meessen, 2018).

Benveniste did not concern himself with his findings and how they could be reproduced; he was interested in the influence it has on the homoeopathic medical field. He was asked that these results be tested again in order to provide evidence (Ball, 2004), but he failed. The editor of the Nature paper, John Maddox commented, “When to believe the unbelievable” (Dunning,2011:3).

This comment is based on the findings of the tests, due to the tests not having the same result as the first time. Therefore, there is no physical way to explain the findings. That is why it is stated by Maddox to believe the unbelievable, as it has been proven once; therefore it is possible.

That something so common as water has the ability to have its own memories, is astonishing (Fig.9). Even though it creates its own memories, it also creates an opportunity for those experiencing it, to form memories of their own. This creates a relationship between water and man, nature and architecture, as both have memory and the ability to form memories in common.

FIGURE 9: Mesuring point for water at a sluis (Author, 2023).

According to David Lowenthal, the main function of memory is to adapt the preserved memory, in order to enrich the current experience (Meessen, 2018). Memories are eclectic and are a reconstruction based on each personal experience. Therefore, a building is not just a space that has to function, but a space that creates a memorable moment.

Each person's expectation of a new experience in the same space is formed within their mind even before they enter through the door. As a result, the function of the space, the building, addresses the expectation and memory, as it influences whether one wants to enter (Lowenthal, 2021). The experience of a particular place is compared to a previous experience, because we hope for a better experience each time we go to the same place.

How is it possible for water to remember where it has been and with whom it was in contact?

Theoreticaly, water can store and transfer information that is passed on from its environment and surroundings (Fig.10). It reacts to both bio- and technical signals; bio-signals come from nature and technical signals can come from radios, for example (Meessen, 2018).

This has also been proven, disproven, and investigated by Prof Bend Kroepen. He was able to determine the following regarding the properties of water (Grander, n.d.):

1. Water reacts to signals.
2. Water stores information, having a memory.
3. Living elements, such as bacteria, react to the ever-changing conditions of water.

The question of how and where, exactly, water stores information remains a mystery. This creates the opportunity to continue investigating the theory of water memory.

FIGURE 10: Canal split way, representing different memories (Author, 2023).

1.1.2. MIND

Every mind reflects one's unique personality, view of perspective, past influences, values, beliefs, memories, and unconsciousness influence (Cherry, 2023).

Daily decisions we make are impacted largely by our minds and thought processes. Ultimately, we rely on our minds to make the final decision, and our thought process determines the sphere of our minds; between the four minds: soul, body, emotional and rational (Cherry, 2023).

Cherry argues that the mind consists of four minds and three brains (Fig. 11). They control our reflexes, the way we behave and the decisions we make.

The four minds (Barrett, n.d):

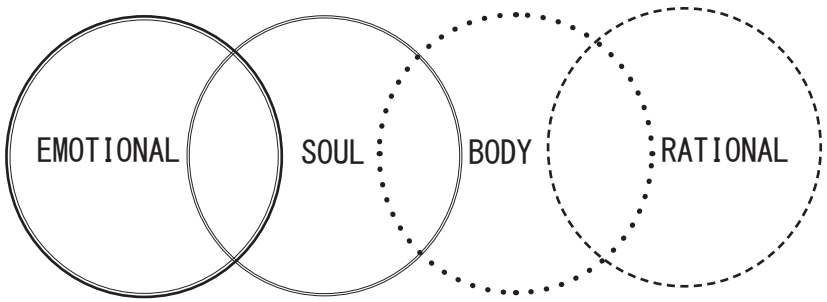
1. Soul-mind
2. Body-mind
3. Emotional-mind
4. Rational-mind

The three brains (Barrett, n.d):

1. Reptilian brain (body)
2. Limbic-brain (emotional)
3. Neocortex-brain (rational)

The knowledge we have impacts our minds and our thoughts (Collins, et al). Knowledge of the subject in question is needed in order to answer the question. At the same time not knowing and asking questions, create opportunities for growth of knowledge and sharing knowledge.

When the required knowledge is obtained, a process of reasoning will take place, generating thoughts, and ultimately forming a final decision (Hall, 2022). The final decision is therefore made as a collective of one of the four minds and three brains, having a direct influence and connection from the brain to the mind, or vice versa (Fig. 11).



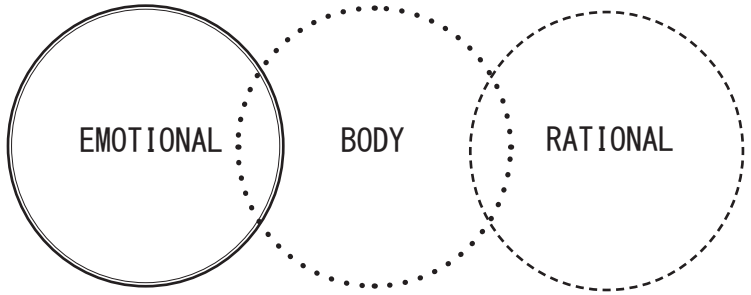


FIGURE 11: Connection between mind and brain (Author, 2023).

When looking closer into how our minds work, we must investigate the personal beliefs of the person in question, thus this can differ from person to person (Barrett,n.d). There are four main types of beliefs, each occurring in different circumstances, with each one having an influence on the other (Fig. 12):

1. Instincts:

This type of belief is formed to help with the body's survival instincts and needs. These instincts are not known, as they are only activated once they are used (Barrett, n.d).

2. Subconscious:

This belief is formed by our experience in utero, known as the process of birth and the first two years of our lives. This forms a part of the decisions we make regarding the body to keep it alive and functioning, also known as the body-mind. It is connected to a person's endocrine system, meaning whether the body goes into fight/flight mode, one experiences something. For example, it can react with fear, joy or sadness (Barrett, n.d).

3. Unconscious:

This belief is formed between 2 to 7 years of age. The body once again reacts to interactions in the form of feelings and emotions. Here the emotional mind decides how open one is to others (Barrett, n.d).

4. Conscious:

This belief only starts to form from the age of 24 years of age and grows for the rest of one's life (Barrett, n.d).

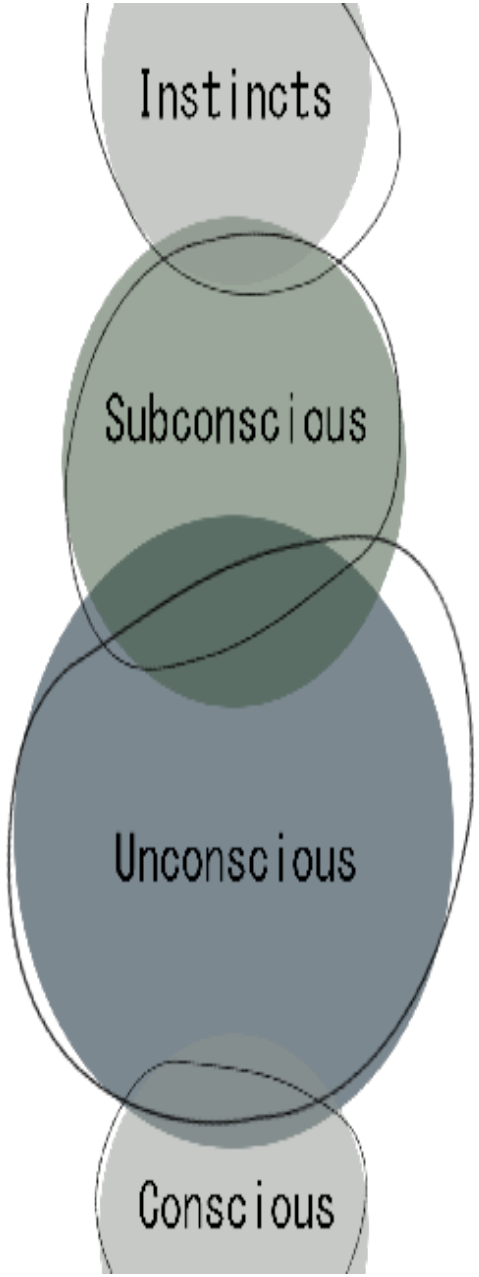


FIGURE 12: Drawing of the connection between the four main beliefs (Author, 2023).

1.1.3. PHENOMENOLOGY

Phenomenology can be defined in different ways. It can be seen as an approach to researching the essence of a phenomenon by looking at it from the perspective of someone who has experienced it (Neubauer et al., 2019).

The goal in defining phenomenology is to describe the experience in such a manner as what and how it was experienced.

There are different forms of phenomenology, depending on how and what was experienced. There are three contemporary methods of approaching phenomenology (Neubauer et al., 2019):

1. Lifeworld research:
It explores different, and combinations approaches to how everyday activity experiences manifest in one's life by looking at selfhood, sociality, embodiment, temporality and spatiality (Ashworth, 2003).

2. Post-intentional phenomenology:
It is the combination of different approaches that focuses on treating the phenomenon as the unit of analysis of multiple, partial, contextual and in flux phenomena. All of them are produced at the same time (Vagle, 2018).

3. Interpretive phenomenological analysis - IPA:
It is the combination of different methods, aiming at providing a detailed analysis of lived experiences and personal views and events. With this approach, the researcher is part of the interpretive process (Tuffour, 2017).

A common definition of phenomenology is the study of experiences; the way they are perceived and understood (Neubauer et al., 2019). It is the study of the lived experiences of individuals.

When these experiences are examined, new perspectives are created and can develop to inform or develop how a certain experience is understood.

Figure 13 is an example of a change of perspective, as one normally looks at a staircase, similar to this staircase, from the side. Only when using the staircase, one views it from the bottom, providing a view of what is to come.

FIGURE 13: Ladder to the top of the dam (Author, 2023).

1.2. HISTORY

The Vaalharts Experiment Farm was started in 1938, the same year as the first renters gained access to their land (Fig.14). The Farms were laid out in a 2x2km grid. According to the literature, both the researchers and the farmers experienced an extremely steep learning curve, and the researchers frequently gave the farmers bad advice (Bornman, 1988).

In addition to the Vaalharts Agricultural Cooperative, some of the major agribusiness ventures that were established in the Vaalharts area over time include:

- Cotton Gin by JL Clark
- Bakery by Bokomo
- Three Grain silos
- Peanut butter factory
- Wine cellar
- Cheese factory
- Vegetable dehydration facility

The Union of South Africa was founded in 1910, which opened the door for the construction of a suitable institutional framework for land settlement. This Act served as the foundation for farmer settlement up until its replacement in the late 1950s. It served as the legal underpinning for Vaalharts to be developed as an irrigation scheme (Bornman, 1988).

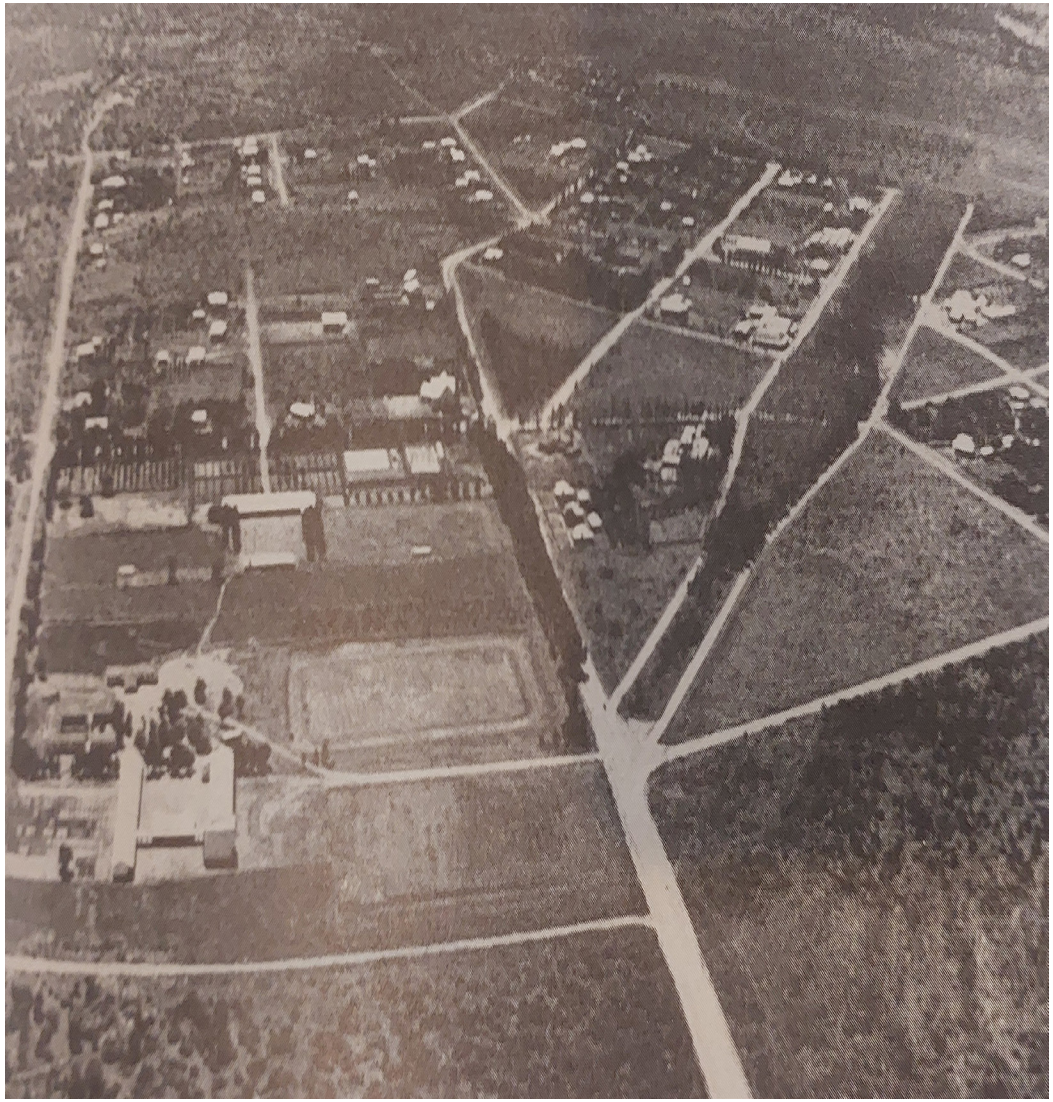


FIGURE 14: Hartswater during the 50’s (unknown, 1950).

1.2.1. DEVELOPING THE VAALHARTS IRRIGATION SCHEME

According to Bornman, despite the fact that the idea to build an irrigation system at Vaalharts was first proposed in 1873, it was not officially approved by Parliament until 1934 (Act 38 of 1934 in 1934) (Bornman, 1988).

The first plots, one of the farms laid out in the grid, were occupied in 1938 by lessees on probation, and by 1947, 100 households had settled while the bulk water facilities were still being built. Depending on the soil quality, these plots had a size between 20 and 30 morgen (17 to 26 hectares).

The Vaalharts Dam (Fig.15) is located within the Vaal River and acts as an obstruction to canalize water into the canal systems. The Dam helps to control the amount of water that is led into canal systems (Fig.17-18), while the opening of the sluices is determined by and controlled using a counterweight system (Fig.16) that is managed by skilled operators (du Toit, 1994).

From this point, the water is directed to other regions, primarily farming settlements or communities that are far from a water source by way of numerous smaller canals. These smaller canals direct the water into dams, located on different farms that collect water and store it for later use, for example, to use to irrigate the produce (Bornman, 1988).

FIGURE 15: Vaalharts Dam, located in the Vaal River (Google Earth, online, 2023).

FIGURE 16: Counter weight system, controlling the sluices.(Author, 2023).

FIGURE 17: Sluice open to a minimium (Author, 2023).

FIGURE 18: The system control connetions to the sluice (Author, 2023).

1.2.2. Current Synopsis

The geographical area of the irrigation scheme (Fig.19) spans the North-West and Northern Cape provincial borders, and passes through the local municipalities of Dikgatlong, Magareng and Phokwane in the Frances Baard District Municipality and the Frances Baard District (De Bruyn, 2023).

Municipal Area (DMA) in the Northern Cape Province; and the Greater Taung Local Municipality in the Dr Ruth Mompati District Municipality in the North-West Province. All these areas are fed by the canal system as a lifeline with water.

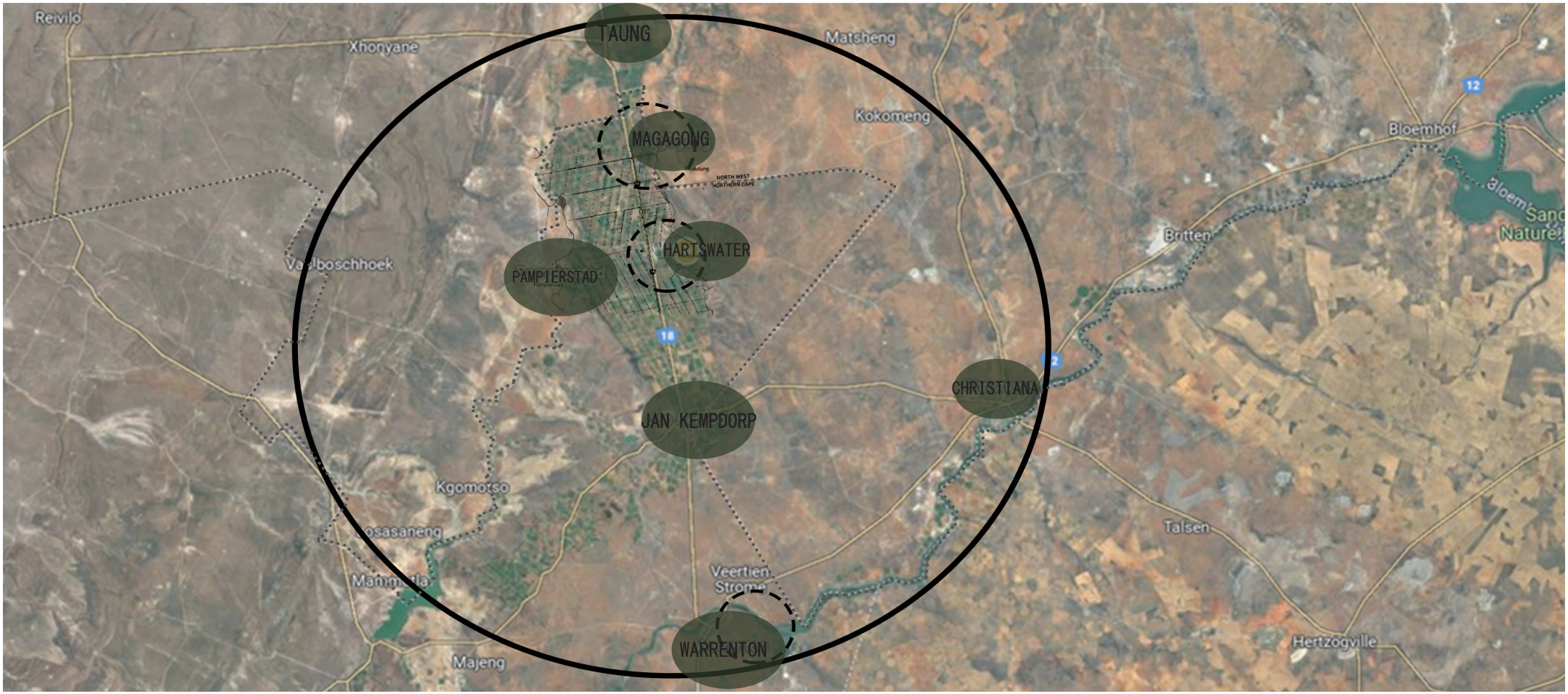


FIGURE 19: Ariel photo of the Vaalharts Scheme (Google maps, online, 2023).

1.2.3. HARTSWATER:

The following towns are situated and influenced by the water canal network in the area (De Bruyn, 2023):

- Barkley West
- Bull Hill
- Harts Valley
- Ganspan
- Jan Kempdorp
- Warrenton
- Hartswater
- Magogong
- Taung area
- Supply water for rural communities next to the canal and through to the North-West town of Vryburg.

Hartswater is the centralized developing town in the Vaalharts Irrigation Scheme with a big farming community, mainly focusing on the following products (Fig.20-27)(De Bruyn, 2023):

- Wheat
- Barley
- Maize
- Pecan nuts
- Lucerne
- Pumpkins
- Watermelons
- Citrus

As one enters Hartswater, one is greeted by rows of trees planted next to the road, which create a beautiful visual effect when the sun sets as the light filters through the branches (Fig. 28).

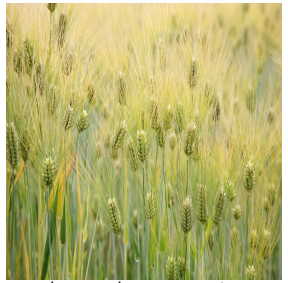
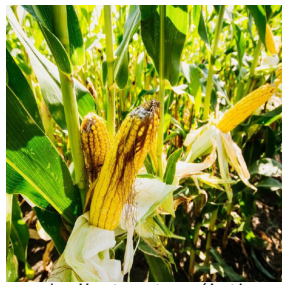





FIGURE 20 - 23:Wheat, barley, maize and pecan nuts produces in Hartswater (Author, 2023).




FIGURE 24 - 27:Lucerne, pumpkins, watermelon and citurs produced in Hartswater (Author, 2023).

FIGURE 28:Populier trees plantes planted next to the road (Author, 2023).

The farmers are able to control the sluices, mainly by hand, in the small canals that are located in the area, resulting in controlling the water flow. For exmaple, Fig. 29, is one of the located in our street, controling the water flow of the smaller canals that fills and supplies water to the individual dam's and irrigation systems. Fig. 30, shows exactly where this particular sluice is located.

The whole scheme comprises a total of 113 110 hectares, of which 35 989 is under irrigation. In April 1938, the first people were allowed to rent a piece of the land (du Toit, 1994).

The second group was in 1946 in the Northen Canal area, and the third group in 1950 in the Western Canal area, known as Harts Valley and Bull Hill (Bornman, 1988).

FIGURE 29: Smaller canal split ways located at the farms (Author, 2023).

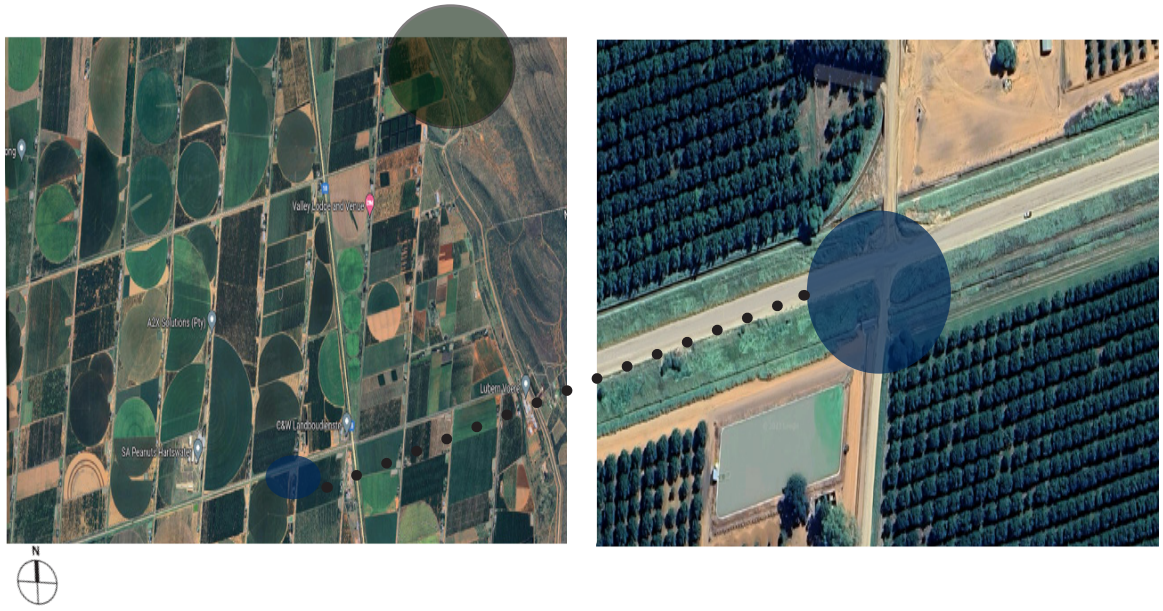


FIGURE 30: Ariel photo of where Fig. 29 is loacted (Google maps, online, 2023).

1.2.4. THE FIRST SUGGESTION OF AN IRRIGATION SCHEME:

The rise of businesses and economics on the new diamond fields on the Vaal River made it a good source of income for the Cape Government. There was a need for it to expand towards the western side.

In 1871, Griqualand West was colonized by Brittain. The area along the western border of the two republics was separated into farms, and settlers could rent the farms. The farms were set out by Francis H. S. Orpen. He also determined that the water from the Vaal River to the Harts Valley be used for irrigation (Bornman, 1988).

The growing economics of Kimberley and the need for fresh produce resulted in a group of 18 people buying a part of the Grasbult farm and starting with the irrigation scheme. This group built a canal onto and into the Vaal River and used an exit (Fig.31)embankment within to help direct it (du Toit, 1994).

This embankment washed away a few times and had to be rebuilt many times. Due to this, a more permanent cement wall was built in 1913 (De Bruyn, 023).

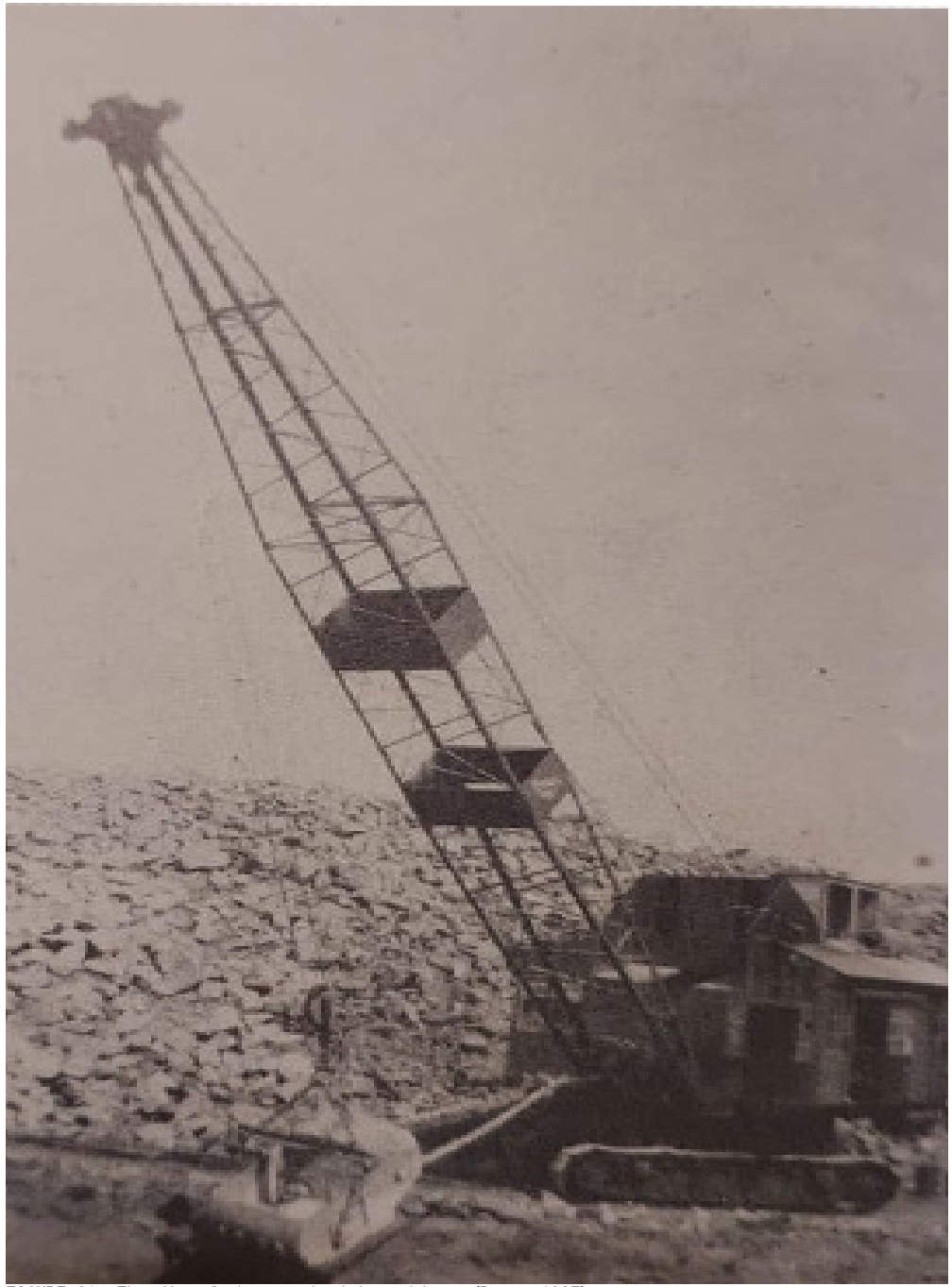


FIGURE 31: The dig of the canal with machines (Botes,1937).

1.2.5. IRRIGATION NETWORK SYSTEM:

In 1901, it was suggested that water could be connected from the Vaal River (Fig.32) to the Harts River Valley. After the war, only two irrigation systems still existed within the Cape Colony, one at Warrenton and the second at Robertson, close to the Breë River (Bornman, 1988).

The director of the Transvaal Irrigation Department created a review of the previous results in order to start up the Harts River Valley. With both, it was suggested that the storage dam be built (Bornman, 1988).

FIGURE 32: Vaalharts Dam wall (Author, 2023).

1.2.6. CRISIS YEARS AND THE BEGINNING OF THE SCHEME:

During the drought of the 1930s, the water flow of the Vaal River virtually stopped and the Rand Water Board worked together with the government to try and form the Vaalbank Dam, currently known as the Vaal Dam (Bornman, 1988), with the condition that the water of the Vaalharts project be stored in the dam.

As a result, water would be let out of the Vaalbank Dam as needed, that was spread across 576 km. The suggested Kromellenboog Dam was no longer needed (du Toit, 1994).

FIGURE 33: The mixing of cement, to cast the floor base of the canal (Botes, 1937).

1.2.7. SOME OF THE FIRST WORK DONE ON VAALHARTS:

This project needed a wide variety of skills and mechanical equipment. Within Vaalharts, there were different levels on 5 different locations; the outlet embankment; the main canal that continued up to Fourteen Streams; the western canal area, close to Jan Kempdorp, at the eastern tunnels of Pokwani, Hartwater; and the ten locks at Taung (Bornman, 1988).

The levels were set out at 3m x 3m, which they had to dig by using a shovel(Fig.34), pick axes and 6 kg hammers to break the soil and rocks. Once they were able to move some of the soil and rock, they filled bags that were then pulled out of the holes.

As soon as one of the levels was done, they would then moved to the next level. Once all the levels were done, the next team that was included in the project took over the main objective of the project, which was cast the concrete (du Toit, 1994).

In soft soil they were able to use machines, but in more rocky areas, they had to use their hands to dig, especially a part known as the Blue Canal, which consisted of rock and hills that they had to dig through (Bornman, 1988).

FIGURE 34: Concrete pannels being casted, for on the sides of the canal (Botes, 1937).

FIGURE 35: Concrete pannels being casted, for on the sides of the canal (Botes,1937).

Three 8 m x 6 m sluices that could be controlled by electricity or by hand, were built into the weir. In order to increase the capacity of the weir, they added an additional 1,2 m (Bornman, 1988).

At the end of 1936, the first part of the 40 km-long main canal was completed. On 15 December that year, water was directed into the canal. On 16 December, Andalusia received their first water supply.

As the water came closer, one farmer yelled out: “So waaragtig, hier kom hy. Ek sou nooit sê dat die water die opdraand sou uitkom nie!”.

[Upon my soul, here it comes. I would never have thought that the water would flow uphill!] (Bornman, 1988).

The main canal flows parallel to the Vaal River for 13 km (Fig.36). From there, the water runs through the Klipdam-Barkly Branch Canal in a southerly direction, towards a channel of smaller canals that feed water to 150 farmers at Windsorton, Barkly West and Delportshoop (De Bruyn, 2023).

The canal crosses towards Pudimoe, 64 km from the branching of the canal, where water is then supplied to Vryburg with the help of a pump system.

Some of the design tools that can be seen and used in the above piece are;
1. Use of gravity, to transfer water.
2. No use of pumping systems.
3. Elongation of the system.

FIGURE 36: Process of building the seperation canals captured in photo (Botes, 1937).

1.2.8. CANAL SYSTEM

The Vaal River was previously named the Goabgariep, Goab meaning the Harts and Gariep the river. Located in the Harts River Valley is the Vaalharts Government Irrigation Scheme.

The construction of the canal was during the Depression years of 1933, which resulted in thousands of unemployed members and farmers during the drought, resulting in them leaving their farms. The flow capacity and ability of the canal decreased slowly as the water was redirected to the different farms.

In 1936, two tunnels were constructed and finished by 1937. The concrete tunnels have different diameters at different locations, but the overall diameter of the tunnels is 2,7 m (Fig.37). The tunnels that are located the closest to Hartswater are the northern tunnel and Tadcaster, the southern tunnel.

Running from the main canal is a second canal system outlet that is commonly known as the supply canal. The supply canals are used to direct water to the smaller canals to the irrigation systems. The supply-and-separation canals were built in 1937, but due to the Second World War, it was only finished in 1946. The supply canal comprises 126 km and the community canal 540 km, all of which built out of concrete (Fig.38).

Once the area was laid out, one had to ask for water two weeks in advance, as the water takes 9 days to get from the Vaal Dam to the storage dam. The amount of water that is needed is calculated by the head of the Water Department at Jan Kempdorp. In order to apply for water, one had to fill in a form and place it in the mailboxes located in different areas.

FIGURE 37: Entrance of the Southern tunnel (Horn,, 1940).

FIGURE 38: Outlet of the Southern tunnel through the hill (Author, 2023).

Due to the amount of pressure at the Vaal Dam (Fig.39-40), the Bloemhof Dam was built and finished in 1970, in order to assist with the amount of pressure. Unfortunately, the Bloemhof Dam does not always fulfil the needs; as a result, water is still supplied from the Vaal Dam into the Vaal River.

The dam wall of the Bloemhof Dam was raised a further 3 m in order to increase its total water intake. This wall is the single longest ground wall in the Republic of South Africa, at a distance of 4 816 m, with a cement part of 340 m.

One of the biggest disadvantages is the soil consisting of light sand-like soil, which is more commonly found in the lower areas of the scheme, which is closer to the ground surface and gives an indication of the serious drowning problem. One other problem that surfaced is drainage.

Once the irrigation system was used, the situation changed drastically and the drainage canal network was started to help the surface water to drain and more drainage canal networks were added to help direct water into the canal.

Before this scheme was developed, the ground in this area was very dry and the rainwater was absorbed in a short period of time. But this changed once the irrigation systems were in use, as the soil was then constantly in a moist condition, and resulted in the rainwater being absorbed at a slower rate.

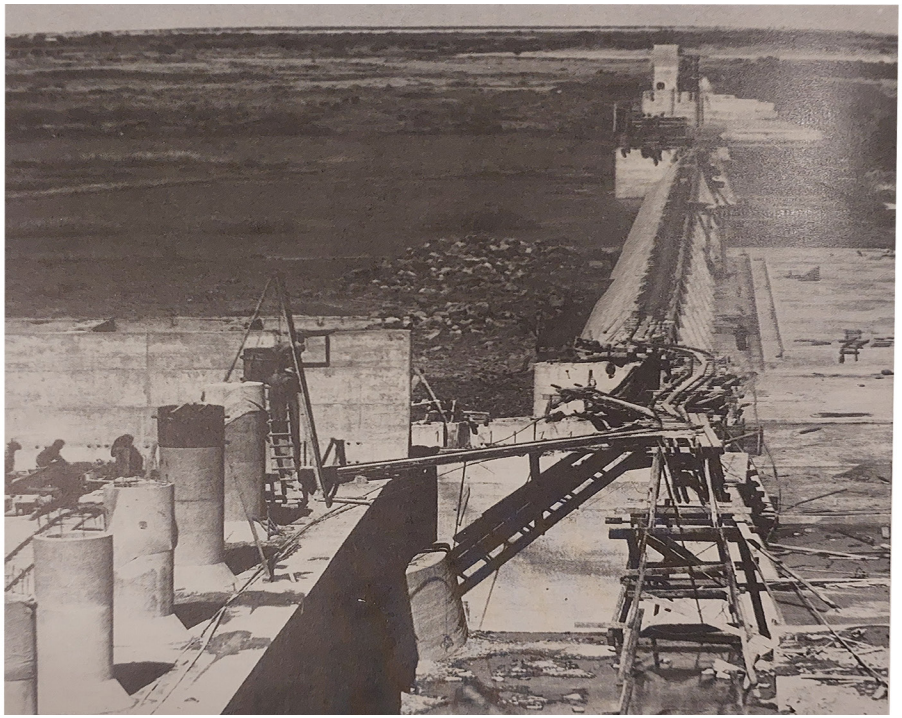


FIGURE 39: Construction of the Dam wall (Horn, 1926).

FIGURE 40: Completed Dam wall (Horn,1927).

1.2.9. TRAIL RENTERS

During the time the canals were worked on, the Department of Land took over some of the areas where they started to set out the farms and built roads.

The irrigation scheme (Fig. 43-46), was split into two, one area along the north canal,flowing from south to north and the national road and railway splitting the area, known as the northern canal area, into two.

It was then set out into blocks and set out alphabetically from Jan Kempdorp, in the south, to Magogong in the north. By 1938, the first 80 farms were ready for use and people were able to apply their skills and start working on the farms.

A committee was established to work through the applications and accept or deny applicants. The approved applicants each received the needed equipment and in return, the farmer (Fig.41) had to give the produce of the first four years to the State as part of their payment for the service and land and development done by the community funds.

The whole area was covered in poplar trees and Vaal Harts came to be known as the place of many trees, green farms, and water streams. The Department of Irrigation planted the first 300 trees in Vaal Harts in 1937. A farmer commented: “A farmer is a strange creature, because when he hears water, his attention is drawn and he immediately becomes interested.”

As the years passed many lot of the poplar trees had to be removed as they were causing damage to the canal (Fig.42) due to their roots and drying out the ground.

FIGURE 41: Photo of one of the trail renting farmers (Horn, 1938).

FIGURE 42: Construction of the canal (van Rensburg, 1934).

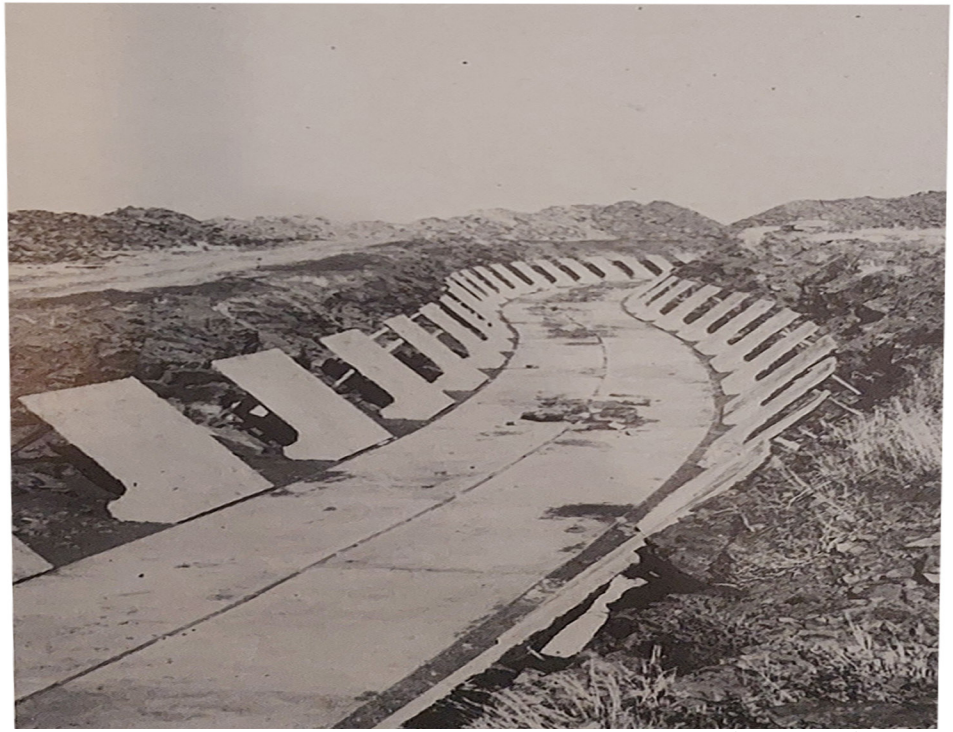


FIGURE 43: Pre-cast slabs placed for the construction of the canal (Botes, 1936).

FIGURE 44: Inspection of the work (van Wyk, 1881).

FIGURE 45: Dig site for the canal (van Rensburg, 1935).

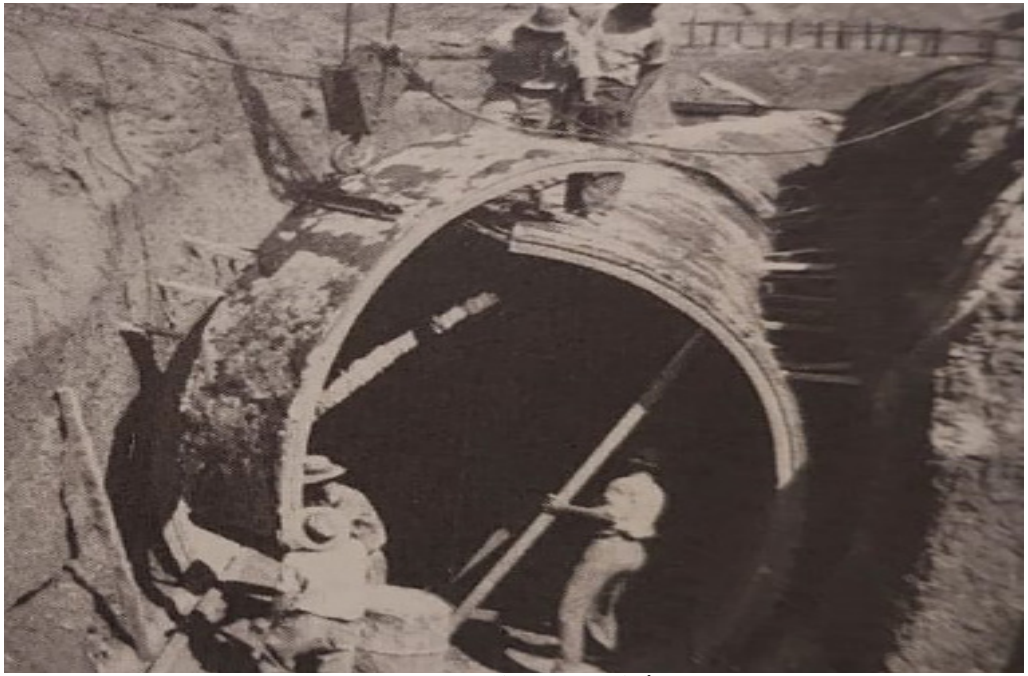


FIGURE 46: Construction of the Northen tunnel (Botes, 1937).`

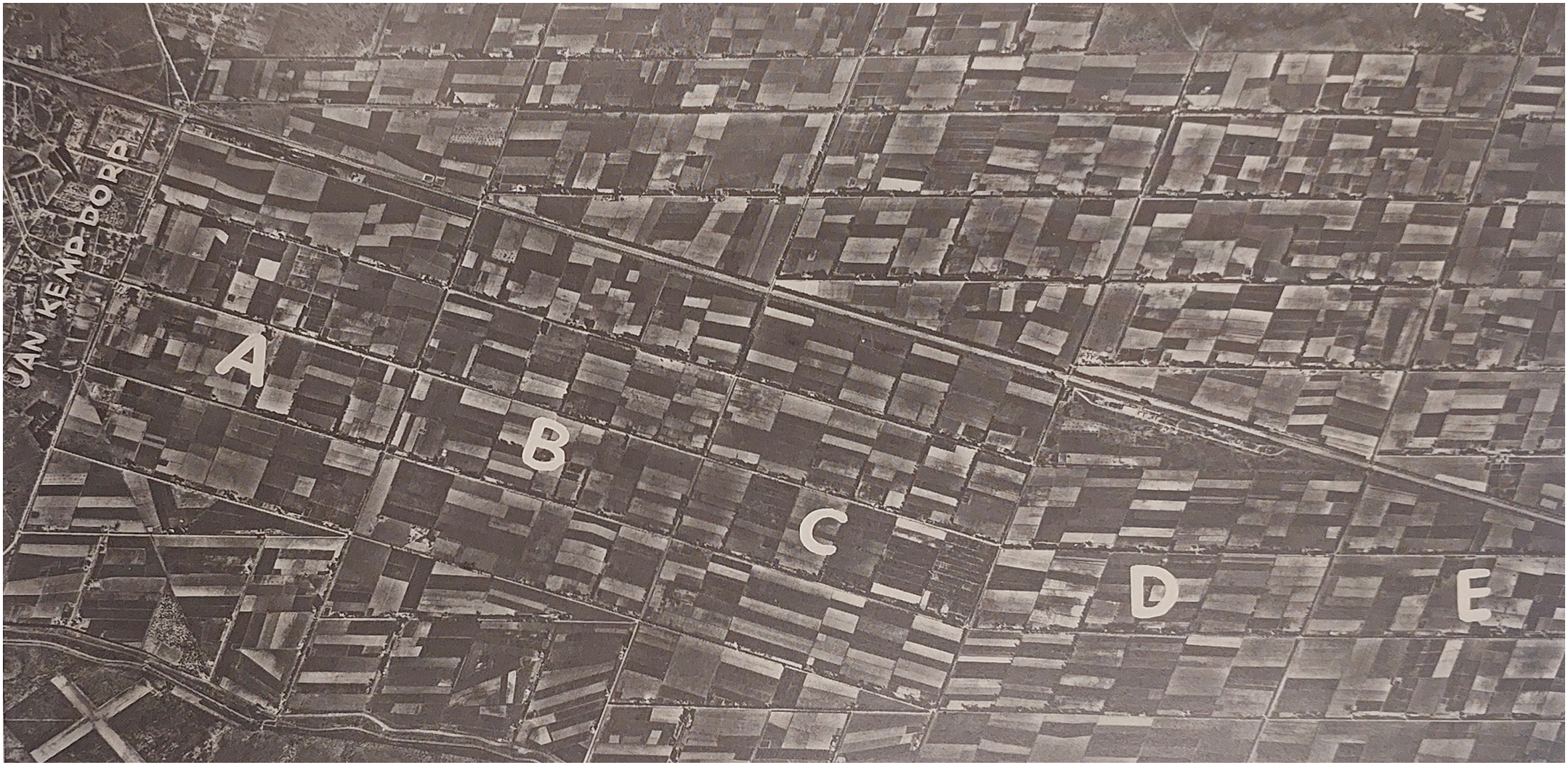


FIGURE 47: Farm layout (Horn, 1938).

1.3. THEMES

The following themes will help to guide the design and provide guidance as the process develops (Fig. 48).

CONTROL:

Definition: Architectural control is the capacity to enable or constrain the design of a system component (or set of components) without directly exercising design rights over it (Woodard, 2008).

Control (verb):
To order, limit, or rule something, or someone's actions or behaviour (Cambridge Dictionary, n.d.).

By looking at the impacts and different methods of control, the design aims at educating and displaying different ways in which it can be done.

For example, as mentioned, the farmers are able to control the sluices by opening and closing it by hand. Another example is the counterweight system that is used at the Vaalharts Dam to control the size of the opening, controlling the water flow and amount as a result.

PERCEPTIBLE FUNCTION:

Perceptible (adjective):
Capable of being perceived; recognizable; and appreciable (Dictionary, n.d.).

This theme guides the design to be perceived in different ways, by having different elements represent more than just one idea. For example, the canal can be seen in both a visual, poetic, and physical manner as art and as a working object. This is the beauty of many of the systems that are and will be used within the design.

The use of a system that was created and used for a specific action and use, by observing and experiencing it, creates a moment of awe, due to the beauty of its simplicity.

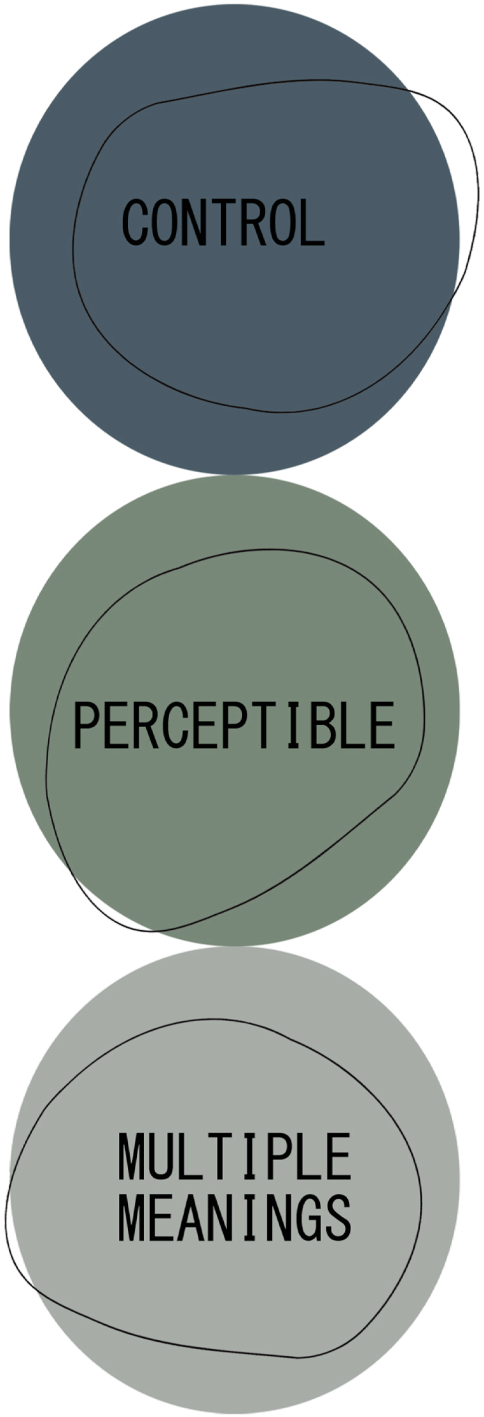


FIGURE 48: Diagram representing the themes (Author, 2023).

MULTIPLE MEANINGS:

MMultiple (adjective):
Many of the same type, or of different types (Cambridge Dictionary, n.d.).

Meaning (noun):
What is intended to be, or actually is, expressed or indicated; signification; import: the three meanings of a word. The end, purpose, or significance of something (Dictionary, n.d.).

Combining these two words creates the opportunity for something, for example, a specific object, to have multiple different meanings for different people, depending on the way in which it is viewed and experienced.

In this design, an example of this is the different ways in which water is viewed, as it has different purposes within the building and program and has the ability to symbolize different things to different viewers and users, such as purity, calmness, danger, or practical use.

CONCLUSION:

These themes combined help to guide the design to create an experience (Fig.49), showing the impact and influences of different components in the design, creating a multi-beneficiary space that can be used and viewed in different ways.

FIGURE 49: Side perspective of ‘‘sluis’’ (Author, 2023).

1.4. RESEARCH

Water is the biggest source of life. The earth we inhabit consists of 71% of water-covered areas (Brown, 2017). Water is always present and is in a continuous cycle of different states as it goes along its journey, impacting different aspects of life and the earth.

The journey is measured by the states of being, meaning the number of times the water droplet changes from solid to liquid to gas.

The proposed site is located next to the main canal (Fig. 50), where the water flow and different elements of the canal systems can be observed.

As a result of the importance of water and the canal, multiple learning opportunities are possible, by transferring the information in the form of a museum and education center.

