

The Hidden Boundary

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01 Introduction

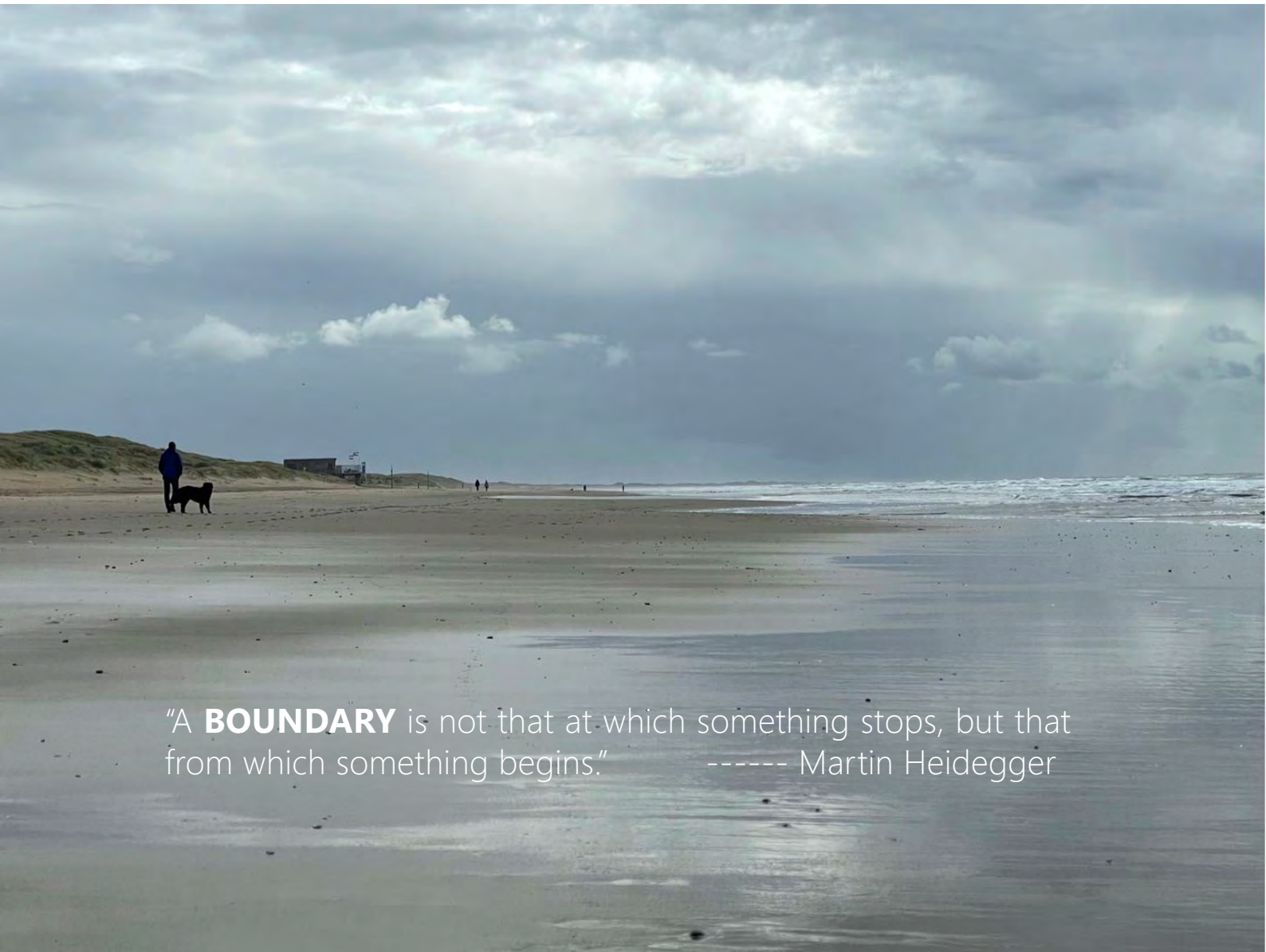
Preliminary research and planning



Figure 01-1 Photograph of the Den Helder demolition zone in 1942
Source: WUR Library Special Collections, and Den Helder Historical Society

In order to create an unobstructed field of fire, in 1942 (during World War II) the Ouwe Helder neighborhood and a wide swath of housing along the coast were systematically demolished, creating an inevitable physical and psychological boundary in the city.

The 'BOUNDARY'
Hidden Boundary in Den Helder
Meanings of the Boundary in Den Helder
Research Question & Goal
Methodology
Glossary



"A **BOUNDARY** is not that at which something stops, but that from which something begins." ----- Martin Heidegger

I have always been attracted to empty landscape spaces in quiet or less crowded boundary areas. These places are like 'another world' from my everyday environment. Here I will calm down and become relaxed, I can daze or even dream. So the 'boundary' area is always of great interest to me.

When I first came to explore the Den Helder as a tourist, these boundaries provided me with a safe place to experience the spatial environment of the city.

The first time I saw Den Helder's map, I found that there was such a large area of green linear space in the center of the city, which was the historical defense line of the city in the past.

As a spatial component, boundaries are sometimes overlooked. During my field trip there, I found that when the space existed as a boundary in this city, it was indeed rarely stayed or even visited by people. At this point, I thought it was time for me to discover its potential and do something for it.

The 'BOUNDARY'

'**Boundary**' is all around the world. Boundaries define the way we live, there are a lot of types: physical, social, political, and many more. These are just the reflection of our inner mental limits and fears that we impose to others and to ourselves. The boundary of an area of land is a **physical line** (and in rare cases, it may be constructed based on an imaginary regional boundary line) that separates it from other areas.

The boundary place is a sort of melting pot where **all layers of society met**, poor, rich, old, children, and so on. When getting into the thresholds of these places, new worlds would emerge.

Boundaries are important for landscape design. They can support multiple uses and are of great experiential and cultural significance.

As a spatial component, the boundary is **sometimes overlooked**. And, when people first came to explore a city as a visitor, the boundary zones might be some places that provide safe places for them to feel the urban spatial environment.

Exploring the boundaries in Landscapes is a process of creating meaningful 'places'.

Furthermore, people need public spaces to meet their needs to **socialize**.

We humans are, by nature social creatures, and without other people, we become alienated, depressed, and lonely. We grow up in families, in neighborhoods, and in schools with lots of kids... That is the life experience.

People need three kinds of time: group time where there is socializing, one-to-one time where there is dialogue, and alone time by oneself.

At the same time, it is in the **boundary area** that meaningful places could be created that provide social opportunities and meet the needs of group **socializing**.....

The **socio-cultural value** of the boundary space:

Inclusion: Boundary space is also the expression of social justice and tolerance; This inclusive "boundary space" is a place that brings together the cultural particularities of the city, embraces the diversity of social life and embodies the spirit of freedom.

Interactivity: The lowest intensity of interaction between people is called passive contact (Jan Gehl, 1960, p.12-15). It is an ordinary chance in everyday life. We could also talk about coexistence in a single space. People in public places are there for personal reasons. Although this passive contact interaction cannot turn into anything more than mere coexistence, it does not affect the purpose of their existence in the same space.

People tend to do activities in public areas. Especially when one is crossing space, it is usually most comfortable to move along the edge (boundary space). So the boundary space increases the "chances" of contact. Even if they do not intend to do so, the interaction between people is still further enhanced.

The **spatial environment value** of the boundary space:

Equality and freedom: The boundary space can be an open public space shared by the whole city. There are no restrictions on the right to use it within the city. Access is equal for all. It is a resource for the whole of society; This equal character is also reflected in the openness to the various organisms of nature, in order to achieve a harmonious coexistence between man and nature. In the meantime, the spatial environment at the boundary is usually more random, and plants can grow more wild and free here.

The **economic/aesthetic value** of the boundary space:

Randomness: As one of the most potential spaces in the city, the land space in the border area has huge potential economic value.

Hidden Boundary in Den Helder

The city, **Den Helder**, is located on the northernmost coastal border of the North Holland province. It is surrounded by 3 different seas, the north sea, the Wadden sea, and the Marsdiep. The **defence line area**, which as the **Hidden Boundary of Den Helder**, is an area acting as a green corridor or a barrier between the city's three main urban built-up area.



Figure 01-3. the 'HIDDEN BOUNDARY' in Den Helder

Source: Image by author, and map based from Map data: Google, SIO, NOAA, U.S. Navy, NGA, GEBCO Landsat / Copernicus.

The meaning of the name of this project:

'Boundary':

In this graduation project, the word 'Boundary' is mainly related to the **defence line area** in **Den Helder**.

'Hidden':

1. unknown: There's a lot of history behind this highlighted defensive line area that people don't know. The city has the Hidden history value.
2. unnoticed: not clearly seen or easily distinguished; being out of sight or not readily apparent:

This **defence line area** is a boundary place that people often pass by but few people pay attention to.

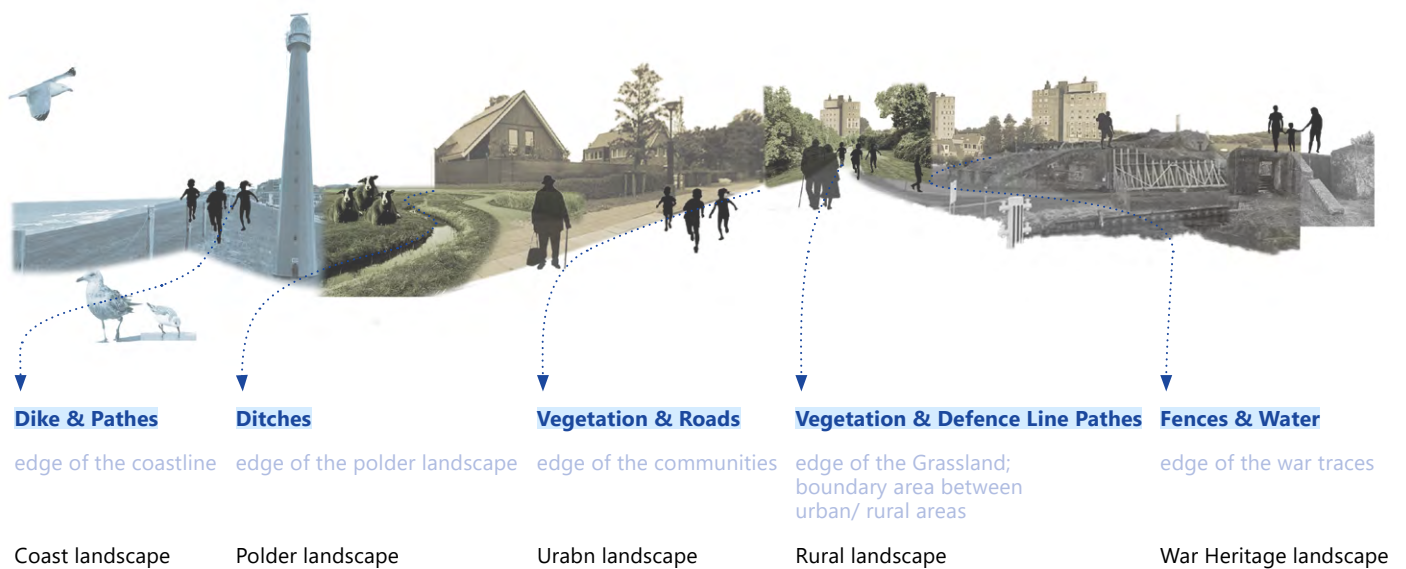


Figure 01-4. First impression of boundaries in Den Helder's Defence Line area
Source: Drawn by author

A city has many kinds of **boundaries**. These boundary areas have great possibilities and opportunities.

During my first time visited Den Helder, I saw many edges or thresholds in these different landscapes. For example, the coastal dike, the ditches, the roads, and the fence.

Meanings of the Boundary in Den Helder

The city of Den Helder has all kinds of boundaries. But now some of its features are fading away. These boundary areas have great possibilities and opportunities.

The 'Stelling of Den Helder', as one of the oldest still present **military defensive lines** in the Netherlands, can be used as a very important urban structural feature of Den Helder. However, as Den Helder develops, the defense line is no longer directly connected. People almost only walk, bike, or drive through, hardly anyone stays.

This green linear space acts as a corridor and lacks recreational function and vitality. This gives Den Helder a great opportunity to enhance its city's structural characteristics, and improve the environmental quality of green living spaces as well as the quality of animal habitats. At the same time, the residents need to raise their awareness of protecting species diversity and preserving historical heritage.

To sum up, the problems or characters of boundary areas in Den Helder can be studied and analyzed mainly from 3 of its values (history, spatial composition, and spatial experience), and the following three related explanations are raised:

1. Den Helder has a **rich history** with the 'scattered' traces of war in the city, and it is facing the problem of losing its historical memory. If people know little about the history, they can only have fragmented memories about the city.
2. The Den Helder city has three main residential areas on the north and south sides of the Defence Line structure. People usually just pass through or cross this boundary area quickly, few people could pay attention to this boundary linear space, and few people stay. This line of defense still **lacks transitional spaces** for people to meet or communicate with others or **continuous focuses** for people to be attracted to keep chasing.
3. When talking about the spatial experience of the Defence Line area, this green linear space serves as a corridor between the three main urban living spaces. The use and landscape forms of this linear defence line space **lacks variation** and can be more diverse. Moreover, this space is **no longer as continuous as it was in history**. People can't go straight from start to finish. It is a space that people rarely notice. Due to the discontinuity of the linear space of the boundary, not to mention it allows people interested in the urban structure the opportunity to experience the entire defensive space.

Research Question & Goal

In general, the boundary space has great development potential, and it is usually continuous linear, and rich in time and space changes. Therefore, based on the above understanding of the boundary, the research question is proposed:

How to **reactivate** and develop a **multi-functional boundary** area and surrounding landscapes based on the exploration of **spatial and temporal continuity**? (**Research Question**)

The defensive line area of Den Helder is currently a space with a rich historical story, where there is a lack of gentle transitional spaces and rich spatial experiences. The project aims to fully understand **the hidden meaning** behind the Den Helder Line area (both historical and continuous) as a boundary space by utilizing the **existing continuous linear space**, which also leads to several steps with **sub-questions** for subsequent cross-scale research and design:

Q1: (theoretical field) understand the '**BOUNDARY**' topic:

What is the 'boundary'? What is the value of boundary? How to make good use of it or get benefits from it?

Q2: (site analysis) explore the '**BOUNDARY**' in the city:

What are different types of boundary areas in Den Helder?

Q3: (site analysis) understand the relationship of the **Defence Line spaces** to the city and to people:

How did the Defence Line area gradually develop into its present form over history? What are the boundary or meaningful 'places' around the Defence Line area? How can people feel about the spatial environment of this area?

Q4: (case study) study the proper **use of boundary space**:

How to reactivate useless or boundary spaces? What kinds of functions, programs or human practices can a boundary space have?

Q5: (case study) study methods of experiencing **temporal change** or **continuity** in linear or boundary space:

Principles and approaches for a linear boundary space connecting meaningful places? How can different kinds of places be connected for better spatial or temporal continuity?

Through the '**design research and research-by-design**' process, the proposed **research question** could be answered gradually and **sub-questions** would be divided into different steps.

1. design research process:

a. theoretical study and literature research:

Den Helder's specific different types of boundary areas will be analyzed according to the research results of the study of these theoretical aspects of the problem:

1. understand the term boundary(what is the 'boundary'?)
2. explore the values/characteristics of boundaries (how does boundary work?)
3. How will boundaries benefit the urban environment?
4. How to make good use of it/ get benefits from it?

b. site analysis:

1. What are the different kinds of boundaries in Den Helder?
2. How did the Defence Line boundary area develop throughout history in Den Helder?
3. What is connected/divided at the boundary from different perspectives?

In order to have a more comprehensive understanding of the urban defense line area, the places in Den Helder are analyzed through various methods such as historical analysis, map studies, spatial analysis, visual analysis, social behavior and activity analysis, etc.

The Defence Line boundary analysis will be done through different scales from the perspective of four dimensions (length/ height/ width/ time):

Large-scale: Starting from the large scale, Den Helder City, the city's main boundary structure would be illustrated.

Middle-scale: After the city-scale study, the study area will be narrowed down. The defiance line area for further research and design in the next phase will be defined. Some historical background information and old photographs of the boundary areas would be organized and interpreted together in timelines.

Small-scale: On a smaller scale, the spatial continuity and environmental quality of boundaries would be analyzed through field trips in Den Helder from my personal perspective. This boundary area will be analyzed from three aspects (in

the direction of length/ height/ width) and visualized by some mappings.

length: spatial components/continuity for different user groups

width: how to access the boundary area? what to experience (sub-spaces/ transitional places)? what is the transition crossing the area?

height: topography

time: development and history of the Defence Line in Den Helder

Field trip analysis: observe people's behavior and feel the spatial quality through sensorial experience and collect recordings or images in different areas(recording sound, walking scores, photographs, mental maps...); Different green spaces combined with different users are classified. Then, summarize and propose improvement ideas to organize them into a more organized system.

c. case study (precedents):

how to reactivate useless/ boundary spaces (What kinds of multifunctional functions/ programs/ human practices can the spaces have?

principles/ approaches for the spatial continuity of the boundary landscape connecting the meaningful 'places'?

Search for appropriate case studies on different topics during the preliminary design experiment stage and come up with approaches for improving the spatial experience and spatial continuity.

topics related to boundary (searching field): linear spaces, linear parks, green corridors, overhead/ bridge connection, community bridge

2. research by design process:

case study (Research for suitable boundary approaches):

brain storm and make imaginary design sketches in different dimensions' circumstances (ecology, path, extreme...).

explore the boundary area's opportunities through different sketches and create new ideas.

according to the sketches, search for suitable precedents and find future proposals/ strategies for Den Helder's boundary area.

Design ideas:

The intention of the project is not to propose new solutions to the problems that would directly change the site completely, but to use the landscape as an intermediate coordinator considering all aspects of the specific site, and then make a loose guide with an open ending to imagine the future. So, an open-ended result would be considered at the end of design:

1. The main idea is to **strengthen the boundary character** of Den Helder city's 'Defence Line', so that people can realize that the boundary is there when getting through or crossing.

2. The **invitation designs** will be placed in the public space: There will be some smooth transitions between public spaces; Being able to see what is going also can be an element of invitation and this will give people chances to have somewhere to go or something to do.

3. **'Slowing down' points (meeting points)** will also be considered. The areas near crosswalks will be improved to slow down the speed of passers-by, which will increase the opportunities for them to meet and interact with each other.

The coherent green space system can be used as an ecological corridor to provide more habitat and stepping stones for animals.

Design approaches according to the 3-dimensional analysis:

1. **length** (parallel the linear boundary space direction):

physical-connection: (reconnected spaces);

visual-connection: (repeated materials/ structures/ focusing points for people to keep chasing and creating their mental image)

conceptual-connection: The process of the city going through the war will be translated as a story into a series of spaces that provide different spatial experiences and feelings and connected by the linear space throughout the Defence Line area.

2. width (crossing boundary direction): add some moments for 'slowing down'; diverse public sub-space attached to the boundary area for people to meet and communicate when crossing boundary area; green system network

3. height (vertical direction): Enriched spatial variation at different height levels

Through this whole project, I proposed the main **research question** and 5 sub-questions that related to different research and design process. I try to search for topics about the 'boundary' and get lots of input, some inspiration from the **theory** field and **practical cases projects**. Then a **glossary** introducing words about boundary and this project was summarized.

Through the '**design research and research-by-design**' process, the proposed **research question** could be answered gradually in different steps. After studying and analysing the history and spatial environment of the whole city, I had deeper understanding and come up with further design ideas of this phenomenal boundary area, the defence line area.

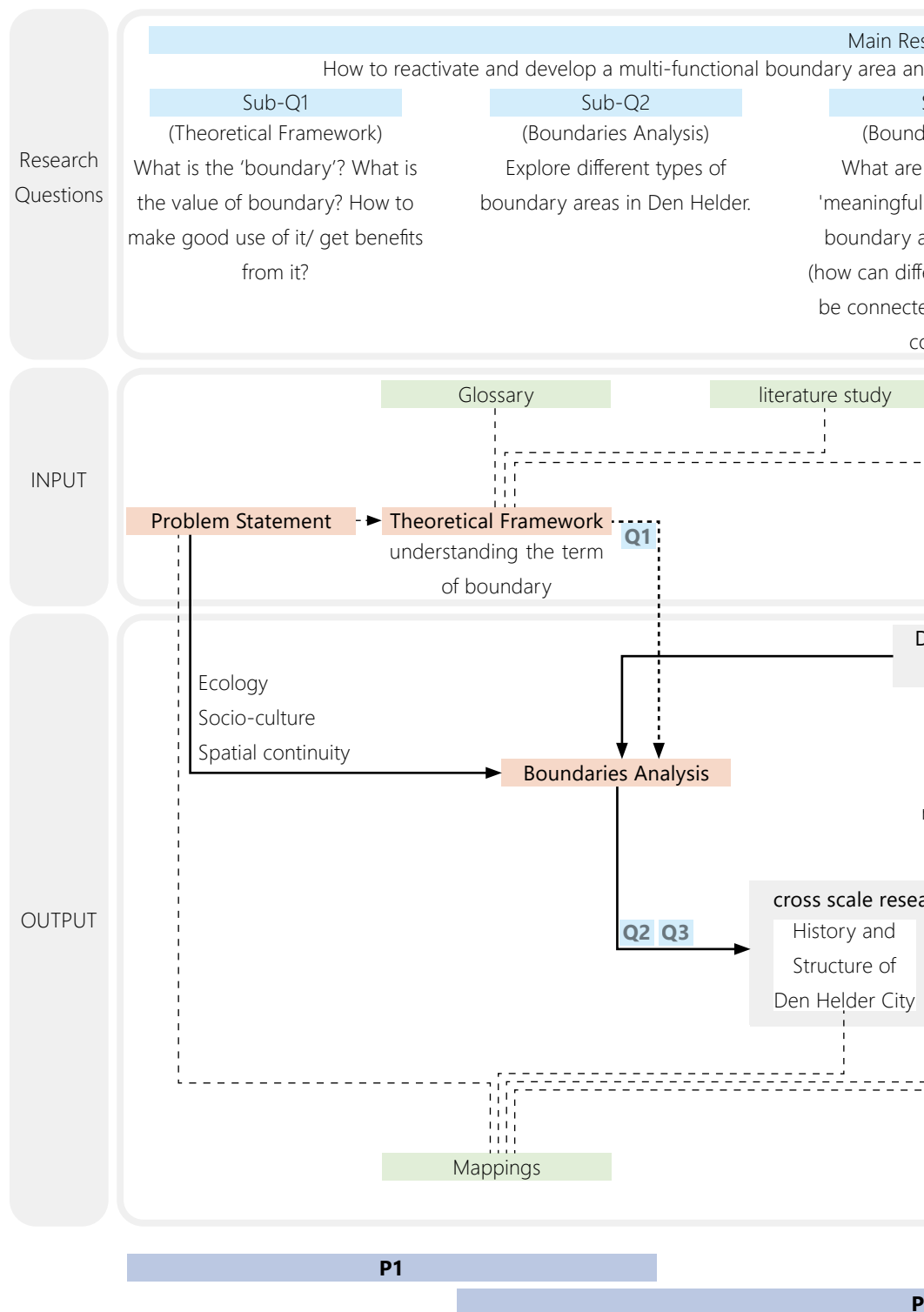
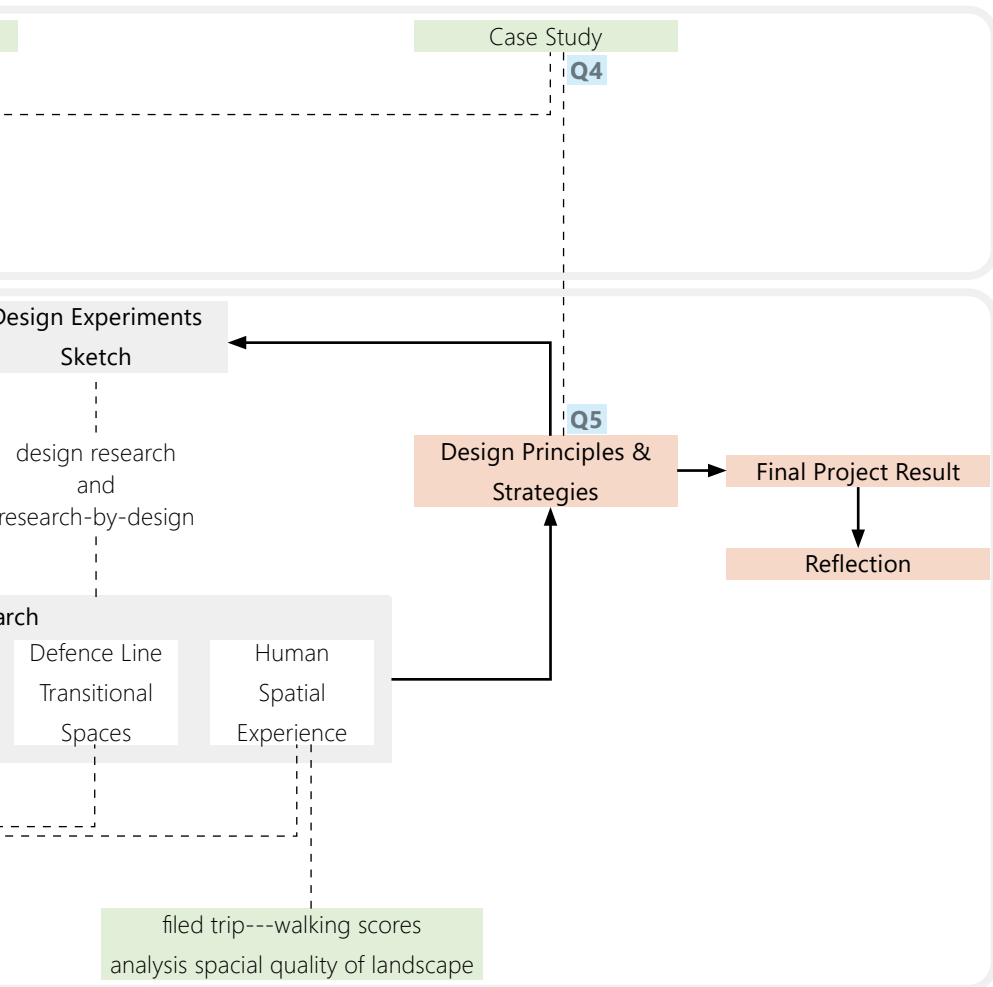


Figure 01-5. Research and design methodology framework
Source: Drawn by author

Search Question		
and surrounding landscapes based on the exploration of spatial and temporal continuity?		
Sub-Q3	Sub-Q4	Sub-Q5
(Landscape Analysis)	(Case Study)	(Case Study)
the boundary &	How to reactivate useless/	Principles/ Approaches for
'places' around the	boundary spaces? (The	the spatial continuity of the
area in Den Helder.	spaces can have what kinds	boundary landscape connecting
erent kinds of places	of multifunctional functions/	the meaningful 'places'
ed for better spatial	programs/ human practices?)	
continuity)		



Time Planning

Questions

Titles

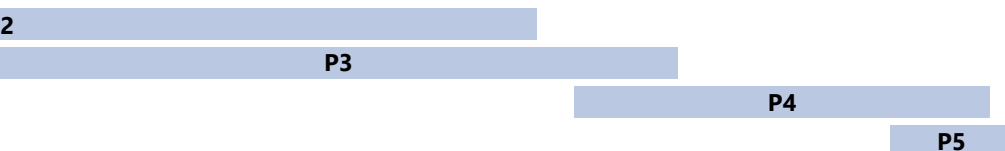
Sub-titles

Methods

→ main links

--- sub-links

----- method links



Glossary

The "Glossary" is listed in the introduction section as a **reading guide** for this graduation project. Some of the main concepts and words related to the "boundary" topic were chosen to explain and define the scope of the project (some of the words will be provided with some explanation of their **relationship to the 'boundary'**). All sources are based on literature and personal interpretation of some interpretations and some interpretations of the relationship between words and boundary.

Accessibility

capable of being reached, capable of being used or seen

Barrier

A physical boundary, a naturally occurring barrier between two areas

Border

A border is a real or artificial line that separates geographic areas. Borders are political boundaries.

Political boundaries are the dividing lines between countries, states, provinces, counties, and cities. These lines, more often called borders, are created by people to separate areas governed by different groups.

Border is a see also of boundary.

As nouns, the difference between border and boundary is that border is the outer edge of something while boundary is the dividing line or location between two areas.

Boundary

A boundary is a real or imaginary line that separates two things; In geography, boundaries separate different regions of the Earth. Neighborhoods often have fuzzy geographical boundaries; Social boundaries occur where social differences lead to unequal access to resources and opportunities.

Connectivity

the state of being connected or interconnected, having all constituent parts linked or connected

Continuity

Lack of interruption or disconnection; the quality of being continuous in space or time

Den Helder (city)

Coordinates: 52° 56'n 4° 45'e

The city of Den Helder is located in North Holland. Den Helder occupies the northernmost point of the North Holland peninsula. It is home to the country's main naval base and have a rich marine history.

Den Helder (city):

Den Helder is a regional boundary (surrounded by the sea on three sides) in a city-scale area.

Many types of boundaries are also structured in Den Helder. The green linear 'Defence Line' area served as a corridor between three main 'fragmented' urban living spaces.

Den Helder (landscape)

Den Helder is enclosed by the sea from three sides: North Sea, Waddensea, IJsselmeer. It is surrounded by different ecologically diverse landscape types with lots of ecosystem units (dune landscape, coast landscape, urban landscape).

Ecotone:

transitional boundary areas between different ecosystem types, which are the boundary zone that can have a variety of species. In other words, the city has a great opportunity to improve biodiversity.

Ecotone

a zone of junction or a transition area between two biomes (diverse ecosystems). Ecotone is the zone where two communities meet and integrate. For e.g. the mangrove forests represent an ecotone between marine and terrestrial ecosystems.

An ecotone is a transition area between two biomes, communities of plants and animals that have common characteristics. An ecotone is a place where two communities meet and integrate, resulting in a higher density of organisms and a variety of species. This increase in biodiversity is called the "edge effect". Ecotones may appear as a gradual blending of two or more communities across a broad area, or they may manifest themselves as a sharp boundary line.

Edge

The line where an object or area begins or ends

Glossary

an alphabetical list of words relating to this specific graduation project and thesis, with explanations; a brief dictionary.

Hidden

The "HIDDEN" in this design project refers to the discovery of areas that have gradually disappeared from people's sight/mind or have not been noticed by people, and intends to invite them back into people's lives.

In-between Space

Aldo Van Eyck and Herman Hertzberger explained 'In-between space' as an intermediate space between opposite elements such as whole and parts, inside and outside, open and close, central and decentral.

Inside (see also Inside vs Outside)

an inner side or surface; an interior or internal part or place : the part within

Inside vs Outside

An appropriate connection between inside and outside is very much determined by the site. There is no absolute inside and outside. Inside and outside are relative, and it depends on how people feel and understand the spaces.

North Sea

Sea that moves sand towards, and takes away from, the Dutch dunes. The North Sea lies between Great Britain, Norway, Denmark, Germany, the Netherlands, Belgium and France. It is an epeiric sea on the European continental shelf.

North Sea:

the coastal boundary of the city of Den Helder, which defines the built-up area of the inner city by the outline of the sea.

Outside (see also Inside vs Outside)

an outer side or surface; a place or region beyond an enclosure or boundary

Place & Memory

This graduation project belongs to the "Place and Memory" lab, one of the labs in the Flowscape Studio of the Landscape architecture Track.

Stelling Den Helder

Stelling Den Helder is one of the oldest surviving military lines in the Netherlands. The line of defense was built on the orders of Emperor Napoleon Bonaparte to protect the Wilhelm Sood Naval Factory. The city of Den Helder owes its current shape to this line of defense, which is still very much present in the landscape.

Stelling Den Helder:

a historical boundary, protect the inside residential area from the outside

Threshold

a zone of passage or pause between two spaces, areas, or rooms. mediating movement from one type of spatial status to another.

"The phenomenon of the threshold thrives on spatial ambivalence. Thresholds open up spaces and organize transitions. At the same time, they are read as part of the boundary and can be perceived as a barrier. A space that is delimited by thresholds and space defining elements can be termed a threshold space. Threshold spaces are required for access to the actual functional rooms. They provide a preface to perception of architectural space. They live in the sequence of what lies in the past, present, and future. This means: threshold spaces also live in the expectation of what is to come." (Till Boettger, 2014)

02 Exploration

Perceive the 'Boundary' in Den Helder



26

Figure 02-1 Photograph of spaces along the Defence Line in Den Helder

Source: Photograph by author, 2022

Different materials (trees, shrubs, water, roads, etc.) serve as boundaries, forming and providing different spatial experiences.

- a. Boundary Landscape as Palimpsest
- b. Defence Line as Palimpsest
- c. Boundaries in Den Helder
- d. Defence Line from a Human Perspective

a. Boundary landscape as Palimpsest

Den Helder is a city with a rich history. Thinking about places and memories of Den Helder, the natural and historical aspects of Den Helder are studied at first.

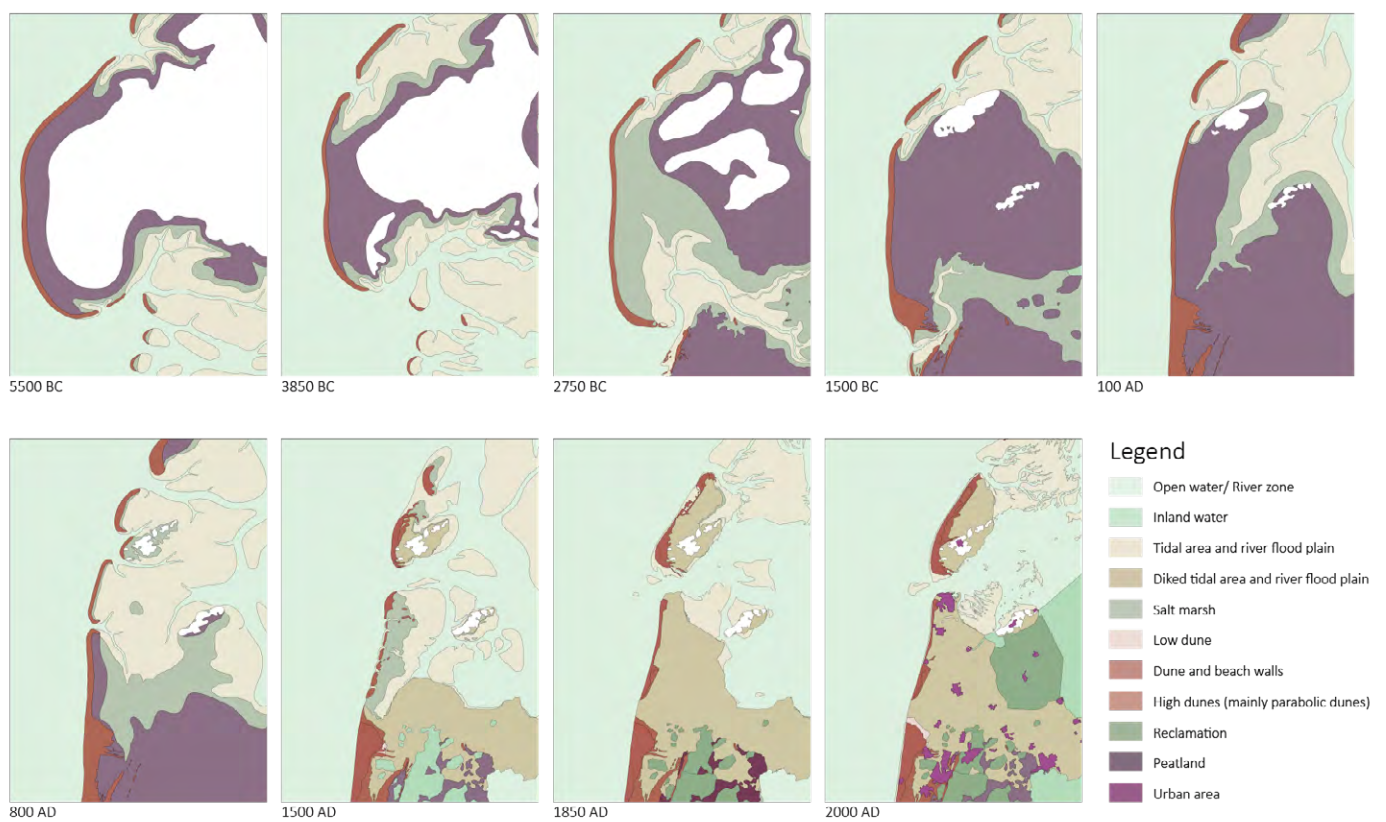
Through the evolution of the ancient geography in the history of the Netherlands, there are corresponding landscape developments in the North Holland region.

It is not difficult to see that as a city surrounded by the sea on three sides, the landscape of Den Helder is a place that has changed dramatically in the past, influenced by human life and natural evolution.

The **landscape has changed a lot** over the centuries. The landscape here is shaped by processes such as **sea level rise, peat growth, subsidence, tidal movements, degradation, and drift**.

It may be hard to imagine now, but for thousands of years, the territory of the city of Den Helder has been **far from the sea**.

This place changed from **a sandy area** with little vegetation to **a Wadden region of islands, marshes, and tidal flats**. Human adapts to changes in the landscape and changes it. Today, the contemporary landscape in and around Den Helder consists of **solid dykes**.



North Holland Geography of Ancient Times Development

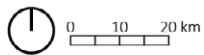


Figure 02-2. The types of soil and the land-sea boundaries have always changed over time
Source: RACM & TNO. Ontwikkeld voor de Nationale Onderzoeksagenda Archeologie www.noaa.nl, redrawn by author

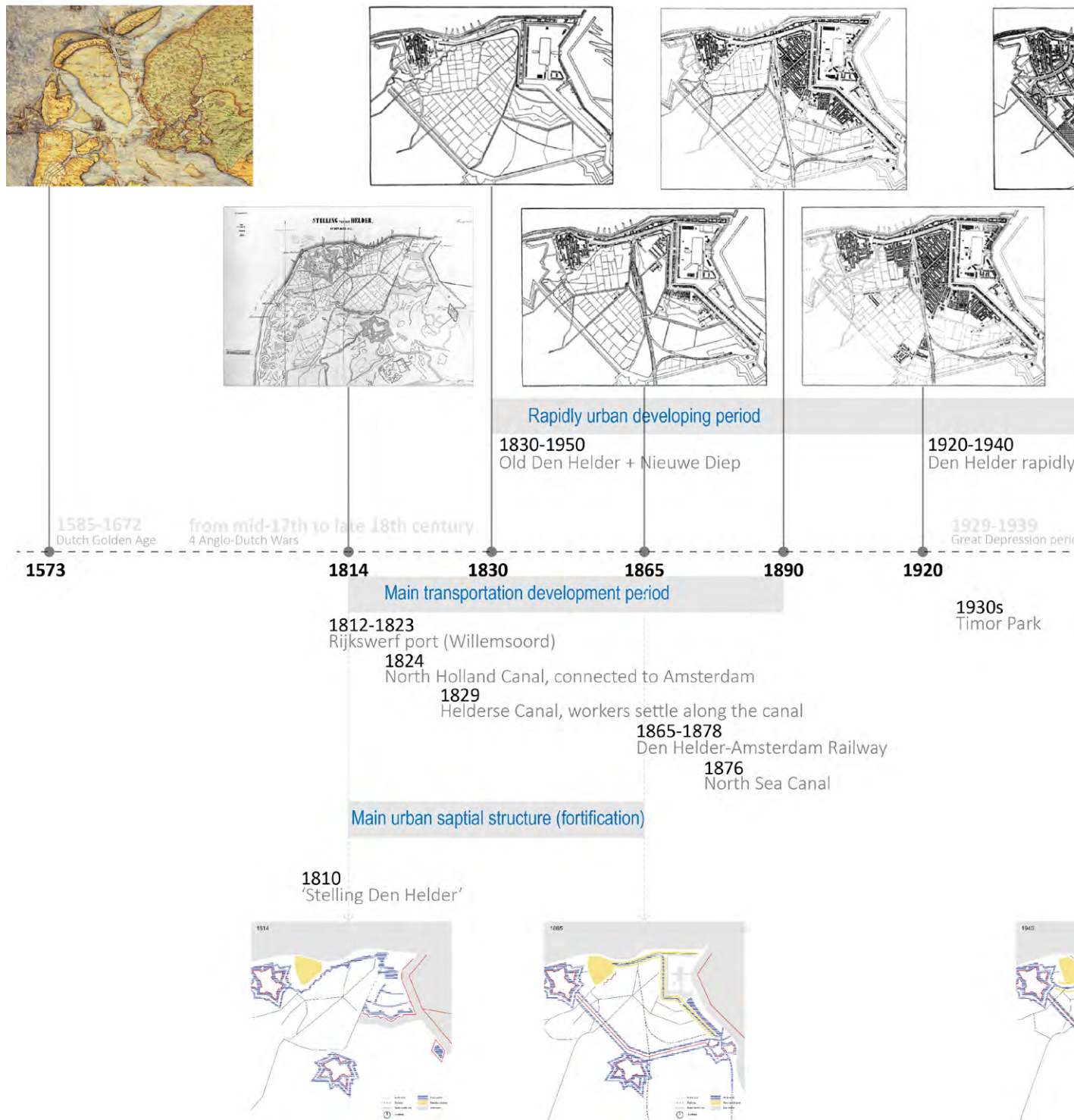


Figure 02-3. Den Helder development process map
Source: image from municipality of Den Helder, redrawn by author



As the city grew, Den Helder went through many stages and expanded from a small village to the present city. The defensive lines gradually developed into the present urban structure.

Den Helder rapidly developed its main transportation in the 1800s, for example, in 1824, the port was connected to the interior by the construction of the North Holland Canal. This made Den Helder a port of Amsterdam. The Herders Canal was completed in 1829. It connects the village to the North Holland Canal. During the construction of the two canals, workers settled along the canals. These constructions promoted the initial development of urbanization.

In these old maps on the top, it's clear that this military defense line area protected the buildings from the past until World War II.

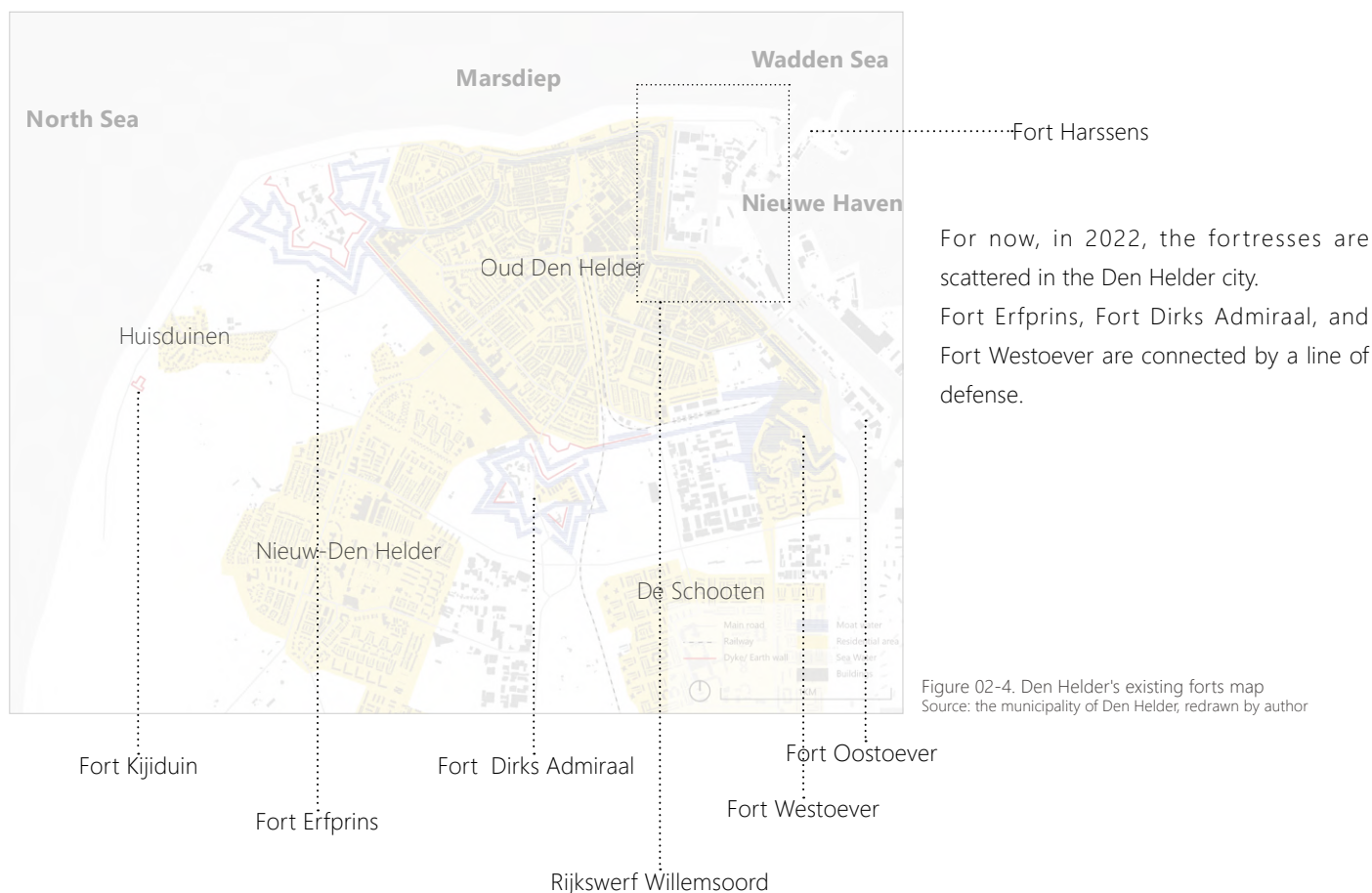
After World War II, 2 more residential centers were built on the south of the defense line and the fortifications were no longer protecting the town, part of the road at the defense line is no longer continuous, and the war gradually became a forgotten memory. Den Helder raised its seawall, promoted urbanization, and built and renovated the Nieuwe Haven on the northeast side.

The city of Den Helder got its shape because of the 'Stelling of Den Helder' which is still visible in the landscape and is very important for the authenticity and identity of Den Helder now.

For the detailed introduction of military functions and historical development of these four Defence Line maps, please refer to the next part, '**b. Defence Line as the Boundary**', in this chapter.

b. Defence Line as Palimpsest

In this section, readers will understand about these important fortress elements along the Defence Line and the development of Den Helder's defensive line and fortification.



The Defence Line of Den Helder

The 'Stelling of Den Helder' is one of the oldest still presence military defensive lines in the Netherlands now, which was commissioned by Napoleon about two hundred years ago, as protection of the navy base, Marinewerf Willemsoord. This line has been built between the forts in the Stelling Den Helder. The goal is to stop the enemy, but also to be able to get from one fort to another unseen. In the Second World War, the Defence Line Den Helder was part of the Atlantic Wall.

The city of Den Helder owes its current form to this Defence Line. It still exists very much in the landscape and is very important for the authenticity and identity of Den Helder.

Fort Kijduin, the fort that was built on top of a strategically located dune, was an important part of De Stelling van Den Helder.

Now, from the large cast iron dome of Fort Kijkduin, visitors can have a view over the dunes, the North Sea, Texel, and the largest sandbank in Europe, the Razende Bol.

Fort Erfprins has an important place in the History of Den Helder. It was built in 1811 and it is also the largest fort in the Netherlands with an area of 49 hectares. Given its size, it has almost all the shapes that are structurally possible. Fort Erfprins was built as a coastal fort with an imposing seafront. The coastal battery was improved several times in the years 1880 to 1900, including by replacing outdated guns with newer ones and by building fire control measuring posts so that a more accurate way of firing enemy ships was possible. After World War II, it was an internment camp for political offenders for three years. At the moment, the fort is still in use as a training center for the Royal Netherlands Navy and can only be visited by appointment.

Fort Dirks Admiraal was originally built by the French between 1811 and 1813. The Dutch modernized the fort between 1880 and 1890. During the German occupation, the fort was transformed into an anti-aircraft battery, armed with four 10.5 cm S.K. C/32 gun pieces. The fort was attacked by the RAF. In 1943, the German occupier built four gun bunkers. Two of these four gun bunkers are still present at Fort Dirks Admiraal.

Fort Westoever, part of the Defence Line of Den Helder, was built around 1825 to defend the newly constructed North Holland Canal against attacks on the port of Den Helder. The inner and outer canals are well preserved so that the routes are still clearly recognizable.

Fort Westoever was built between 1823 and 1830 and was modernized between 1880 and 1882. Between 1939 and 1940, Dutch soldiers were stationed in the fort. During the German occupation (1940-1945) a "Kabelschaltstelle" (telephone bunker) and a brick shelter were built at the fort.

Fort Oostoever was built between 1833 and 1835. During the German occupation (1940-1945) a large number of defenses were built at and on the fort. The German army units were stationed here between 1943 and 1945. The fort was bombed by the RAF on 21 June and 15 September 1944.

Fort Harssens, built around 1885, is the armored coastal fort which had two domes with 2 guns each, the largest that ever stood on a fort in the Netherlands.

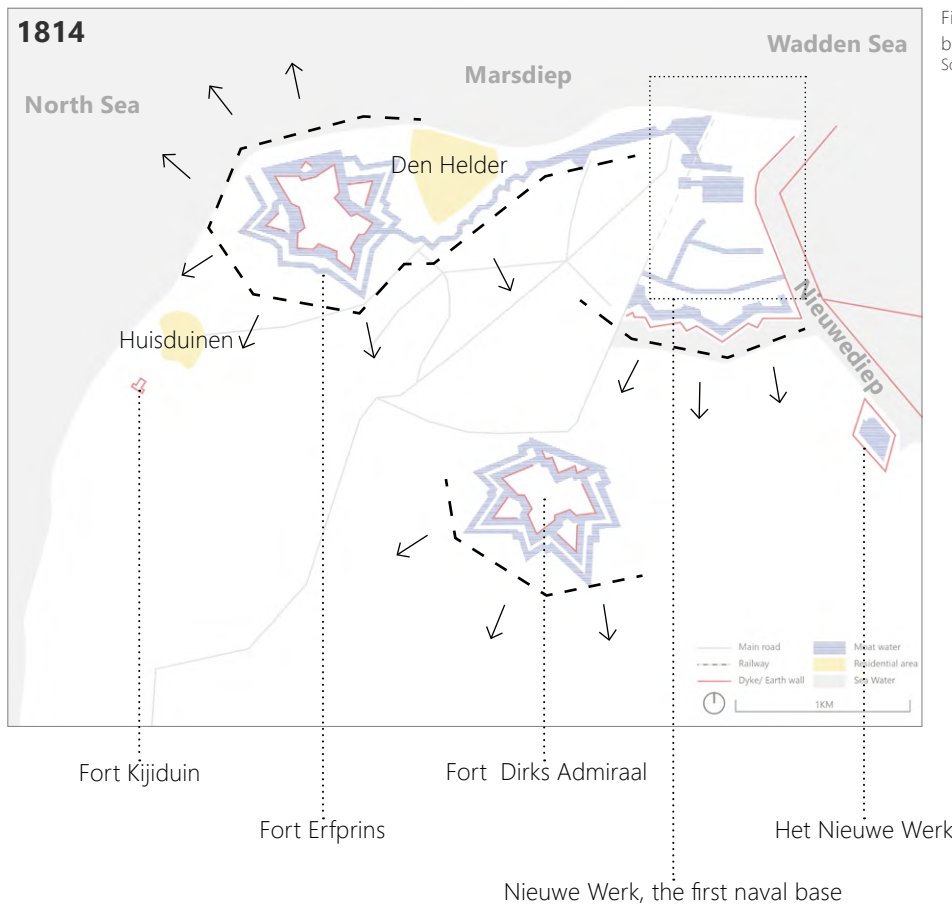


Figure 02-5. Distribution of the Den Helder defence boundary (protection area) in 1814
Source: the municipality of Den Helder, redrawn by author

A **military campaign** in 1799 caused people to rethink the defense of the city. This also led to the **construction of the defensive structure** of the city's present defensive line beginning in 1814.

