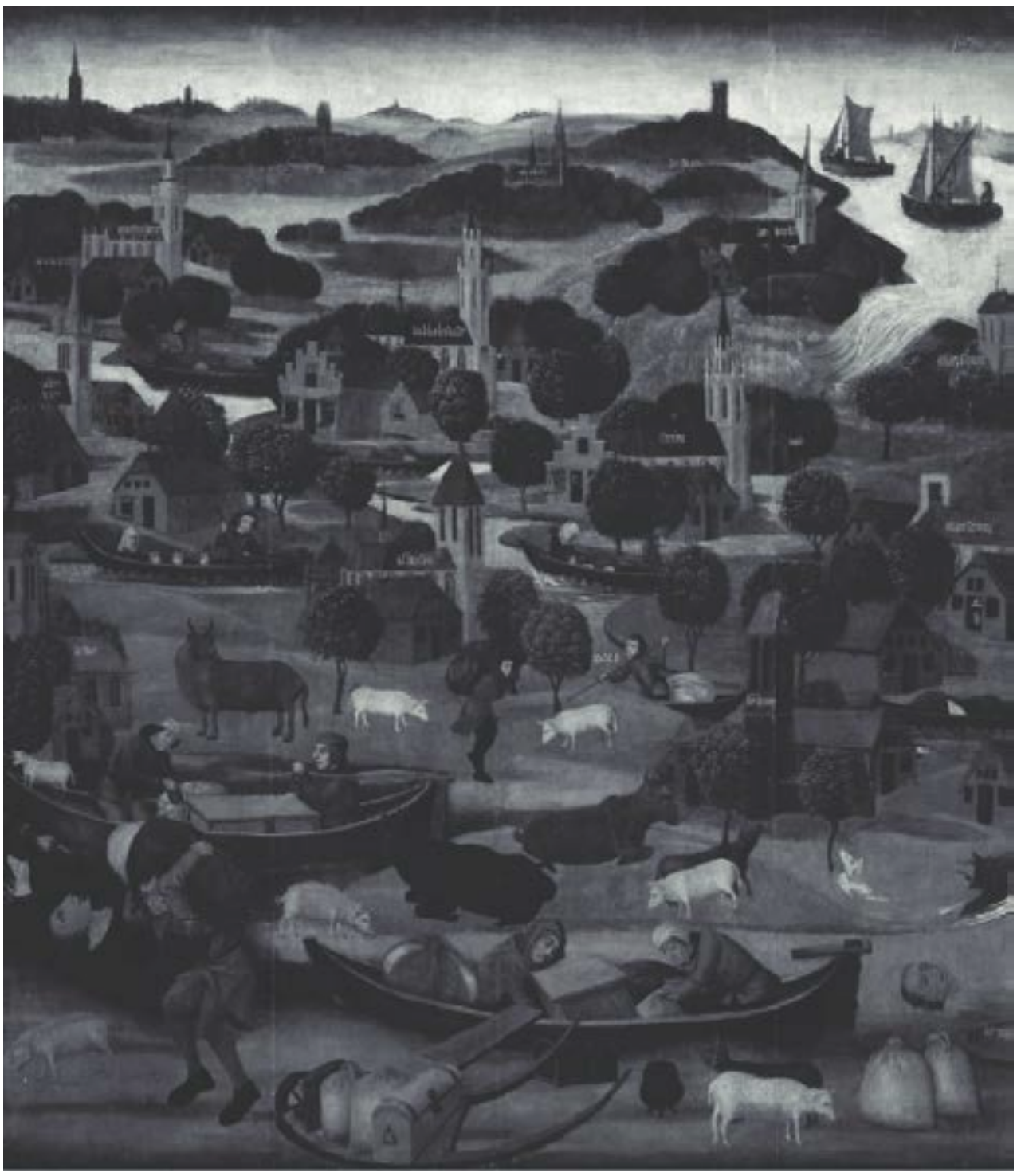

Tides Of Change

graduation design booklet

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MSc3/4 2025

Revitalising Maritime Heritage

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Msc Architecture
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Revitalising Heritage

Msc 3 & 4, 2024-2025

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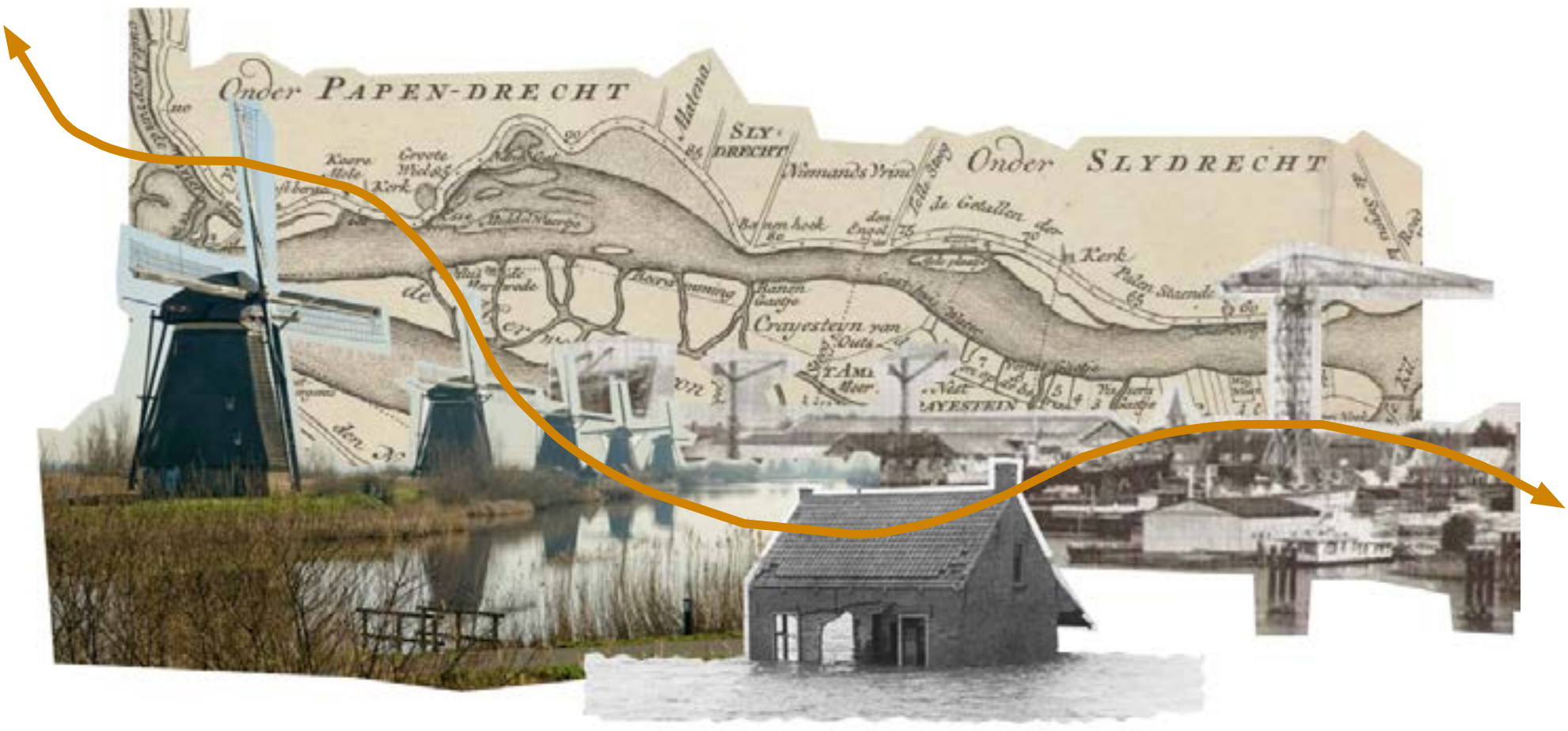