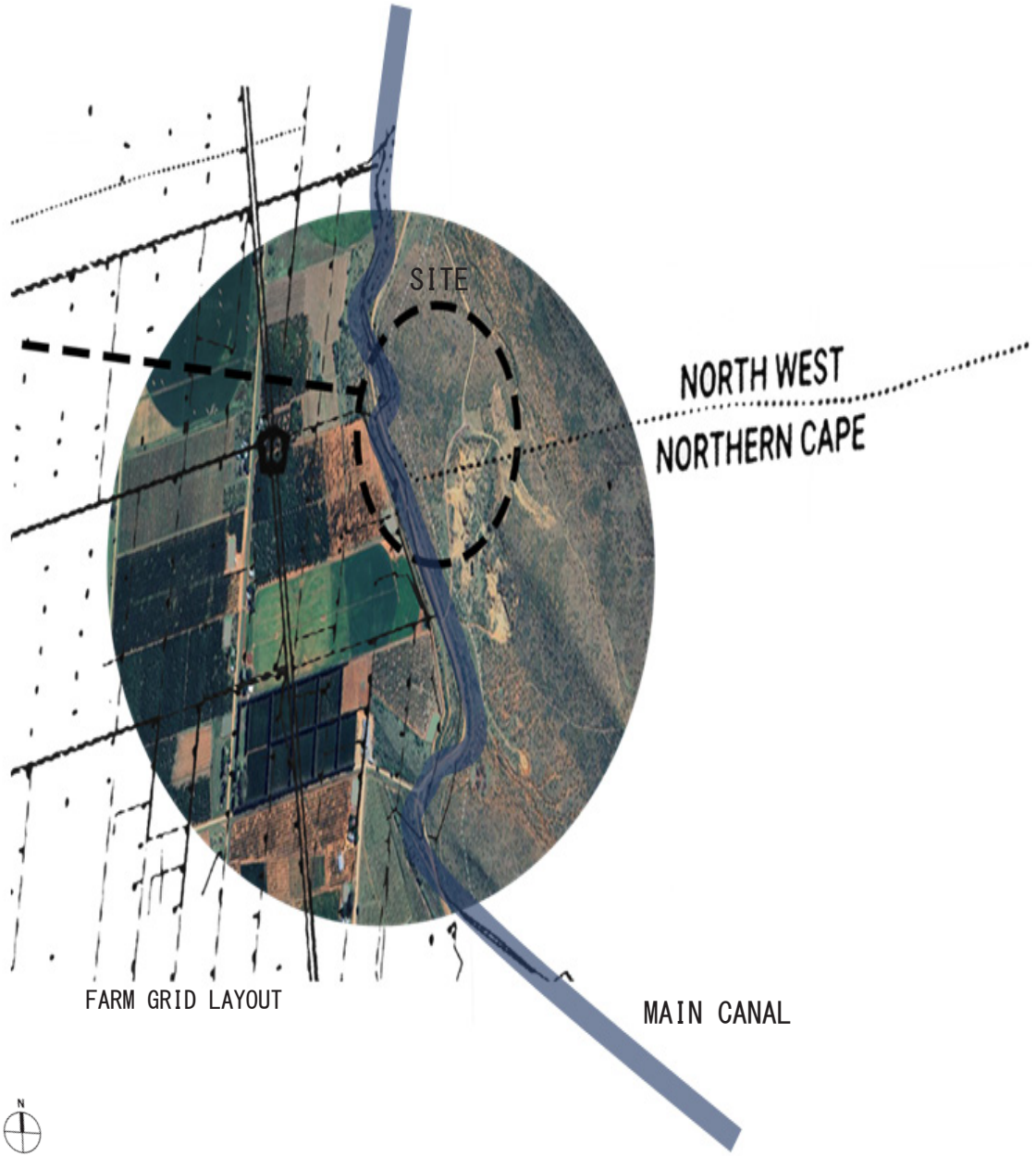


FIGURE 50: Ariel photo, illustrating the main canal, farm grid and site (Google earth, edited by Author, 2023).

1.4.1. WATER

The different stages of water can be seen as the following;

- Solid, for example, ice.
- Liquid, for example, a river.
- Gas, for example, steam.

The lack of one of the stages forms a gap and creates no cohesion between the physical form of water and its surroundings.

Water has different aspects to it; therefore it must be observed in different ways, for example, time, space, meaning, technology, cause of life, art forms, and incorporating it in architectural design methods (Collins, P. et al., n.d.). This creates the opportunity for multiple relationships to be formed with water, which is determined by the perspective it is viewed with.

One of the relationships that will be investigated is the relationship between water and architecture. It influences the mindset of how a connection can be made between man-made and natural. The term ‘shackle’ can be used as a metaphor to view the relationship between natural and man-made (Heckenast, Ferencz & Kertész, 2021) (Figure 51).

Water has the ability to shape the built environment; for example, a design can adapt to a fluid-like typology where the spaces are designed in such a way that they flow into one another. Mimicing the water’s flow in architecture.

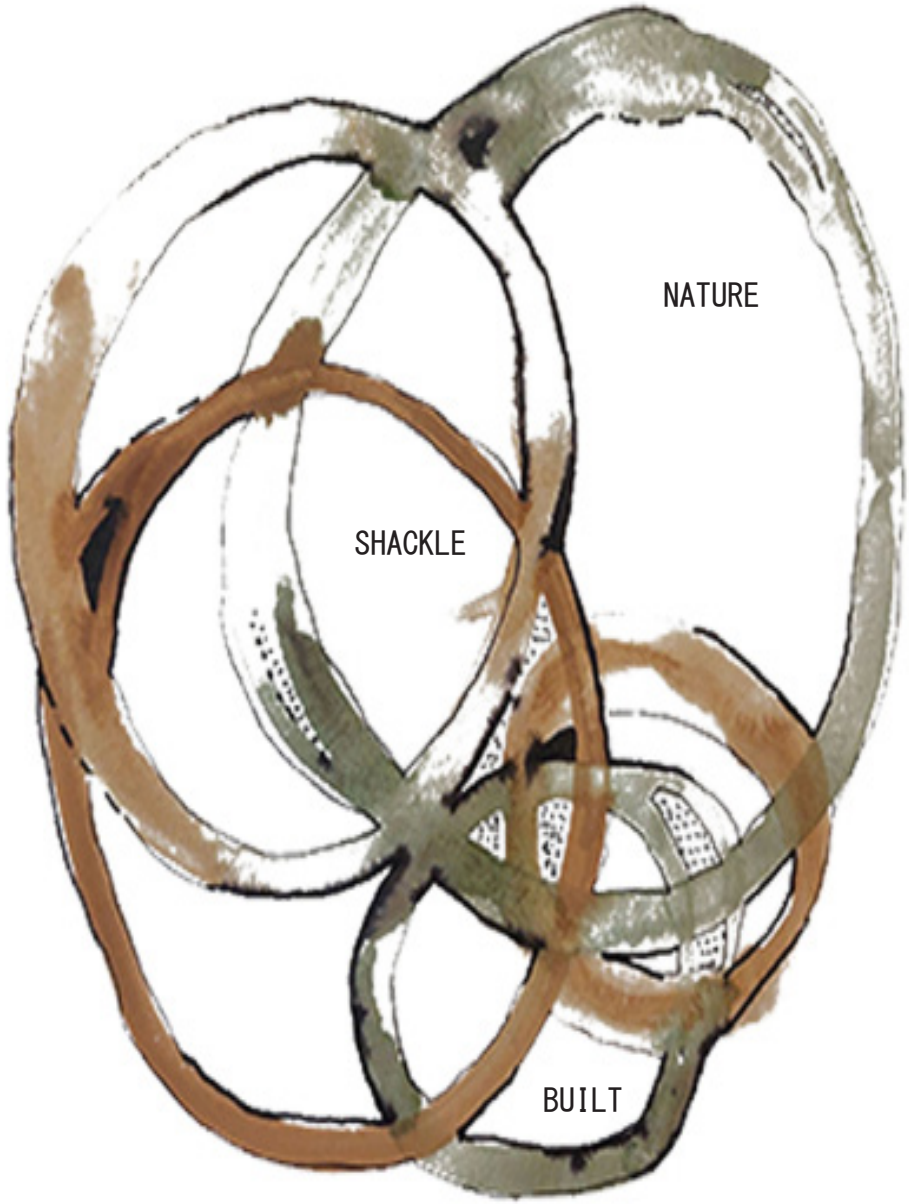


FIGURE 51: Symbolic drawing of the relationship between water and other elements (Author, 2023).

1.4.2. TYPOLOGY OF WATER:

Water also has the ability to mimic a certain shape it is placed in and forms an imprint within its natural environment. Water has the unique ability to adapt and seek its own course in nature (Heckenast et al., 2021).

Looking at the metamorphosis of water in architecture, it influences how one thinks and creates new opportunities. A physical example is aqueducts, water courses and special water features. This will include the construction of a waterway system, guiding water through the air by using a fixed pathway that includes the construction of a support for the weight of the water.

The quality and physical features of water (Fig.52), however, change over time. Depending on the season, light, time of the day and weather circumstances, it can produce different visual and psychological influences at different times of the day and seasons (Effect of water bodies, n.d.).

There are multiple benefits to water, but the sound and flow have psychological benefits that will be investigated. For example, when looking at the ocean as the source of water, it helps with reducing stress, improves alertness and concentration, and alters the brain waves, all of which contribute to a relaxing feeling in people (Heiser, 2018).

FIGURE 52: Photo of the ‘‘sluise’’ that are connected to the canal, depicting the quality and physical features of the water (Author, 2023).

Some of the physiological benefits water are the reduction of stress and tension in the body and staying hydrated (the human body consists of up to 60% of water) (Brown, 2017).

Another psychological benefit is the improvement of mental health and relaxation (Fig.53). The sound of water creates a calming atmosphere, helping one to focus and relax. At the same time, the auditory effects of water also trigger experiences one has had, may it be positive or negative, although normally it is positive (Brown, 2017).

FIGURE 53: Sunset captured at the canal (Author, 2023).

1.4.3. HOW DOES WATER INFLUENCE THE MINDSET, THE ARCHITECTURAL MINDSET?

Architecture on its own is complex, and with each space, a different perspective is formed to create a unique design. Therefore, a multi-perspective approach is important (Heckenast et al., 2021).

Looking at the relationship between water in architecture from a historical viewpoint creates the opportunity for multiple viewing platforms to be formed, creating a map that in the end can be used to formulate new responses to different architectural spaces (Heckenast et al., 2021).

When analysing this relationship, the context thereof, with outside influences and the philosophy, the process can be traced.

Throughout history, the relationship between architecture and water has taken on many different forms, for example(Heckenast et al., 2021):

- water palaces
- canals
- special water features
- fountains

Through these different uses, spatial connections are made, linking man-made to natural, interior to exterior, by the dematerialization of facades and by connecting the existing to the new.

Fig. 54 represents the different uses and different connections by isolating the shadows and light parts of the photos and placing it over the original photos.

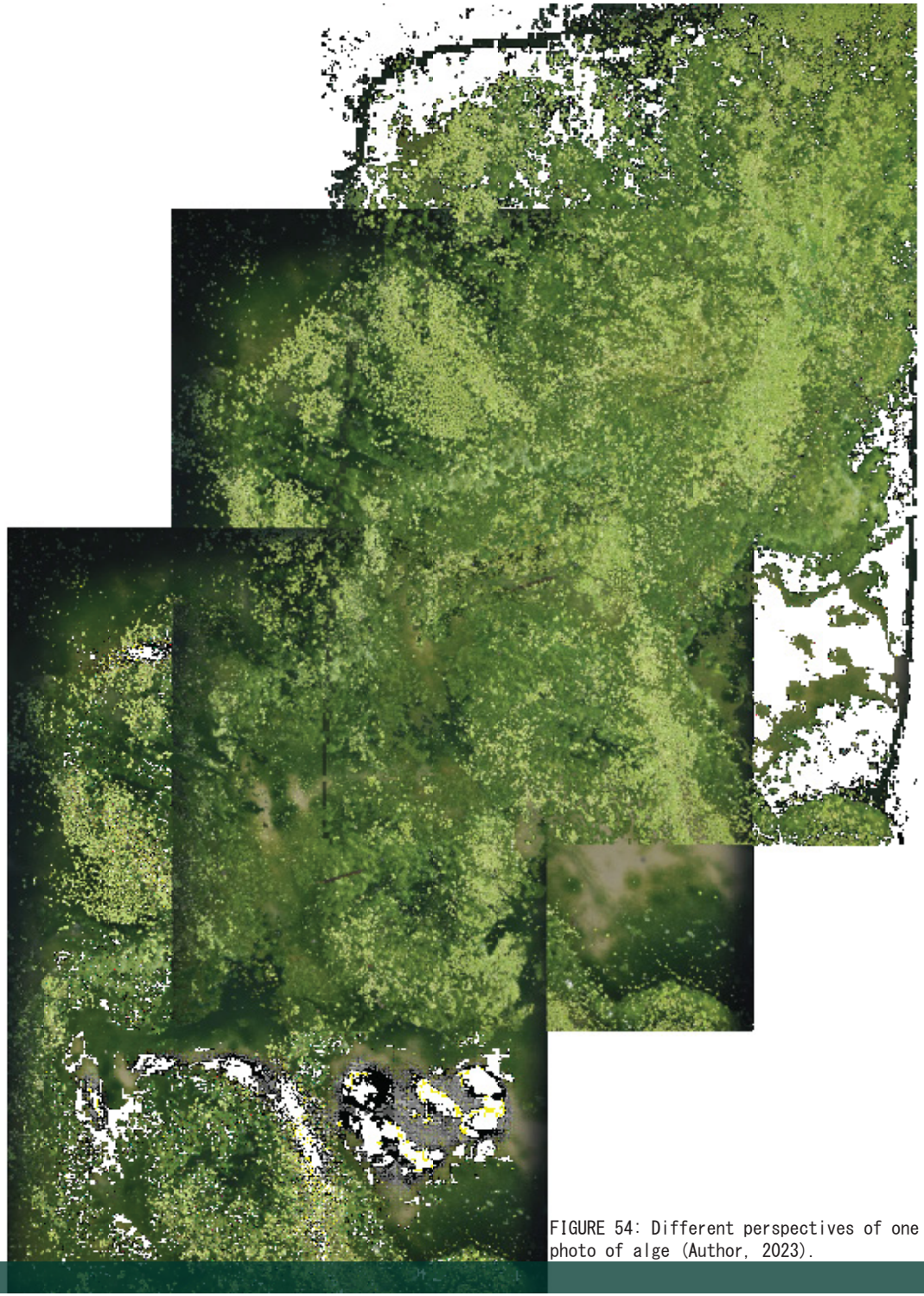


FIGURE 54: Different perspectives of one photo of alge (Author, 2023).

1.4.4. A WATER DROPLET'S JOURNEY:

Consider a drop of water that forms part of a bigger body of water. At first, it exists at the bottom of the ocean, part of a big liquid source. In this dark and cold place, the droplet is consumed by a dweller and passed through its body to rejoin the ocean once again.

It can happen that the droplet is found at a shallower part of the water body, where the pressure is less and more exposed to light. From there, the droplets generally move higher up in the water level, until it reaches the surface.

This exposes one part of the surface of the droplet, contacting the air and other elements. Any water droplet has the tendency to stay close and connected to a liquid (A drop's journey, 2013).

One factor that can change this is when it gets exposed to heat, which causes it to change its structure. The droplets gain energy until it has enough to break free, moving up into the air. This is when the droplet evaporates and enters its next state, known as gas. As the droplet moves higher up into the air, it starts to cool down once again.

It slowly loses its energy slowly and connects and collides with other droplets, forming clouds. As the cloud moves, due to wind, it gathers enough water drops that as a result get too heavy and have to release some of the water. During this phase the water returns to the land in the form of rain and many other forms.

Once back on land, the water drops come together to form a bigger water body, such as rivers, lakes and pools (A drop's journey, 2013).

Figure 55, illustrates the journey of the water throught the smaller canals.

FIGURE 55: Photo capturing the waters journey, through the smaller canals (Author, 2023).

1.4.5. THE PSEUDOSCIENCE OF CREATING BEAUTIFUL (OR UGLY) WATER:

Emoto states that human speech and thought have a big impact on water. When speech and thought are directed at water (Reville, 2011), during its solid state, the crystals will either be 'beautiful' or 'ugly'.

All of this depends on whether it is positive or negative. As a result, it has a big and dramatic influence on everything (Fig. 56), as 75% of biological tissue consists of water, including the human body (Reville, 2011).

FIGURE 56: Moment of beauty captured as light shines on water (Author, 2023).

1.5. CONCLUSION

With the information provided and research done on water, the unmeasureable impact and influence it has and the importance of water, is clearly visible that water is one of the biggest sources that has an influence on everything, from man-made, to nature (Fig.57). And is one of the biggest influences on the dissertation.

FIGURE 57: View of canal from site (Author, 2023).

02

FIGURE 58: PHOTO OF THE SURROUNDING PLANTS (AUTHOR, 2023).

2.1. INTRODUCTION

The chosen location of the site for this dissertation is at Hartswater (Fig.59) in the Northern Cape. The area is surrounded by nature and small hills.

Due to the focus of the project being water, it is ideal for the project to be close to a water source, in this case, the main canal, where it can be experienced when visiting the building (Fig. 60). A beautiful view of the area can also
be experienced as one looks across the farms.

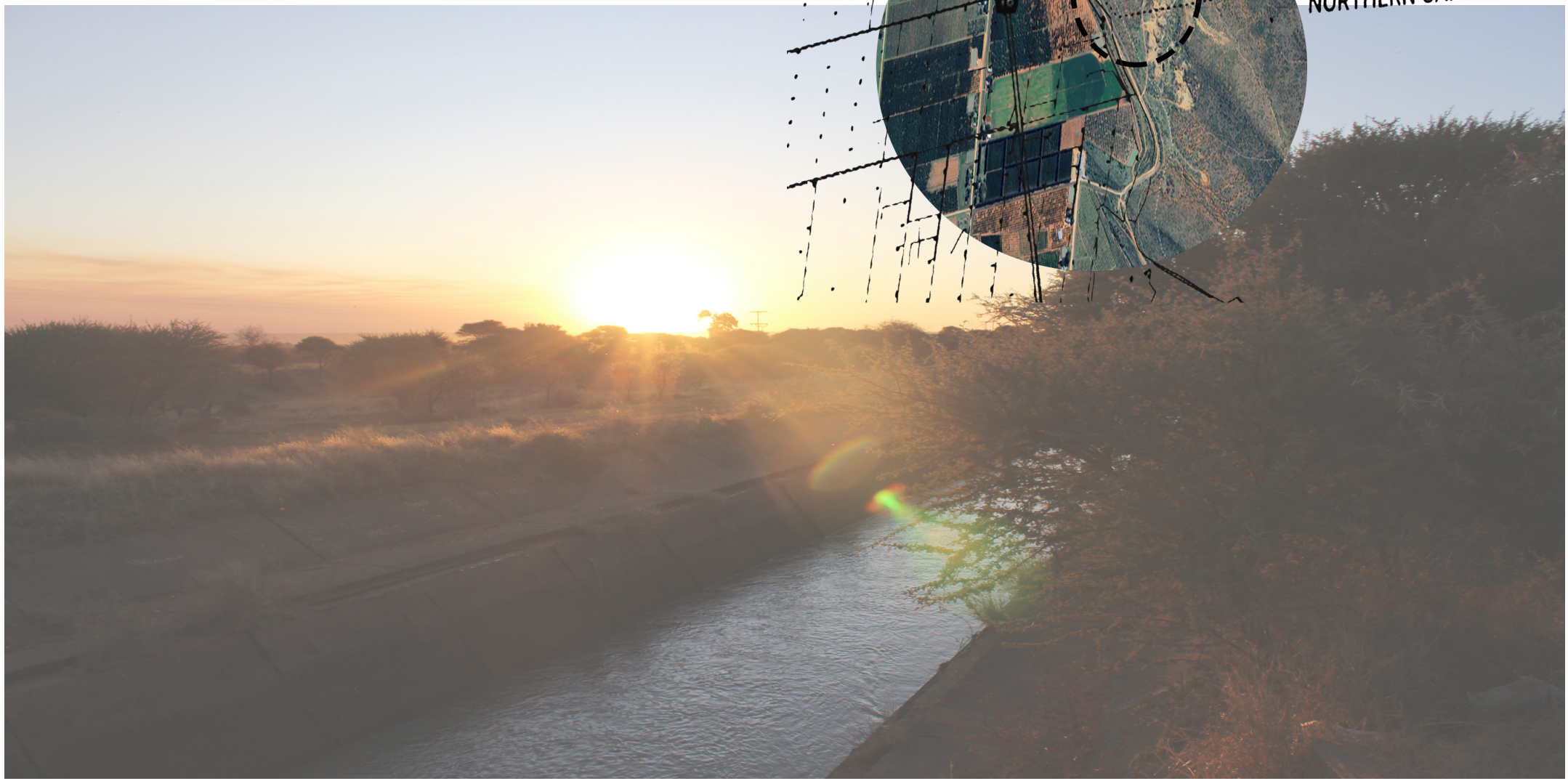


FIGURE 59-60: Bottom - View of the main canal from the cross over bridge, during sunset (Author, 2023), Top right - Map of Hartswater (Google Maps, edited by author, 2023).

2.2. SITE ANALYSIS

The site is located in the Northern Cape (Fig.61) on the outskirts of Hartswater. When moving northeast on the site, one approaches the northwestern border as well as an incline in the surface level.

In the opposite direction, the surface level declines towards the farms. This helps with the water system that is used, because due to gravity and the slope, there is no need for added systems, for example, a pump, to spread the water, as it flows and falls with the slope.

Towards the south, the more populated areas are found, which include housing, schools, shops and businesses. Towards the north, more privately owned property is found that is mainly used for farming, be it for cattle or plant produce.

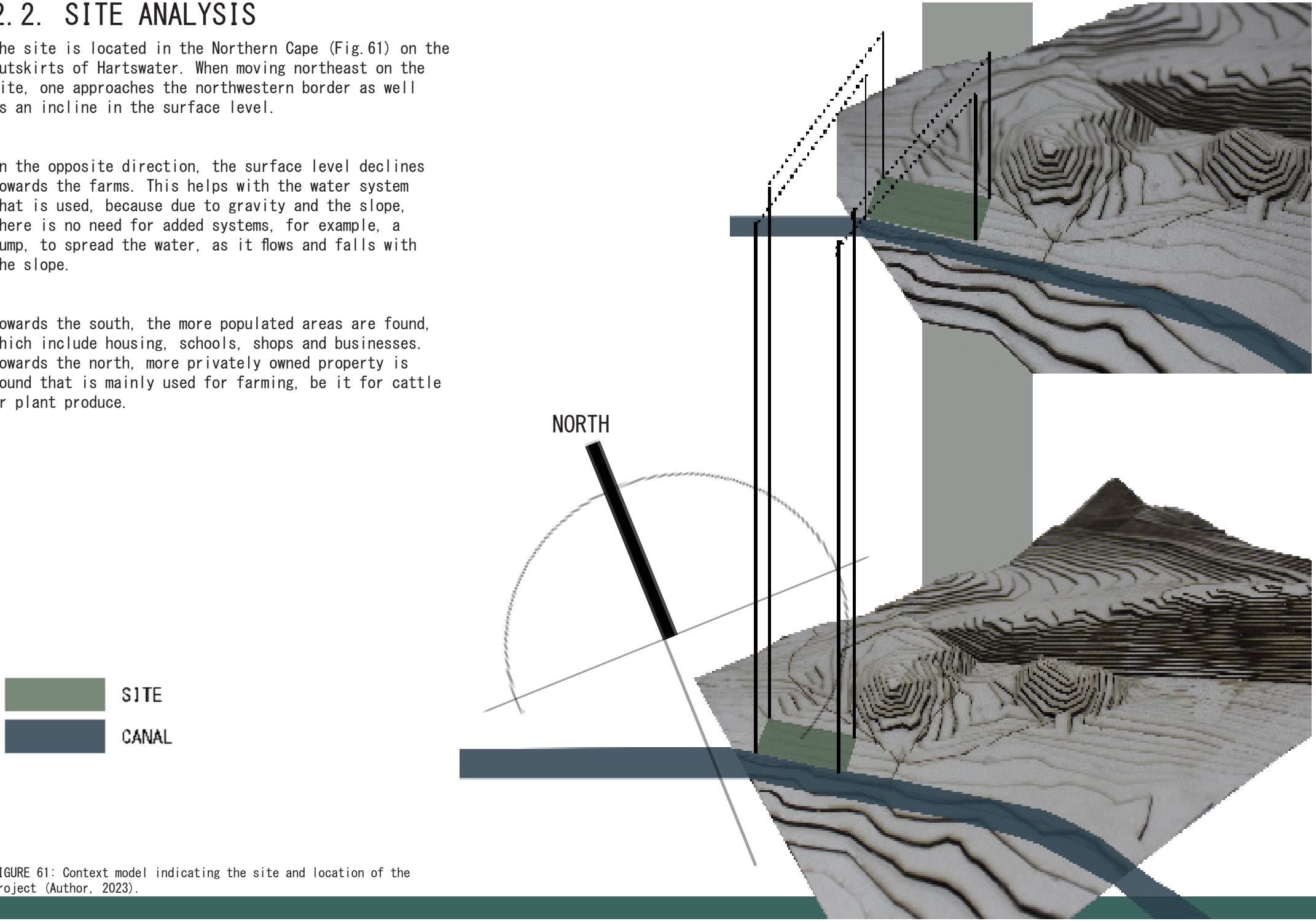


FIGURE 61: Context model indicating the site and location of the project (Author, 2023).

2.3. CLIMATIC CONDITIONS

CLIMATE AND WEATHER DATA OF HARTSWATER

The following data is based on weather information (Fig. 62). It provides an overall indication of the general climate patterns and conditions in Hartswater (Schludecker, 2023).

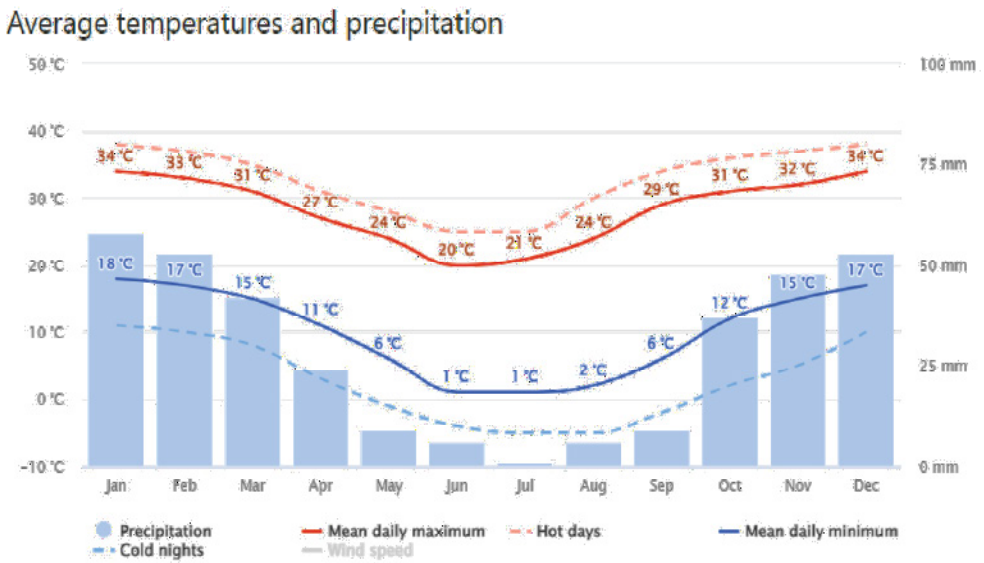


FIGURE 62: Temprature graph (Schludecker, 2023).

CLOUDY, SUNNY, AND PRECIPITATION DAYS

Figure 63-65, below, indicates the monthly numbers of days of different overcasts. With a 20% cloud cover, the day is considered as sunny, with 20-80% of cloud cover, as partly cloudy and with 80% or more (Schludecker, 2023).

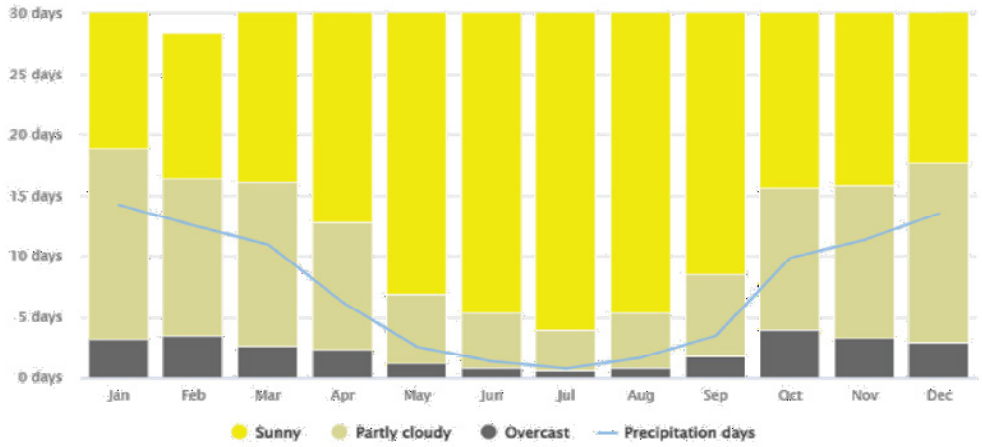


FIGURE 63: Overcast graph (Schludecker, 2023).

MAXIMUM TEMPERATURES

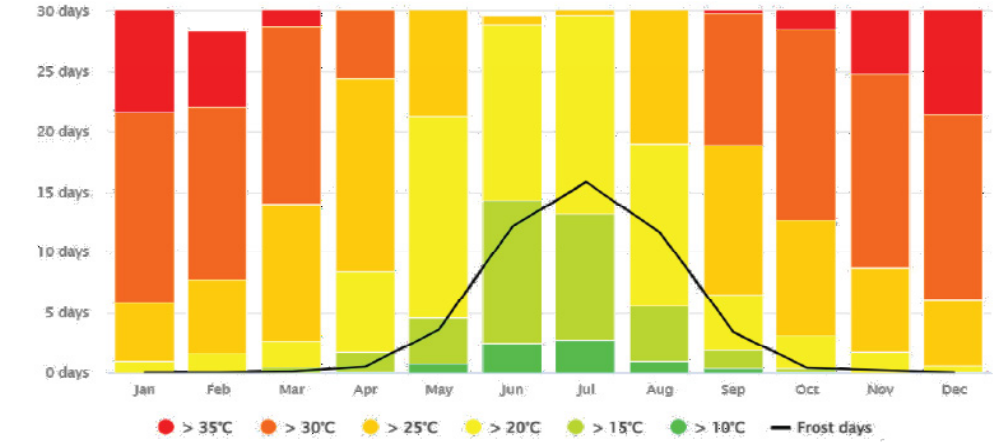


FIGURE 64:Temprature graph (Schludecker, 2023).

PRECIPITATION AMOUNTS

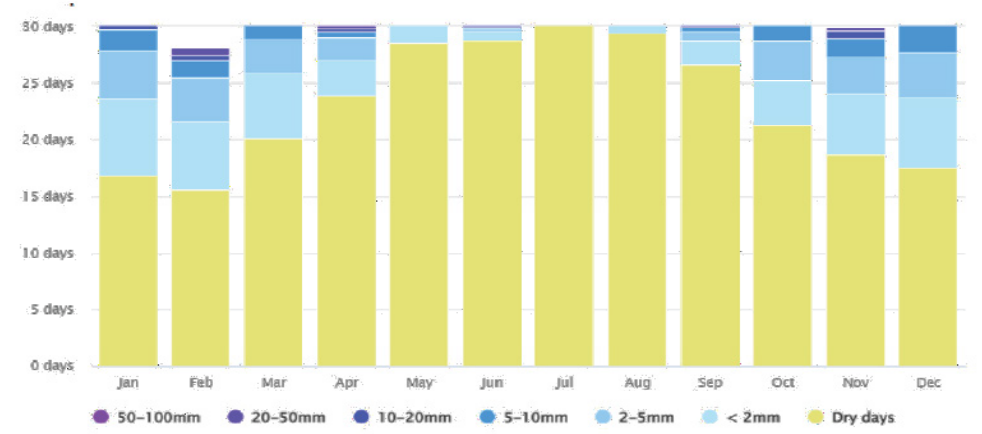


FIGURE 65: Rain graph (Schludecker, 2023).

2.4. SITE CONTEXT ANALYSIS

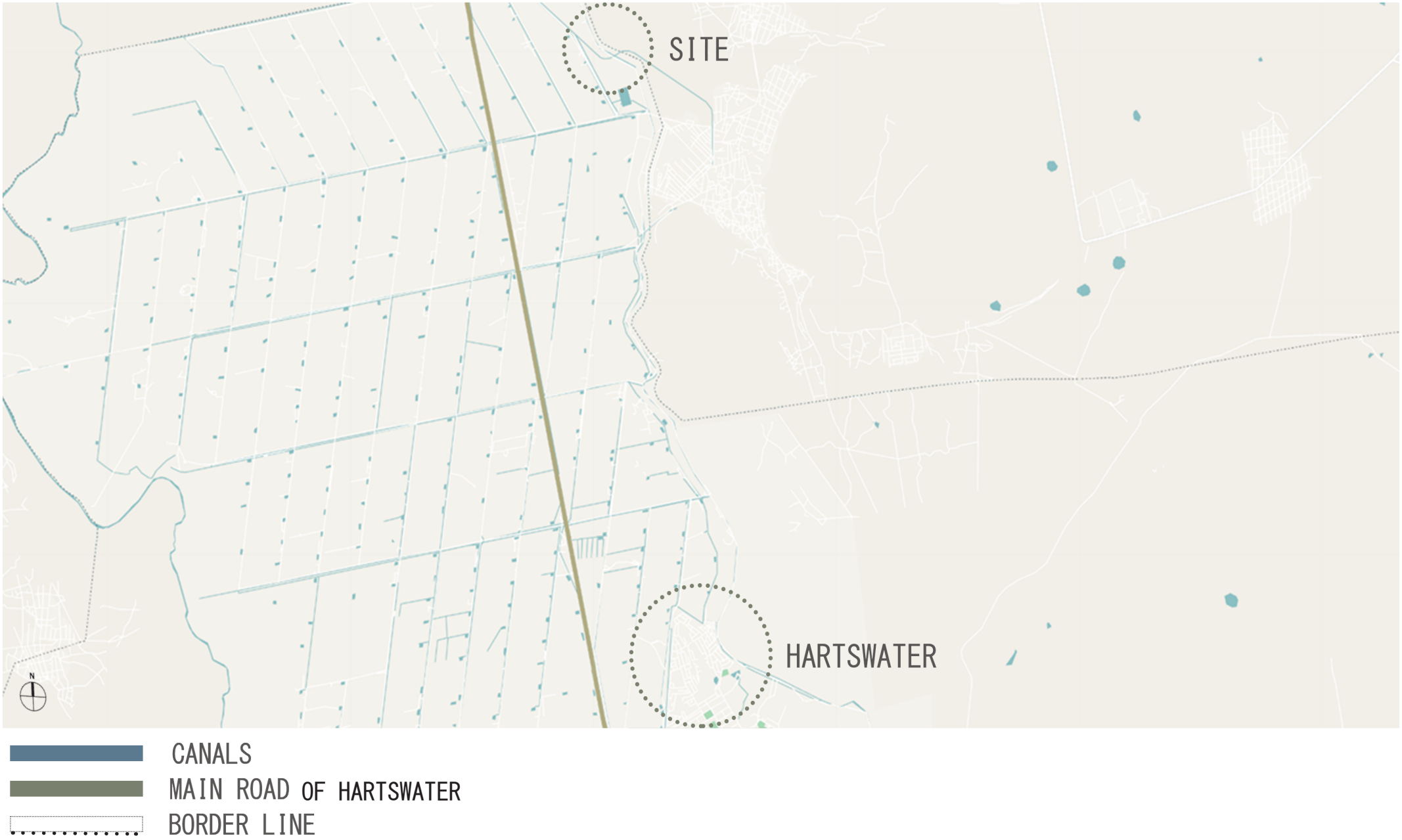


FIGURE 66: Layout of Hartswater (Google mapps, edited by author, 2023).

The chosen area for this project is located next to the main canal that flows through Hartswater and is the main source of water that is used for farming (Fig. 67). In order to get to the site, one has to drive along the main canal.

There is an existing bridge, big enough for a vehicle, which allows one to cross over to the area on the other side of the canal where one is met by a quarry and the memorial for the Kosai King. As one follows the dirt road, one reaches a hill, with a mesmerizing view of the farms.

The visible dirt road shows that even though the location is very private (Fig.68), there are still dwellers who visit this

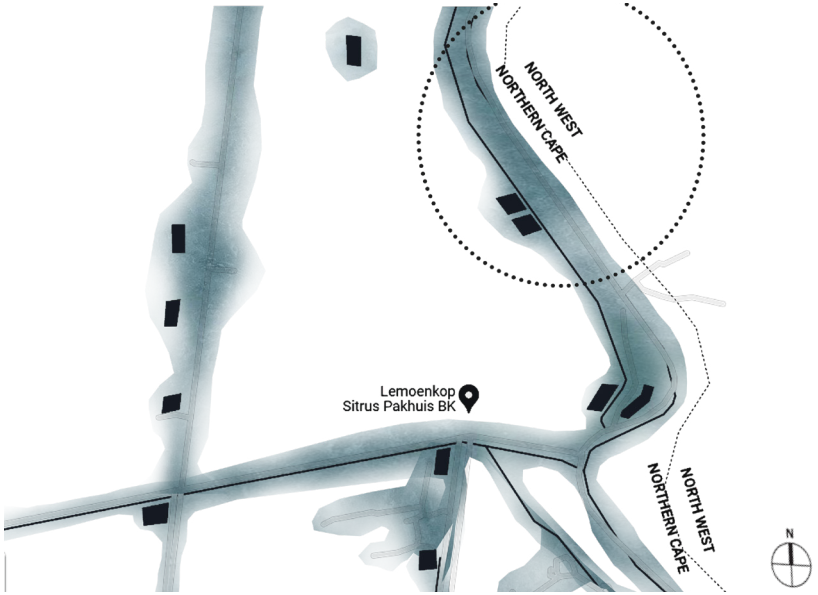


FIGURE 67: Site indication (Google maps, edited by Author, 2023).


FIGURE 68: Photo of site showing the canal, road and bridge (Author, 2023).

2.5. SITE SECTION

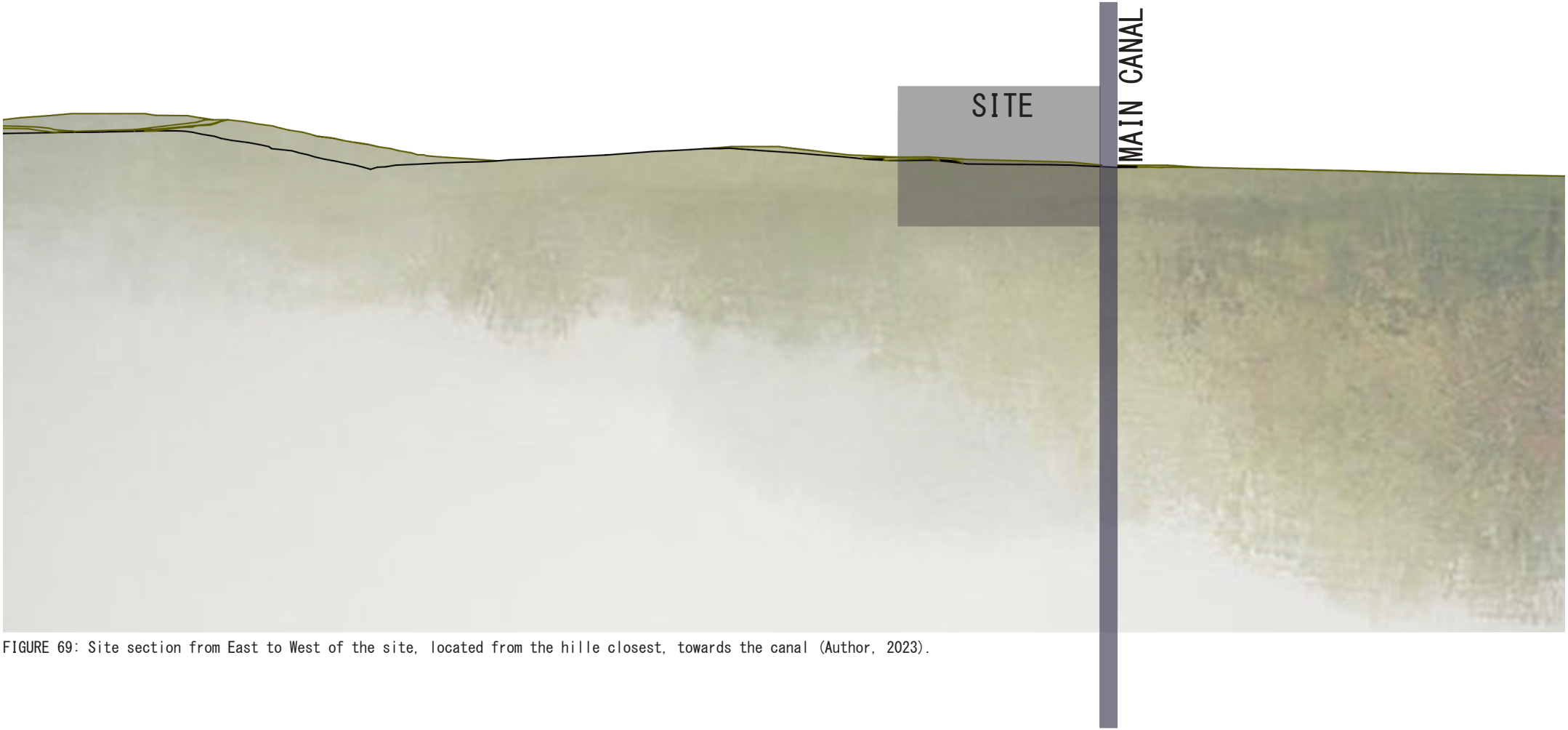


FIGURE 69: Site section from East to West of the site, located from the hille closest, towards the canal (Author, 2023).

2.6. PROPOSED SITE

The selected area chosen to work on is located next to the canal and the proposed design elements are placed parallel to it (Fig. 70).

The slope of the site falls slightly from the northwestern part of the site to the northeastern part.

The surrounding surface area is mostly covered with plants and rocks, which will have to be removed within the selected area where the project will be constructed (Fig.71-94).

The rest of the area will be kept as is to focus on the natural beauty of Hartswater.

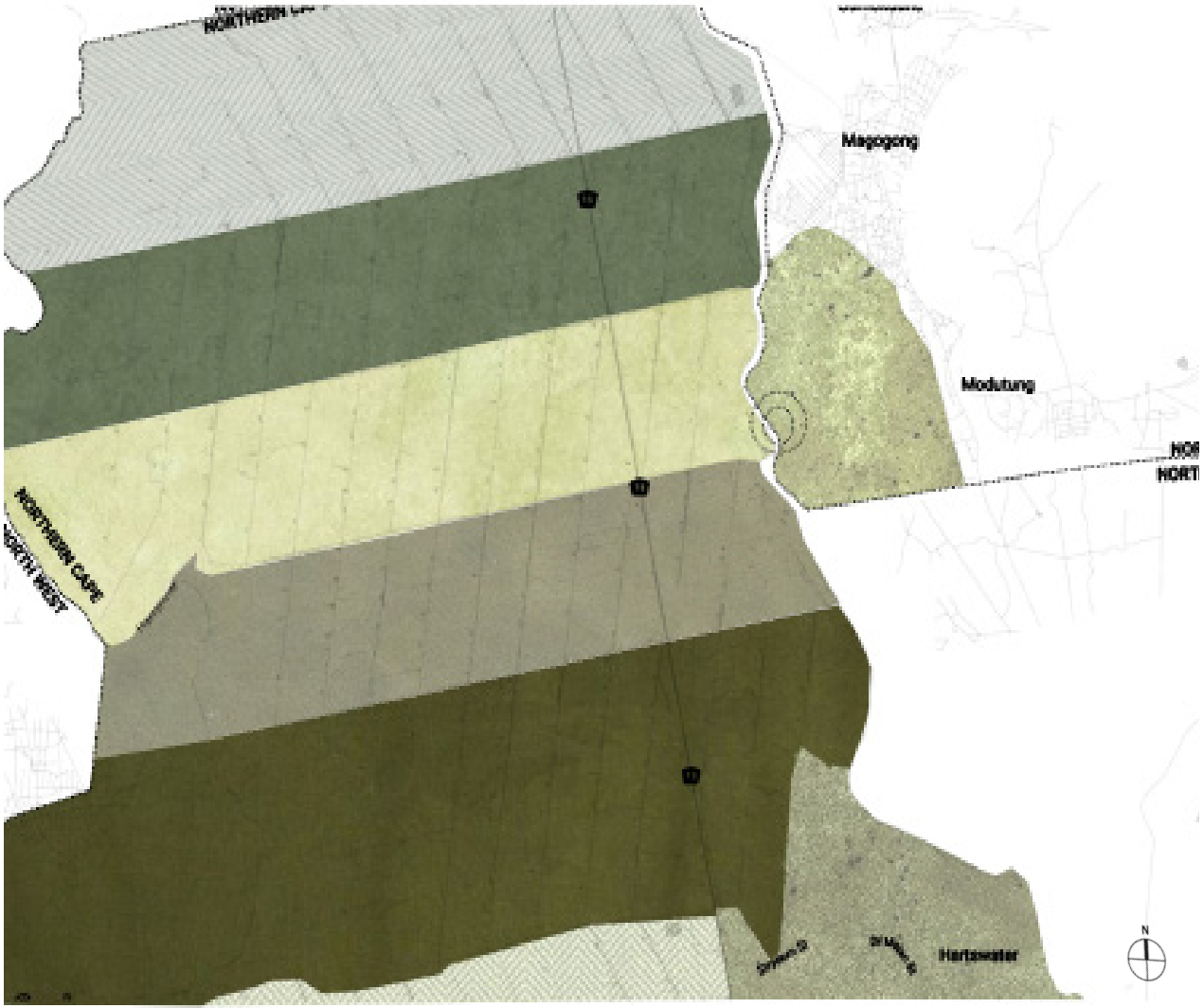


FIGURE 70: Site indication (Google maps, edited by Author, 2023).

2.7. SITE PHOTOS

FIGURE 71-74: Photographs of the site (Author, 2023).

FIGURE 75-78: Photographs of the site (Author, 2023).

FIGURE 79-82: Photographs of the site (Author, 2023).

FIGURE 83-86: Photographs of the site (Author, 2023).

FIGURE 87-90: Photographs of the site (Author, 2023).

FIGURE 91-94: Photos of the site (Author, 2023).

2.8. CONCLUSION

When reflecting on the location of the project, it can be seen that the surroundings play an important role, as they contribute to the functions and use of the design.

The area around the project is currently not used (Fig.95); as a result, there is a possibility for the project to expand and grow and create even more opportunities to develop watering systems, agricultural methods and testing of different systems and techniques.

FIGURE 95: Photo including the main part of the site that will be used (Author, 2023).

03

FIGURE 96: PHOTO OF THE SURROUNDING PLANTS (AUTHOR, 2023).

3.1. PRECEDENT STUDIES

3.1.1. PRECEDENT STUDIES 1: Wufu Longjing Agricultural Products Exhibition Center / Describing Architecture Studio

The Wufu Longjing Agricultural Products Exhibition Center in Shiyan, China, is situated in the Wufu Longjing Smart Agricultural Creation Park. This project relies on the land that connects two towns (Fig.97) to form and build an Agricultural Smart Park, Agricultural Cultivation Park, and Agricultural Research Park.

With “smart agriculture, agricultural experience, education and research, leisure tourism, catering and entertainment”, it seeks to establish an ecological demonstration platform for agricultural tourism integration (Chen, 2023).

The objective of this project is to encourage rural revitalization effectively, energise local economic growth, and motivate others to create something similar with the same objectives.

However, because it is a rural tourism project in a dispersed rural setting, the structure cannot ensure constant comfort standards.
`

The energy consumption and management costs of the building can successfully be decreased while creating a smooth transition between indoor and outdoor spaces by providing an open space that can connect indoor and outdoor sections and is reasonably flexible (Fig.98-101).

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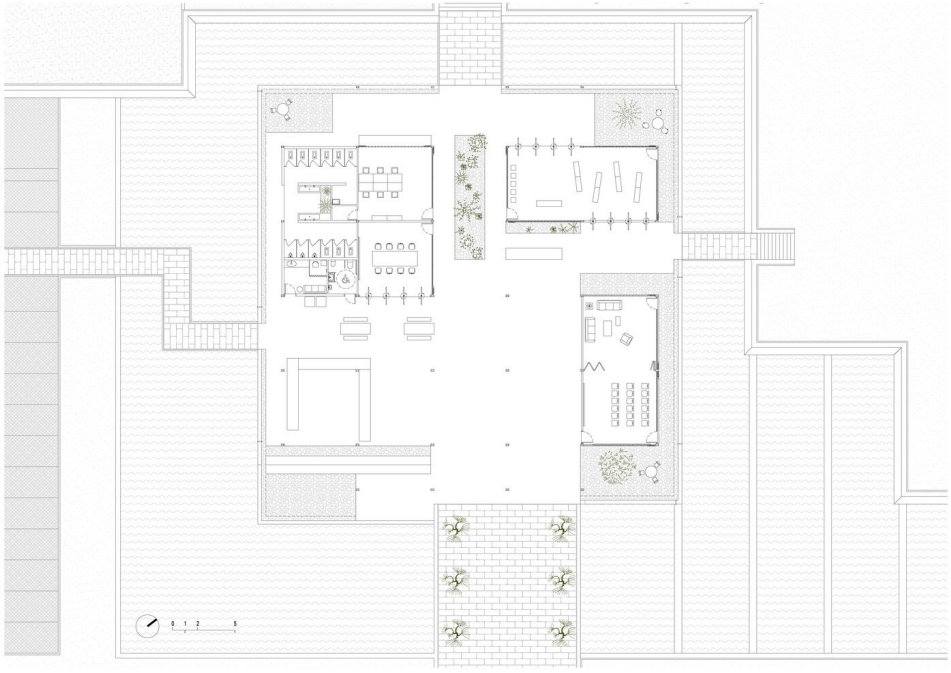

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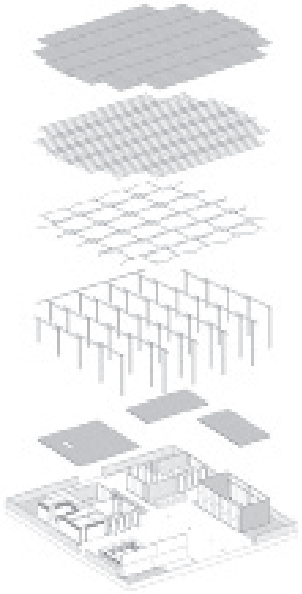

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FIGURE 97-101: Photos of the existing project (Lian He, 2022).

Fig. 104 is an exploration of the ventilation of the building. The ventilation is optimized, by breaking the interior spaces into smaller enclosed spaces, with a big open area, causing the wind to move through the whole building. The enclosed spaces are lower in height than the roof structure, creating a second opportunity for ventilation above the structure, cooling it from above.

Due to the manner in which the building is built, the base, body and top, are clearly defined, due to the change in level between the body, the built spaces, and the top, the roof structure, without having a continuous façade connecting the base to the top (Fig.105).

In Fig. 102 and 103, the roof structure viewed from the inside is carefully designed for the whole structure to work together. As depicted in Fig. 102 and 103, it shows how the beams rely on the columns, for it to carry the load of the roof covering and create the desired pitch and aesthetics of the design.The design of this roof structure creates an appearance of a more open, pavilion-like design, than an enclosed design.

This precedent inspired the idea of looking at different ways and methods to form a space. For example, a building in its entirety does not have to be enclosed, in order to be used for a specific function. It creates a spark for new ideas for ways in which to connect the base of a building to its top.