In 1574 an attack by the Spanish fleet on the Netherlands threatened and the desire arose to make defenses on Huisduinen and Wieringen.

For centuries the guns of Den Helder have protected the Marsdiep (the gateway to Amsterdam and the place where the Batavian war fleet and many merchant ships were anchored). People believed that the defences only needed to aim towards the sea. Another threat led to the construction of the **current defense line** at Den Helder.

But, in 1799, a **military campaign** happened. The English conquered Den Helder by attacking on land from the south. The Anglo-Russian invasion of Holland led to the capture of Nieuwediep and the Nieuwe Werk. This defeat made painfully

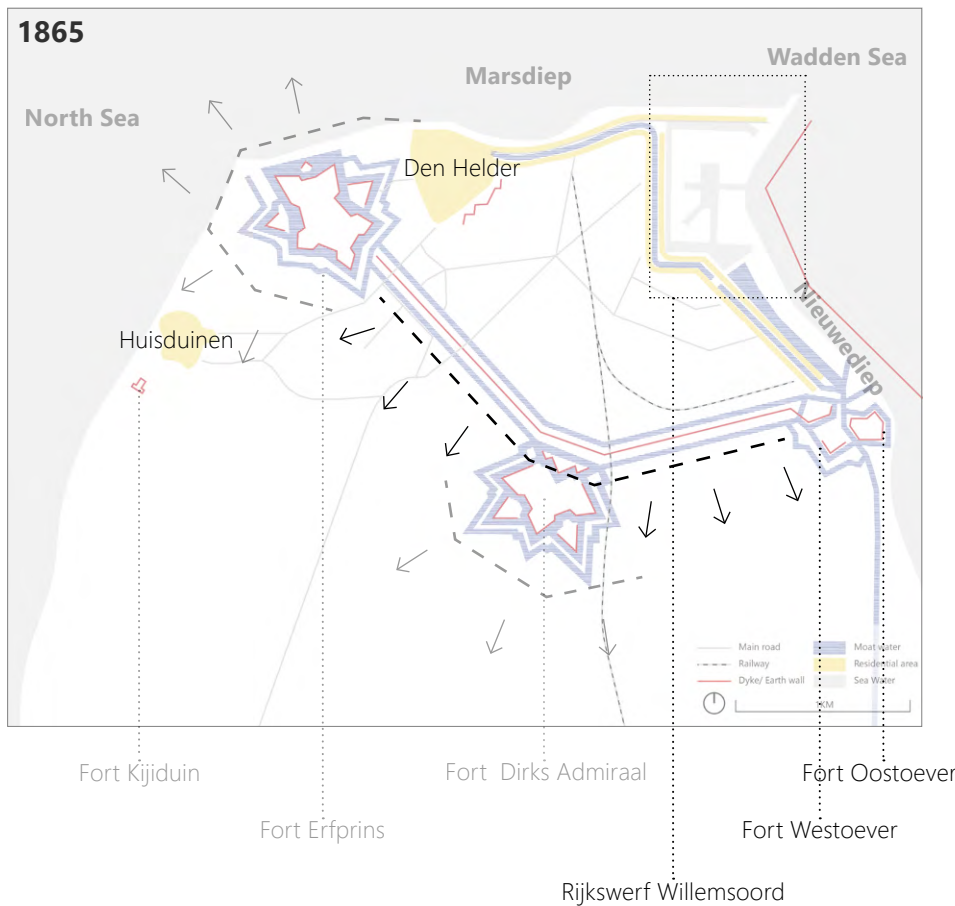


Figure 02-6. Distribution of the Den Helder defence boundary (protection area) in 1865
Source: the municipality of Den Helder, redrawn by author

The **defence line** area had been built to protect the city and the Rijkswerf Willemsoord on the land side; In 1824, the 'Nieuwe Werk' became **Fort Osterover** on one side of the North Holland Canal, and in 1825 it became **Fort Westover** on the other side. This defensive complex was built to protect Den Helder harbor from water.

The shape of the defense line was already very similar to what it is now.

clear what the defences were lacking.

The Dutch authorities now realized that the fleet (military ships) could only be safe in Nieuwediep if it was also **protected on the land side**.

Then, Water engineer Jane Blanken designed a line of forts that would protect the land side of the city around 1807. Due to lack of funds, the construction of defensive lines did not produce much.

It wasn't until 1811 that the Emperor Napoleon Bonaparte visited the city after incorporating the Netherlands into his empire. He concurred with all previous authorities that Nieuwediep had great strategic potential as a base. He also

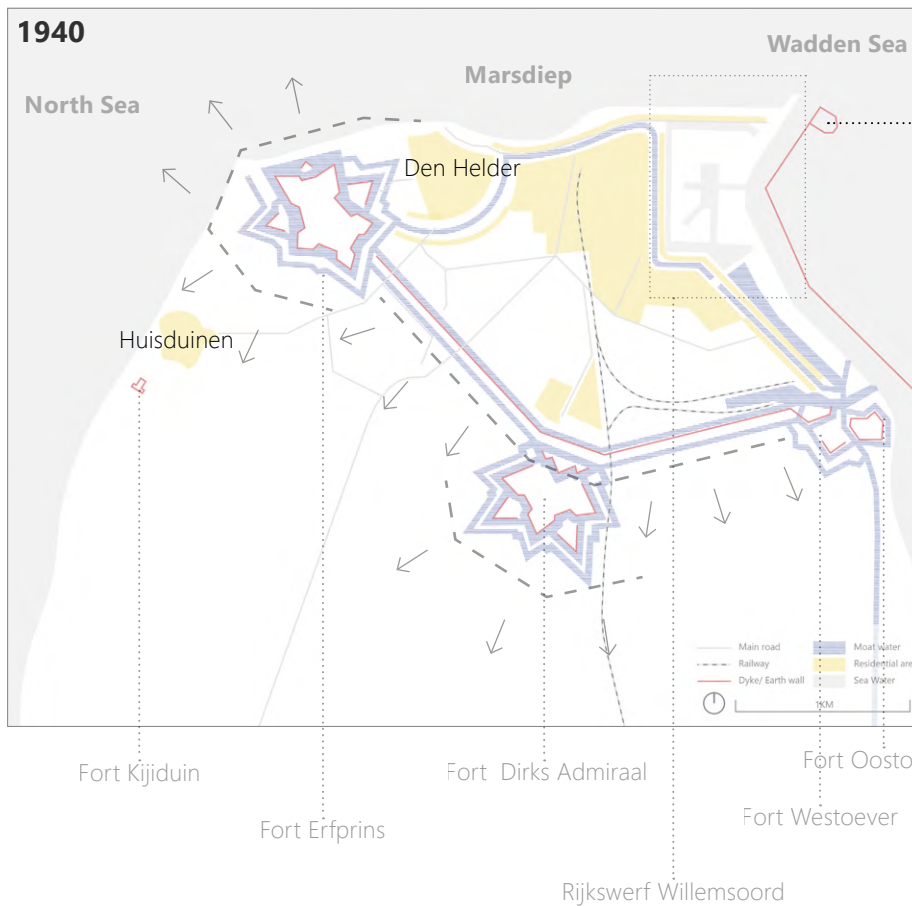


Figure 02-7. Distribution of the Den Helder defence boundary (protection area) in 1940
Source: the municipality of Den Helder, redrawn by author

Before the World War II (January 1, 1940) began, the city of Den Helder had been rapidly **urbanizing and expanding** remained **in the area protected by the Defence Line** and the population had grown to 37,328, making Den Helder the fifth largest city in North Holland after Amsterdam, Haarlem, Hilversum and Zaandam.

saw the strategic value of Den Helder and he could spend much more than the previous authorities. In the meanwhile, Napoleon was preparing for an invasion of Russia, fearing that Britain would attack the Netherlands without him. Therefore, he ordered the works to begin immediately and ordered Jan Blanken to build the largest naval base and maintenance shipyard of the Netherlands and a series of forts (Den Helder Defence line).

During these years, Fort Erfprins, Fort Kijkduin, Fort Dirksz Admiraal, the Nieuwe Werk (the current fort Westoever and Oostoever) and the connecting moat between the fortresses Erfprins, Dirksz Admiraal and Oostoever were built.

Due to the many tensions in Europe, the 'Vestingwet' was passed in the

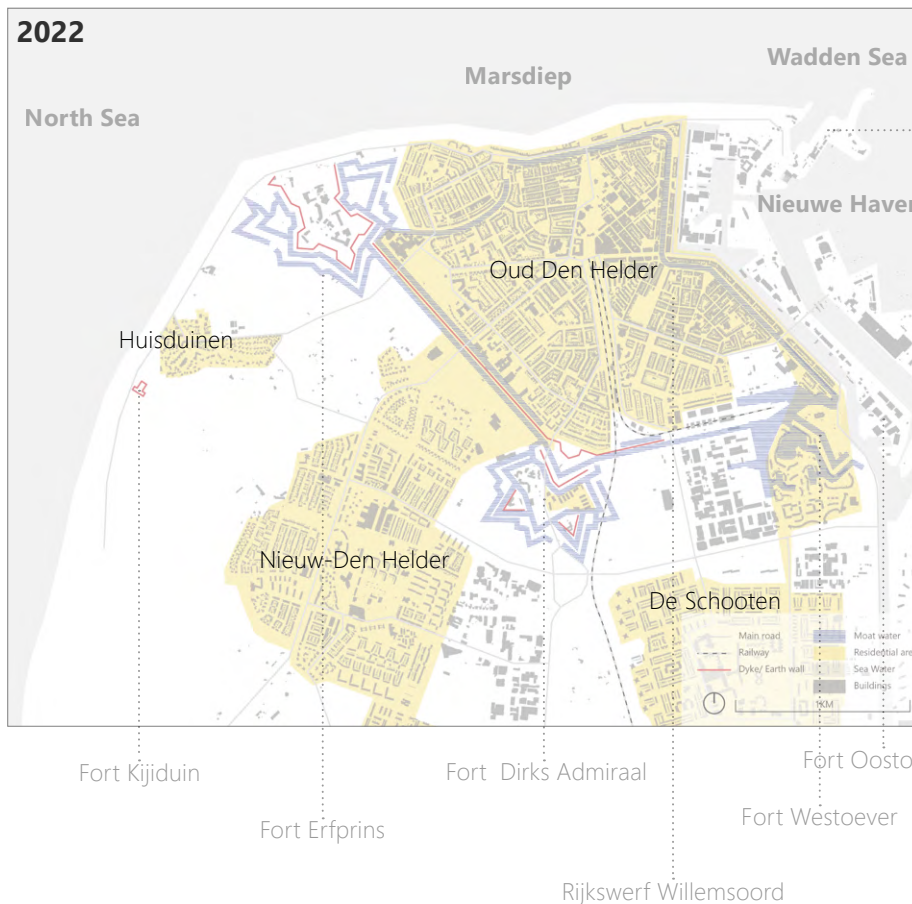


Figure 02-8. Distribution of the existing Den Helder defence boundary in 2022
Source: the municipality of Den Helder, redrawn by author

Fort Harssens

Now that the city has been rebuilt after World War II, the defensive line is no longer used, but as a **strip-shaped space**, an important part of the city running from west to east.

Netherlands in 1874. This law regulated the defense of the country against enemy attacks. Literally, it means that every existing fort and defense line will be reinforced and new works will be built, such as the New Dutch Waterline and, it will be decided to construct the Defense Line of Amsterdam. For Den Helder this meant the construction of the coastal armored fort on the Harssens, which started in 1879 and was completed in 1882 on the sandbank 'de Harssens' at the mouth of the Nieuwe Diep.

In 1958, the Den Helder Line ceased to function as a military fortress. As the city grew, nowadays, the lines of defense were no longer completely connected from end to end. But the spatial structure of the defensive line still exists obviously in the city.

c. Boundaries in Den Helder

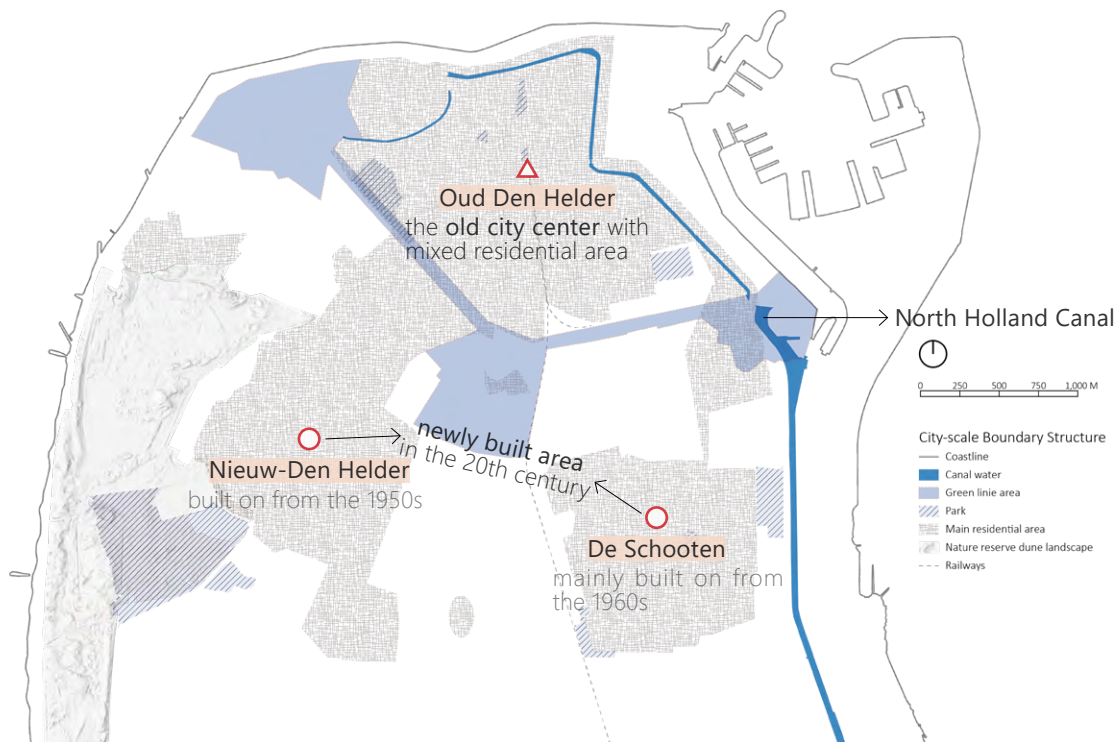


Figure 02-9. different boundaries in Den Helder
Source: drawn by author

Many **types of boundaries** are structured in Den Helder. And the boundary spaces mainly exist on (or in between) coastlines, dunes, canals, railways, and urban built-up areas.

The green linear space, the Defence Line in the center of this map is served as a corridor between the 3 main urban living spaces.



Figure 02-10. historical and cultural elements in Den Helder
Source: drawn by author

The dunes and the coastal landscape, the three main residential areas of the city, and the historical fortress traces are closely linked together.

Now, the **traces of war** and cultural buildings are 'scattered' in the city around the defence line area.

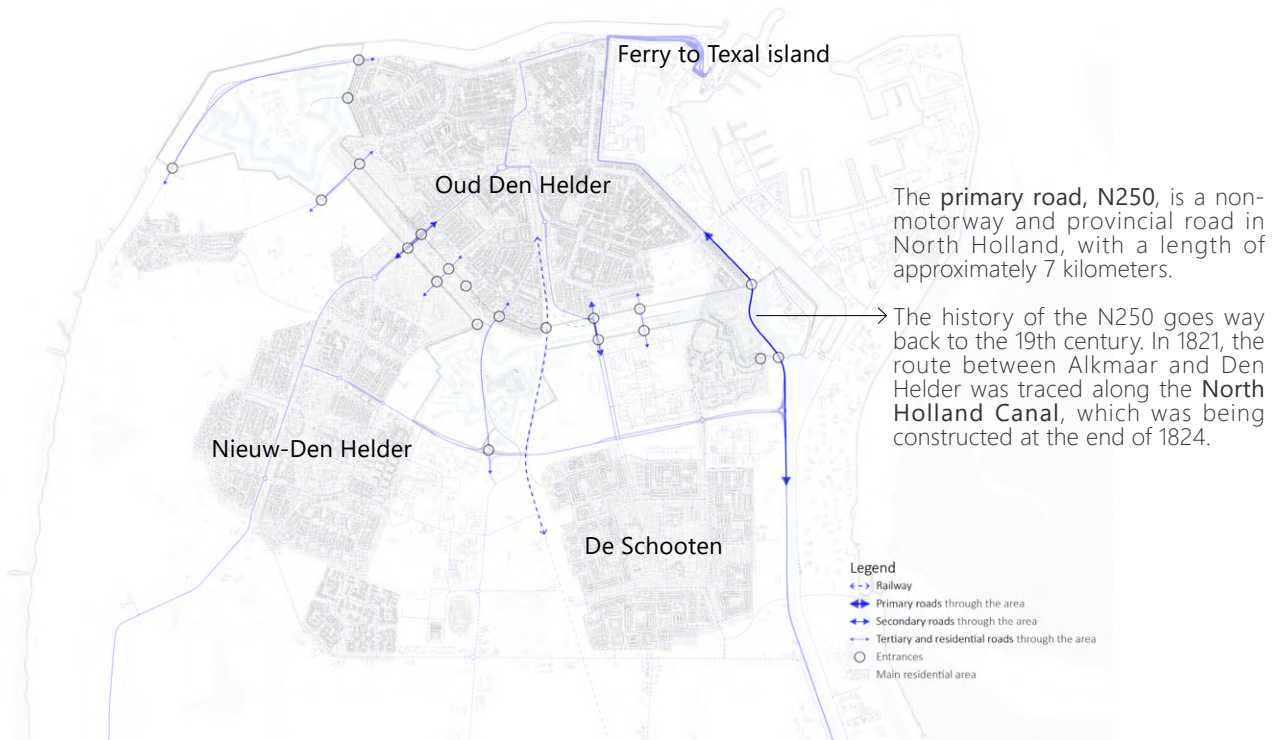


Figure 02-11. crossing points acrossing the Defence Line area
Line area
Source: drawn by author

The **transportation** of the city links the three main residential areas.

The city's main road (primary road), on the right side of this map, runs from south to north to the ferry, which is an important link to the Texel island and abruptly cuts through the defence line boundary area.

As a corridor between the three main urban living spaces, there are a lot of **crossing points** when going across the defence line area.

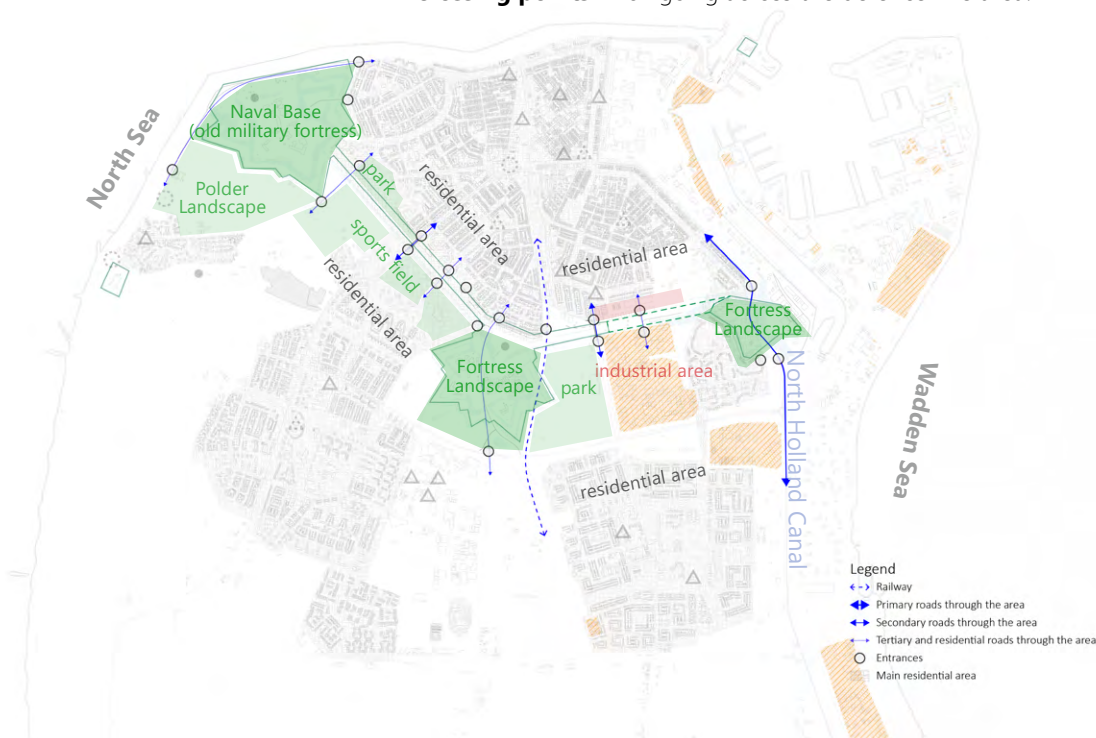
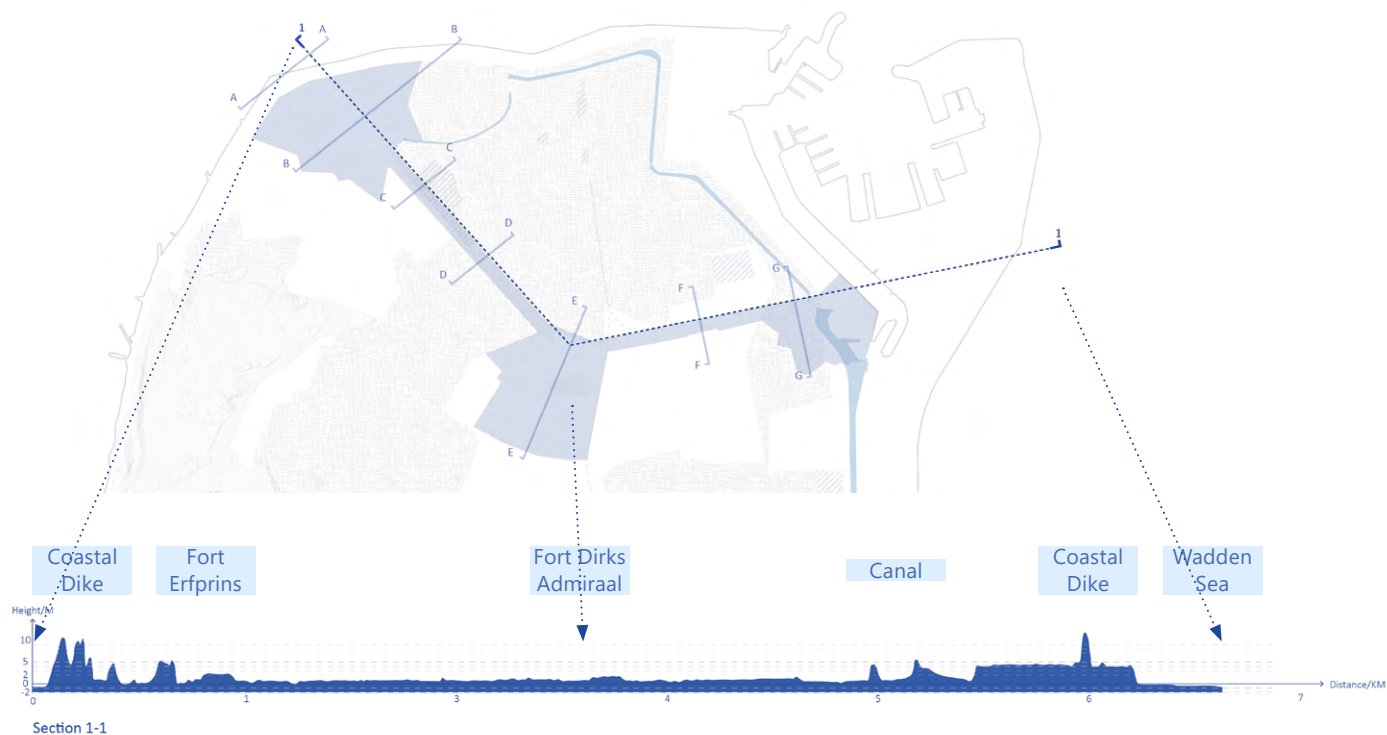
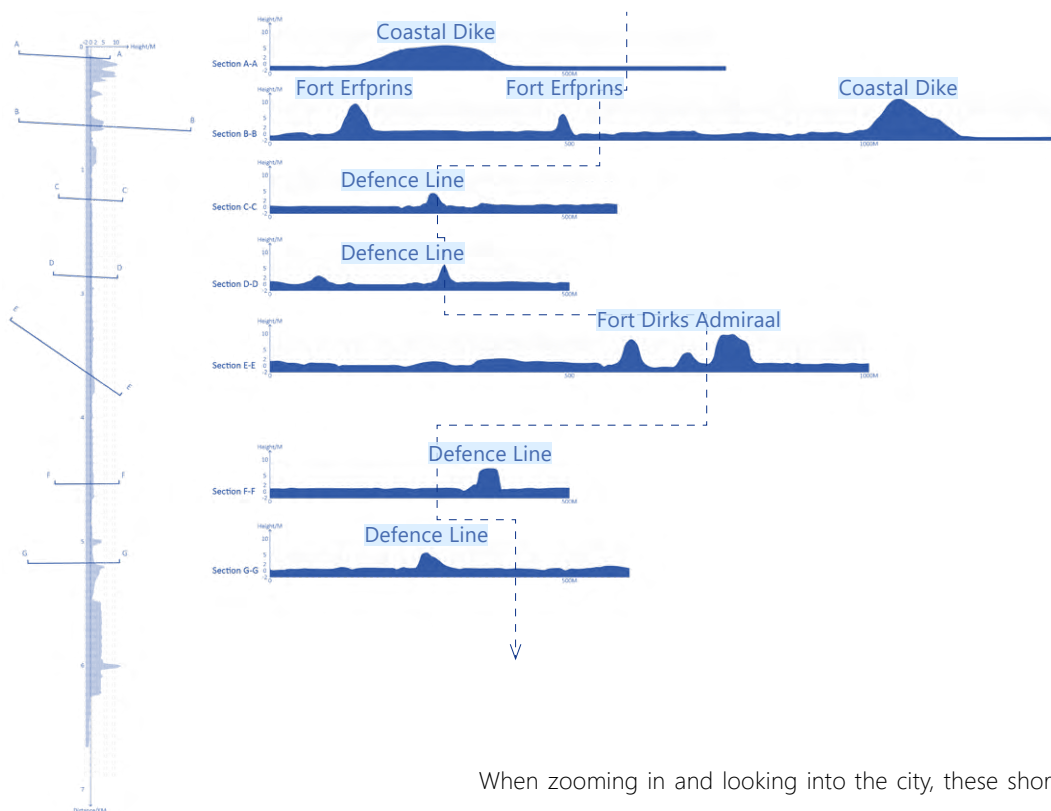


Figure 02-12. distribution of different types of area around the Defence Line
Line area
Source: drawn by author

In Den Helder, the **Defence Line area** on the north side faces the **North Sea**; In the middle, there are many roads that connect **urban residential areas**; Also, there is a large **industrial area (highlighted area)** on the right, and the road is no longer continuous here. And it ends at the edge of the **canal**, and, unfortunately, there is no direct access to the **Wadden Sea**.



When looking at the **topography of the defence line**, a long section across the entire city shows many boundaries are formed in different places through the elevation difference of the terrain. And, the most obvious change of elevation is concentrated in the coastal dike area. The varied height forms **physical boundaries or barriers** (as protection or separation).



When zooming in and looking into the city, these short sections across the defence line shows the defence line also have a great **variation in height**, which naturally forms a **boundary linear space** and separates the different areas of the city on both sides.

Figure 02-13. Variations in the height of different areas form different boundaries in Den Helder
Source: drawn by author

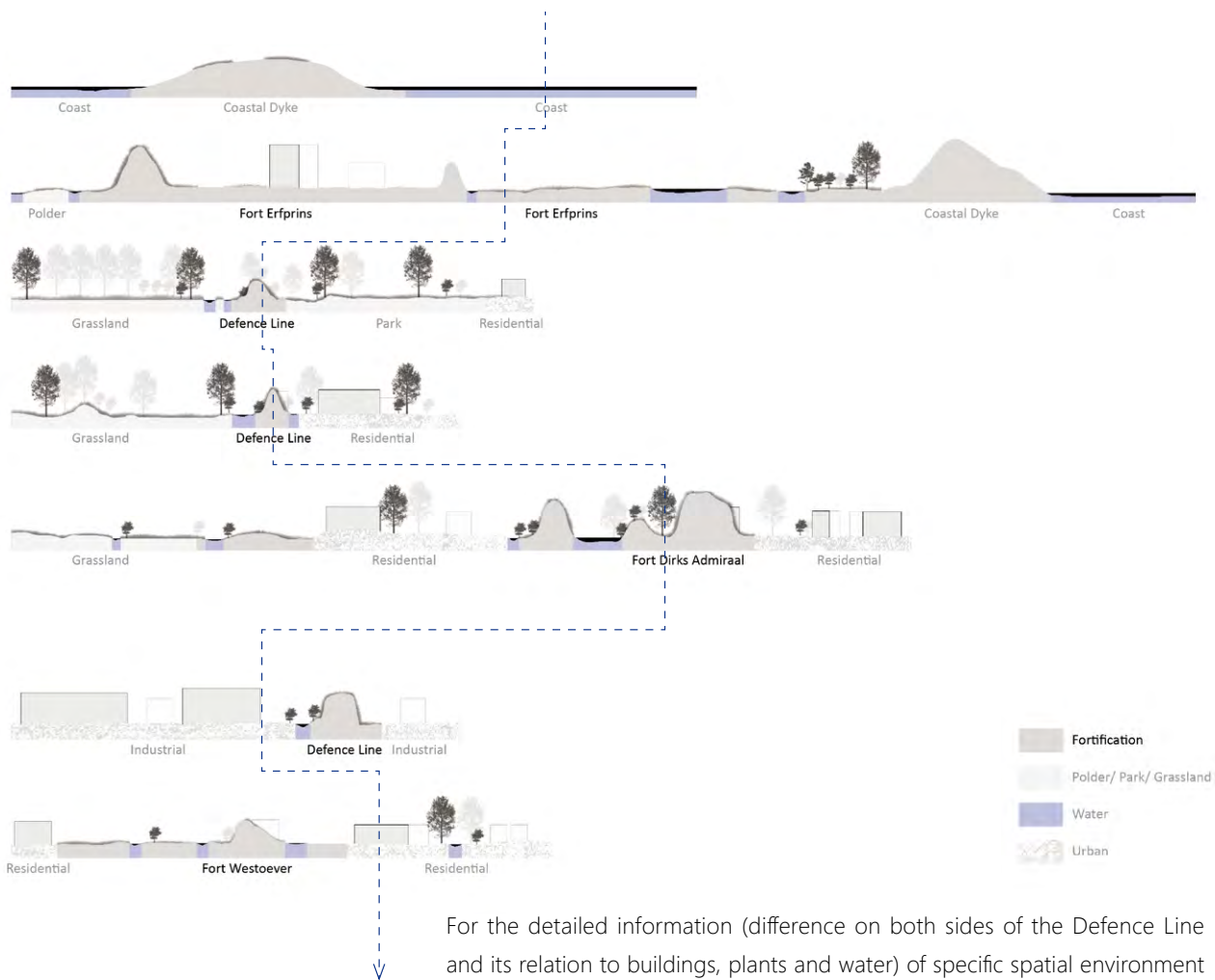


Figure 02-14. Defence Line area connects or separates different areas in Den Helder
Source: drawn by author

For the detailed information (difference on both sides of the Defence Line and its relation to buildings, plants and water) of specific spatial environment through different areas in Defence Line, please refer to the next part, '**d. Defence Line from a Human Perspective**', in this chapter.

d. Defence Line from a Human Perspective

Feeling the Spatial environment quality of the defence line area through field trips' walking scores and photos

Field trip analysis: observe people's behavior and feel the spatial quality through sensorial experience and collect recordings or images in different areas(recording sound, walking scores, photographs, mental maps...); Different green spaces combined with different users are classified. Then, summarize and propose improvement ideas to organize them into a more organized system.

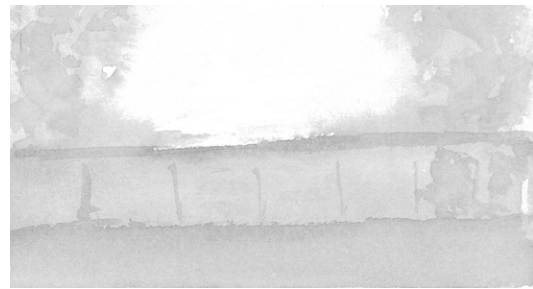


Figure 02-15. Watercolor drawings abstracts the spatial environment of different Defence Line areas.
Source: drawn by author



Figure 02-16. cognitive map in Den Helder around the Defence Line area.
Source: drawn by author

Through several times of walking and cycling in the city, I found that the Defence Line area, as an important structural component of the city, divides the space of different functions of the city, and these different area in the Defence Line also creates many different spatial atmospheres.



Figure 02-17. physical or visual boundaries in Den Helder around the Defence Line area.
Source: drawn by author

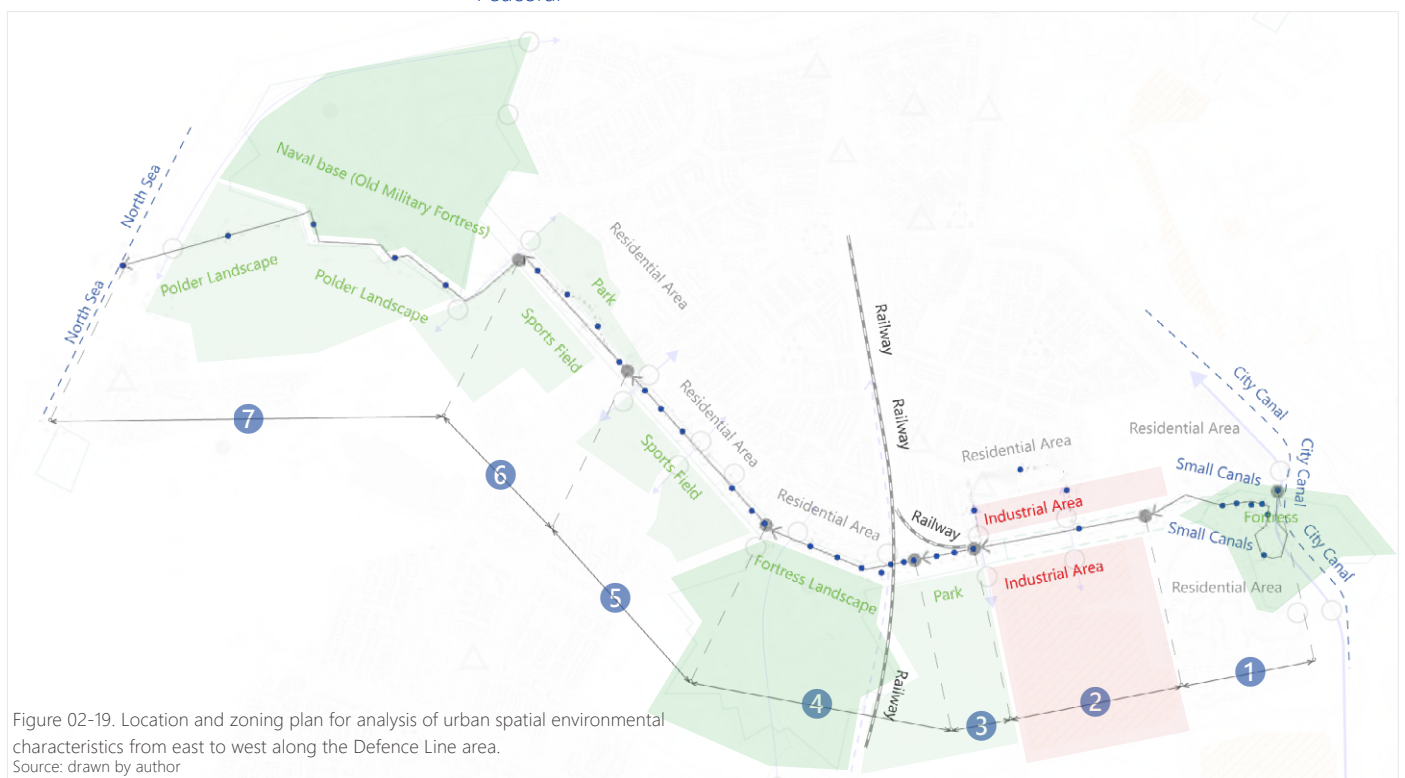
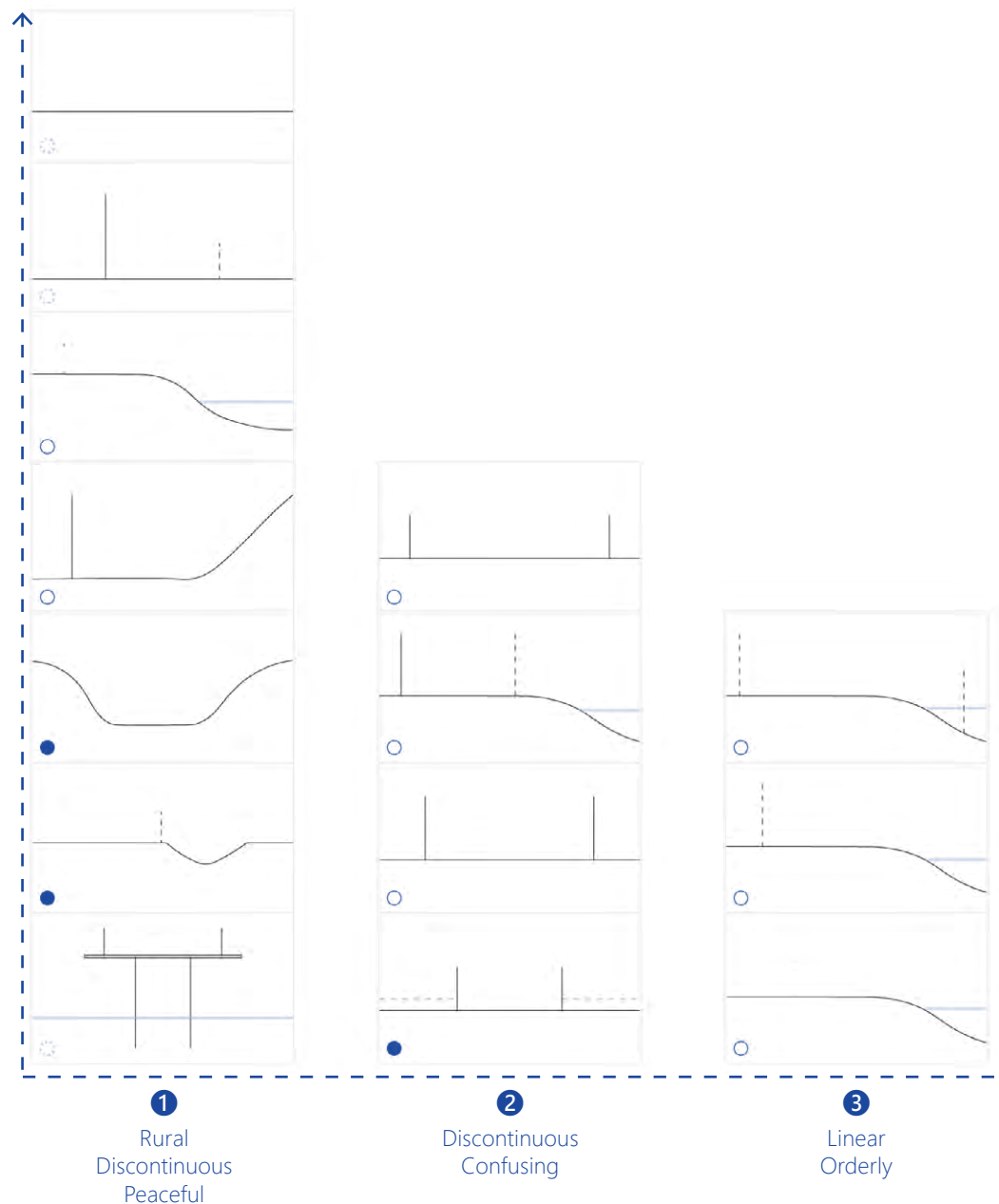
Walking along the area around the Defence Line in the city, I found that the Defence Line sometimes acts as a giant boundary in the middle of Den Helder, with a few barriers (land for industrial areas along the river, water, fences and so on) in the way preventing me from moving on.

But at the same time, this area still has a lot of attractions for me, different areas will have a lot of linear scenery, landmarks or open spaces to catch my eye.

- Open Space
- Semi-open Space
- Enclosed Space

Section diagrams and degree of spatial closure at different locations along the Defence Line area from east to west.

(Read from bottom to top, from left to right)



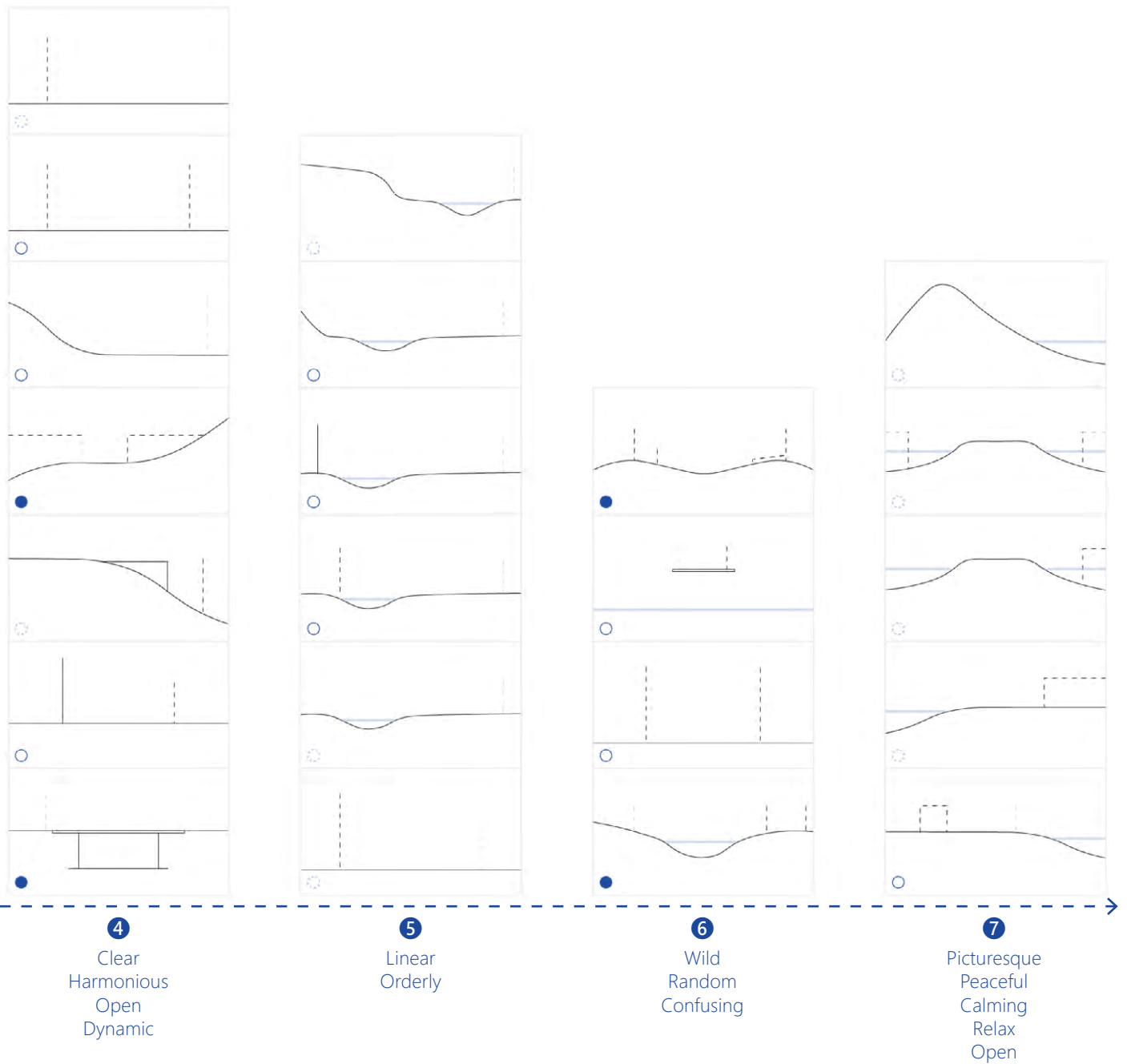


Figure 02-18. 7 Zones' spatial environment characteristics in the Defence Line area.
Source: drawn by author

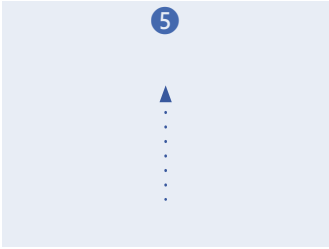
Based on the different spatial atmosphere, the Defence Line and the nearby areas are divided and summed up into seven different areas. These areas have different spatial characteristics or surrounding areas' functions.

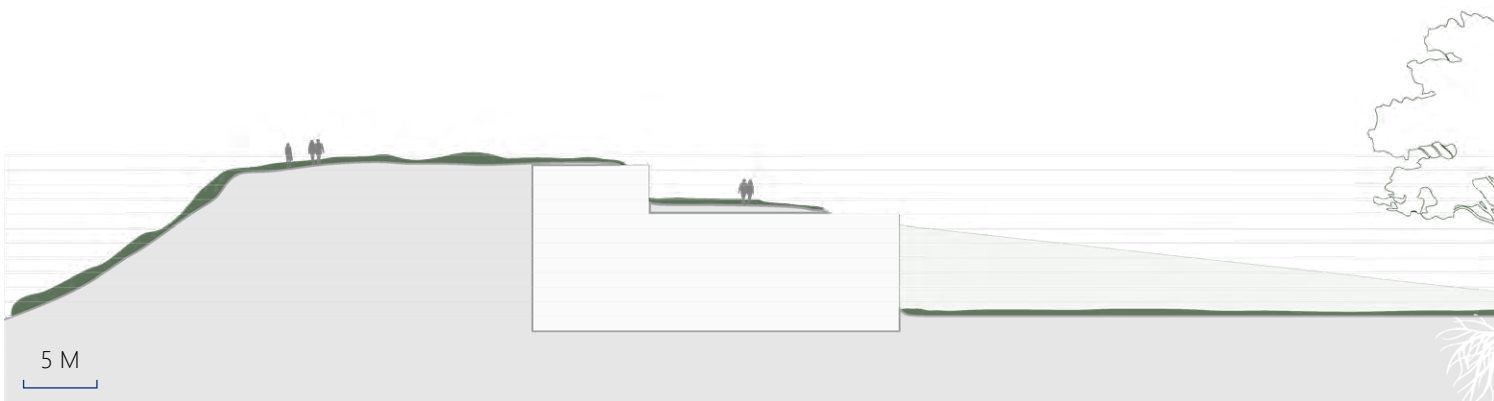
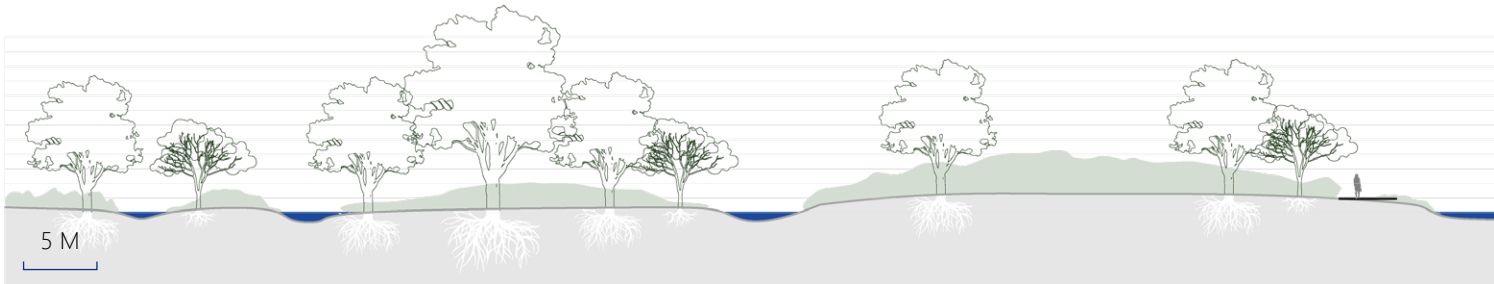
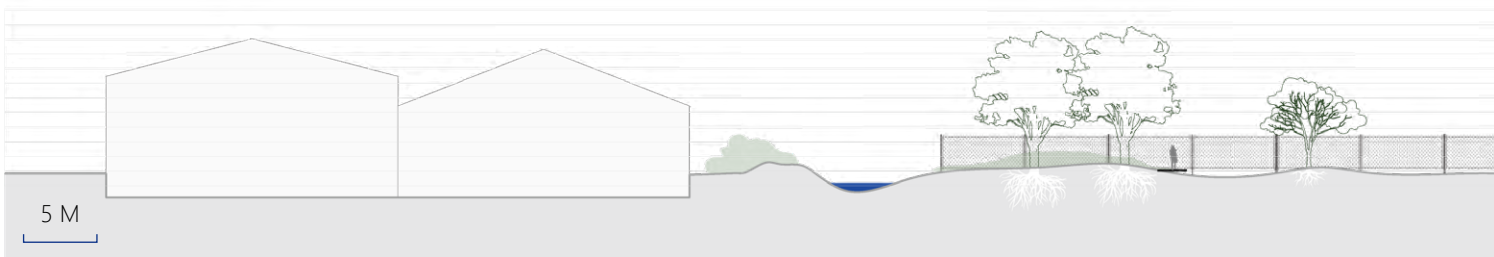
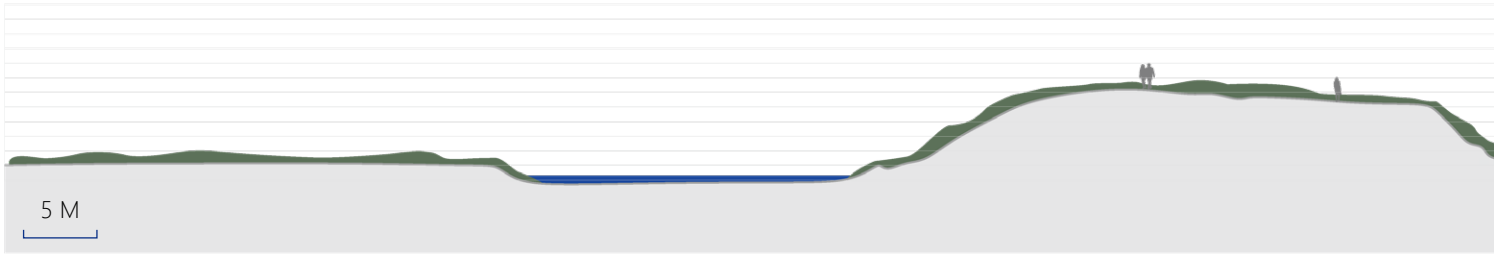
In addition, it is worth mentioning that the division of these spaces is inseparable from the proposal of further design strategies.