Preface

This booklet is a compilation of the research and design from my graduation project. During the Revitalising Maritime Heritage studio, part of the Heritage & Architecture department, I conducted research for a design assignment in the Waterdriehoek region, which is part of the heritage line Maritime Industries. My project takes place on the site of the former water tower in Sliedrecht, known as 't Zaagje.

This booklet brings together the individual research, design research, and final design outcomes. Over the course of the year, I collected a vast amount of information and developed many concepts—far more than could be included here. Instead, this booklet presents the most important results, offering a clear summary and overview of the past year.

The focus of the project was on giving new meaning to the history of this part of 'Oer Sliedrecht'. Both the tangible and intangible heritage are given a new narrativethroughthisadaptivereuseandtransformation. In doing so, the project strengthens the connection with nature, history, the character of Sliedrecht, and the water—in this case, the river Beneden-Merwede.

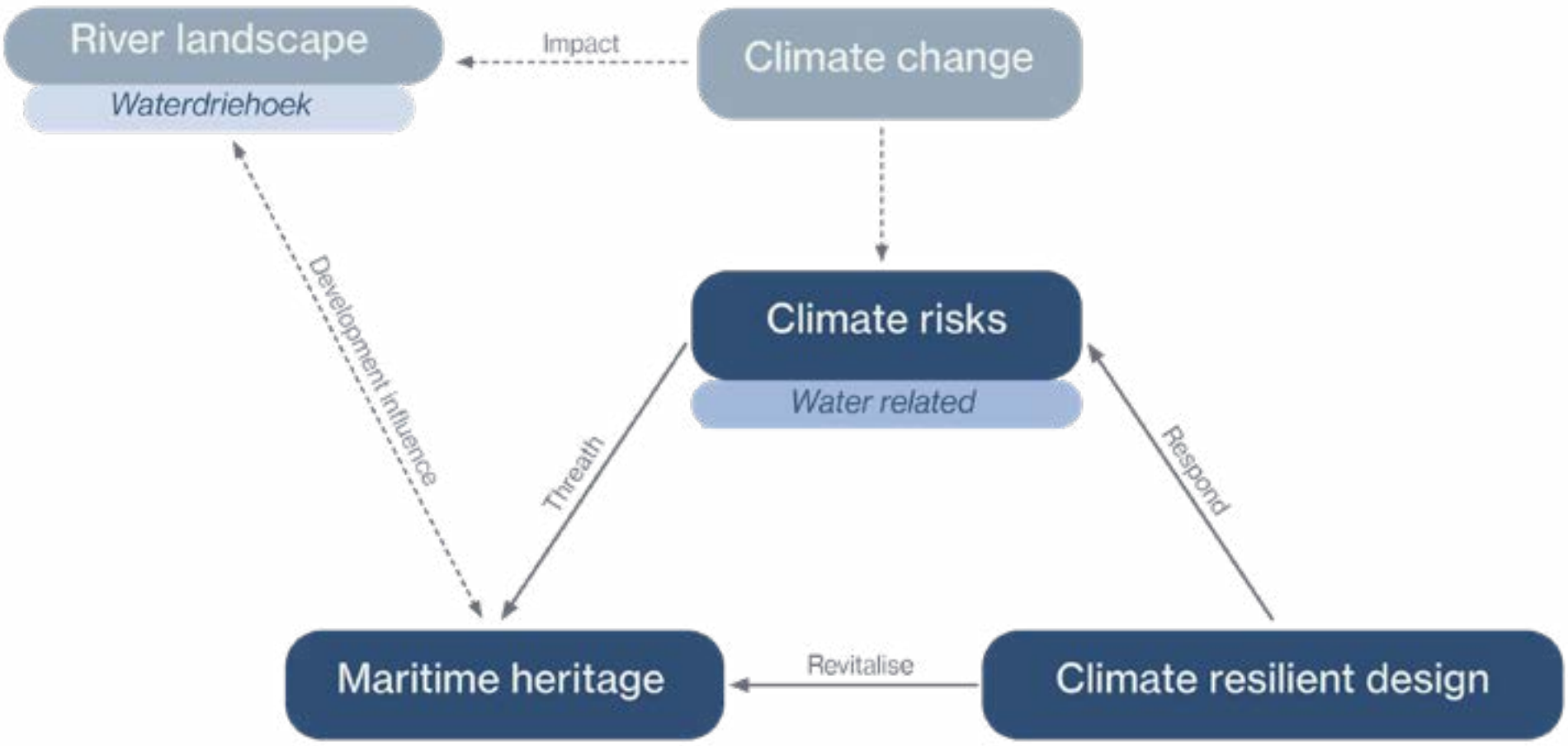
The structure of the booklet is roughly chronological. It begins with the research phase, followed by the design research, the design itself, and finally the technical details. Of course, there is a great deal of overlap between these phases, as the process was highly iterative.

Enjoy reading!

Content

Chapter 1

Research Paper



Research topic

Before doing the research, I had to come to the research topic. What immediately fascinated me about this area was the constant presence and influence of water. The delta landscape and the many rivers have shaped the region into what it is today. People here have not only seen water as a threat, but also as an opportunity for development. The maritime industry has flourished here for decades and has strongly influenced the identity of the region. However, this industry is gradually shifting to other locations, leaving behind vacant buildings. What was once pioneering infrastructure is now cultural heritage. Despite its historical significance, this heritage is increasingly under threat from climate change—especially due to its often unprotected location outside the dikes in this water-dominated landscape.