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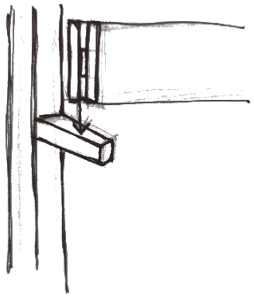

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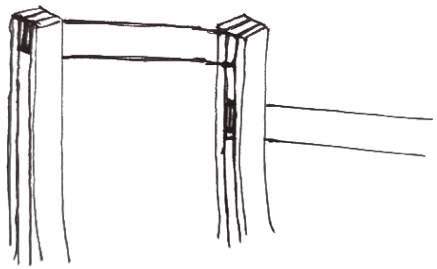

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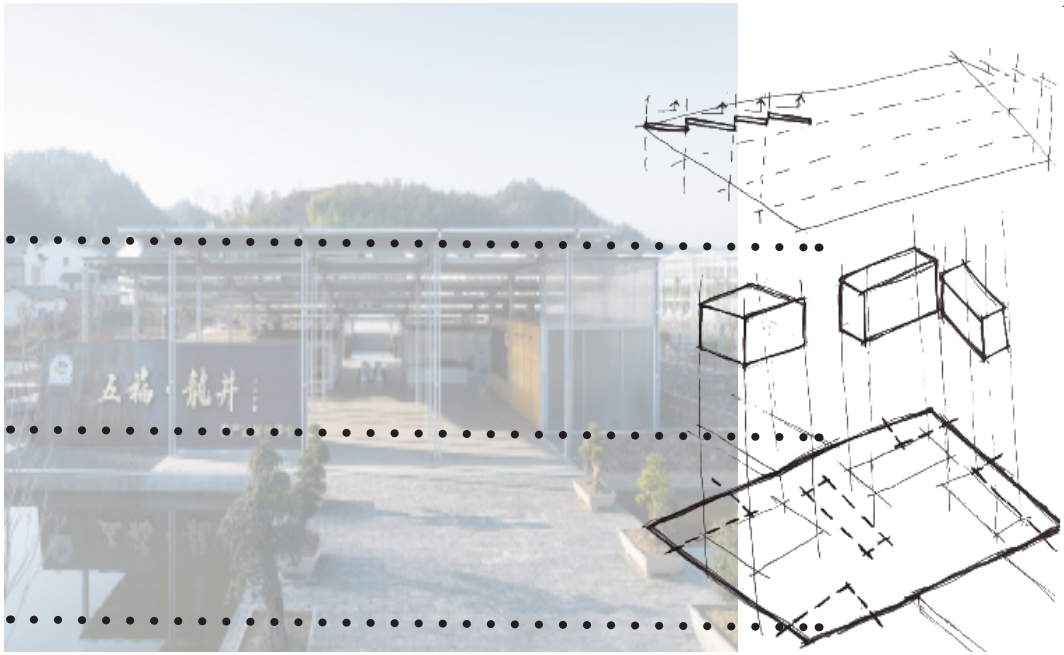


FIGURE 102-105: Analysis done by author using photos of the project (Author, 2023).

3.1.2. PRECEDENT 2: Humber Centre for Justice Leadership / Gow Hastings Architects

The Humber Centre for Justice Leadership in Toronto, Canada, is dedicated to teaching students about the art of different investigation techniques.

The institution, which gave a derelict auto dealership new life, is a shining illustration of the college's annexation plan for growing its lakeside campus.

The renovated building provides adaptable spaces that are ideal for courses like the three-year Police Foundation program and the Blood Spatter Interpretation course.

The previous service area of the dealership has been transformed into a crime scene investigation lab, and the showroom has been transformed into classrooms that are used for both normal lessons and mock trials (Daniel, 2013).

The room is stretched and squeezed to great advantage by the facility's various ceiling heights, which further conceals the dealership and gives the impression that it is a big space.

The dealership's original facade is now hidden behind (Fig.106-108) a transparent aluminium screen, giving the building outside dynamic shapes. Large cracks in the screen reveal a green living wall that cascades down the façade.

In addition to being aesthetically pleasing, the aluminium screen helps to diffuse the harsh light that formerly flooded the building through the enormous showroom windows. The screen's pointed sculptural design and the street's rough cobblestone are contrasted with the vertical garden's lush, natural appearance.

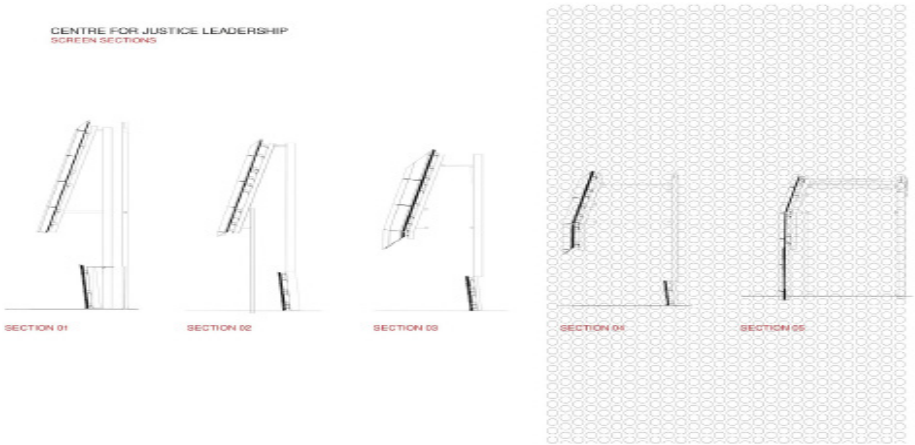


FIGURE 106: Metal screen on facade (Tom Arban, 2012).

FIGURE 107: Street view of the building (Tom Arban, 2012).

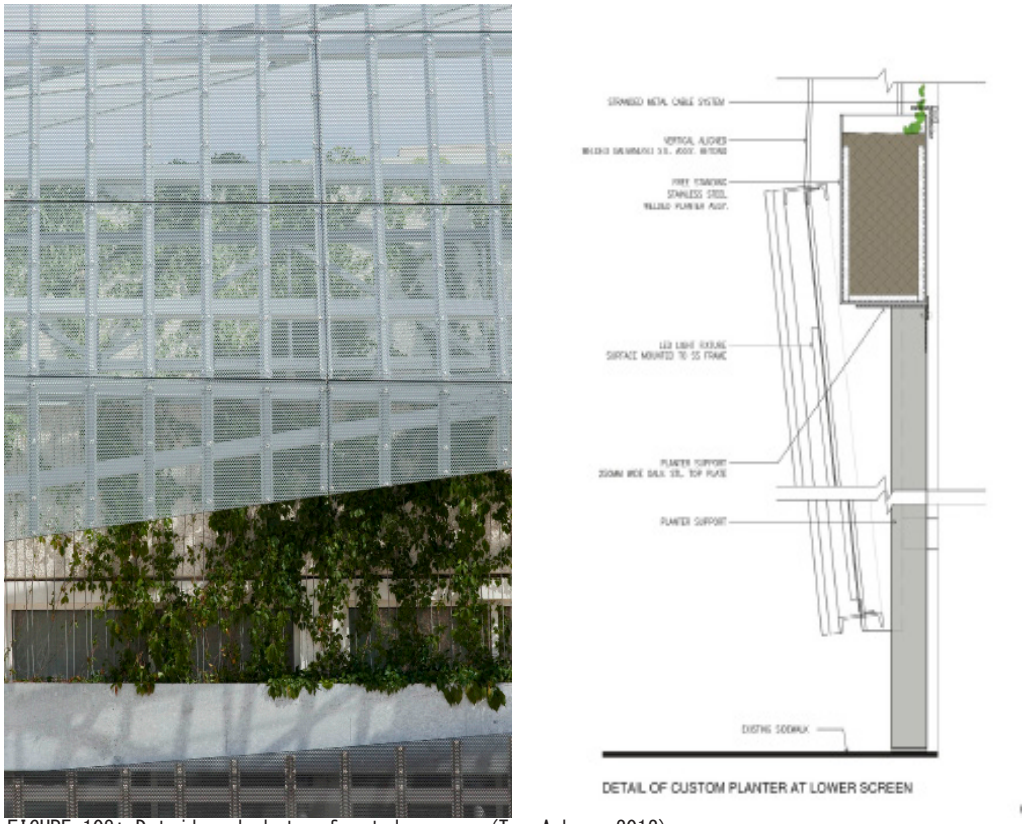
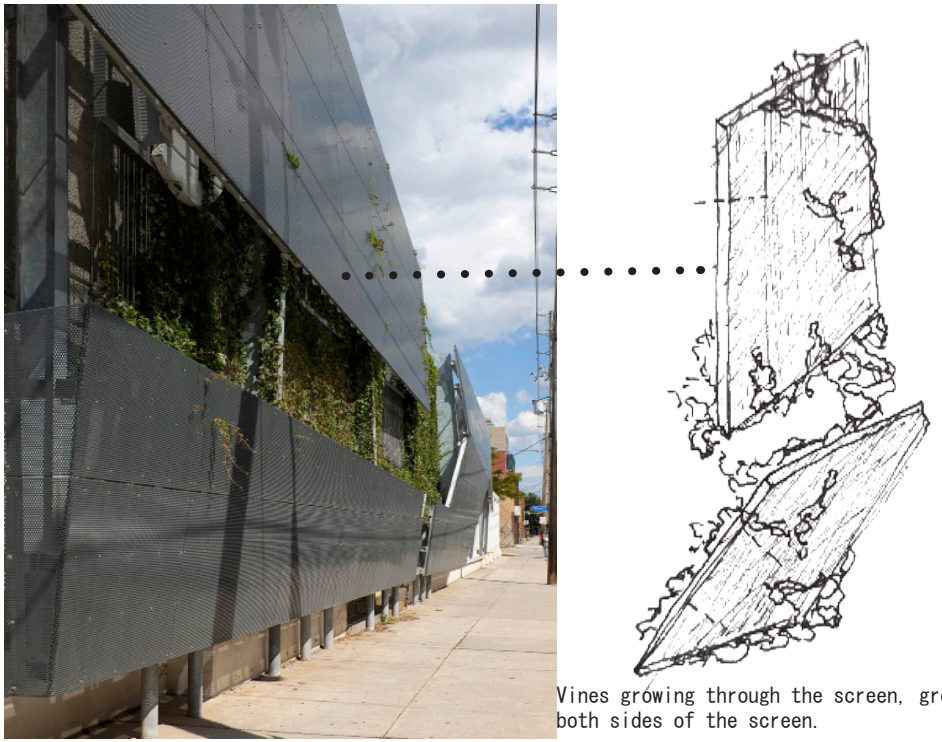


FIGURE 108: Detail and photo of metal screen (Tom Arban, 2012).

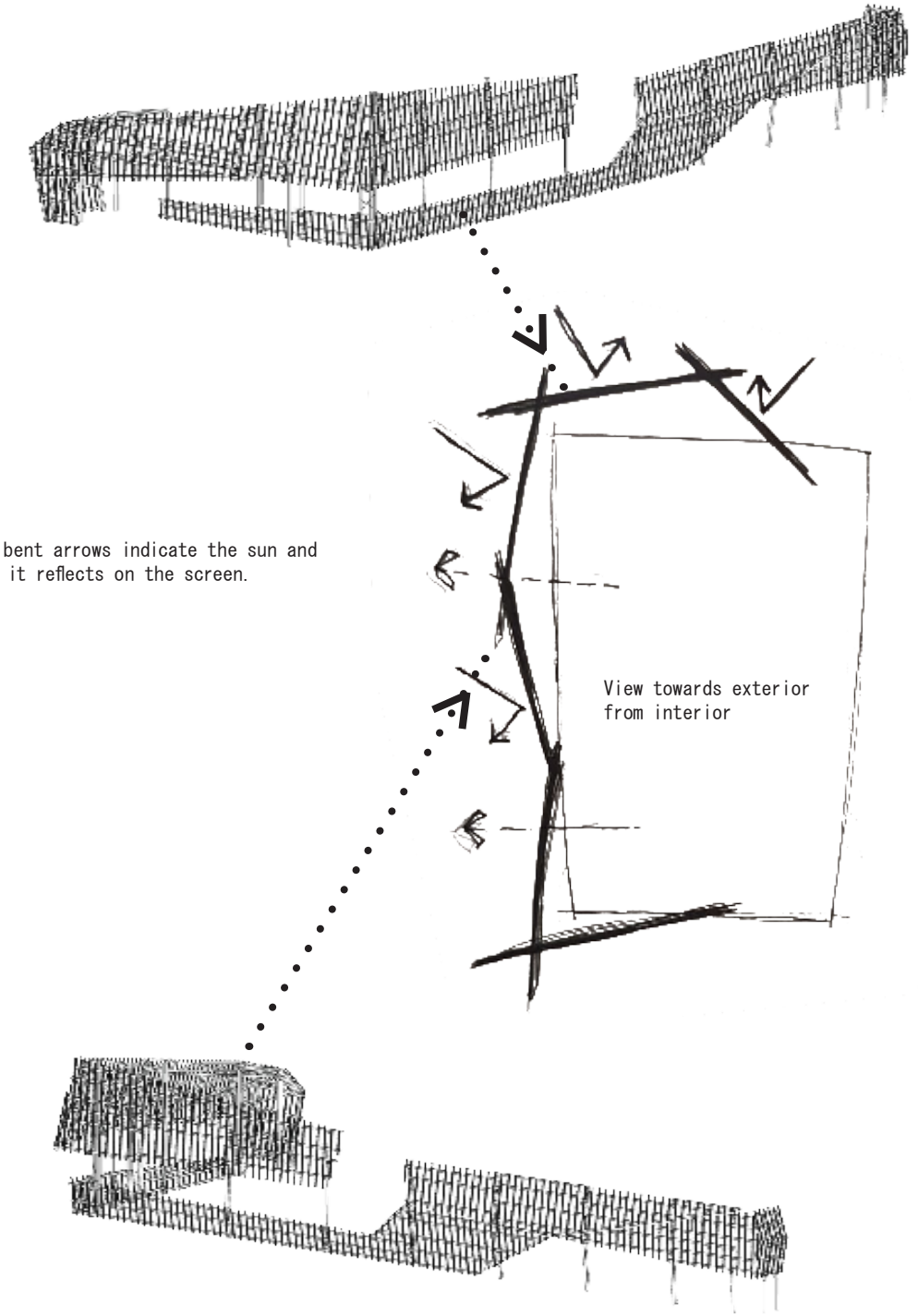
This precedent illustrated how a screen can be used in multiple ways, for example, as a visual element, passive design strategy, and to improve privacy from the exterior towards the interior. Fig. 110 is a view from the floor plan of the screen, with the bent arrows, indicating the sun that is being blocked by the screen. The arrows pointing from the interior towards the exterior, represent, that the exterior can still be viewed from the interior, through the small openings of the screen.

The screen pokes the curiosity of dwellers on the outside (Fig. 109), as they are only able to see a glimpse of what happens inside. It is a method that can be used to draw people in, and clearly shows the existing building apart from the newly built.



Vines growing through the screen, growing on both sides of the screen.

109



110

FIGURE 109-110: Analysis done by author, using photos of project to indicate place (Author, 2023).

3.1.3. PRECEDENT 3: Garden Garage / Studio North

The Garden Garage in Upper Mount Royal, Canada, focuses on the difference between the typologies of a garage and a yard. The resolution they found for this difference was to overlap the typologies into two landscapes (Fig.112).

An elevated plane of natural vegetation is created. In order to channel surplus water into the nearby planters below, which also have incorporated drainage holes that allow for even nutrient distribution as the water cascades down, the roof has specially perforated scuppers at its edge (Fig.115).

The substantial and open blocks that make up these Corten planters are meticulously massed to offer levels (Fig.113-114) for seating and stair access up to the roof for maintenance (Koshta, 2023).

Together, the garden and the garage's clashing materials and textures produce a contrast of tenderness and toughness (Fig.116).

In the meantime, the vegetation overhead transforms into a contrasting palette of gentle and delicate plant and animal life to heighten the sense of natural immersion and escape from the nearby city.

112

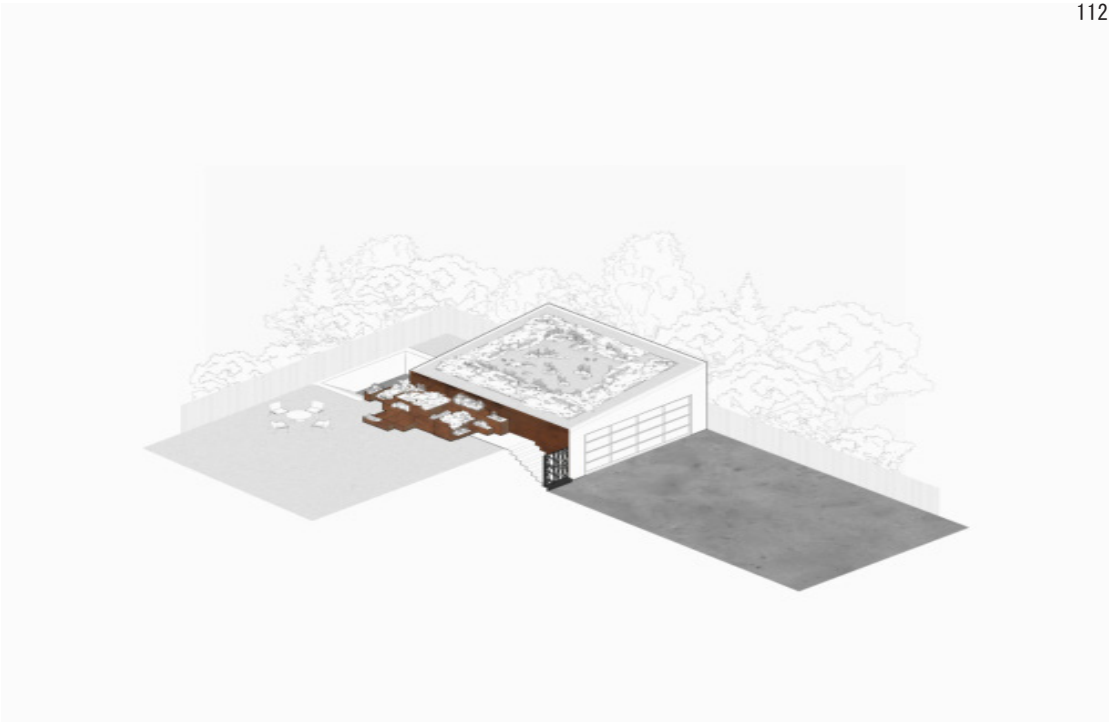


FIGURE 112-115: Planter boxes (Hayden Pattullo, 2020).

113

114

115

FIGURE 116: Top view of planter boxes ((Hayden Pattullo, 2020).

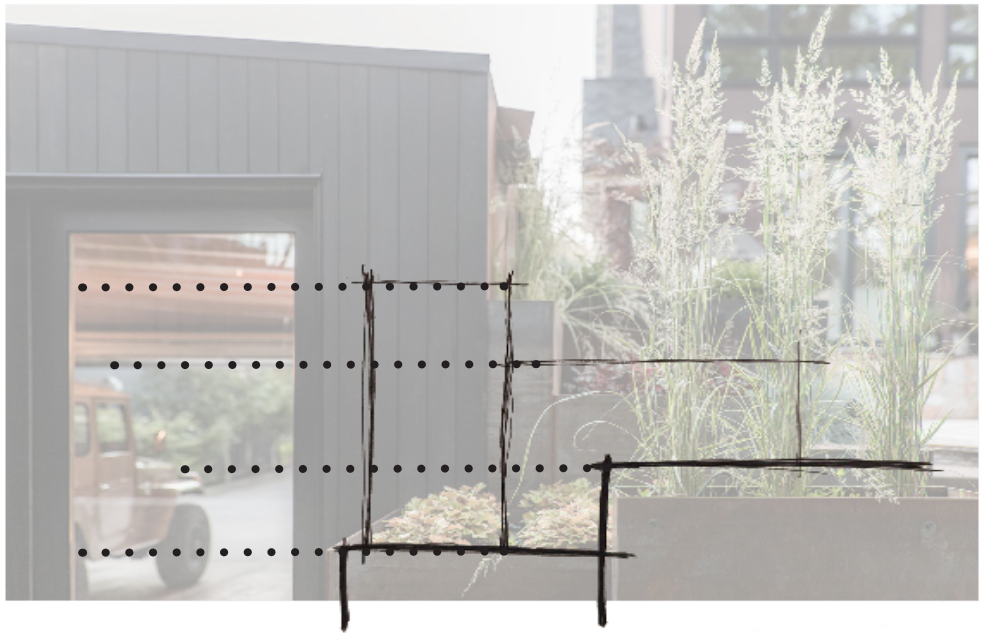
This precedent used plants in a unique way to connect two different types of typologies, a garage, and a yard. The plants are used between the spaces, creating a relationship between the different spaces.

The planter boxes are at different interchanging levels (Fig. 117), starting from the surface level of the garage, up to the green roof of the garage.

Creating a growing façade, that impacts the connection and relationship between the two typologies.

On the side of the façade (Fig. 118), connected to the green roof, the water is collected and directed towards the planter boxes. The mesh the water flows through, acts as a filter, preventing unwanted objects from flowing into the planter boxes.

117



118

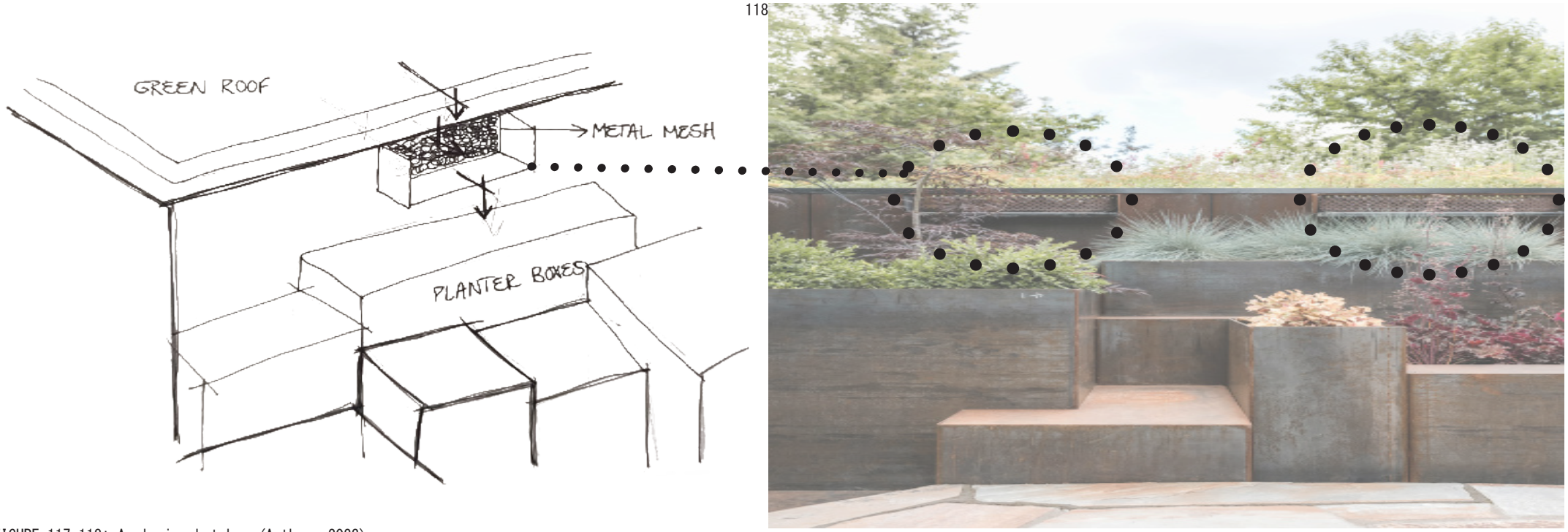


FIGURE 117-118: Analysis sketches (Author, 2023).

3.1.4. PRECEDENT 4: Luis Barragán / Mexican architect

The work of Barragán is a combination of two professions:
1. Architecture
2. Engineering.

His projects and designed elements, such as lofty walls, fountains, and constructions of noble proportions give a strong sense of Mexican culture (Fig.119-120)(Design, 2022).

Colour was a necessity, just like water, which he championed as a complement to architecture. The vibrant colour of Mexico harmonizes with the architecture. If architecture is viewed as an art form, Luis Barragán made it his mission to thrill and captivate us with his creations (Schielke, 2018), through the use of bright colours and water.

Barragán tells the tales of his upbringing, with just one external source of inspiration (Schielke, 2018), but it was in Granada at the Alhambra that he came up with the essential ideas for employing water as a form of expression (Fig.121).

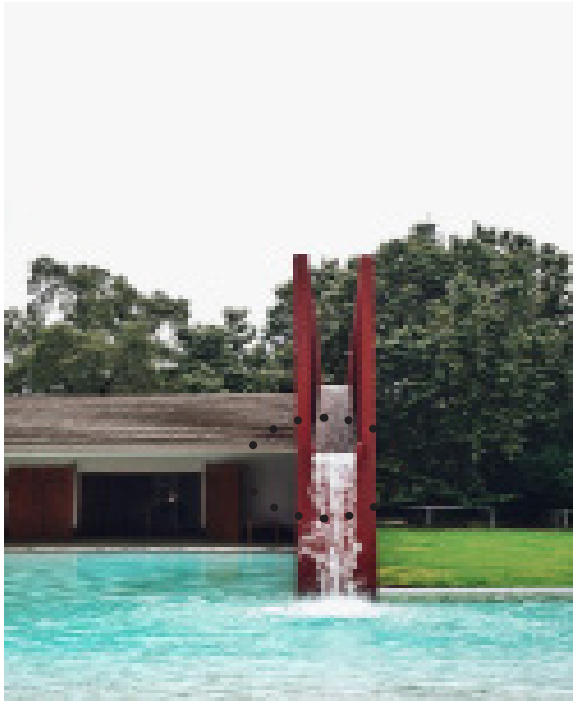


FIGURE 119-120: Cuadra san Cristobal and Las Arboledas (Armando Salas Portugal, 2022).

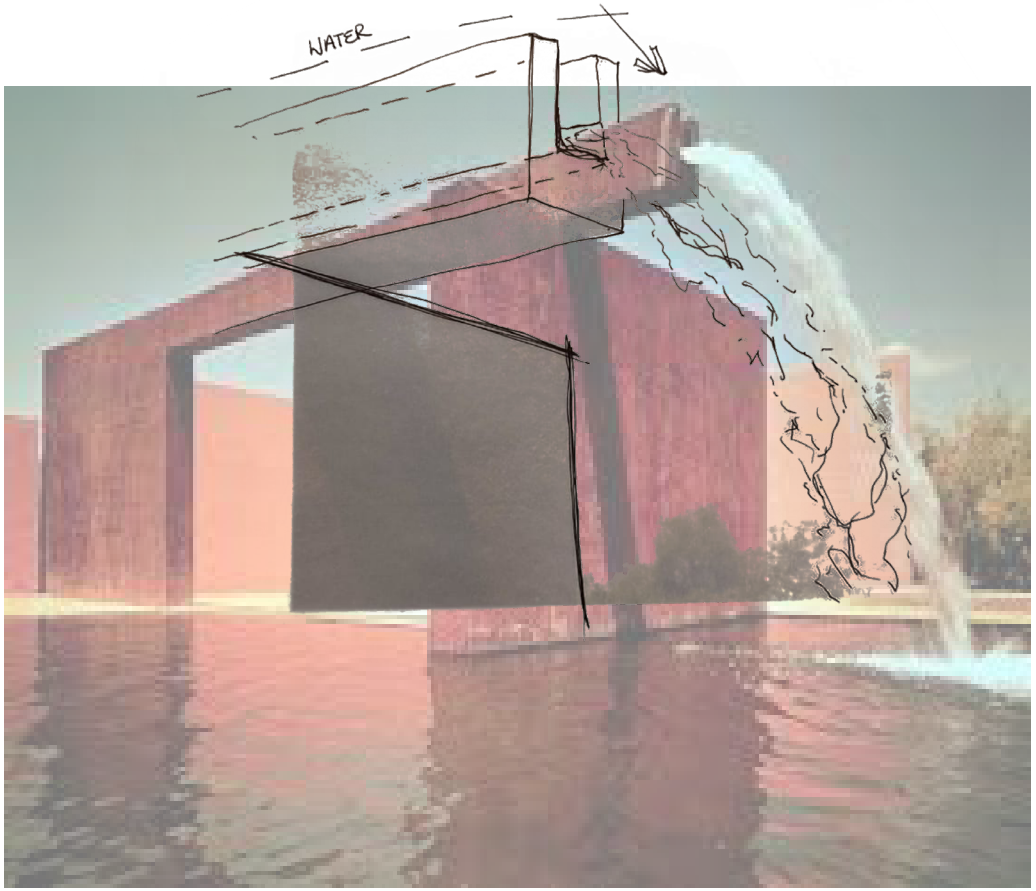


FIGURE 121: Fuente de los Amantes (Rodrigo Flores, 2022).

When comparing these elements to the design of the dissertation, it is clear that water is just as big of a necessity, as it is for Barragán. In this case, colour does not have as big of an impact on the design as in Barragán designs, instead, the focus is more on the materials used.

Materials that are familiar to the users and that are used commonly in the area. Such as the construction of exposed brick walls, plastered walls and the use of corrugated roof sheeting on walls and other surfaces as the roof.

The use of water, geometric abstraction, colour, and magic can be used to summarize Barragán's aesthetic principles. A piece of architecture that inspires us with its beauty and the mood it reflects (Fig.124).

When comparing this to the dissertation, the following can be used to summarize the aesthetic principles of the project:

- The use of water, on the interior and exterior, using it as both a visual tool and physical tool for teaching (Fig.122).
- The use of different materials, creating different aesthetic effects.
- A building that inspires the function of the building to be more than one, in this case, the building functions as a museum and a learning center (Fig.123).

FIGURE 123: Render of the interior of the main exhibition space (Author, 2023).

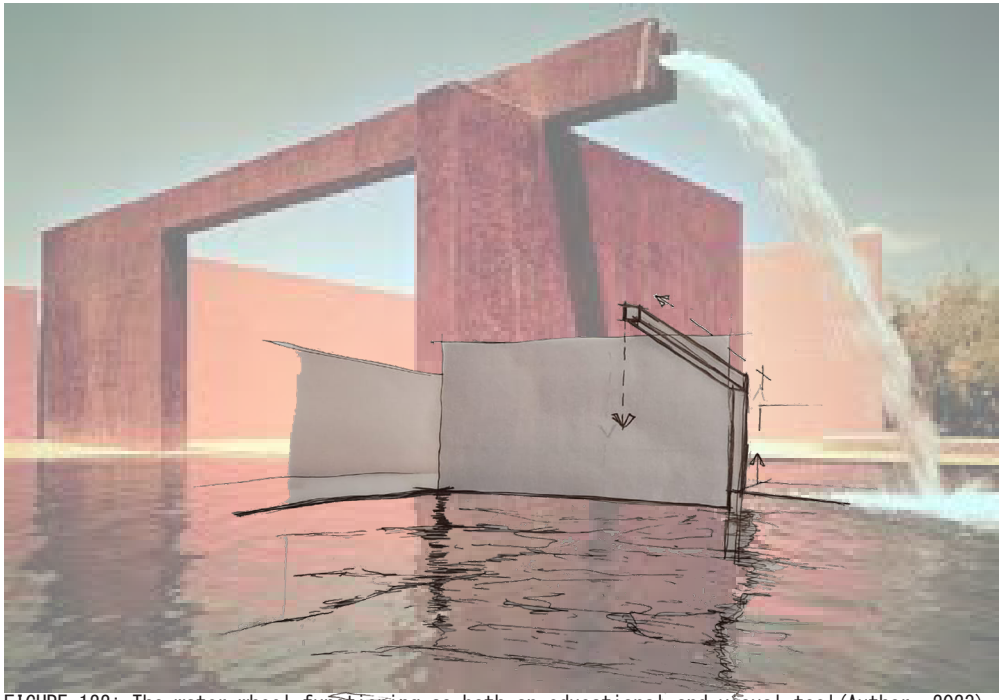


FIGURE 122: The water-wheel functioning as both an educational and visual tool(Author, 2023).

FIGURE 124: Entrance walls, with built-in water channels, creating a feeling of calmness as one enters(Author, 2023).

3.2. VAALHARTS DAM

The following photos were all taken during a site visit that was guided by one of the members of the Department of Vaalharts Water and one of the operators (Fig. 125-148).





FIGURE 125-130: Photos capturing different moments during the site visit (Author, 2023).









FIGURE 131-139: Photos capturing different moments during the site visit (Author, 2023).



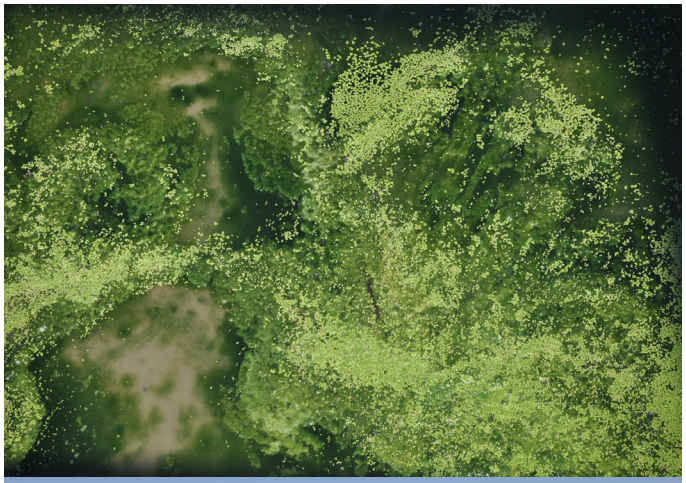






FIGURE 140-148: Photos capturing different moments during the site visit (Author, 2023).

3.3. CONCLUSION

The work discussed in this chapter provided inspiration for the design of this dissertation. It showed how important architecture is within a certain space and place, which creates relationships between man and nature, the existing and the new (Fig.149).

It provided new perspectives on how to handle architecture, meaning the way that the project is designed and the implications those choices have.

FIGURE 149: Photo capturing the visual and physical moments, inspiring the design to do the same, within the project (Author, 2023).

04

FIGURE 150: PHOTO OF THE SURROUNDING PLANTS (AUTHOR, 2023).

4.1. DESIGN DEVELOPMENT

The following chapter will discuss the brief of this dissertation, and how the project was approached and the influences the process has on the result.

FIGURE 151: PHOTO OF THE SURROUNDING PLANTS (AUTHOR, 2023).

4.1.1. BRIEF

The whole program is focused on the canal watering system, its history, as well as how it was used and how it is currently being used; how it developed, and the use of it in a learning experience (Fig.152).

This proposed design will create an opportunity for rejuvenation of the systems and knowledge of the application of the past. At the same time, it creates work and learning opportunities, rejuvenating the area, and bringing attention to the different methods.

The program will support the accommodation of four main areas of the proposed project. Each area has an important contributing factor, in order for the project to work and accomplish its goals.

ACCOMMODATION LIST:
Main building:
- Reception
- Ablutions
- Exhibition
- Storage

Admin building:
- Reception
- Ablutions
- Storage
- Offices
- Staff room
- Boardroom

Learning centre:
- Reception
- Classroom
- Presentation room
- Ablution
- Green room
- Storage
- Waiting area

Café
Courtyard:
- Greenhouse
- Practical learning spaces

FIGURE 152: Concept models (Author, 2023).

4.1.2. TOUCHSTONE: RENDERING OF THE FLUME

By changing the direction of the flow, a new perspective is created when looking at the process and the narrative of the canal system.

It exhibits the influence of what is needed during the present time, past and future. As a result, new methods are formed based on the tradition of the basics of the existing system, and its function and knowledge are passed on from generation to generation (Fig. 157).

With the built system, one part is dependent on the other, one influences the next. Each time it enters a new method, the outcome needed stays the same: the supply of water. Figures 157 are the result of waterorbees being dropped from above, falling into the highest container, which is filled with blue-dyed water, representing the tradition of a certain time, and the influence it had.

Once the process starts it creates a chain reaction, as the water and or-bees fall into the container below. At the bottom, the container collects the remaining water, which is then directed into a bigger body of water (Fig.153-156). This symbolizes the water that flows in the canal surface water and other water sources flowing back into the main canal.

153 154 155 156

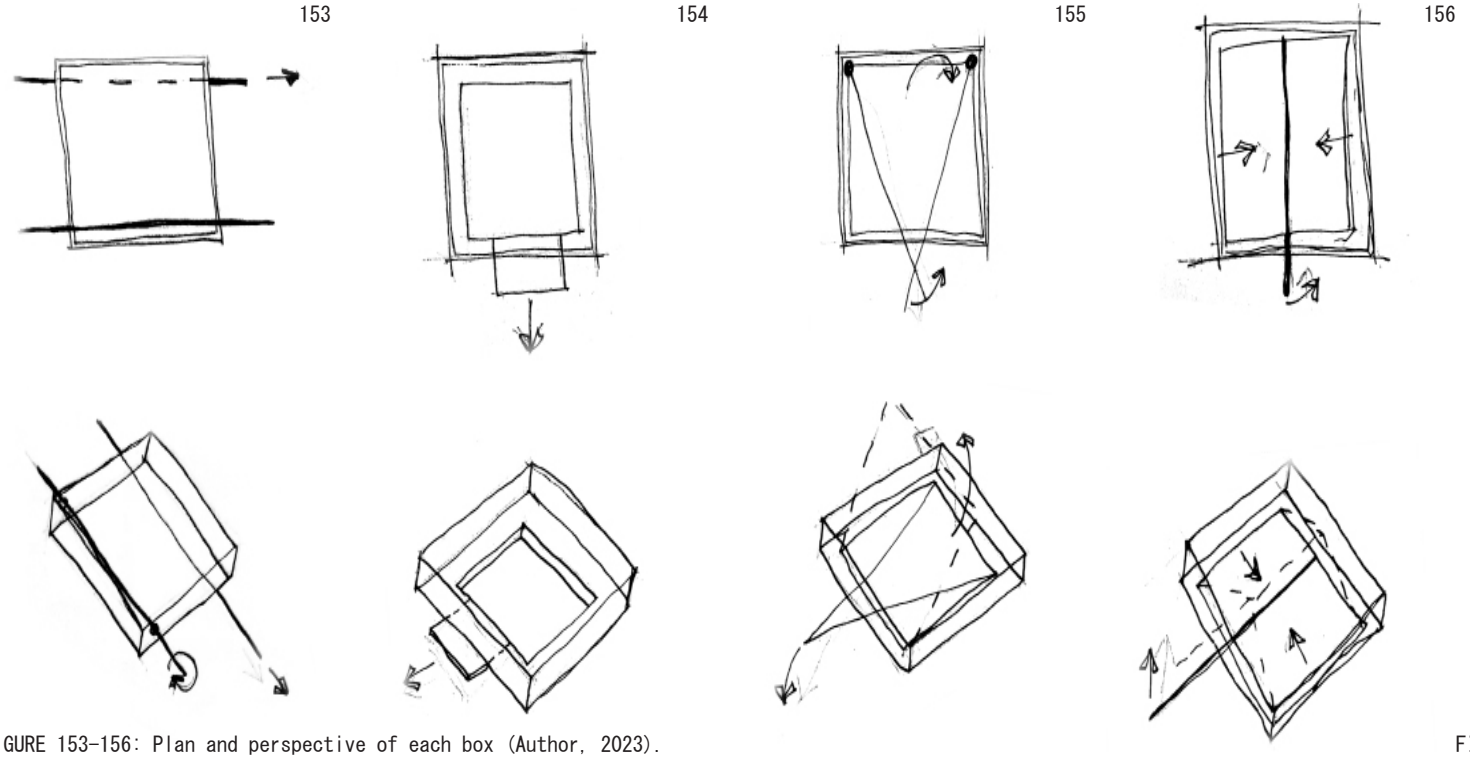


FIGURE 153-156: Plan and perspective of each box (Author, 2023).

FIGURE 157: Touchstone, after use (Author, 2023).

4.1.3. CONCEPTS

The following three concepts, work together, forming a narrative of the stages of water and represents the influence it has on the design, by indicating possible architectural uses.

Even though they all consist of water, each concept and stage differ from the others, symbolizing different meanings and influences (Fig.158).

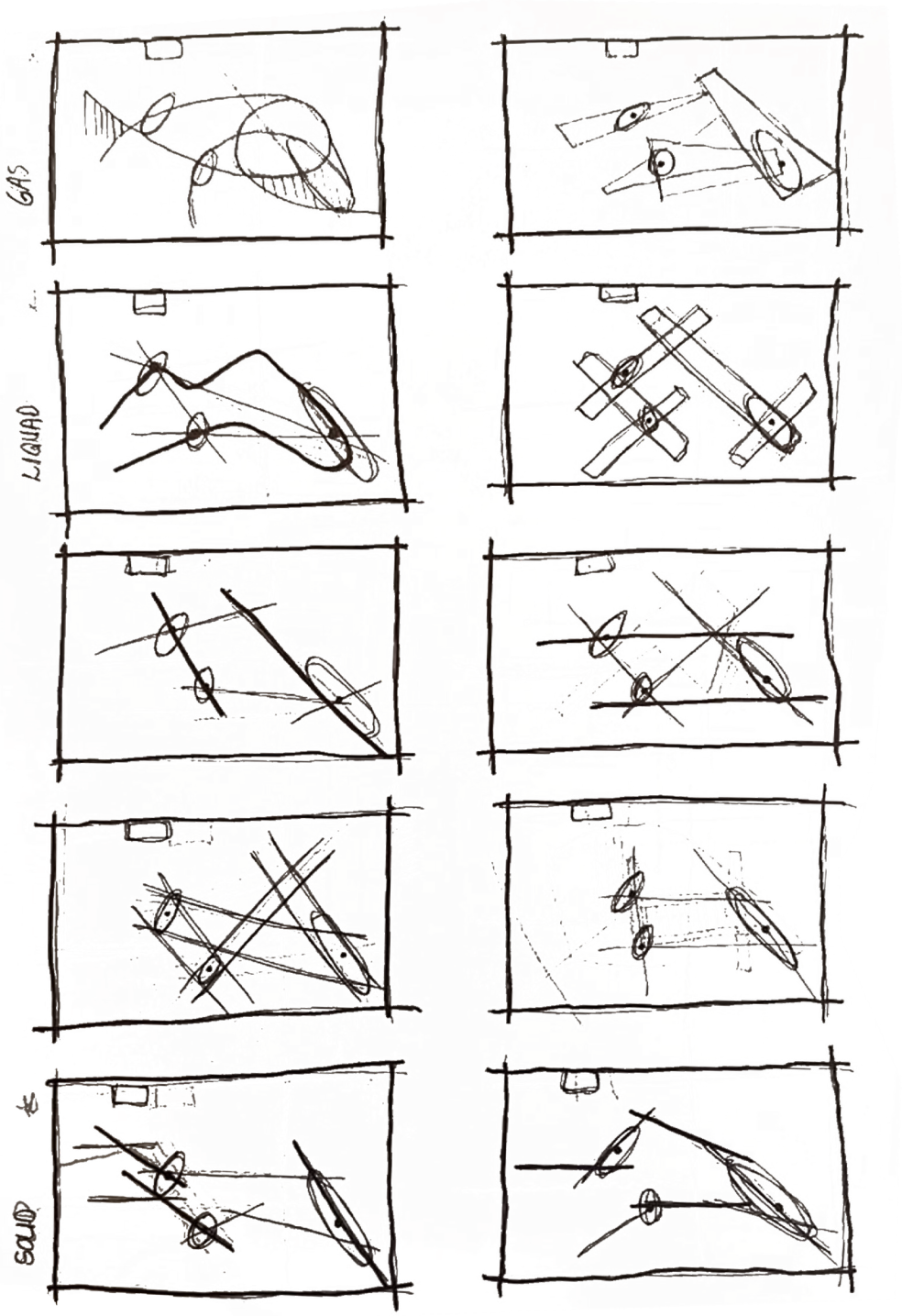


FIGURE 158:Concept model exploration (Author, 2023).

4.1.3.1. CONCEPT 1

This stage of water is mysterious, we can feel it and know that it is there, but we cannot see it. One thing is certain, it is recurring and cyclical.

During this state, space is added to the water and is not restricted to a fixed form. It is symbolic of life, of growth and something new. It represents the growth of agriculture, water systems, and the implementation of new-found knowledge.

The possible contributing architectural elements at this stage, for example, are creating open natural spaces, dematerializing the boundaries between man-made and natural elements, and creating the opportunity for a stronger relationship between the two.

Figure 159 represents the forming of spaces and the creation of new spaces.

FIGURE 159: Concept model integrated with sketch exploration (Author, 2023).

MYSTERIOUS | RECURRING | SYMBOLIC

4.1.3.2. CONCEPT 2

This concept represents the crossing between the two stages of gas and solid. Figure 160 symbolizes the different states in which flowing water can be experienced, for example, the middle represents a big body of water, and the pathways surrounding it the canal.

This stage of water is symbolic, visual and auditory. The in-between space of solid and gas can be comprehended visually and auditorily. The elements apply to both flowing water and solid, although these two states differ.

The two states create a calming effect, draw attention, and create a bond between the viewer and the water. As it flows, it adopts and adapts to the conditions, with the ability to interact with water and control it. This stage of water is constantly within the in-between.

The liquid stage is the moment when the stages meet in the middle; where the past and future meet in the present. The possibly contributing architectural elements, for example, the reflection ponds, and spaces flow into one another creating a relationship between the exterior and interior elements.

It is a space of comfort, reflection, and connection between man and nature.

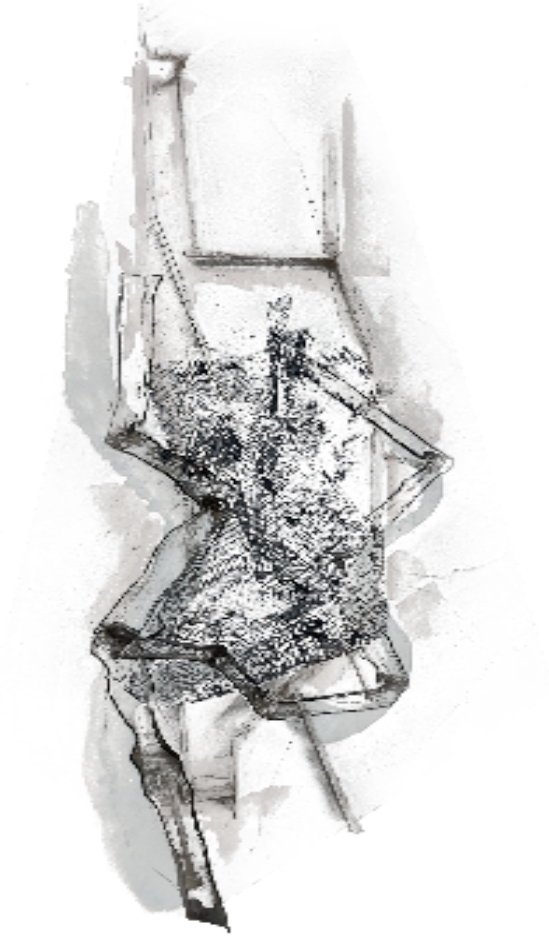


FIGURE 160: Concept model integrated with sketch exploration (Author, 2023).

4.1.3.3. CONCEPT 3

The third concept is symbolic of engraving the landscape. In this situation, it means that something solid, such as a canal waterway system, is placed within the landscape. Within the solid element - the canal - space is provided for water to flow and be controlled.

This stage of water is mainly visual. It is form-driven and has endless possibilities of forms. The form is dependent on the maker, as the maker shapes and creates the permanent form.

The water mimics the shape, provokes interest and draws attention. The state of the water changes over time as well, as it melts down into a liquid, and has the possibility of reshaping.

The possibly contributing architectural elements, for example, are the existing ones that have an impact on the design, such as the orientation, the quarry, the historical elements and mainly the canal.

Figure 161 is a controlled space that creates an imprint within the nature, which influences the man-made.

FIGURE 161: Concept model integrated with sketch exploration (Author, 2023).

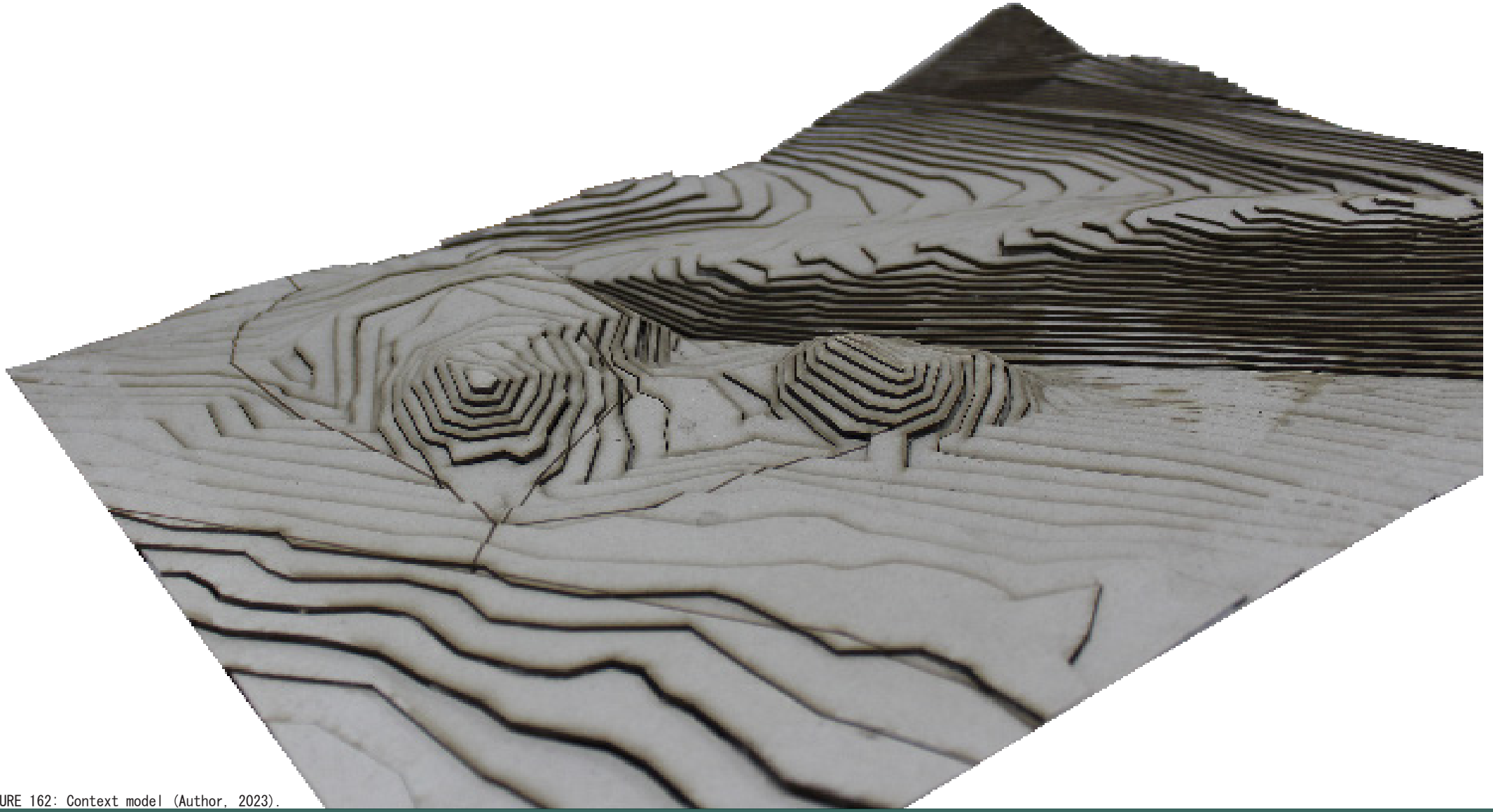


FIGURE 162: Context model (Author, 2023).

4.2.1. PHASE 1

The first phase of work consisted of experimenting with possible layouts and design ideas.

During this phase, the location of the project was located on top of a hill, close to the final chosen site.

These led to the first working model, which is shown in Fig. 172.