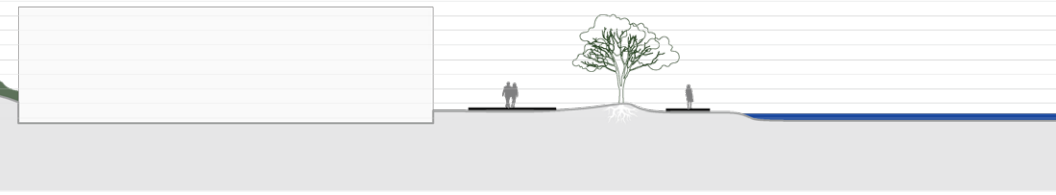
Photos along the Defence Line area from east to west.
(Read from bottom to up, from left to right)

Figure 02-20. Views of the 7 Zones.
Source: Photograph by author, 2022 & 2023



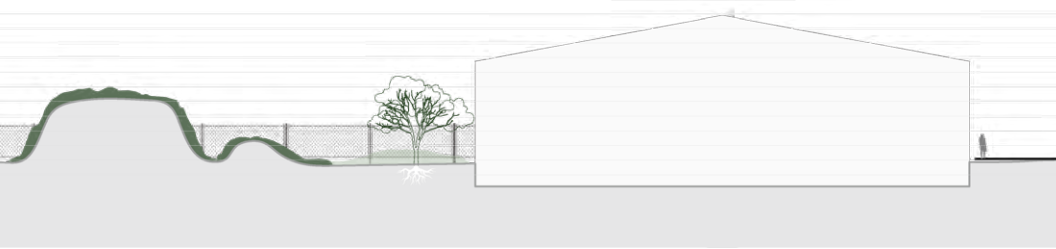


Section Zone 1 - Fort Westoever Area



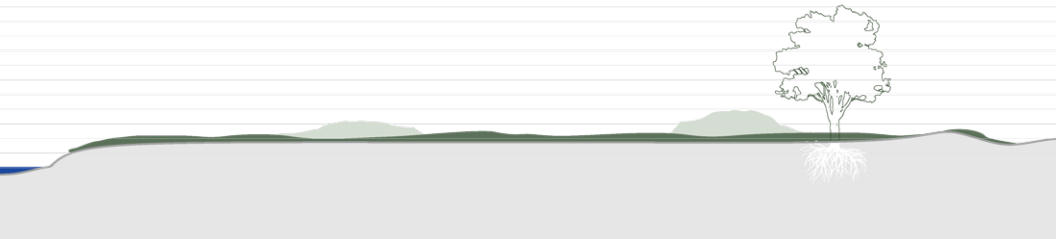
A **rural** area (in the old Fort Westoever) with **peaceful** environment, the paths are **discontinuous** at the edge of the water to the next industrial part (Zone 2).

Section Zone 2 - Industrial Area



The Defence Line is still existing and visible, but because of these industrial area, the paths are **discontinuous** here which could made the field trip along the Defence Line a little bit **confusing**. So people had to find another way through nearby settlements to get to the next location.

Section Zone 3 - Corridor Area



This is a **linear** corridor with a park to the south and a railway line to the north. People walking, walking their dogs or cycling through this linear and **orderly** space.

Section Zone 4 - Defence Line In-between Area



The Fort Dirks Admiraal is in the middle of Den Helder's Defence Line. In this area, with the big fort hill to the south and the residential area to the north, an interesting **in-between space** is enclosed by the rich variation of topographic elevation. This space is more **open, clear** and **harmonious** than the previous area. People tend to stay and move in this **dynamic** enclosed space.

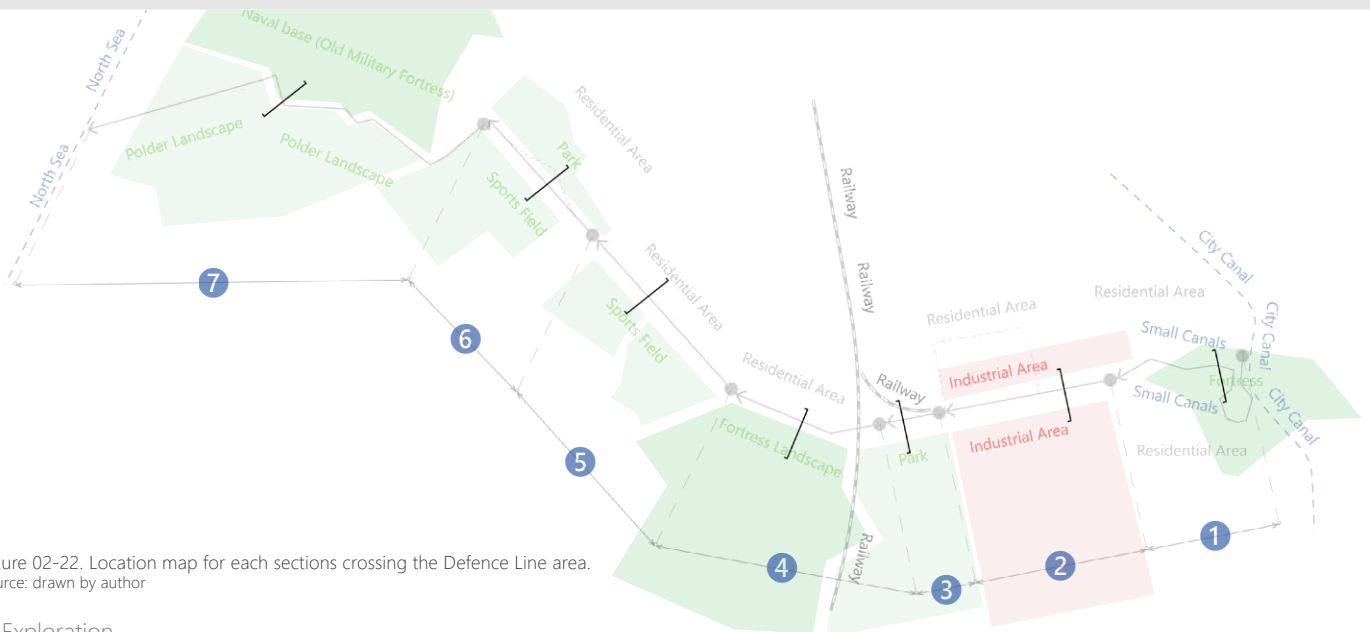
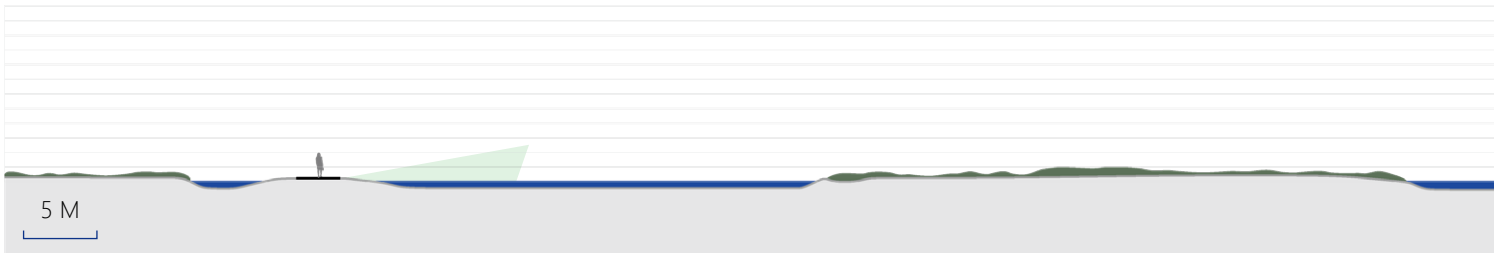
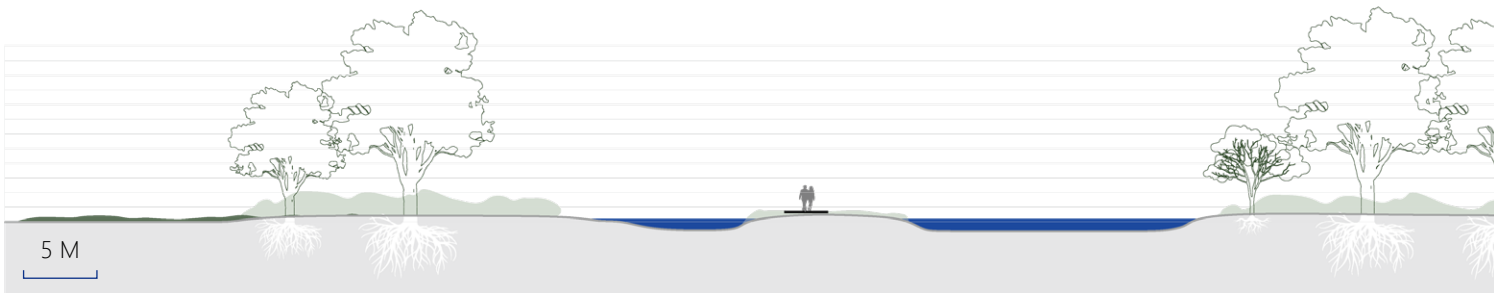
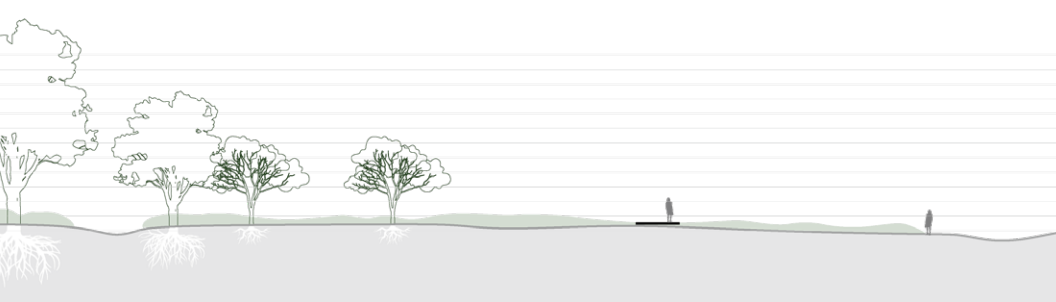


Figure 02-22. Location map for each sections crossing the Defence Line area.
Source: drawn by author



The Defence Line in Zone 5, with the sports field to the south and the residential area to the north, is an **orderly linear** place. The few or no shrubs and trees on the slopes make the structure of a large part of the defensive line in this area clearly visible.

Section Zone 6 - Timor Park Area



The Defence Line in Zone 6, with the sports field to the south and the Timor Park to the north, is connected with the Timorpark spaces, in which the space is **wilder** and **random**. As people move around the park near the ditch water beside Defence Line, they have to take narrow paths through many trees and bushes, which makes the route interesting and **confusing**.

Section Zone 7 - Polder & Seaside Area



Finally, when people come out of the park area (Zone 6), they come to this open, large polder area. Here the space environment is **picturesque**, let a person feel **peaceful**, **relaxed** and **calming**. At the end of the path, people come to the sea on the northwest side of the city.

Figure 02-21. sections crossing the 7 Zones in Defence Line area.
Source: drawn by author

Typical and representative position of 175m-long sections in each area are marked with the corresponding positions of plants, building, water surface, etc.

These seven sections would be further designed to help readers understand more clearly the current spatial environment of these seven areas and the differences between them.

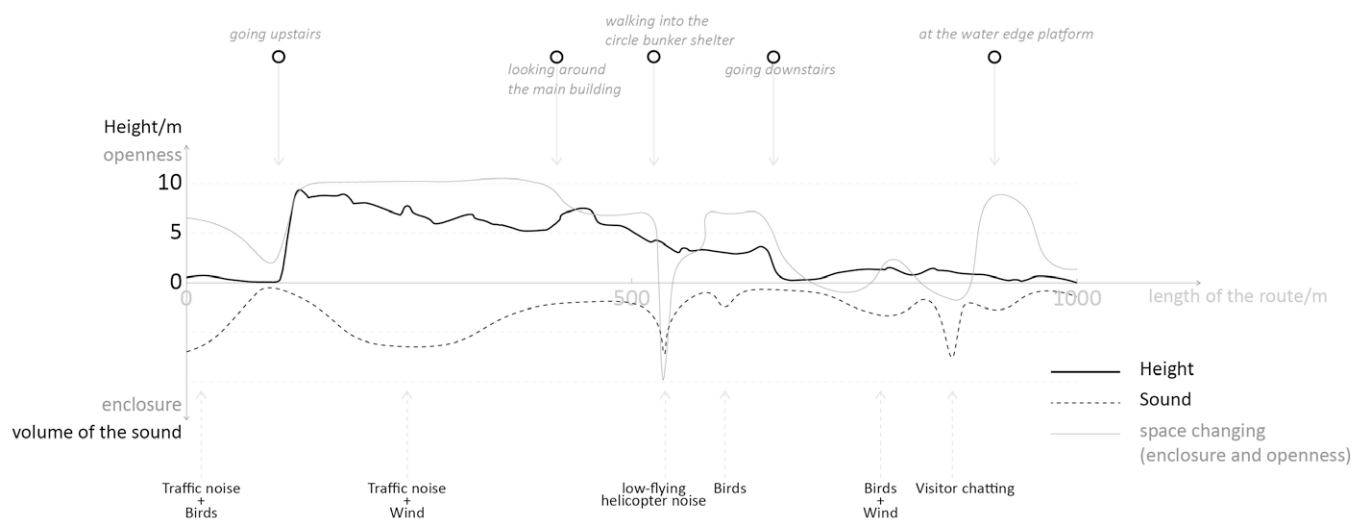
Spatial Experience - Zooming in the Zone 4 in Defence Line Area

1000M Walking Score - the bunker at Fort Dirkz Admiraal

-----On a clear, cloudy, sunny afternoon on September 28, 2022



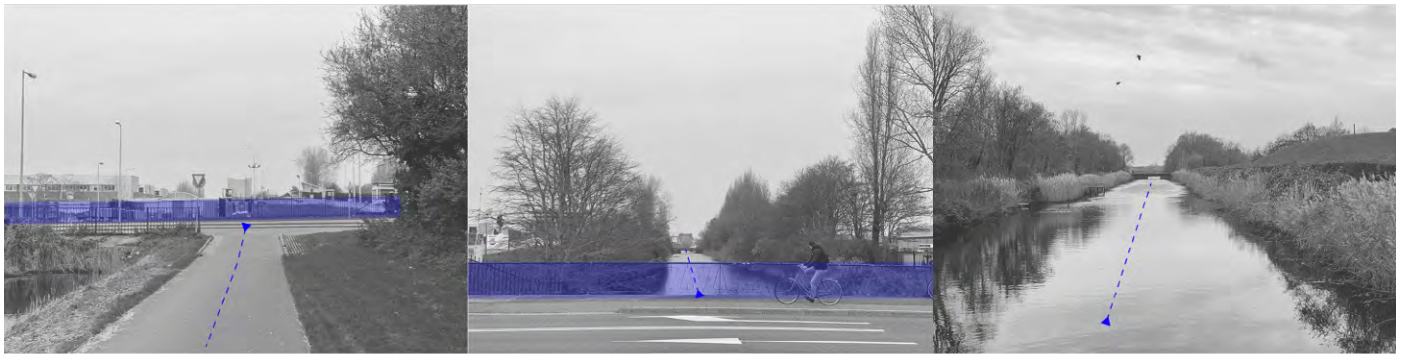
The Fort Dirksz Admiraal (built in 1812-1813), the middle fort in the Stelling van Den Helder (Den Helder's Defence Line system). And, there is still an anti-aircraft battery on it made by the German during the Second World War.



In the process of walking, different senses could be used to feel the changes in the environment, such as the change in height, the change in the openness of the space, the change in the volume or types of sounds they heard, and so on. I try to feel and know more about the atmosphere here.

Figure 02-23. field trip walking score in the Fort Dirksz Admiraal.
Source: drawn by author

Spatial Experience - Zooming in the Zone 2 in Defence Line Area



The defense line is not always continuous, people can not follow the path to the end.

Spatial Experience - Zooming in the Zone 3 and Zone 5 in Defence Line Area



During the walking along the defence line structure area in Den Helder, it was obvious that the space barely changes as people walk there. They don't have spaces to stay in. What they can do here is just pass quickly without stopping and enjoying their time.

03 Understanding

Different Aspects of Boundary (Theory and Case study)



Boundary Thinking
Multi-dimensional Layered 'Boundary' Space
Boundary Space
Transition Space of Boundary
Spatial Environment of Boundary Spaces
Temporal Experience of Boundary Spaces (a 4 Dimensional Boundary)

Boundary Thinking

Understanding boundary and spatial/temporal continuity from different aspects and forming the 4-dimensional framework of boundary.

Perceive/ feel the environment, and analyze (boundary) landscape:

The analysis of the landscape can be carried out within a variety of landscape scales, spatial patterns, and levels of organization (Wu, 2006).

In the article '**De/Re/In[form]ing Landscape**', Peter Jacobs proposed an "expanded field" of landscape architecture, interrelated with society, environment, and artifact, which means that the meaningful landscape forms need to be explored from multiple perspectives (Jacobs, P., 1991);

Analysis means conceptually separating the parts of the whole (such as a landscape) and examining their interrelationships, in order to improve understanding. '**Landscape Analysis Investigating the Potentials of Space and Place**' the author summarized a variety of ways to look at the landscape and analyze spaces, such as a historical analysis, a natural factor analysis, visibility analysis, eye-level analysis, serial vision, infrastructure analysis, structural analysis, etc (Stahlschmidt, P., 2017);

'**Talking about landscape spaces towards a spatial-visual landscape design vocabulary**' lists many terms related to landscape space and provides a systematic approach to how to understand, design and communicate landscape space with others (Liu, M., & Nijhuis, S., 2022).

Social boundary (framing spaces/boundaries):

Boundaries exist throughout our social environments (Ozaki & Lewis, 2006). **Social boundaries** are objectified forms of social differences manifested in un-equal access to and unequal distribution of resources (material and nonmaterial) and social opportunities. As **boundaries always exist along with space**, the definitions of spatial boundaries are always related to different concepts of space.

Boundaries affect both spatial properties and human behaviours. The ways in which people relate to boundaries determine how space is processed and developed.

That's why the city, as a social space, has all kinds of boundaries or barriers, such

as a moat at the edge of a town, a canal or a fence around a small farm or a house, Den Helder city has the Defence Line structure (with slopes and hawthorn hedges), etc.

In the classic work, '**The Image of the City**', Kevin Lynch claims, 'cities are constructed using five elements, including paths, edges, districts, nodes and landmarks' (Lynch, K., 1960, p.36). Edges are the linear elements that are usually the boundaries between two kinds of areas which can include shores, railroad cuts, and walls. The edges are not only visually prominent, but also formally continuous, sometimes even impenetrable to cross motion. They can be barriers that separate one area from another, or seams that bring two areas together. In Lynch's theory, boundaries do not have a fixed form, instead, each individual boundary interacts with other elements in the city and varies according to different users and time.

Also, boundary spaces are often **dynamic locations** in potential social public spaces. In a public space, people often choose to **occupy the edges of the space** to sit, stand or socialize, rather than positioning themselves in a more central area.

Many theories and studies can help explain this behavior, Jay Appleton also concluded that most people have an "inborn desire" for environments that allow the capacity to **observe without being seen** – to assess threats from a place of safety. He called this the '**Prospect - Refuge Theory**' (Appleton, J., 1996).

Boundary, space and users' interaction (spatial experience):

Edges are **interlocking forms** or **places of transition** that **enclose and separate** different spaces (Dee, C., 2001). Boundary as an important element of space, it could be came into being for many reasons and take many forms.

It's hard to tell whether a space causes a boundary or not, and vice versa. Both **space and boundary** exist in an ambiguous dependent relationship, and both are **affected by user interaction**, which makes the relationship complex.

Our interactions with boundaries affect the quality of the space, while the design of those boundaries determines the quality of our lives in that space (Hsia, C.,

1994). Given the powerful influence between **boundaries, space and users**, it is extremely important that we consider and study the relationships between these factors.

The research book '**Border Ecologies Hong Kong's Mainland Frontier**' uses the border area between Hong Kong and Shenzhen as an example to provide me with some methods and strategies to look at the relationship between boundary spaces and spatial experience, etc (Bolchover, J., & Hasdell, P., 2017);

In the book '**Life Between Buildings: Using Public Space**', at all spatial levels from residential to urban, Jan Gehl analyzed in detail about how to attract people to walk, rest, stop and play in public space and thus promote people's social interaction. He proposed three types of outdoor activities in public spaces according to people's different requirements for the physical environment: necessary activities, optional activities, and social activities. People all have different levels of **social needs**. It is important to have a smooth, gentle **transition zone** between different categories of public space. This will increase the chances of pedestrians slowing down and stopping to meet (Gehl, J. , 2011).

4 dimentions of the Boundary

When Christopher Alexander spoke about the importance of border areas, he explained that, without borders, the vitality of the region would be greatly reduced, the border is not a simple line, but **a spatial object** through which moves the people.

That is to say, the boundary spaces existing as spatial bodies, they have dimensions in different directions.

People sometimes perceive the boundary or the edge as a line or a linear space with specific width. When boundaries acting as physical components, the researches were more likely to look at them as a flat object and only do analysis on a **two-dementional** way (a map). But, actually these 'outlines' are still solid objects, which as spaces, that ont only have **length** and **width**, they also have the **height**. As a result, study on the spatial form and functional characteristics of the boundary should not be localized in the two-dimensional plane. The research

Finally, after reading a few articles and books, I added some of my own understanding and summarized this framework to show the understanding of the boundary in a city.

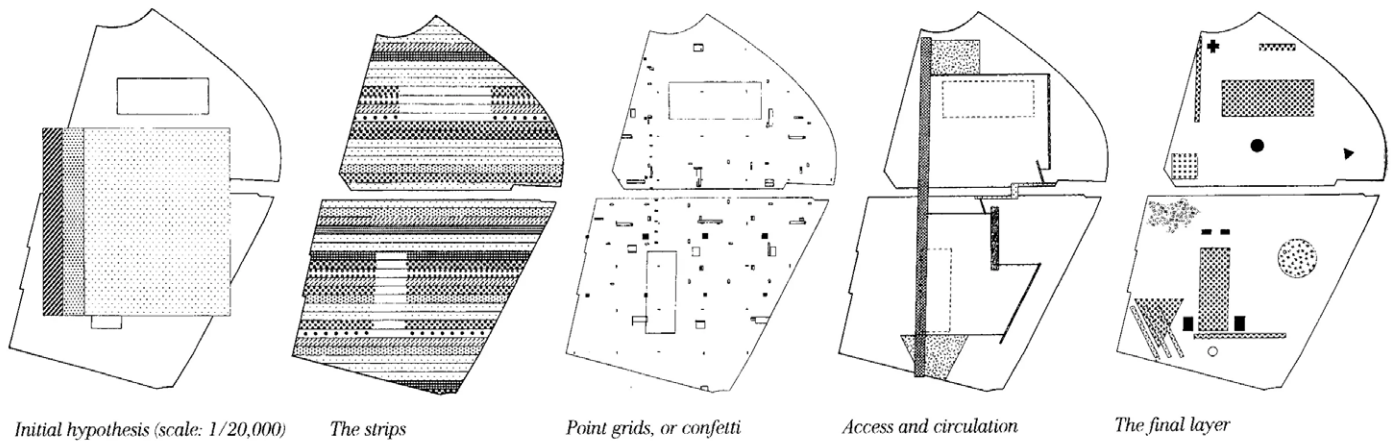
The diagram illustrates the concept of a 'Boundary' as a transition zone between two areas, Area A and Area B. It shows the interior of Area A (top) and Area B (bottom), separated by a wavy blue line representing the boundary. The boundary is labeled 'The edge' and 'Boundary (The transition zone)'. Dimensions are indicated: 'Height' (vertical distance from the boundary to the top of Area A), 'Width' (horizontal distance across the boundary), 'Length' (horizontal distance along the boundary), and 'Time' (vertical distance from the boundary to the bottom of Area B). The boundary is also labeled 'Defence Line area' and 'Small Spatial Quality'. The diagram is divided into three sections: 'Four dimensions', 'Multiple values', and 'Relationships Across time & scales'.

boundary area is not only itself, it has to do with the whole city or a larger area. And, there are also different small spatial environments for human perspectives in the boundary.

Multi-dimensional Layered 'Boundary'

After the boundary space were defined as a multi-dimensional space, I had the inspiration to layer the boundary design with complex space. I searched for some examples of layered thinking. I try to understand and think about boundaries from different dimensions and integrate them. In Koolhaas's case, he also used layering in the design process. He thought rationally and objectively about the needs of the park, and finally combined the design idea of layers.

Parc de la Villette / 1982, OMA
COMPETITON PROJECT • PARIS, FRANCE



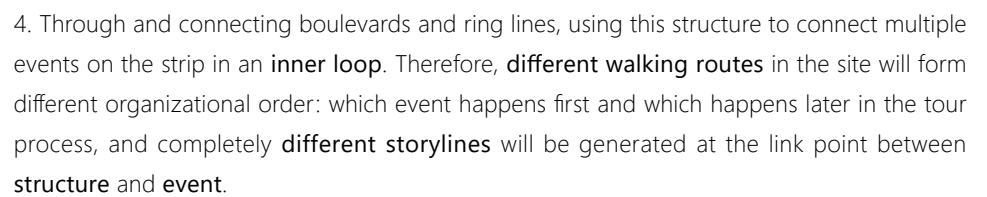
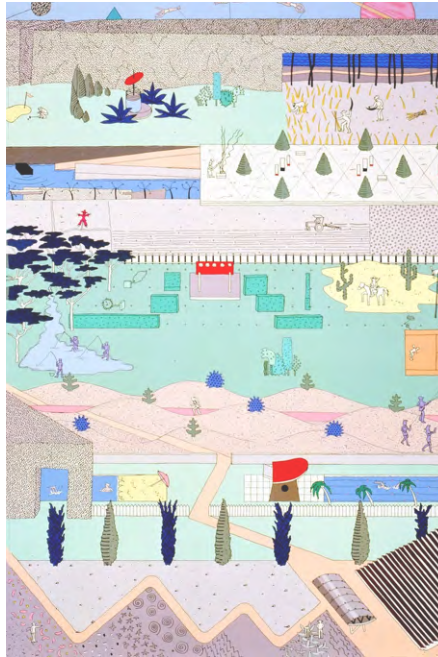
Koolhaas, an architect with a focus on social issues, sought to redefine the park as a cultural, educational, sporting and social "domain" of contemporary Paris. The **complex functional needs** (both concrete and symbolic, spiritual and inexplicable) are organized and solved in a 50-hectare site.

OMA uses **the strategy of strips**, which have **five levels**. The series of diagrams above illustrate this strategy (the first as an initial hypothesis, and the next several layers that need to be superimposed together to form a complete superstrip):

1. The first figure is an **initial hypothesis** for the problem of "how to organize multiple possible activities in a limited space".

2. The site is cut into strips with a basic width of 50m. According to different functions and different area requirements of the strips, add or subtract the variables of 5m, 10m, 25m or 40m on the basis of 50m, which is the flexibility of the **strip strategy** in **dimension**. Put functionality in Stripe Policy.

3. According to the grid density derived from the area required by different service functions processed by the algorithm, 6 layers of **point grids (confetti)** are stacked.



Finally, beyond these superimposed structural levels, **landscape and natural elements** are implanted and configured in different strip environments and external "ring forest" and "linear forest". The interaction between the main entrances and exits of the park and the city is also determined.

image source: <https://www.oma.com/projects/parc-de-la-villette>

Boundary Space

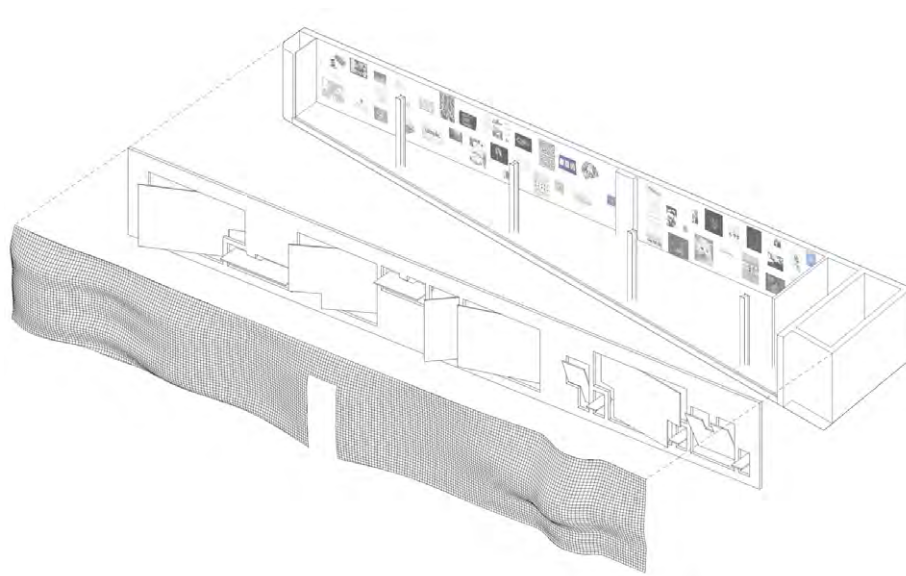
Doing research on this graduation project with the theme of "boundary", the most important thing is to collect the landscape transformation projects of different scales of **boundary space**. The following two projects are: One is about the planning and renovation of the public space of the residential area in the existing large railway area in the city (with beautiful transformation of the **topography in sections**); Another project is to set up some interesting interactive boundary devices in a long and narrow triangular space located on a street corner in the city, as if to bring the boundary space back to life (**blurring the boundary**).

Wisselspoor (Swap track) / DELVA PARK • Utrecht, NETHERLANDS



Wisselspoor is a striking area of approximately 9 hectares **on the edge of the Utrecht city center**. By preserving and repurposing the impressive industrial halls and **translating the relics in the landscape into a grand railway park**, the area continues to breathe its history. The area will be car-free so that the characteristic architecture and landscape will determine the image and **plenty of space** will be created for greenery. Between the many **trees**, pieces of **track**, **points**, and **buffers** make the history of the place legible.

Storefront for Art and Architecture / Steven Holl + Vito Acconci (Artist)
INSTALLATION • NEW YORK, UNITED STATES



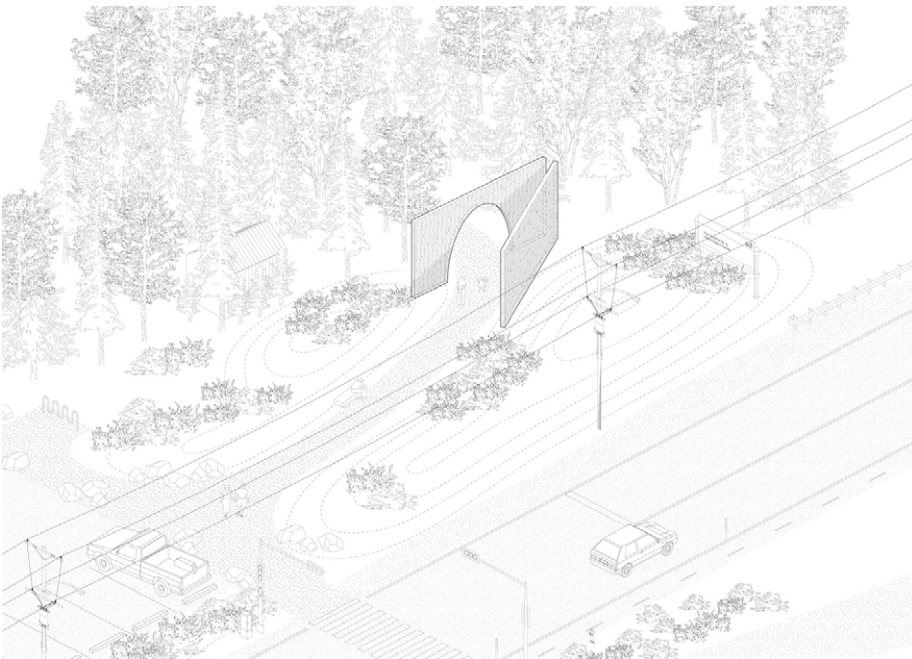
Storefront's gallery space is located in a unique triangular floor space. Artist Vito Acconci and architect Steven Holl replaced the existing facade with a series of twelve **movable panels** that rotate vertically or horizontally. These removable panels open the entire length of the gallery directly onto the street. It **blurs the boundary between inside and outside** and realizes the infinite possibilities of this wall device configuration. The design encourages artists and visitors to create their own entrances, tour routes and experience of the gallery space.

Transition Space of Boundary

Where there are borders, there will always be thresholds (or transitional Spaces) that cross or break them. Therefore, I studied some landscape design as transitional space and slow space.

The following two projects, one at the corner of the street, serve as a space to attract visitors into the site; Another project designed a linear natural space over a bridge and surrounding area. This area and the structure of the bridge serve as a public space connecting the transition area of the living area on both sides of the natural space.

Entre les lignes Landmark / Luca Fortin
LANDMARKS & MONUMENTS • QUÉBEC, CANADA

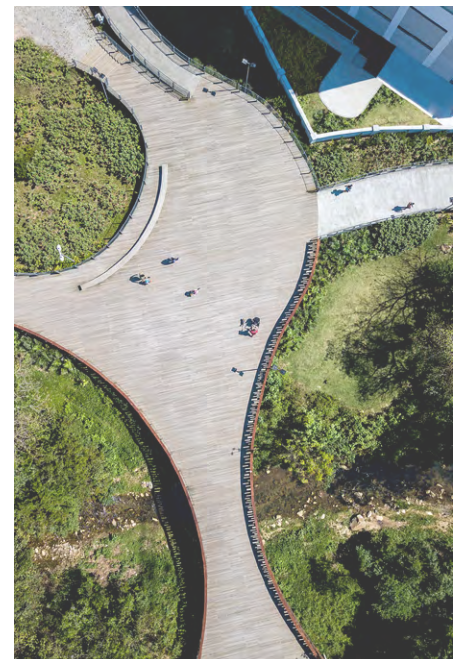


Two concrete walls by designer Luca Fortin resemble an open book to form a passageway inside a Quebec city park.

It is designed to draw park visitors through the circular arch into the wooded space.

"Like an opened book, this work is an invitation to walk through a new landscape, whether real or imaginary," Fortin said.

Córrego Grande Linear Park / JA8 Arquitetura Viva
PARK • FLORIANÓPOLIS, BRAZIL



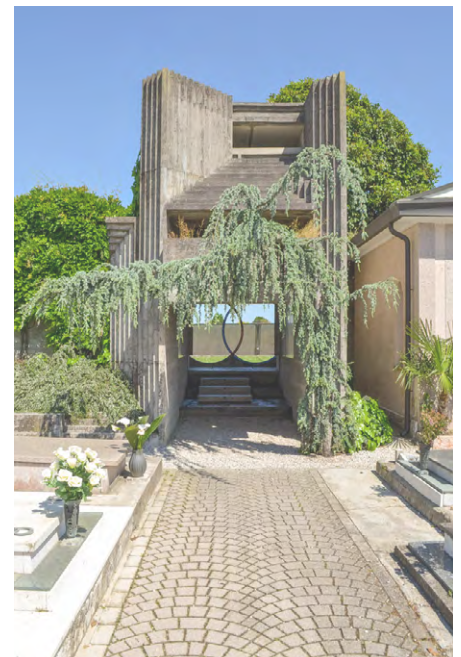
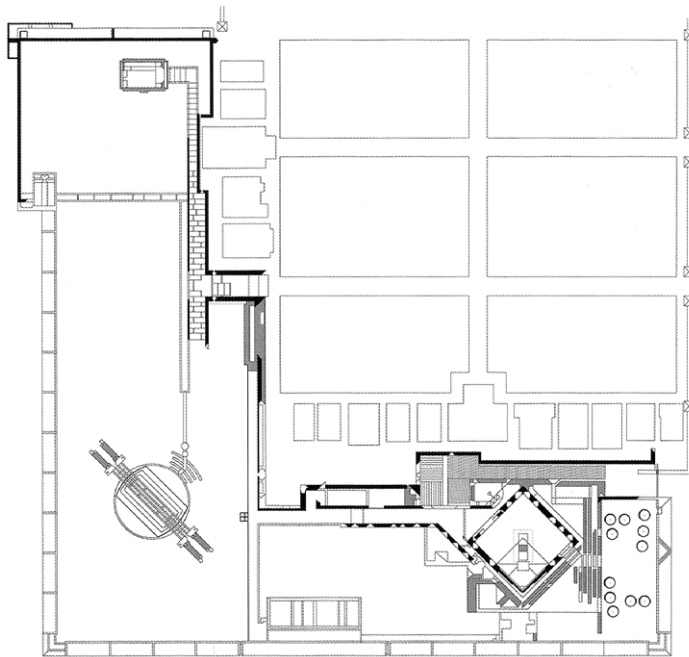
The park works to improve **connectivity and accessibility** and expresses an appreciation of nature. The project explores the local flora and attempts to restore the degraded space to allow the public to enjoy this **public natural space**.

The pedestrian cycling bridge interconnects with the walking and cycling paths throughout the stream, creating opportunities for lateral **connections between the watercourse boundary areas** that cross the boundary of the road system.

Spatial Environment of Boundary Space

In order to better transform the border landscape, serve people, give people better and richer space experience and feeling. I collected some detailed designs with a good sense of space atmosphere. One of the two projects is a memorial site, which provides visitors with a rich spatial experience. The other is to combine the surrounding environment with the same material language (the pure white metal plate) on a road, creating spaces of different forms and functions.

Brion Tomb and Sanctuary / Carlo Scarpa
CEMETERY • San Vito d'Altivole, ITALY



66

Carlo Scarpa tries to add some **poetic imagination** to the Brion Cemetery, as if death has the ephemeral meaning of life. The **poetic narrative spaces** that connect the whole space make the tomb of Brion a truly evocative garden.

The water and forms made of **different materials**, such as concrete, metal, marble and glass, lead visitors to calmly reflect on life and death. Meditation pavilion, ritual Hall, corridor and other spaces create a **unique atmosphere**. The passageway, for example, is hidden, and the entrance is planted with sagging cedars, requiring one to break through the curtain to enter. Only small amount of light penetrating through allows the source of light and **visual focus** of the whole corridor to come from the end of the frame, which consists of two interlocking circles. Everyone who comes is walking up and down, **feeling life and time**.

image source: <https://www.architectural-review.com/archive/garden-of-death-and-dreams-brion-cemetery-by-carlo-scarpa>
<https://www.archdaily.com/991218/architecture-that-hides-stories-a-look-at-the-brion-tomb-by-carlo-scarpa>

Miradouro da Serreta (Serreta Viewpoint) / Adriano Niel, Miguel Mourão
COMPETITION (LANDSCAPE INTERVENTION) • ANGRA DO HEROÍSMO, PORTUGAL



The Serreta Viewpoint is understood not only as a path that leads to a magnificent view of the sea but as **a set of spaces for reflection and interpretation** that unfold along the way, making the place **a space of sensations** that encourages exploration and connection with nature, Inviting people to enjoy its rhythms, timing, colors, textures, smells, and sounds.

The use of a **single material** creates a **strong identity**. A set of white planes in soft dialogue with natural elements, assuming subtle and prominent forms that stand out in contrast and create comfortable spaces.

Temporal Experience of Boundary Spaces

As a space, the Boundary could not only provide visitors the spatial experience, but also temporal experience. The rich **temporal and spatial variations of a space** can provide visitors with a variety of experiences. In other words, the boundary can be studied and designed as a **four-dimensional space**.

Brickless Brick Walls
(can be seen through)



concrete and
bricks made of raw mud (unfired bricks)

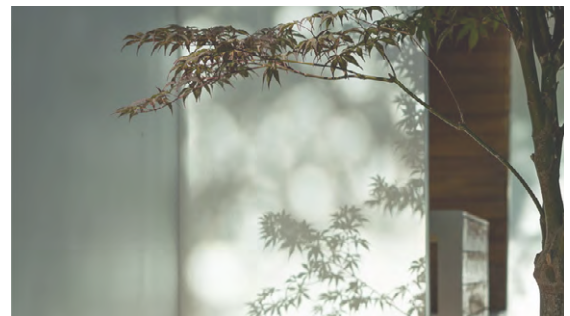
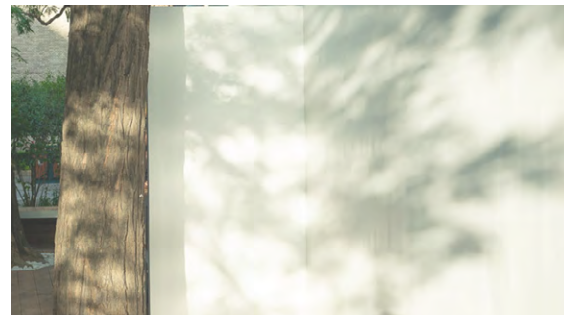


bricks were pushed out with pressure washers



showed traces of time on the walls

White Walls (made of bricks or thick steel plates)
(with nice shadow changes throughout the day)



Spatial boundaries are usually composed of different objects, forms, or materials. The boundaries formed by different material groups can often form different spatial experiences at different times.

In the selection of the design **language (Materiality)** of this design project, the role of different materials in the boundary landscape project was taken into account.

wooden piles
(as fort outline's guiding lines)



The physical boundary formed by the **brickless brick wall** can easily be affected by man-made or natural factors to change the permeability of the space. At the same time, the bare cement will give people a more natural and wild feeling.



However, in contrast, **white walls**, as a more concise and flawless material than brickless brick walls, give people a more urban feeling. Paired with beautiful plants, it will also have a rich light and shadow change throughout the day.



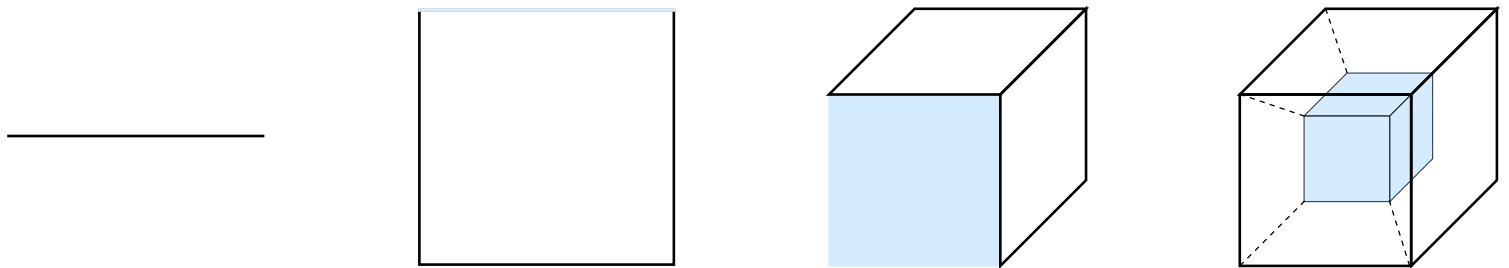
A line of **wooden piles** placed into the environment can easily attract people's attention or curiosity. At the same time, as a material that can be easily obtained from the natural environment, wooden piles will be changed little by little and gradually integrated into the natural environment under the action of weathering and erosion as time changes.

The effects of material blocking, penetrating or guiding people's line of sight, light and shadow changes, etc., create different spatial experiences and enrich the space atmosphere.

Brickless brick walls and **white walls** were chosen to be used more on both sides of the border, respectively, to enhance or highlight the sense of sharp contrast of the boundary; The continuous **wooden piles** serve as a visual guide to enhance spatial continuity.

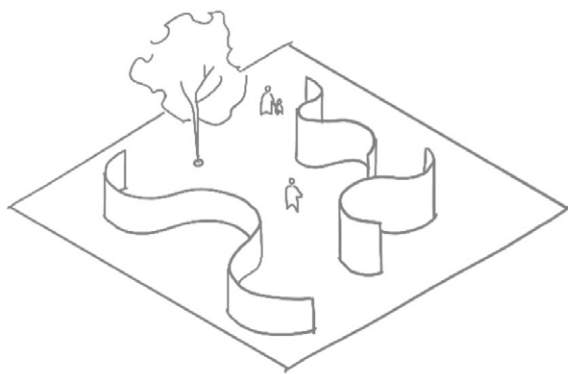
04 Defining

4 Dimentions of the 'Boundary'

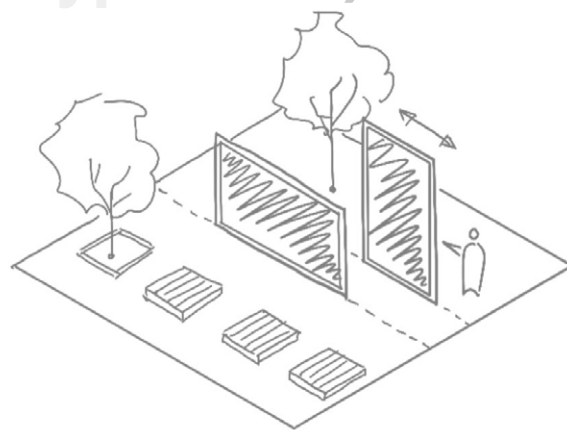


(Experimental Boundary Hypothesis)
The Contrasting Boundary
Four Dimensions of the 'Boundary' Space
a. Length of the Boundary
b. Width of the Boundary
c. Height of the Boundary
d. Temporal Dimension of Boundary Space

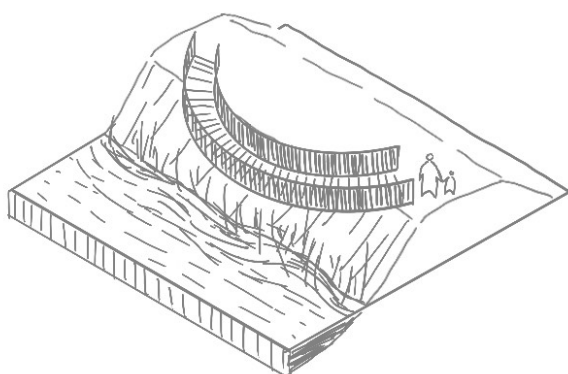
(Experimental Boundary Hypothesis)



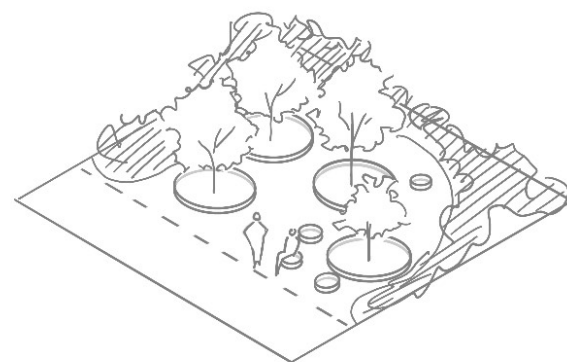
a. 'In-between' Space



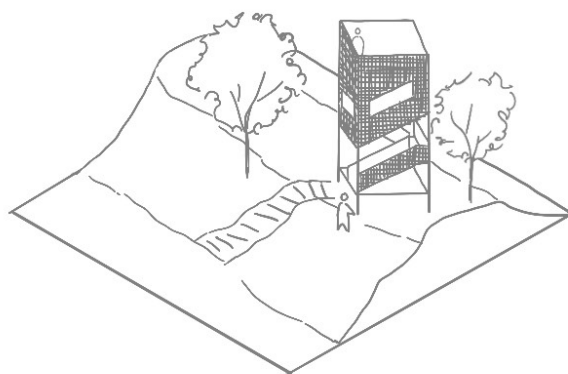
b. Temporary/ Movable Exhibition Space



c. Wooden Platform Bridge



d. Communicating Public Space



e. Viewing Tower

The **process** of the boundary hypothesis experiment:

1. Researching for suitable boundary approaches --- brain storm and make imaginary design sketches in different dimensions' circumstances (ecology, path, extreme...).

2. Exploring the boundary area's opportunities through different sketches and create new ideas.

Considering the space type or space structure needed by the public, in the end, **an experimental hypothesis sketch design combination** sketches was made.

3. According to this following sketch, searching for suitable precedents and find future proposals/ strategies for Den Helder's boundary area.