This applies not only to my project site but to the entire heritage line it is part of. This, combined with my personal interest in history and the focus of the research assignment, has led me to my current research topic.

In this research, I explore the relationship between climate risk—particularly flooding—and climate-resilient design, with the aim of making heritage structures, which were originally built to protect the region, themselves resilient to climate change. I also reflect on how we can learn from history in doing so. The development of the Water Triangle is part of this analysis, as it is closely linked to the region's historical and spatial evolution.

This research is presented in the following paper.

Annotation

Some images in this study have been edited with orange lines or markings to highlight important elements. Below the image, the relevant text is marked in orange to indicate what is being referenced. If an image has been modified, this is explicitly mentioned in the description.

Introduction & methodology

The Waterdriehoek under threat

The Dutch connection to water is deeply rooted in its history and cultural heritage, shaping its landscape and identity. This relationship is vividly reflected in the Waterdriehoek – a region where Dordrecht, the Biesbosch, and the windmills of Kinderdijk form a unique landscape. Linked by water and its history, this area is part of the heritage line Maritieme Industrie (figure 1), which extends to Hoek van Holland (Provincie Zuid-Holland, 2024). A heritage line is a geographic route connecting sites through a shared historical narrative, enhancing the visibility of the cultural landscape (Hein, 2020). This research focuses on the Waterdriehoek area only, following the rivers Beneden Merwede and the Noord.

As the starting point of the Dutch delta, the low-lying Waterdriehoek showcases centuries of Dutch water management expertise. Protective measures here date back centuries, alongside the many floods that shaped the region. However, water was seen not only as a threat but also as an opportunity, evident in shipyards (figure 2), dikes, windmills, pump stations, willow cultivation and fisheries (Rijksdienst voor het Cultureel Erfgoed, 2024). What was once pioneering infrastructure is now cultural heritage. An intangible aspect of this legacy is the tradition of innovative engineering and water management to address a constantly changing environment (Hein, 2020).

Despite its historical significance, the region faces threats from climate change. Over the past two centuries, industrialisation has disrupted this fragile delta, accelerating sea level rise and river peak discharges, putting the landscape under pressure (Gramsbergen, 2021). The rest of the Netherlands, with a quarter of its land below sea level, is similarly vulnerable to climate impacts and flooding (Daamen & Taylor, 2022). Public awareness of these risks remains limited, while urban delta areas like the Waterdriehoek face heightened consequences. Both protection and adaptation are crucial.

The success story of overcoming the water threats is now challenged by climate change. New strategies are needed to preserve both tangible and intangible heritage. Drawing lessons from this history – both successes and failures – can

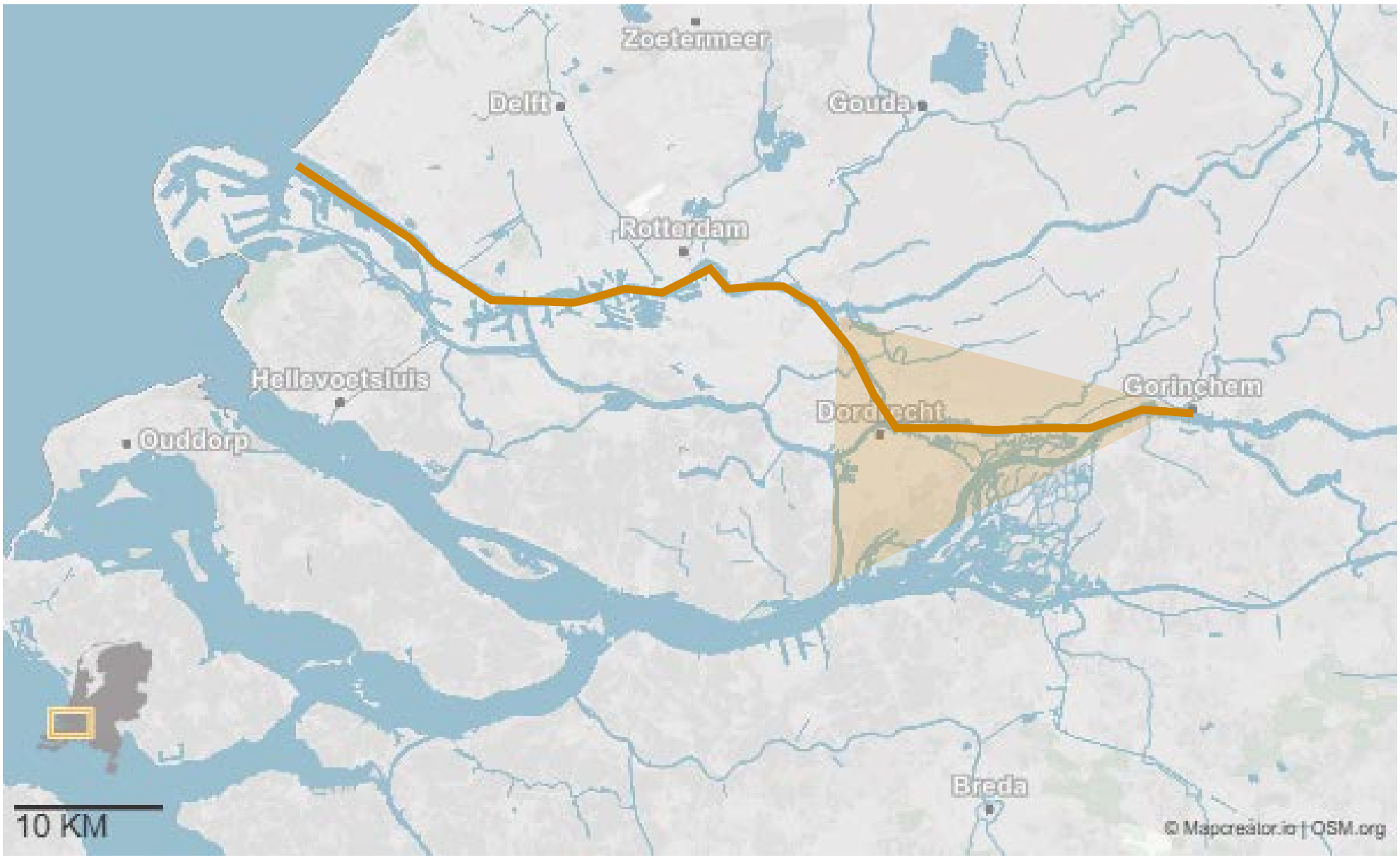


figure 1: Heritage line Maritime Industry, with the highlighted Waterdriehoek area on the east (own picture, created on Mapcreator.io)

figure 2: Shipwarf The Merwede at the Rivierdijk, Boven-Hardinxveld (Regionaal Archief Dordrecht, 1965)

inform future water management and urban planning. Engineers and conservators propose integrating heritage into these strategies to create climate-resilient solution while safeguarding cultural legacies (Hein, 2020). The dynamic and adaptive character of the delta, combined with water-related heritage, can inspire innovative policies and designs. This approach continues a centuries-old tradition, not as a break from current practices but as a new phase (Hein, 2020).