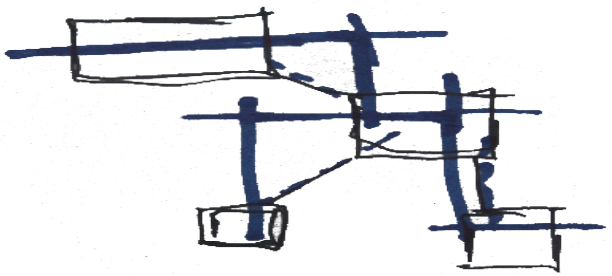


FIGURE 163: Space indication and connection drawing (Author, 2023).

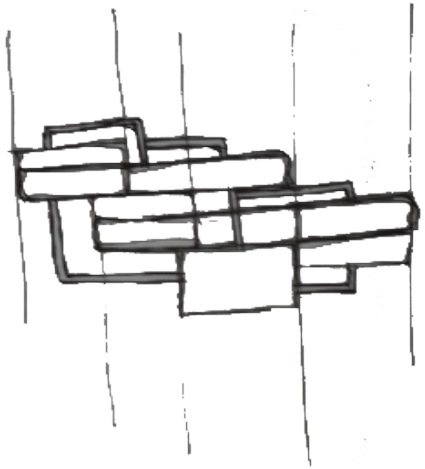


FIGURE 165:Space diagram and grid drawing (Author, 2023).

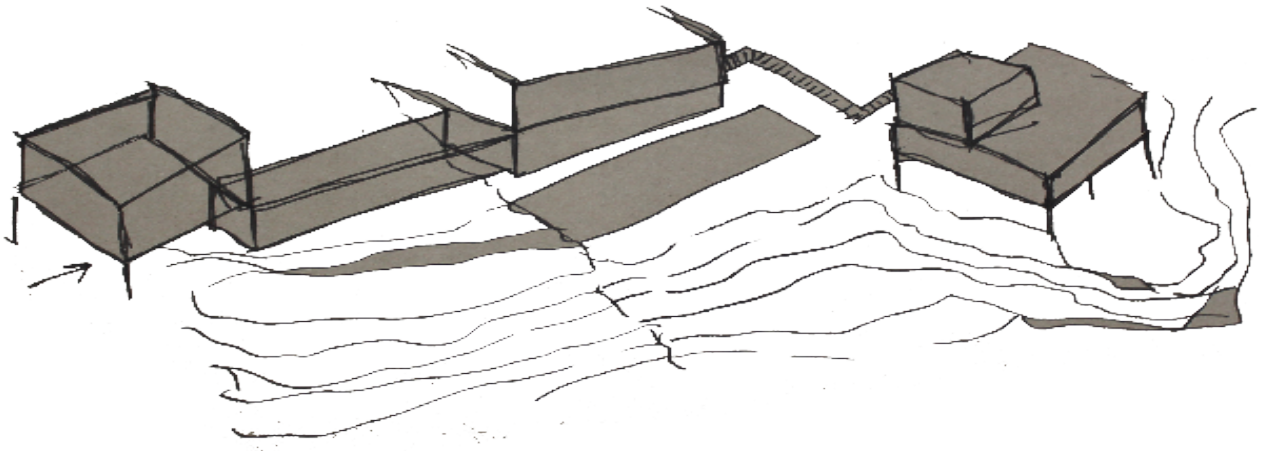


FIGURE 164: Mass model drawing of first idea (Author, 2023).

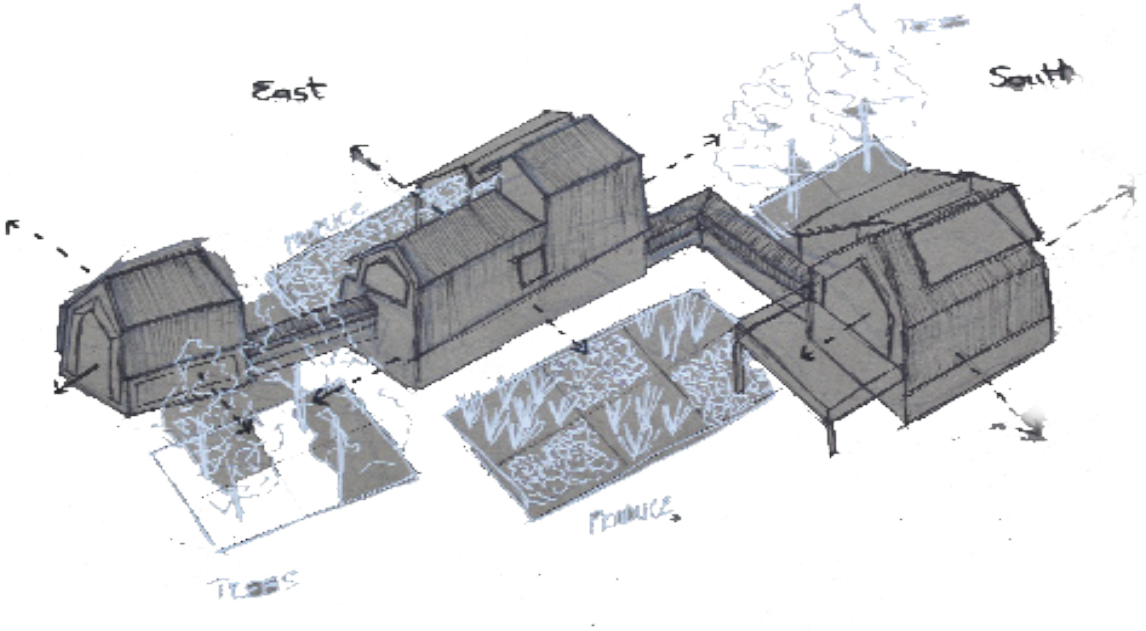


FIGURE 166: Perspective drawing of mass model idea (Author, 2023).

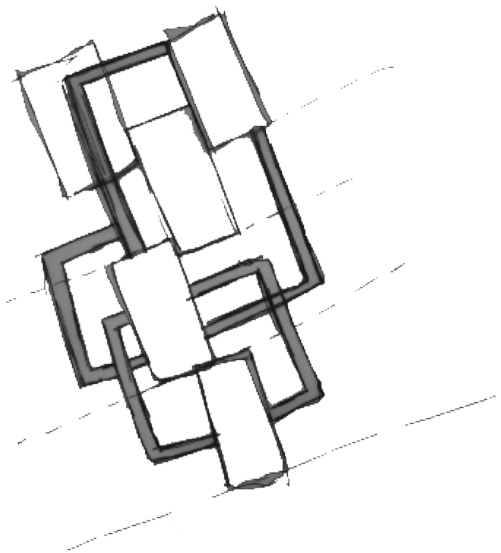


FIGURE 167: Space diagram and grid drawing (Author, 2023).

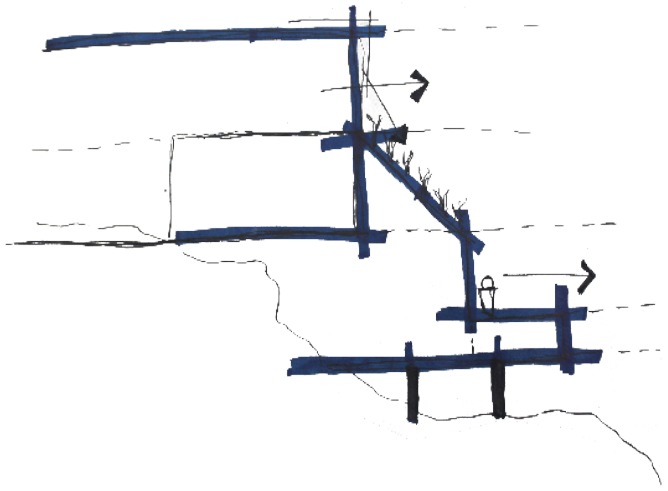


FIGURE 168: Section of building on site (Author, 2023).

FIGURE 169: Perspective of idea for roof (Author, 2023).

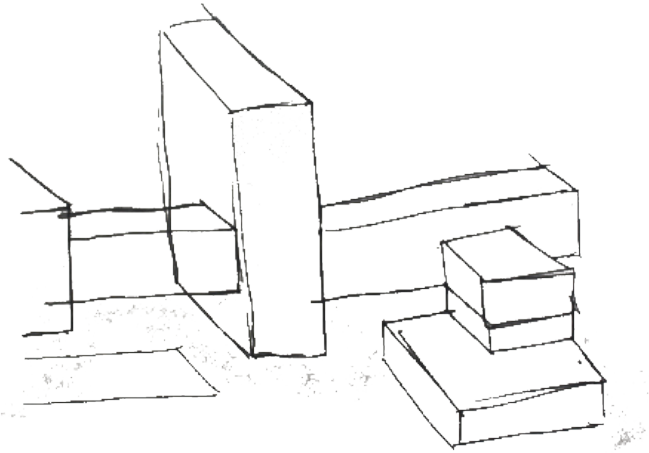


FIGURE 170: Massing indication (Author, 2023).

FIGURE 171: Roof structure idea (Author, 2023).

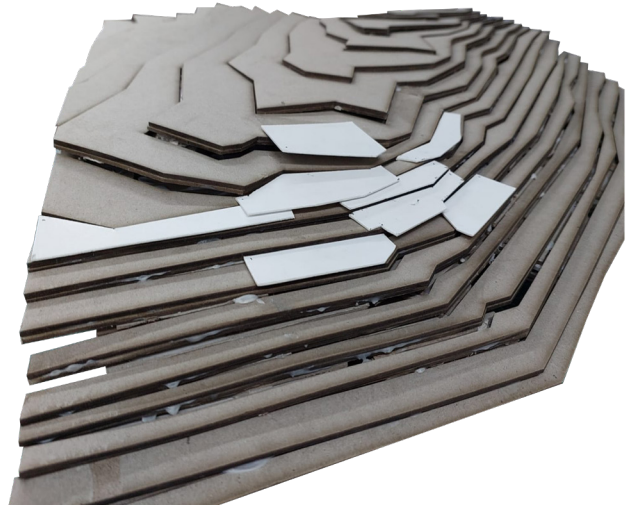


FIGURE 172 :First working model (Author, 2023).

4.2.2. PHASE 2

Phase two consisted of different diagrams allocating the different spaces that would be used in the project.

In Fig 177 and 179 the working model for this phase is shown.

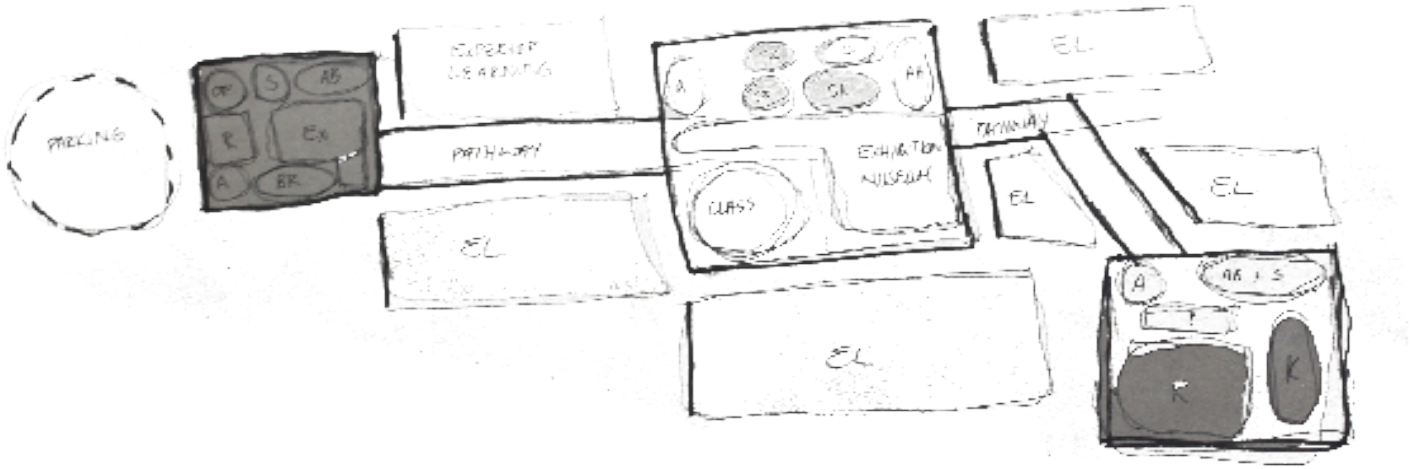


FIGURE 173: Bubble diagram, indicating spaces (Author, 2023).

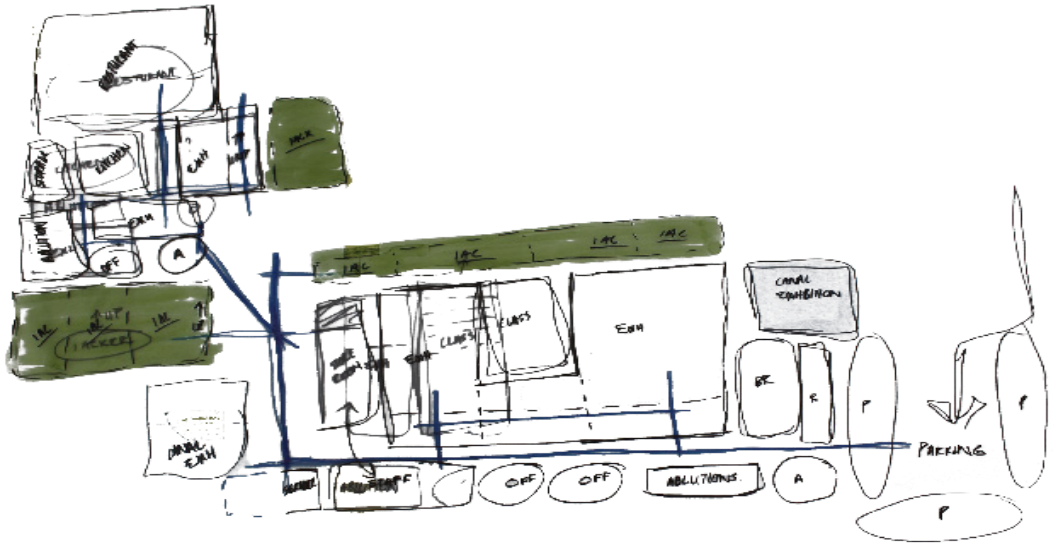


FIGURE 174: Bubble diagram, indicating spaces (Author, 2023).

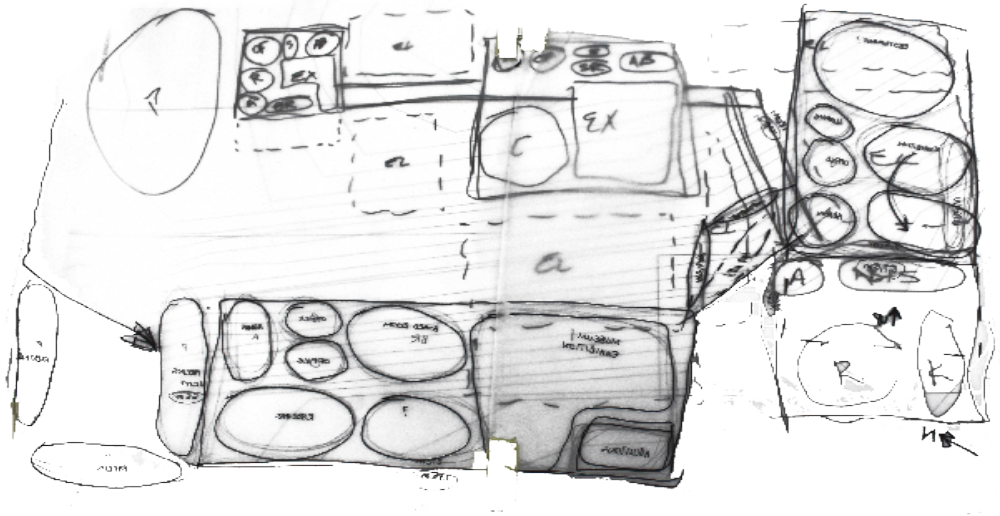


FIGURE 175: Bubble diagram, indicating spaces (Author, 2023).

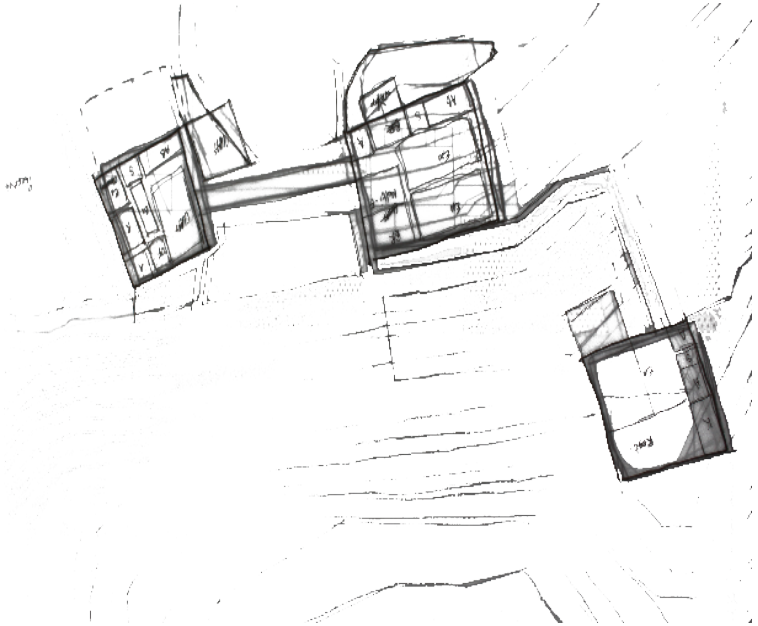


FIGURE 176: Bubble diagram, indicating spaces (Author, 2023).

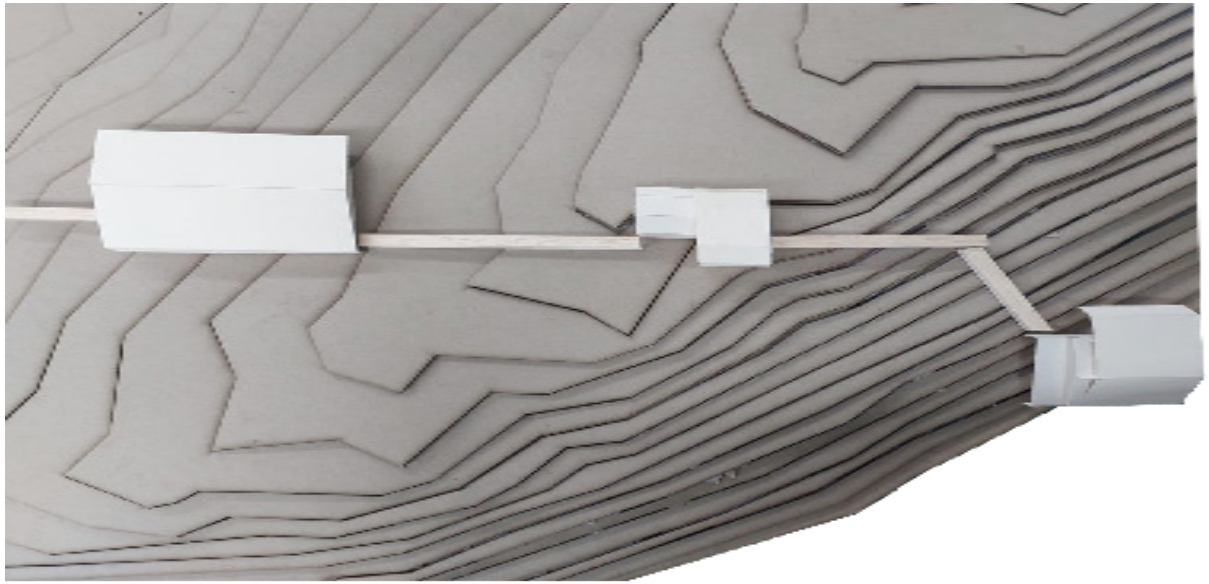


FIGURE 177: Working model (Author, 2023).

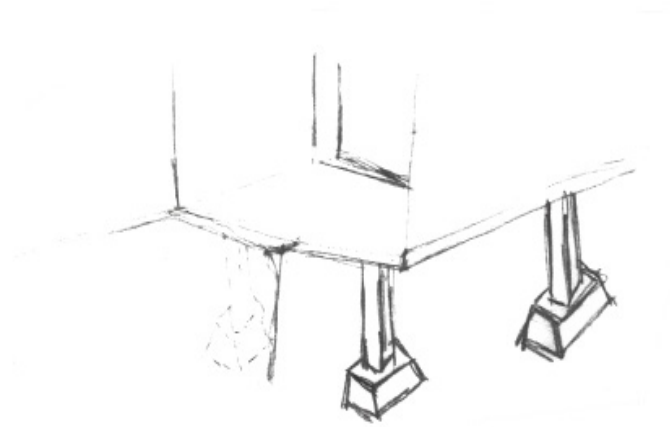


FIGURE 178: Structure drawing (Author, 2023).

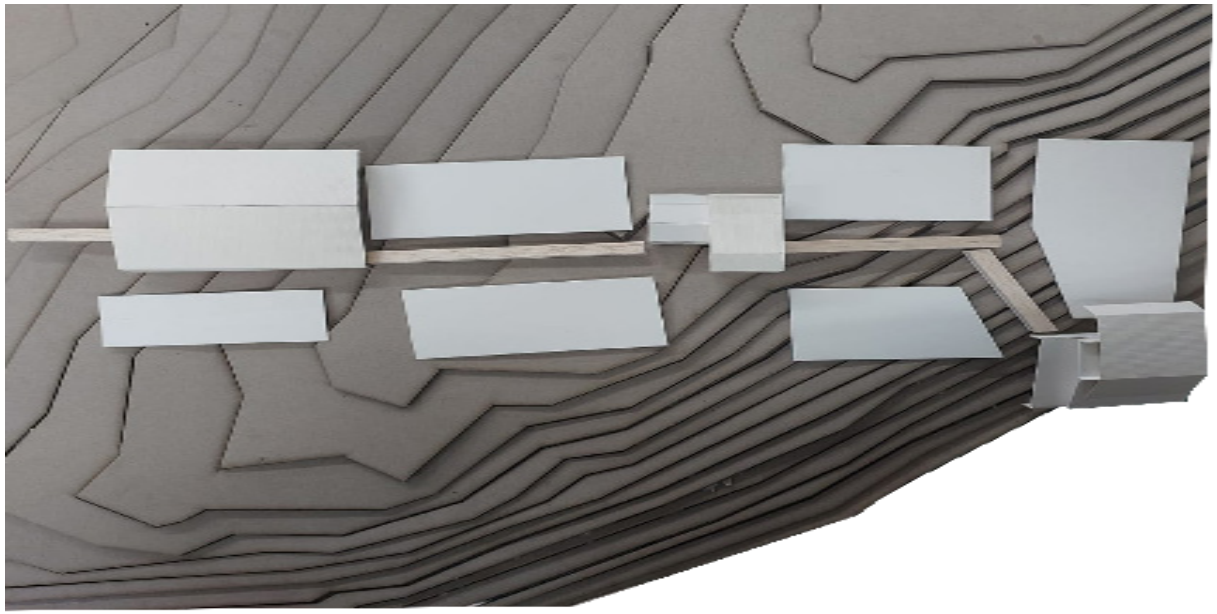


FIGURE 179: Working model (Author, 2023).

4.2.3. PHASE 3

During phase three, different layouts and possible shapes were explored, guided by the contours of the site, the hill.

Waterways were placed on the contour lines, acting as a guide into the building (Fig.180-192).

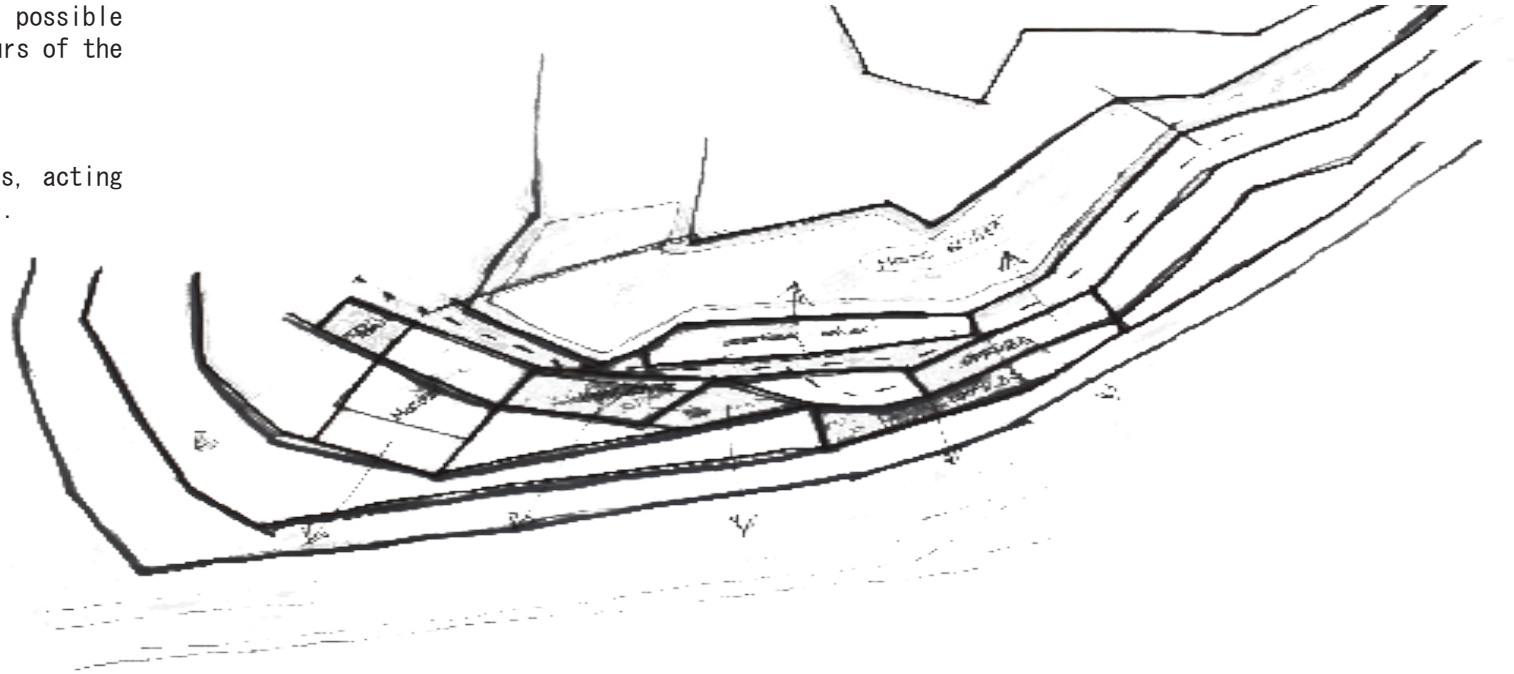


FIGURE 180: Working drawing (Author, 2023).

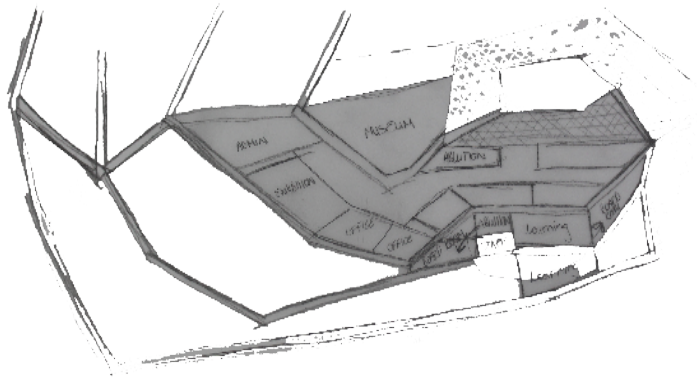


FIGURE 181: Bubble diagram (Author, 2023).

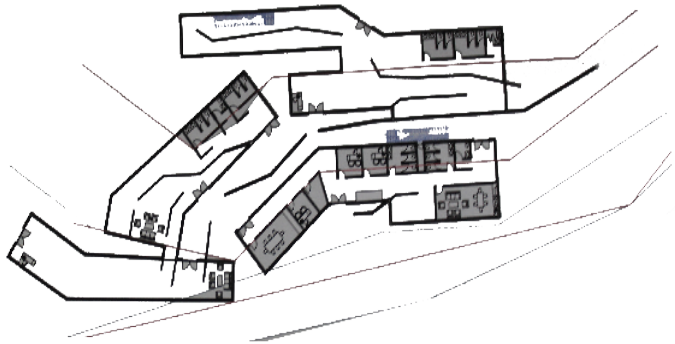


FIGURE 182: Space allocation diagram (Author, 2023).

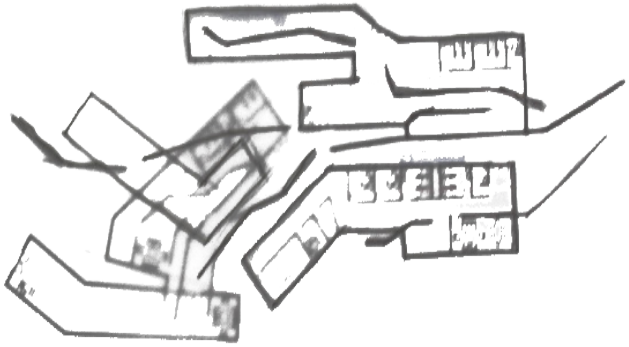


FIGURE 183: Space allocation diagram (Author, 2023).

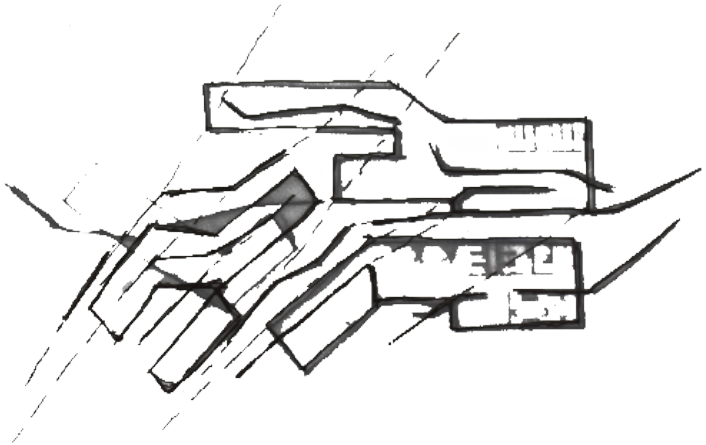


FIGURE 184: Space allocation diagram (Author, 2023).

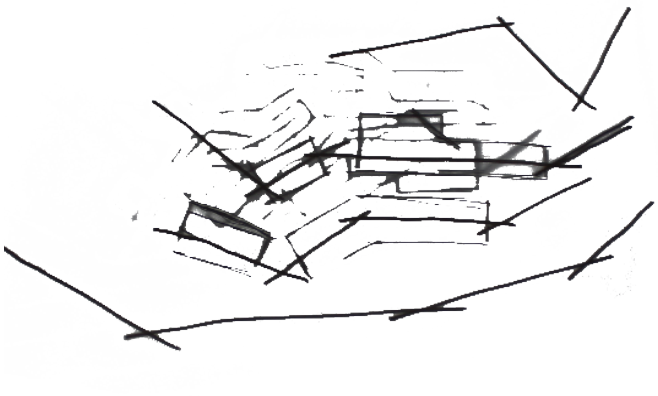


FIGURE 185: Shape diagram (Author, 2023).

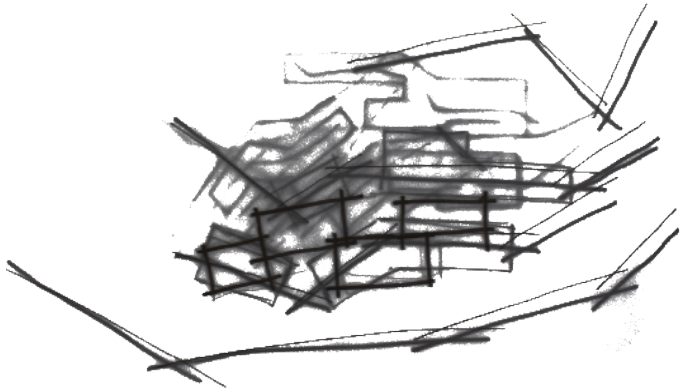


FIGURE 186: Shape diagram 1 (Author, 2023).

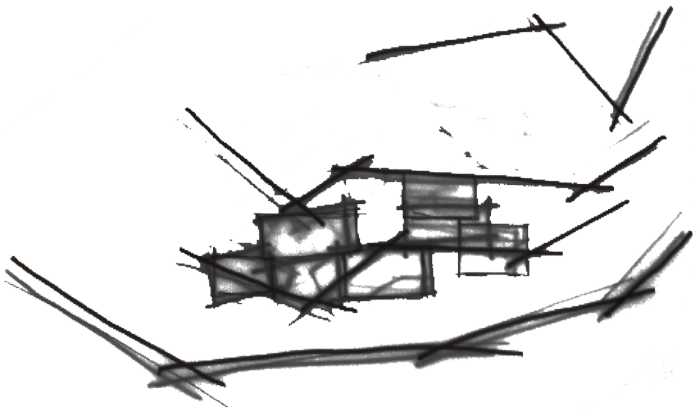


FIGURE 187: Shape diagram 2 (Author, 2023).

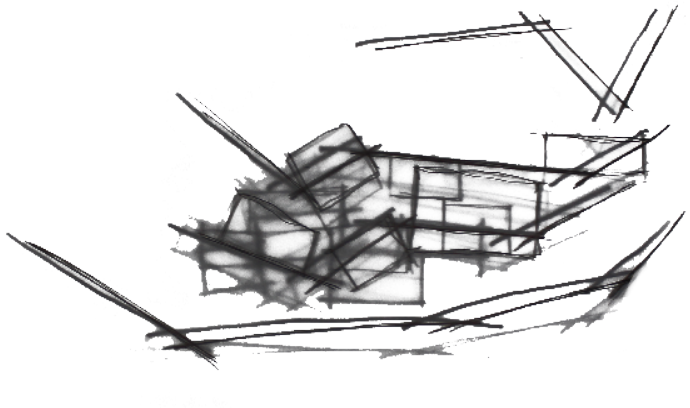


FIGURE 188: Shape diagram 3 (Author, 2023).

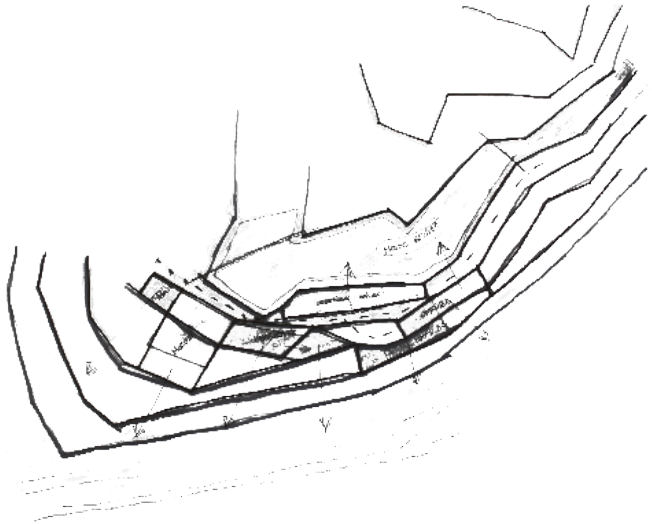


FIGURE 189: Space allocation diagram (Author, 2023).

FIGURE 189: Contour line layout (Author, 2023).

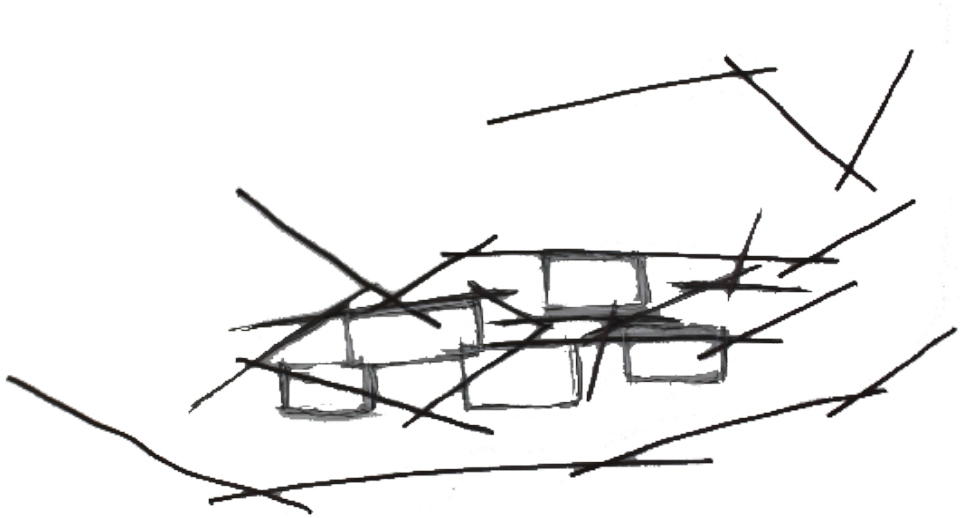


FIGURE 190: Shape diagram 2 (Author, 2023).

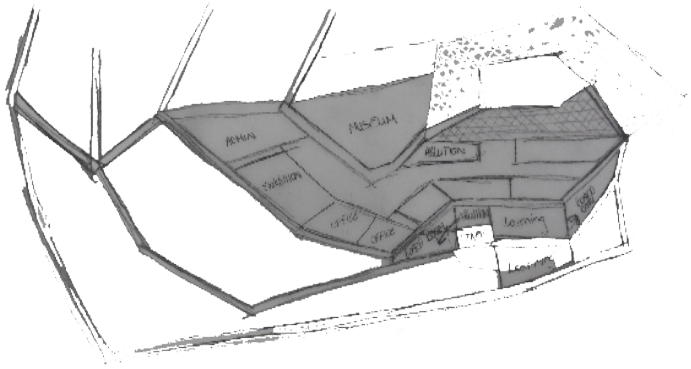


FIGURE 191: Shape diagram (Author, 2023).

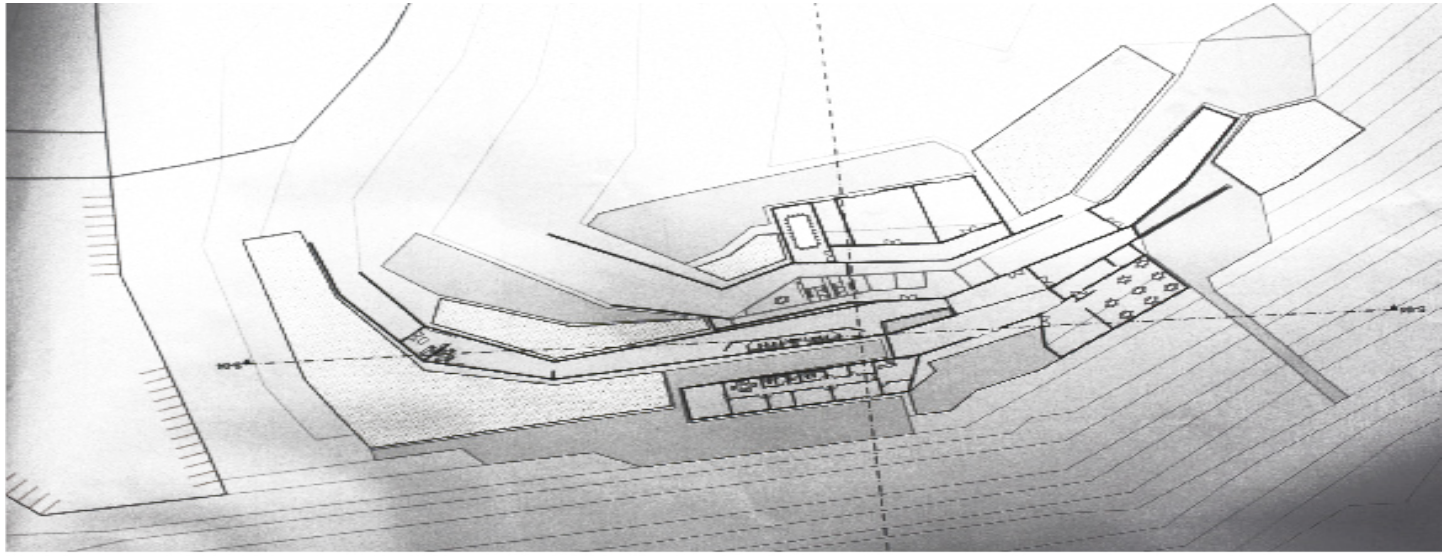


FIGURE 192: Floop plan diagram (Author, 2023).

4.2.4. PHASE 4

In phase four, the first floor plans, sections and elevations were produced, along with renders of the building (Fig.193-205).

In Fig 193 and 194, massing models show the shape of the design.

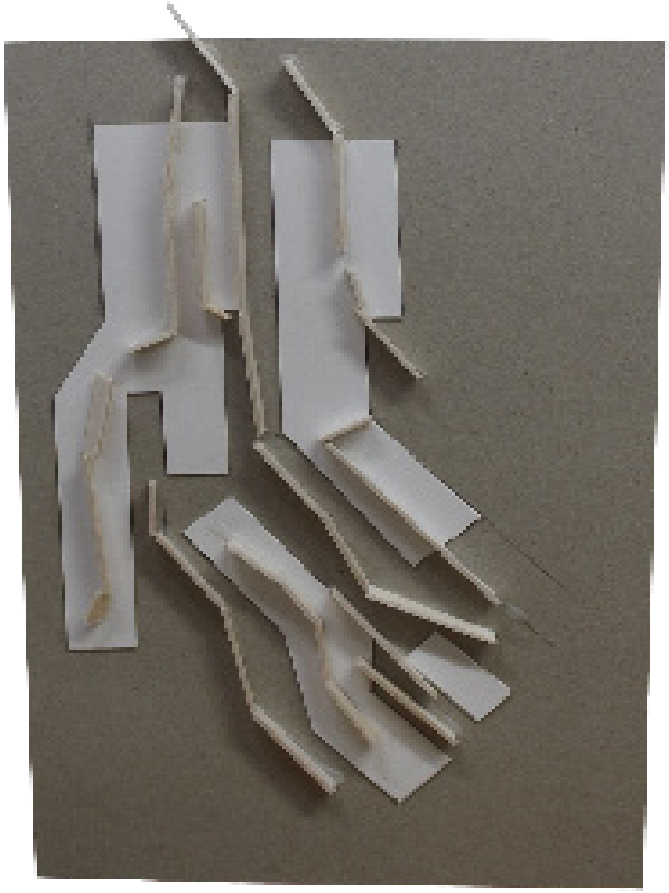


FIGURE 193: Working model (Author, 2023).

FIGURE 194: Working model (Author, 2023).

FIGURE 195: First renders of project (Author, 2023).

FIGURE 196: First renders of project (Author, 2023).

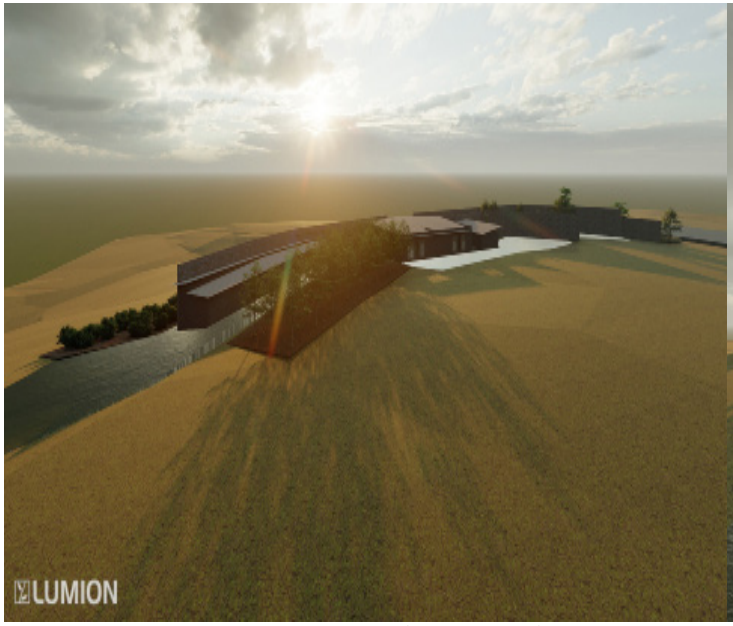


FIGURE 197: First renders of project (Author, 2023).

FIGURE 198: First renders of project (Author, 2023).

FIGURE 199: Working model (Author, 2023).

FIGURE 200: First renders of project (Author, 2023).

FIGURE 201: First renders of project (Author, 2023).

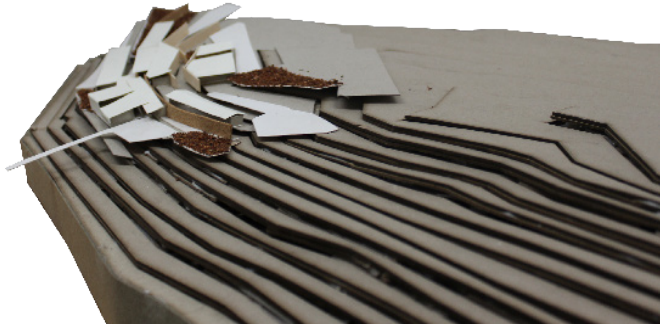


FIGURE 202: Working model (Author, 2023).

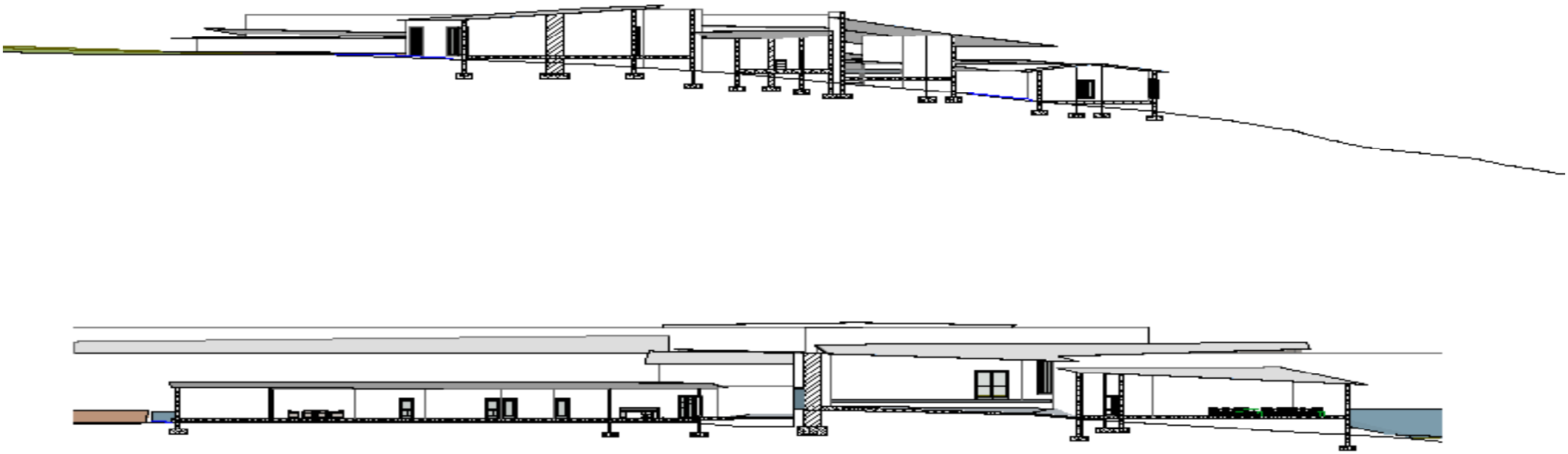


FIGURE 203: First developed sections (Author, 2023).

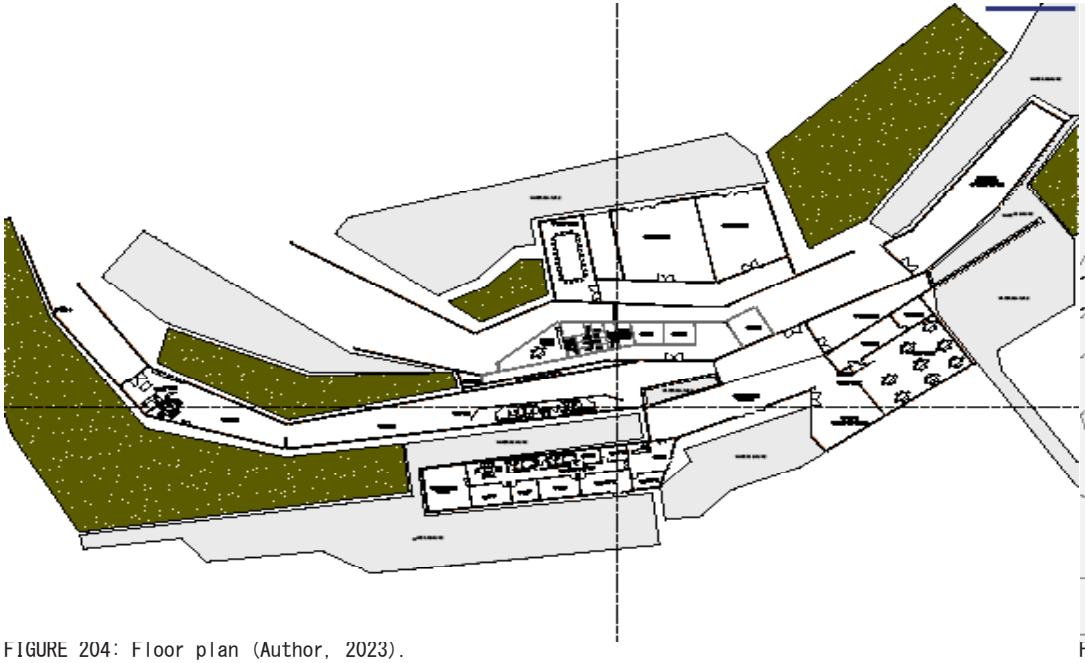


FIGURE 204: Floor plan (Author, 2023).

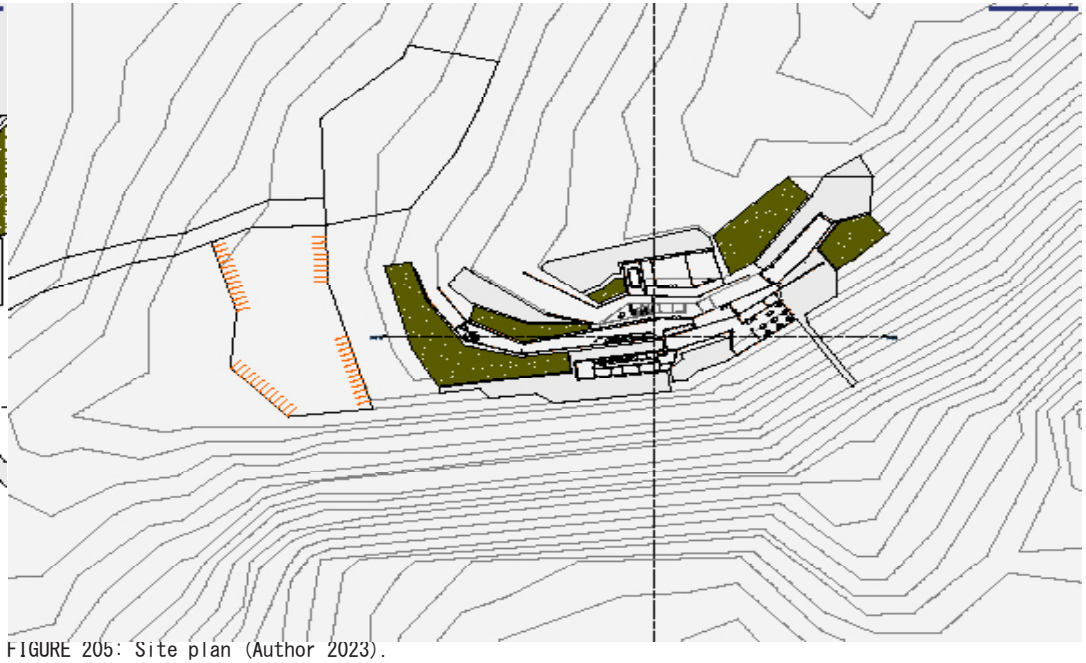


FIGURE 205: Site plan (Author 2023).