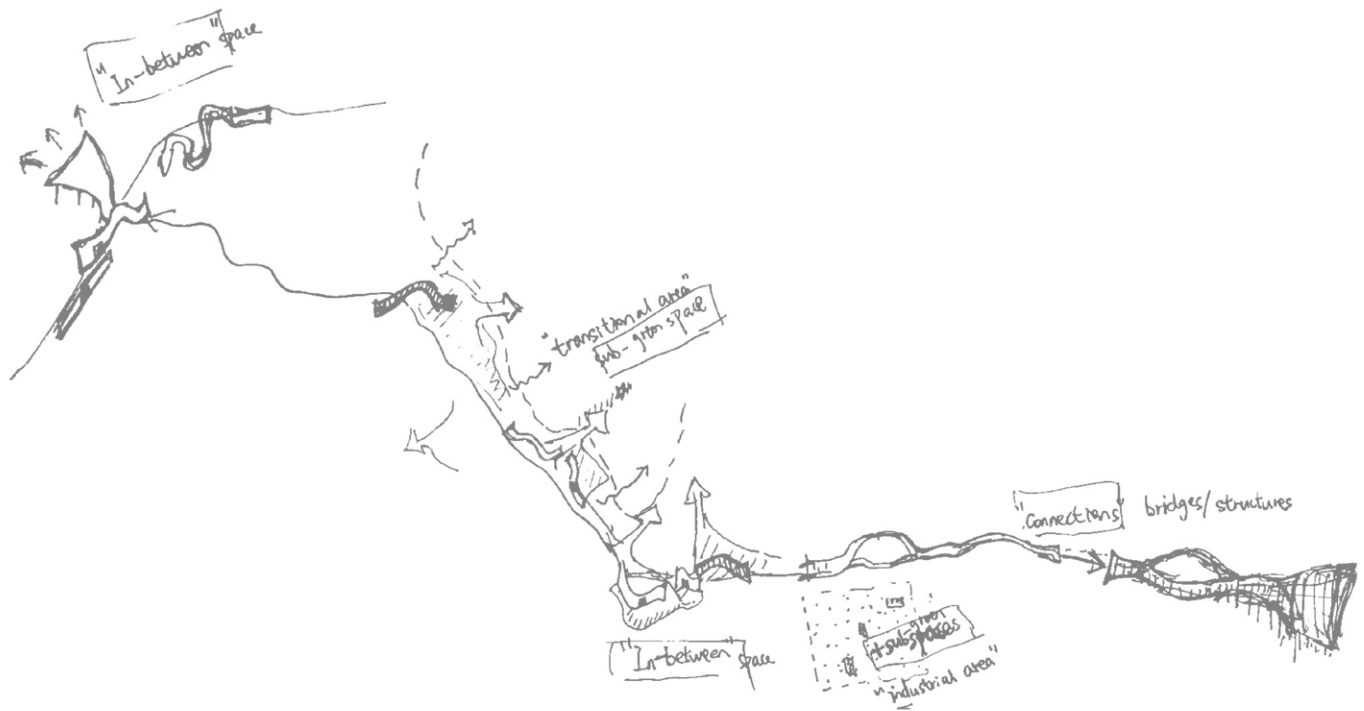


Figure 04-3. Experimental Boundary Hypothesis in the Defence Line boundary area.
Source: drawn by author

Now this historic defensive line area connects the east and west sides of the city as a linear space in the shape of a long strip. At the same time, it serves as a space separating several urban residential areas and a transition space connecting the two sides. When I was thinking about the process of generating design concepts at the initial stage of the design, I tried to make a series of extreme designs on the urban scale that took into account different situations. The experimental sketch design gave me the opportunity to think about and understand the site at a deeper level.

For example, I designed a huge wall structure connecting the entire city from west to east, and added openings in some locations to strengthen and highlight the existing spatial boundaries of the defensive lines, forming a series of 'in-between Spaces'. For example, I designed a series of expensive Bridges that protrude and connect the defensive line area. For example, I designed a complete green space system connecting the whole city and added some subspaces to the defensive line area.

I began to seriously think and analyze the design of this site and this project, so as to design more specific details in the later stage.

The Contrasting Boundary

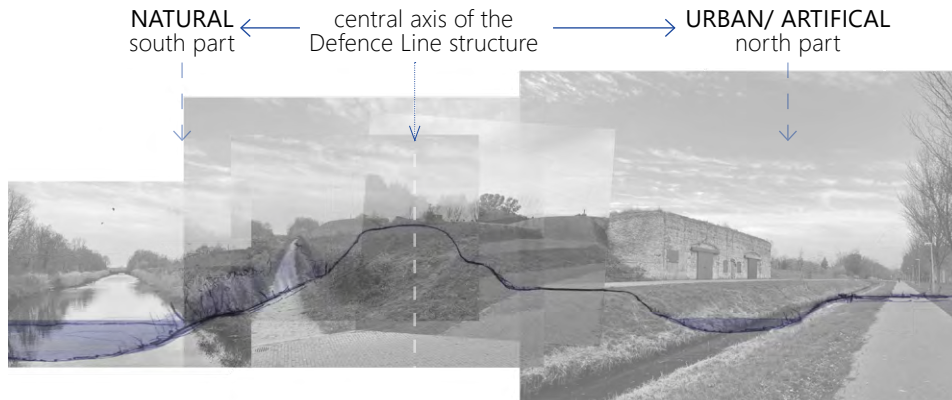


Figure 04-4. Different spatial environments on the south and north sides of the Defence Line.
Source: drawn by author

The intention of the project is not to propose new solutions to the problems that would directly change the site completely, but to use the landscape as an intermediate coordinator considering all aspects of the specific site, and then make a loose guide with an open ending to imagine the future. So, an open-ended result would be considered at the end of design.



Figure 04-5. Concept diagram of the contrasting boundary landscape (southern natural part on the bottom and northern urban part on the top).
Source: drawn by author

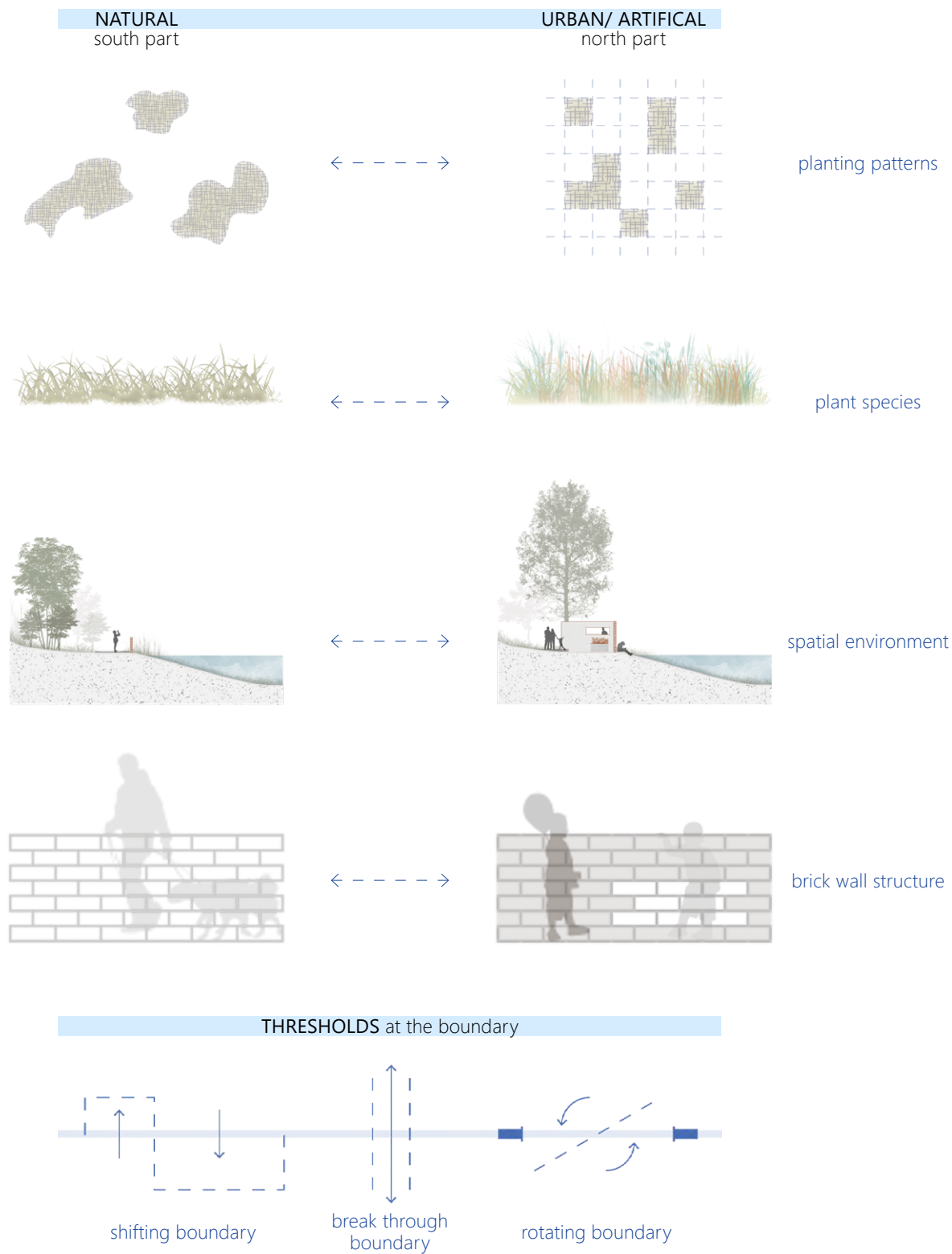
Concept: A contrasting boundary landscape

The boundary not only serves as a separation, but it also acts as a bonding agent to connect the two sides as a transition space for them. So what I want to do is to figure out how to make better use of this linear boundary space, and form some transition space.

For now, the spaces in the north side of the defence line are **more urban** (With many residential or industrial areas). In the meanwhile, the spaces in the south side of the Defence Line area are **wilder and more natural** (with many sports fields, parks, or some canals).

I wanted to reinforce the existing contrast between the north and south sides of the boundary area. In this way, a '**contrasting boundary**' concept could enhance the spatial environmental characteristics of this boundary area. And, visitors would notice these **differences** better during the exploration of the spatial continuity in Den Helder's Defence Line area.

Principle 1 --- The Contrasting Boundary



In order to emphasize the concept of contrast boundary in the design. I came up with a series of design strategies (including but not limited to planting patterns, number of planting varieties, type and distribution of public spaces, placement and arrangement of the brick wall structures, etc.) to highlight the contrast between north and south.

Figure 04-6. The design of the different experiences of the spatial environment on the south and north sides, and the strategy of dealing with the intermediate boundary.
Source: drawn by author

The Hidden Boundary

Four Dimensions of the 'Boundary'

Design approaches according to the 4-dimensional analysis:

1. **Length** (parallel the linear boundary space direction):
Physical-connection: (reconnected spaces);
Visual-connection: (repeated materials/ structures/ focusing points for people to keep chasing and creating their mental image of the area)
Conceptual-connection: Along the boundary space, the concept of a unified boundary theme allows people to experience the spatial changes of the diversity of Defence Line in this direction
2. **Width** (crossing boundary direction):
Add some moments for 'slowing down';
Diverse public sub-space attached to the boundary area for people to meet and communicate when crossing boundary area;
Consider the connection with the surrounding landscape and green space system.
3. **Height** (vertical direction):
Make good use of the existing height differences;
Enrich the spatial variation at different height levels.
4. **Time** :
Use different materials combined with nature create multiple spatial experiences

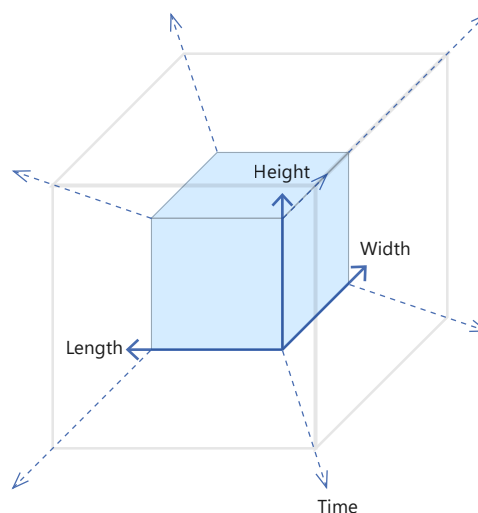
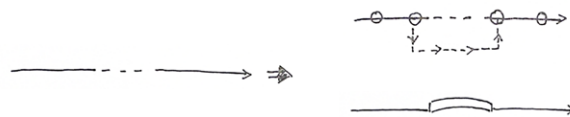


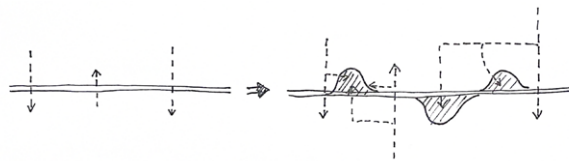
Figure 04-7. The design about the four dimensions of the 'Boundary'.
Source: drawn by author

The Multi-dimensional Boundary:



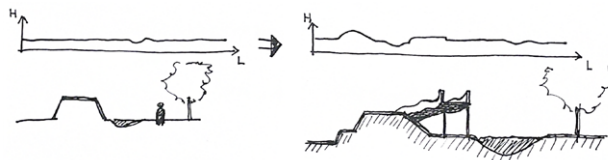
Physical/ Visual/ Conceptual Connection

'Length'



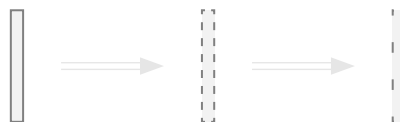
'Slowing-down'/ Meeting Points/
Diverse Transitional Public Spaces

'Width'



Enrich the spatial variation of different heights

'Height'



different spatial environment created by different
materials (views changing through time)

'Time'

a. Length of the Boundary

Principle 2 --- Length of Boundary

linked by journey about the war or about the various spatial experiences; multiple guiding points

The state of war



Change of space atmosphere



Design hypothesis

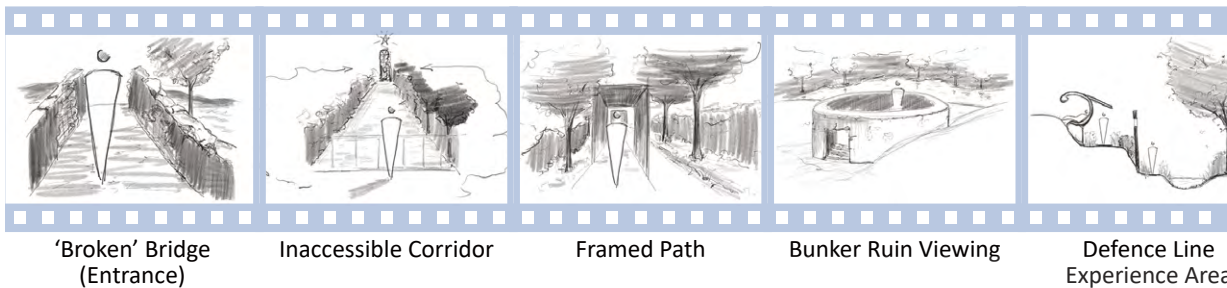


Figure 04-8. storyline linked by journey about the war or about the various spatial experiences in the length direction.
Source: drawn by author

In order to connect the whole space as a whole as possible in the 'length' direction, with **physical, visual and conceptual links**, I proposed to give visitors and residents different **layers of spatial experience** in this direction.

Aiming at the **unforgettable historical stories** that the city has experienced and the different **existing space environment atmosphere**, I proposed a series of related historical story lines and space experience lines for these different areas.

The spacial experience in the Defence Line area will become more **coherent and rich**, and become a space that can **be visited and experienced**.

From the perspective of people's **walking behavior**, people always observe the front landscape, devote themselves to finding a **reference object (guiding points)** as the **middle target**, and then basically move forward in a straight line to the target.

When approaching the goal, people then choose the next target and move on naturally. As the target keeps changing, without other special constraints, people's walking trajectory becomes roughly a slightly curved curve.

Guided by reference objects (**guiding points**), people do not always have to consider the direction of walking in the process of walking, and can have time to calmly talk, think and feel the atmosphere of the environment. The longest distance people can walk easily is **about 200m~300m**. Therefore, it is easier to **attract the attention of pedestrians** to set markers to be emphasized every 200m~300m.

Figure 04-9. length direction principle map.
Source: drawn by author

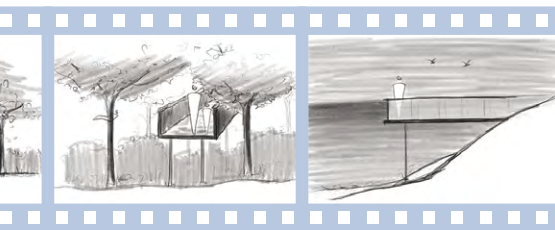
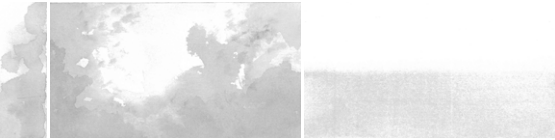
nd

6

City Reconstruction

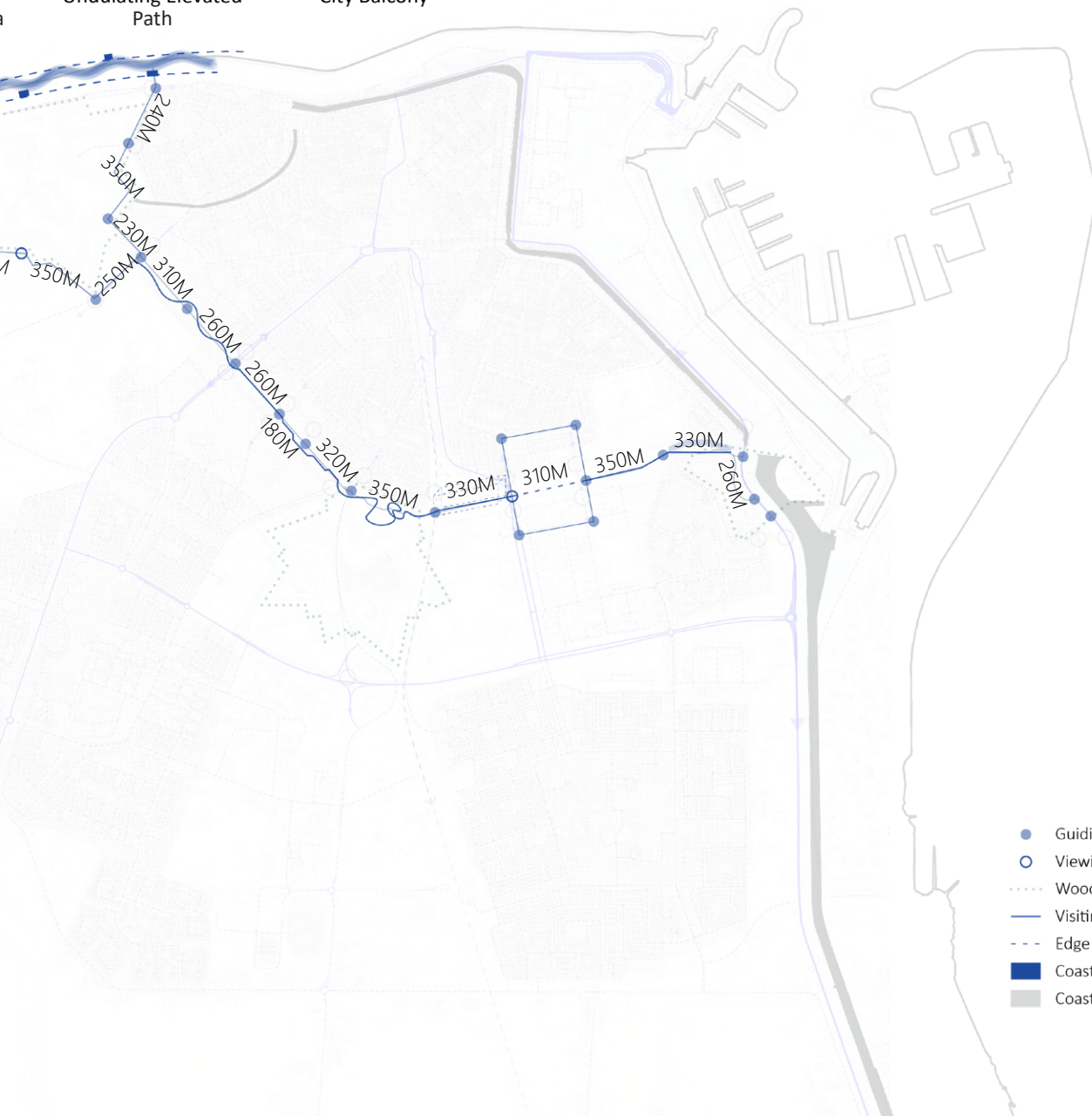
7

Peaceful Days



Undulating Elevated Path

City Balcony



b. Width of the Boundary

Principle 3 --- Width(transition) of Boundary

dynamic connection to residential areas

slowing down points/ meeting points beside crossroads

This Defence Line boundary space now serves as a separation and transition zone between the different functional areas on the north and south sides. There are many roads running through this space.

Studies show that people are most likely to slow down when they cross the street. Therefore, these **intersections** are also the most likely places for people to have the opportunity to meet or communicate with strangers.

'Slowing down' points/ meeting points (as the invitation designs in public spaces) will be considered in the areas near crosswalks, which may slow down pedestrians or even change their route, and increase the likelihood of their encounters and interactions. These public spaces will be the smooth transitions between both sides of the boundary; Being able to see what is going also can be an element of invitation and this will give people chances to have somewhere to go or something to do.

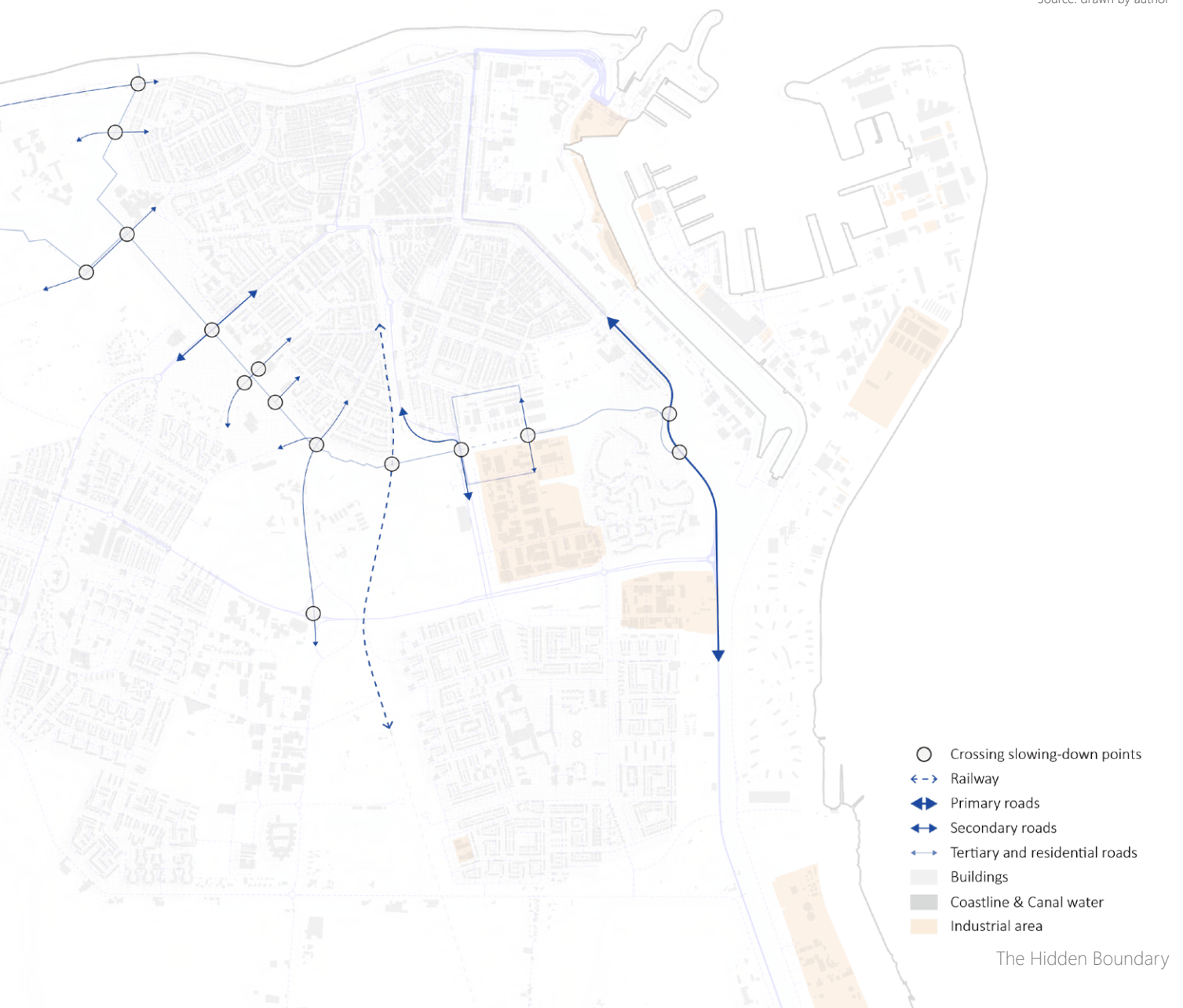
Therefore, when considering the intervention design in the 'width' direction, I tried to find some suitable places and add some 'slowing down' moments to them, as a transition zone connecting different areas on each side.

80



Figure 04-11. conceptual conclusion plan, in which part a and b (length and width of the boundary) are taken into account to get the final result of the plan.
Source: drawn by author

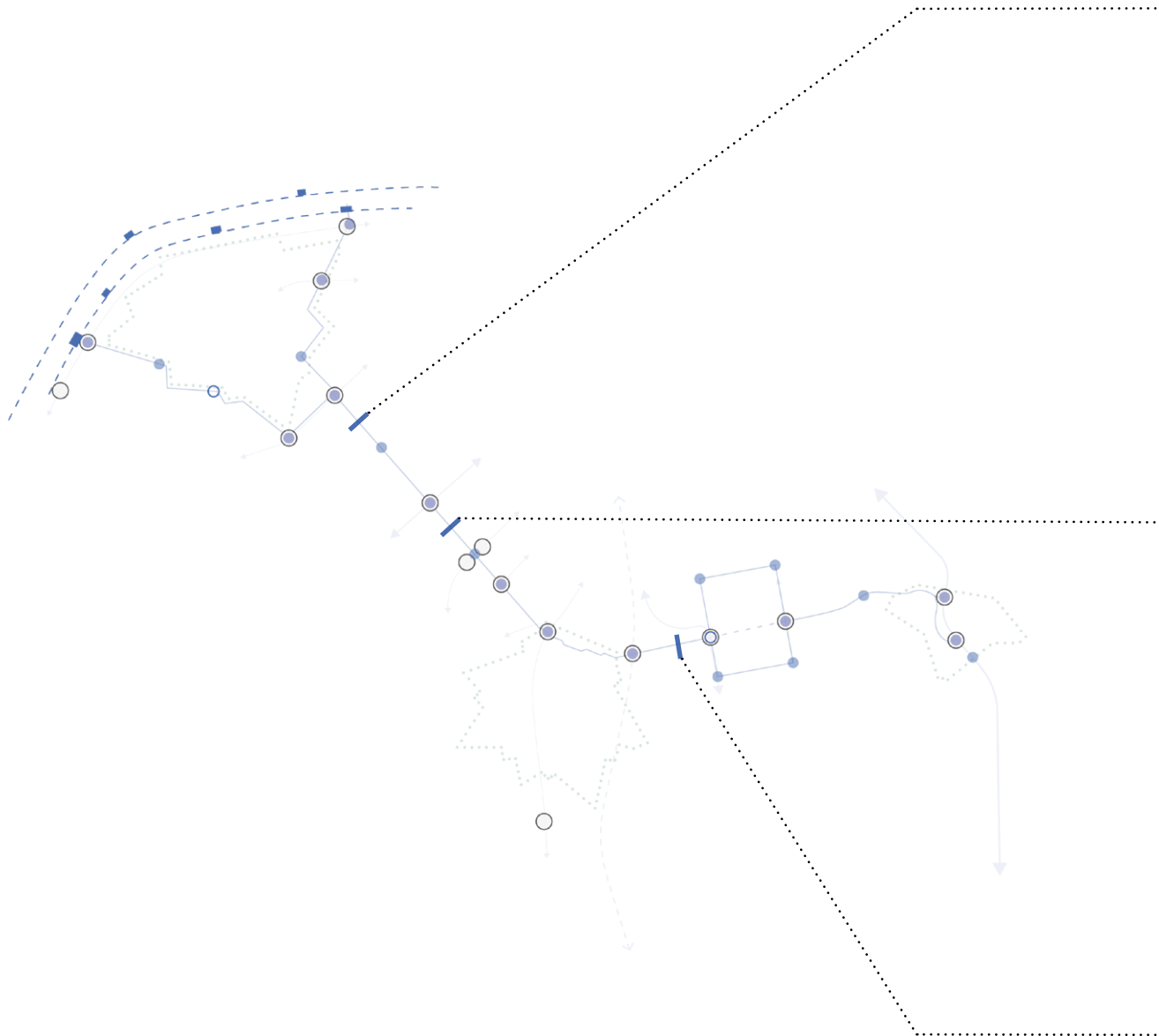
Figure 04-10. width direction principle map.
Source: drawn by author



c. Height of the Boundary

Principle 4 --- Undulating Boundary
to deal with the topography
spatial experience of high or low location

In the dimension of 'height', different methods are proposed to intervene in the existing sites at different heights or with different height differences, so as to **enrich or create the spatial experience changes** of Defence Line in height. For example, For example, increasing or decreasing the height difference, changing the location of the height change, increasing the height change to form a new space, and so on.



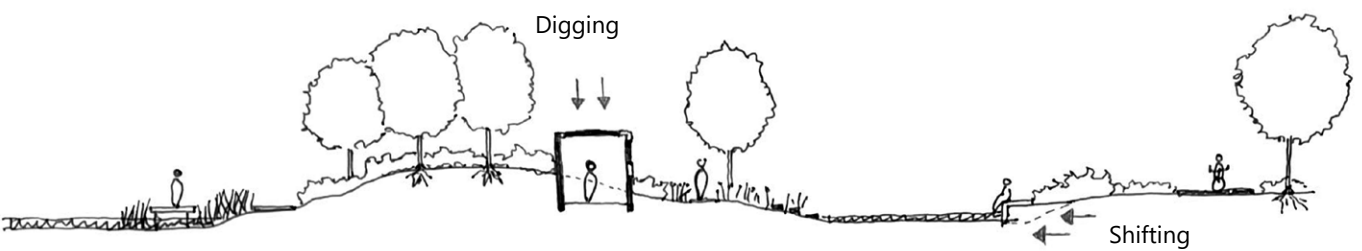
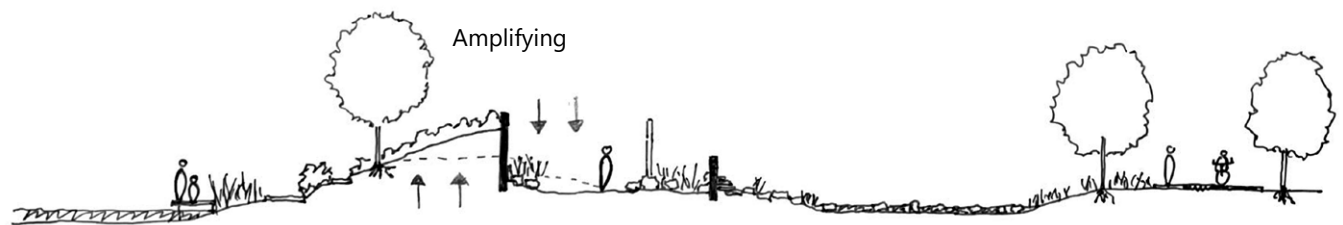
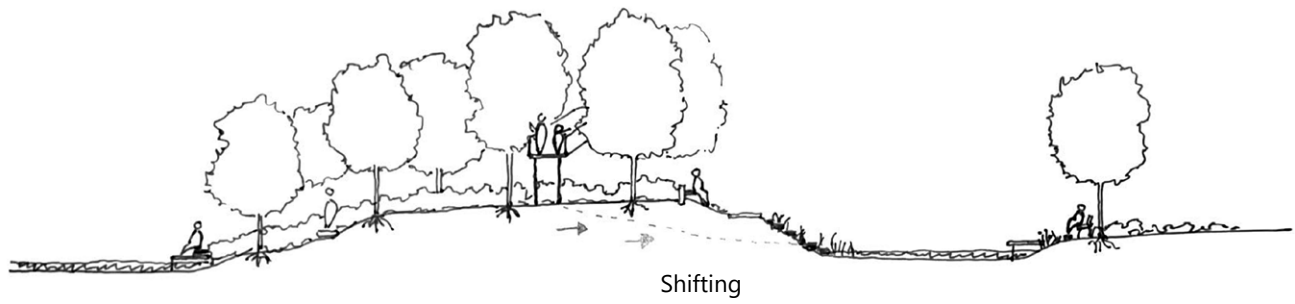
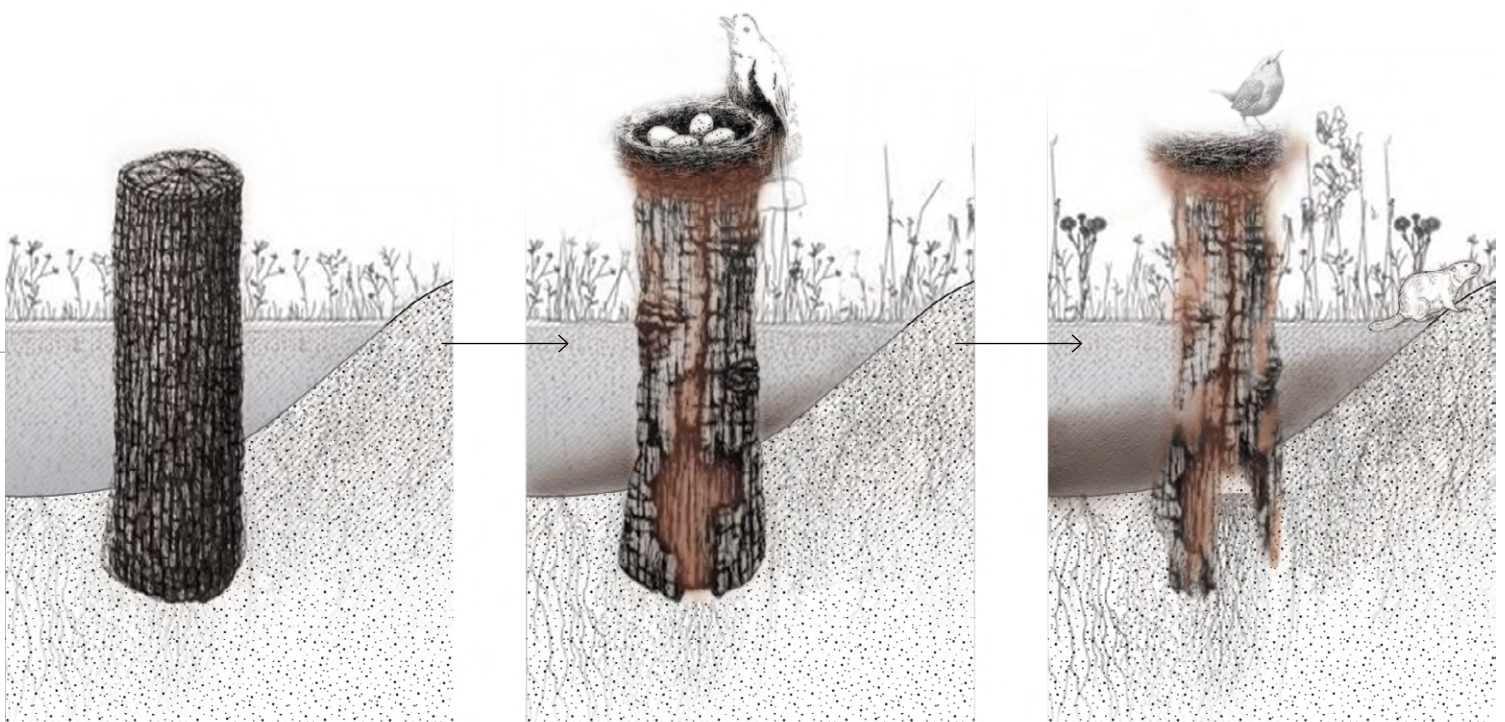
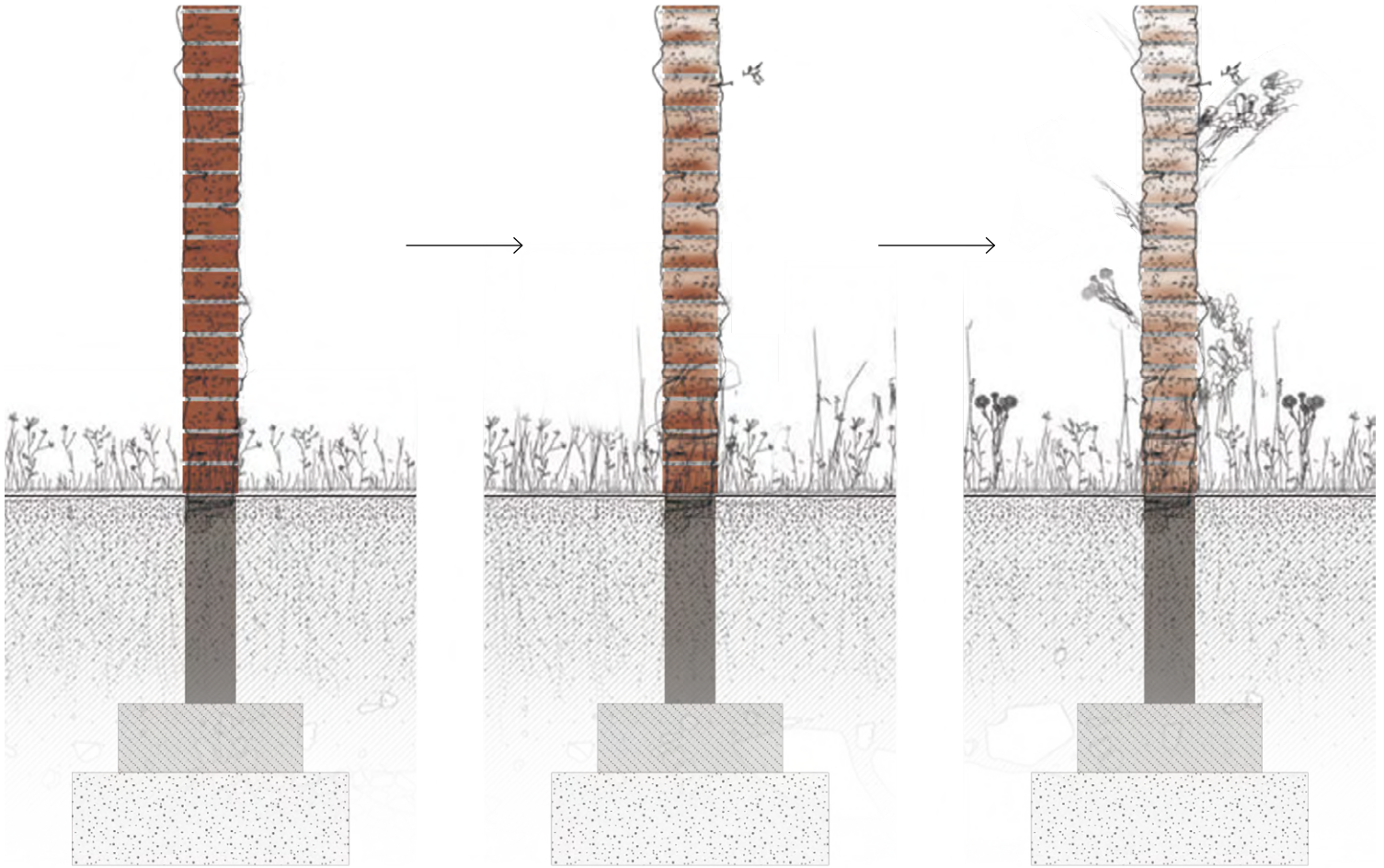


Figure 04-12. height direction principles.
Source: drawn by author

d. Temporal Dimention of Boundary Space

Principle 5 --- Dynamic Boundary Landscape
to deal with the Relationship Between Materials & Nature
spatial experience in different time



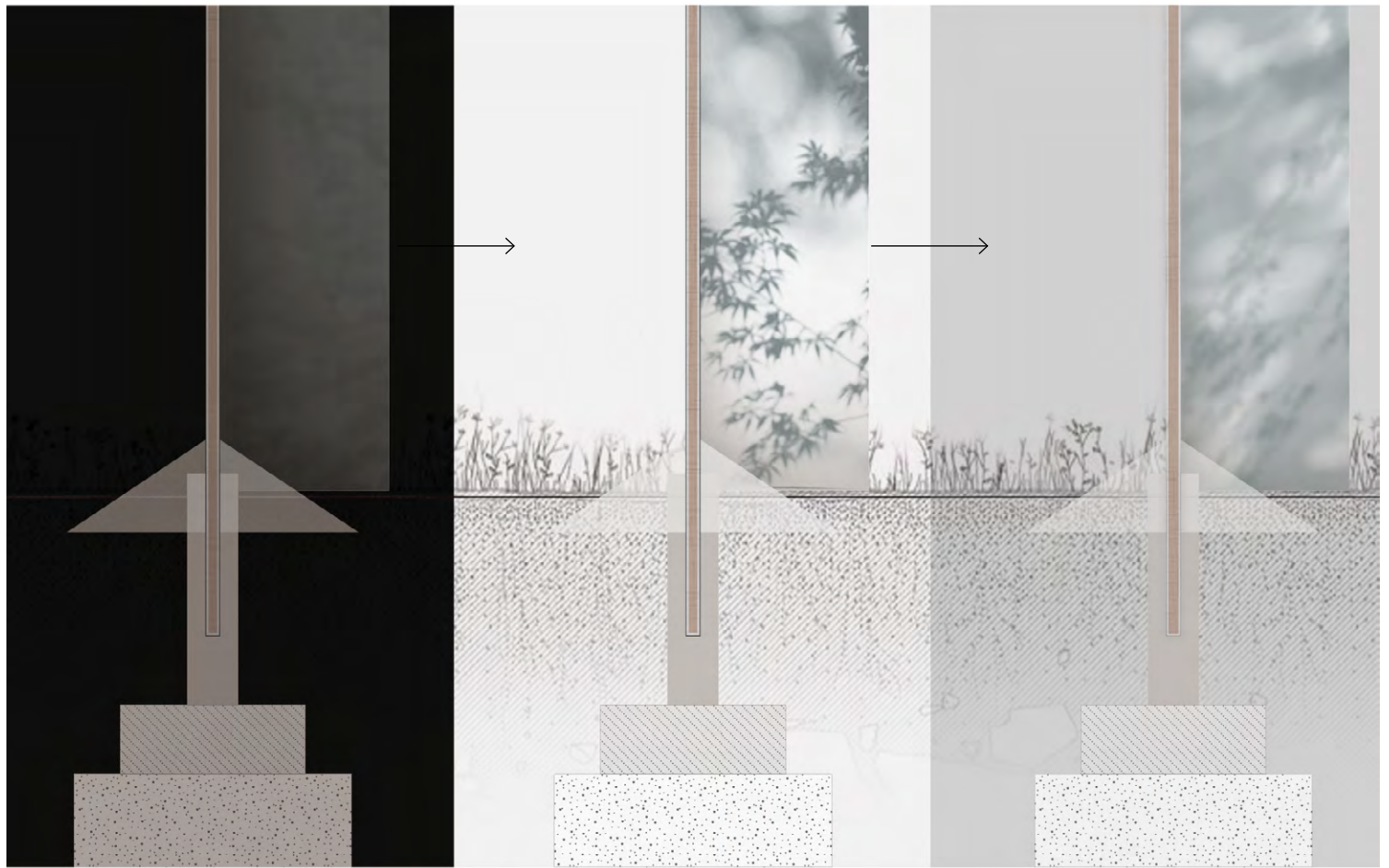


Figure 04-13. Relationship Between 3 different materials (brickless brick walls, white walls and wooden piles) and nature in the dynamic landscape.
Source: drawn by author



Crataegus monogyna



Acer palmatum



Prunus serrulata



***Taxus baccata* 'Fastigiata'**



***Betula pendula* 'Youngii'**



***Prunus cerasifera* 'Nigra'**



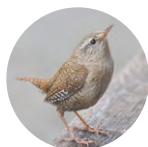
European robin (Roodborst)
Erithacus rubecula



Western jackdaw (Kauw)
Coloeus monedula



True thrush (Merel)
Turdus merula



Eurasian wren (Winterkoning)
Troglodytes troglodytes



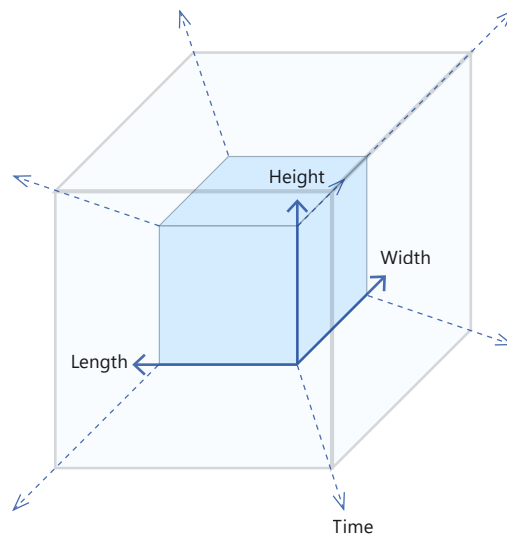
Eurasian woodcock (Houtsnip)
Scolopax rusticola



Marsh warbler (Bosrietzanger)
Acrocephalus palustris

05 Design

make interventions in these 7 Zones and introduce the boundary areas into daily life



Boundary Spaces and Inbetween Spaces Design (7 Zones)
Crossing Road 'Meeting Points' Example
Defence Line Linear Space Design (Zone 5)
Defence Line In-between Space Design (Zone 4)

Boundary Spaces & Inbetween Spaces Design

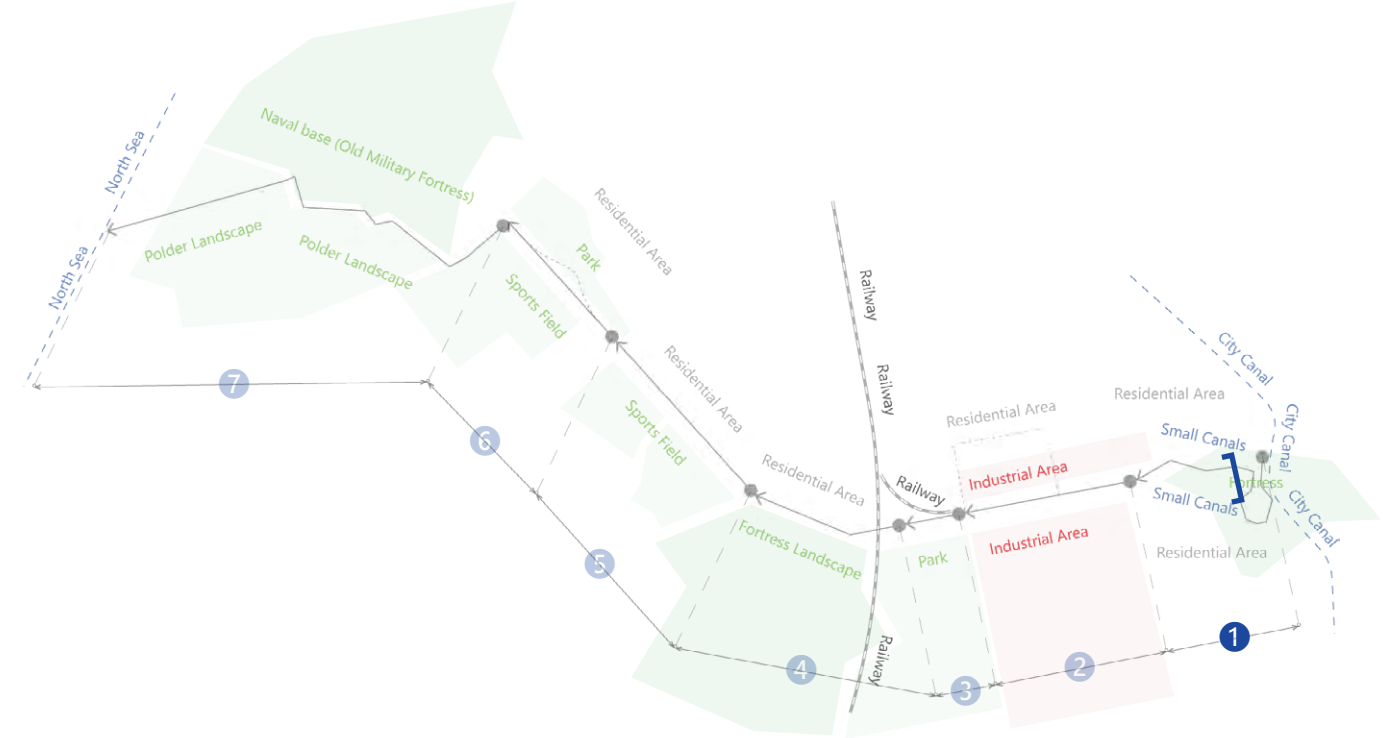


Figure 05-2. zoning map in the Defence Line area.
Source: drawn by author

Using the **existing visual and physical connection** and **different spatial environment**, and introducing some **design interventions** to the Defence Line of these seven zones according to the principles about the contrasting boundary concept and four-dimensional boundary will make the process of moving through or across this boundary landscape more lively and interesting. In the mean time, this boundary area would be treated as a whole and integrated as an area in the middle of the city

In the following parts of this chapter, **detailed designs** and the **seven sections** across the boundary in each of these seven zones would help readers to connect the whole story along the Defence Line boundary area.