This research paper examines the historical and landscape developments of the Waterdriehoek to identify steps for designing flood-resistant buildings in a maritime heritage context. Learning from the region's past in terms of landscape and architecture can provide a strong foundation for addressing future challenges.

't Zaagje

This paper supports a design task within the Waterdriehoek, located at the Watertoren site in Sliedrecht – an industrial floodplain along the Beneden Merwede. Know to locals as a historical floodplain called *'t Zaagje* (figure 3), the area holds a piece of Sliedrecht's heritage. Featuring only an abandoned shipyard and a derelict water tower, this site is slated for redevelopment (figure 4). A value assessment (Appendix A) has been conducted to establish the site's heritage context. The conclusion will summarise which aspects of the research are relevant for this site and which are not.

Research questions

Based on the introduction and problem statement, the following research question has been formulated:

How can insights from the historical landscape and architectural strategies in the Waterdriehoek inform the design of flood-resilient buildings in the maritime heritage context of this delta?

The main question is divided into several sub-questions, each addressing a specific aspect of the research:

1. What key historical transformations in the Waterdriehoek's landscape were driven by climate and water management?

2. What lessons can be drawn from historical architectural adaptations in the Waterdriehoek to address water-related risks?

3. How can these historical measures be combined with contemporary approaches to design flood-resilient buildings in the Waterdriehoek?

Each sub-question is explored in a dedicated chapter. The first two questions focus on historical developments in landscape and architecture, highlighting the formation of the maritime heritage context. The final question integrates these historical insights with current techniques and strategies, shifting the focus towards the future. The concluding chapter summarises the answers to these questions and briefly connects the findings to the design task.

Methodology

The research for the main question is primarily based on historical research, which is linked to current design strategies and theories. This has been examined using different methods.

The core of the study is literature research, which provides insights into historical developments in the Waterdriehoek, focusing on maritime architecture and its relationship with the water landscape. The history of maritime heritage in the Waterdriehoek can tell us more about architecture and its position in society.

In addition, the literature research also examines current measures and projects within the Waterdriehoek, as well as background information on general phenomena. The literature was mainly found in historical reports, studies, and (online) books, accessed through the online database Google Scholar and the TU Delft Library. This literature helps to understand the topic and forms the foundation of the research.

A few literary sources are especially important in this research and serve as the main sources of information. The book *Adaptive Strategies for Water*

Heritage: Past, Present, and Future by Hein (2020) presents a multidisciplinary study connecting water and heritage, as well as the steps needed to preserve, transform, and reuse maritime heritage. The book also occasionally focuses on the Waterdriehoek. The article *Voor als de dijken doorgingen* by Toebast (2012) supports the historical research on measures taken in response to floods in the Waterdriehoek. More general sources are for example *Urbanized Deltas in Transition* from Meyer & Nijhuis (2012), where they provide general information on the transformation of urban deltas and possible future developments. The book *Adaptive Planning for Resilient Coastal Waterfronts* by Van Veelen (2016) examines current planning strategies for resilient urban waterfronts at both large and building scales. Additionally, the strategies outlined in *Meerlaagsveiligheid* by Pötz & STOWA (2014) are used. This book discusses different measures, such as multi-layer safety principles, and strategies at street and building levels.

In addition to the literature study, spatial analysis is used. This involves examining old maps and comparing them with current ones to track developments in both the landscape and urban planning within the Waterdriehoek. The website Topotijdreis provides most of these maps and is used for historical comparisons. However, this source only goes back to the 19th century, so other sources are needed for earlier periods.

Archival material plays a supporting role in this process. Old drawings, maps, and paintings help support the spatial analysis. While scale and orientation are not always precise, these materials still convey important underlying messages. Additionally, old photographs create a connection between the past and present. Archival materials are mainly obtained from municipal archives in the Waterdriehoek, such as the Historische Vereniging Sliedrecht and the Regionaal Archief Dordrecht. Other general archives, such as the Beeldbank Rijksdienst voor Cultureel Erfgoed and the Nederlands Nationaal Archief, are also used.

figure 3: The map of Sliedrecht with **'t Zaagje** (Topotijdreis, 1850)