4.2.5. PHASE 5

During this phase, a change of site was made. The site was still located in the same area, but closer to the main canal (Fig.206-.217).

This prompted a drastic change in the design, as a lot of questions had to be asked, due to the sites change in slope, as the new sites slope is exceedingly less that when the site was located on the hill.

This was the first attempt to new floorplans, sections and elevations for the new site, along with renders, providing a 3D of how it would look.

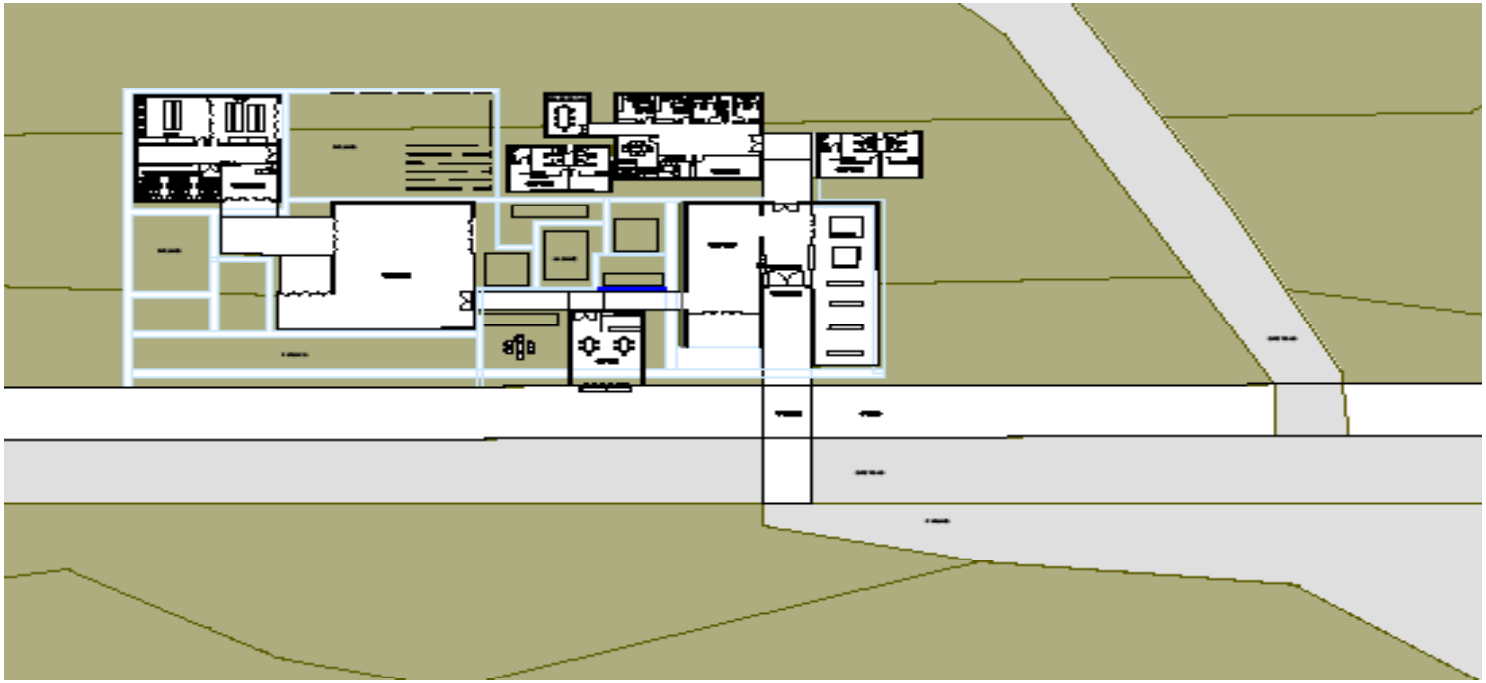


FIGURE 206: First developed floor plan next to the canal (AUthor, 2023).

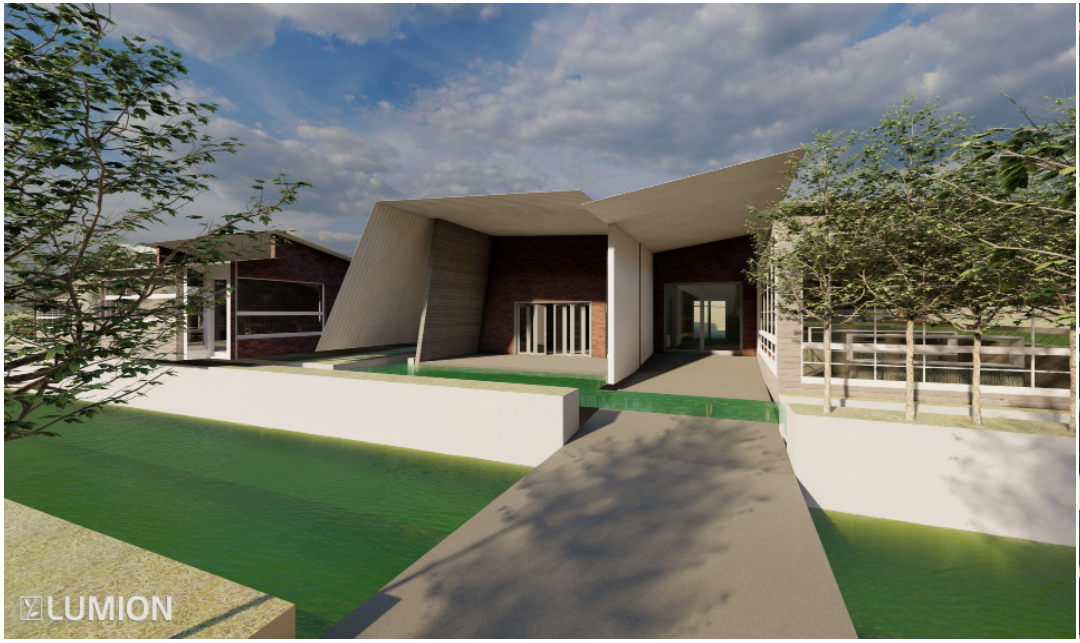


FIGURE 207: Render of entrance (Author, 2023).

FIGURE 208: Render of entrance from interior outwards (Author, 2023).

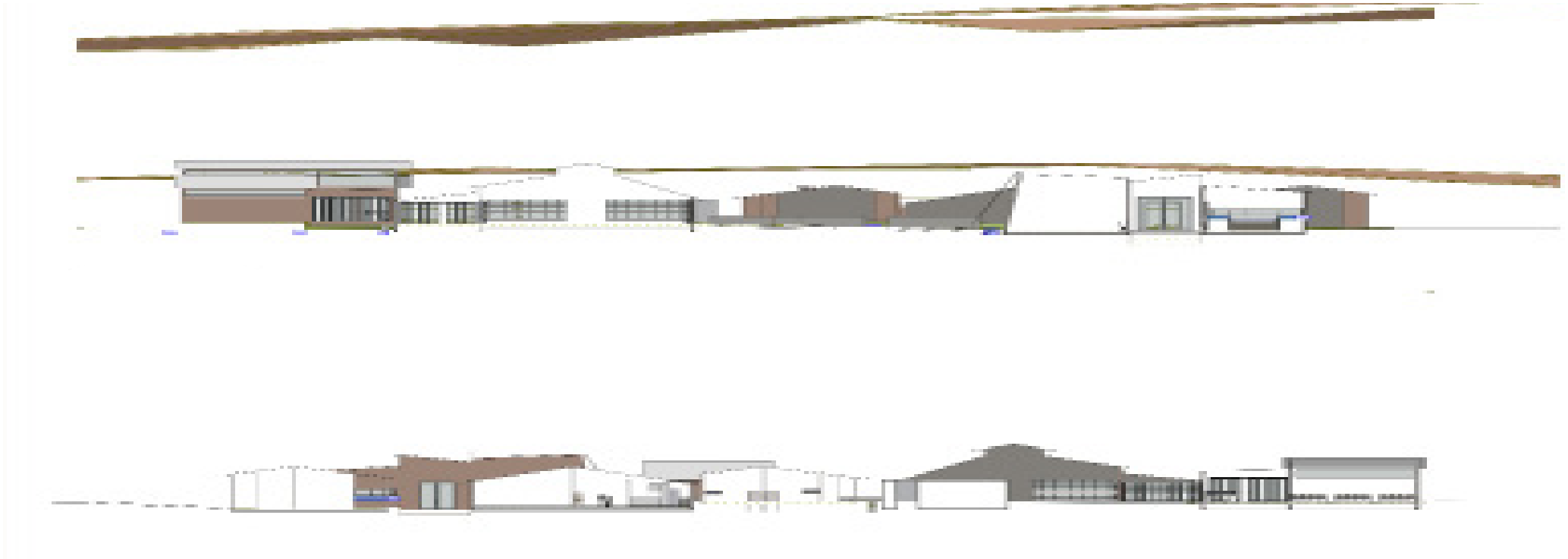


FIGURE 209: Sectional development (Author, 2023).

FIGURE 210: Elevation development (Author, 2023).

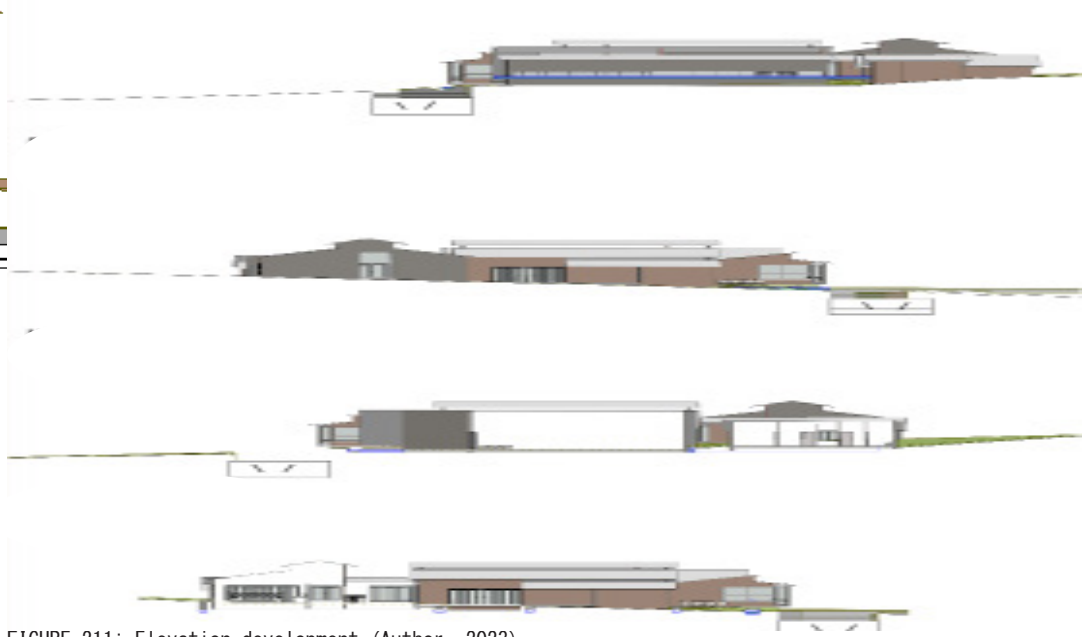


FIGURE 211: Elevation development (Author, 2023).

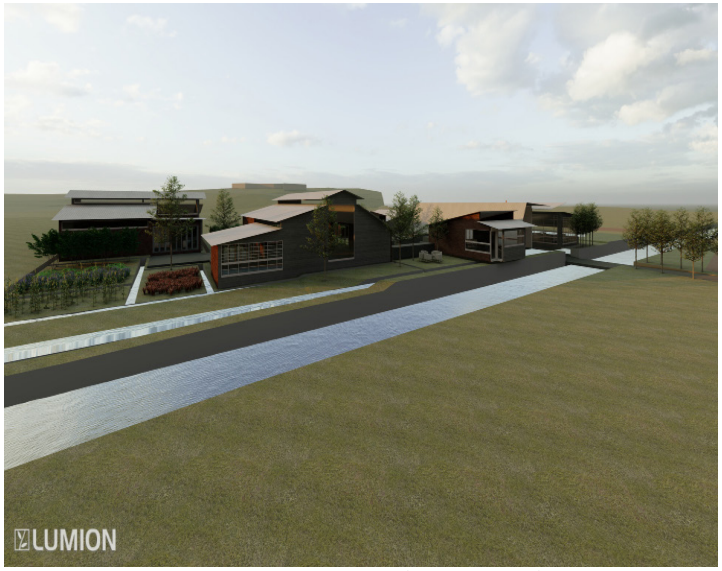


FIGURE 212: Exterior view of project (Author, 2023).

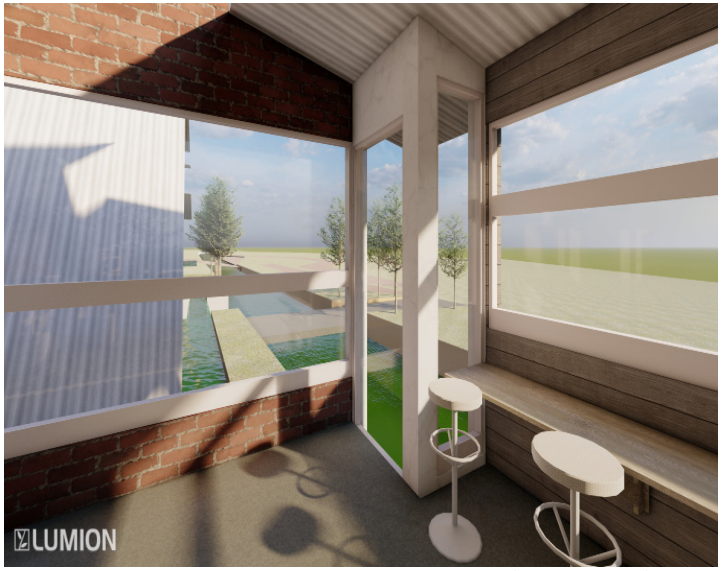


FIGURE 213: View from resturant onto the canal (Author, 2023).

FIGURE 214: Echibition space (Author, 2023).

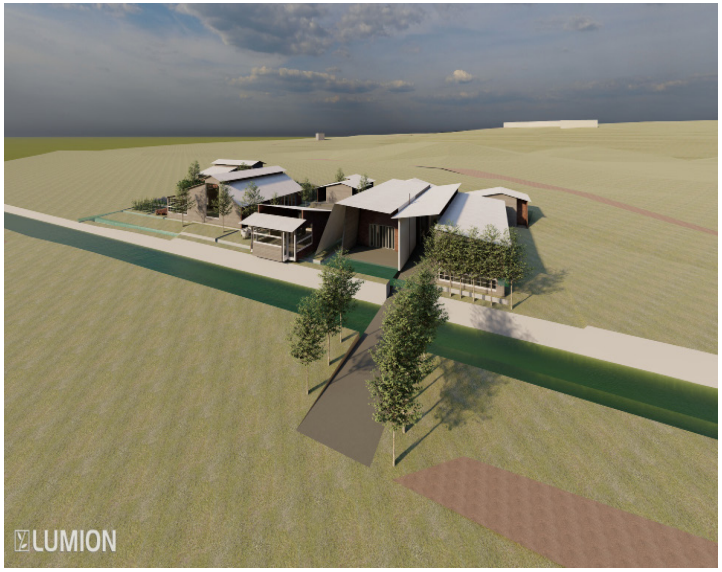


FIGURE 215: Ariel view of project (Author, 2023).

FIGURE 216: Exterior view of exterior learning space (Author, 2023).

FIGURE 217: Exhibition space (Author, 2023).

4.2.6. PHASE 6

Phase six is the refinement process of phase five, providing new sketch plans and drawings, along with renders and a new model (Fig.218-245).

A section of the site (Fig. 220) is also provided, showing the difference in levels.

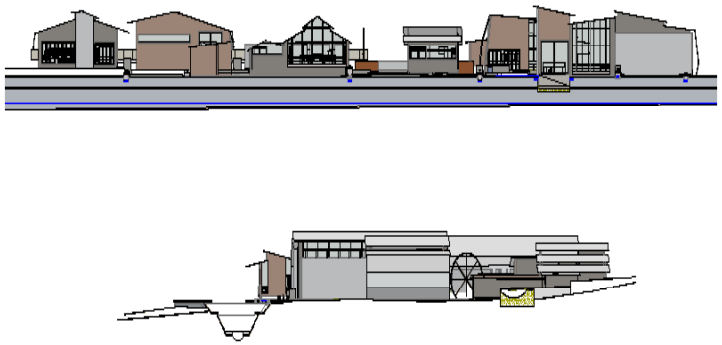


FIGURE 218: Elevation development (Author, 2023).

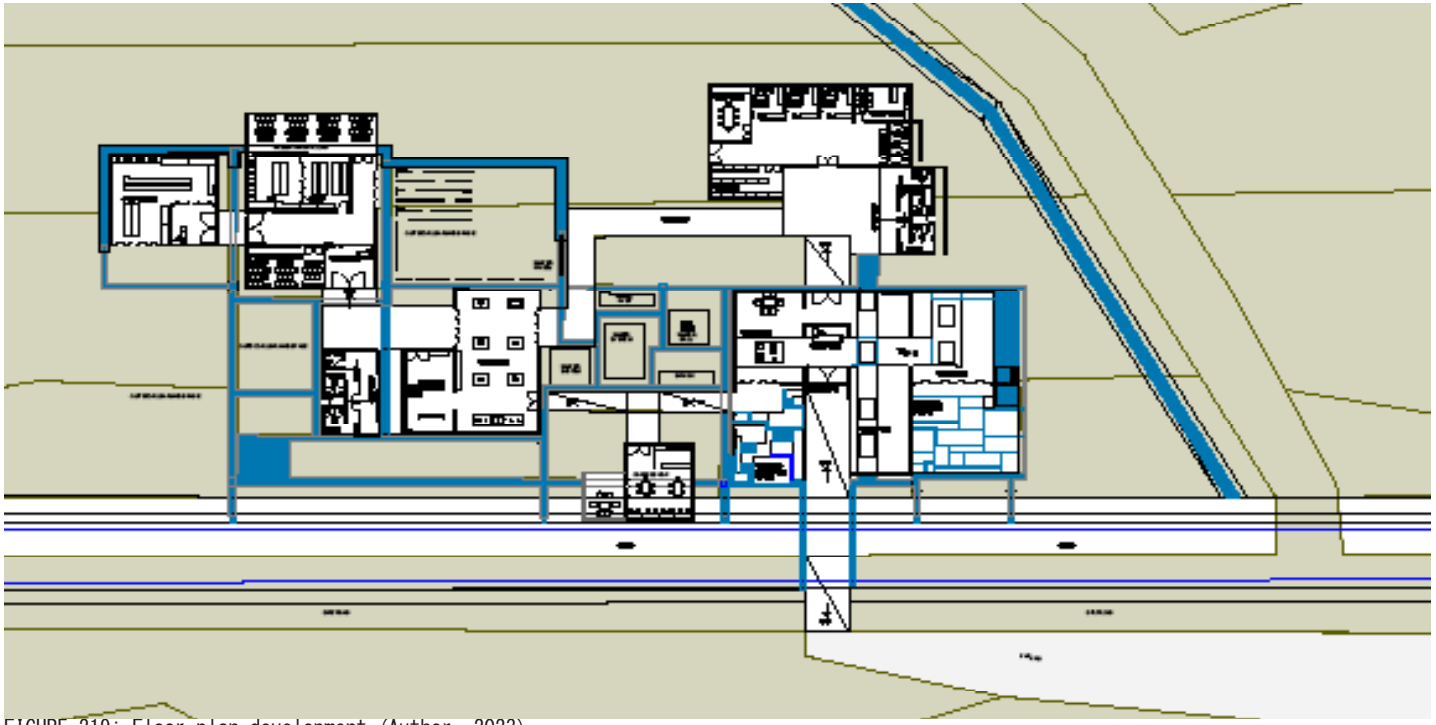


FIGURE 219: Floor plan development (Author, 2023).

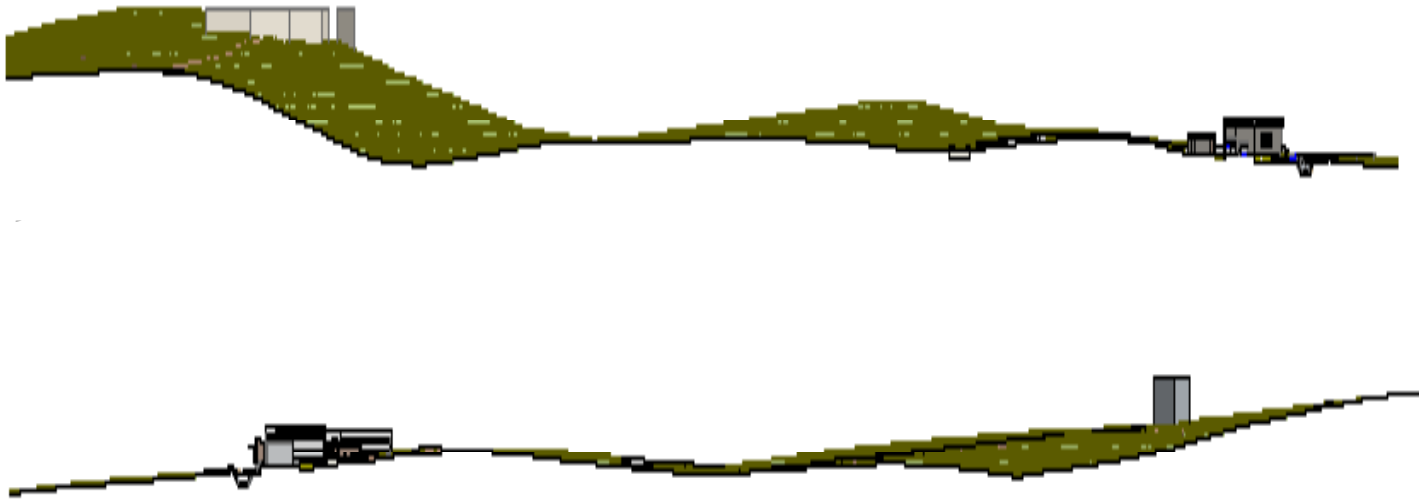


FIGURE 220: Site sections (Author, 2023).

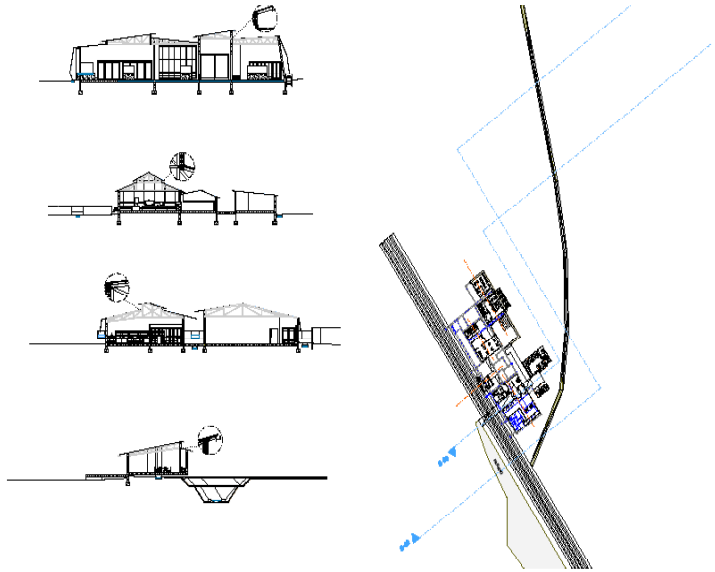


FIGURE 221: Sectional development (Author, 2023).

FIGURE 222: Render of entrance (Author, 2023).

FIGURE 223: Render of entrance from a different perspective (Author, 2023).

FIGURE 224: Render of entrance from a different perspective (Author, 2023).

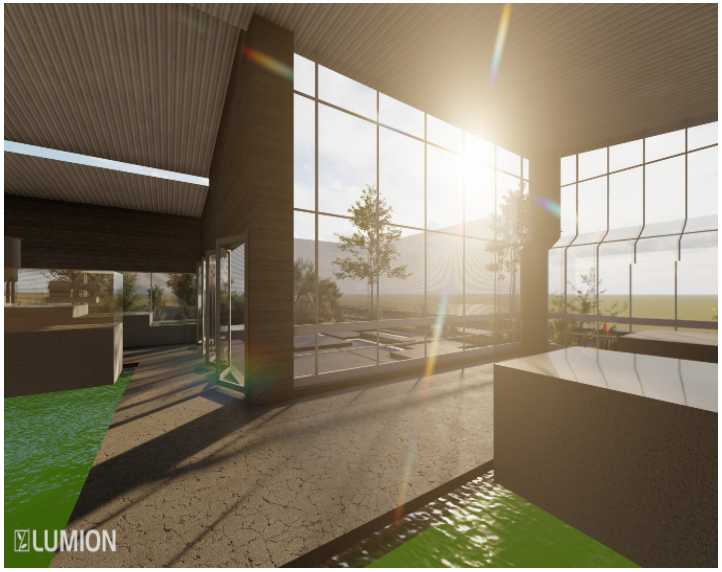


FIGURE 225: Exhibition space (Author, 2023).

FIGURE 226: Exterior exhibition space (Author, 2023).

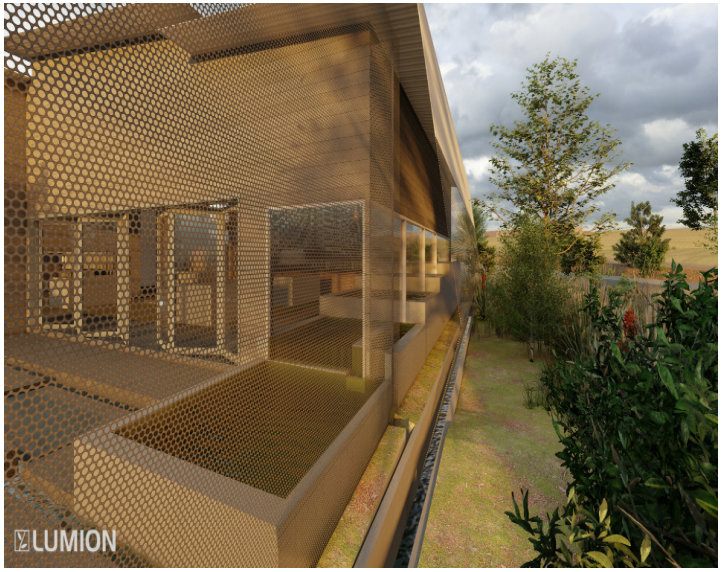


FIGURE 227: Render of exterior view (Author, 2023).

FIGURE 228: Render of exterior (Author, 2023).

FIGURE 229: View of exhibition from exterior (Author, 2023).

FIGURE 230: Exterior render (Author, 2023).

FIGURE 231: Render of the water wheel and waterways (Author, 2023).

FIGURE 232: Exterior view of the resturant (Author, 2023).

FIGURE 233: View of exterior exhibition (Author, 2023).

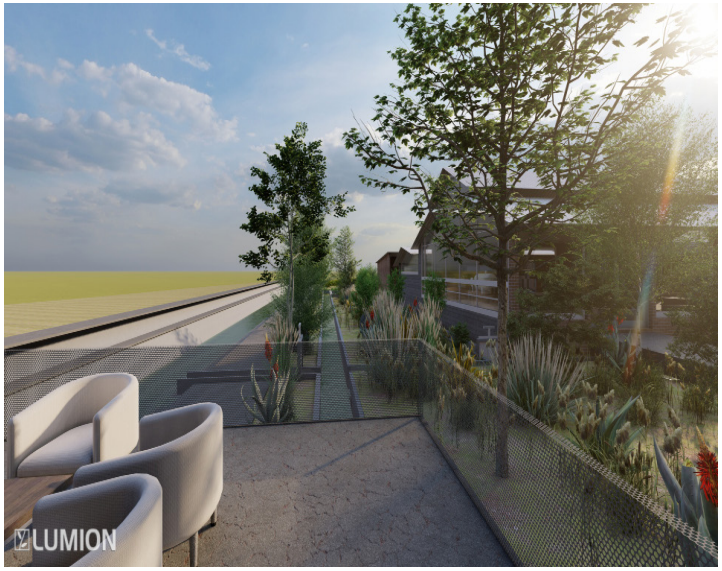


FIGURE 234: View from resturant balcony (Author, 2023).

FIGURE 235: Render of waterways and exhibition building (Author, 2023).

FIGURE 236: Render of view onto the resturant (Author, 2023).

FIGURE 237:View onto the exterior learning space (Author, 2023).

FIGURE 238: Eye-level perspective of exterior learning space (Author, 2023).

FIGURE 239: Exterior render (Author, 2023).

FIGURE 240: Render of interior of exhibition space (Author, 2023).

FIGURE 241: Ariel view render (Author, 2023).

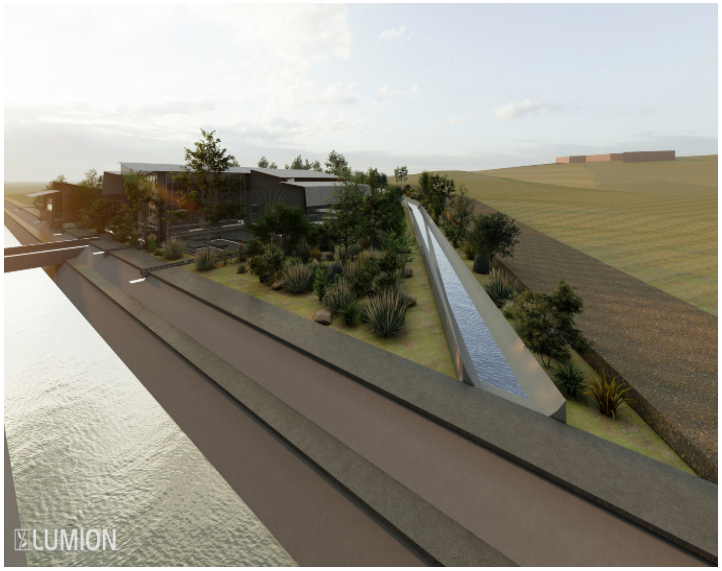


FIGURE 242: Render of view approaching the building (Author, 2023).

FIGURE 243: Ariel view of project (Author, 2023).

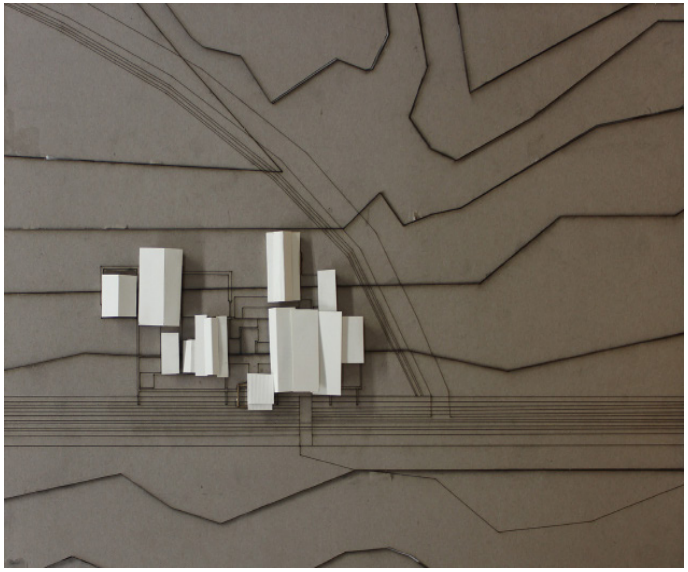


FIGURE 244: Top view of working model (Author, 2023).

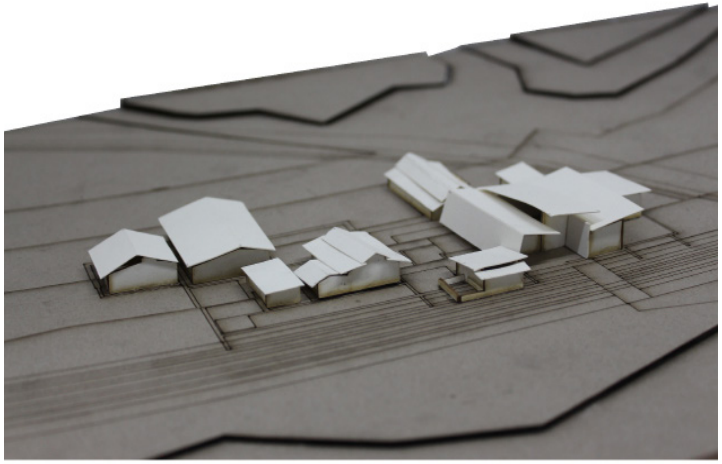


FIGURE 245: Perspective view of working model (Author, 2023).

4.2.7. PHASE 7

After phase six, it was questioned, if the building should be rotated, pointing towards the north, and part of the building cantilevering over the canal.

New diagrams with space allocations were drawn, exploring the different possible shapes (Fig.246-255).

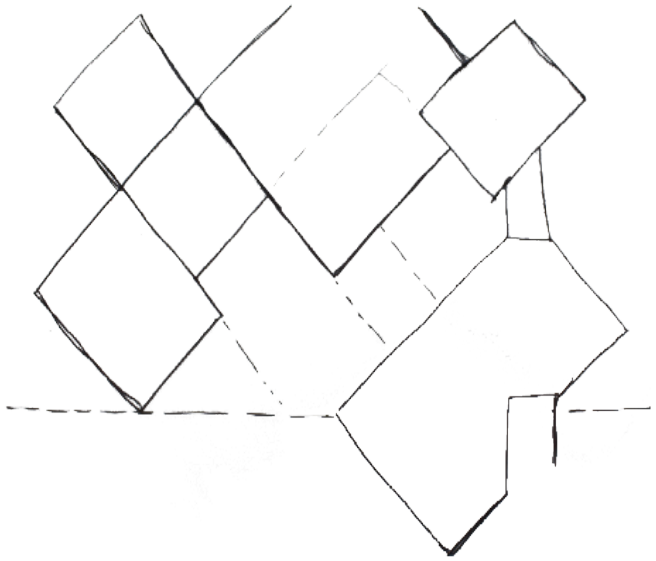


FIGURE 246: Space exploration (Author, 2023).

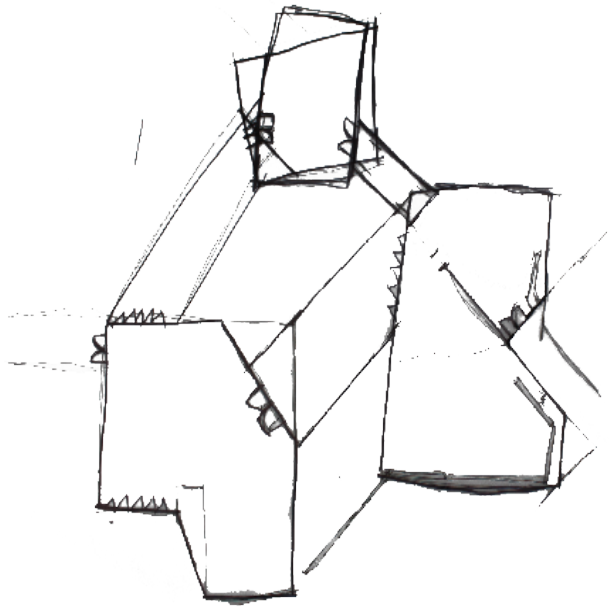


FIGURE 247: Space exploration (Author, 2023).

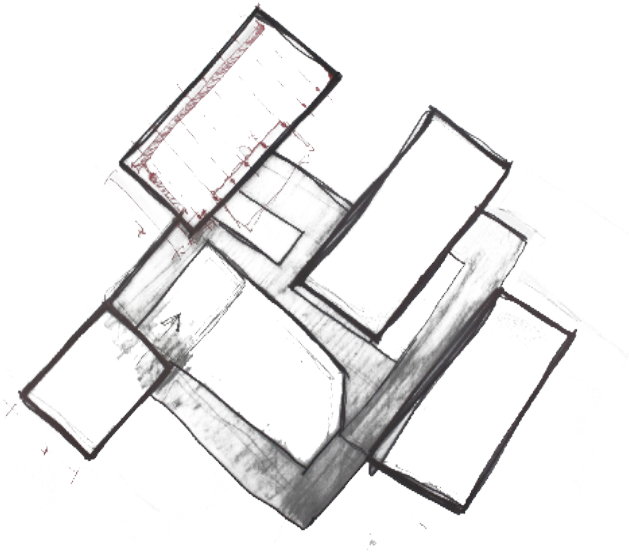


FIGURE 248: Space exploration (Author, 2023).

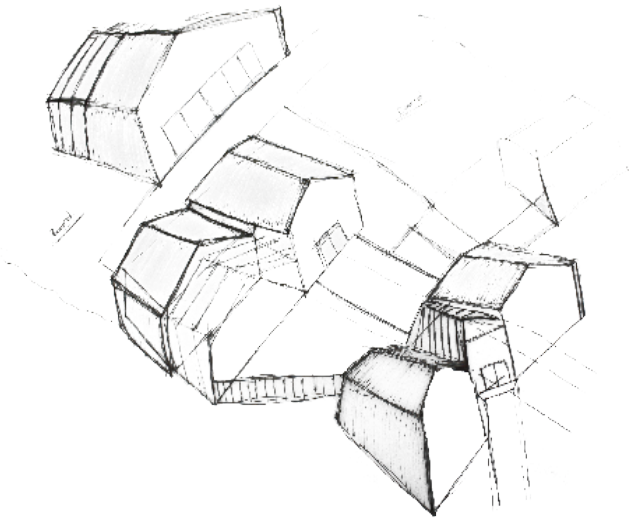


FIGURE 249: 3D view of space explorations (Author, 2023).

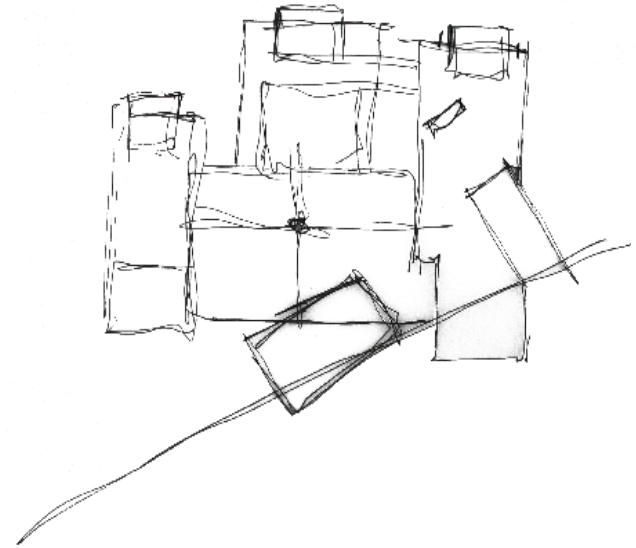


FIGURE 250: Parti diagram (Author, 2023).

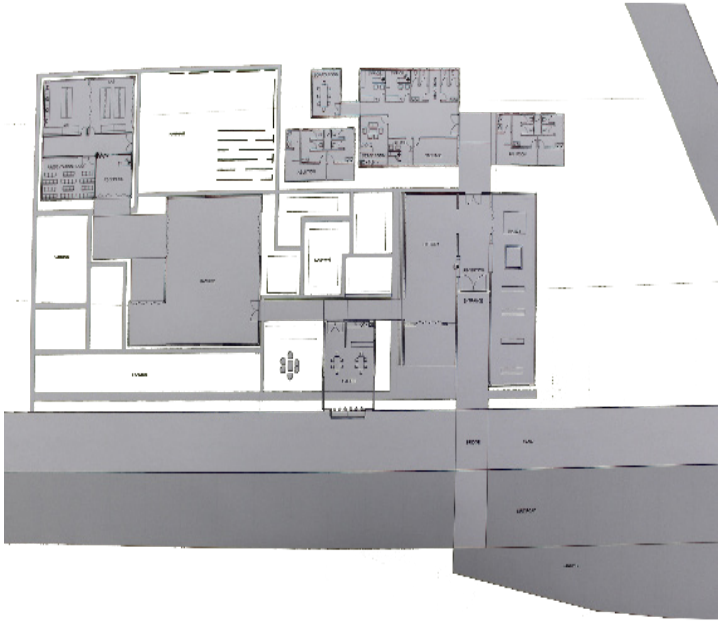


FIGURE 251: Floor plan diagram (Author, 2023).

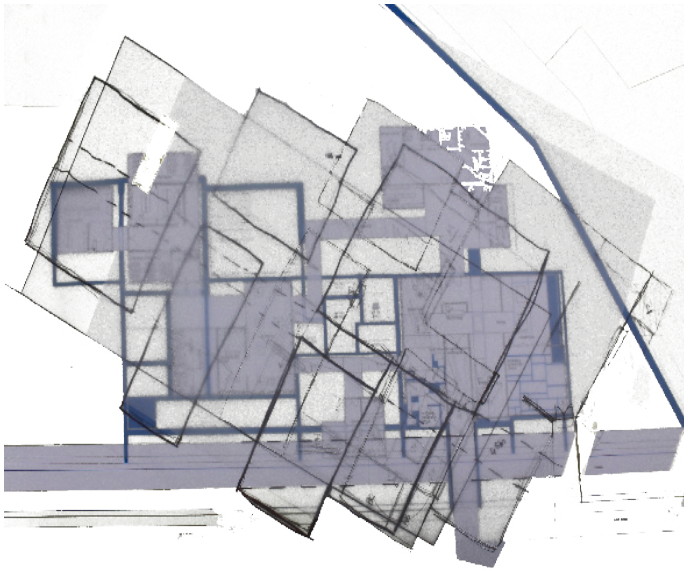


FIGURE 252: Space exploration (Author, 2023).

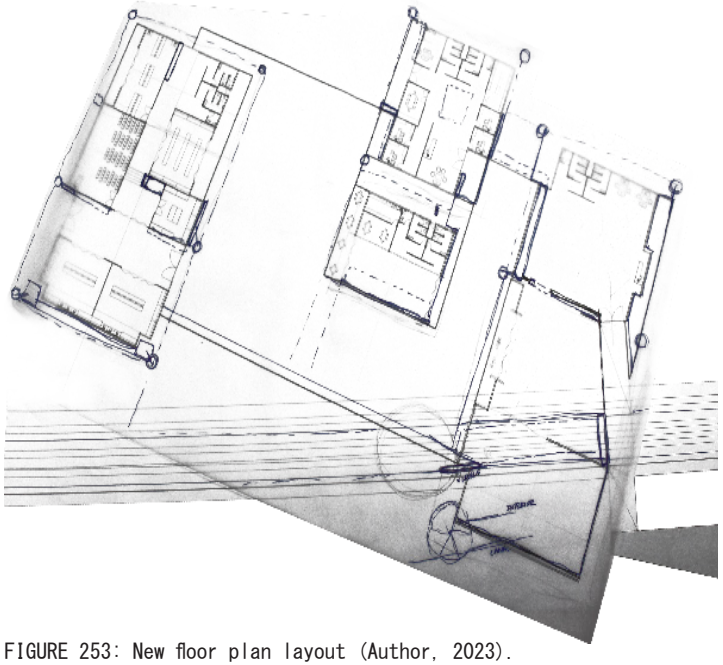


FIGURE 253: New floor plan layout (Author, 2023).

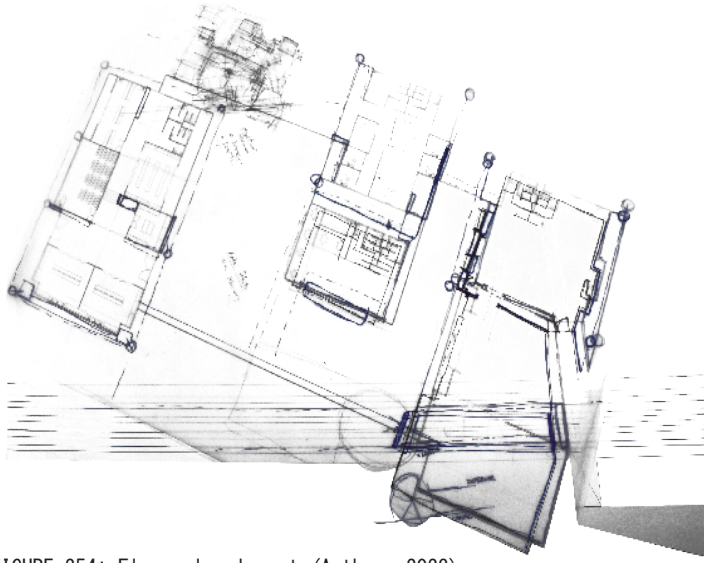


FIGURE 254: Floor plan layout (Author, 2023).

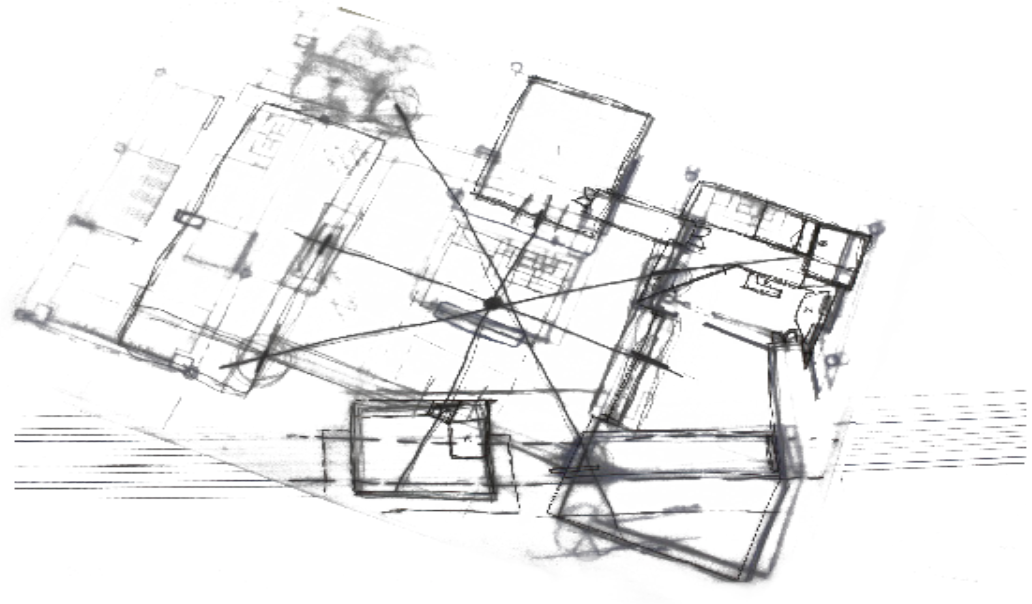


FIGURE 255: Drawing indicating connection of spaces (Author, 2023).

4.2.8. PHASE 8

Phase eight is the last phase in the design process, with completed plans, sections, and elevations, with the renders depicting the building as it would be experienced (Fig.256-280).

This phase included the final working model, shown in Fig.277-280.

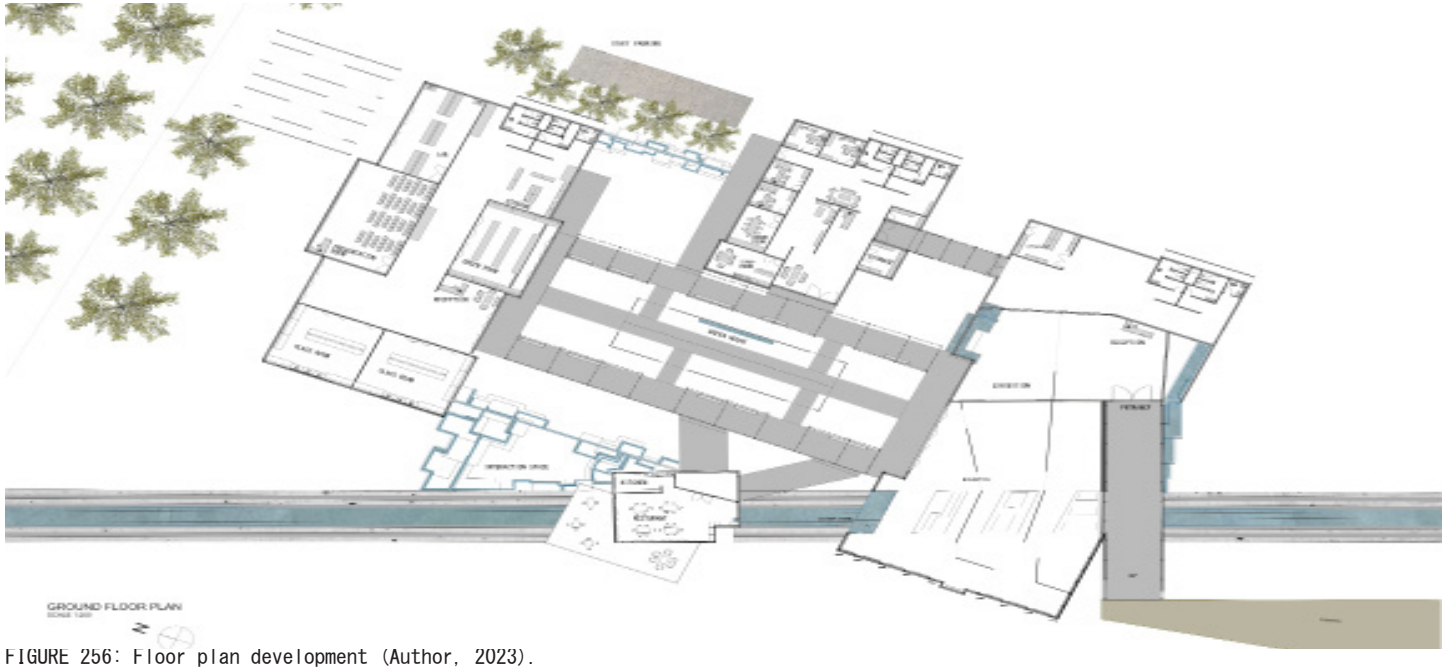


FIGURE 256: Floor plan development (Author, 2023).

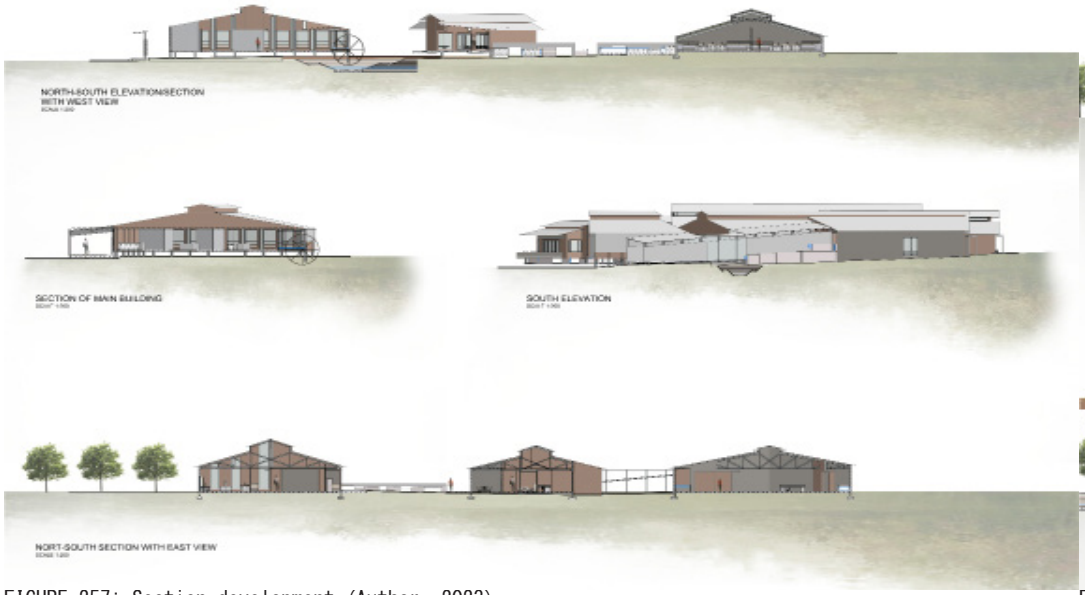


FIGURE 257: Section development (Author, 2023).