Zone 1 - Fort Westoever Area



Current spatial atmosphere of Zone 1

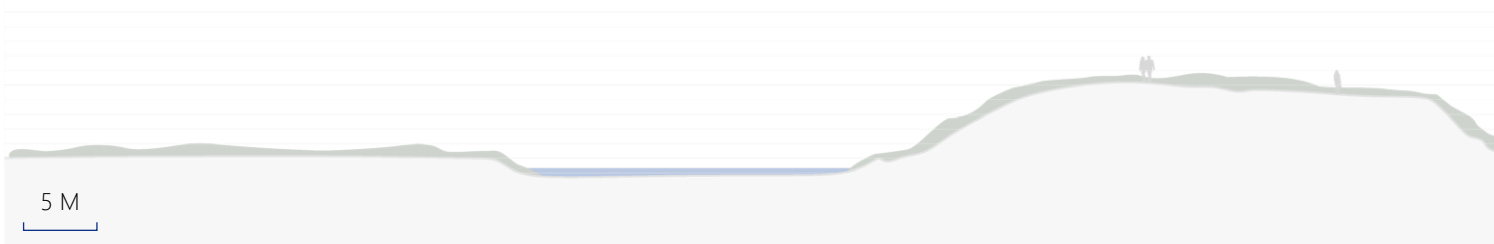
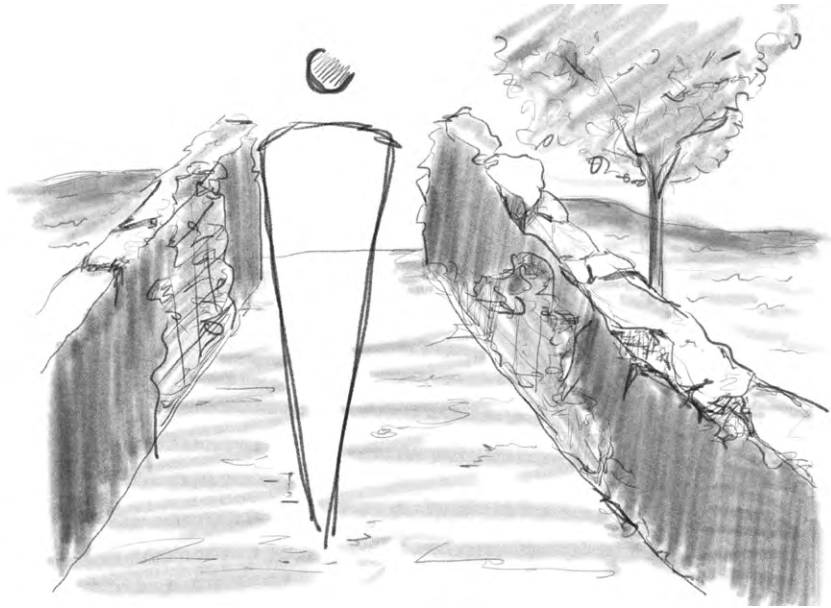


Figure 05-3. section of zone 1 design hypothesis.
Source: drawn by author



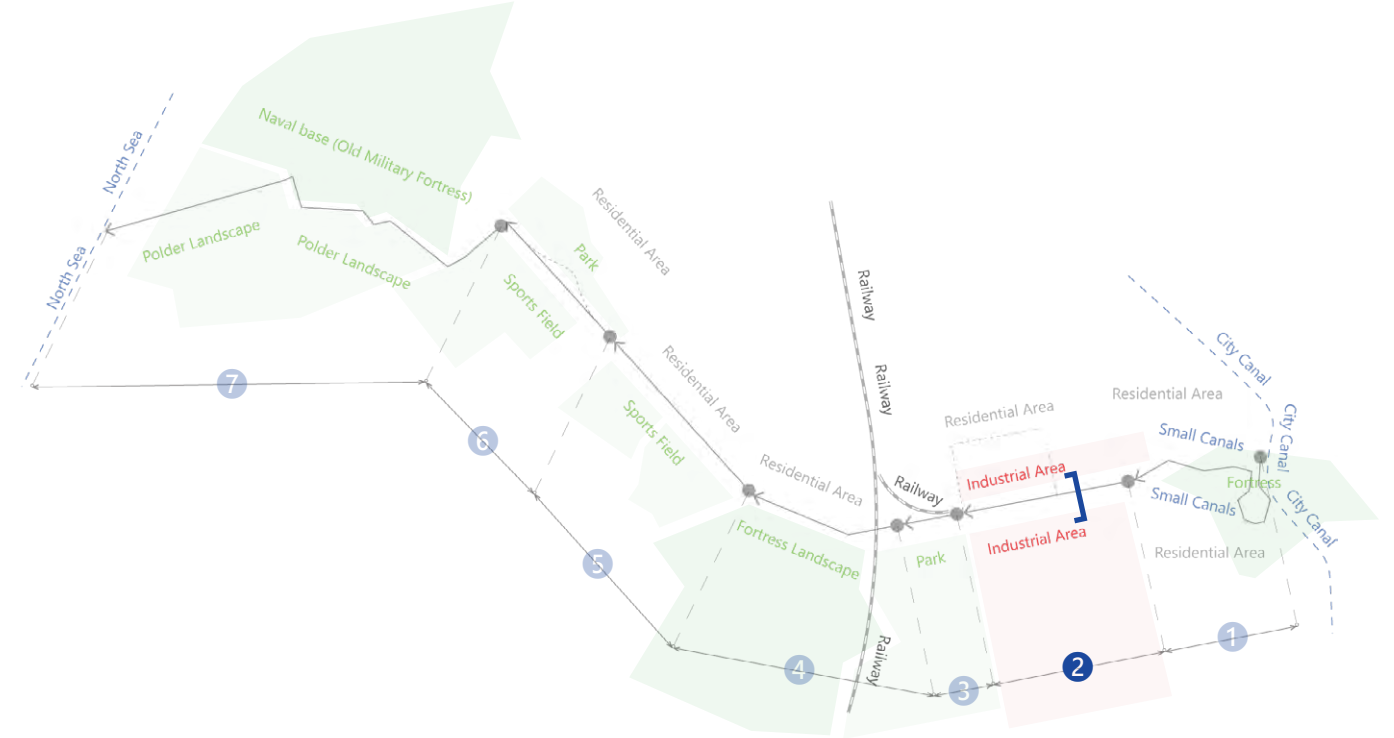
Design hypothesis of Zone 1

Blocked by the water of the canal, people cannot reach the other side directly to continue the tour of the Defence Line area (the land is located in one of the old fortress), and as the starting point of the tour route, a newly introduced broken-looking bridge and signs will attract people's attention and guide them to the next point.



Section Zone 1 - Fort Westoever Area

Zone 2 - Industrial Area



Current spatial atmosphere of Zone 2

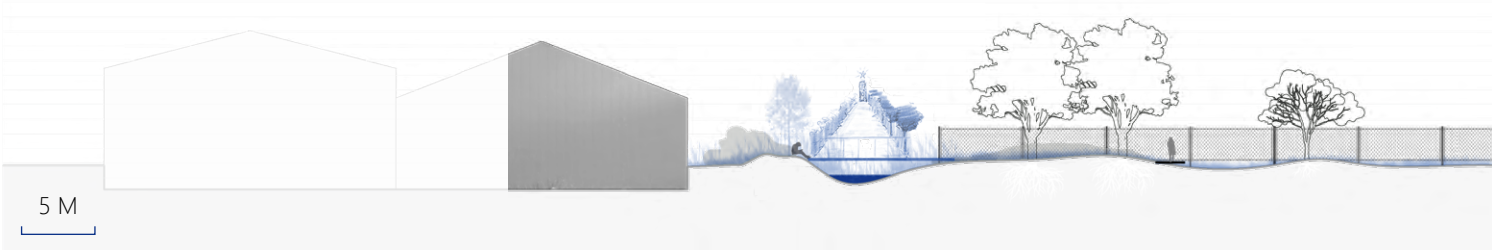
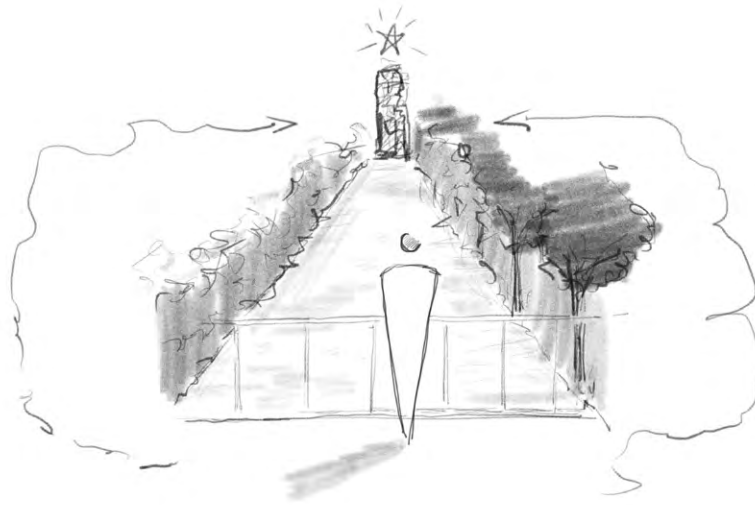


Figure 05-4. section of zone 2 design hypothesis.
Source: drawn by author



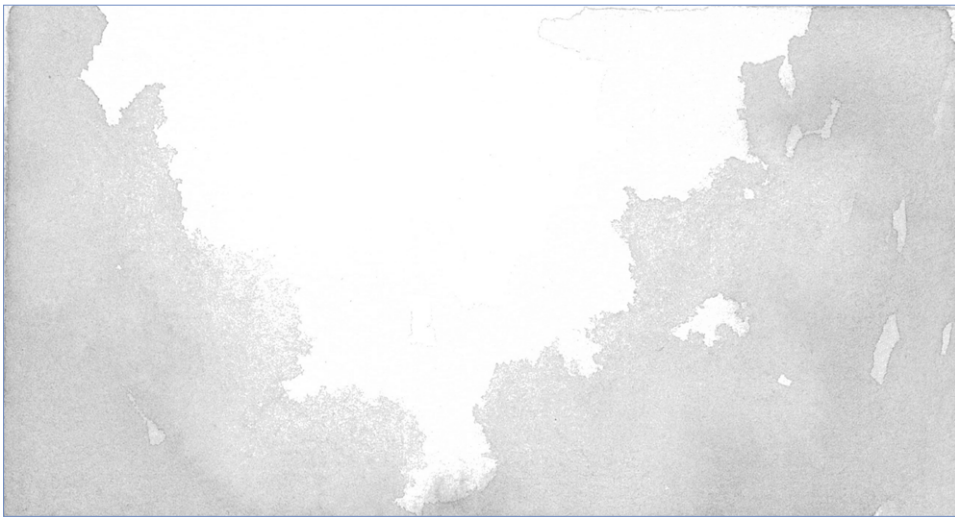
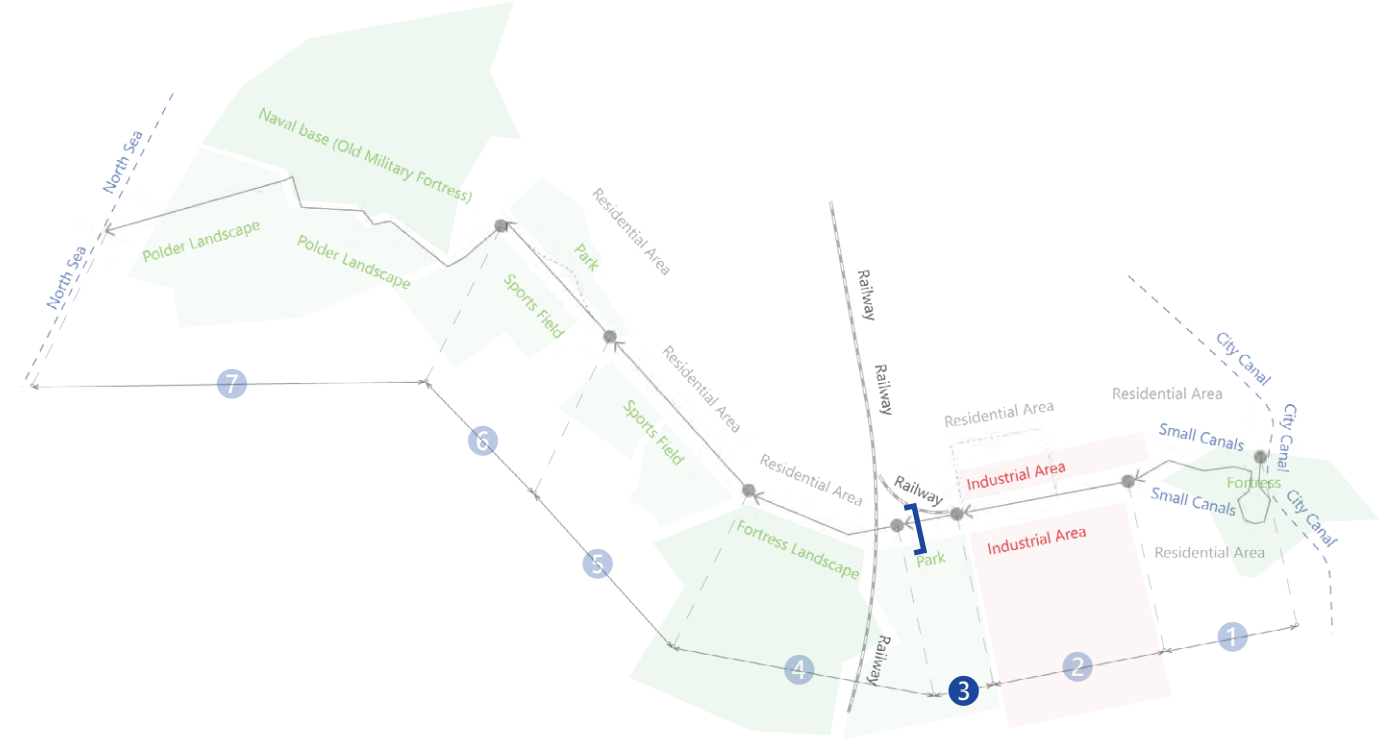
Design hypothesis of Zone 2

In this linear corridor area (blocked by fences and the land belonging to the industrial area) that cannot be crossed directly to the next point, there will be signs to attract attention and guide people.



Section Zone 2 - Industrial Area

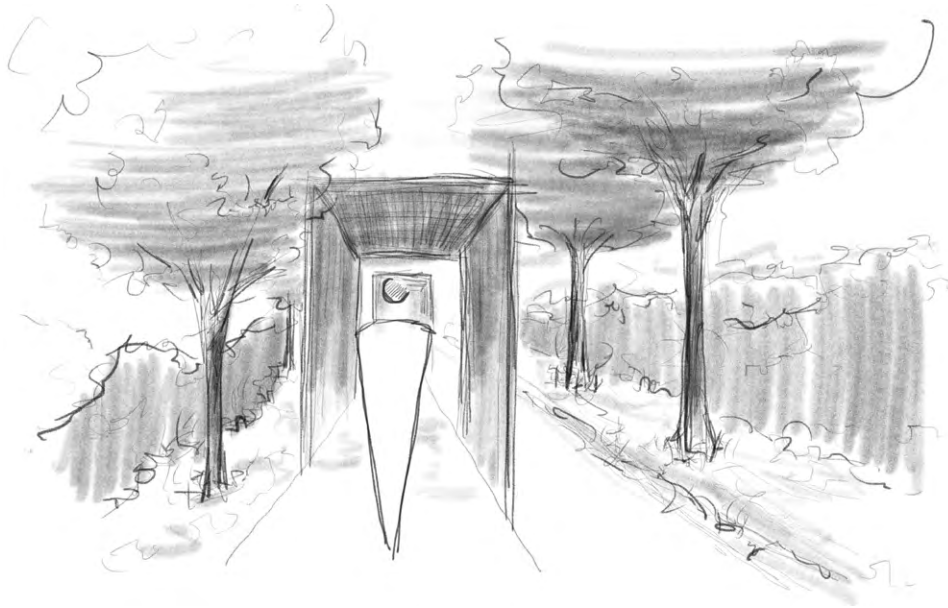
Zone 3 - Corridor Area



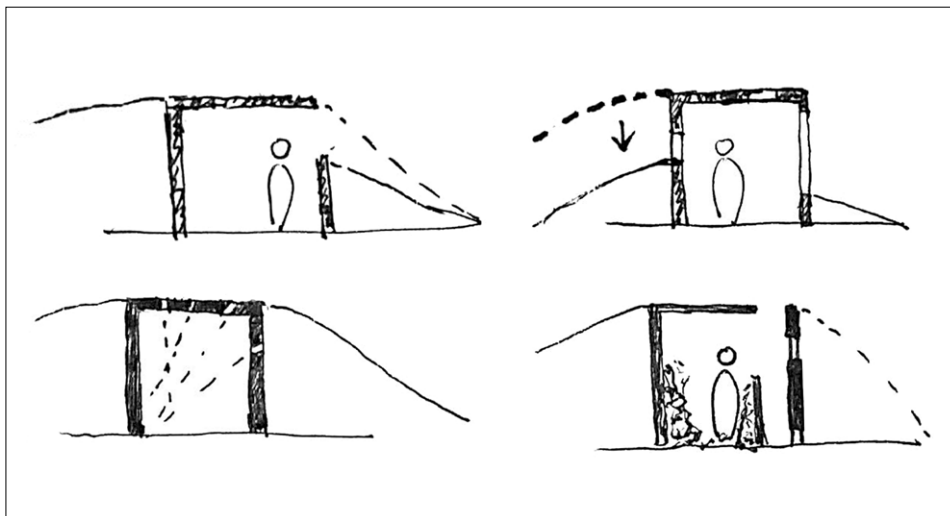
Current spatial atmosphere of Zone 3



Figure 05-5. section of zone 3 design hypothesis.
Source: drawn by author



Design hypothesis of Zone 3

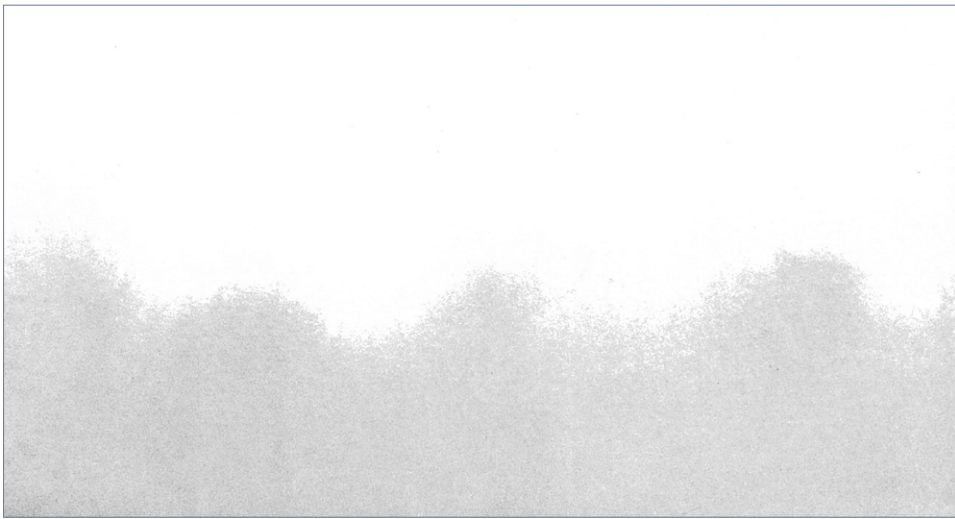
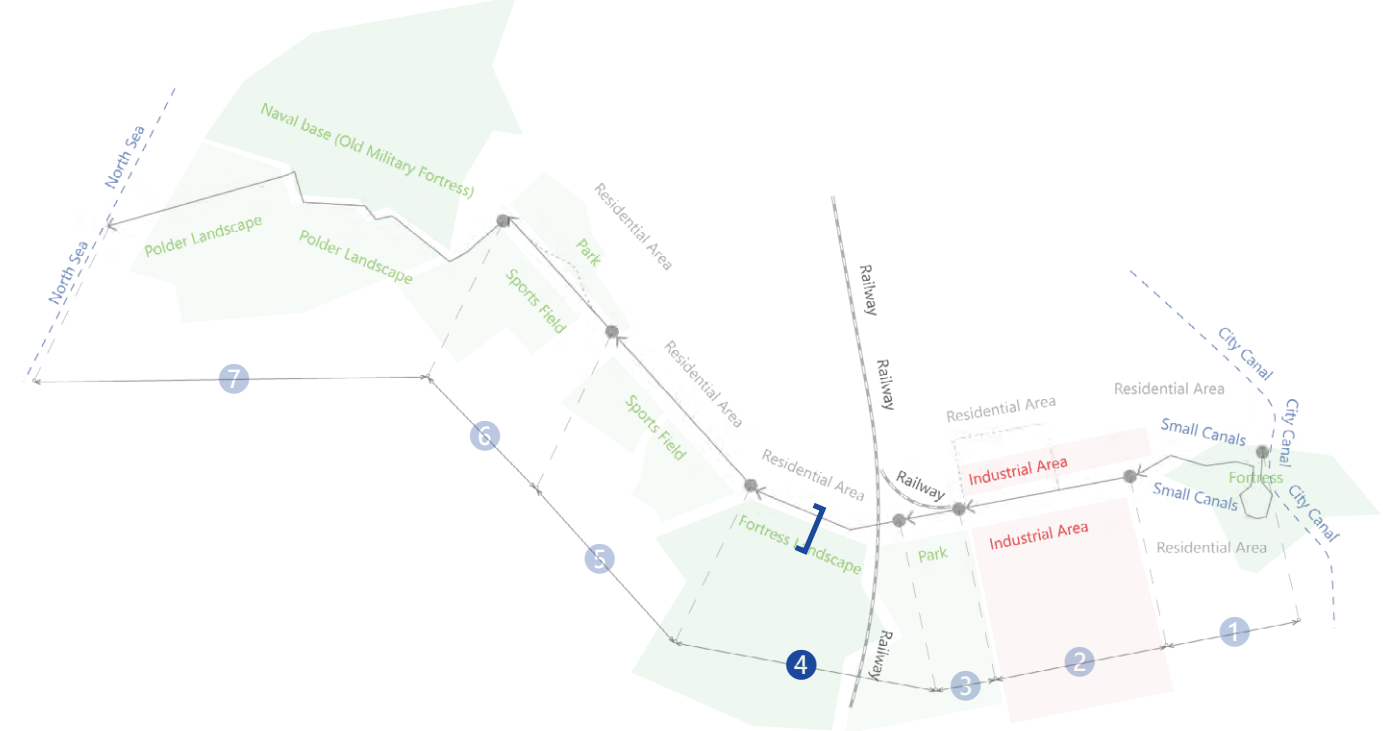


Various framed structures could provide different spatial experiences.



Section Zone 3 - Corridor Area

Zone 4 - Defence Line In-between Area



Current spatial atmosphere of Zone 4

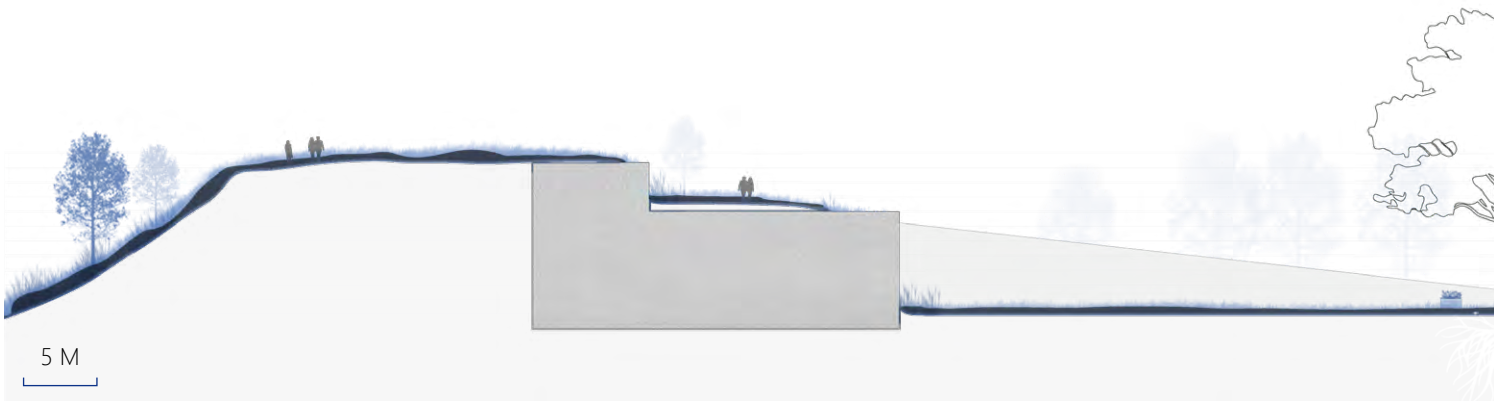
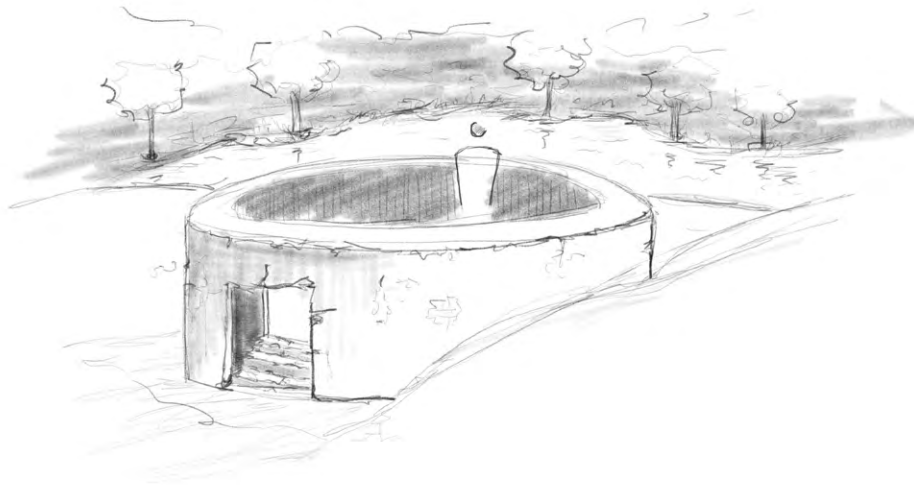
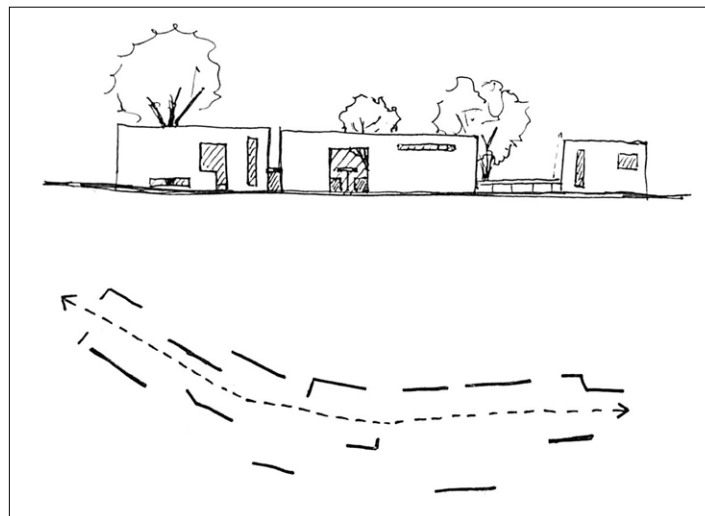


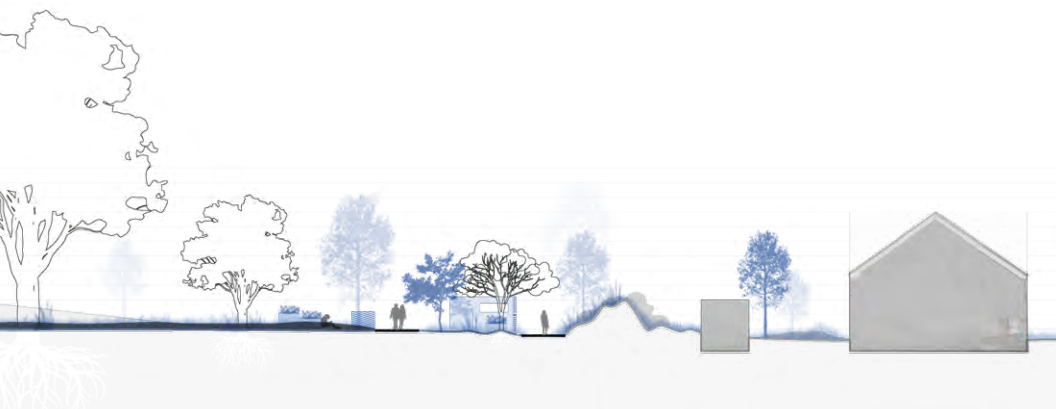
Figure 05-6. section of zone 4 design hypothesis.
Source: drawn by author



Design hypothesis of Zone 4

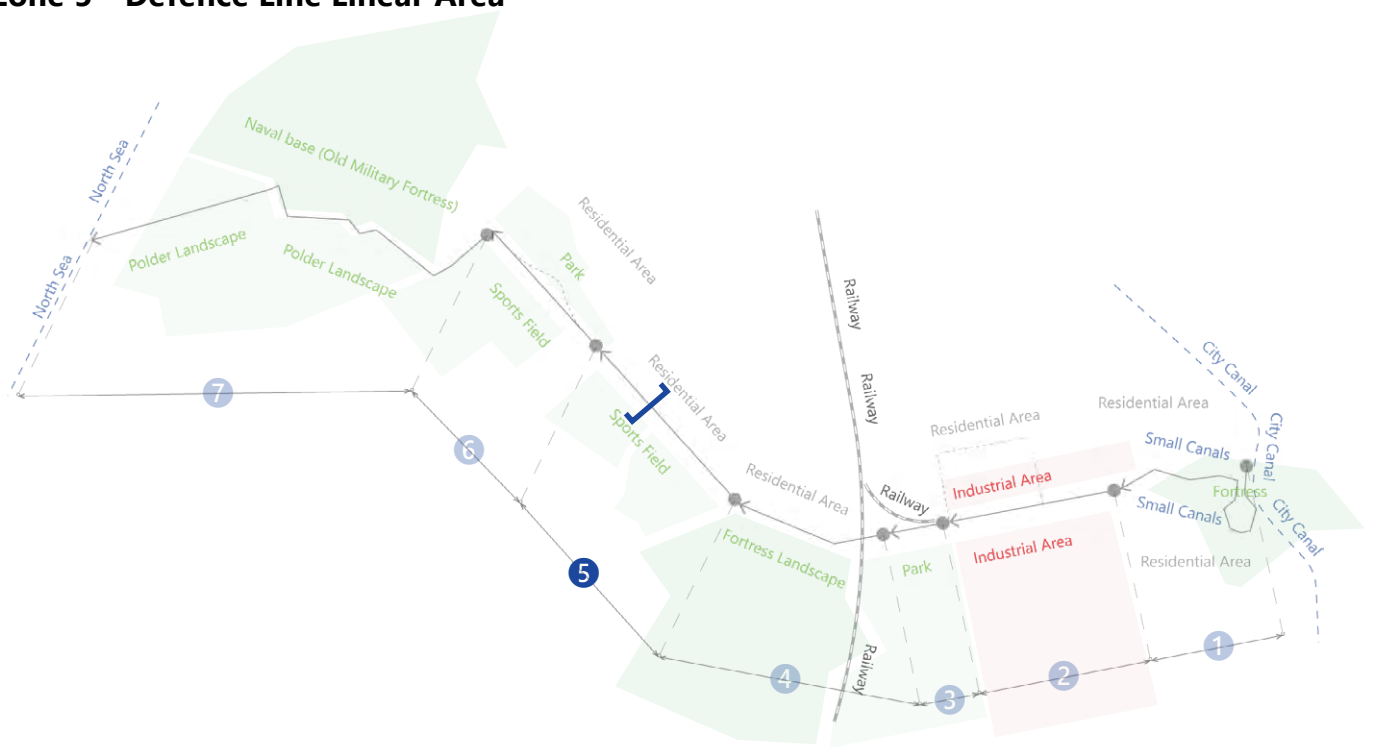


The holes of different positions and sizes are combined with different wall structures forming different interesting spaces.



Section Zone 4 - Defence Line In-between Area

Zone 5 - Defence Line Linear Area



Current spatial atmosphere of Zone 5

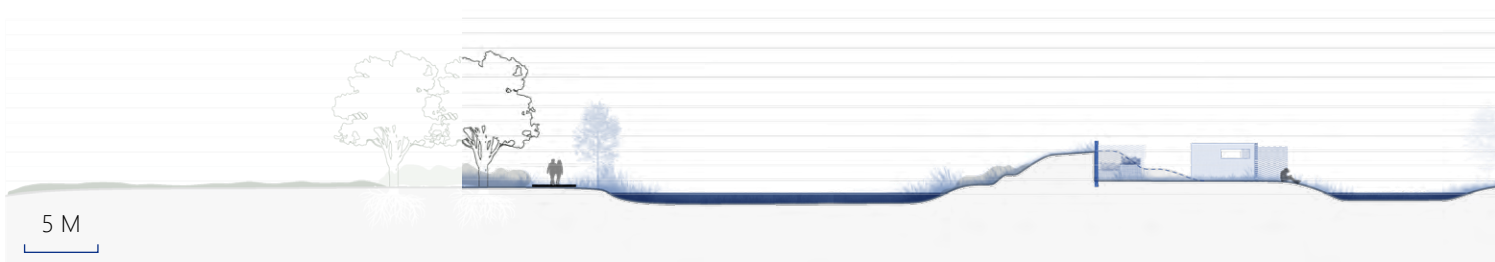
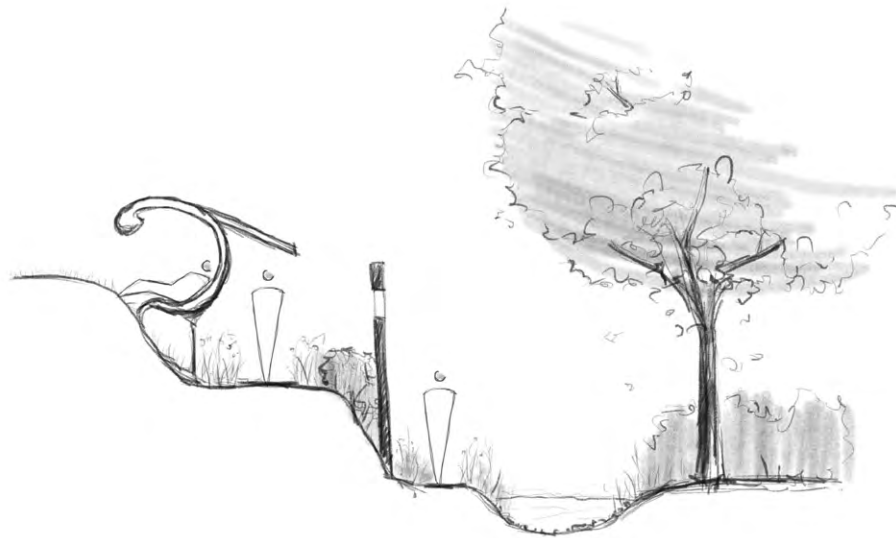
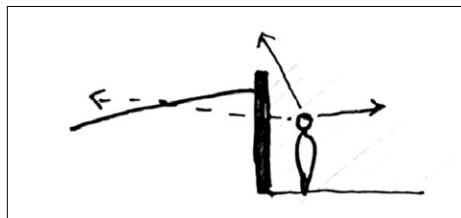


Figure 05-7. section of zone 5 design hypothesis.
Source: drawn by author



Design hypothesis of Zone 5

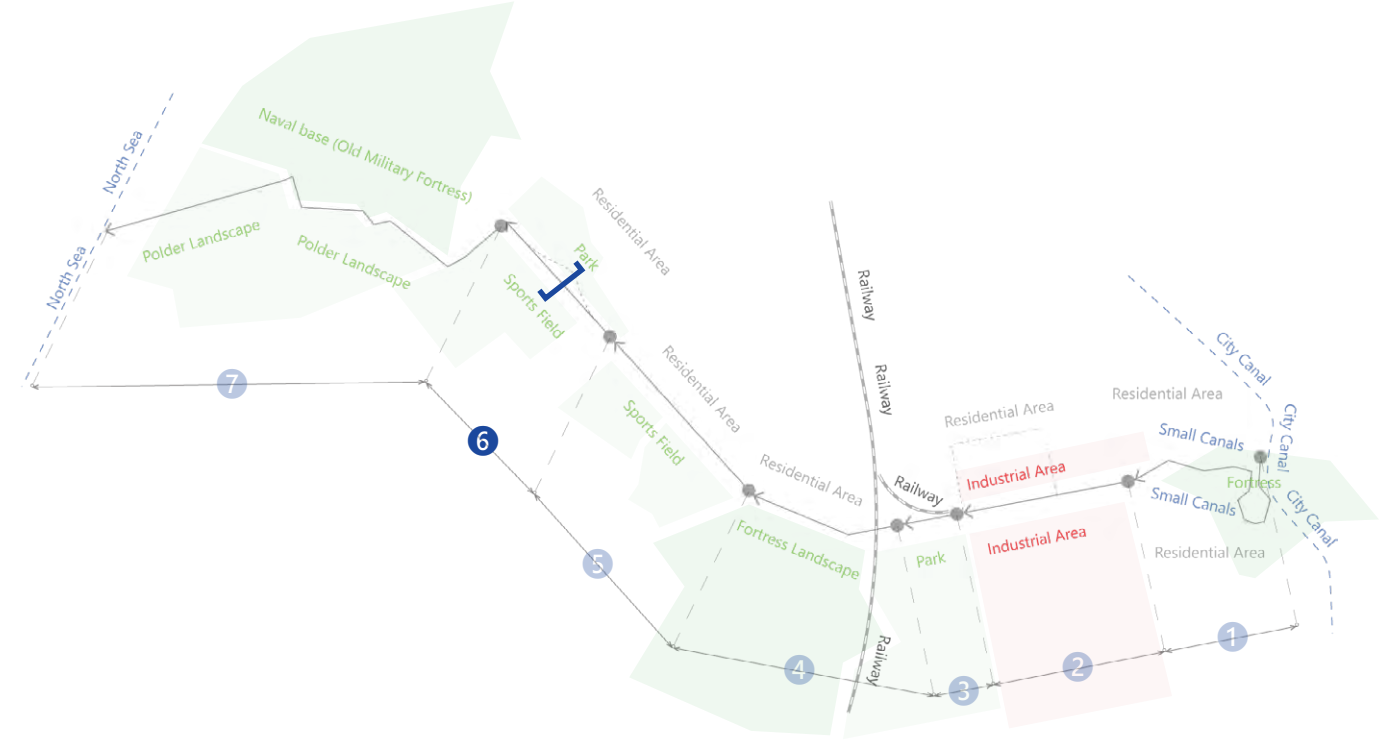


The holes of different positions and sizes are combined with different wall structures forming different interesting spaces.



Section Zone 5 - Defence Line Linear Area

Zone 6 - Timor Park Area



Current spatial atmosphere of Zone 6

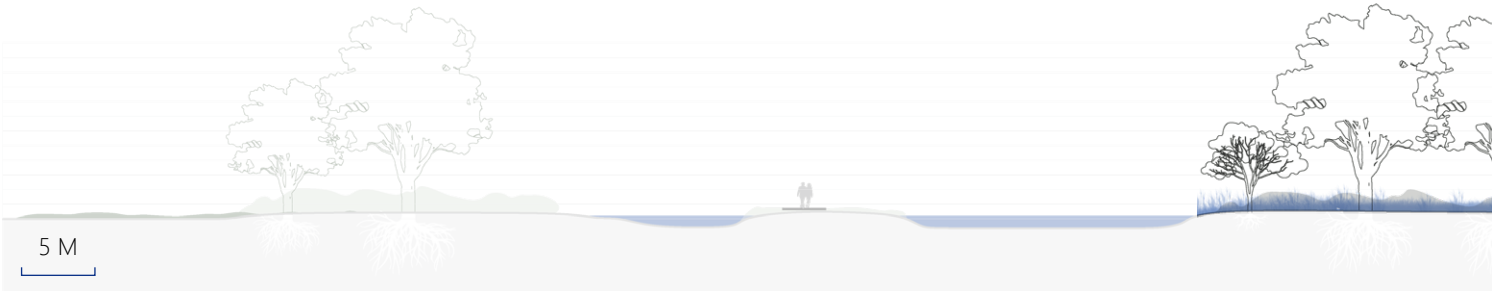
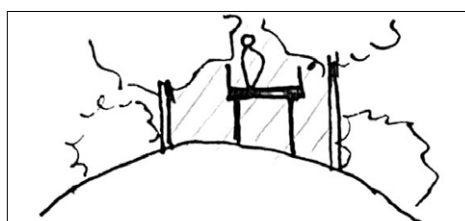


Figure 05-8. section of zone 6 design hypothesis.

Source: drawn by author



Design hypothesis of Zone 6

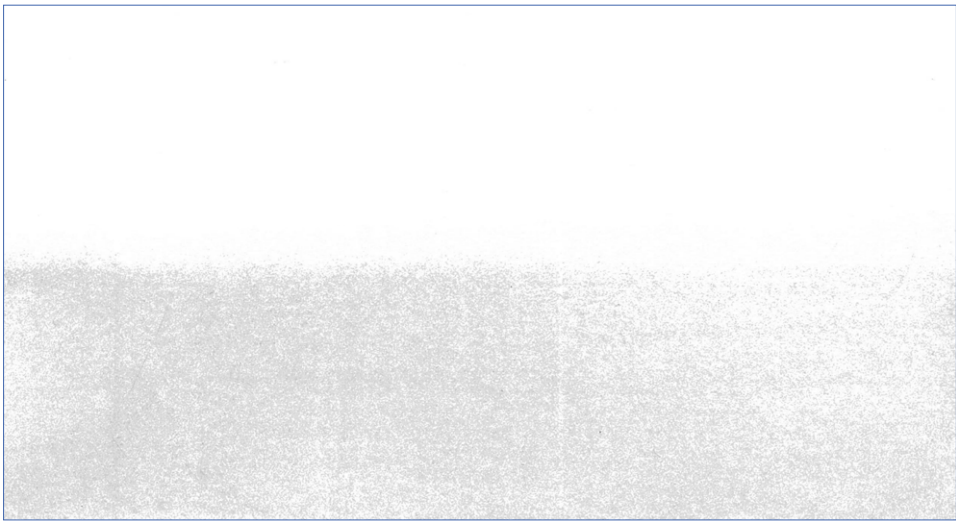
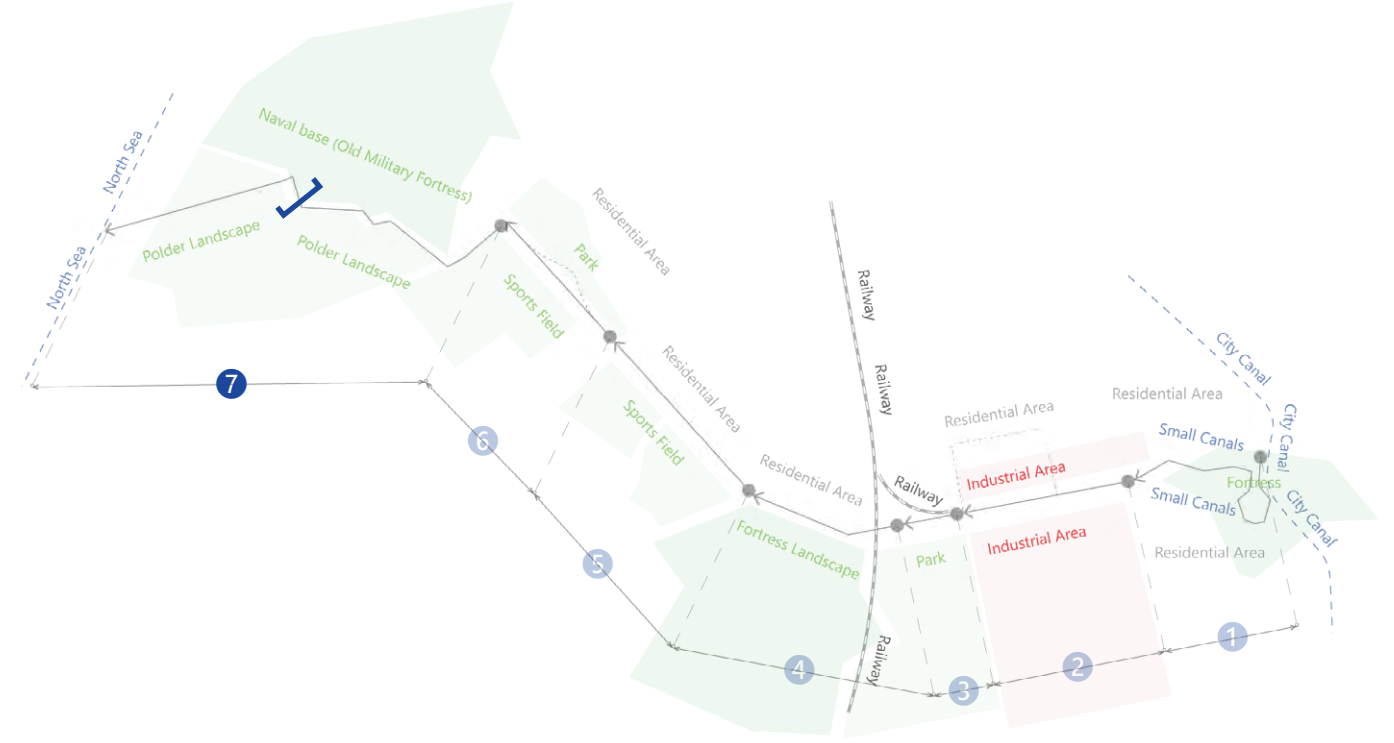


Combined with many existing trees, the undulating elevated path uses the space under the trees to provide people with more opportunities to connect with the natural environment.



Section Zone 6 - Timor Park Area

Zone 7 - Polder & Seaside Area



Current spatial atmosphere of Zone 7

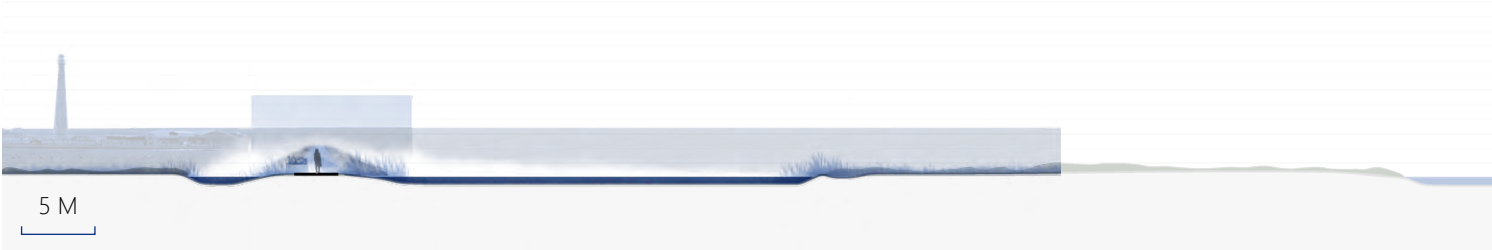
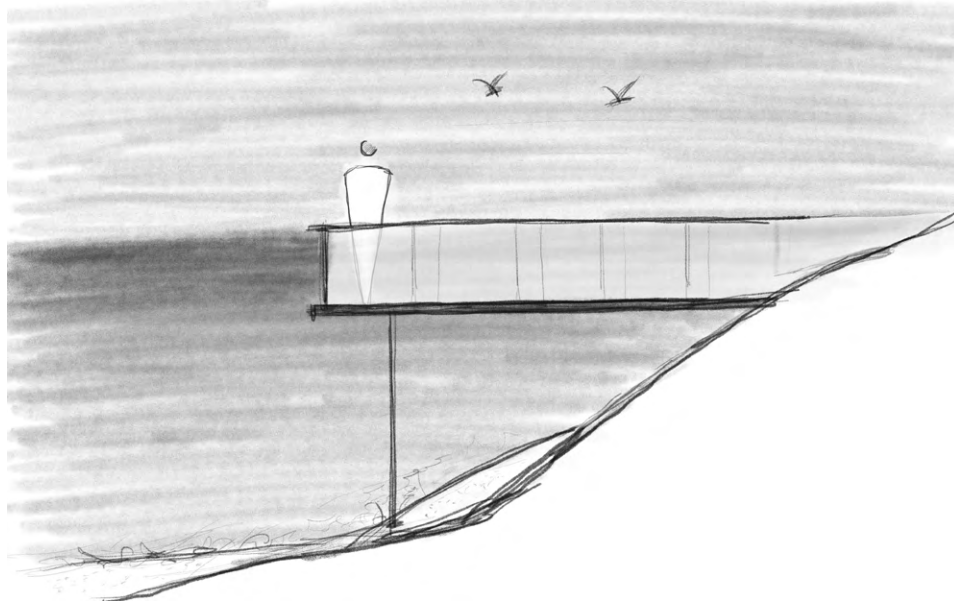
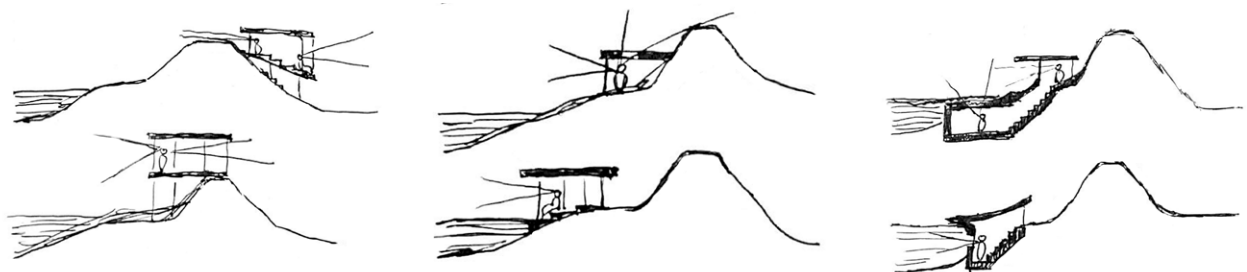


Figure 05-9. section of zone 7 design hypothesis.
Source: drawn by author



Design hypothesis of Zone 7



A series of small structures are hypothesized at different locations along the coastal dyke boundary (inside, above, in-between and outside), where people can experience different relationships with seawater, sandy beach, the land inside the dyke and the sky inside.



Section Zone 7 - Polder & Seaside Area

Crossing Road Design Example

In order to respond to the design idea of the slowing-down 'Meeting Point' place and to make the design intervention more universal and persuasive, one of the crossings in this boundary area is chosen as a demonstration example in a small public social space.