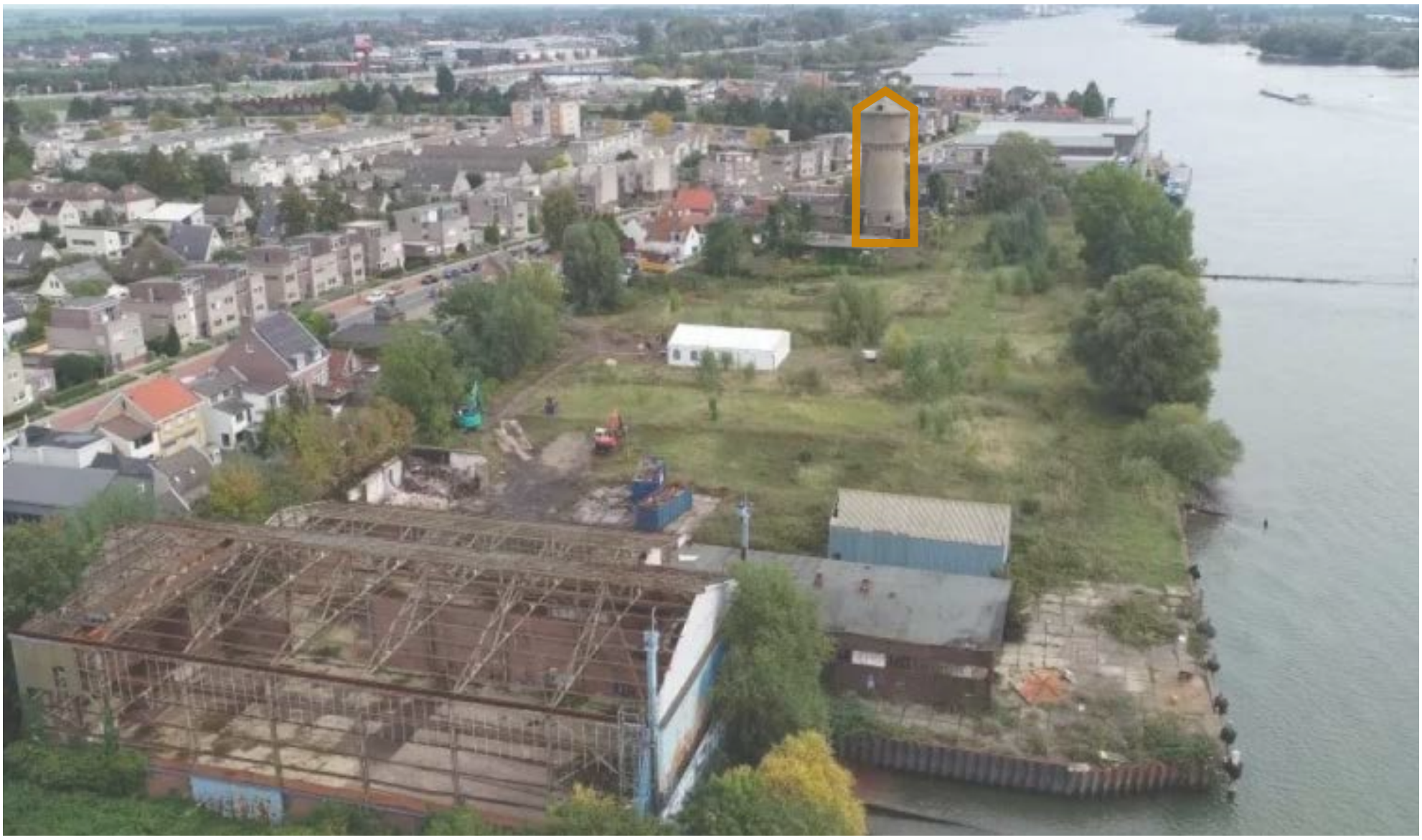


figure 4: The abandoned shipyard and **Watertower** in the background (by P. Donk, Sliedrecht24, 2021)

Chapter 1
The Waterdriehoek as a Delta

The river landscape of the Waterdriehoek is defined by three main rivers: the Beneden Merwede, the Noord and the Oude Maas, which transitions into the Dordsche Kil. In this area, these rivers branch into side streams, canals and distributaries, creating a deeply interconnected landscape. The strong relationship between the landscape and water has existed as long as this region has been described.

From a natural to managed Delta

As the mouth of major rivers, this landscape has undergone significant changes over centuries. The foundation of the Waterdriehoek dates back approximately 10.000 years. Around 5000 BCE, peat began forming, expanding significantly over time. However, in later centuries, the interconnected river system interrupted peat formation. Rising sea levels increasingly influenced the delta, with tides blocking river discharge and spreading sediment across the landscape (Safatij, 2006). This process marked the beginning of the current delta system in the Waterdriehoek, paving the way for human activity. During the Middle Ages, human intervention intensified. Dykes were built to protect the land, significantly impacting nature, water management, buildings and industrialisation. An example is the Alblasserwaard dyke ring (figure 5), which included sluices. Fishing villages like Alblasserdam developed around these sluices, later growing through maritime industrialisation (Den Boer, 2019). Drainage systems were also established to facilitate agriculture. Over seven to eight centuries, some parts of the delta subsided by 6 to 8 meters due to drainage, resulting in land lying 5 to 6 meters below sea level (Meyer & Nijhuis, 2014).

Between the 12th and 15th centuries, erosion and floods drastically altered the landscape. One of the most significant floods was the St. Elisabeth's Flood of 1421, which transformed the former Grote Waard into a vast estuary. Around 30 villages were washed away, leaving Dordrecht as the sole surviving city, protected by its walls (figure 6). For nearly 150 years, the area remained flooded, allowing the river free rein (Maas, 2000), marking the creation of the Biesbosch.