FIGURE 258: Elevation development (Author, 2023).

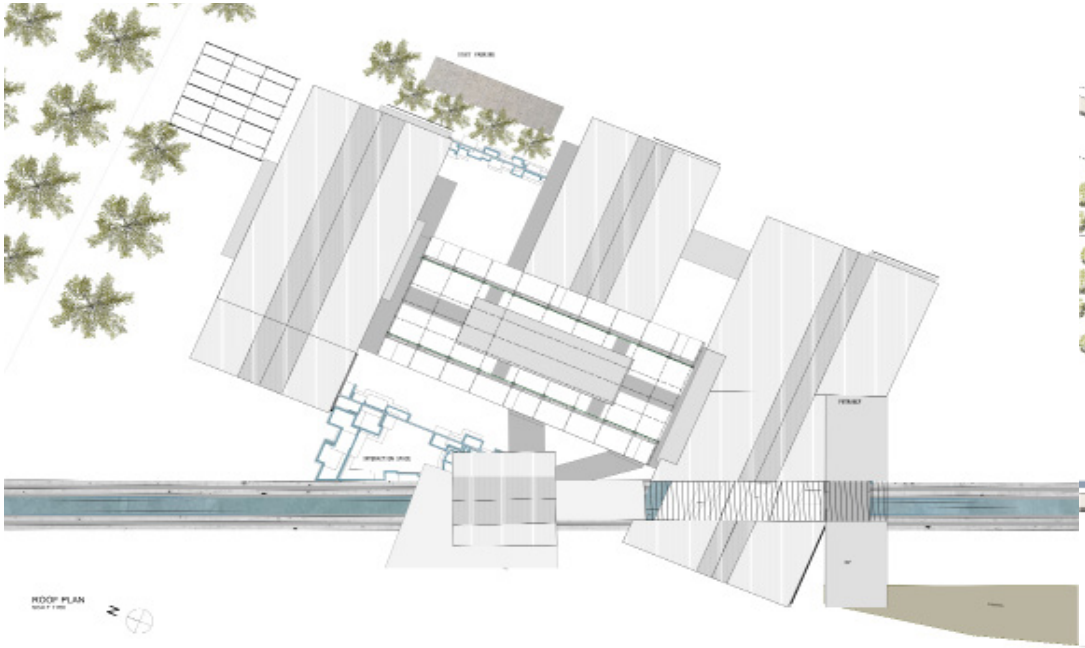


FIGURE 259: Roof plan (Author, 2023).

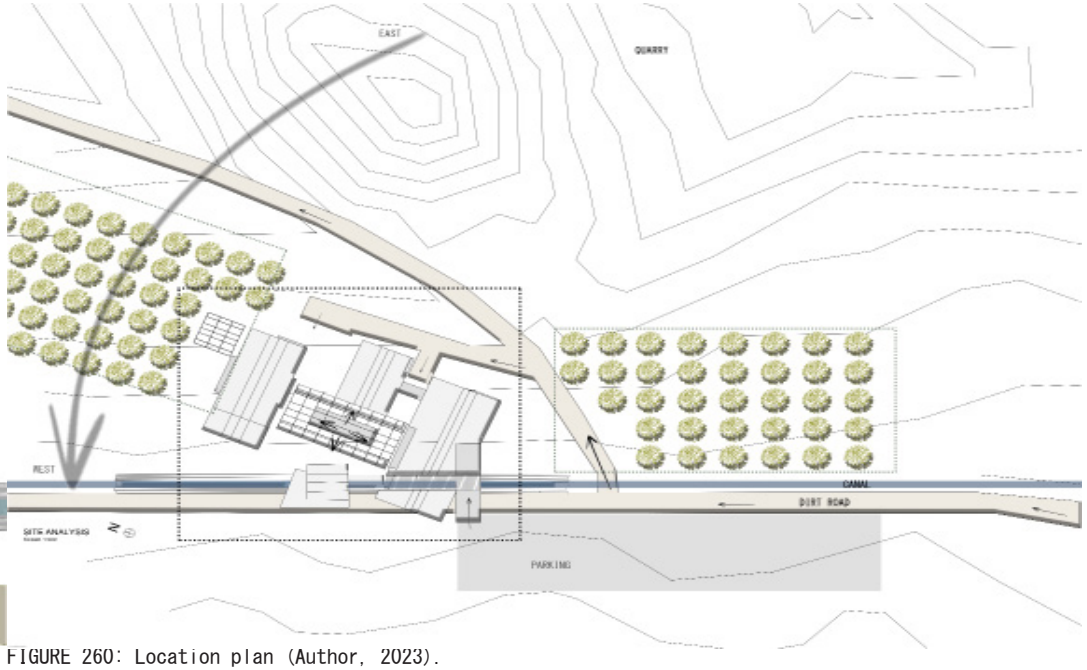


FIGURE 260: Location plan (Author, 2023).

FIGURE 261: Render of view of the entrance (Author, 2023).

FIGURE 262: View of entrance (Author, 2023).

FIGURE 263: Exhibition space (Author, 2023).

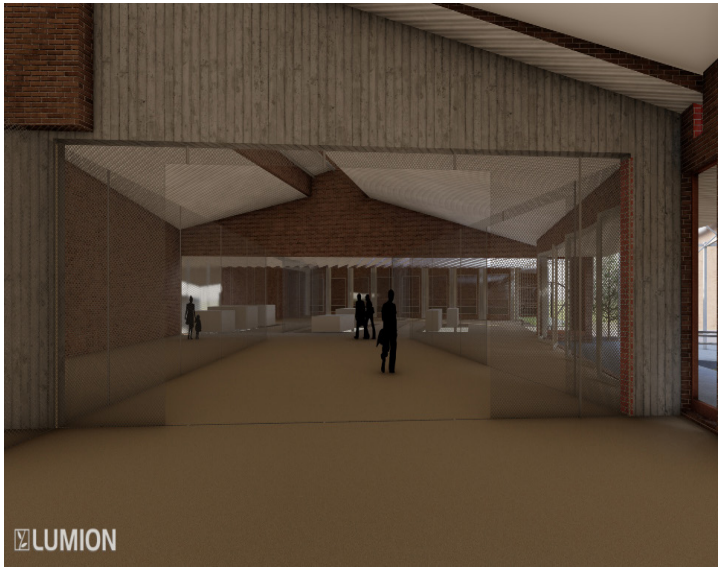


FIGURE 264:Interior view of exhibition space (Author, 2023).

FIGURE 265:Interior view of exhibition space (Author, 2023).

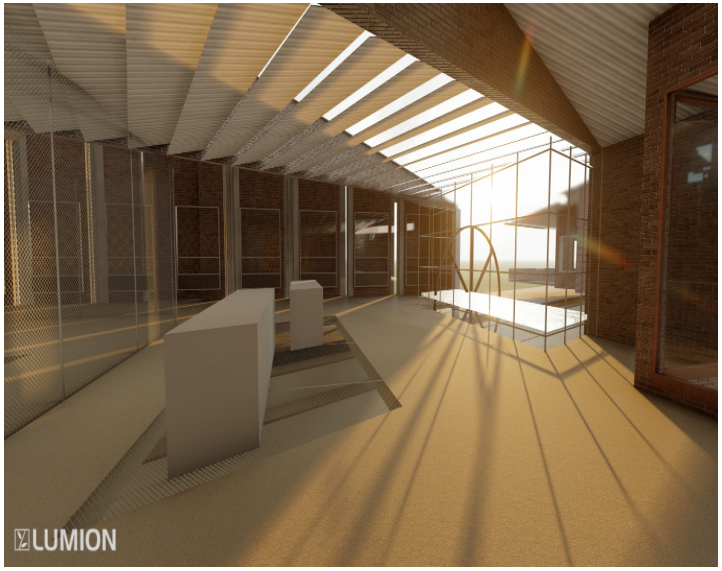


FIGURE 267:Interior view of exhibition space (Author, 2023).

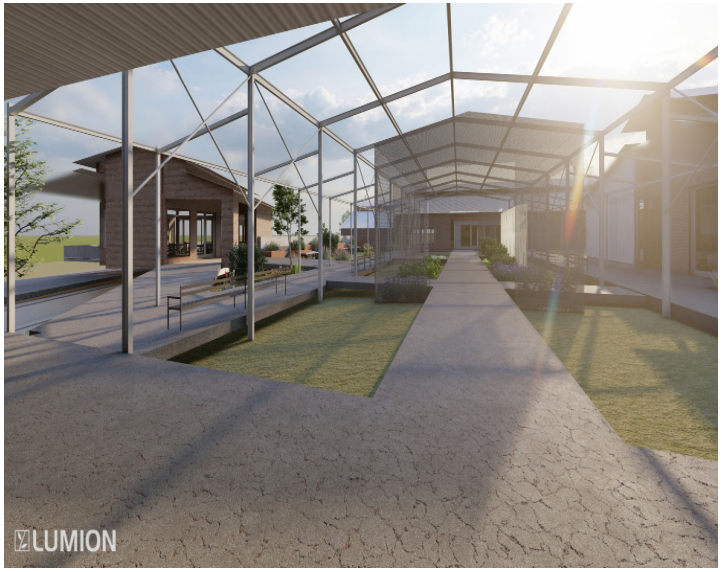


FIGURE 268: Render of courtyard (Author, 2023).

FIGURE 269: Balcony of resturant (Author, 2023).

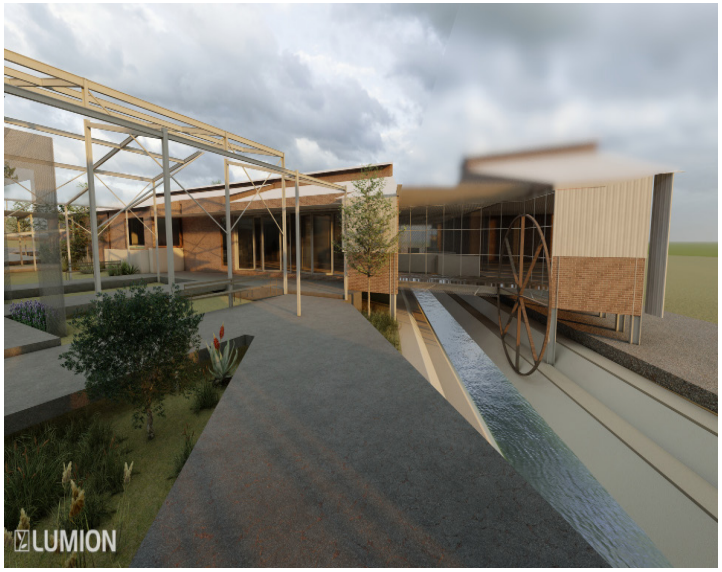


FIGURE 270: View from resturant onto exhibition space (Author, 2023).

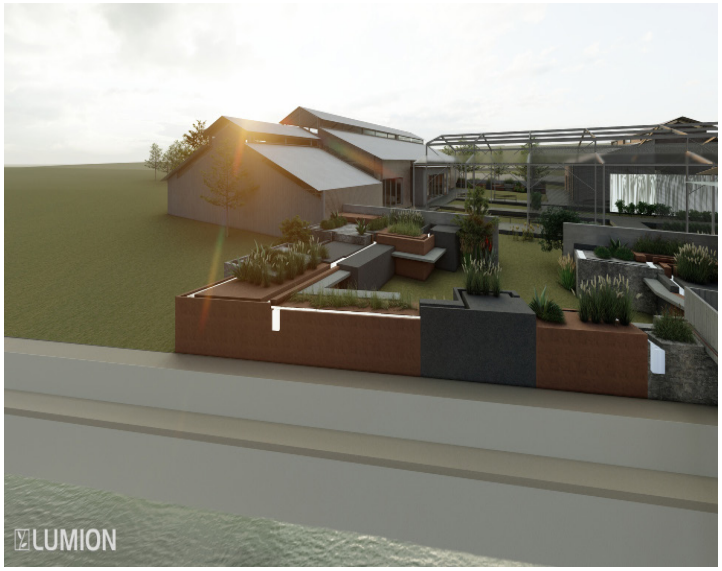


FIGURE 271: View onto planter boxes (Author, 2023).

FIGURE 272: Learning center reception (Author, 2023).

FIGURE 273: Interior view of class room (Author, 2023).

FIGURE 274: Exterior learning space (Author, 2023).

FIGURE 275: Ariel view of the building (Author, 2023).

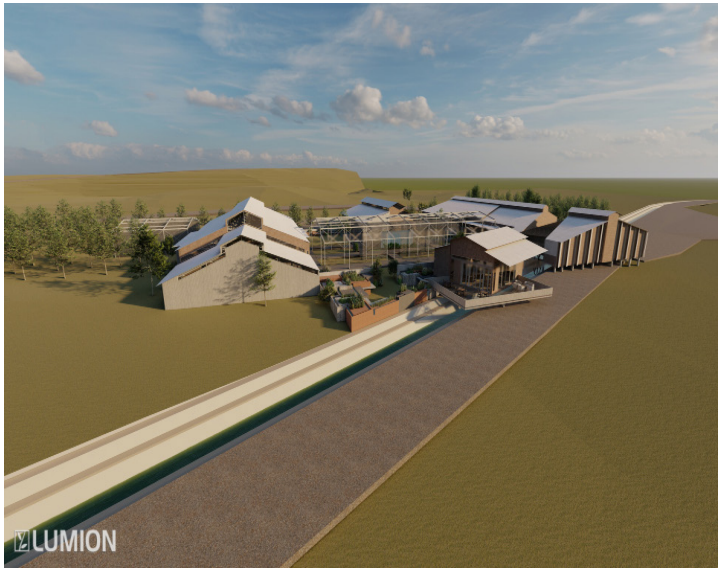


FIGURE 276: Ariel view of the building (Author, 2023).

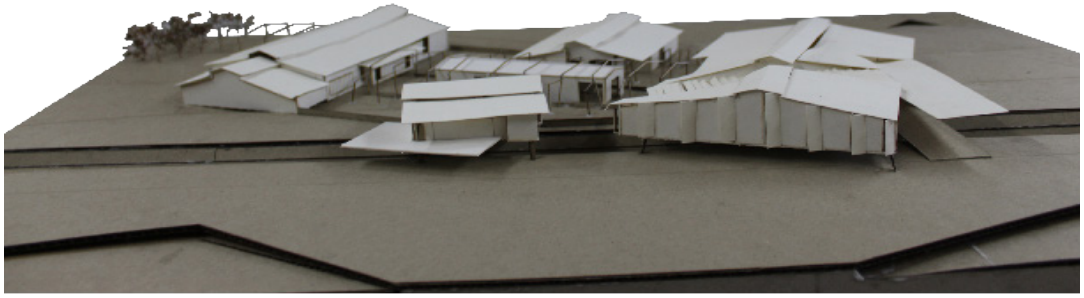


FIGURE 277: Working model (Author, 2023).

FIGURE 278: Working model (Author, 2023).

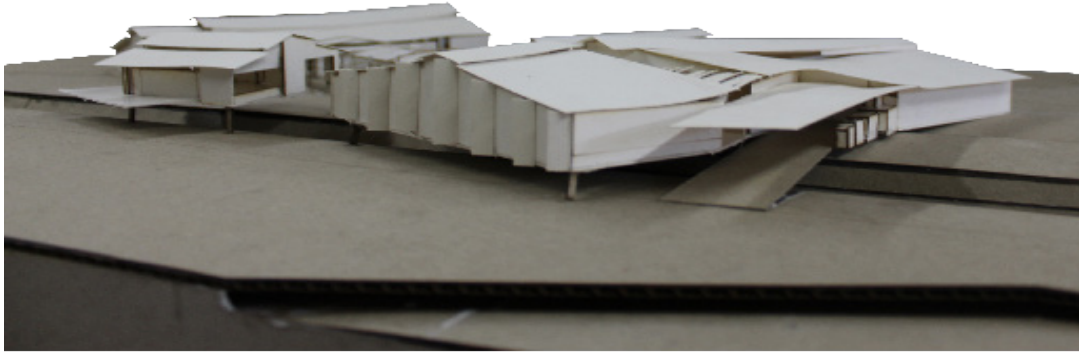


FIGURE 279: Working model (Author, 2023).

FIGURE 280: Working model (Author, 2023).

4.3. CONCLUSION

During each phase, something new was learned about the project, design, and program, having a greater impact on the final design, which will be discussed in Chapter 5.

The design development process showed how the smallest changes can have a drastic and important impact on the next and final phase.

05

FIGURE 281: PHOTO OF THE SURROUNDING PLANTS (AUTHOR, 2023).

5.1. SYNTHESIS

The following chapter is the combination of all the process and development work throughout the year. Depicting how the project would look if it were to be constructed (Fig.282).

It combines concepts, research, water, and site, to educate about the canal waterway, flowing through the farms of Hartswater.

Control plays an important role in the theory, construction, experience, and design of this dissertation, as many components depend on the control an individual has over themselves and what surrounds them. This has the possibility to be mentally, physically, visually, or even more than one at the same time.

FIGURE 282: View of project from other side of the canal (Author, 2023).

5.2. FINAL DESIGN

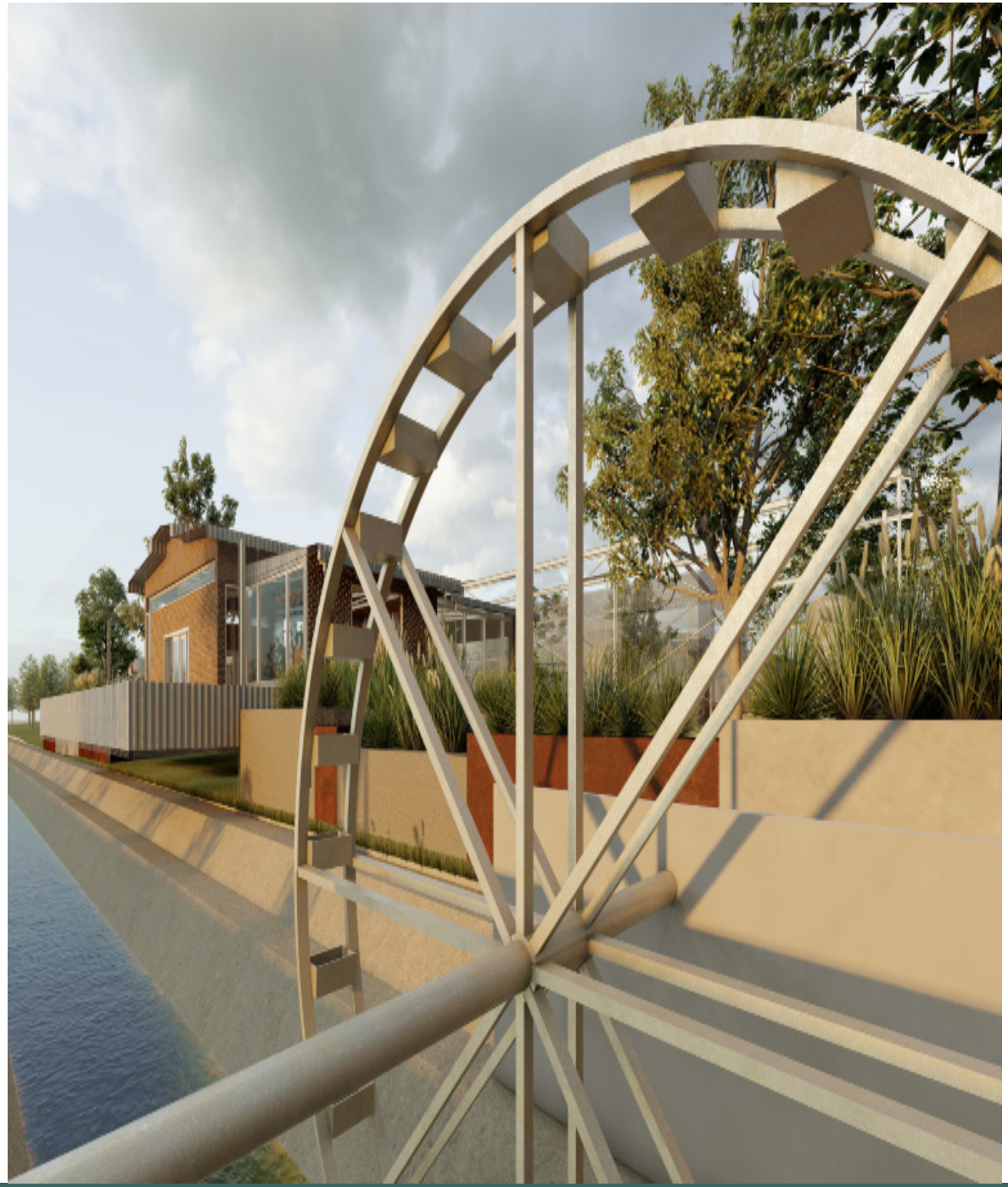


FIGURE 283: Close up view of the water wheel (Author, 2023).

5.2.1. FLOOR PLAN

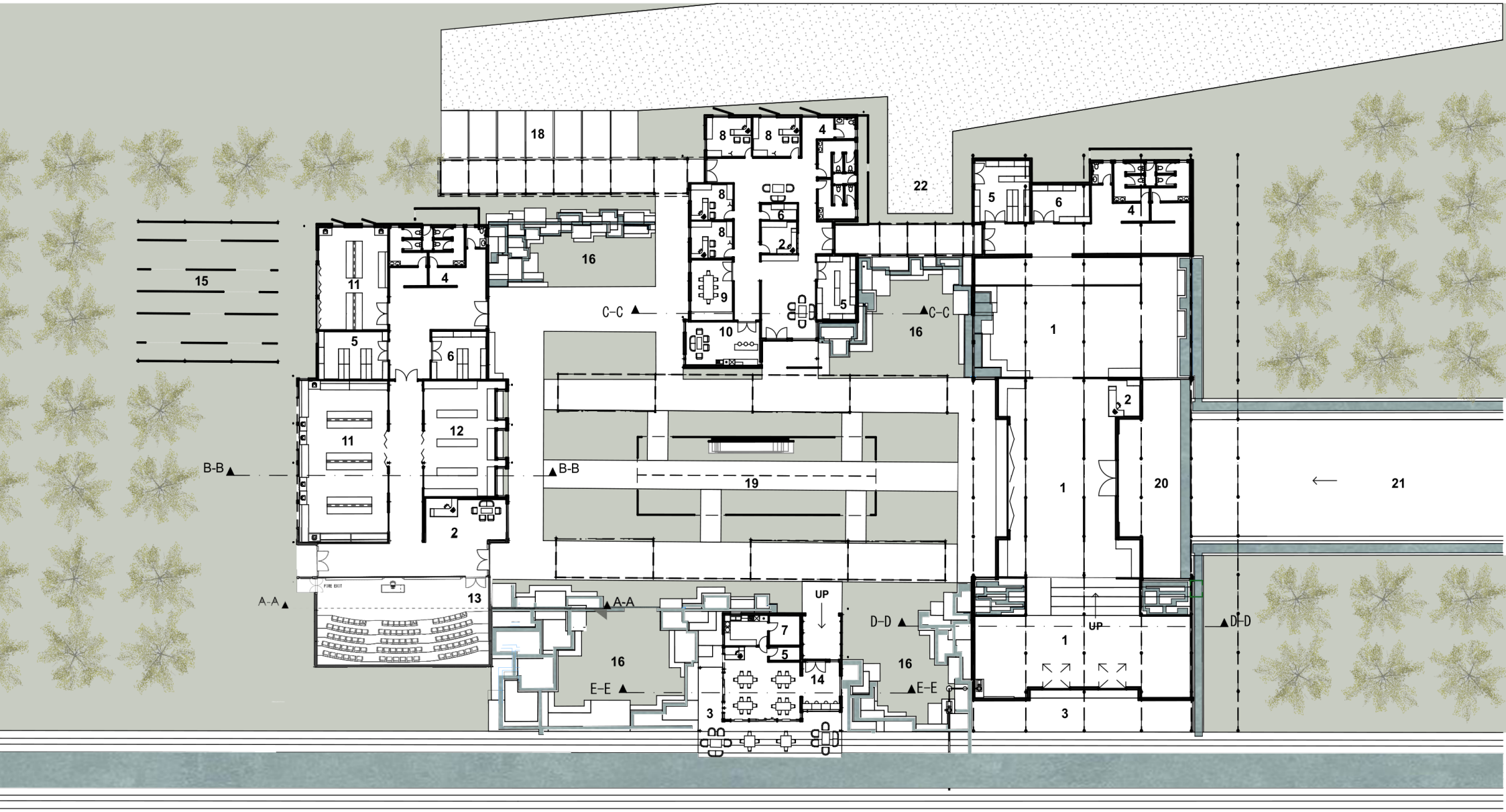


FIGURE 240: Floor plan (Author, 2023).

5.2.2. FLOOR PLANS OF MAIN SPACES

1. Exhibition
2. Reception
3. Balcony
4. Ablutions
5. Storage
6. Cleaning room
7. Dry/cold-storage
8. Office
9. Board room
10. Staff room
11. Class room
12. Green room
13. Presentation room
14. Coffee shop
15. Exterior green house
16. Exterior interactive learning space
17. Water wheel
18. Staff parking
19. Green house and courtyard
20. Entrance
21. Walkway to building
22. Service parking

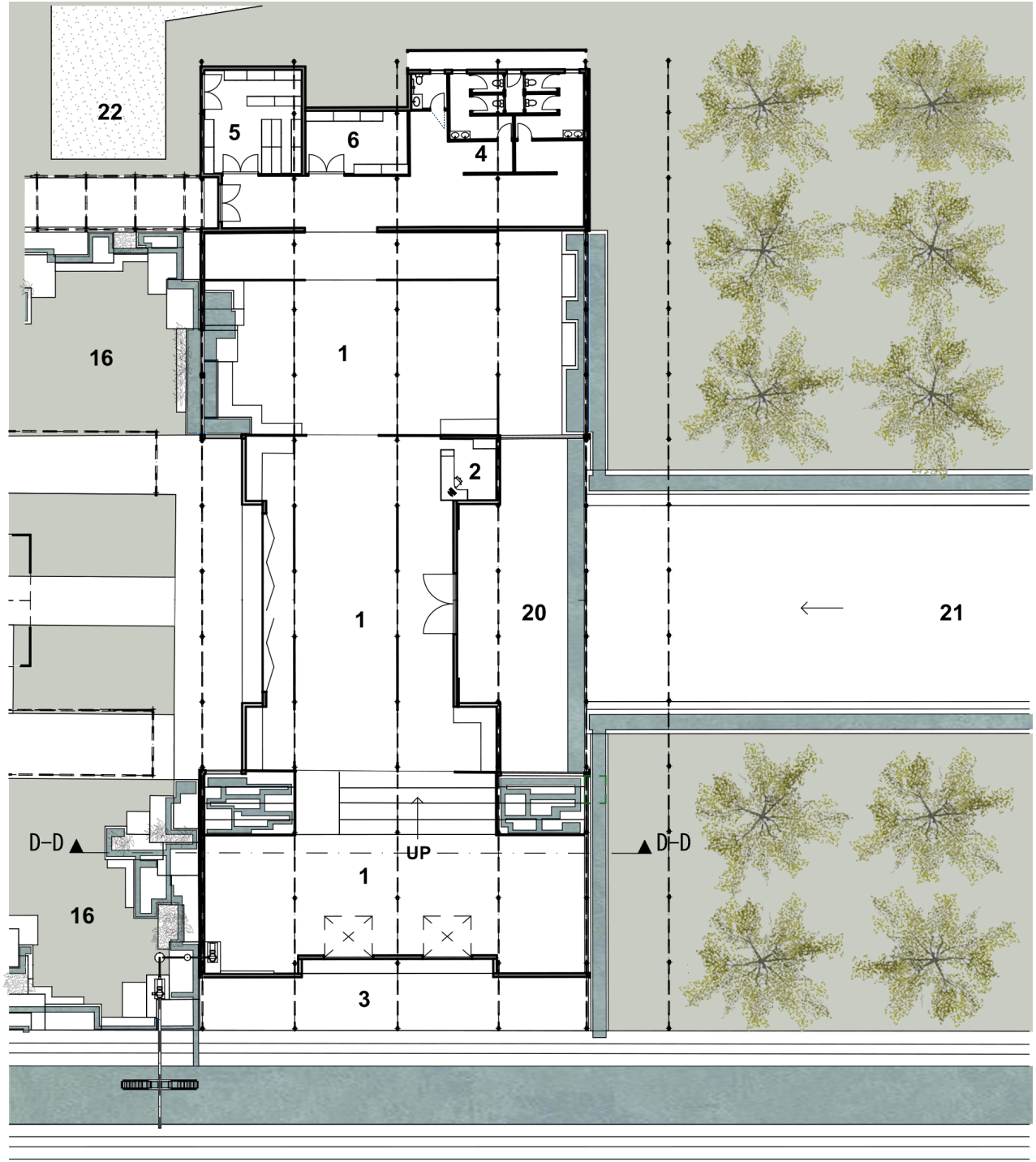
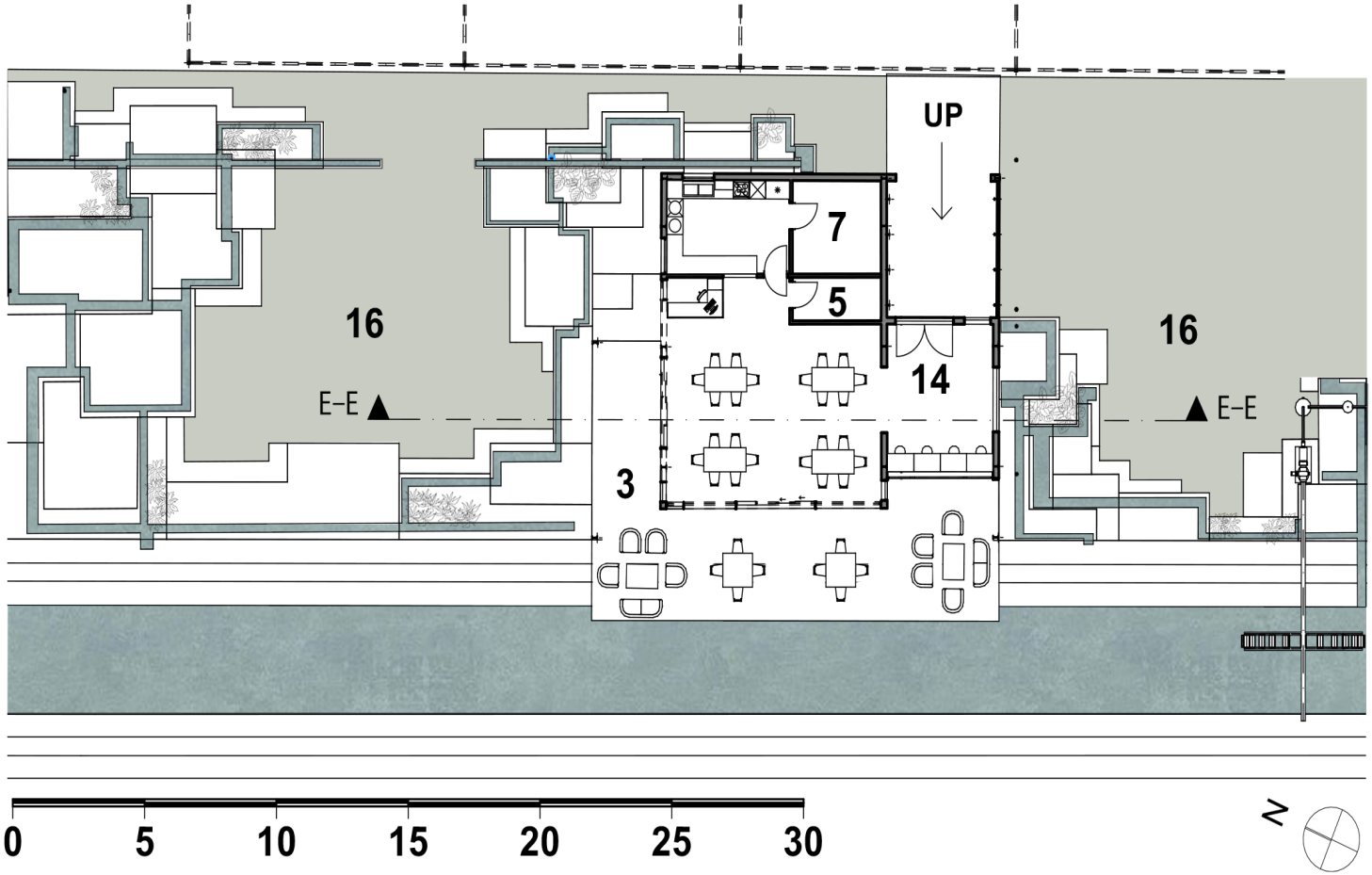


FIGURE 285: Entrance building floorplan (Author, 2023).



1. Exhibition
2. Reception
3. Balcony
4. Ablutions
5. Storage
6. Cleaning room
7. Dry/cold-storage
8. Office
9. Board room
10. Staff room
11. Class room
12. Green room
13. Presentation room
14. Coffee shop
15. Exterior green house
16. Exterior interactive learning space
17. Water wheel
18. Staff parking
19. Green house and courtyard
20. Entrance
21. Walkway to building
22. Service parking

FIGURE 286: Coffee shop floorplan (Author, 2023).

1. Exhibition
2. Reception
3. Balcony
4. Ablutions
5. Storage
6. Cleaning room
7. Dry/cold-storage
8. Office
9. Board room
10. Staff room
11. Class room
12. Green room
13. Presentation room
14. Coffee shop
15. Exterior green house
16. Exterior interactive learning space
17. Water wheel
18. Staff parking
19. Green house and courtyard
20. Entrance
21. Walkway to building
22. Service parking

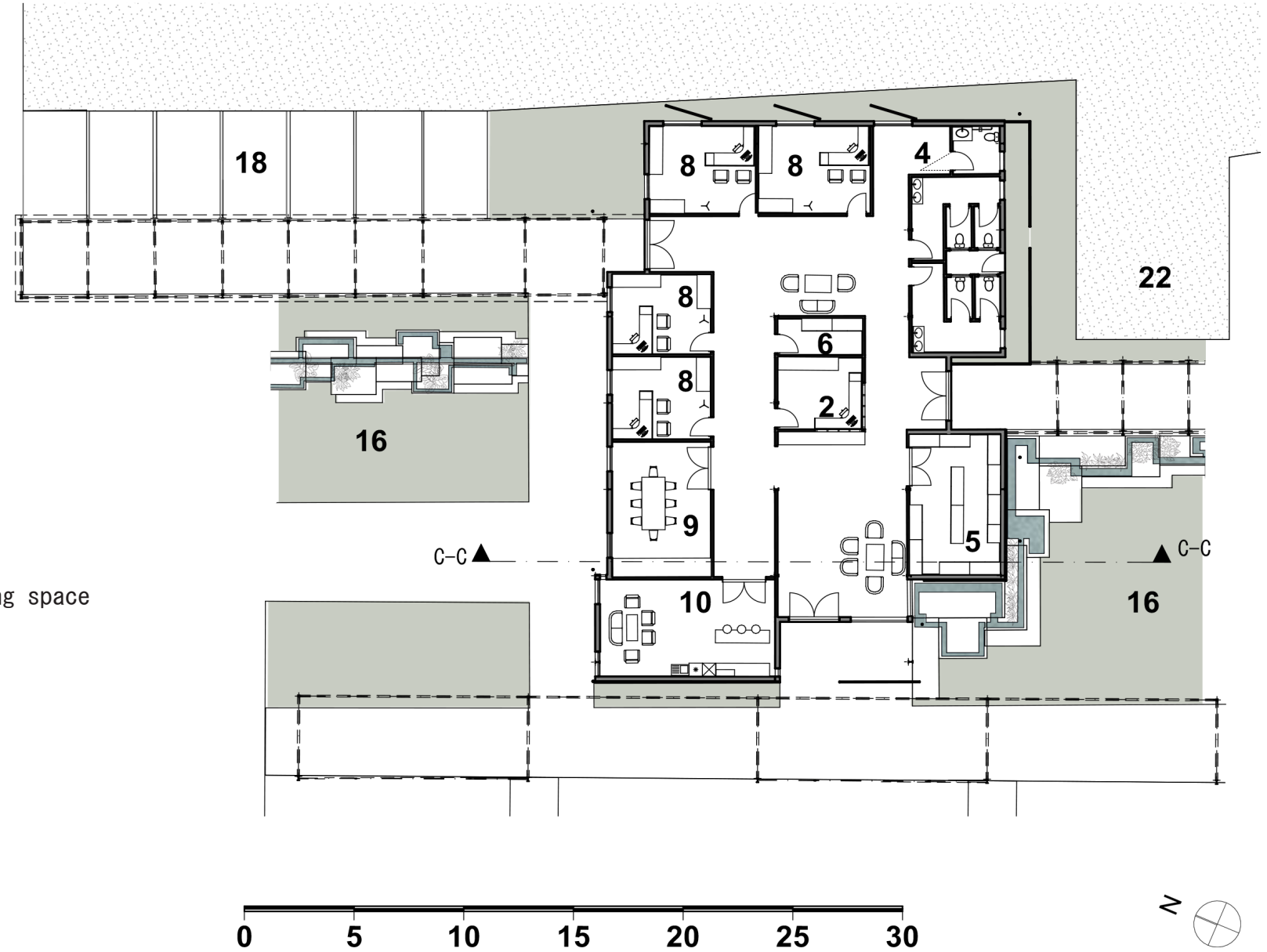
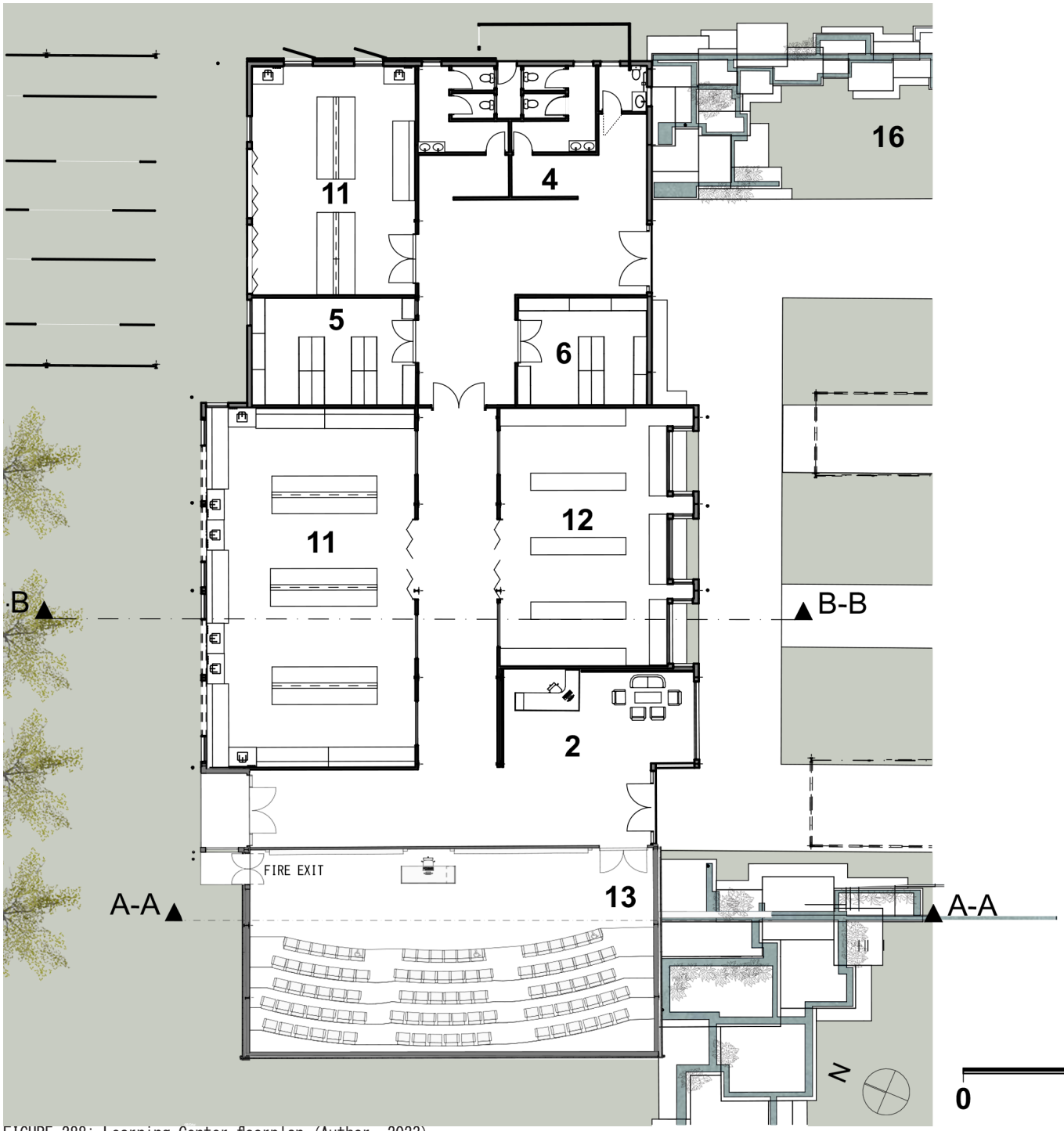


FIGURE 287: Admin building floor plan (Author, 2023).



1. Exhibition
2. Reception
3. Balcony
4. Ablutions
5. Storage
6. Cleaning room
7. Dry/cold-storage
8. Office
9. Board room
10. Staff room
11. Class room
12. Green room
13. Presentation room
14. Coffee shop
15. Exterior green house
16. Exterior interactive learning space
17. Water wheel
18. Staff parking
19. Green house and courtyard
20. Entrance
21. Walkway to building
22. Service parking

FIGURE 288: Learning Center floorplan (Author, 2023).

5.2.3. SECTIONS

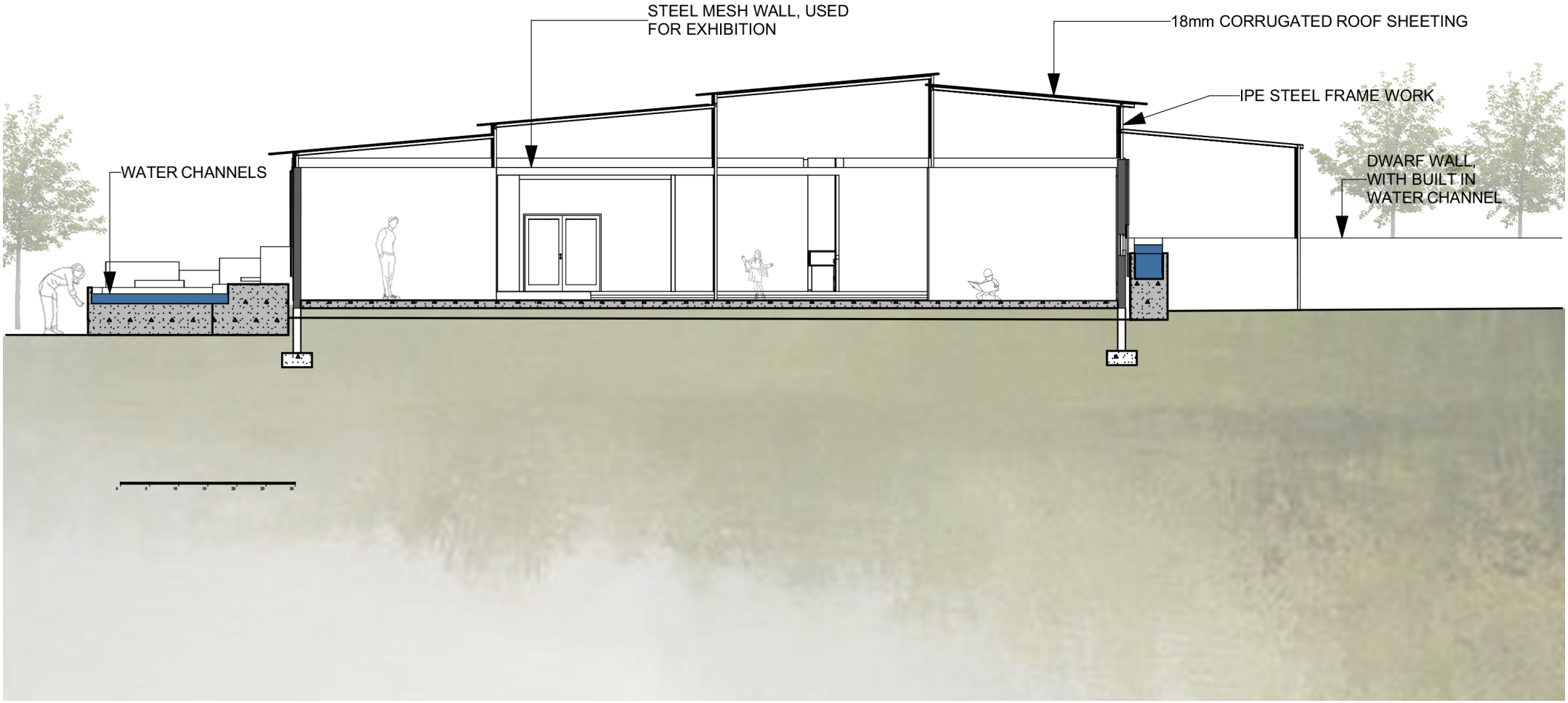


FIGURE 289: Section D-D (Author, 2023).

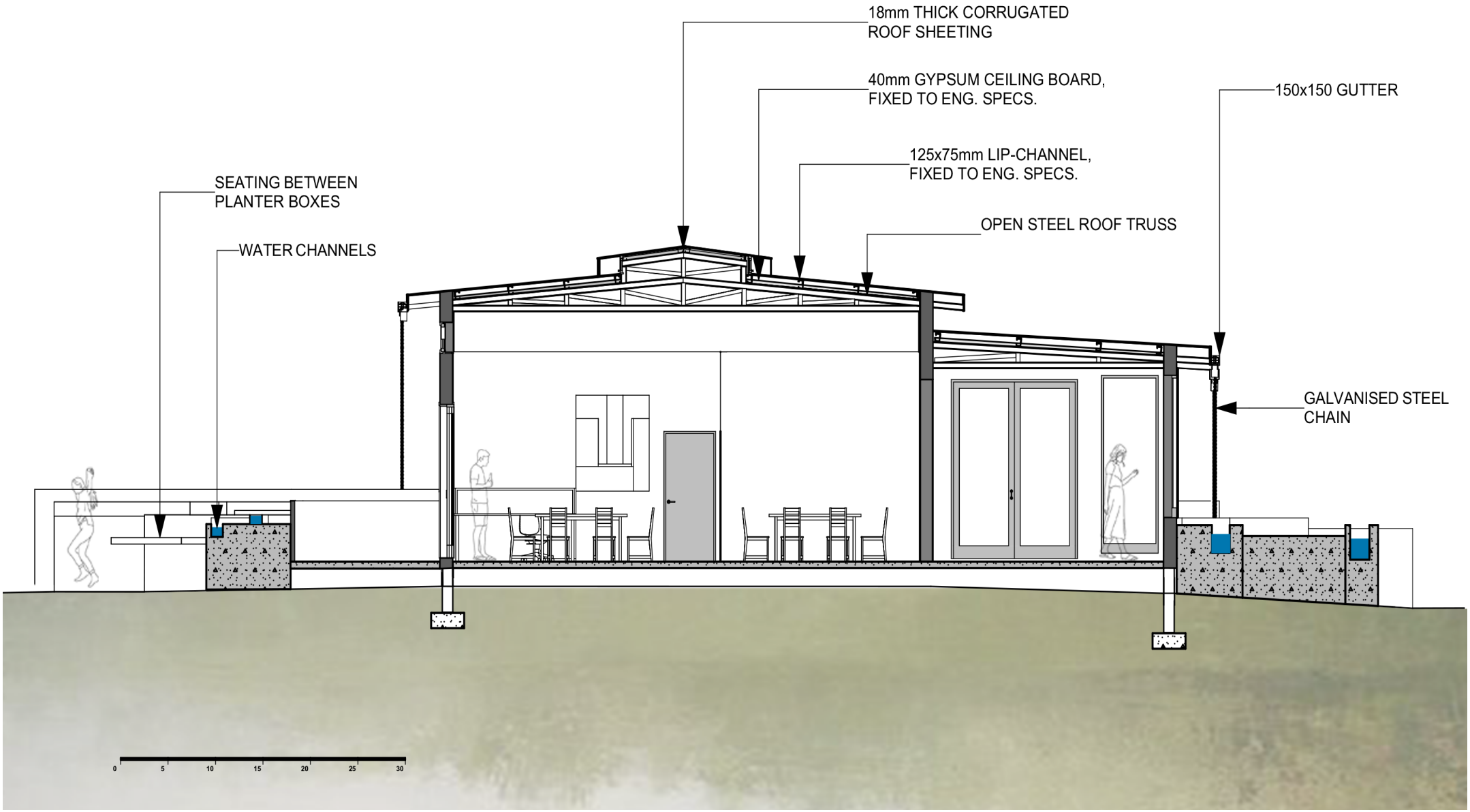


FIGURE 290:Section E-E (Author, 2023).

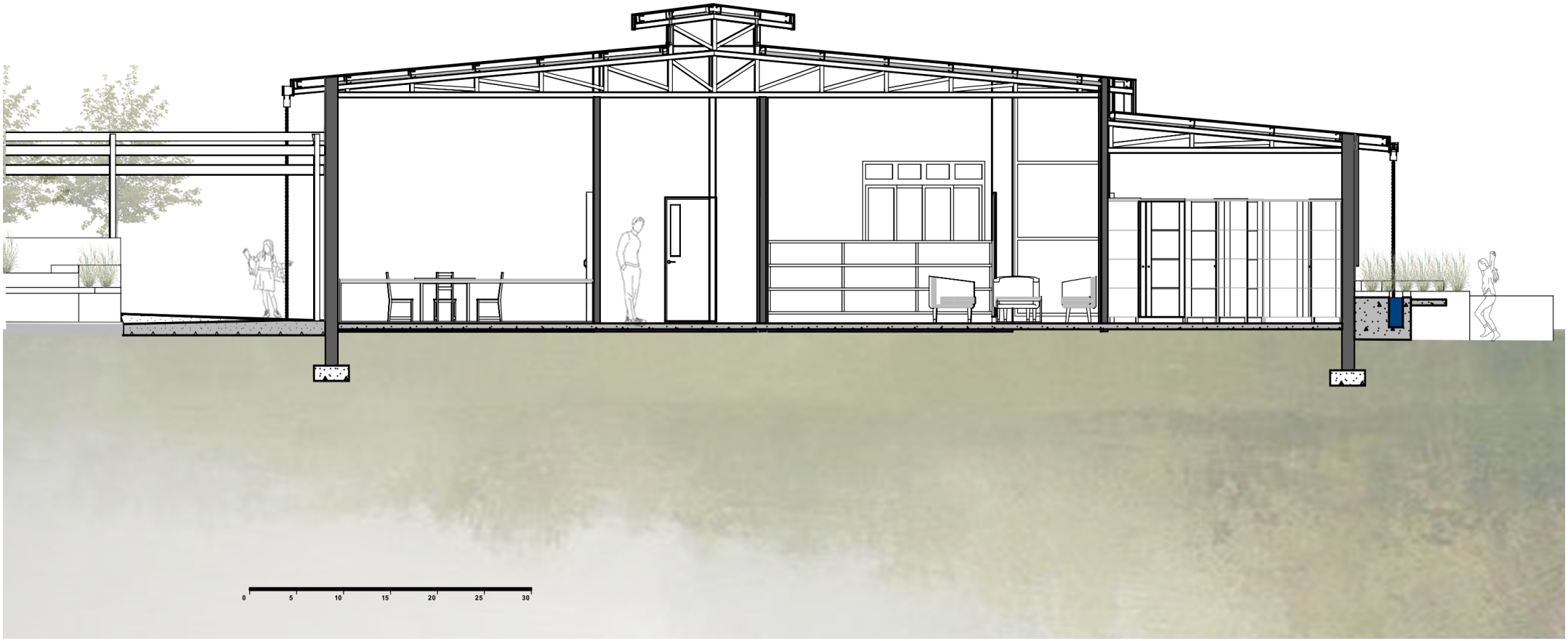


FIGURE 291:Section C-C (Author, 2023).