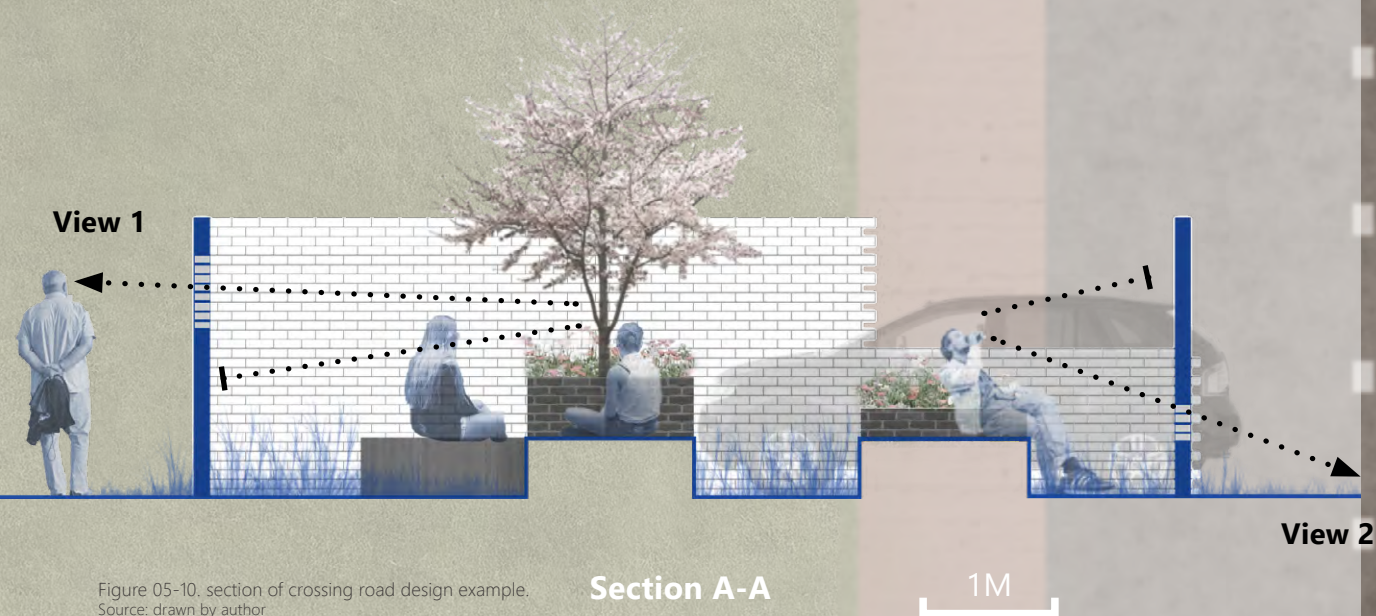


Figure 05-10, section of crossing road design example.
Source: drawn by author

Section A-A

1M

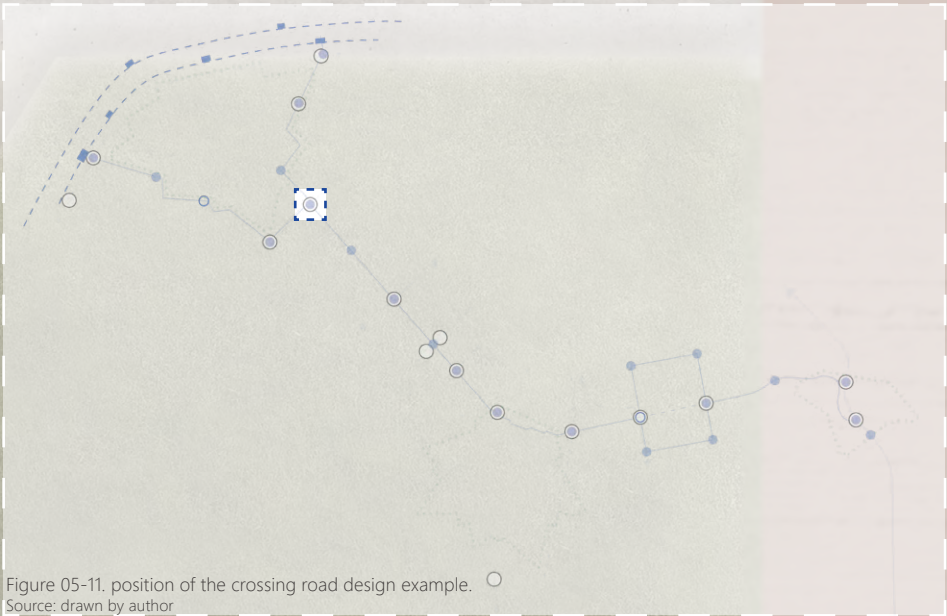
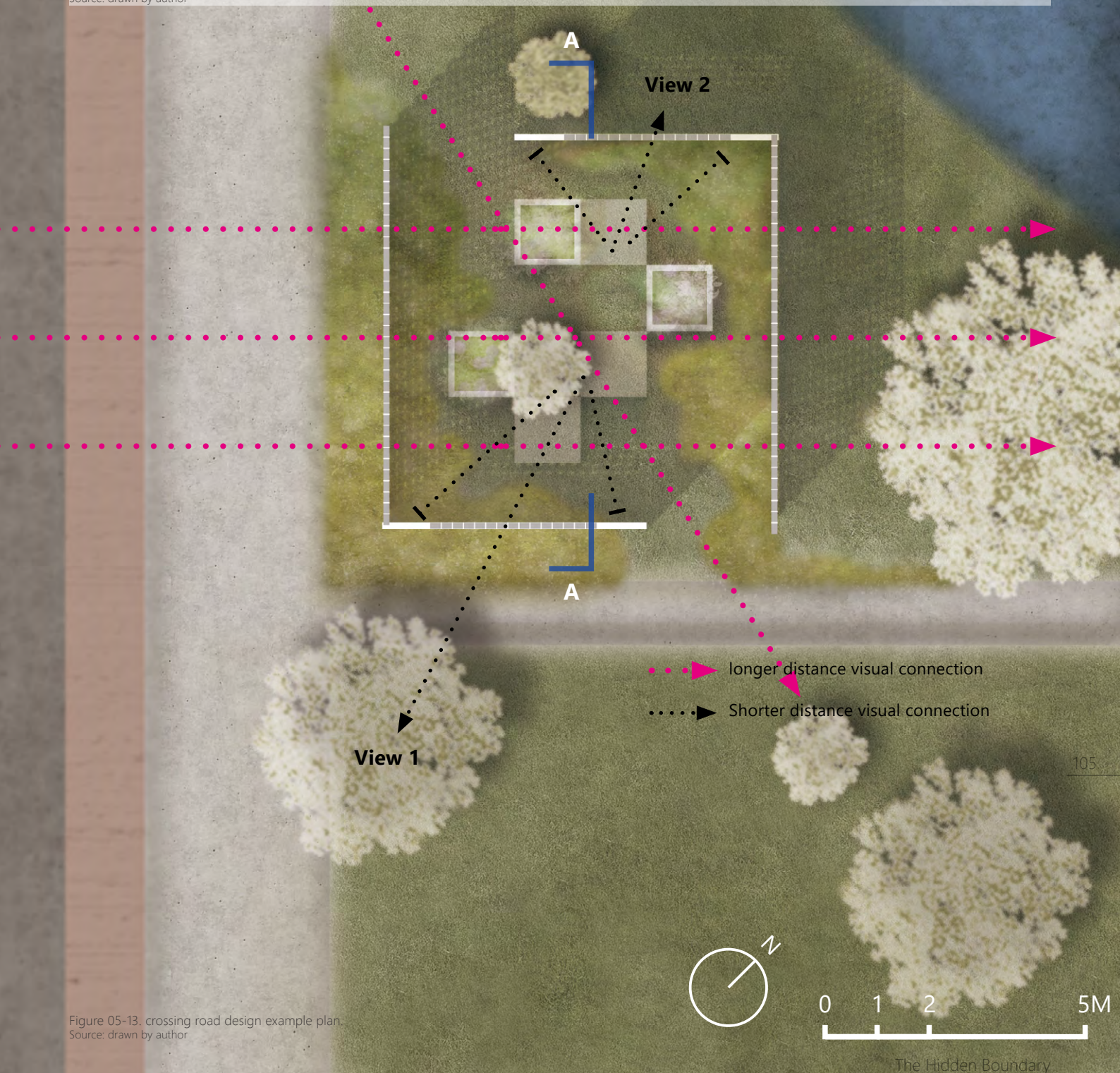
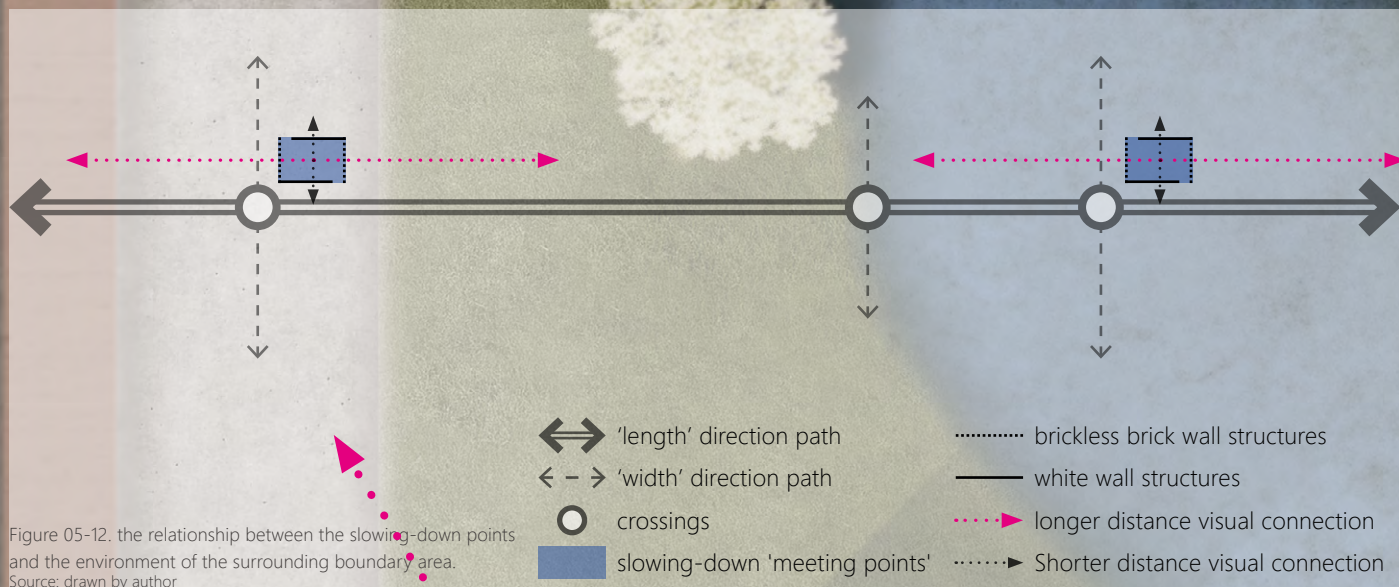
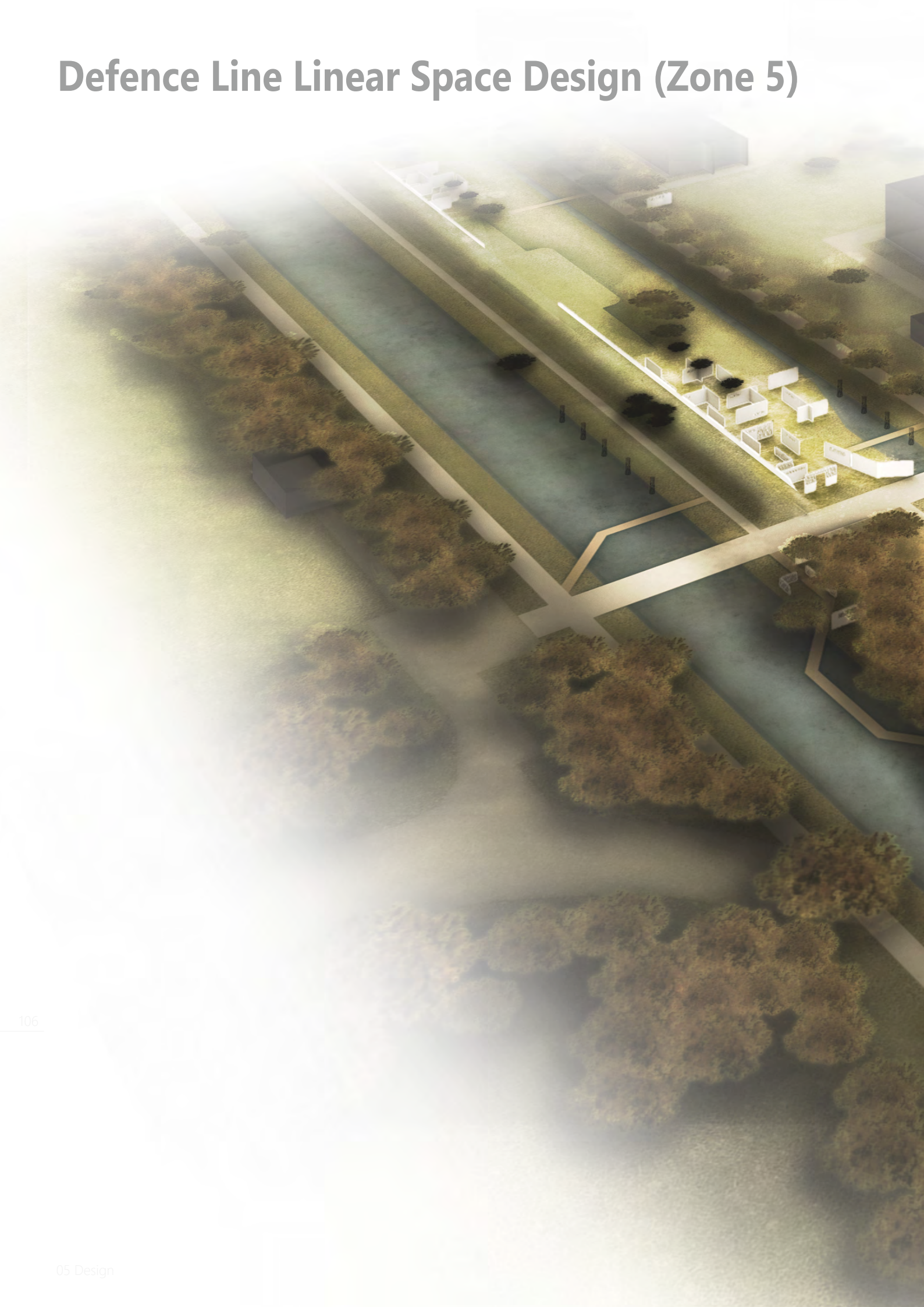
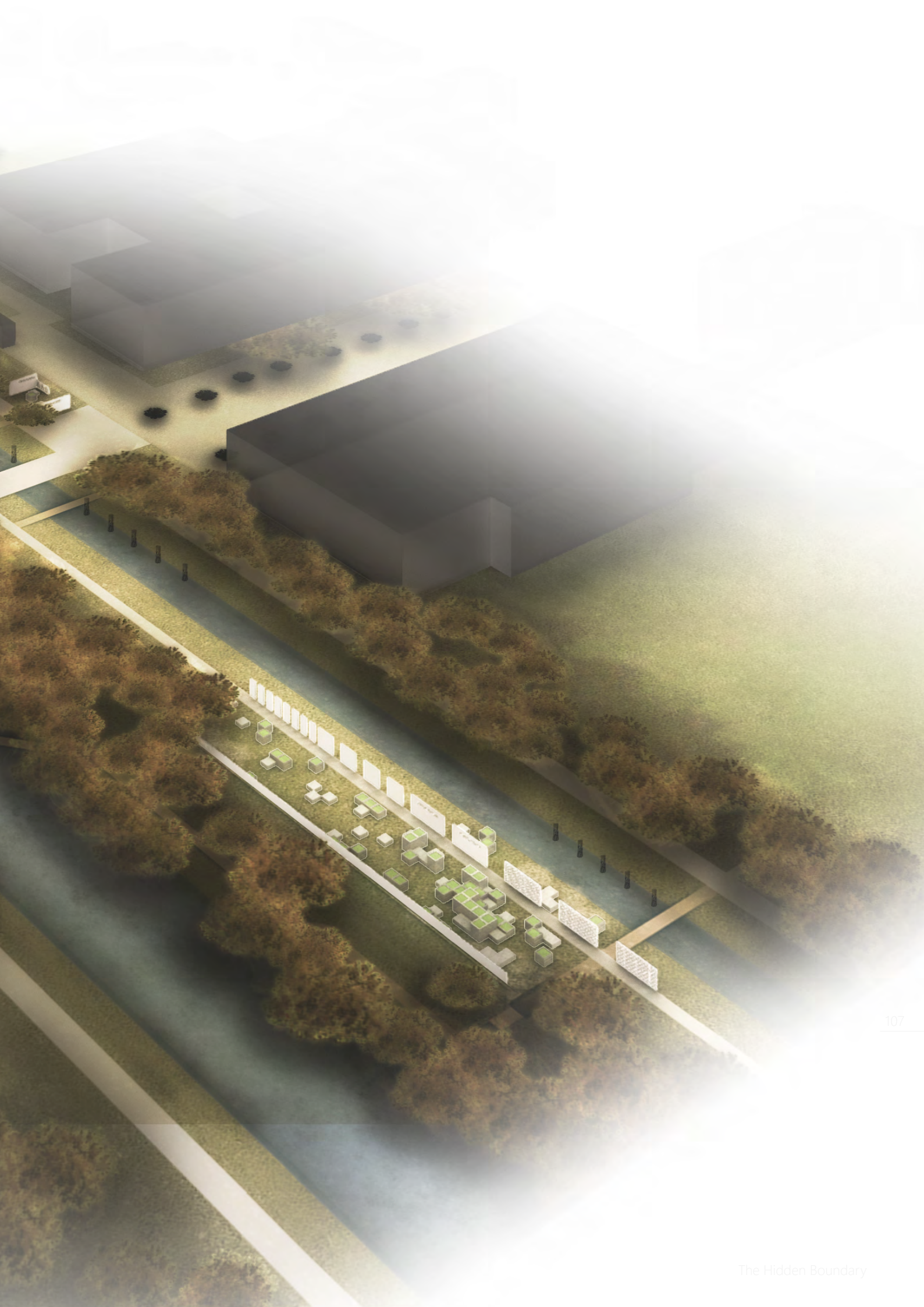


Figure 05-11, position of the crossing road design example. ○
Source: drawn by author

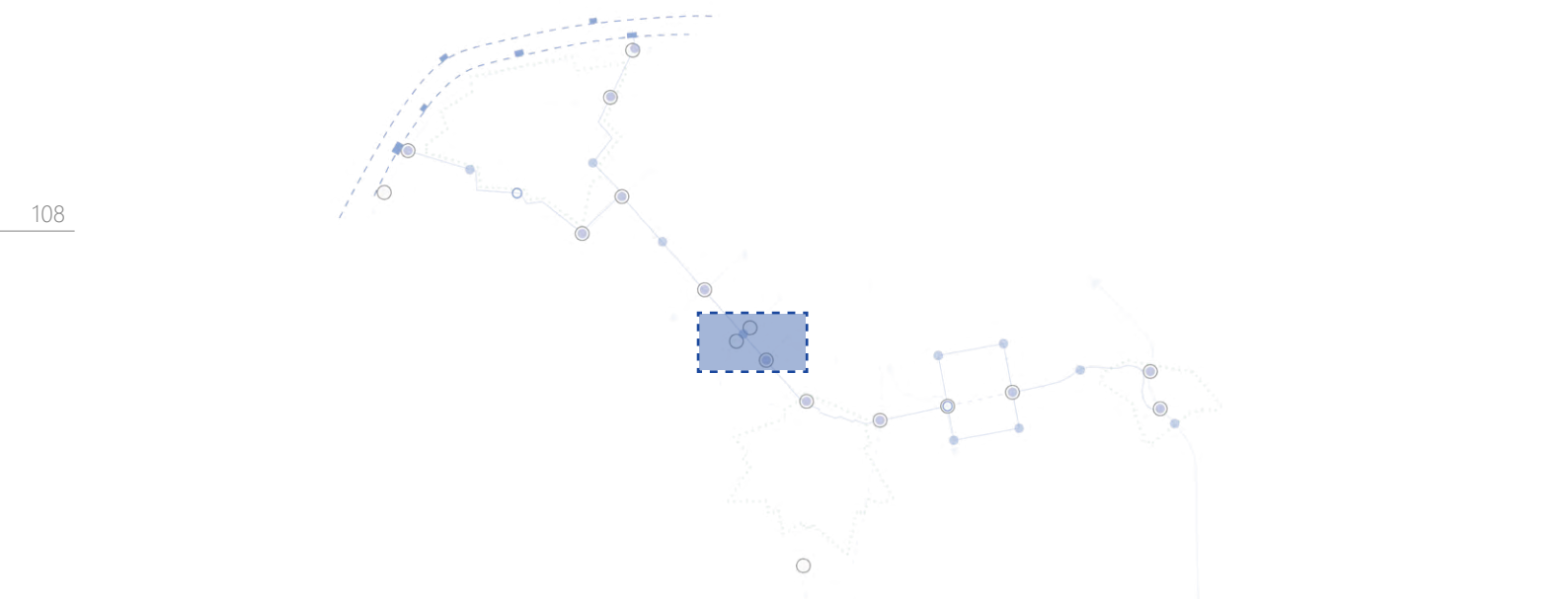
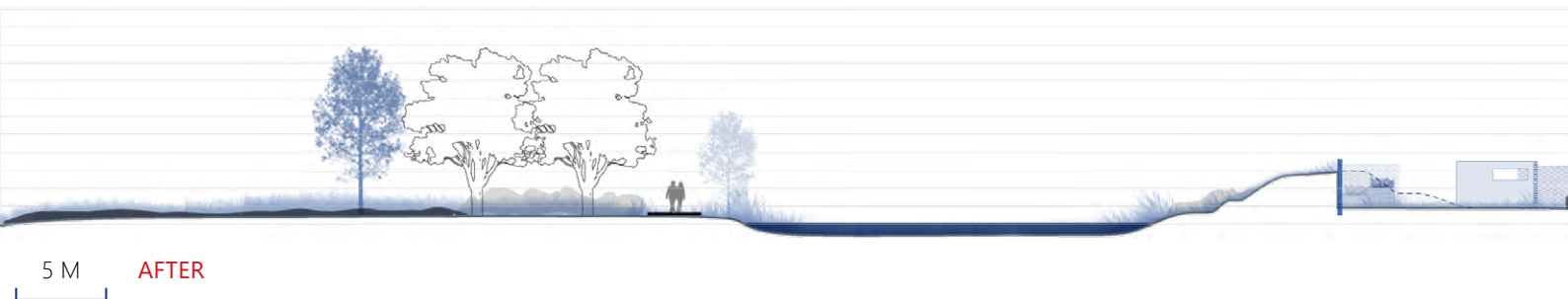
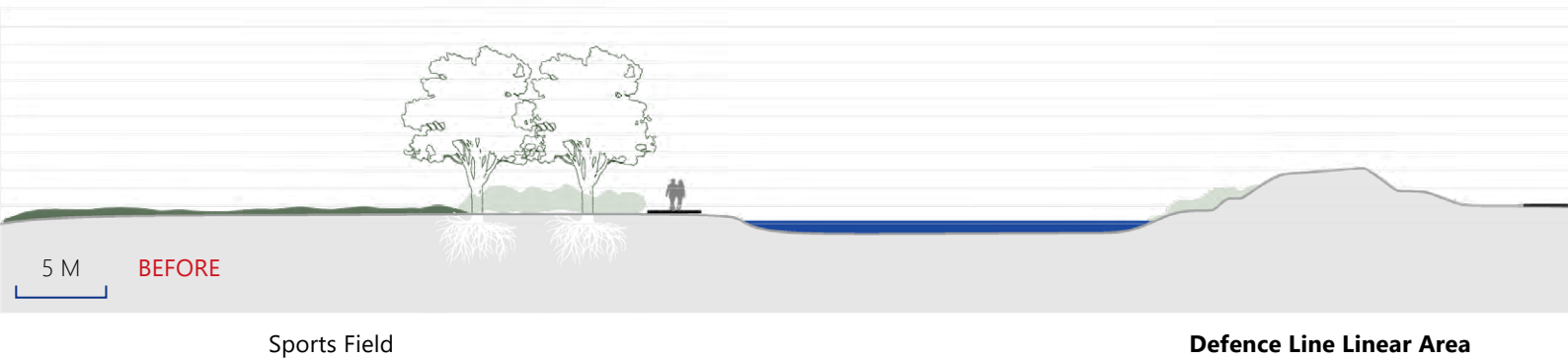


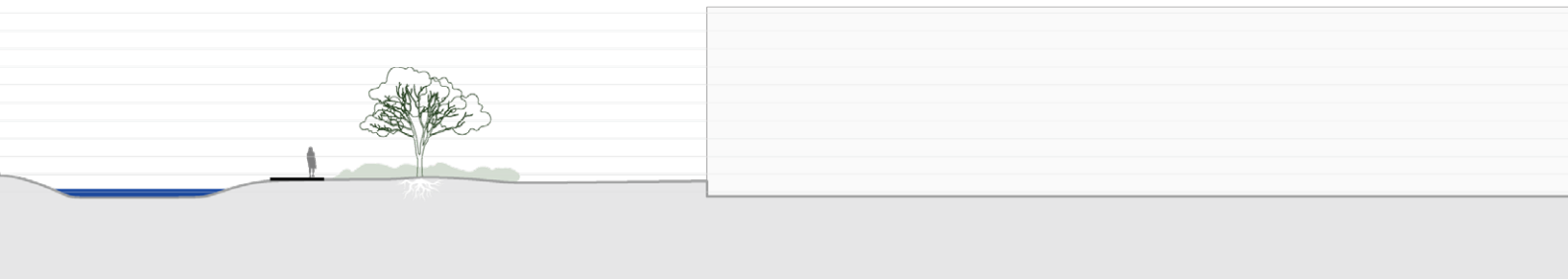
Defence Line Linear Space Design (Zone 5)



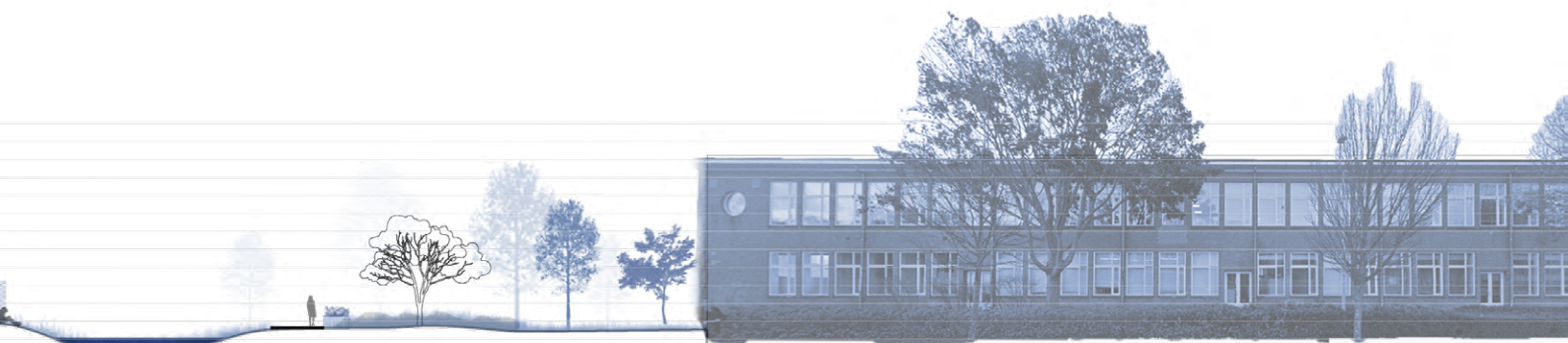


Defence Line Linear Space Design (Zone 5)





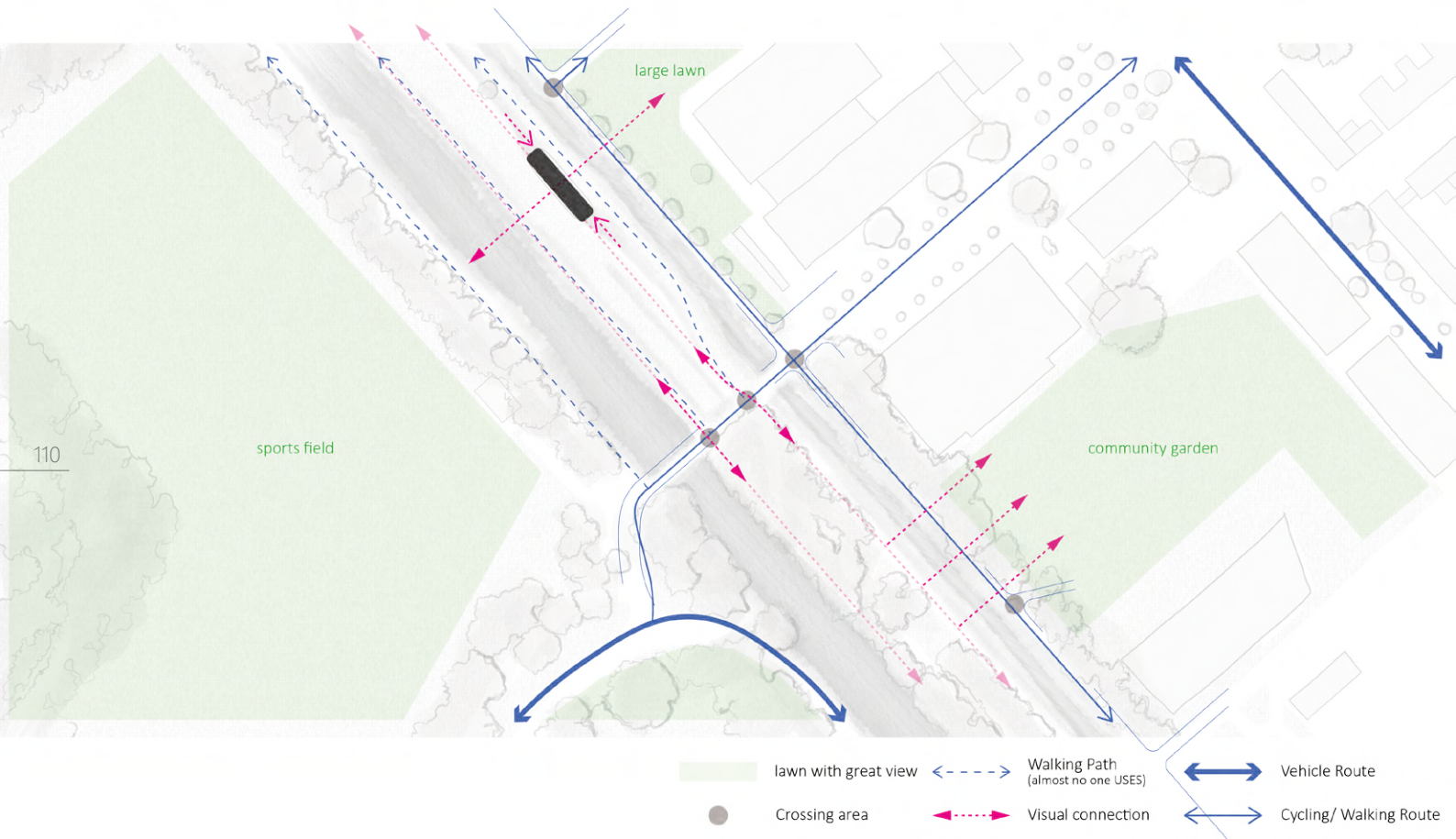
Residential Area



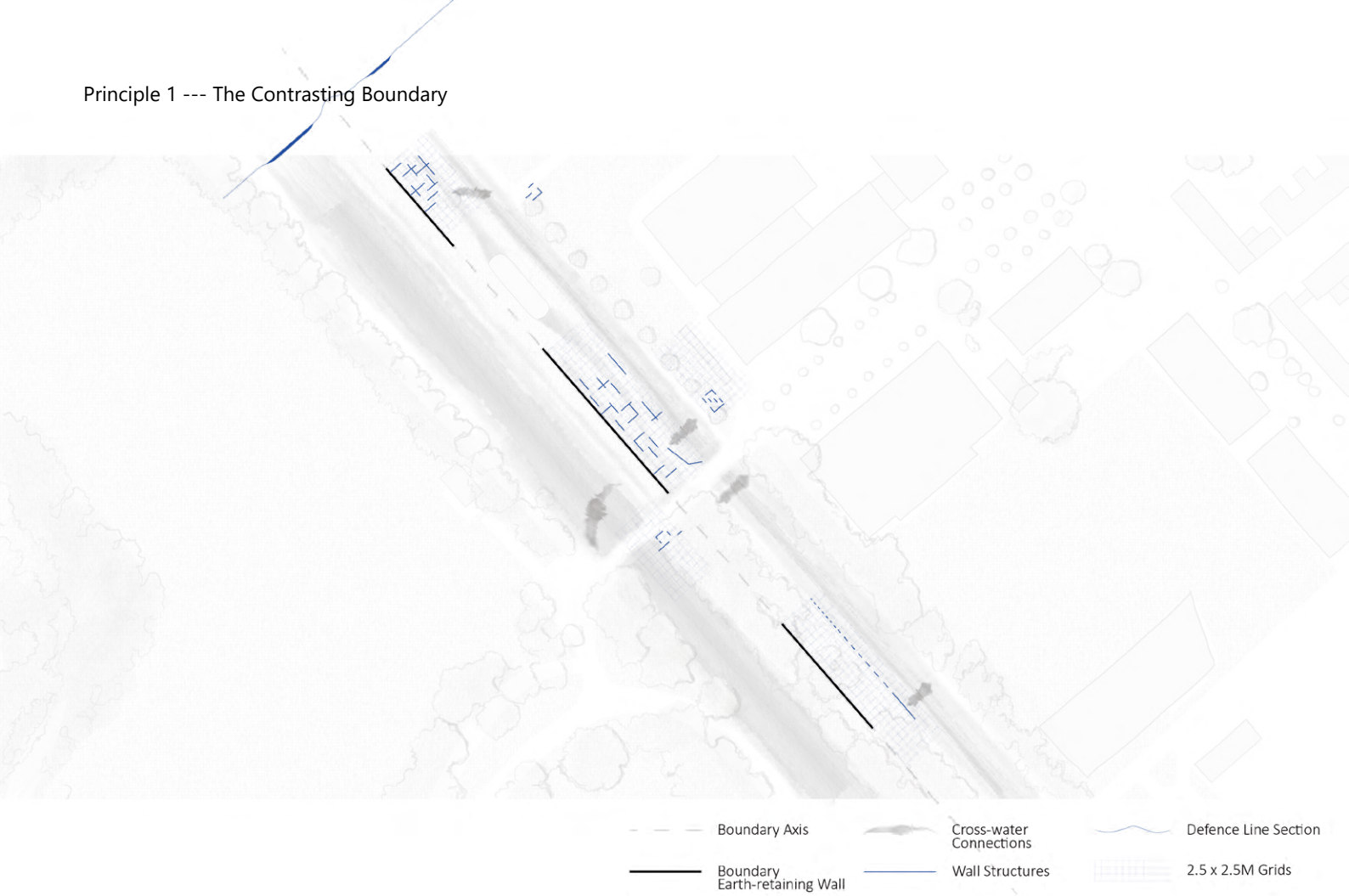
Current Environment



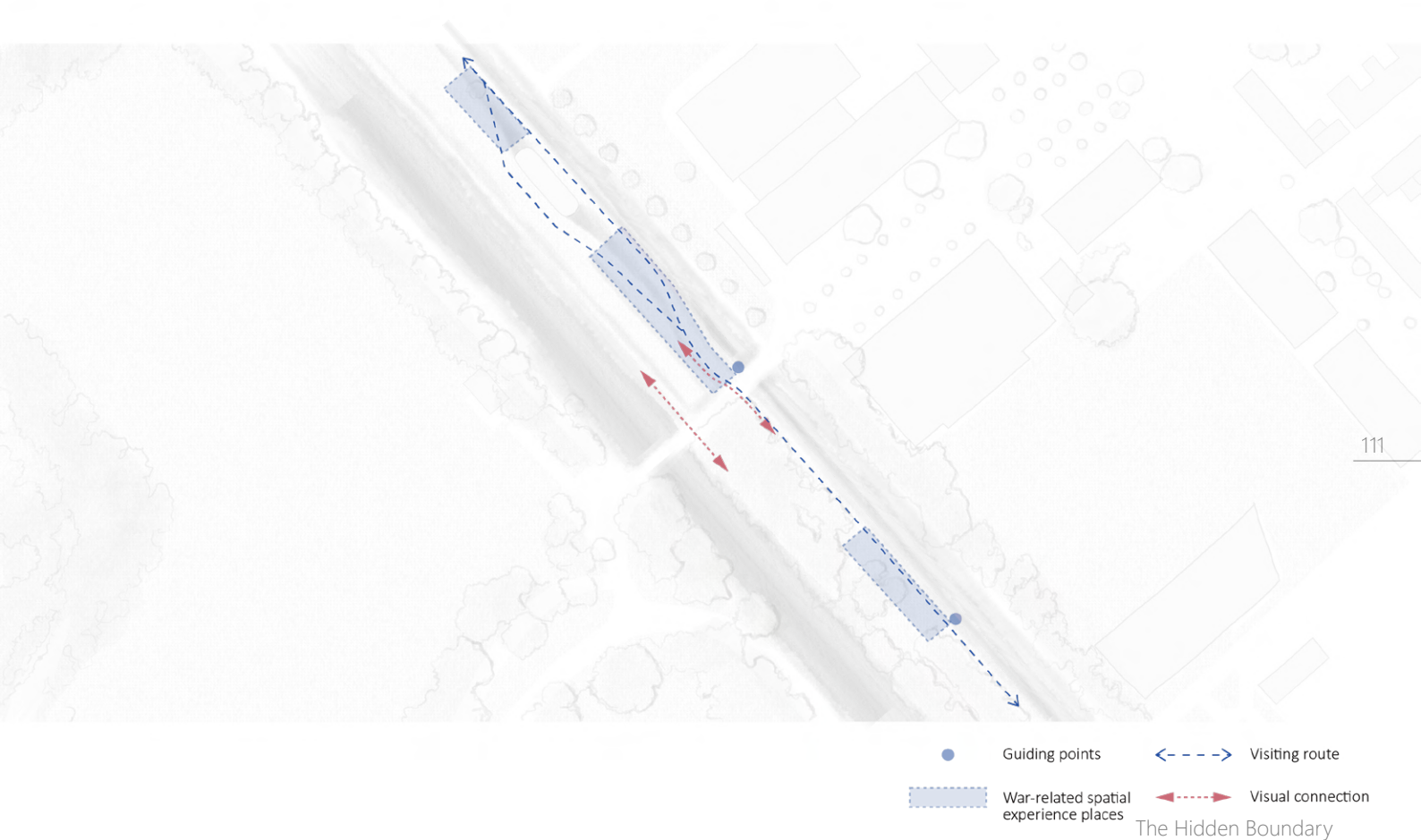
Current physical and visual connection



Principle 1 --- The Contrasting Boundary



Principle 2 --- Length of Boundary



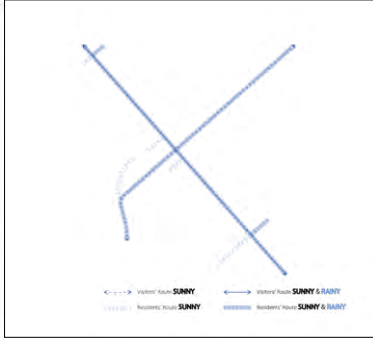
Principle 3 --- Width(transition) of Boundary



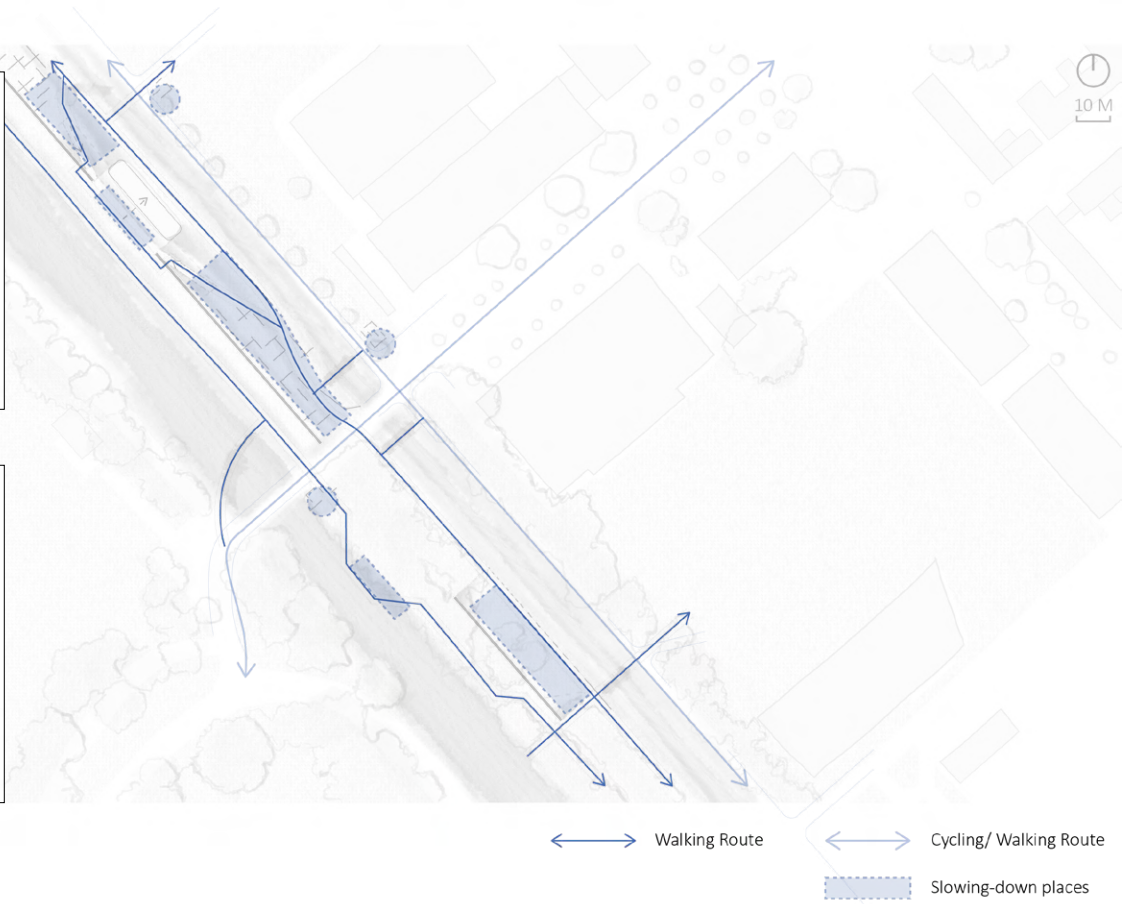
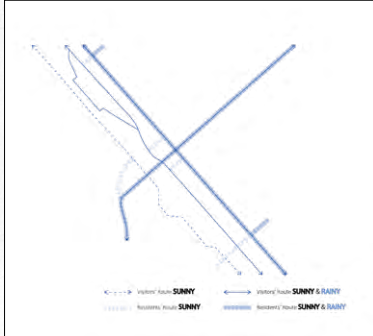
Principle 4 --- Undulating Boundary



ROUTE IN THE MORNING



ROUTE IN THE AFTERNOON



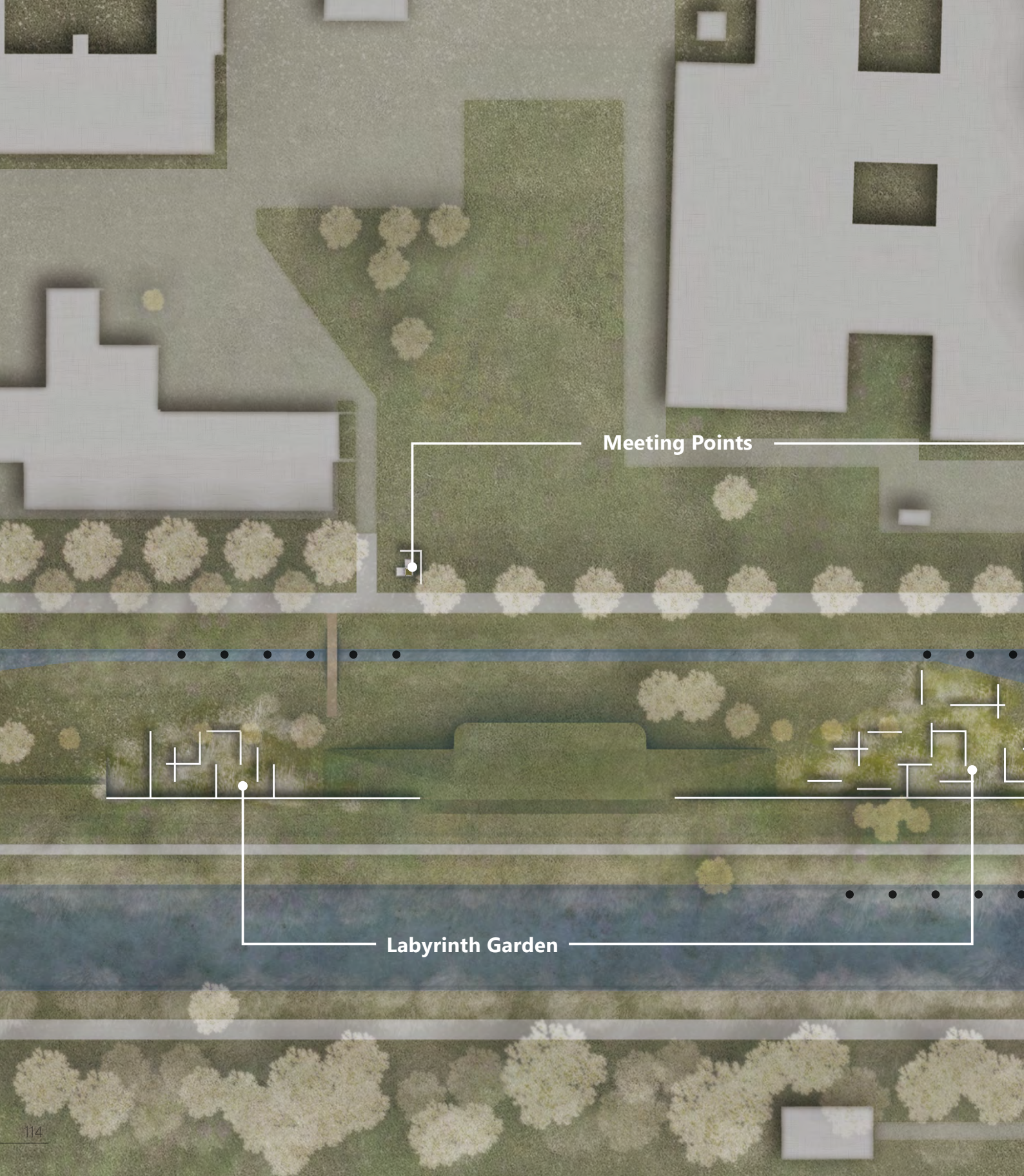
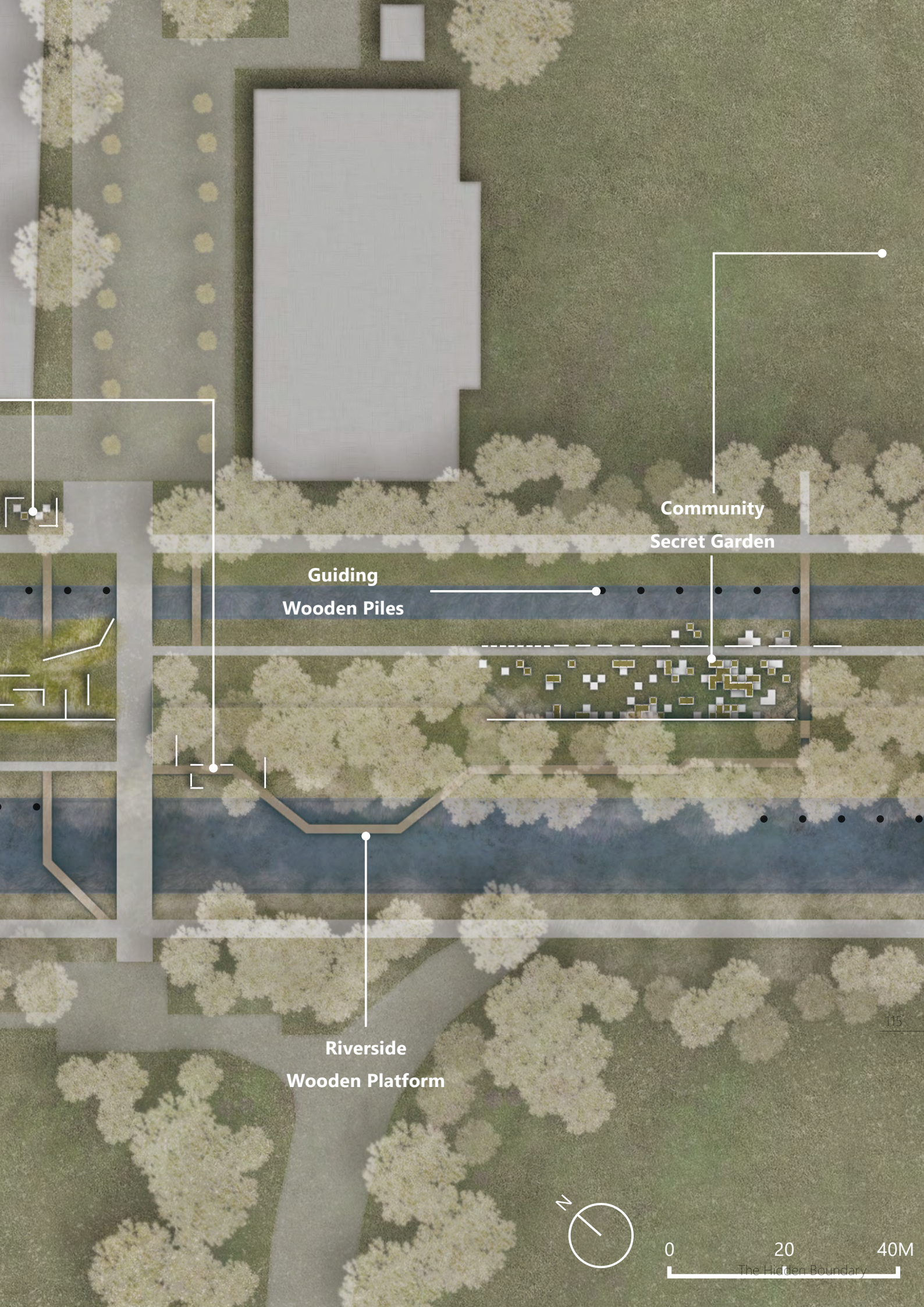