Residents attempted to reclaim lost land using

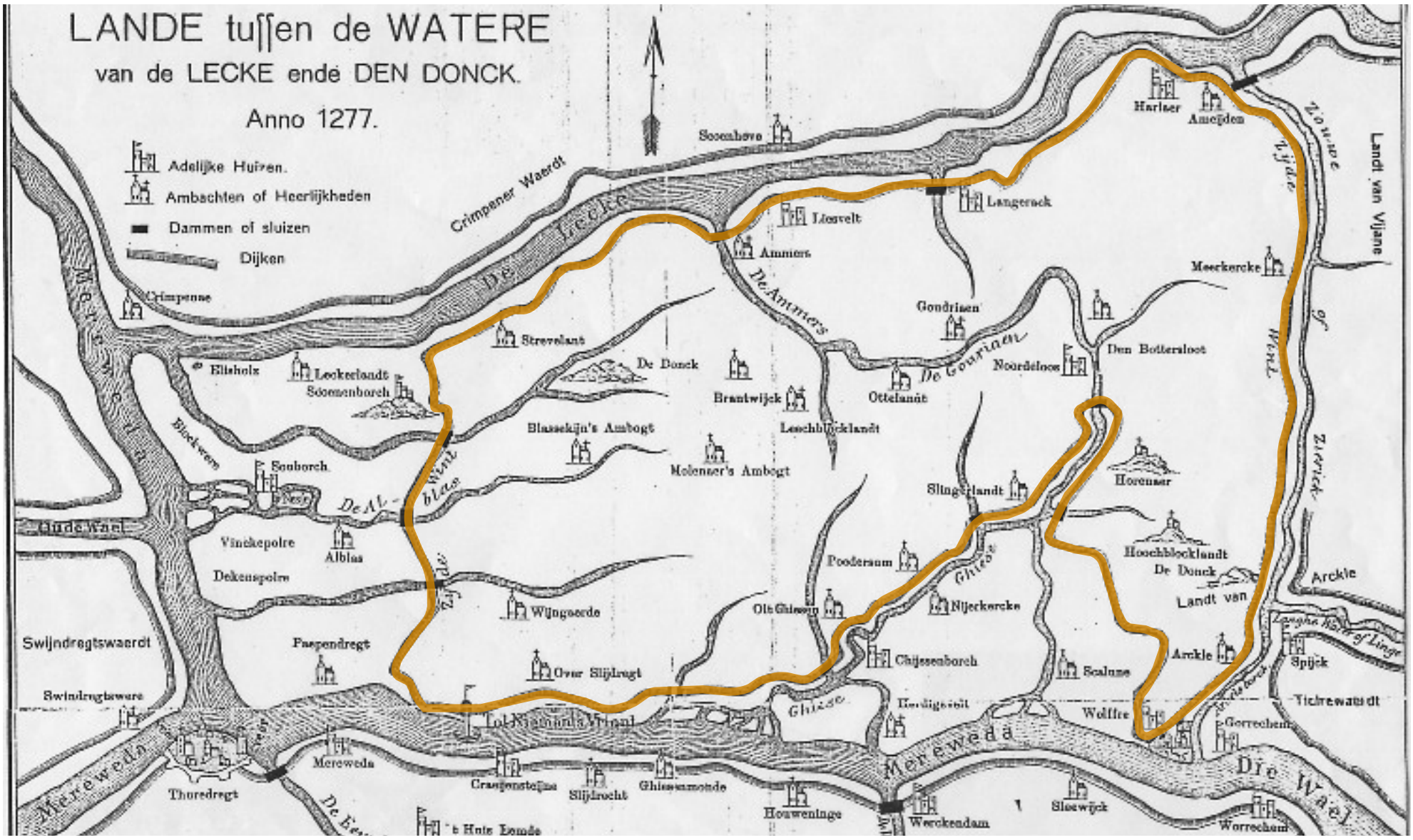


figure 5: **Dyke ring of Alblasserwaard** anno 1277 (Sliedrecht24, 2024. Edited by my own)

figure 6: **Dordrecht** surrounded by water after the St. Elisabethsflood (P. Sluyter, 1560. Edited by my own)

silt traps, dams and poldering. However, human impact remained limited until the 18th century, when interventions increased. The most significant change was the construction of the Nieuwe Merwede in 1885 (figure 7), altering the flow of the Rhine and Maas (Safatij, 2006). This led to increased summer riverbeds and the formation of sandbanks on the northern side of the Merwede (Maas, 2000).

Growth of the modern landscape

In the 19th and 20th centuries, the Waterdriehoek evolved into a human-controlled delta. The natural dynamics of the delta landscape served as the foundation for networks of dykes and drainage canals (Meyer & Nijhuis, 2014). The canalisation of the Merwede and the Noord required new urban layouts. Cities incorporated harbours, sluices and canals into their built environments (figure 8) (Den Boer, 2019).

Industrialisation accelerated sea-level rise and peak discharges, disrupting the balance of water inflow and outflow (Gramsbergen, 2021). Urban delta areas like the Waterdriehoek face a combination of tidal, coastal and fluvial flooding, compounded by local wind and wave effects (Van Veelen, 2016). The constant threat of water drove the development of maritime industries. The construction of the Nieuwe Waterweg transformed the region into an industrial hub for shipbuilding, dredging and metal industries (Arcadis, 2024). The banks of the Noord and Merwede became attractive for industrial development (figure 9) due to economic and logistical advantages, such as river access, low land costs and cold water availability (Den Boer, 2019). These areas were artificially elevated to 3.2 and 4 meters above NAP (Meyer & Nijhuis, 2014), providing a relatively high floodplain suitable for harbour facilities and maritime industries, contrasting sharply with the lower-lying urban and agricultural areas protected by the dykes.

Conclusion

The historical landscapes and maritime architecture of the Waterdriehoek have evolved together, shaped by the region's ongoing struggle with and reliance on water. From medieval dyke systems and windmills to moder industrial complexes, each era demonstrates adaptive strategies to address environmental challenges while driving economic and cultural growth. Moving forward, integrating this heritage into sustainable development will be key to preserving the region's legacy for future generations.

figure 7: The map of the Waterdriehoek with the **Nieuwe Merwede** (Topotijdreis, 1885. Edited by my own)

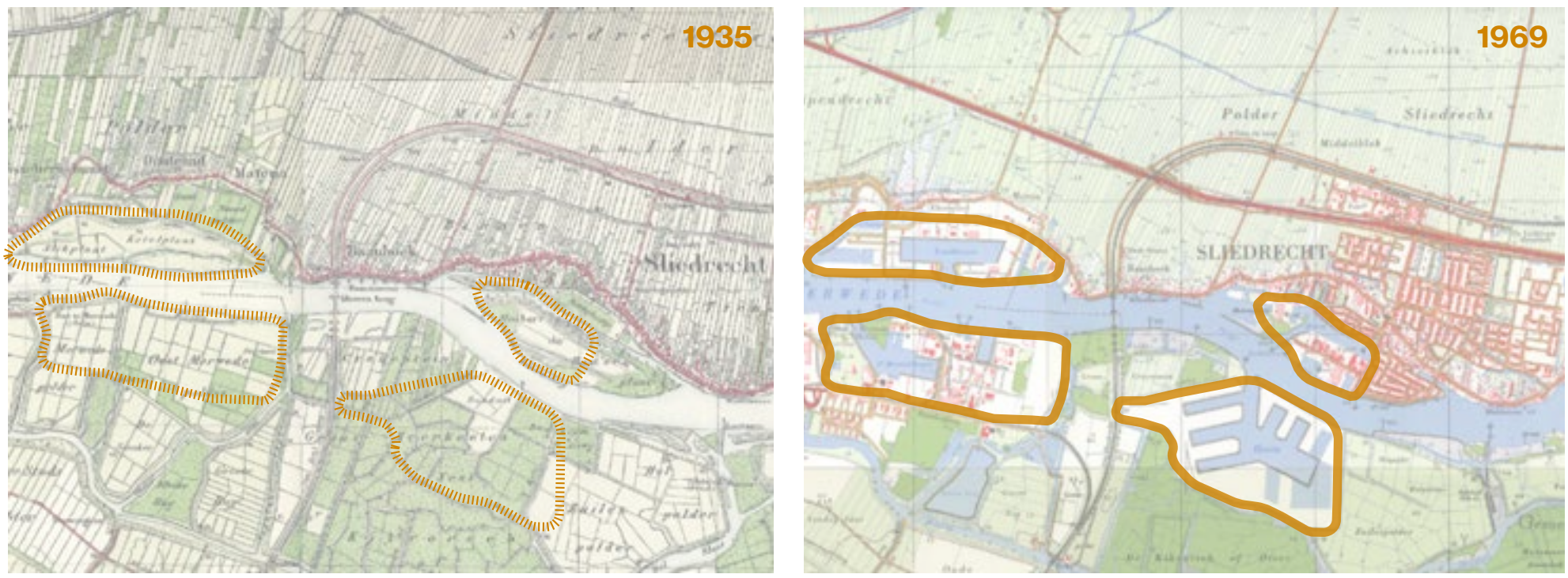


figure 8: Integration of **harbours** into the urban fabric of Sliedrecht in 1935 and 1969 (Left: Topotijdreis, 1935. Right: Topotijdreis, 1969. Edited by my own).