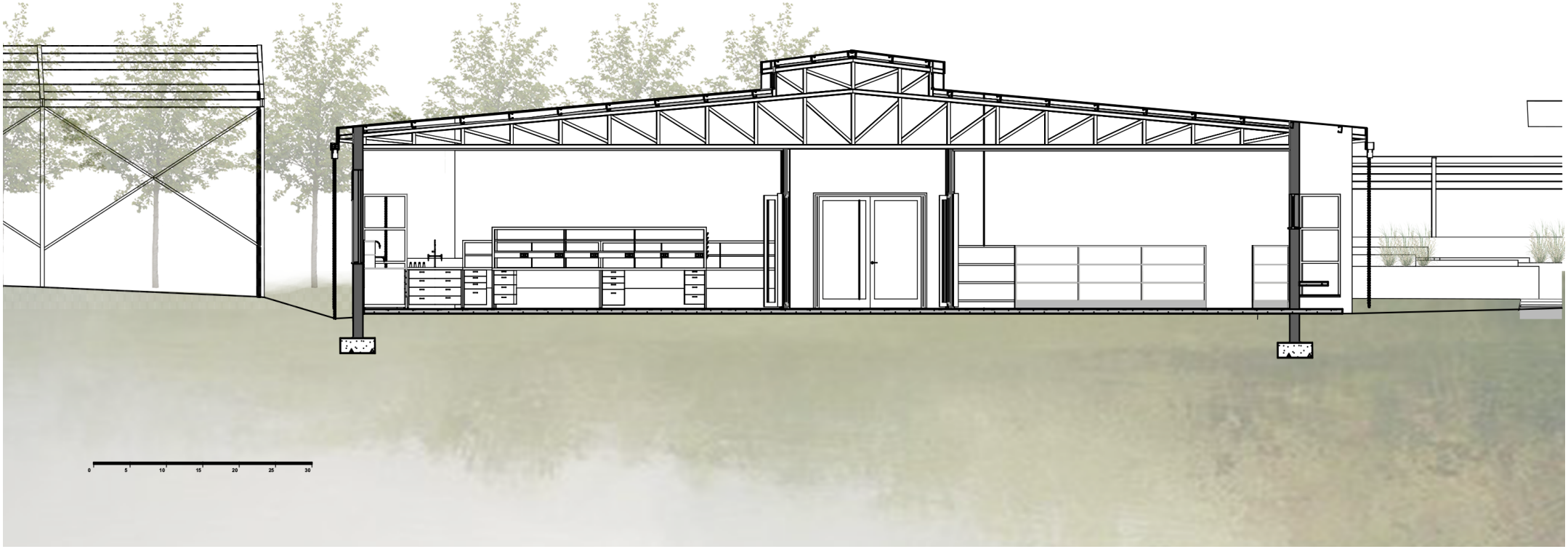
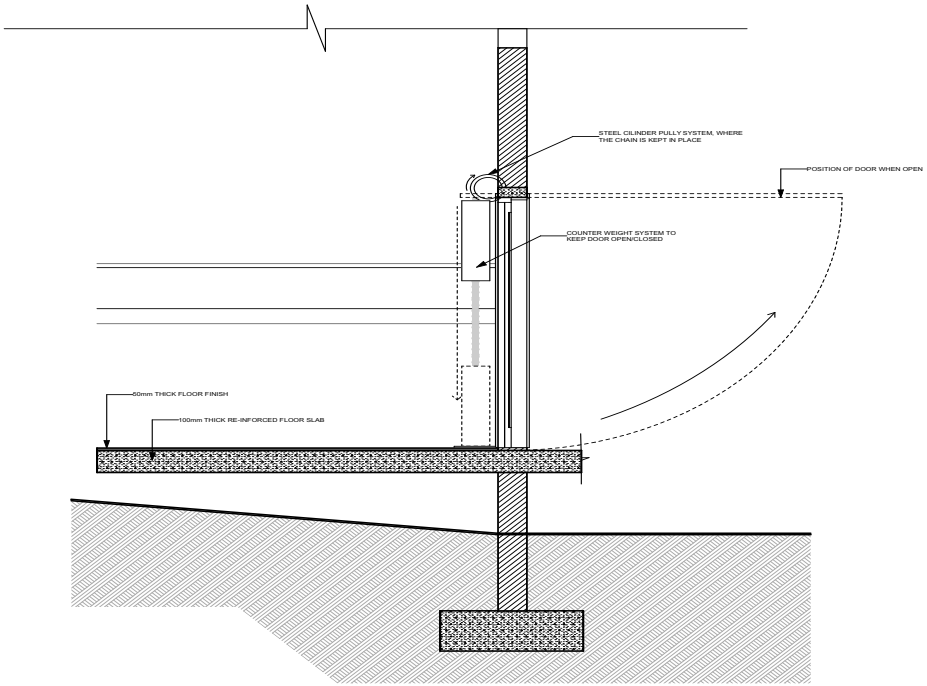
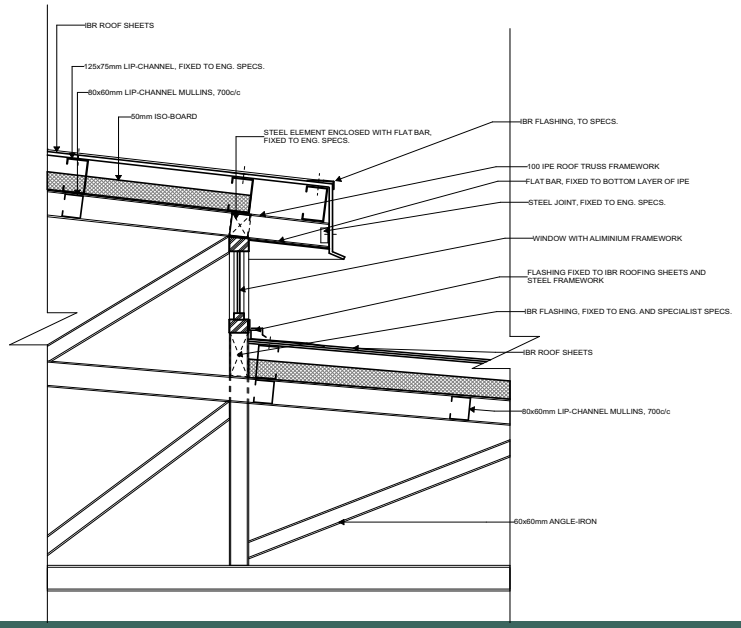


FIGURE 292: Section B-B (Author, 2023).





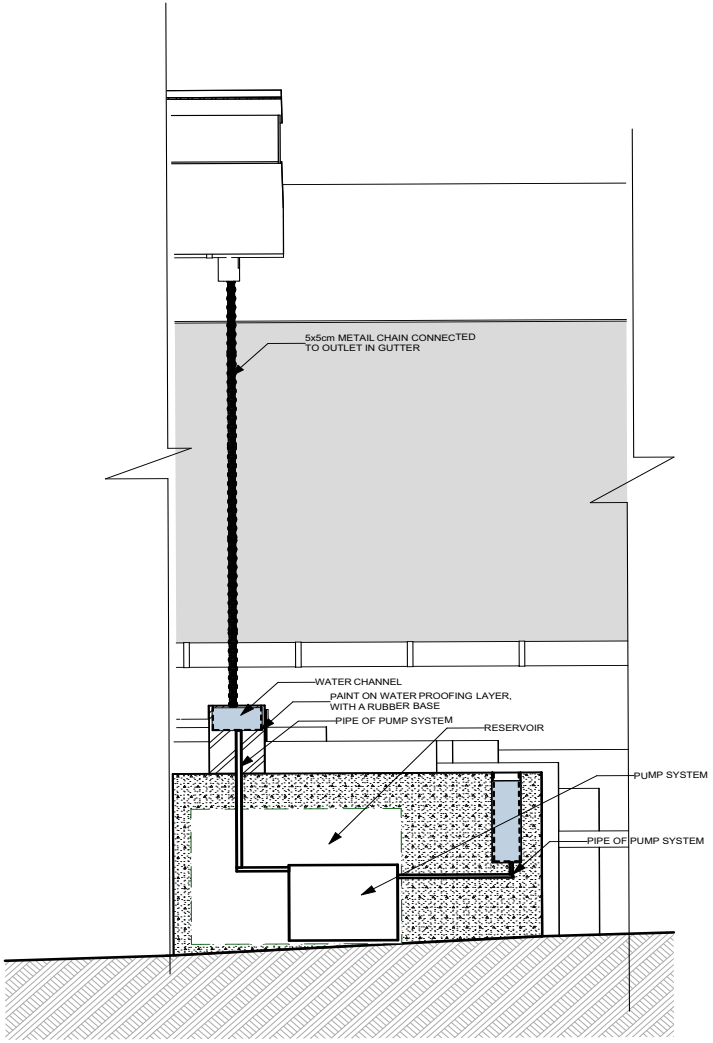


FIGURE 293-295: Detail sections (Author, 2023).

5.2.4. ELEVATIONS

FIGURE 296: South-Western Elevation(Author, 2023).

FIGURE 297: North-Eastern Elevation (Author, 2023).

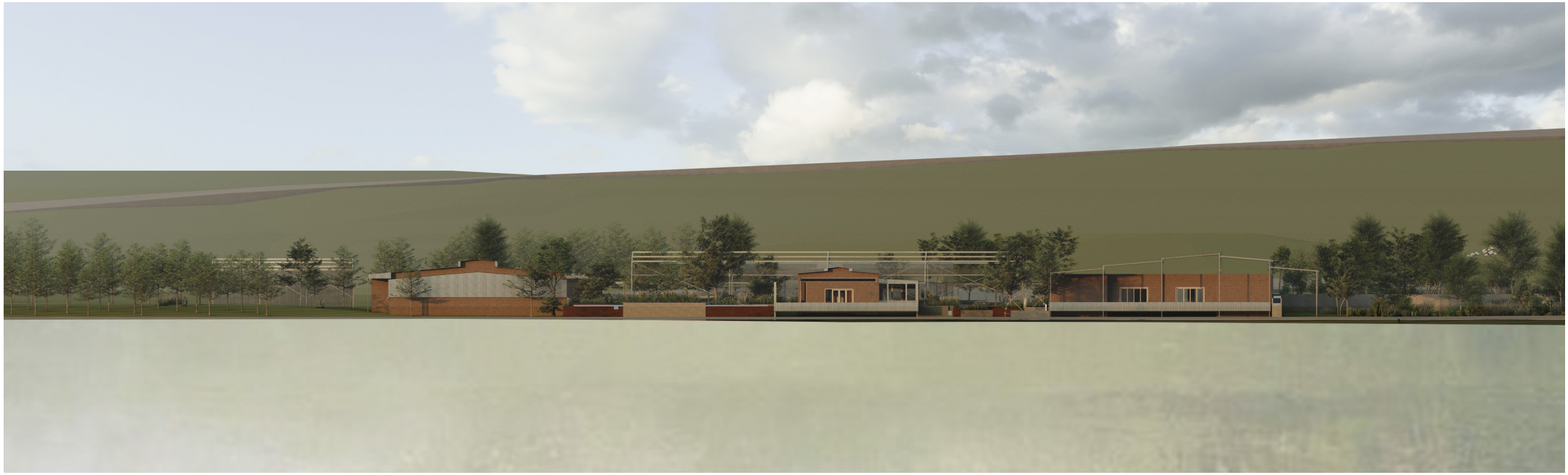


FIGURE 298: West-South Elevation (Author, 2023).

FIGURE 299: North-Eastern Elevation (Author, 2023).

5.2.5. RENDERS

FIGURE 300: Render of building opposite the canal (Author, 2023).

FIGURE 301: View of South-Western side (Author, 2023).

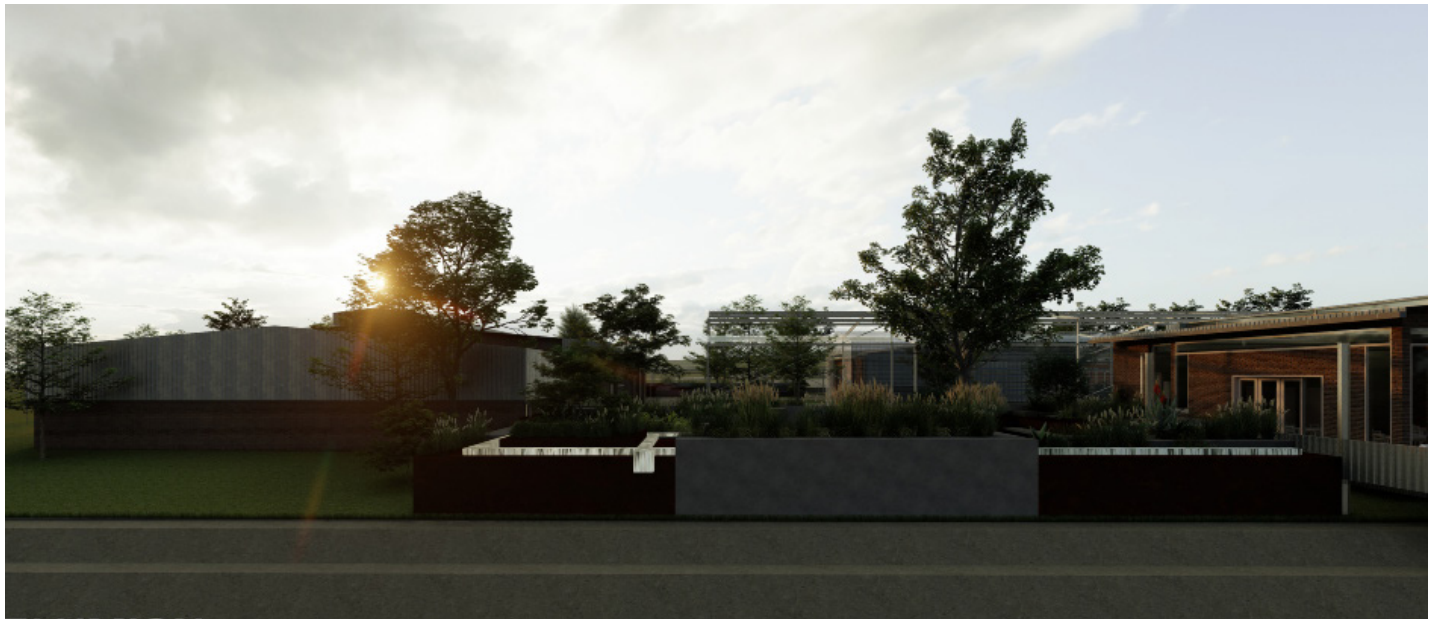


FIGURE 302: View of site during sun risses (Author, 2023).

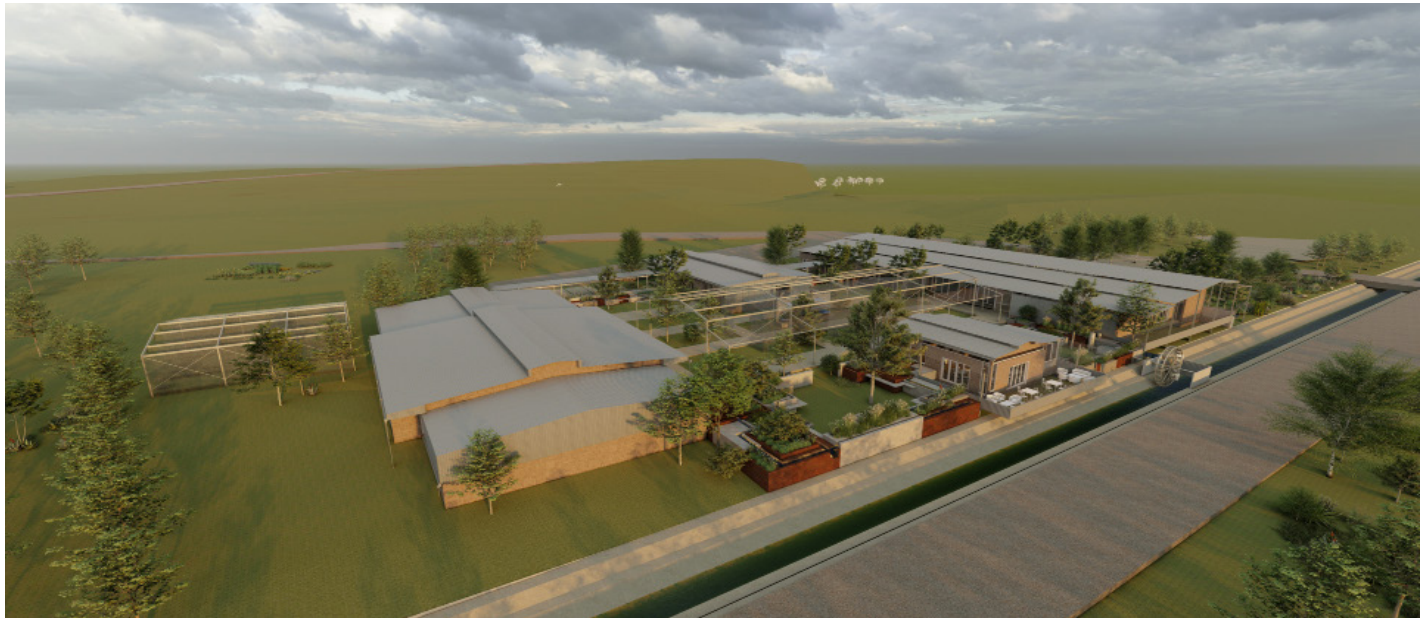


FIGURE 303: Ariel view of site (Author, 2023).

FIGURE 304: Close up view of the water wheel (Author, 2023).

FIGURE 305: Ariel view of project from the East (Author, 2023).

06

FIGURE 306: PHOTO OF THE SURROUNDING PLANTS (AUTHOR, 2023).

6.1. TECHNICAL REPORT

The technical report consists of the project's technical aspects and discusses some of the systems in greater detail.

As this project is located next to the main canal, the technical elements have the potential to form part of not only the functional and practical part of the design but also a visual and learning experience.

This connects back to one of this dissertation's main objectives: to look at multiple opportunities that can be created within one space. For example, the museum, functions as both an exhibition and a space for learning.

The touchstone is also symbolic of multiple opportunities, as the water moves vertically, filling the containers with water, and the water flows out horizontally. It is designed in such a way for both to take place at the same time and can be further developed for the movement to be separated, meaning, for the water to move vertically and not flow out horizontally at the same time. This gives the operator control over the system more efficiently.

A brief overview of the main materials that will be used is provided in 6.3, where it is used and why. The visual impact of the materials will be shown in the renders and 3D's of the project, and the way it is used for constructional purposes will be better displayed in the construction drawing that will be added at the end of the document.

The different water systems (Fig.307) that will be used for this project will also be briefly discussed and explained. A water diagram of the water passages will also be provided in 6.7, showing the direction of flow, from different points, to create a constant movement in the water, this will be discussed in greater detail.

A general overview of the parking will also be provided, as well as the access point from the parking spaces to the main building.

To conclude, the main objective of the technical report is to provide a brief overview of the systems that will be used in the design and the impact it has on the design.

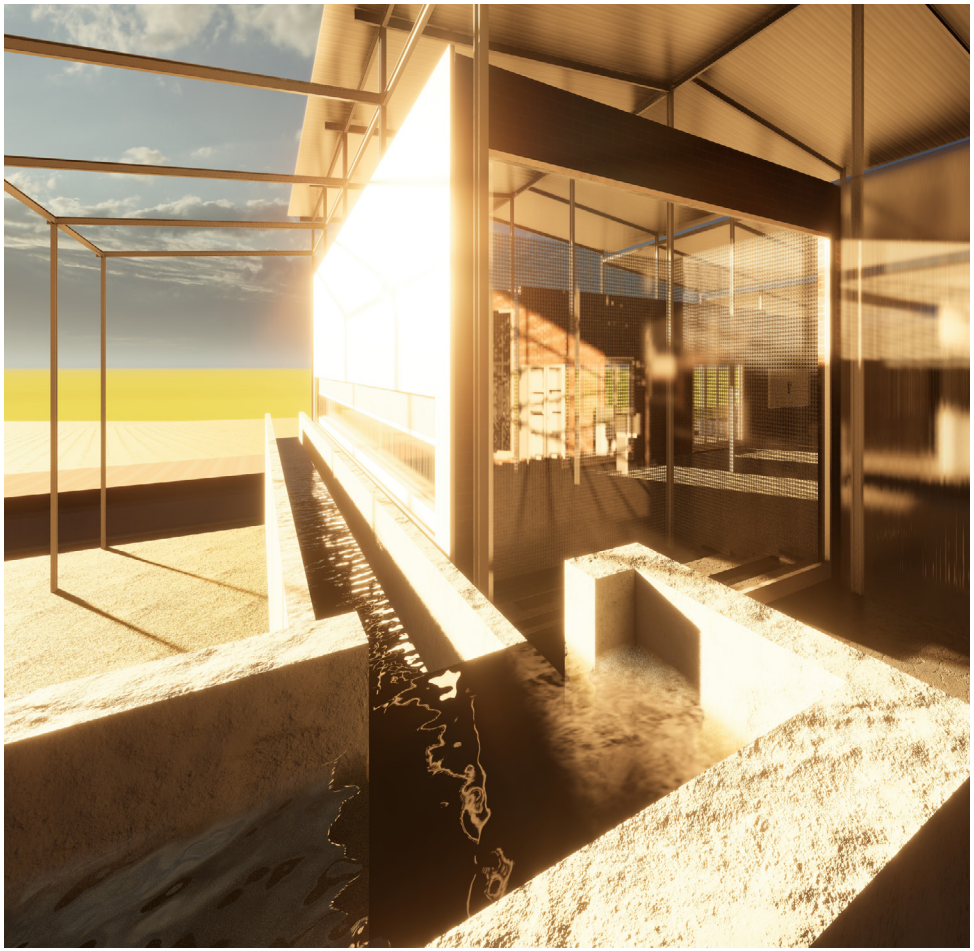


FIGURE 307: External waterway, leading up to the entrance (Author, 2023).

6.2. TOUCHSTONE

RENDERING OF THE FLUME:

The construction touchstone is based on three stages, with each stage representing a physical existing part of the canal:

1. The siphon.
2. The canal moves vertically and horizontally at the same time.
3. The redirection of rainwater.

This system works as follows:

1. A siphon system is created by placing a higher water source that leads to a lower outlet point (Fig. 308).

2. As the container at the back, fills with water that gets directed from the siphon, the water flows out horizontally. As the water flows out, it waters the produce (Fig. 309).

3. From there the water filters through and moves downwards, into a container with an opening. From there the water gets redirected into a bigger water body (Fig. 310).

PART 1

FIGURE 308: Part 1 of the construction touchstone (Author, 2023).

PART 2

FIGURE 309: Part 2 of the construction touchstone (Author, 2023).

PART 3

FIGURE 310: Part 3 of the construction touchstone (Author, 2023).

The construction touchstone is implemented in the design by incorporating it in the courtyard, to be used for the learning center. Fig. 311 and 312, is a visual representation.

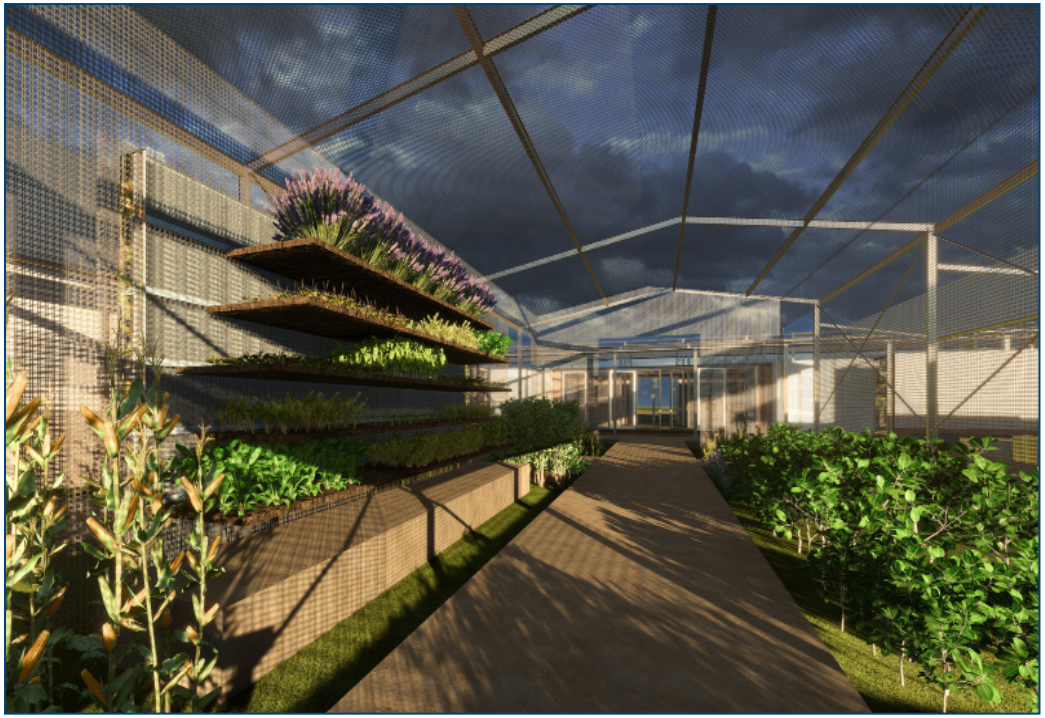


FIGURE 311: Render of the construction touchstone in the project (Author, 2023).

FIGURE 312: Render of the construction touchstone in the project from the entrance(Author, 2023).

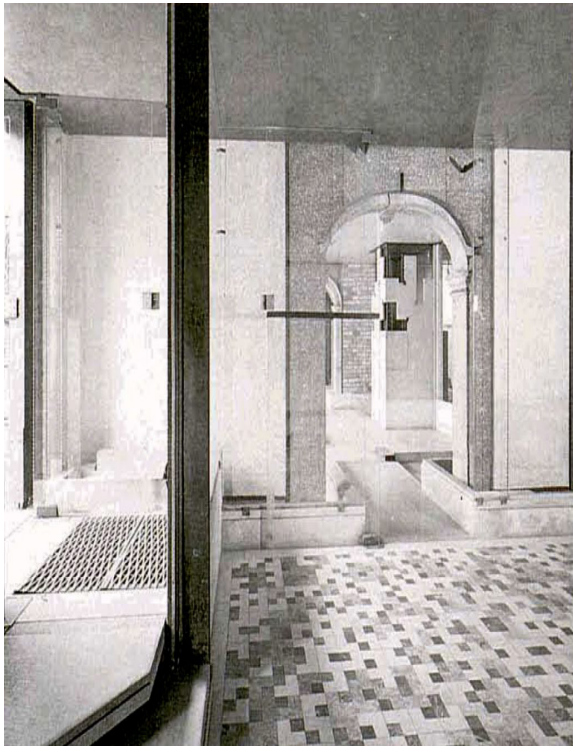
6.3. PRECEDENS FOR THE ACTIVATION OF WATER ON SITE: THE QUERINI PALACE, BY CARLO SCARPA

The Querini Palace is a place where the past and the present, are integrated and made visible in the renovations done by Scarpa. It creates an opportunity for history to be seen in a different light, in a contemporary way (LE COLLEZIONI, n.d.).

The Fondazione Querini Stampalia was built in 1869 by the last successor of the Querini Stampalia family (Fig.313-314), Count Giovanni Querini. The Stampalia was once the home of the Querini Stampalia family (Prosdocimo, 2020).

The name, Fondazione, implies that it is not a conventional museum, but also a research space. While Scarpa was renovating his part of the building, he aimed to transform this centuries-old building (Fig.315)(Volner & Cal, 2023).

The building forms a narrative, between the old and present (Fig.313, 314, 316), the ancient and contemporary architecture, which supports cultural productions, by studying the history and artistic heritage of the space, as well as being used for contemporary events (Prosdocimo, 2020). This is similar to the dissertation, as the museum and learning centre support and create an opportunity to learn about the history of the area and the study of the canal system used in the area (Fig. 315).



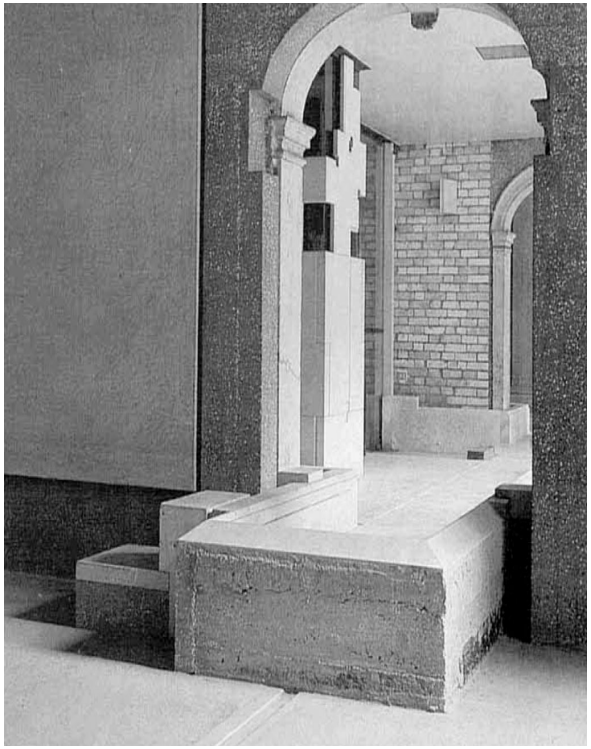


FIGURE 313-314: Fondazione Querini Stampalia, Venice, Italy. 1961 (de Cal, 2019).

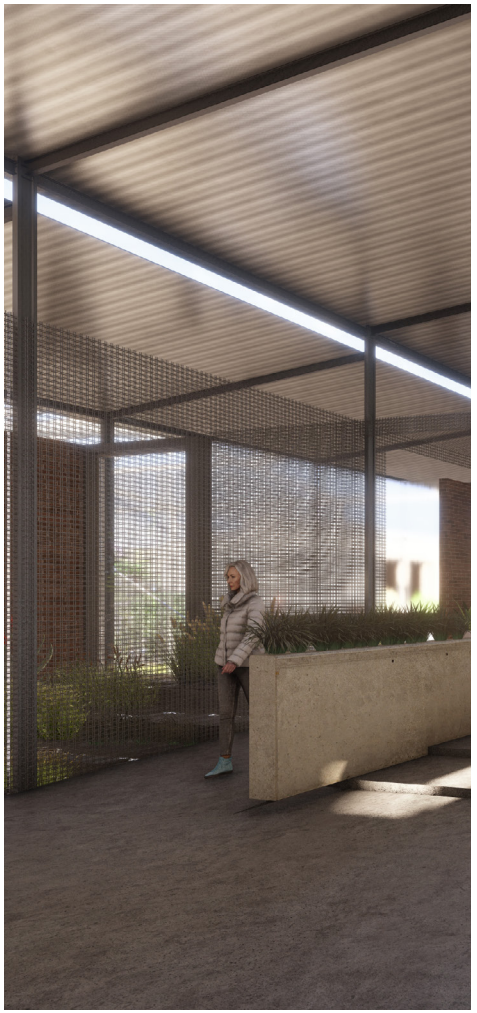


FIGURE 315: Render of the interior space, showing the influence of Scarpa' s work (Author, 203).

FIGURE 316: Renovation at water gates (de Cal, 2019).

In 1949, the decision was made by the Council of the Fondazione Querini Stampalia to start with the restoration of a section of the building; a part of the ground floor and the back garden (Fig.318-319)(Prosdocimo, 2020).

Strict requirements for the renovation of the project were provided by the Council. The Institute required (Hidden Architecture, 2019);

1. New entry point to the building that is directly linked to the square.
2. To make the ground floor accessible (Fig. 317).
3. Re-designing the garden.

When Scarpa started with his work on the building, he wanted to start by rehabilitating the spaces to their original form, to the known "Portego" and the central hall. Once that was finished, the work and construction of the bridge, the design of the water systems and the transformation of the garden followed (Hidden Architecture, 2019).

The renovations by Scarpa were based on a combination of old and new elements, unique workmanship, and the use of materials (Prosdocimo, 2020). When comparing these characteristics to the dissertation, it is clear that there are similar characteristics, such as the use of materials known to the area, the unique craftsmanship of the canal, the integration thereof and the combination of the knowledge of the past with the present (Fig.320)..

FIGURE 317: Renovation at groundfloor (de Cal, 2019).

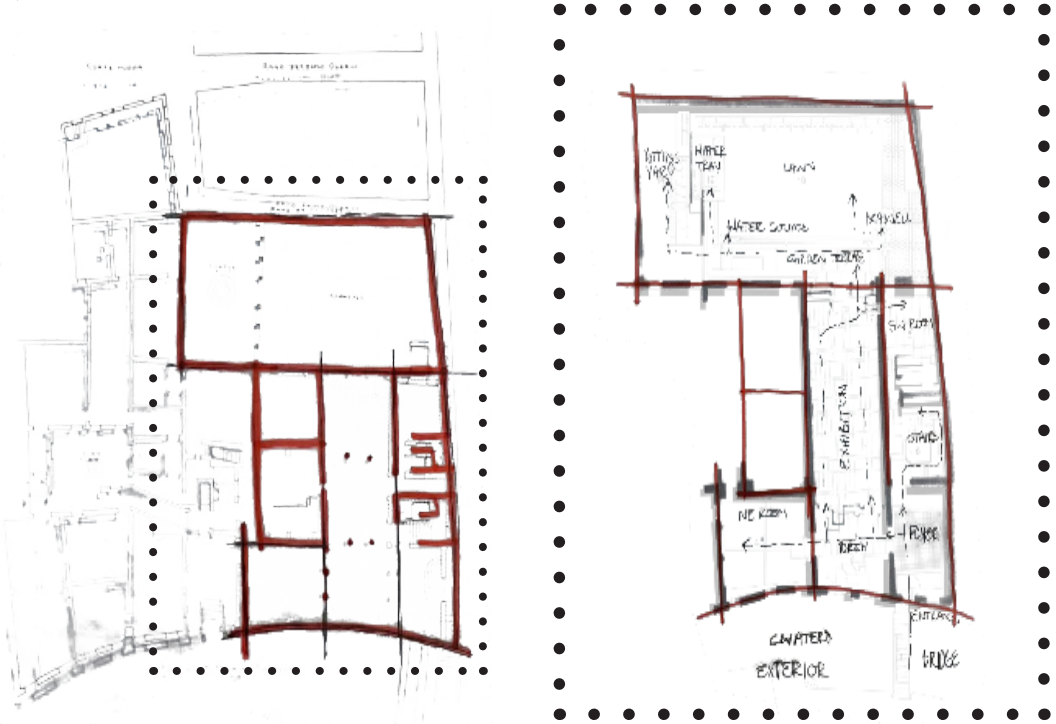


FIGURE 318-319: Original plan on left, the red showing the exiting walls (de Cal, 2019).

FIGURE 320: Render of view from balcony at exhibition space (Author,2023).

Due to water being able to enter the building, the architects accepted and adapted to working with the water, instead of looking at it as an obstacle but as an opportunity for new design elements (Hidden Architecture, 2019). In the dissertation, the water does not enter the building naturally, but using man-made systems, incorporating the water into the building.

The two main elements of the design in both Scarpa's work and the dissertation is (LE COLLEZIONI, n.d.);

1. Water - reflecting the palace on the outside and enters the building through the water gates and is also found in the garden (Fig. 321).
   - in the design of the dissertation, the water-channel walls lead one towards the entrance of the building, as well as through the rest of the spaces (Fig.339).
2. Light - it reverberates on the water, refractures and vibrates against the ceilings, resulting in a dematerializing effect (Fig.325).
   -In the design of the dissertation, the light reflects onto the water, creating unique experiences, and is important to provide enough natural sunlight for the produce and plants to grow, located in the greenhouse and green room (Fig.338).

He restored the central path, the staircase, which includes various levels and borders. This helps to regulate the water flow of the ground floor, when there are high water levels in the lagoon (Prosdocimo, 2020).

Scarpa redesigned and renovated the ground floor of the Fondazione, from 1959 to 1963, into a space for exhibitions and meetings (LE COLLEZIONI, n.d.).

Scarpa created a unique new entrance to the building, by turning one of the existing windows (Fig. 323), on the main façade into a new entrance into the palace (Hidden Architecture, 2019).

The work done by Carlo Scarpa, Italian architecture of the 20th century, represents four themes (Prosdocimo, 2020);

1. The bridge - a light arch connection (Fig. 324).
2. The entrance - including safety bars, protecting the dweller from high water levels (Fig.323).
3. The portego (Fig. 325).
4. The Garden (Fig. 326).



FIGURE 321-326: Steps at the water gate (BARBA & DE LA QUINTANA, 2016)



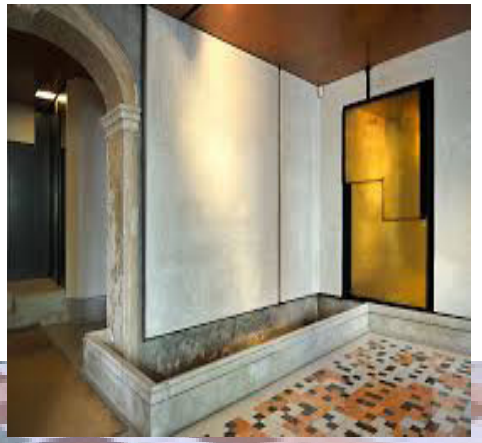



FIGURE 327: Steps leading into the courtyard, with a mosaic floor finish of red, white, and pink, with green marble tesserae (Prosdocimo, 2020)7

WATER USE AND INFLUENCE

The main character of this building is water. The water enters the building through the water gates in the walls (Fig. 331), which are supplied by the water channel, located next to the Palace.

The water is mainly located in the garden, by use of different levelled copper basins, made of cement and mosaic (Prosdocimo, 2020).

In many of Carlo Scarpa' s works, water forms an important element. For example, the garden has a high perimeter wall with a water channel (Fig. 330), creating a border between the garden and the terrace (Prosdocimo, 2020).

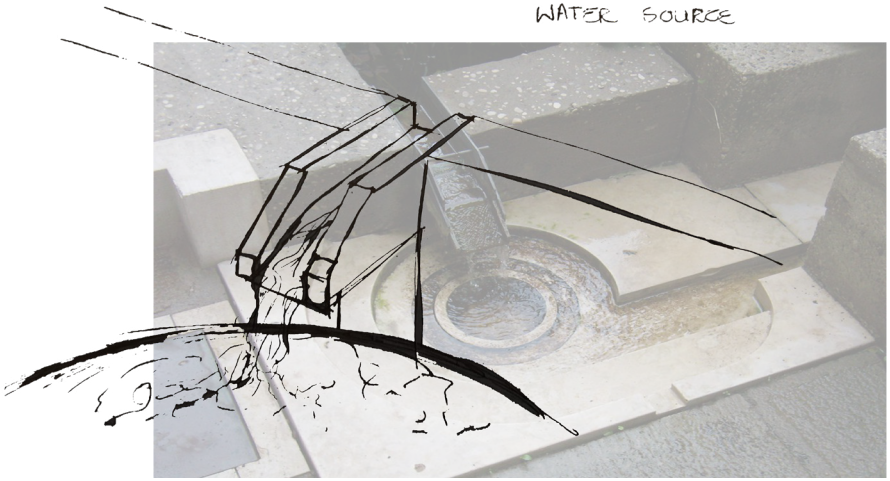


FIGURE 328: Details done by Carlo Scarpa (de Cal, Edited by Author, 2023).

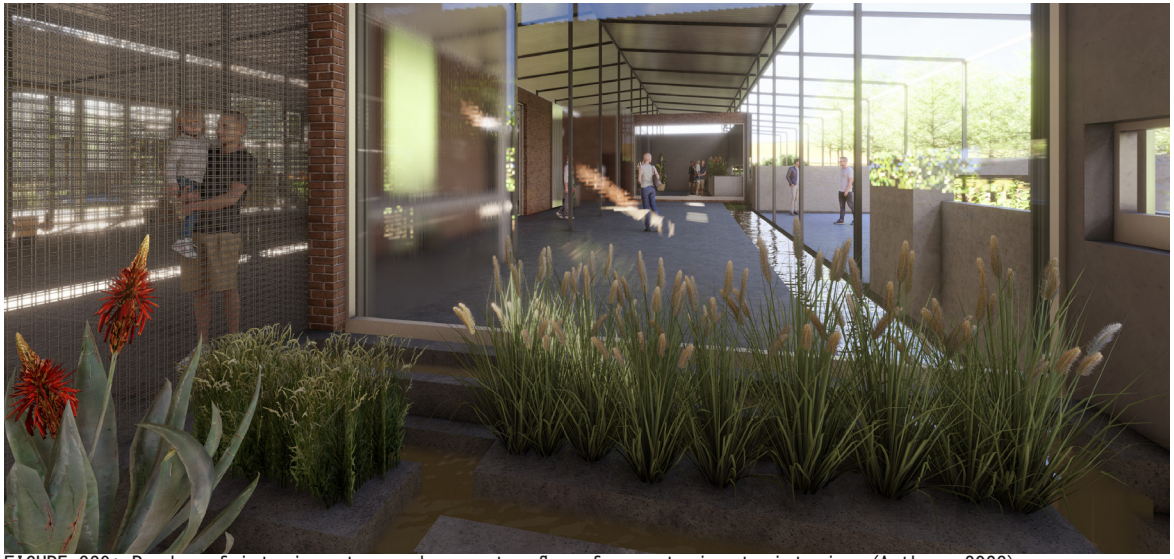


FIGURE 329: Render of interior steps, where water flows from exterior to interior (Author, 2023).

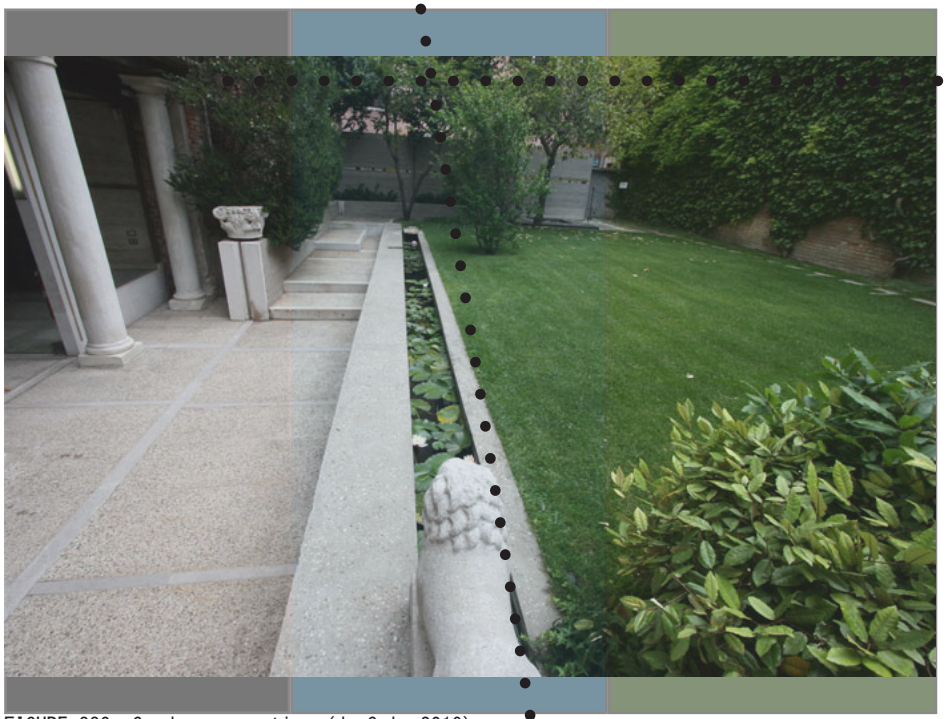


FIGURE 330: Garden renovation (de Cal, 2019).

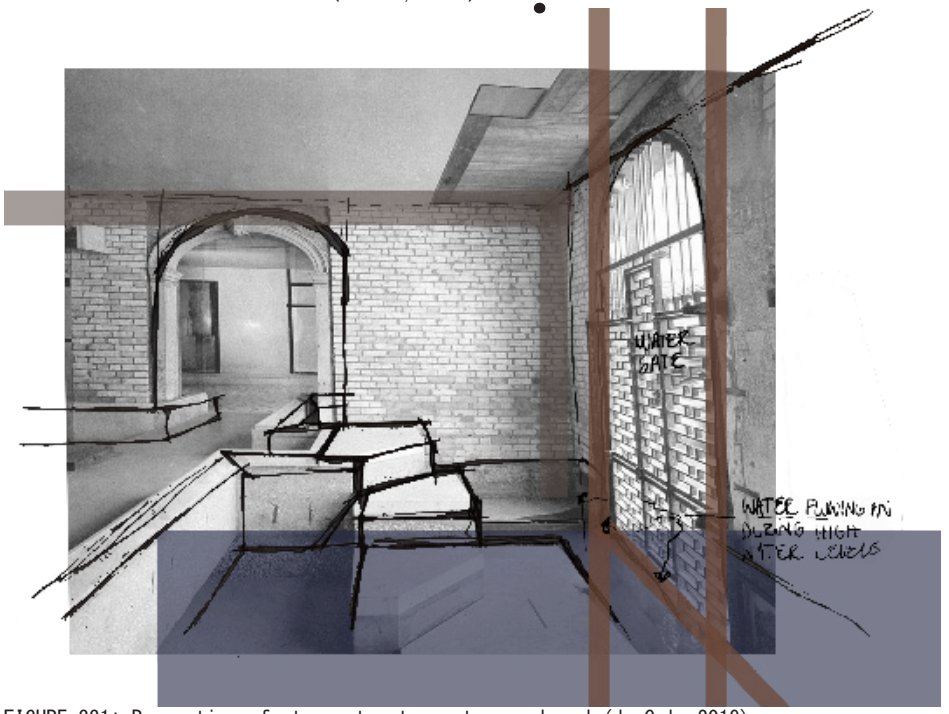


FIGURE 331: Renovation of steps at water gate, analysed (de Cal, 2019).

“One morning of the ‘61 in Querini, when I asked him to keep the high water outside the palace...” he told me, looking into my eyes, after a pause: inside, high water will be inside, as it is in the rest of the city (BARBA & DE LA QUINTANA, 2016).

It is just about holding it, controlling it, using it as a bright and reflective material. You’ll see the effects of light on the roofs of yellow and purple stucco, it will be wonderful! “ Giuseppe Mazzariol, director of the Querini Stampalia Foundation from 1958 to 1973, remembered (BARBA & DE LA QUINTANA, 2016).

Scarpa is seen as a poet of architecture (LE COLLEZIONI, n.d.). His work was mainly influenced by his determination of perfection in architectural details (Fig.328). The details of the Palazzo Querini Stampalia, are a good example of his determination, as the joints he designed between elements (Fig. 333), “are points every builder takes an interest in and always has, but the solutions are different in different periods.” (BARBA & DE LA QUINTANA, 2016)

FIGURE 332: Detail work done by Scarpa (BARBA & DE LA QUINTANA, 2016).

FIGURE 333:Details done by Carlo Scarpa (BARBA & DE LA QUINTANA, Edited by Author, 2023).

FIGURE 334: Detail work done in the garden by Scarpa (BARBA & DE LA QUINTANA, 2016).

OBSTACLES & INFLUENCES

Both sites have obstacles that are created both by nature and man. Scarpa was faced with strong restrictions, requirements and obstacles that were created by the site and Institution. With this dissertation, the site and existing canal, also created obstacles, such as working around and with the existing structures (Fig.335).

One of the obstacles he encountered, was the irregular changes in the levels of the steps and floor surface. The interior space is also divided into smaller spaces, having different levels (Volner & Cal, 2023). By comparing the irregular level, he worked with, to the dissertation, it is visible in the renders and visuals of the project, in the interplay of the levels, between the interior and exterior, and even more so in specific design elements.

For example, the main water source is located on a lower level, the canal (Fig. 336), than the building and water elements, creating the need for different pumping systems. Once the water enters the water channels, the water flows from the interior of the building to the exterior (Fig. 337).

FIGURE 335: Details done by Carlo Scarpa (de Cal, Edited by Author, 2023).

FIGURE 336: Render of the construction touchstone in the project from the entrance(Author, 2023).

FIGURE 337: Render of where water flows from interior to exterior (Author, 2023).

A design element example is the different levels of the planter boxes (Fig. 3339), that create a natural flow, as the water is supplied from the highest level, and flows through the channels towards the lower levels and back into the main canal.

The garden consists of different elements, all complementing the use of water. The water for the pools and fountains is supplied using delicate sluices, made from stone and bronze, with patinated finishes (Volner & Cal, 2023).

In the dissertation, there are sluices located in the channels, that help with water control. Another example is the different materials used to build the planter boxes, as the materials have different effects on the water (Fig. 338-340), creating different visual effects.

FIGURE 338: Render of interior seating with planter boxes (Author, 2023).

FIGURE 339: Render of exterior planter boxes (Author, 2023).

FIGURE 340: Render of exterior planter boxes, illustrating the flow of the water (Author, 2023).

CONCLUSION

Goethe's once-celebrated phrase of architecture as "frozen music" (Fig. 341), is a good example of symbolising the idea that some buildings can get stuck in one's mind (Volner & Cal, 2023).

When it is done effectively, it has the chance to influence a whole generation of designers (Volner & Cal, 2023). As discussed, the influence of Scarpa's work on the dissertation is provided by examples and visuals.

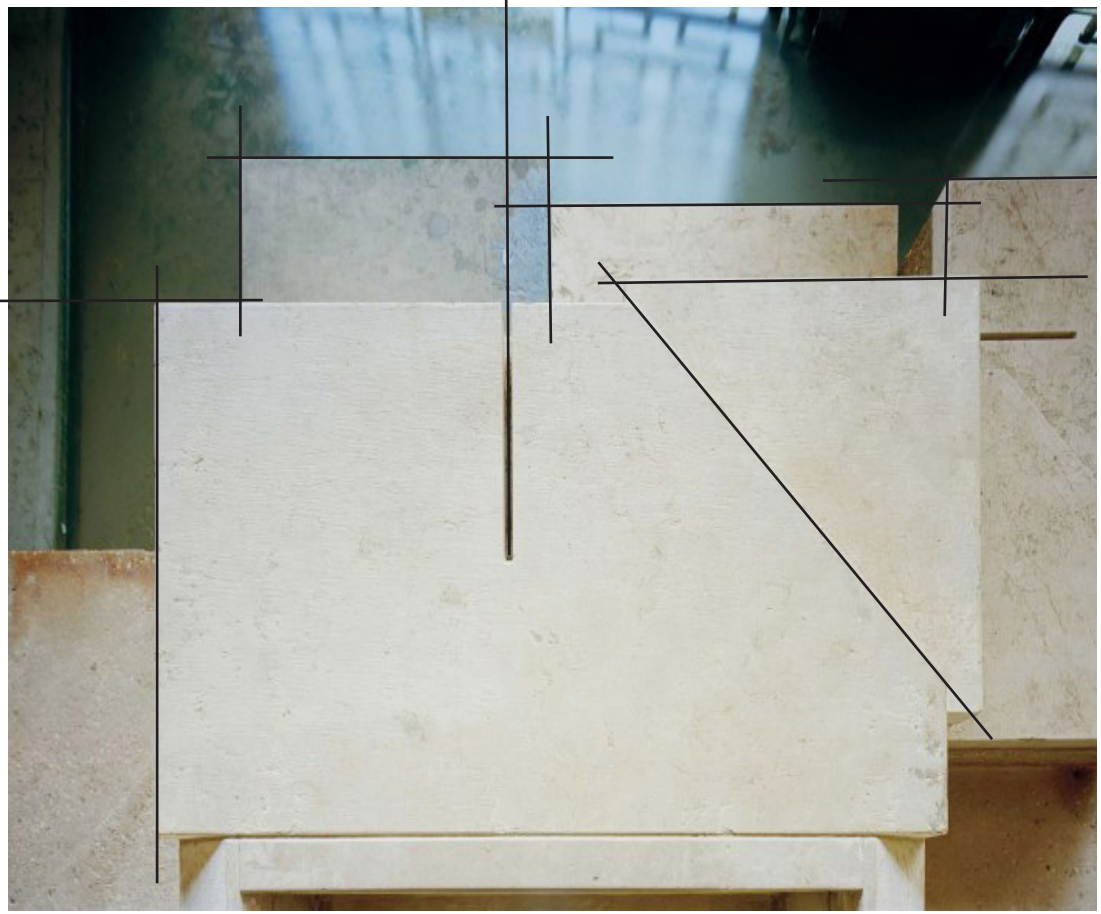


FIGURE 341: Detail work done in the garden by Scarpa (BARBA & DE LA QUINTANA, 2016).