Figure 05-14: Defence Line linear space (Zone 5) plan.
Source: drawn by author



Guiding
Wooden Piles

Community
Secret Garden

Riverside
Wooden Platform



0 20 40M
The Hidden Boundary

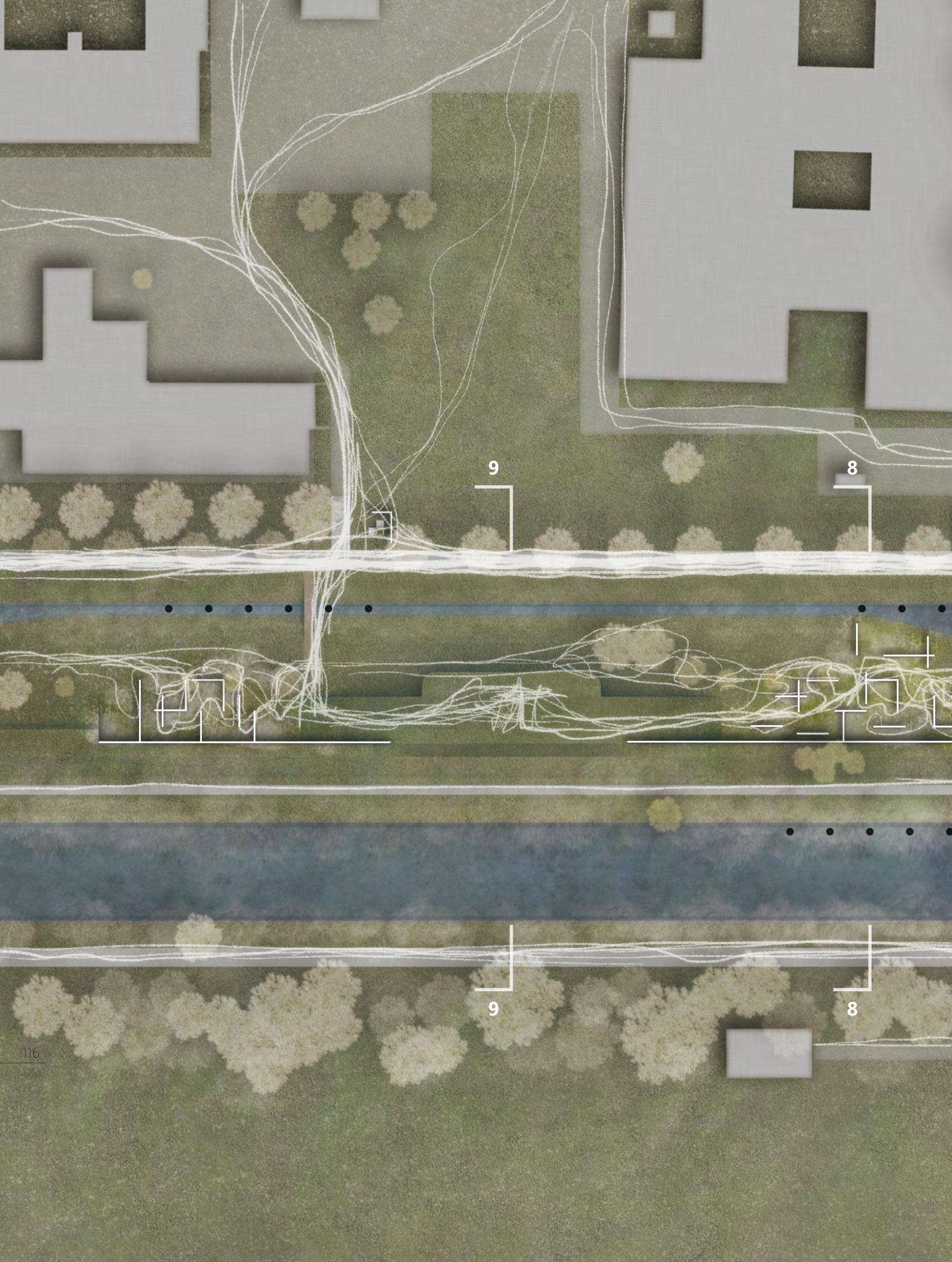
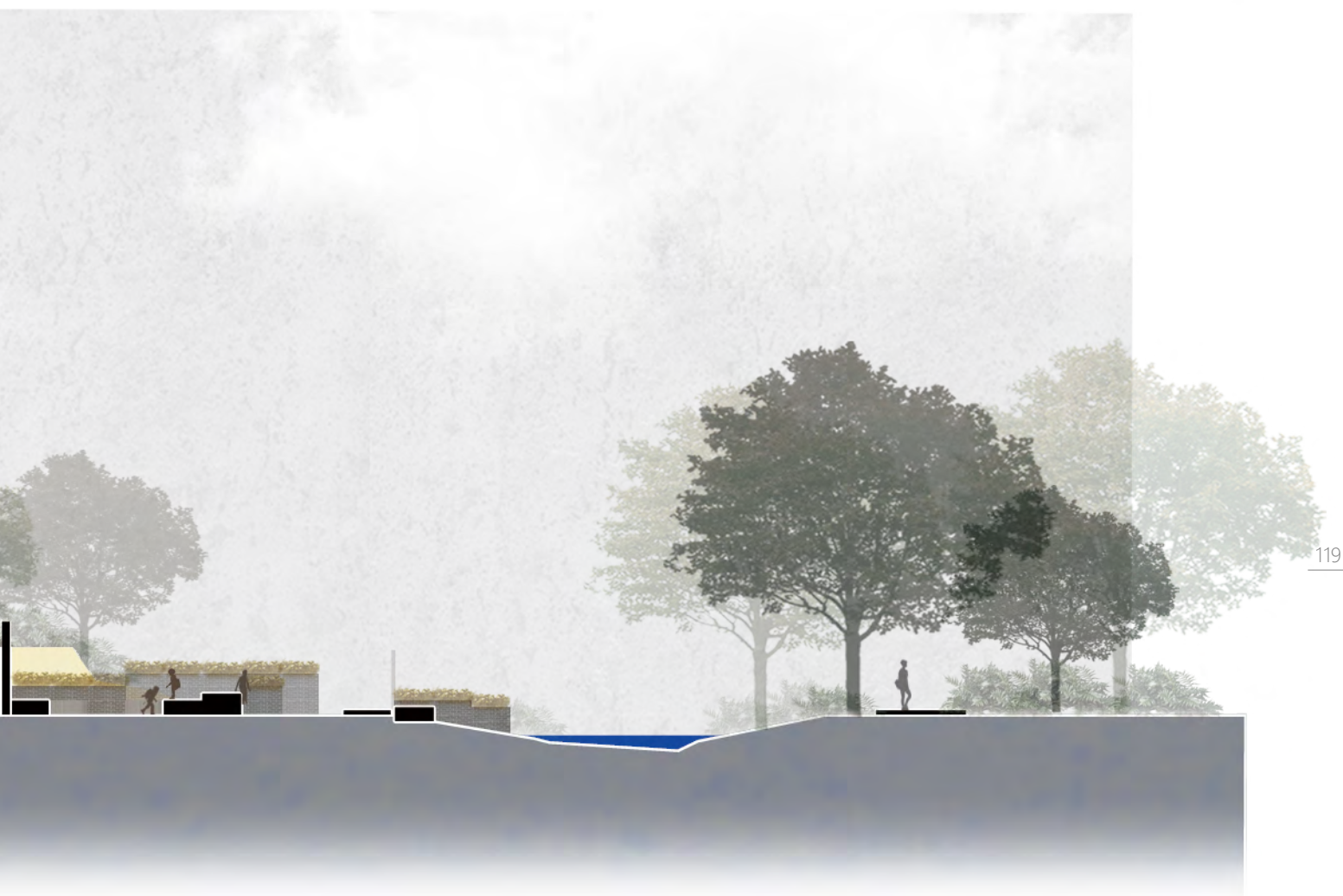
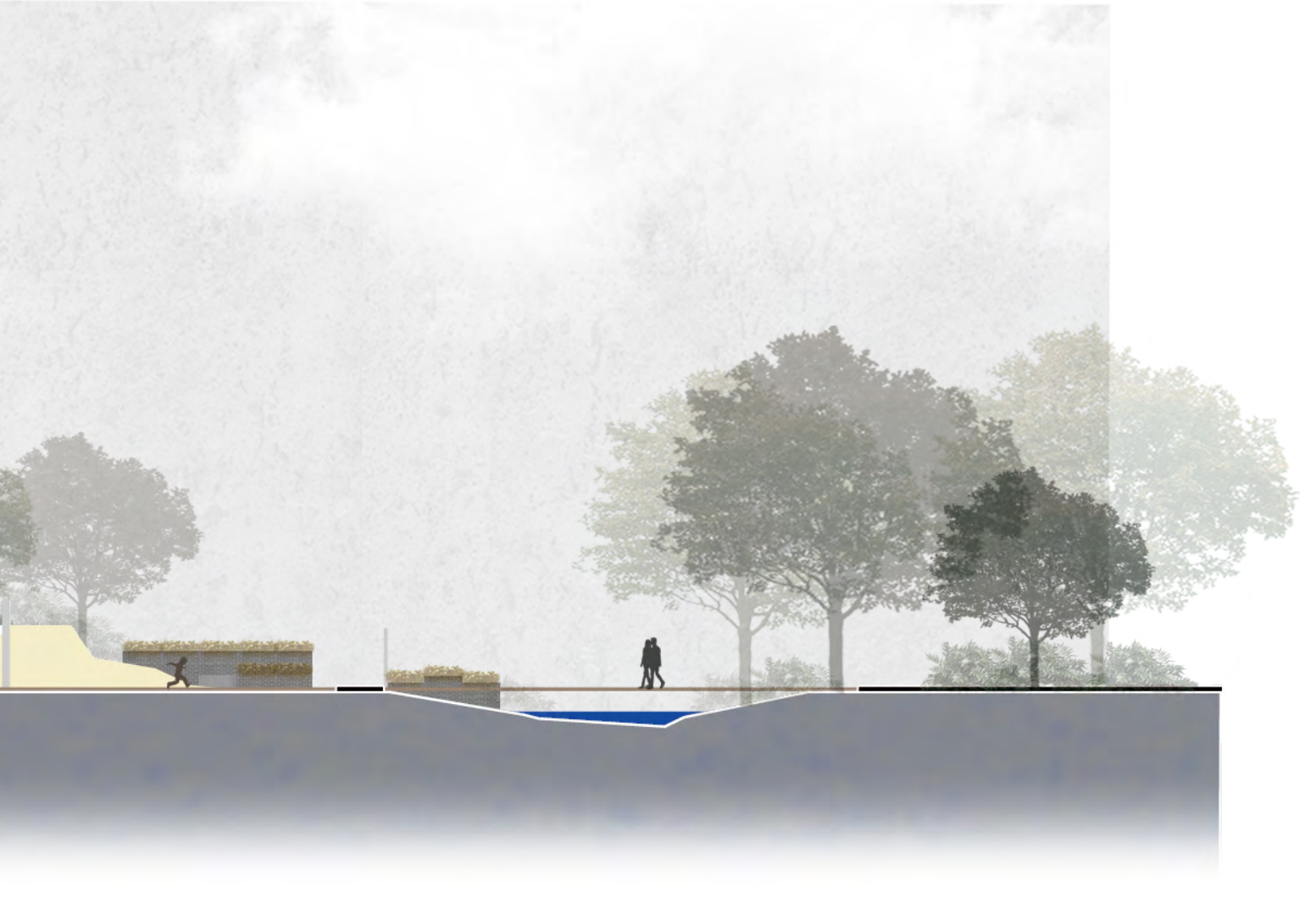


Figure 05-15. hypothetical people flow in Zone 5 area.
Source: drawn by author

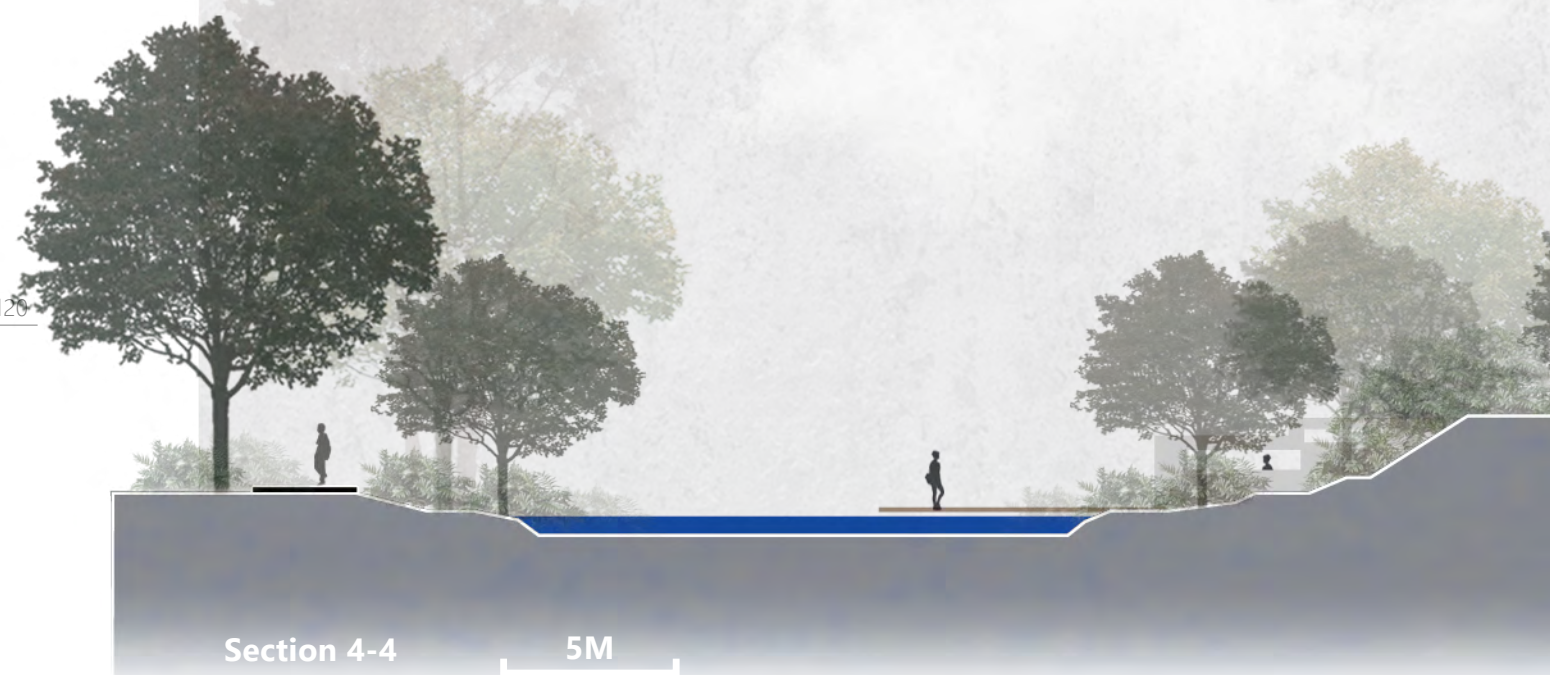


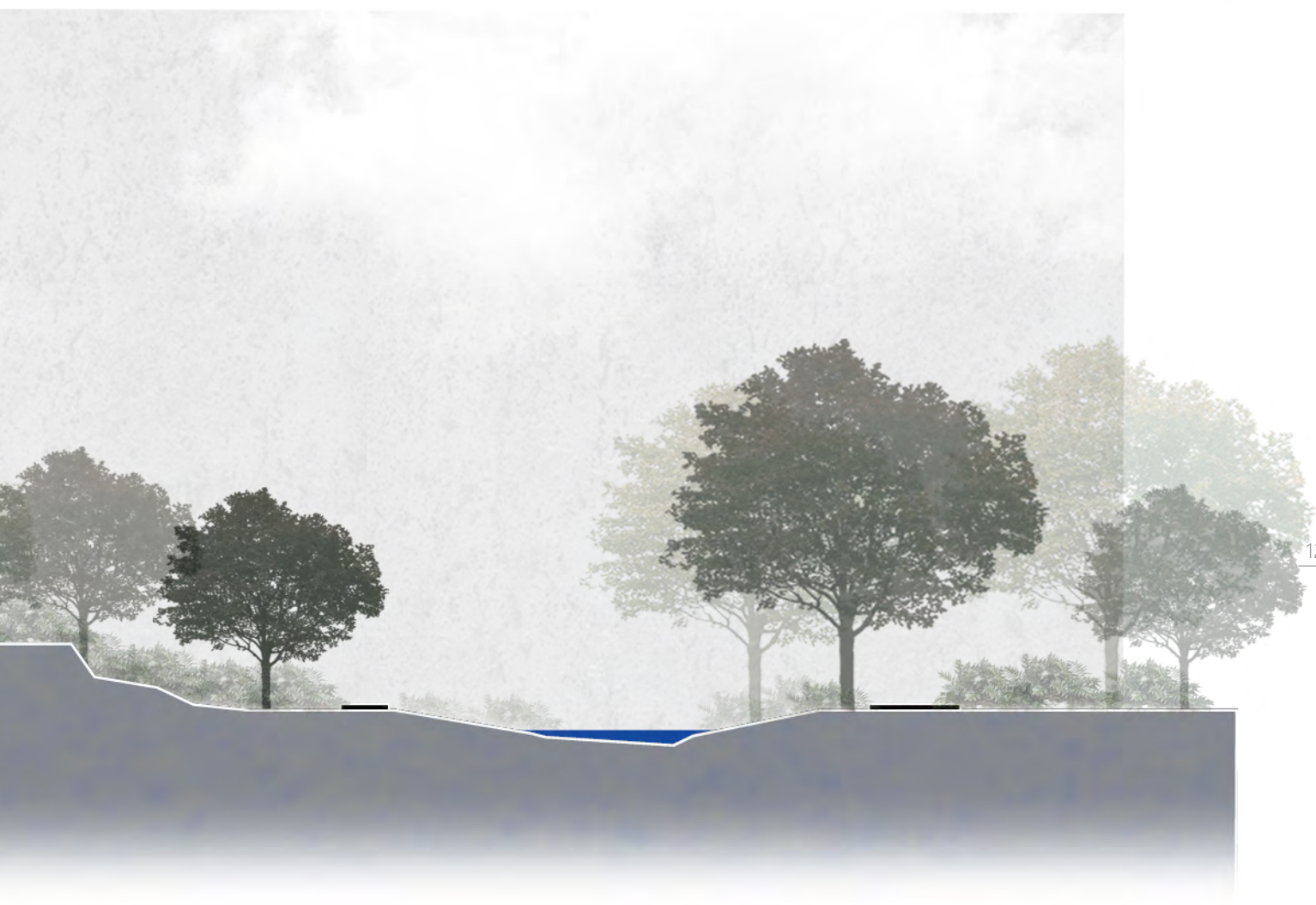
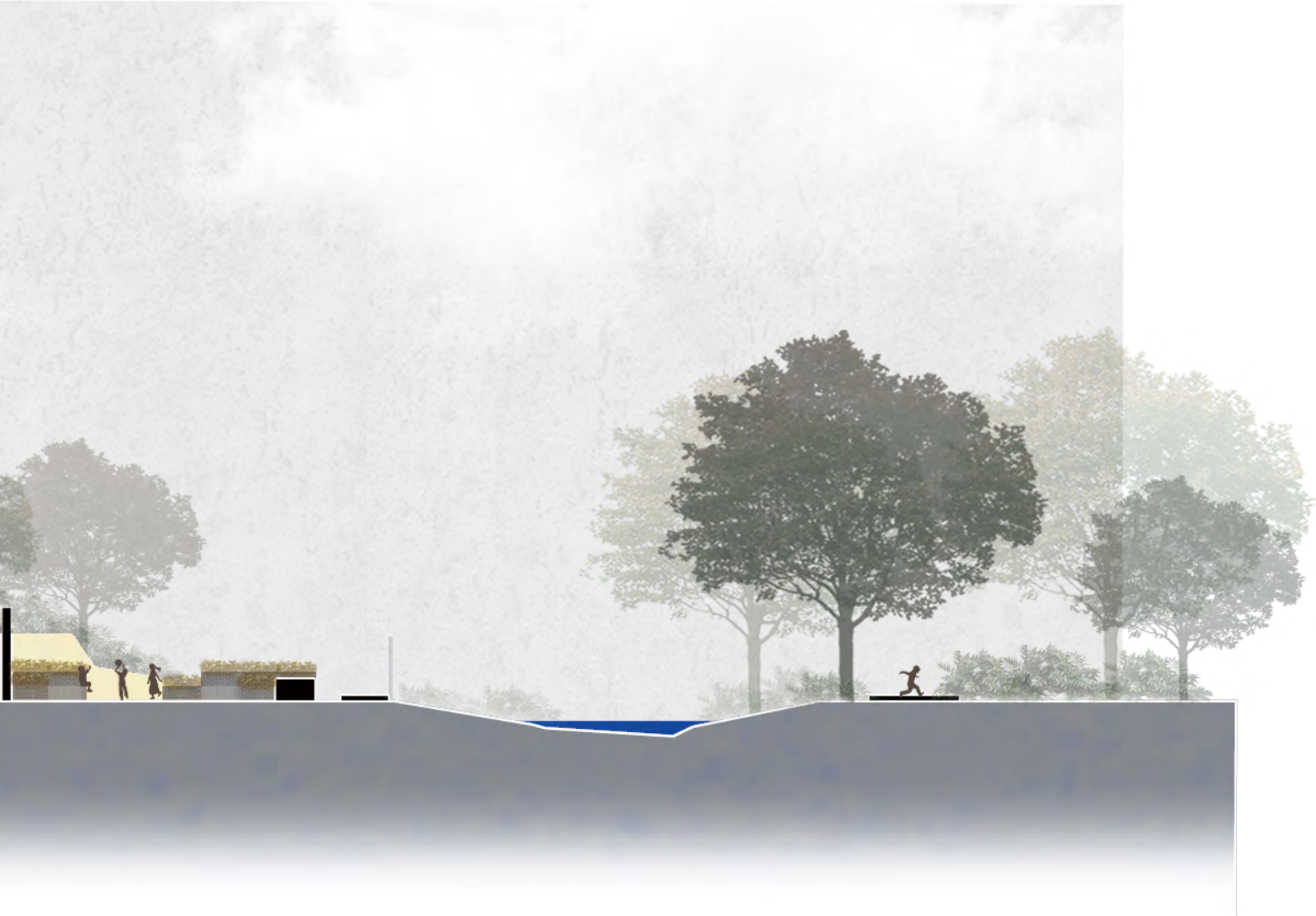






120





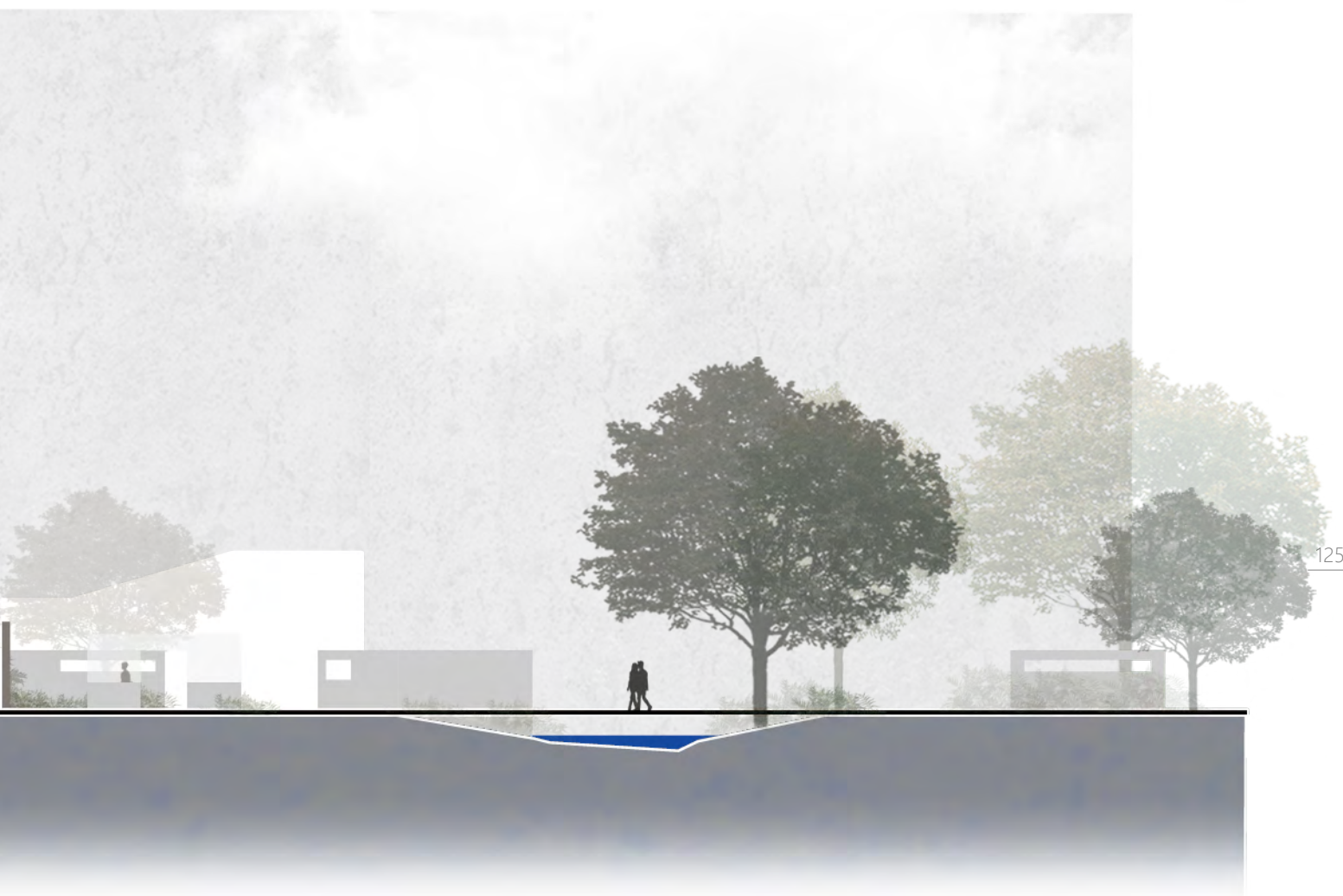
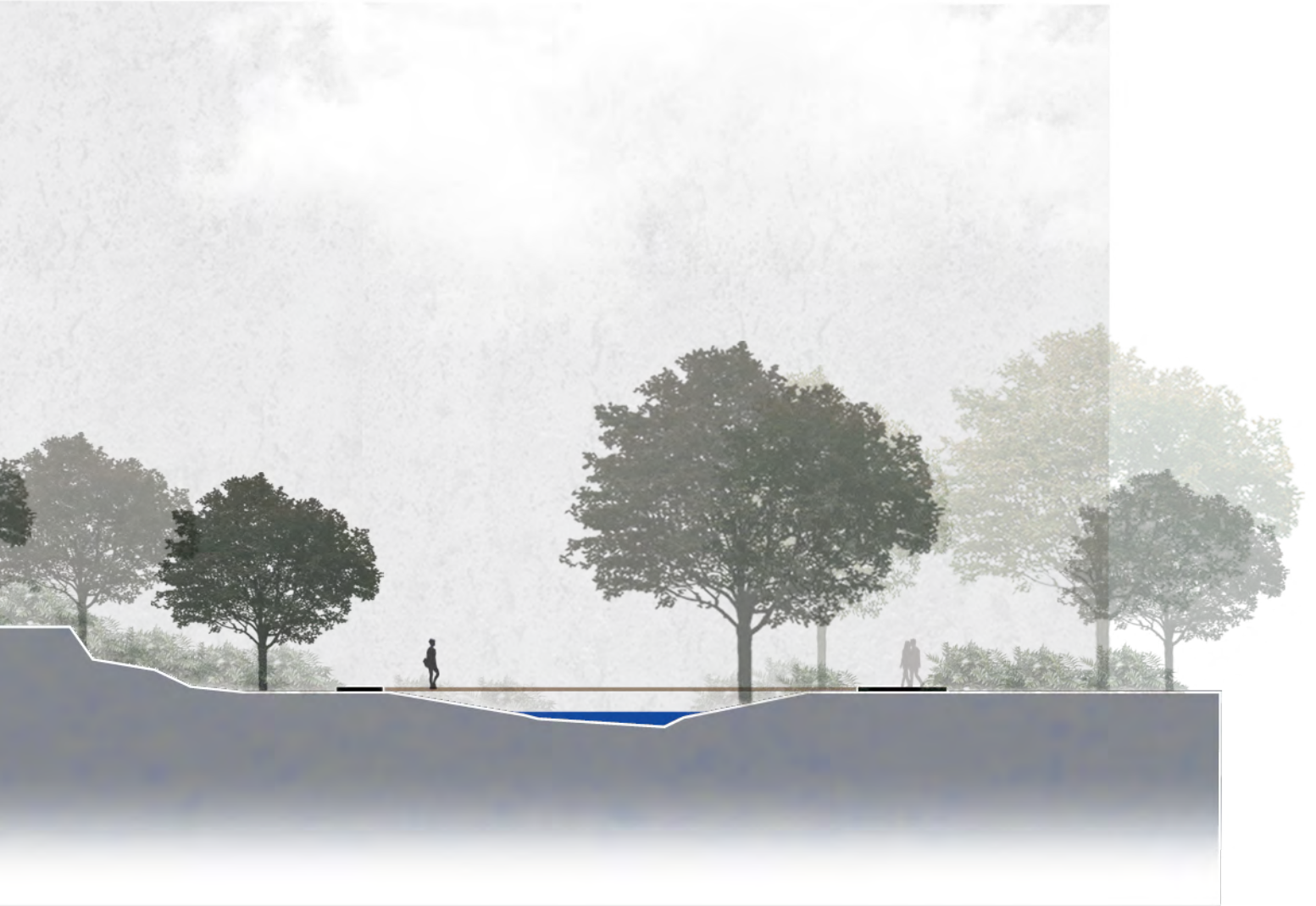




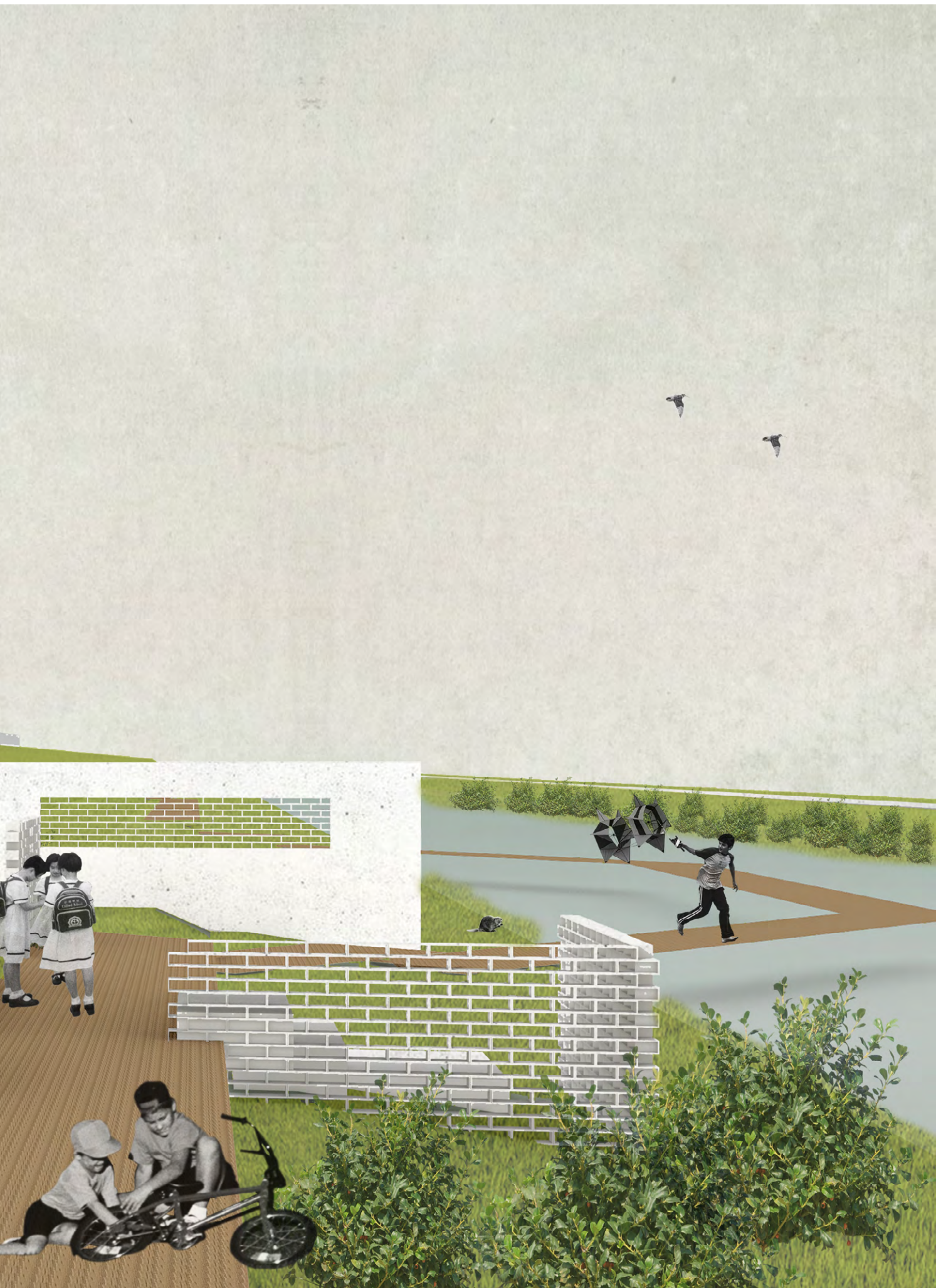


124



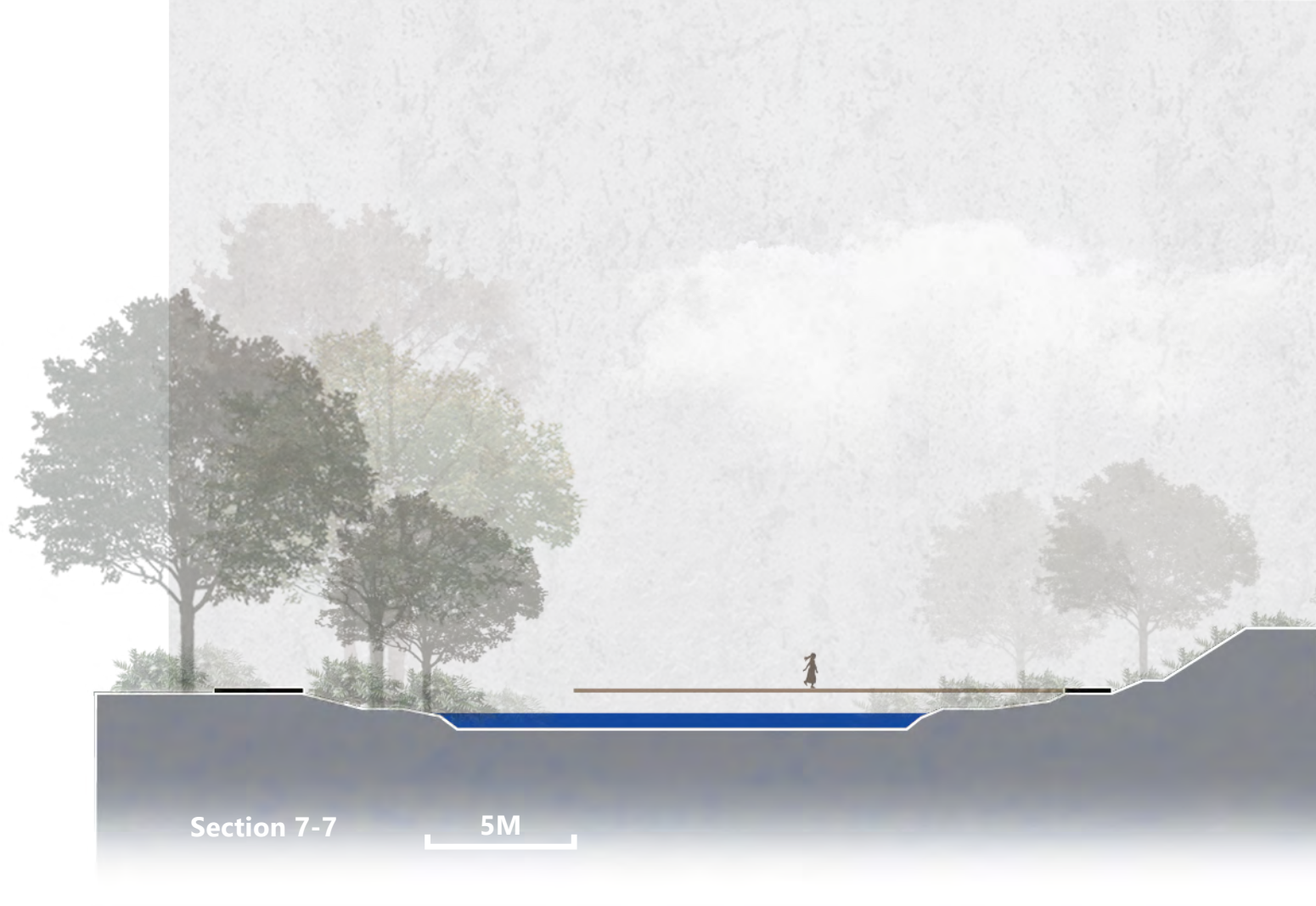


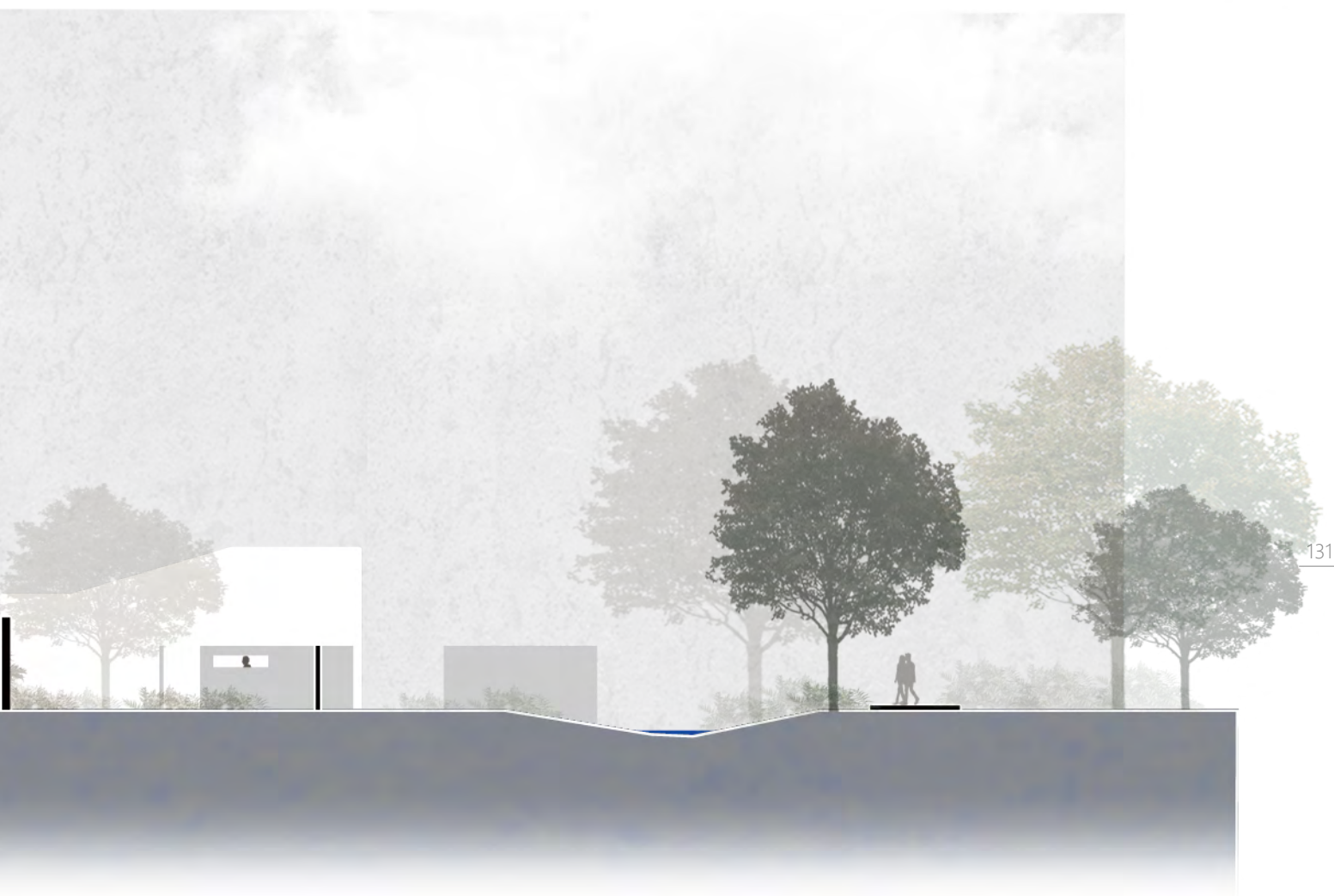














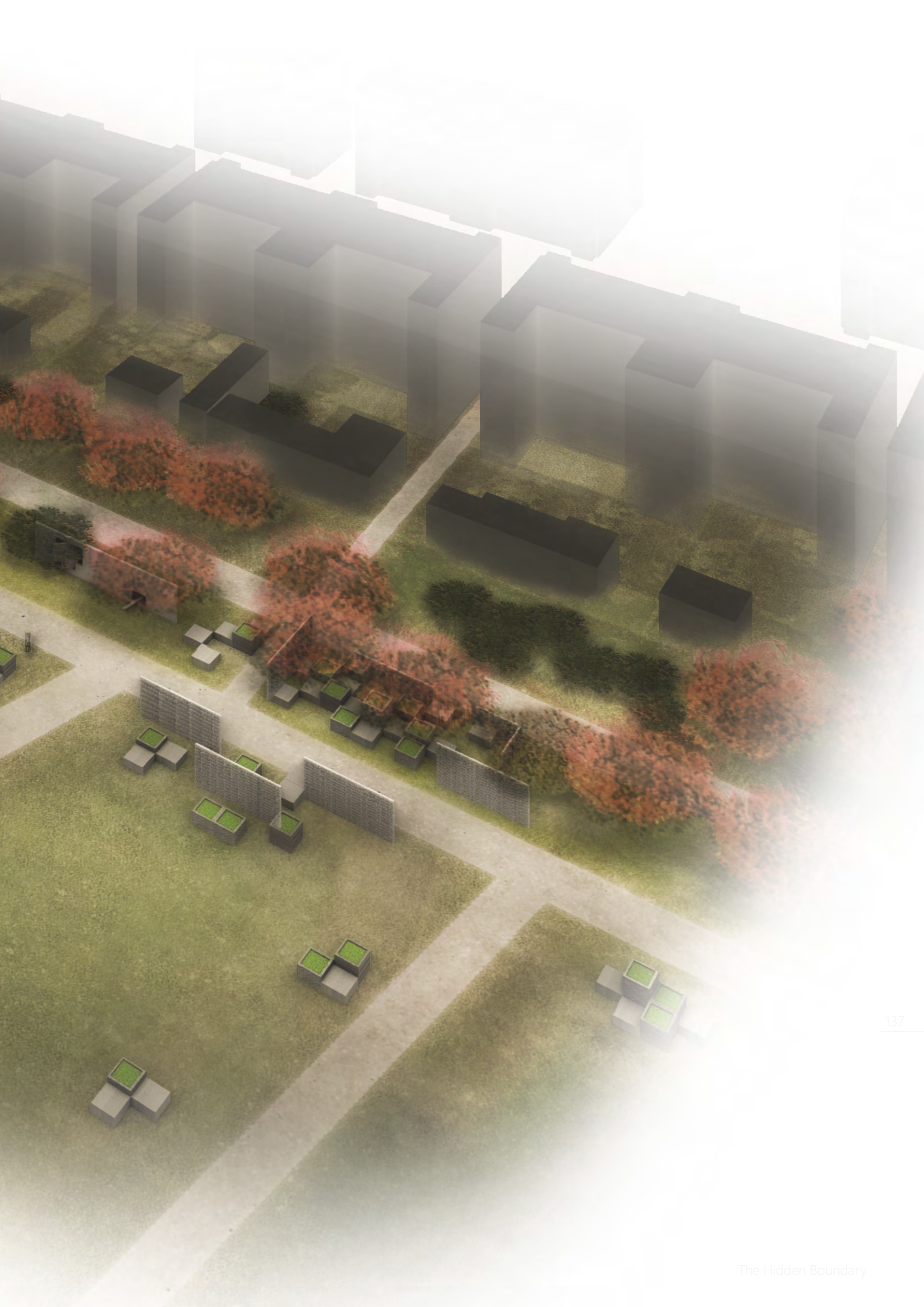




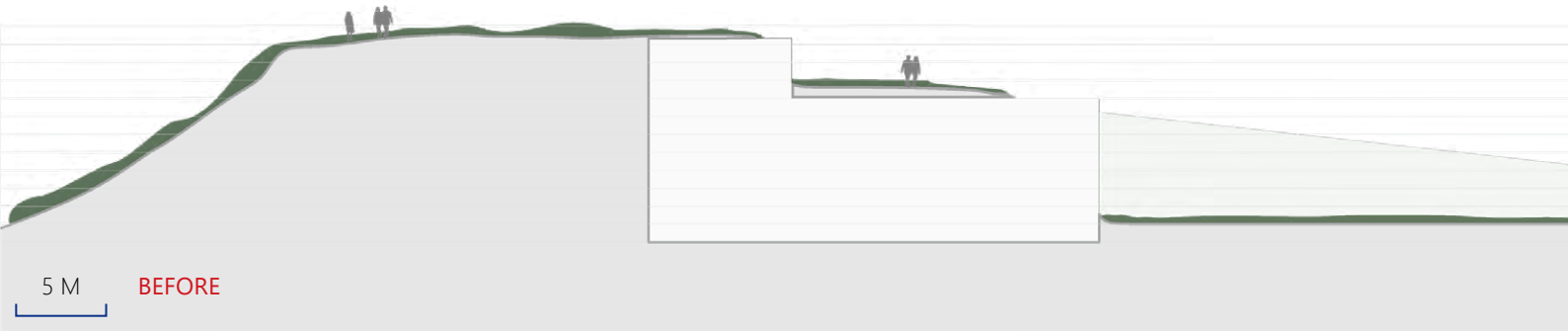


Defence Line In-Between Space Design(Zone4)

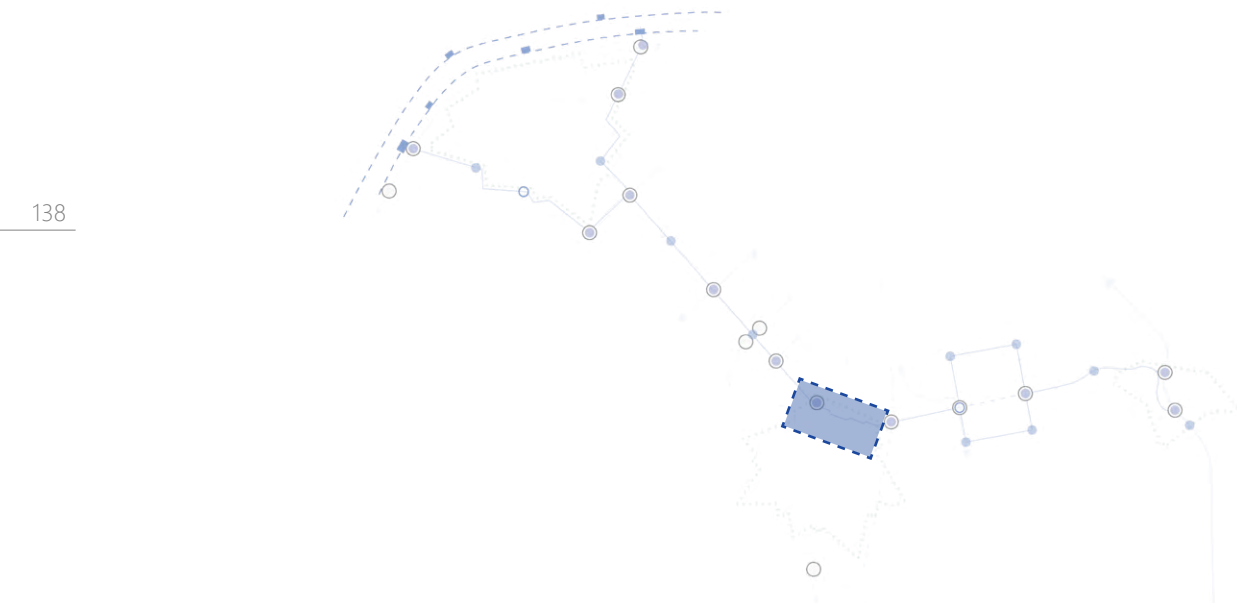
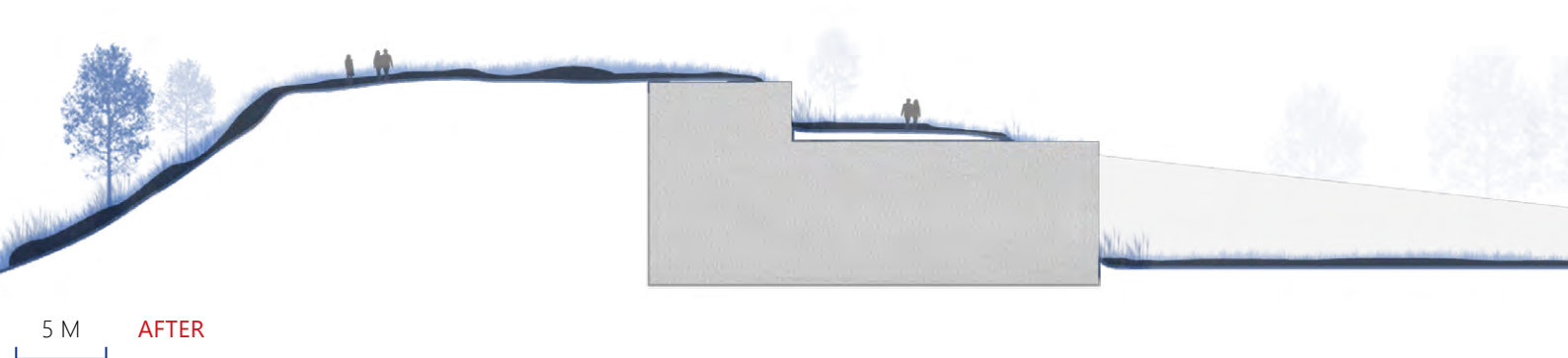




Defence Line In-Between Space Design(Zone4)