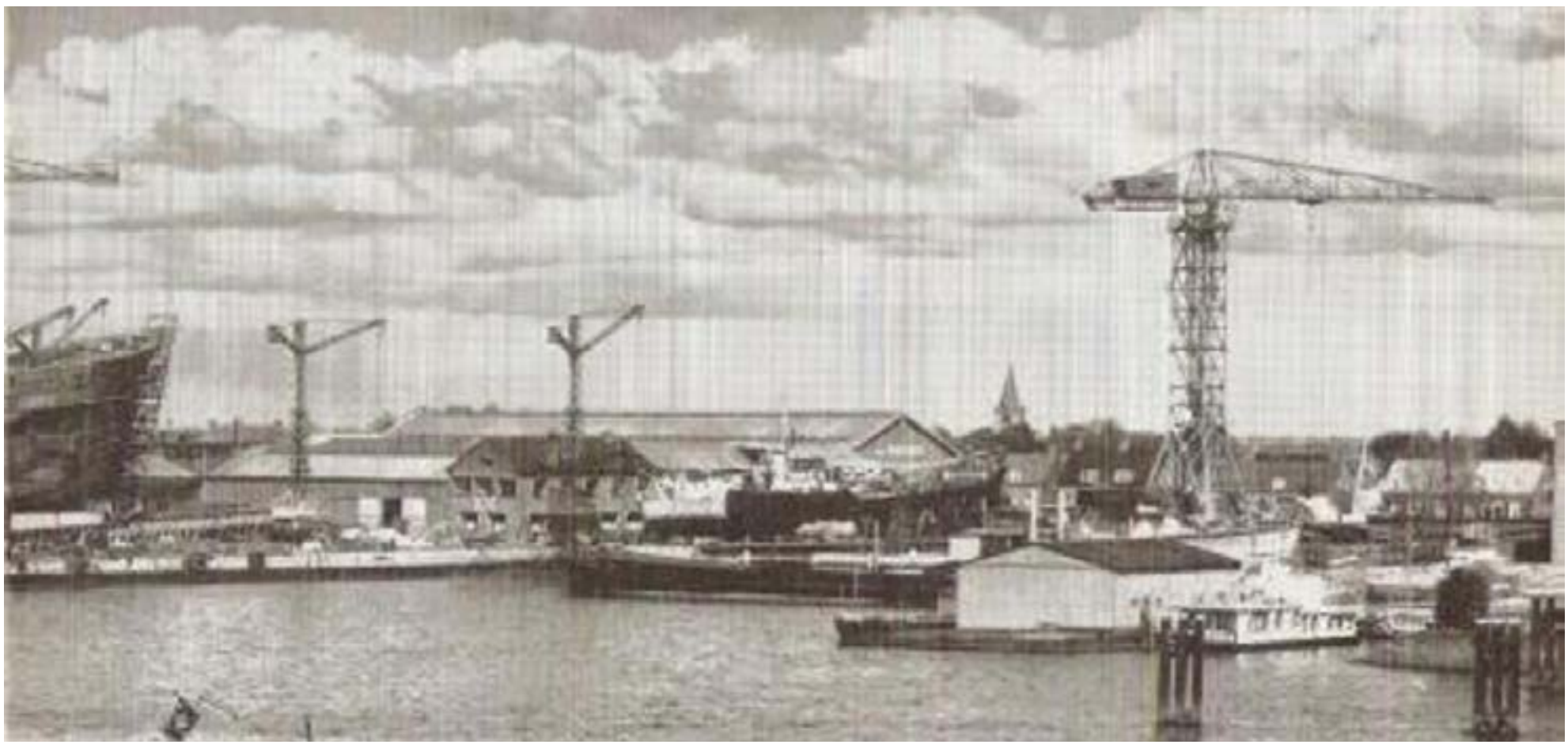


figure 9: The skyline of Alblasserdam halfway the 20th century (J. Kramer, n.d.)

Chapter 2
Historical strategies

The Waterdriehoek has a rich history of coping with the constant threat of flooding. Communities in the region developed innovative architectural and landscape strategies that not only protected them from high water but also shaped the cultural heritage of the area. These measures – ranging from dike construction to adaptive building designs – demonstrate deep knowledge of living with the threat of water.

Early measures

Since the earliest settlements in prehistoric times, the inhabitants of the Waterdriehoek focused on higher parts of the landscape, such as river dunes and levees. This was due to the rivers regularly overflowing their banks. The lower-lying basin grounds were used as meadows. As mentioned in the previous chapter, dikes continued to evolve during the 12th century, providing better protection to the hinterland. However, this necessitated the regular raising and strengthening of the dikes, which, in turn, led to more severe consequences when a dike breach occurred (Toebast, 2012). In addition to large-scale interventions, smaller-scale measures were also taken. Living on 'terpen', artificial mounds, was another strategy. In use since the 5th century BCE, these provided elevated locations for homes, farms and churches (figure 10). This allowed space for water to spread without causing too much damage.

A similar approach was taken in the city of Dordrecht. Historical structures such as the Grote Kerk were strategically built on elevated and reinforced foundations to withstand the wet and unstable soil of the area (Hoogwater en Wateroverlast, n.d.). As early as the 12th century, people lived in this area around a smaller church. Another measure implemented after the St. Elisabeth's Flood was transforming the Voorstraat into a water-retaining dyke (figure 11). This dyke served a dual purpose as both a flood barrier and a central urban axis. Door thresholds, ground floors, and entrances were built higher than street level, which became a hallmark of Dordrecht's adaptive architecture. An example of this can be seen at the Korte Engelenburgkade, located close to the Oude Maas (figure 12). Lower-lying houses used sandbags and barriers for

figure 10: Churches on mounds in the Waterdriehoek, detail of the right outer panel of the Elisabeth Alterpiece with the flooding of the Grote Waard (Master of the Holy Elisabethspanels, ca. 1490)

protection. Additionally, features such as floodboards and water-resistant barriers were integrated into house facades (Hoogwater en Wateroverlast, n.d.). Several times a year, the water would rise into the quays, and the area outside the dikes would be flooded even more frequently. Dordrecht's residents learned to live with the threat of water. Despite centuries of provisions against high water, very few architectural measures from before the 17th century remain due to the less durable building materials used at the time. Most surviving flood-related applications in the Waterdriehoek date from the 18th and 19th centuries (Toebast, 2012).