6.4. MATERIALS

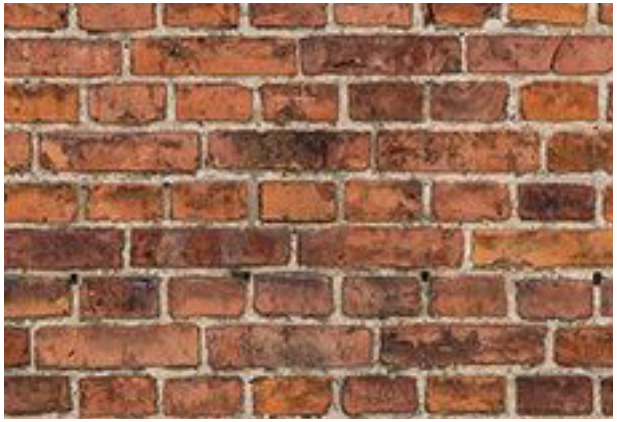


FIGURE 342: Exposed brick surface (Brick Cladding, 2022).

EXPOSED BRICK

Most of the brickwork is left exposed and is only covered where indicated.

This material is commonly used in this area; therefore, the builders will be comfortable working with it and minimize the need to clean the facades of the building.

FIGURE 343: Corten steel surface (Freepik, 2021).

STEEL

Different types and forms of steel are used, on the surface of some of the walls and planter boxes, and for structural components as well.

For example, Corten, and Aluminum.

This adds a visual and texture element to the project.

FIGURE 344: Corrugated roof sheeting (Apavisa, n.d.).

CORRUGATED ROOF SHEETING

All roof coverings will consist of treaded corrugated roof sheeting.

This is also a material that is commonly used and is used on the facades of the building as well, where indicated

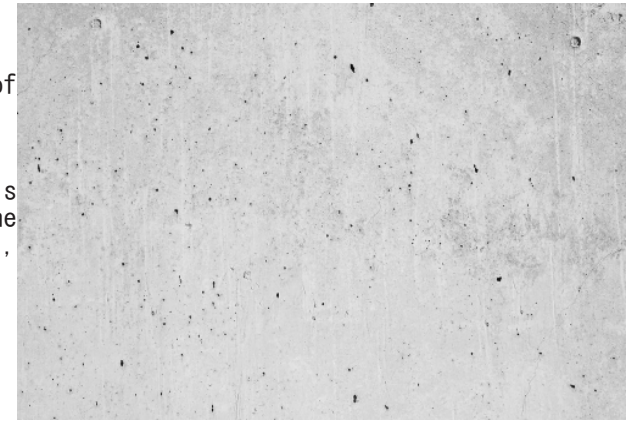


FIGURE 345: Concrete surface (Baresque, n.d.).

CEMENT AND CONCRETE

Most of the floor surfaces are covered with a polished concrete layer, with a rougher texture on the exterior spaces, such as the walkways and passage in the courtyard.

This helps to prevent visitors and staff from falling, as well as keeping a clean appearance.

FIGURE 346: Water body (Pexels, n.d.).

WATER

Water is an important element in this project, even though is provided naturally, it is used in both the museum's exhibition and in the learning space.

It is also a prominent feature as the canal is located next to the project.

FIGURE 347: Polycarbonate surface(Polycarbonate sheets, 2020).

POLYCARBONATE

This material helps to create a transparent element in the design, as it is used for partial sections of walls and to close the opening from the top of the wall to the roof.

This is used in the museum space, creating a visual effect, as it appears that the roof is separate, from the rest of the building.

6.5. WATER AND DRAINAGE

6.5.1. INTRODUCTION

The chosen site, for this project, does not consist of any man-made rainwater collection systems, other than the canal. In the proposed project, a collection system is included in the design, only in the area where it will be constructed. Once the rainwater is collected by man-made systems (Fig. 348), and not by nature, it is known as stormwater, as it no longer soaks into the ground.

6.5.2. DESCRIPTION OF STORMWATER COMPONENTS

Stormwater definition (Architective, 2018):
It is the excess surface water from heavy rain.

Runoff definition (Architective, 2018):
It is the water in a natural or man-made watercourse or conveyance system.

Precipitation definition (Architective, 2018):
It is any form of water, falling from the sky. For example, rain, hail, or snow.
It is the main source of all water movement across sites.

Percolation definition (Architective, 2018):
It is the filtering of a slow-flowing liquid. This often occurs on-site, when the water moves through the soil to an underground aquifer.

FIGURE 348: Existing spout that directs surface water into the canal (Author, 2023).

6.5.3. DRAINAGE

There are different drainage systems used at different sites. Runoff water is normally directed towards canals, commonly found above ground, or tunnels, more commonly found underground, or even a combination of the two methods (Greywater Systems, n.d.). From there it is then transported by man-made waterways to natural watercourses.

There are different drainage systems that consist of a combination of different components (Greywater Systems, n.d.):

1. Foundation (Fig. 349):
Drains divert stormwater away from buildings, for example by using drainage pipes, that are surrounded by gravel and a geotextile filter (Greywater Systems, n.d.).

2. Roof drainpipes (Fig. 350):
They can be connected to the municipal stormwater drainage system, or to a water harvesting system or water body (Greywater Systems, n.d.).

3. Gutters (Fig. 351):
Gutters collect the runoff from the roof of a building. Downpipes are connected to them directing the water to a collection point (Greywater Systems, n.d.).

4. Storm drainpipes (Fig. 352):
Storm drainpipes can be made from different materials. Some of the main materials used are, clay, concrete, metal, and PVC (Greywater Systems, n.d.).

5. The municipal inlet (Fig. 353):
This system is used to transport surface water by use of underground drainage pipes, towards a discharge point. It is commonly built in either a round or rectangular shape, and can be built with different materials. Normally one would find a metal grate covering the opening, this prevents the drain from clogging (Greywater Systems, n.d.).

6. Erf (or site) inlets/field inlet catch pits (Fig. 354):
They are similar to the municipal inlets, but smaller and connect to larger stormwater structures (Greywater Systems, n.d.).

1

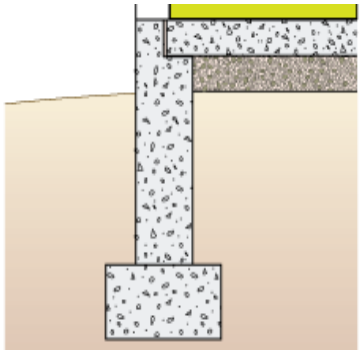


FIGURE 349: Foundation (Foundations Section ,n.d.).

FIGURE 350: Drain pipe (Author, 2023).

3

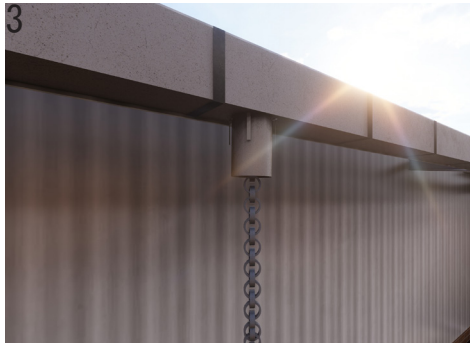


FIGURE 351: Gutter (Author, 2023).

FIGURE 352: Storm pipe (GSM plumbing, 2021).

5

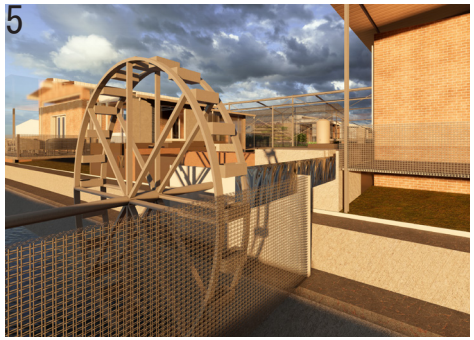


FIGURE 353: Municipal inlet(Author, 2023).

6

FIGURE 354: Erf inlet (Author, 2023).

6.5.4. AGRICULTURAL DRAIN

This type of system is used in specific applications, for example, for underground sub-soil drainage for large areas, that can often become waterlogged (garden-resq, 2009). There are different sizes of drainage pipes ranging from 75mm to 160mm and lengths up to 6m. A push-fit coupling connection is most used, with or without rubber sealing rings.

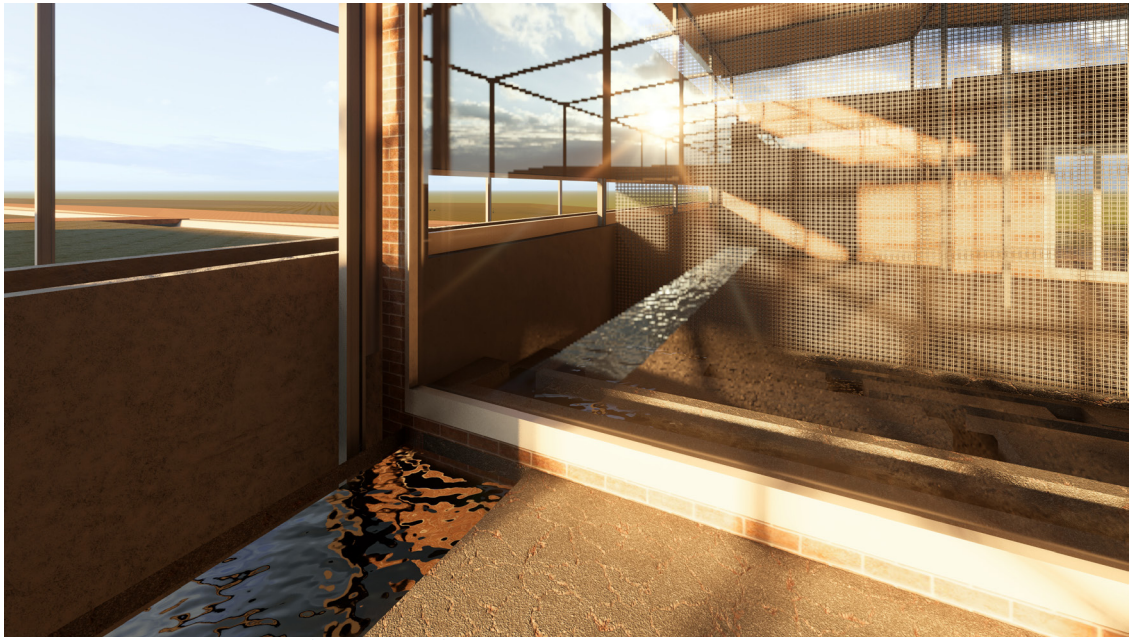


FIGURE 355: Waterway system (Author, 2023).

FIGURE 356: Agricultural system (Author, 2023).

6.6. GREYWATER

6.6.1. DEFINITION OF GREYWATER

Is all household water except for wastewater, from toilets. Wastewater from laundry can be included if biodegradable soaps are used (Crosbie, D,2022). There are greywater systems that allow the water to be re-used, if it is separated from sewage pipes, known as black water.

Greywater systems make it able to use the water more than once, saving water. These systems usually consist of the following elements (Crosbie, D,2022) (Fig. 357):

- Plumbing system - made up of pipes and valves to capture the grey water at source; Surge tank to temporarily hold large drain flows from washing machines or baths.
- Filter - to remove particles which could clog the irrigation system.
- Pump -to move the water from the surge tank to the irrigation field.
- Irrigation system - to distribute the water to plants.

It is important to note that greywater cannot be stored. Surge tanks used in this system, only keep the minimum capacity needed and do not function as storage, it is used to balance the flow of water, in cases of high-volume water surges (Crosbie, D,2022).

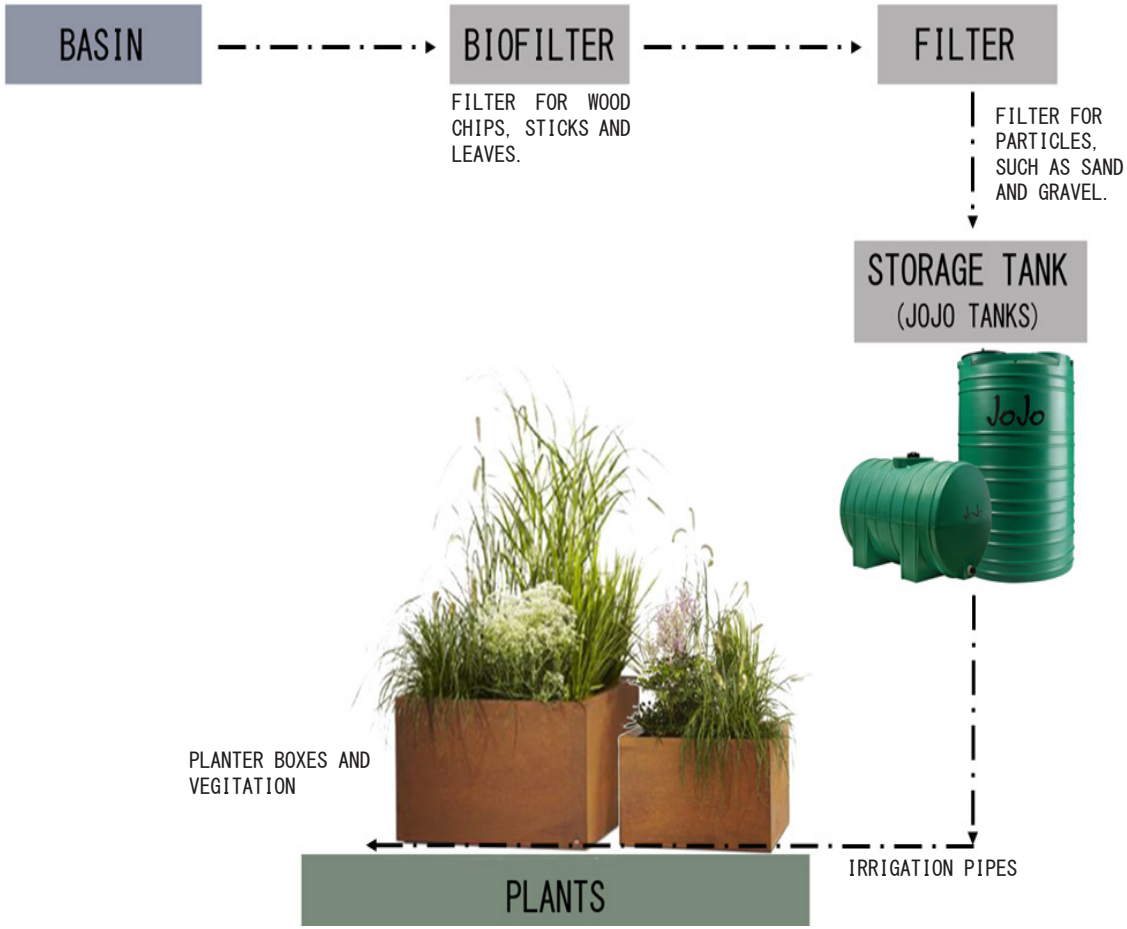


FIGURE 357: Greywater system diagram (Author, 2023).

6.6.2. WATER PURIFICATION

Clean water is becoming more and more scarce, therefore it is important to not waste water, as it is a constitutional right to have access to clean water (garden-resq, 2009). Due to this, a sufficient water supply infrastructure or system must be applied.

For this project, a standard filtration system will be used (Fig. 358), that is more commonly known as a reverse osmosis system. This system removes chemicals and other compromising elements from the water, making it safe to drink and improves the smell of the water as well(SA Water Purification, 2023).

6.6.3. CODES AND STANDARDS

The requirements both for the design and construction of drainage systems are defined and set out in SANS and the SABS (Muller, 2002). The requirements, for drainage, can be found in part P of the SANS (Schmidt, S. and Pinheiro, D, 2013).

FIGURE 358: Reverse osmosis system (SA Water Purification, 2023).

6.7. RAINWATER HARVESTING

6.7.1. DEFINITION

It is the collection, storage, and reuse of rainwater. Mainly collected off roof surfaces or other platforms, for example, balconies. Another source for collecting rainwater is from the ground surface and below-ground levels. This is more commonly known as stormwater collection (School of Engineering, n.d.).

A rainwater-harvesting system (Fig.359) consists of the following components; a catchment surface, and runoff channels, more commonly known as gutters, to harvest the rainwater. In some of the systems, a filter is also included, to remove particles, that can clog the irrigation system (School of Engineering, n.d.).

Once the water is collected a pump is used to divert the water to other points of use.

6.7.2. HARVESTING FORMAT

The capacity of the amount of water harvested is influenced by the method of catchments- and runoff systems (Swanepoel and Holden, 2004).

In the final design of this dissertation, mainly double-pitched roofs are used. This makes it more difficult to collect and transfer rainwater (Wetec, 2019).

With these types of systems, a separate storage tank is used with its own irrigation and distribution network (Swanepoel and Holden, 2004).

FIGURE 359: Chain into water channels for rain water (Author, 2023).

The tank should be adequately ventilated to prevent anaerobic decomposition of any matter required for cleaning (School of Engineering, n.d.).

The tank internals should be easily accessed. It should be of sufficient structural strength to withstand wear and tear, and occasional significant natural forces (School of Engineering, n.d.).

It should present no hazard to passers-by or small children it should be constructed of non-toxic materials (if water is destined to be reused as potable) (Wetec, 2019).

6.7.3. WATER QUALITY

For rainwater to be used for consumption, requires an analysis of the elements used in the system, such as the catchment surface, systems, and needed information for purifying the water (Swanepoel and Holden, 2004).

The existing vegetation found on site could impact the quality of the water (Swanepoel and Holden, 2004). Once the potential contamination sources are known, an applicable filtration system is included, to clean the water.

The water quality is also impacted and influenced by the type of tank that is used to store the water (Fig.360), for example, if the tank is composed of translucent materials, it encourages the growth of algae (Swanepoel and Holden, 2004).

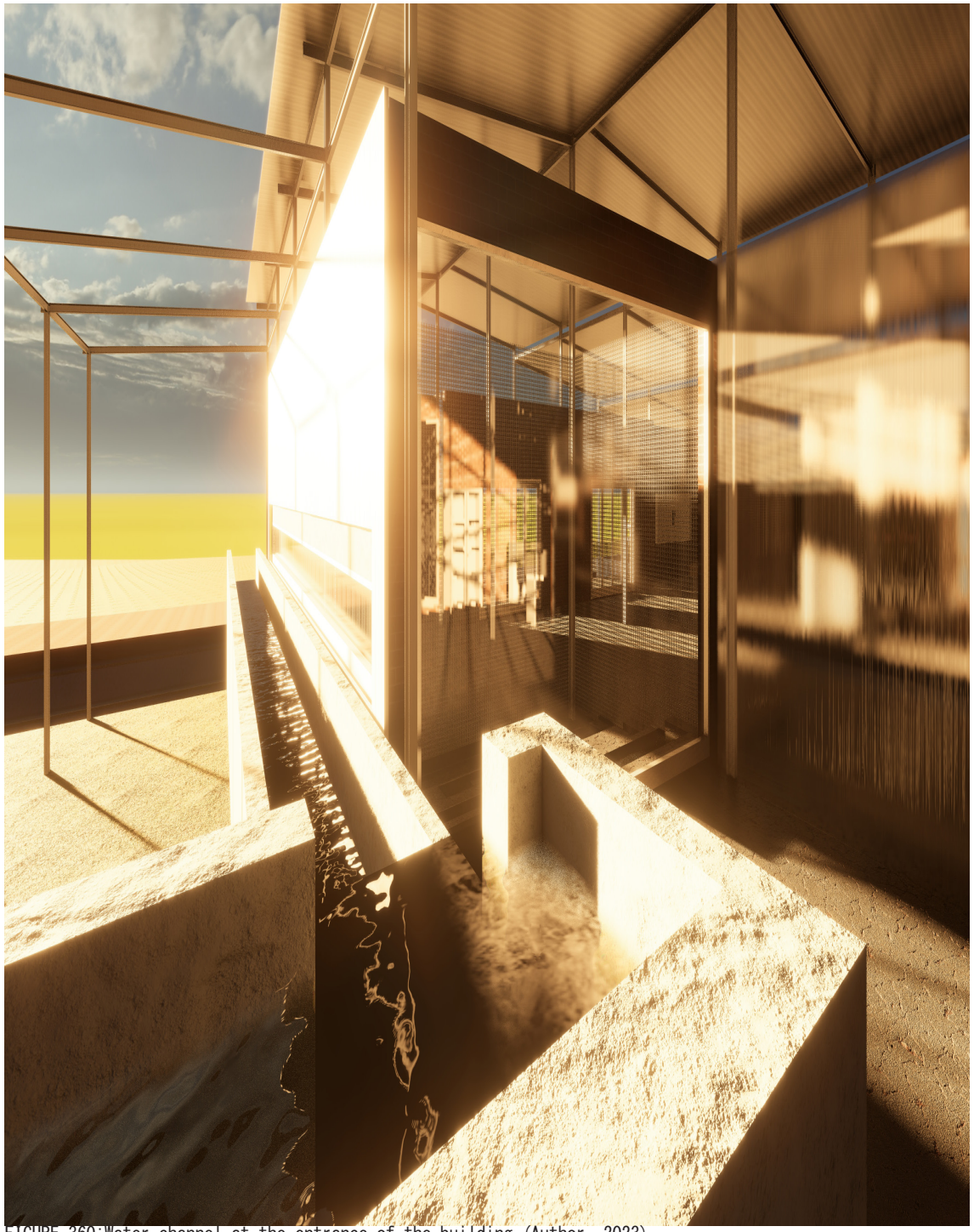


FIGURE 360:Water channel at the entrance of the building (Author, 2023).

6.8. WATER DIAGRAM

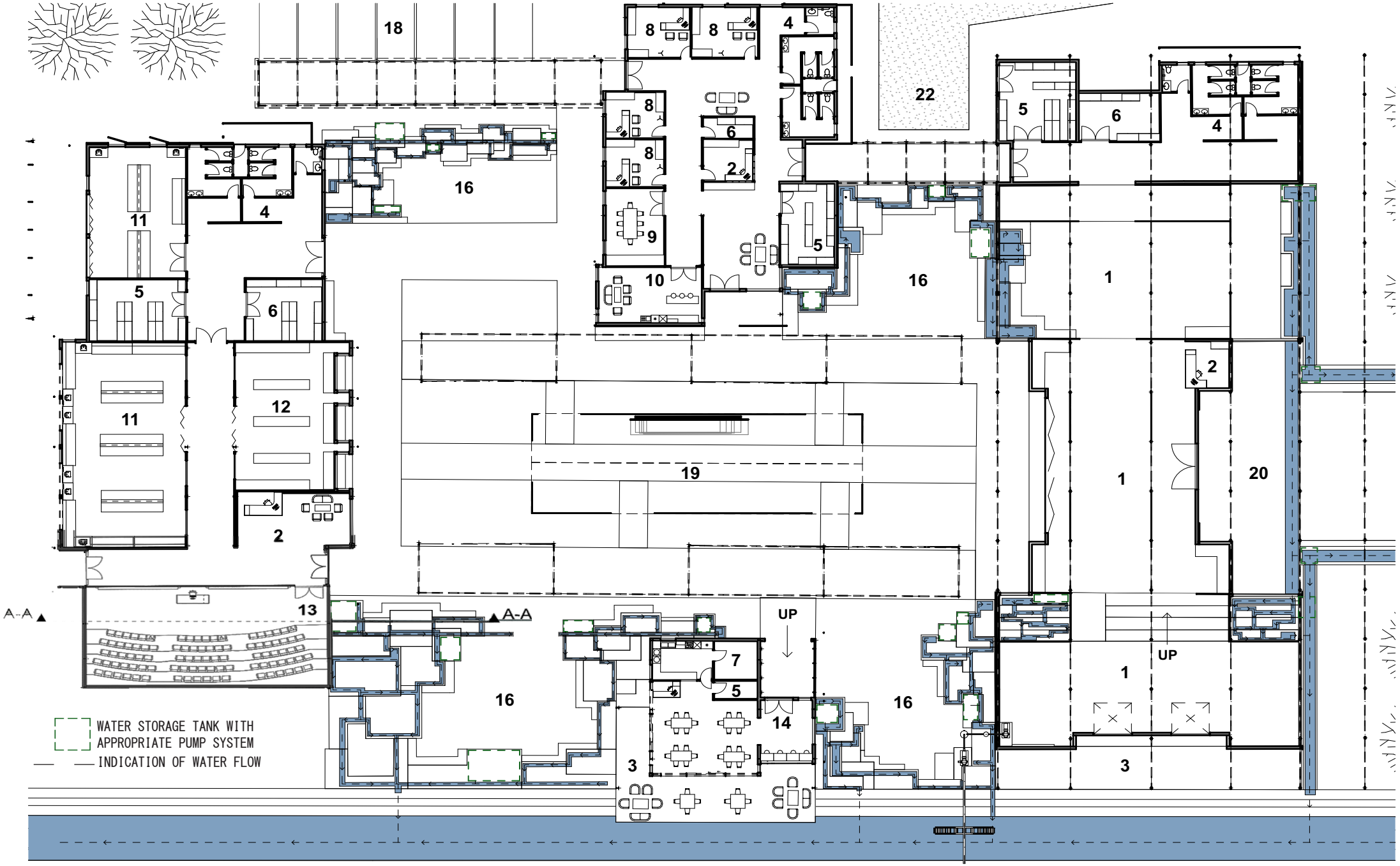


FIGURE 361:Water diagram (Author, 2023).

The water channels water supply is provided by a pump system, that consists of a storage tank and a pump system (Fig. 362).

This creates the opportunity for consistent movement of the water in the channels, which helps to prevent algae from growing and the infestation of insects.

A detailed section of the channels will be provided in the construction drawing, at the end of the document.

The gutters also supply water to the channels during rain periods, by directing the water from the gutter to the channels, by using a chain, that is treated to prevent rust and other forms of erosion. A detail of this will also be provided in the construction drawings.

FIGURE 362:Water channels in the planter boxes at the resturant (Author, 2023).

6.9. PARKING AND ACCESS: Form is created by countours.

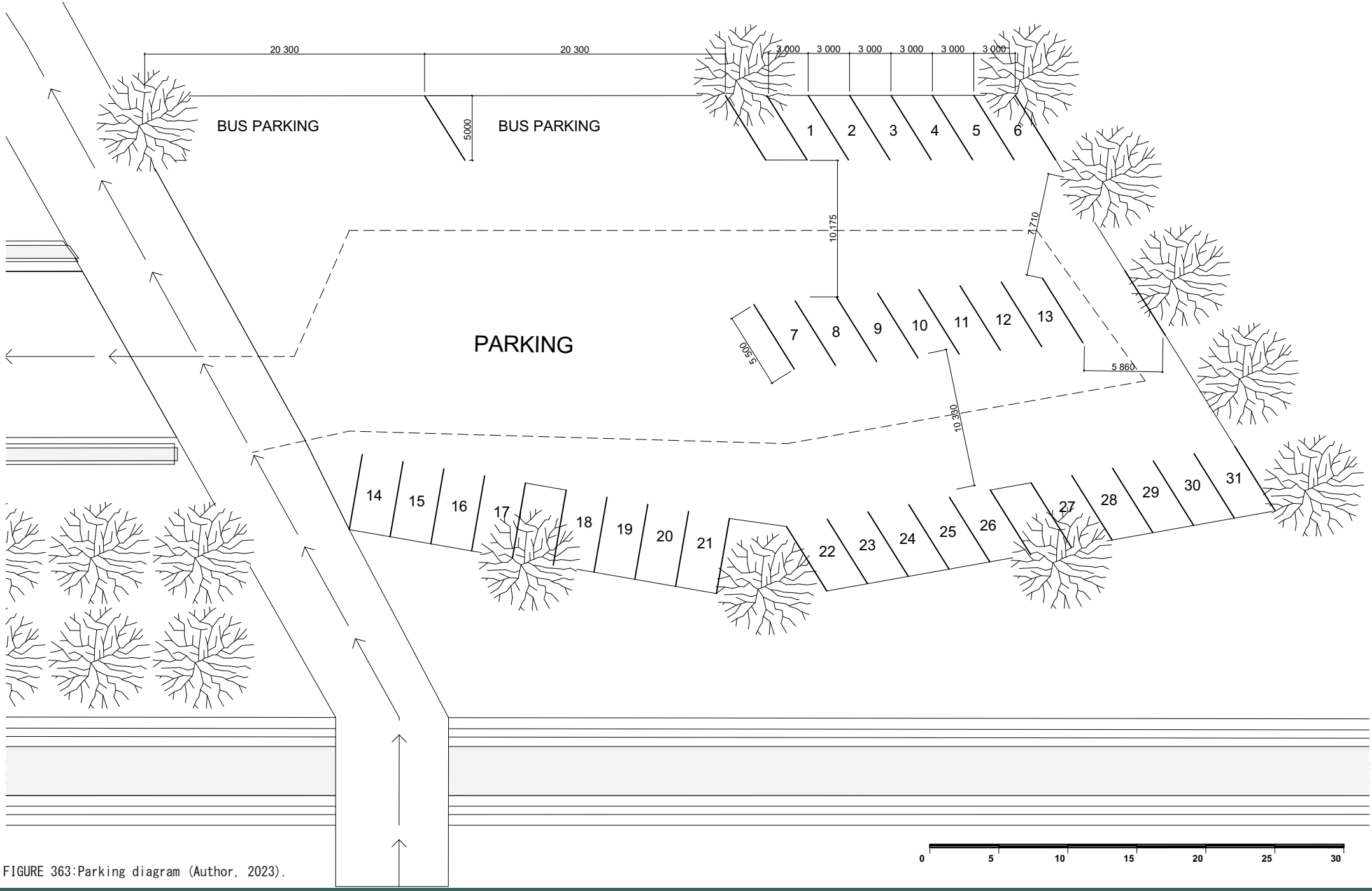


FIGURE 363:Parking diagram (Author, 2023).

6.10. VENTILATION OF EXHIBITION SPACE

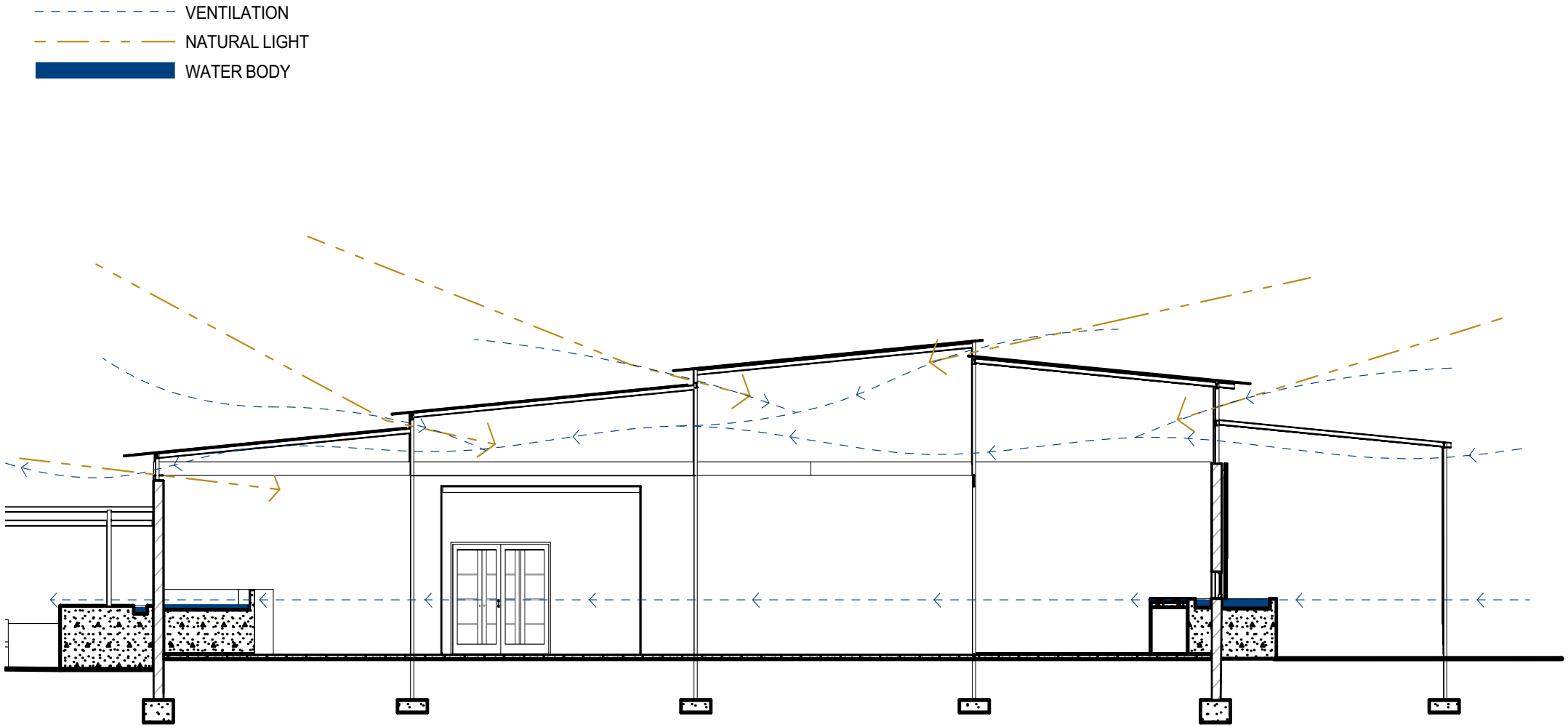


FIGURE 364:Ventilation diagram (Author, 2023).

6.11. ELECTRICITY

6.11.1. SOLAR ENERGY

The following system will be looked at for the generating of electricity for the building, a PV system and energy storage solution (Fig.365). This provides the opportunity to harness the power of the sun, to generate electricity that we can control (Wilson, 2023).

Sungrow has different smart energy solutions, for different systems and circumstances. They aim to help overcome electrical challenges, such as load shedding and help achieve energy independence. It is easily used, with the use of a switch and is noise-free (Wilson, 2023).

This system consists of the following componets (Wilson, 2023):

1. ENERGY INDEPENDENT
- Fast Charge
- High Discharge
- Usage during load shedding.
- Multiple system options for different load-shedding stages and sizes of buildings.
- Seamless Switch: without influencing the operation of the appliance.
- Grid Adaptive

2. BETTER EXPERIENCE & EASY INSTALLATION
- Extremely Quiet
- Smart Monitoring
- Increase installation efficiency with standardised plugs.
- Stackable Design
- Built-in battery circuit breaker, fuse & SPD.
- Smart Battery

3. SAFE & QUALITY
- Water & Dust Resistant
- Lightning Resistant
- Fire Threat Resistant
- Corrosion Resistant
- South Africa NRT & CoCT approved quality.
- EU standard low radiation level.

FIGURE 365: Ariel view of PV system (Wilson, 2023).

4. MORE GENERATION & MORE PROFIT
- Start generating earlier and stop later with a wider MPPT range.
- 200% PV capacity.
- Connect more panels to charge batteries and power load at the same time.
- Connect high-power panels for various roofs.
- Recovery panel daily loss through patent PID recovery design.

5. FIRST-CLASS SERVICE
- 10-Year Warranty
- 48h Maintenance
- 24/7 Service Hotline

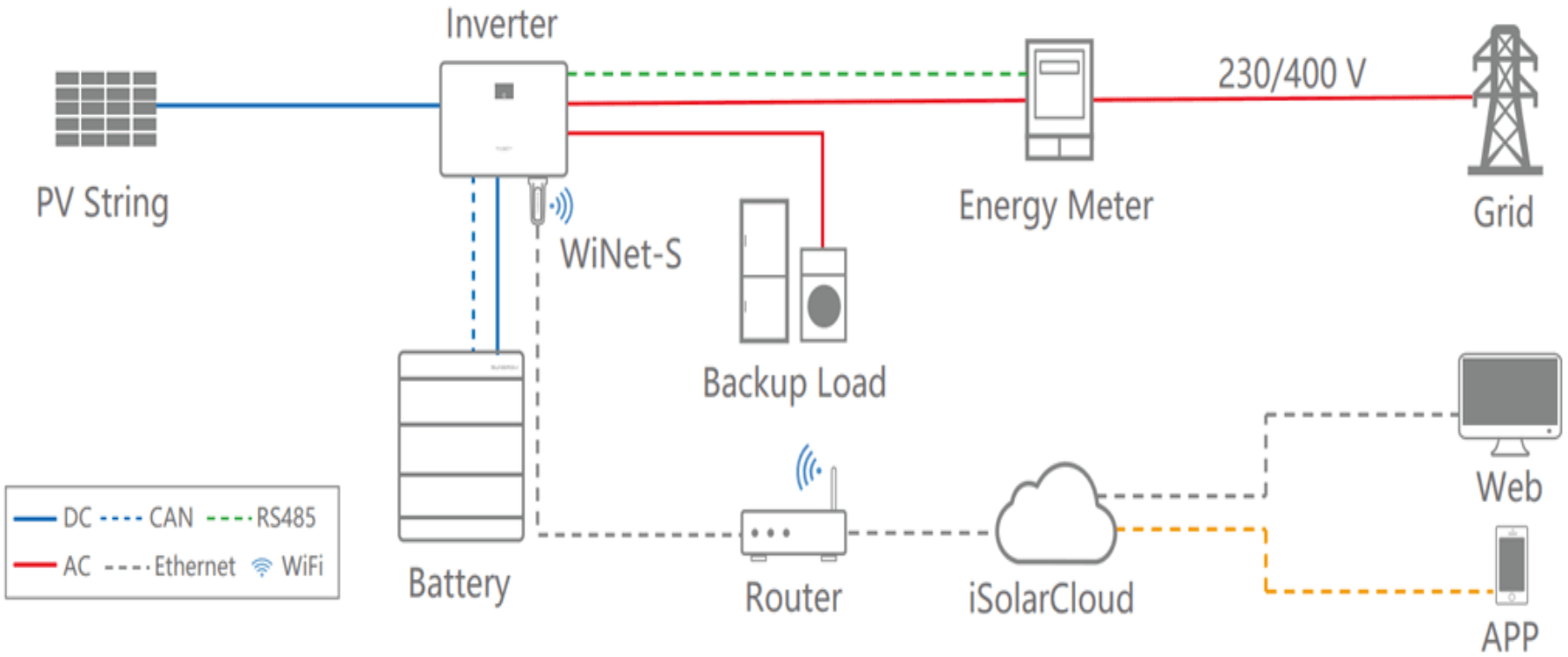


FIGURE 367: Exploration diagram of the system (Wilson, 2023).

6.11.2. HYDROPOWER

WHAT IS HYDROPOWER?

Electricity generated by water is one of the oldest and largest systems of renewable energy (Energy.gov, n.d.). There are different types and sizes of hydropower facilities, it all depends on the size and flow of the water source and where it is located (Energy.gov, n.d.).

HOW DOES IT WORK?

To be able to use hydropower systems, there must be a difference in elevation, from the upper water source to the lower water body (Fig.368). The structure allows water to flow in on the one side from the upper level, and then out again on the lower level (Energy.gov, n.d.).

Due to the system only relying on the energy of moving water, it is much more affordable and economical(Fig 369). During the use of this type of system, the cost is lower, compared to other electrical systems that can be used (Energy.gov, n.d.).

There is an unfortunate cost of the installation that is unavoidable, but due to hydropower systems having a longer lifespan, and less maintenance work needed throughout the years that it is used, the cost can be spread over a longer period. The replacement of components is also minimal, which saves money (Energy.gov, n.d.).

Depending on the type of system that will be installed, will determine the cost, and need for additional services and expertise to install the system. Such as civil construction works, and electrical machinery (Energy.gov, n.d.).

FIGURE 368: 3D view of the water wheel in the project (Author, 2023).

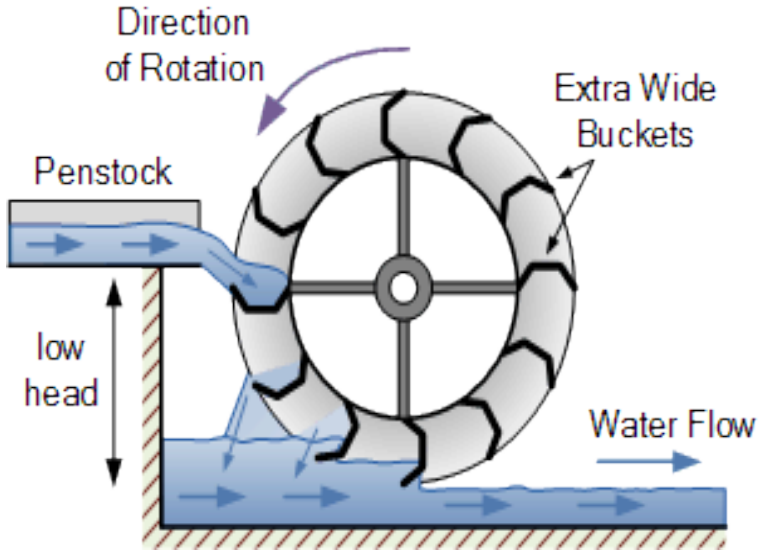


FIGURE 369: Water -wheel diagram (Tutorials,n.d.)

The location of the site also has an impact on the type of system that will have to be used as the site will have to be analysed by an expert (Fig.371), to determine the type of system that will be needed and how they will be able to minimize the cost, during the beginning stages of thee project (Fig.370) (Energy.gov, n.d.).

WHAT ARE THE BENEFITS OF HYDROPOWER?

The following points are some of the benefits of the use of hydropower (Energy.gov, n.d.):

- Clean form of energy
- Cost-effective
- Can provide power to the grid immediately
- Flexible and reliable form of power
- Helps with flood control
- Provides irrigation support
- Supply water

FIGURE 370: 3D view of the water wheel in the project (Author, 2023).

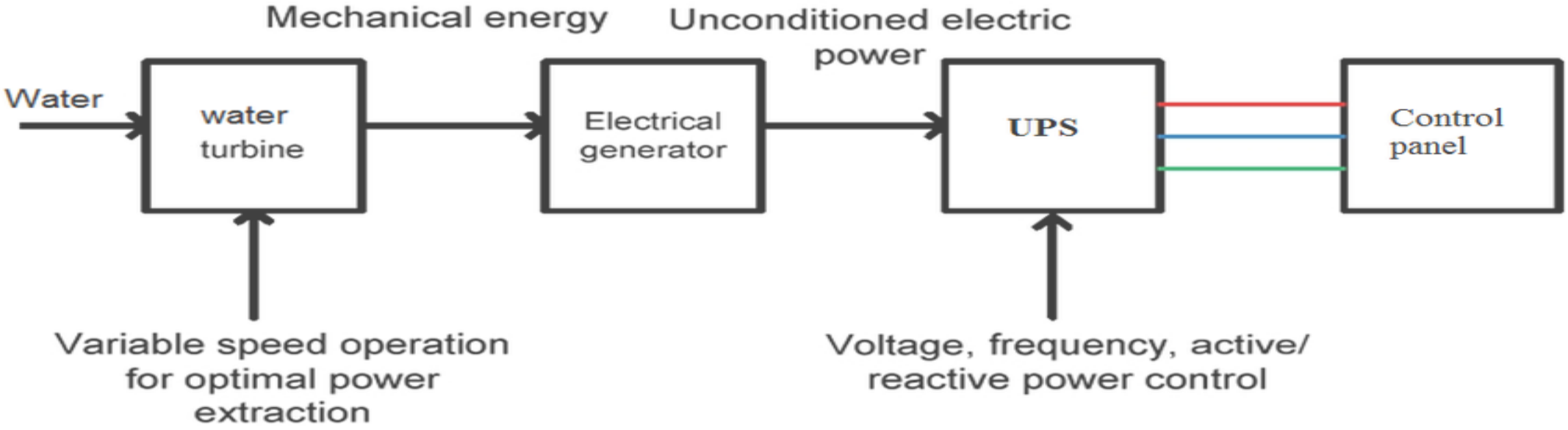


FIGURE 371: Block diagram of the process of hydropower (Bhardwaj, 2014.)

6.12. CONCLUSION

In conclusion, the given information provides a brief overview of the systems that will be used in the project.

With each part, there will have to be more in-depth research done to specify how, where and when it will be used and if it is applicable to the use of that system.

There are also other possibilities of systems that can be used, as there are with every project. By researching different systems, it has led to the systems described and discussed above.

With many of the different components of the systems (Fig.372), specialists or workers with the required knowledge will have to be consulted and appointed in order for it to work successfully.

In the end, all the different systems and components will help to provide better control and minimize possible defects or problems in the future.

FIGURE 372: 3D view of Internal waterway (Author, 2023).

07

FIGURE 373: PHOTO OF THE SURROUNDING PLANTS (AUTHOR, 2023).

7.1. PROJECT REFLECTION

The Water Memory and Control Center is a combination of natural and man-made. It reflects and shows the impact the one has on the other and the impact it has on a larger scale, towards the community and its surrounding areas.

It has the potential to grow and expand, by building onto the existing, or by designing spaces that aim towards the same goals as this dissertation. The rejuvenation of knowledge, creating a relationship between man and nature, sparking interest in the subject in question, and honouring what, why and where an experience took place.

This dissertation creates a space where education, experimentation, and experiences happen within a learning environment, both visual and auditory. It is a building that can be appreciated in different ways depending on the mindset and perspective one approaches (Fig.374).

Ultimately having control of the experience and memory in your hands.

FIGURE 374:PHOTO OF LOCAL SLUICE (AUTHOR, 2023).

08

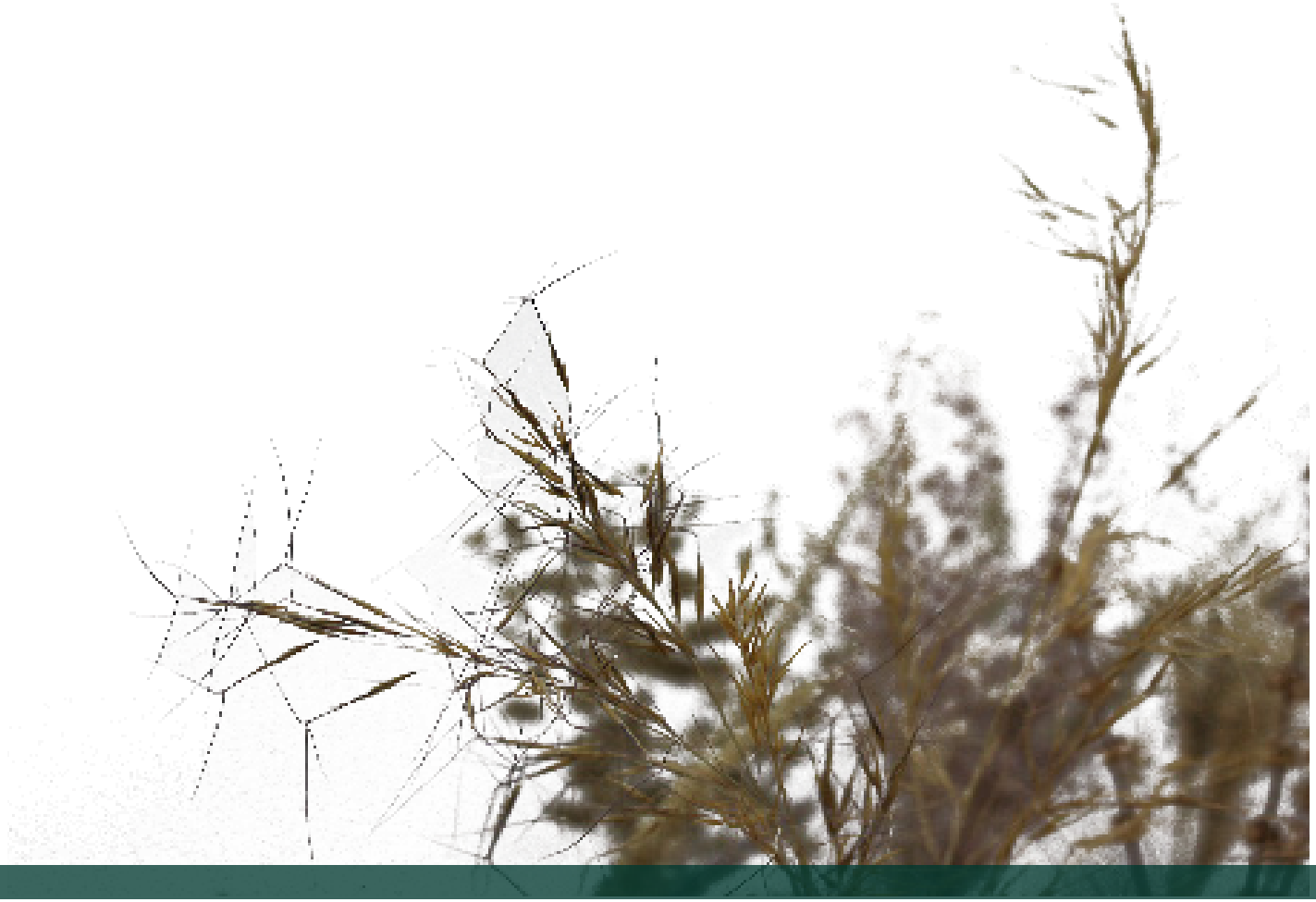


FIGURE 375:PHOTO OF THE SURROUNDING PLANTS (AUTHOR, 2023).

8.1. REFERENCES

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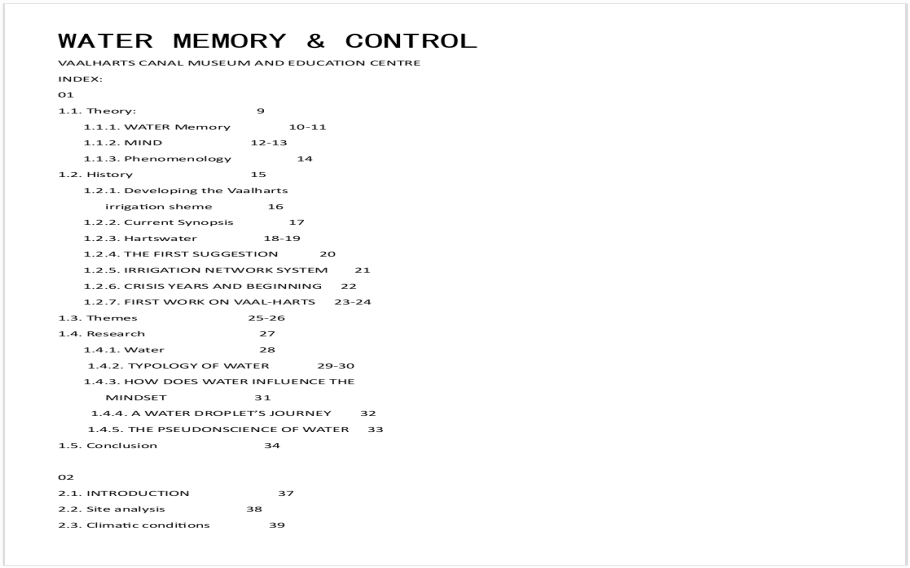

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