Fort Dirks Admiraal



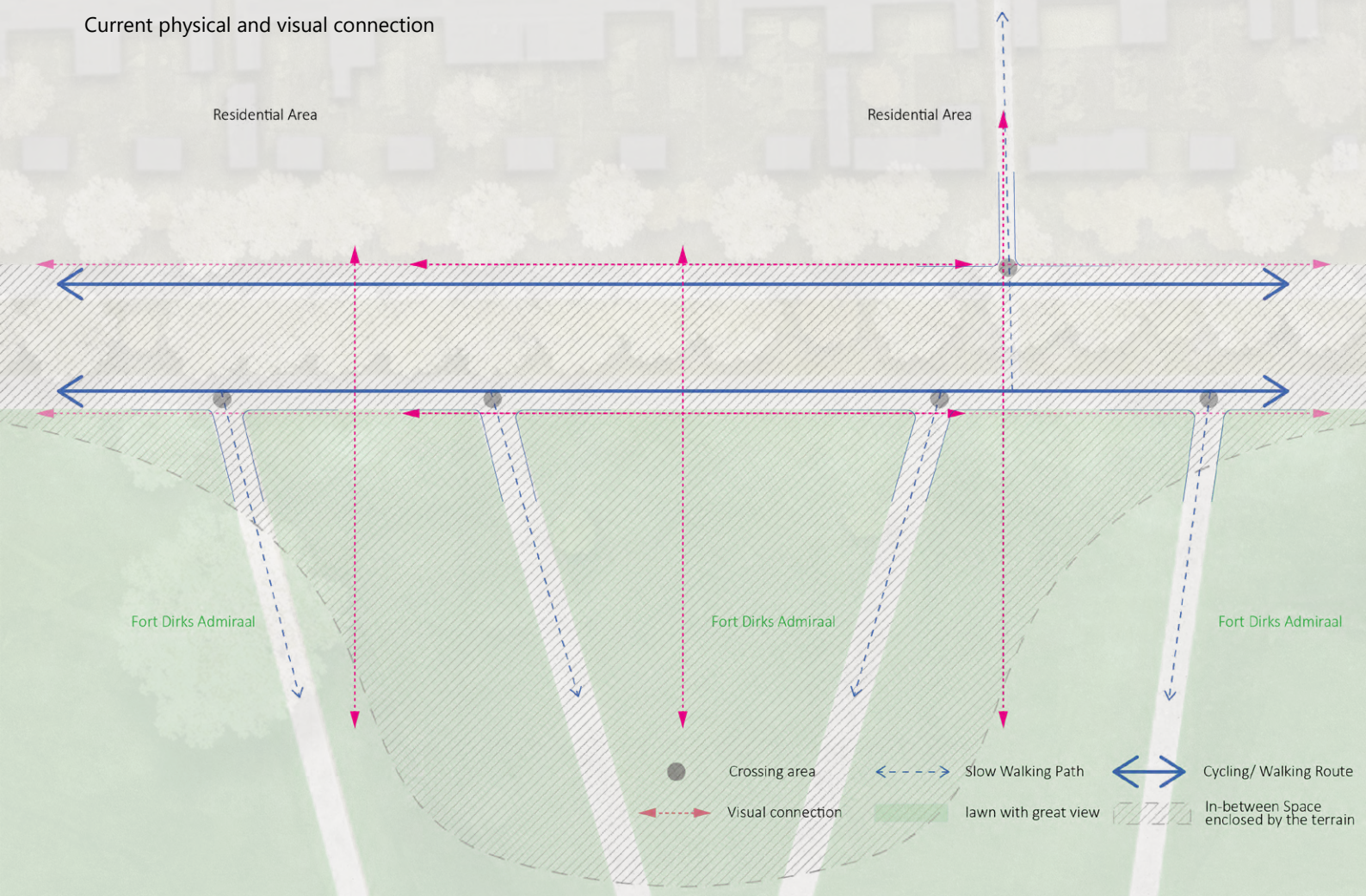


Defence Line In-Between Area

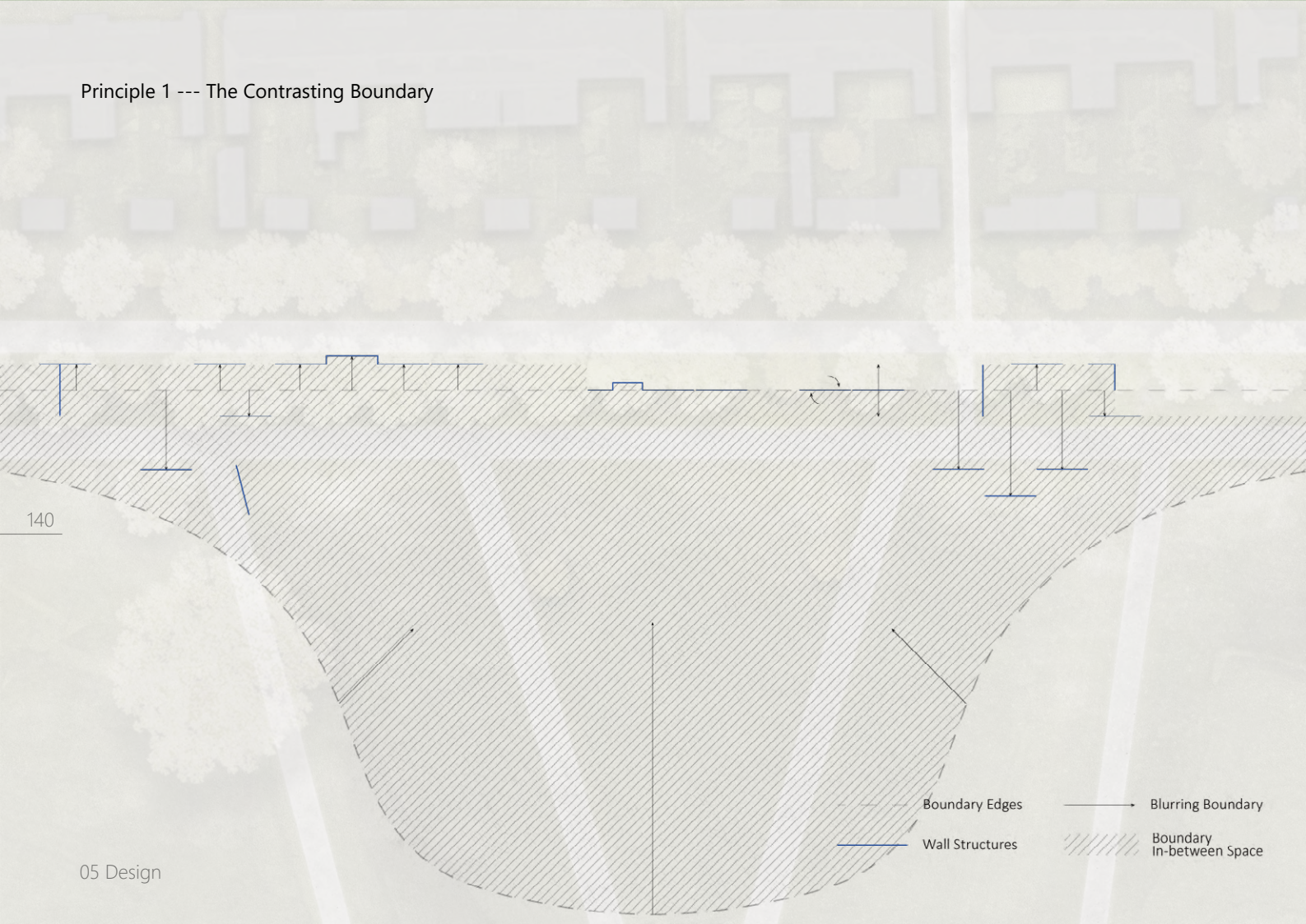
Residential Area



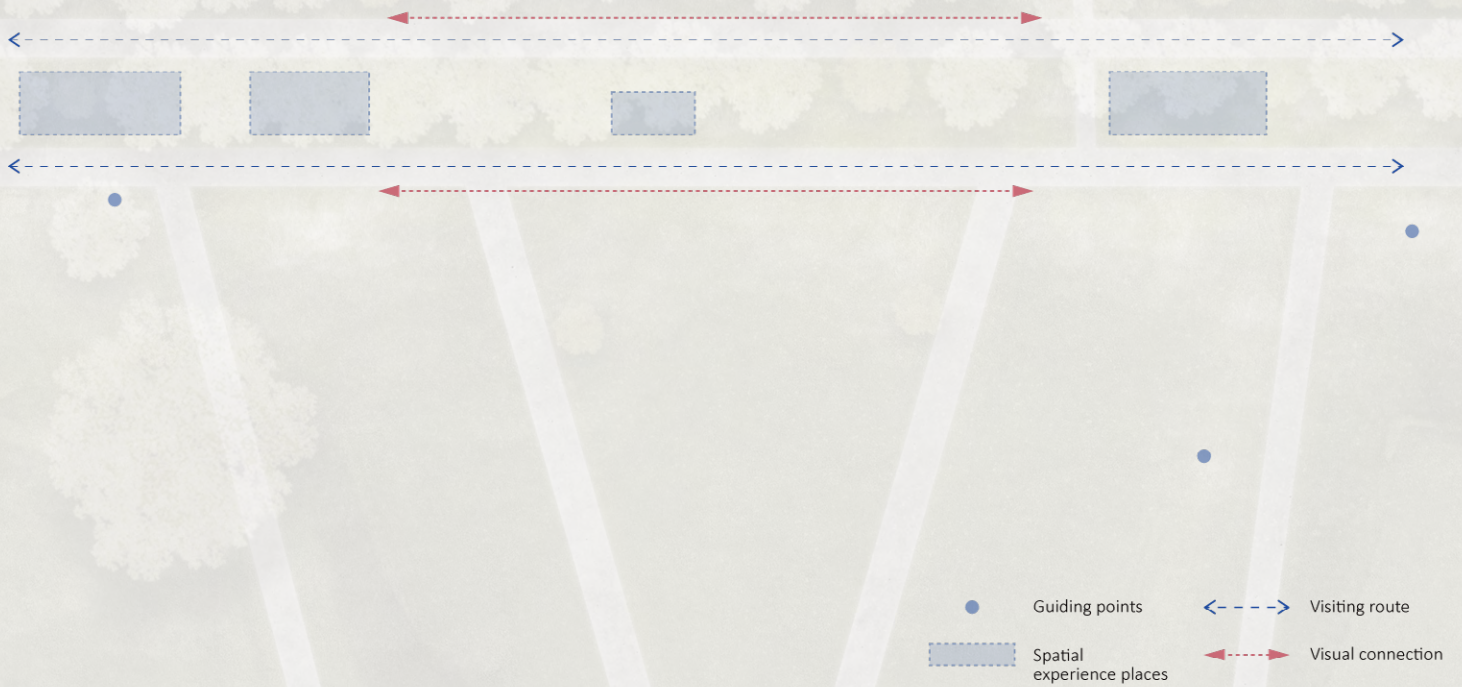
Current physical and visual connection



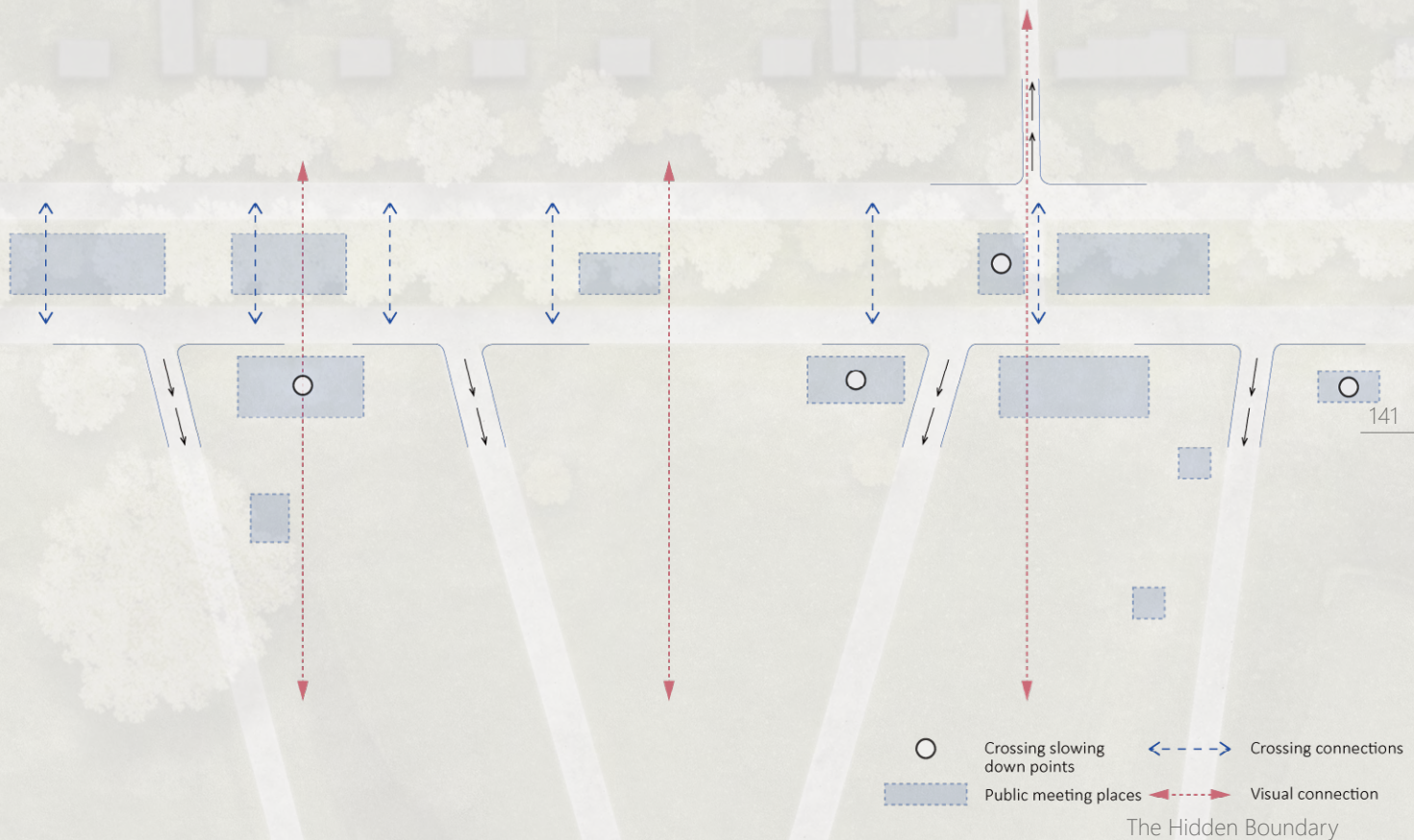
Principle 1 --- The Contrasting Boundary

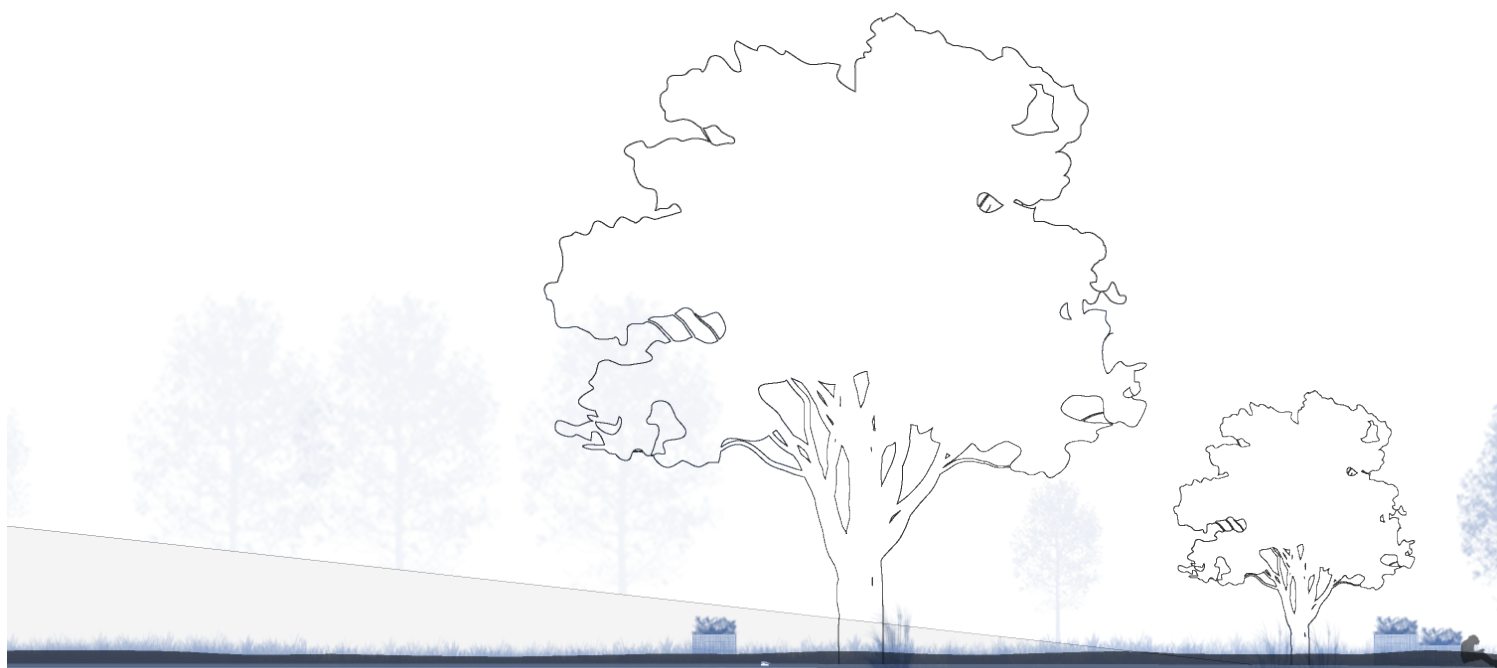
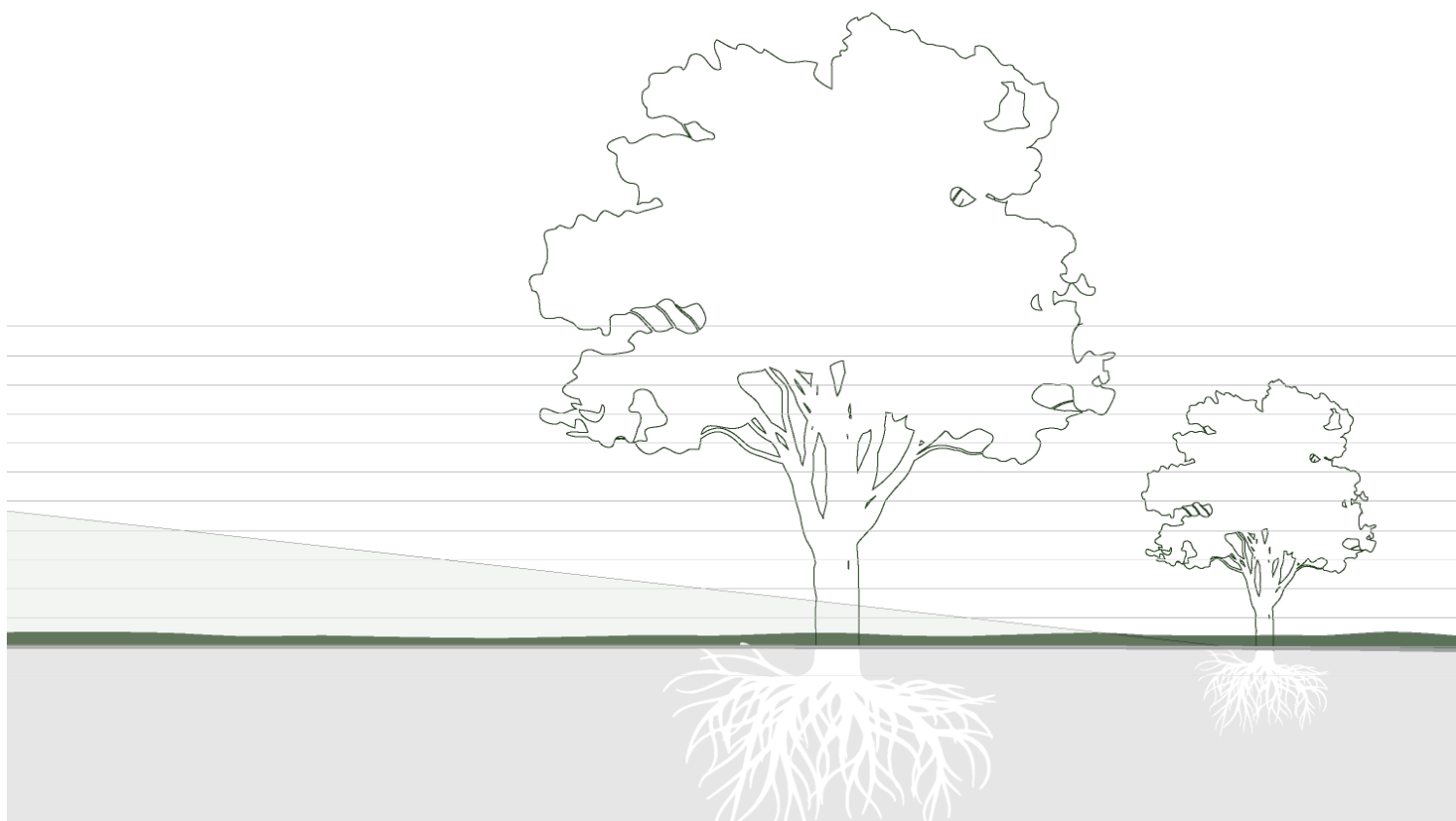


Principle 2 --- Length of Boundary

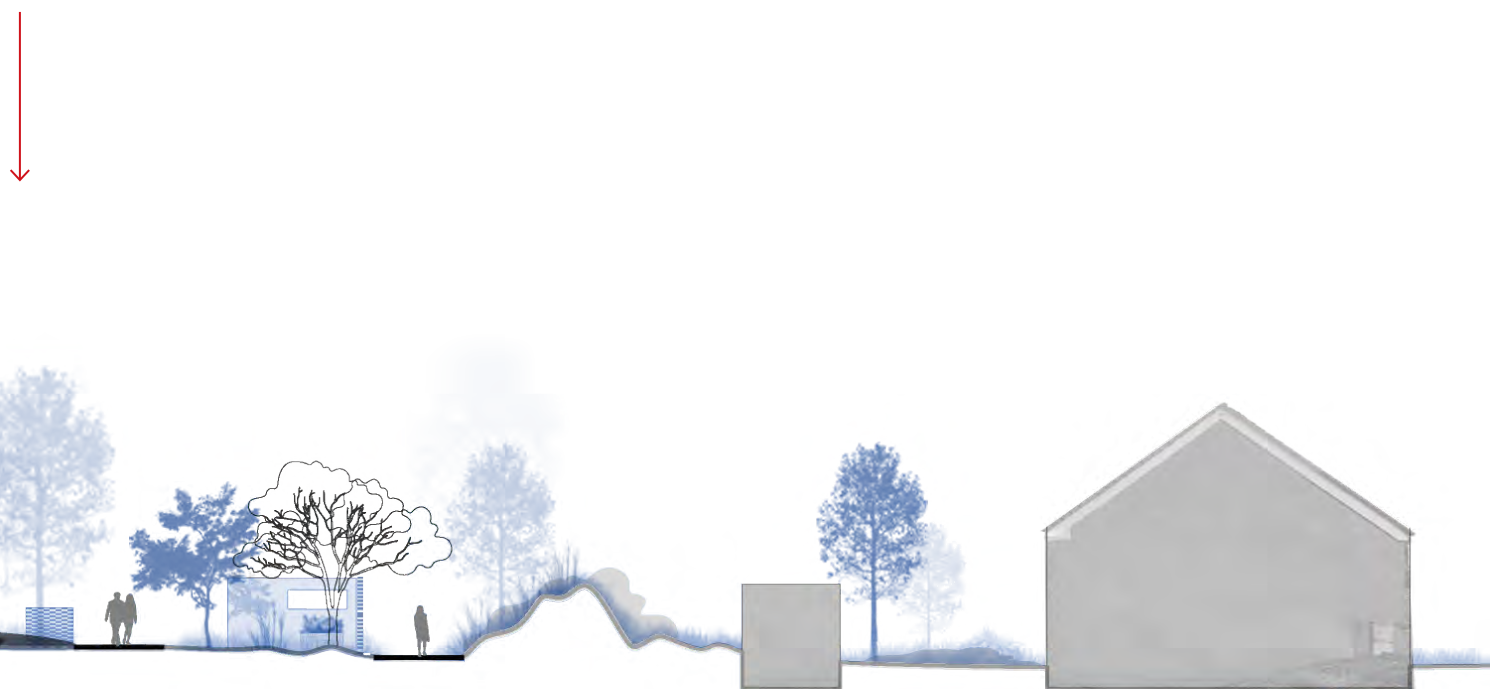
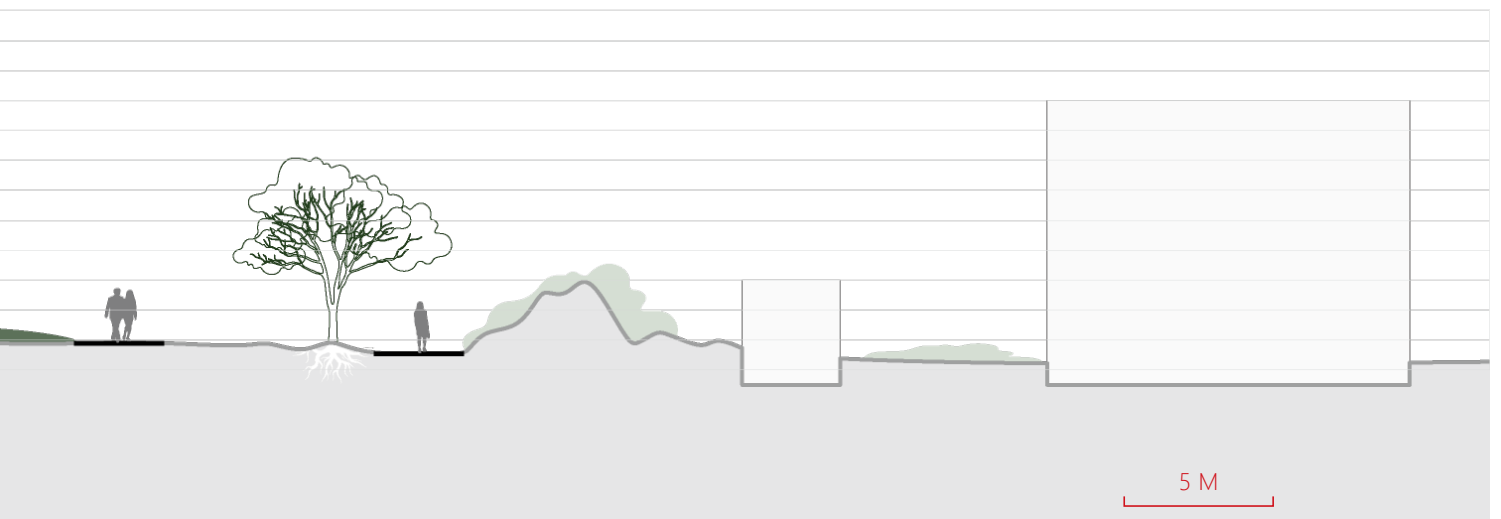


Principle 3 --- Width(transition) of Boundary





AFTER





Interactive Wall
Installation

Guiding
Wooden Piles

Meeting Points



Community
Secret Garden





Figure 05-17. hypothetical people flow in Zone 4 area.
Source: drawn by author













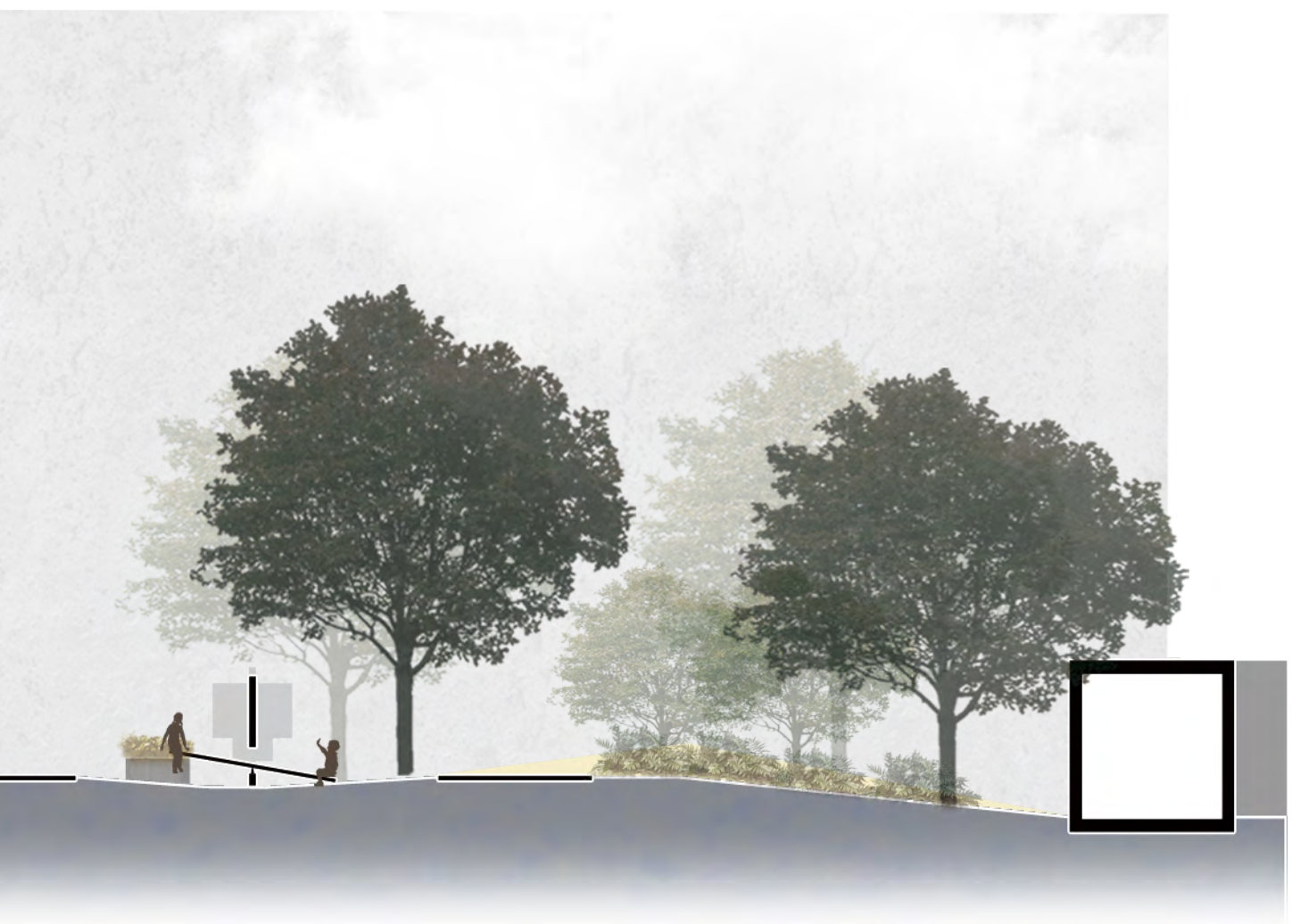
Section 3-3

5M



Section 4-4

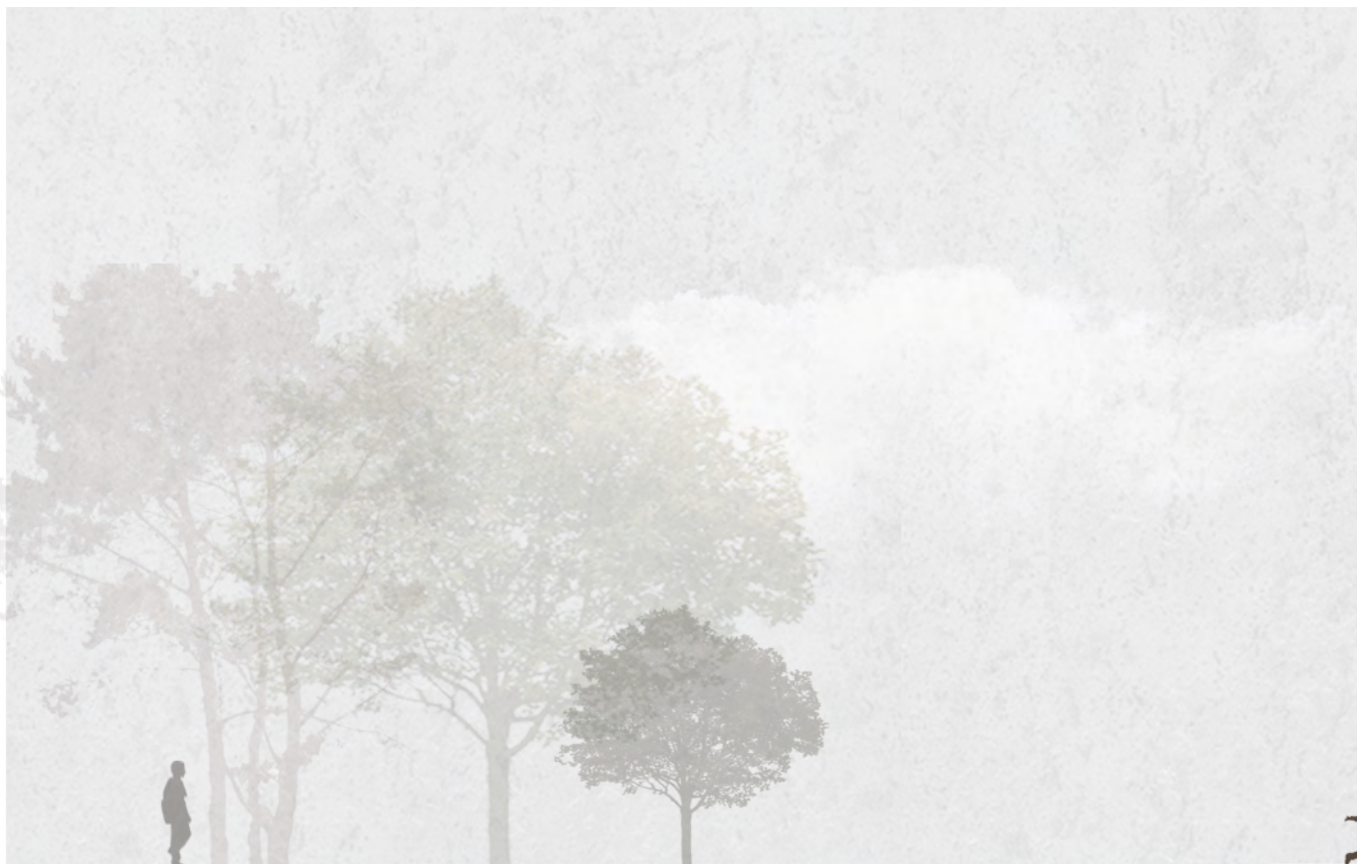
5M





Section 5-5

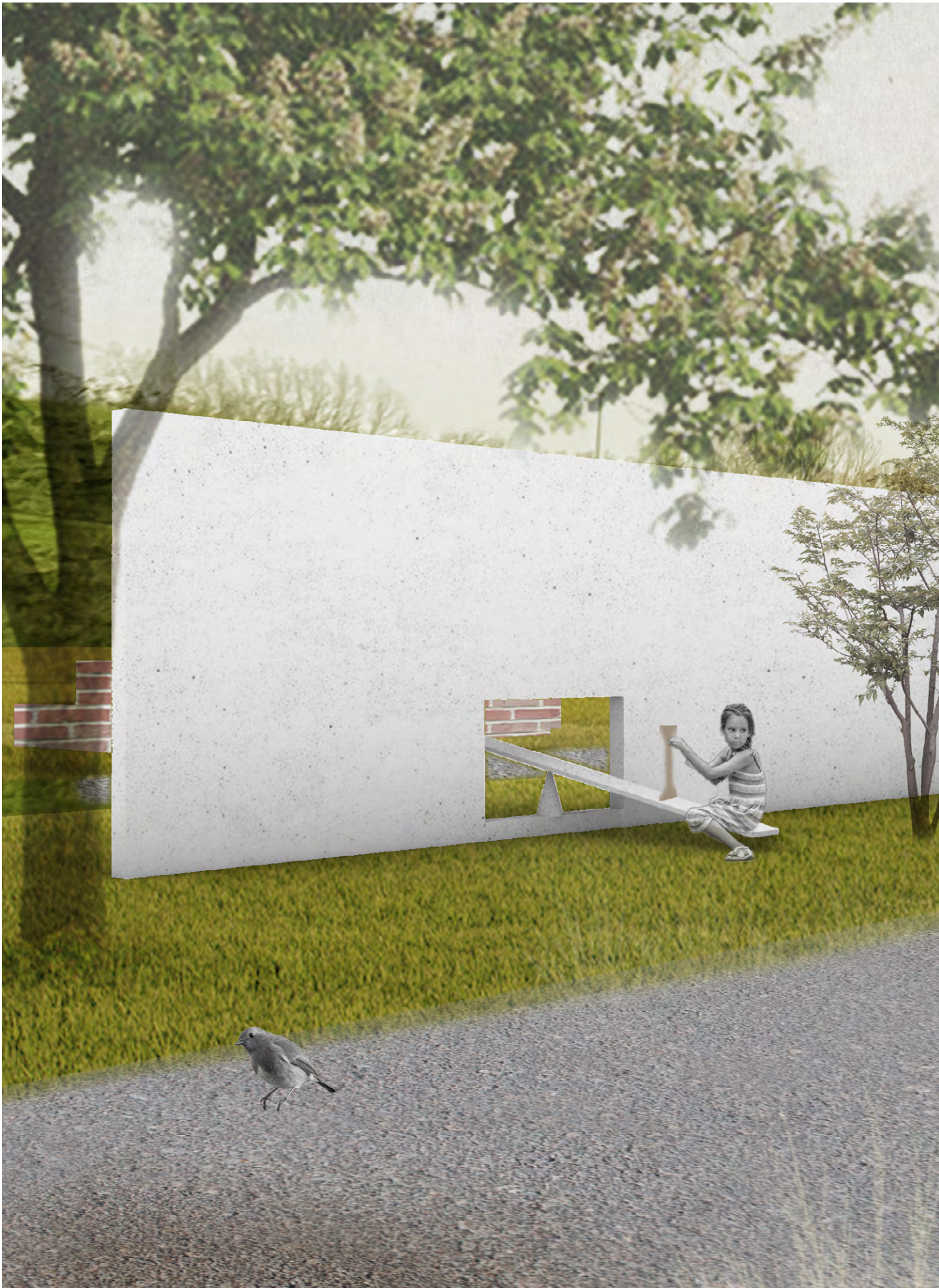
5M

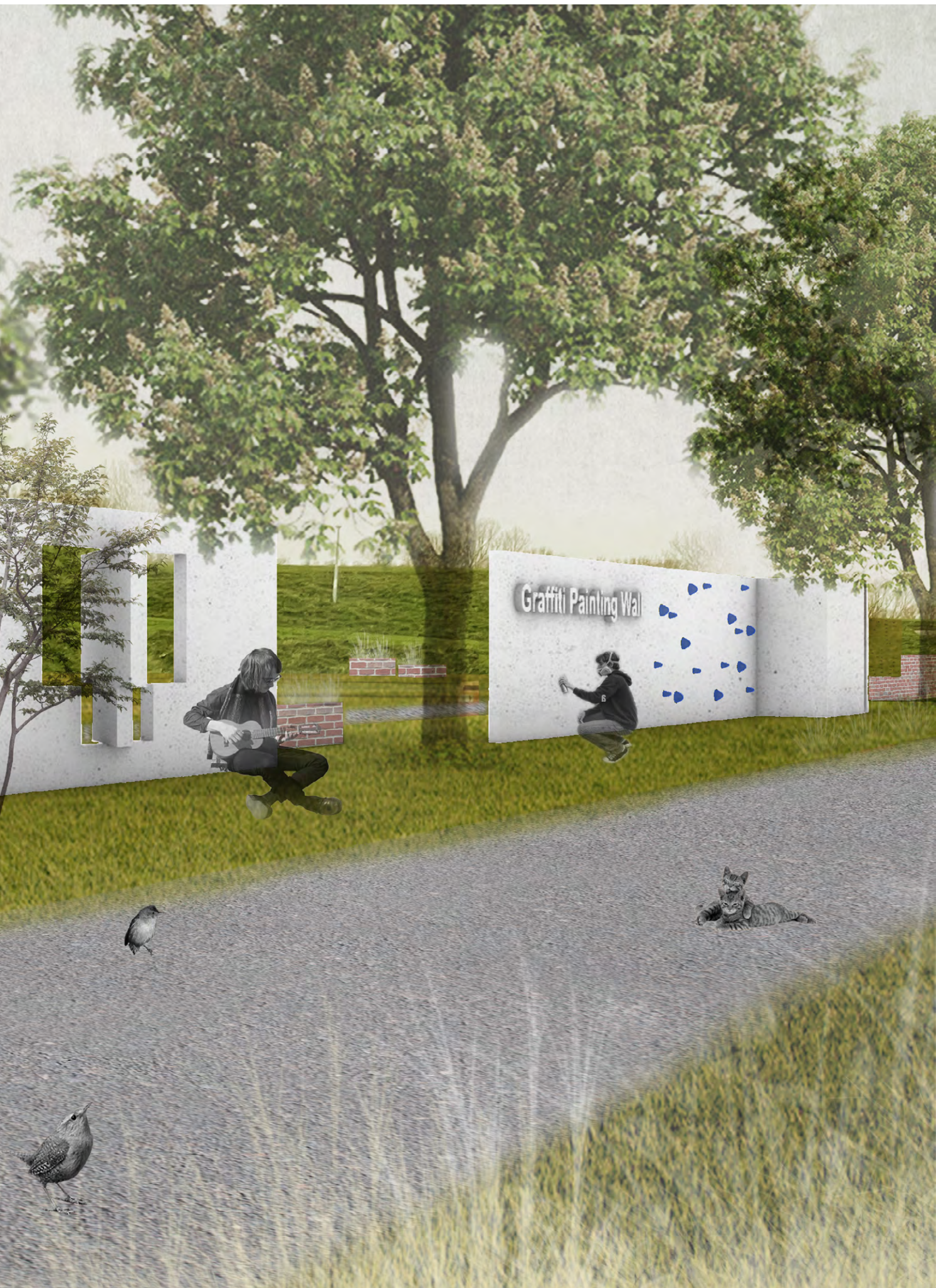


Section 6-6

5M









Section 7-7

5M



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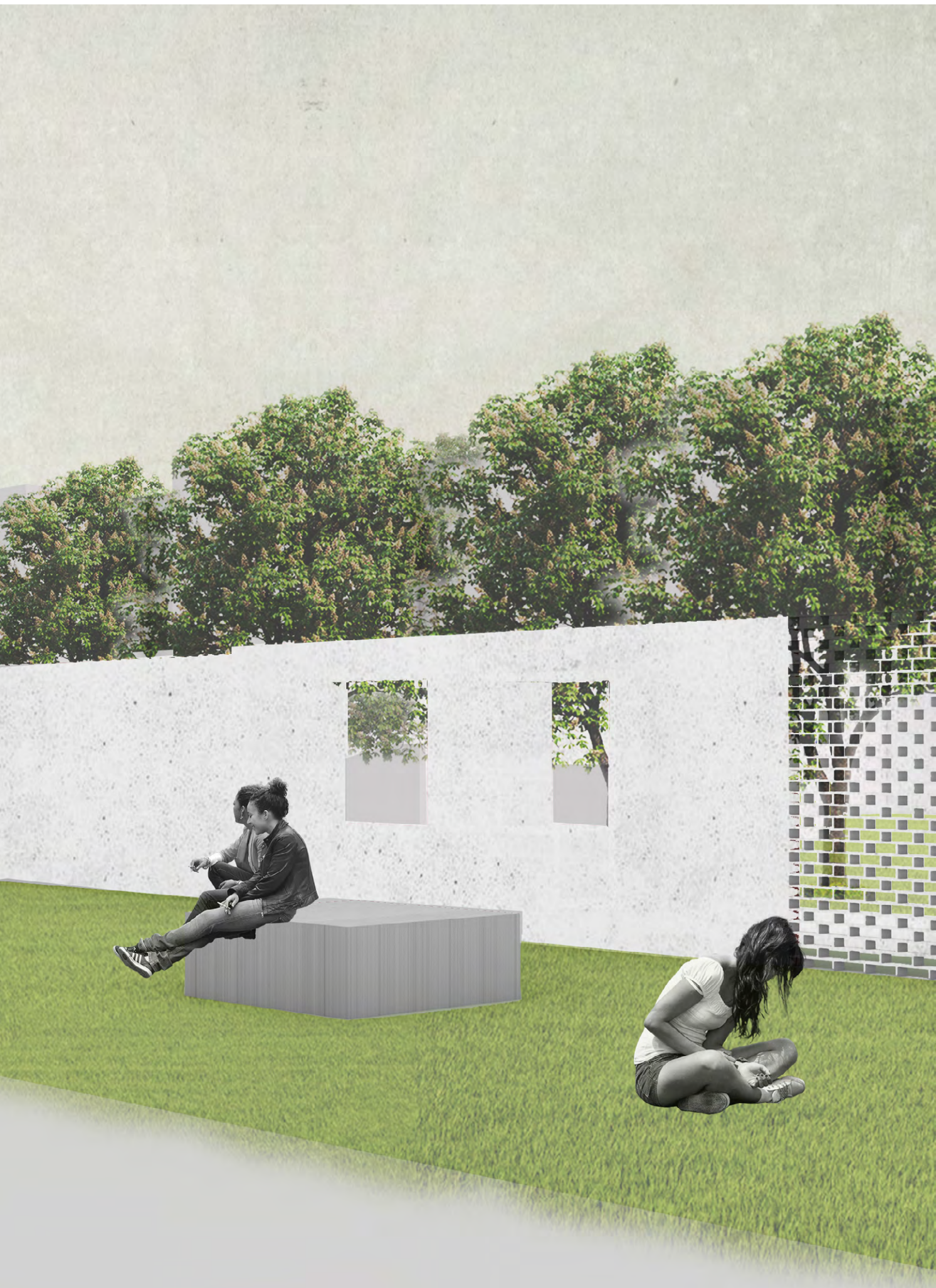
Section 8-8

5M

















06 Conclusion and Reflection

Conclusion
Reflection

Conclusion

The answer to the main research question? Research and design? Recommendations for future work on the 'boundary' topic?

Now that I'm in the final stages of the project, I recall the research problem I put forward at the very beginning, 'How to reactivate and develop a multi-functional boundary area and surrounding landscapes based on the exploration of spatial and temporal continuity?'

I think I have responded to different aspects of this question in this design projects to varying degrees.

Different kinds of border areas all over the world have the same problem or function as a 'marginal area', dividing or separating two or more different spaces. When these boundary spaces exist as edges, it is more or less inevitable to produce some leftover spaces without clear signs or targets to attract users. But it is these boundary spaces that have enormous potential.

Therefore, when I thought about activating this boundary space of the city of Den Helder, the defensive line in the past history, I did not want to weaken or even delete the area of the boundary, but to effectively use and strengthen the characteristics of the boundary of the area. On the basis of the existing environment of the boundary, I **strengthen the characteristics of the contrast** between the two sides of the boundary area.

These boundary spaces serve as the edge of separation and also serve as a **transitional space**. In order to highlight the transitional feature of the border in the design, I also chose some intersections located on the Defence Line, to provide people with opportunities to meet or socialize with others (or even strangers), and to add some interesting transition spaces or slowing-down points.

In terms of **exploring the continuity of space and time**, the research analysis and design of the site are carried out together, and the two continue to interact with each other.

In the beginning, I just drew a few lines running through the whole space on the map of a large area of the city.

In the later stage, I made a more in-depth study on the environment of these spaces, divided the specific space into several areas according to different spatial

characteristics, and specifically thought about designing for different feelings of the spatial atmosphere.

The continuous deepening process make me have more in-depth thinking about the design of boundary landscape spaces, such as using different plants and installations to provide a variety of different spatial experiences in a series of spaces.

Finally, I also hope that more and more people can realize that the space located at the boundary is not just some negative and useless grey space, and sometimes it even has more positive side worth exploring through a small degree of design intervention.

Relationship between research and design

How and why the approaches worked or not?

I will think about design strategies from different aspects while doing theoretical research at first and search for related cases while making design interventions. And these process of design and research will continue to influence each other and improve until I complete my theoretical framework and thinking about design.

The chosen research method, design approach, and scientific relevance

The concept of boundaries in the landscape architectural field would be organized and described. And the way of analyzing the characteristics of various boundaries in a city from large to small scales will be demonstrated. I propose a method to analyze the boundary space, looking at different aspects of the boundary space from a four-dimensional perspective (time and three directions of length, width and height), and in this process propose a design strategy to apply the analysis and understanding of the four dimensions to the design associated with the research.

Readers will know what kind of programs can be imagined in an urban public space, and what kind of methods can be used to effectively improve the continuity of space and ecology in the city so that the city becomes adaptive and sustainable development.

At the same time, in order to clarify the design and research and make the project easier for readers to understand, a glossary related to the design site and the boundary topic will be completed.

Relationship between graduation topic, lab topic, studio topic, and master track

The graduation studio topic is 'Flowscales' which aims to understand landscape through different time, process and infrastructure. The graduation lab 'Place & Memory' aims to explore the meaningful memories of the places or give new memories to make the places meaningful, which belongs to the 'Flowscales' studio.

This 'the hidden boundary' graduation project will explore the 'memories and places' of the naval city of Den Helder. While studying the boundaries and space-time continuity of the Defence Line area, this project can attempt to reveal this meaningful 'HIDDEN' area to the public. Then, the Defence Line of Den Helder will become a more meaningful space not only for the past but also for the future.

The intention of the project is to bring attention to the boundary area and to find a balance between the preservation and renewal of the historic site.

The boundary area has these posed problems now, but it can also act as a problem solution. Boundaries are usually porous, transparent, and ambiguous. They can not only separate spaces but also can interlock spaces. By reconnecting the broken historical defense line and improving the quality of green spaces, the city's history traces will be reinforced and the continuity of biological habitats will be strengthened.

Social and environmental relevance (the transferability of the project results)

This graduation design project aims to explore the possibility of boundary space experimentally and make the boundary space more inclusive and interactive.

The boundary area, which accommodates the diversity of living Spaces, will be better utilized by the residents.

In addition, the boundary space acts as a good adhesive here, while people carry out activities in the public area, it increases the opportunity of contact, so that all kinds of people have the opportunity to meet here.

In real life, any boundary space or spare space in a city can be designed to provide a space for people to meet. This will help increase happiness and reduce loneliness in the daily lives of contemporary residents.

Considering the environment of the whole city, the boundary space serves as an open public space for the whole city to share. This space is also open to all kinds of natural creatures, so people can better achieve the goal of harmonious

coexistence with nature here.

Ethical issues and dilemmas

It is not clear what is the most appropriate approach to the preservation of a heritage site like this with so much historical memory.

At the same time, when designing and transforming the space environment of the landscape, I may ignore many things and use many subjective ideas to interfere with the site. For example, as a visitor from outside the Den Helder city, I can't do real-time research to verify that people really live in cities 24/7, 365 days a year, as I assume. Therefore, the design based on my observation and speculation will inevitably have some ill-considered flaws.

Personal development and exploration

In the process of exploring the theme of boundaries, I kept thinking about and related issues about boundaries. Moreover, this is the first time for me to do such in-depth exploration and research on a subject.

During this period of more than half a year, I came into contact with some theoretical and practical areas that were unknown to me, or I explored countless problems that I had never thought about before.

For example, the formation and development of political and social boundaries; Each word or phrase dealing with boundaries; The multiple functions and effects of boundary as a spatial component; How to design in different boundary spaces, etc.

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