Rural innovations

In the Alblasserwaard polder of the Waterdriehoek, agricultural communities began developing methods in the early 18th century to protect themselves, their livestock and their crops from flooding. Flood barns safeguarded livestock and hay by being built on mounds, having elevated stables or combining both. These barns were permanently elevated above water levels and featured high-positioned manure hatches and stable and stable windows (Toebast, 2012).

Unlike in central parts of the Netherlands, in the Waterdriehoek only the foundations were made of stone, while the walls were constructed from wood due to the weak peat soil (figure 13). This weak soil also complicated the expansion of mounds, especially as livestock numbers grew. A new solution was developed: livestock and hay were placed in the attic of the farmhouse itself. During floods, people and animals moved to these 'water attics'. In residential houses, water attics or water rooms were also common. Often, there was a high external door allowing access to a boat during high water (figure 14) (Toebast, 2012). By the late 19th century, attic spaces in houses and farms were improved with cupboards, beds and stoves, enabling prolonged stays.

In addition to safeguarding people and livestock, buildings themselves were protected as much as possible. One method was wrapping buildings in reeds or planks or placing barriers between trees. The standard use of wood, due to the

peat soil, had another advantage: some planks could be removed to allow water to flow inside, reducing pressure on the façade (Toebast, 2012). Eventually, brick facades replaced wooden ones due to their durability and better resistance to water.

Landscape adaptation

In the 16th century, engineer Andries Vierlingh published a philosophy on land reclamation and dike construction. Vierlingh emphasised that giving rivers space was more important than fighting water – what he referred to as working 'not with brute force but with a gentle hand' (Meyer & Nijhuis, 2014). He warned against reckless land reclamation and overconfidence in controlling nature. This philosophy inspired the modern 'Room for the River' program and illustrates how historical practices can inform contemporary water management.

An example of flood management inspired by the past is the case of the Noordwaard polder in the Biesbosch. Due to land reinforcements in the 20th century, many historical elements had disappeared. The new design (figure 15) restored old waterways to their original locations, reviving patterns. The reintroduction of the ancient ditch system not only reduced flood risk but also enhanced the ecological and cultural qualities of the landscape. Additionally, the centuries-old terp dwelling strategy was reintroduced. The design also incorporated innovative dykes, such as wave-resistant structures and planted weeping willow forests to break waves (Hein, 2020). This holistic approach balances safety, nature conservation and cultural heritage while reviving historical water management techniques.

Conclusion

The water management heritage of the Waterdriehoek offers valuable lessons for today's challenges posed by climate change and rising water levels. By acknowledging flood risks, we create opportunities to consider ways to reduce the potential consequences of flooding. Floods themselves also leave a cultural legacy in the form of landscape and architectural adaptations. Traditional practices such as terp dwellings, building protection, dyke raising and creating space for water highlight the importance of historical knowledge. The long history and innovative character of water management in the Waterdriehoek can inspire adaptive designs for the future that are both resilient and culturally valuable.

figure 11: The **Voorstraat** protecting the hinterland of Dordrecht (J. van Deventer, 1550. Edited by my own)

figure 12: Houses at the Korte Engelenburgkade are built to flood only at the basements (Reizen langs rivieren, n.d.)

figure 13: Example of a barn with a **stone foundation** and wooden walls (Rijksdienst voor het Cultureel Erfgoed, 1976. Edited by my own)

figure 14: Barn in Alblasserdam with a highered **flooddoor** (VVV Alblasserwaard, n.d. Edited by my own)

figure 15: 'Ontpoldering' of the Noordwaard project (West8, 2015)

Chapter 3
Learning from the past

As concluded in the previous chapter, much can be learned from historical measures against the threat of flooding. Adapting maritime heritage to flooding challenges, as well as addressing the newly built environment, requires strategies that combine these historical lessons with modern protective measures. This approach can yield strategies that promise flood resilience while safeguarding the historical and ecological value of the Waterdriehoek landscape.

Flood-resilient strategies and measures

Flood-resilient architecture in maritime heritage areas must strike a balance between structural integrity, cultural value and environmental sustainability. In terms of flood safety, integrating multi-layer safety principles (*meerlaagsveiligheid*) is crucial (Pötz & STOWA, 2014):

- **Prevention**: Strengthening primary defences, such as dykes, to mitigate the most probable threats.

- **Spatial adaptation**: Designing buildings and landscapes to reduce vulnerability, such as elevated structures or neighbourhoods with storage capabilities.

- **Disaster management**: Establishing clear evacuation routes and resilient infrastructure to provide escape options during floods.

Two main strategies emphasise this balance and multi-layered approach: robust planning under uncertainty on a larger scale and adaptive measures at building and neighbourhood levels (van Veelen, 2016).

Robust planning under uncertainty

Due to the uncertainties of climate change and water dynamics, robust planning is essential for developing long-term flood protection. This involves keeping options open and avoiding irreversible decisions. Conditional planning strategies, implemented step-by-step, are highly effective for adapting to changing flood risks (Van Veelen, 2016). At smaller scales, the most effective approach shifts from rigid, norm-based policies to performance-

figure 16: This building resists the highwater in Dordrecht (R. Boon, 2012)

oriented strategies that respond to local needs and vulnerabilities. This requires customised solutions based on thorough risk assessments and community-focused approaches, differing by area. Such approaches not only strengthen flood resilience but also create opportunities for added value and better integration into urban environments (Van Veelen, 2016). This is particularly important in areas like the Waterdriehoek, where the threat of water is significant, but the historical and ecological values are perhaps even greater.

Flood resilient measures: streetscape level

1. Flood-resilient building techniques: Buildings in the Waterdriehoek require adaptations that protect against water while preserving historical integrity. Measures include:

- Elevated construction: Raising buildings on mounds, platforms, or stilts, as historically seen in this delta region. Ground floors can also be designed for storage or parking.

- Raised floor levels or thresholds: Reintroducing elevated thresholds offers protection against moderate water levels up to several centimeters.

- Water-resistant materials (dry-proofing): Using durable materials such as concrete, brick, steel, glass, and water-resistant insulation to limit structural damage and accelerate recovery (figure 16). Structural elements must withstand water pressure (Pötz & STOWA, 2014).

- Sealable openings: Incorporating floodboards, barriers, and closable shafts. This is particularly applicable in areas prone to moderate flooding (0.1–1 meter of water) with a relatively high probability (up to 1/50–1/100 annually) (Van Veelen, 2016). However, fully sealing buildings is rarely cost-effective and often unsuitable in urban heritage locations (Pötz & STOWA, 2014).

2. Neighbourhood-level resilience : At the community scale, measures include both small- and large-scale interventions:

- Integrated water storage: Parks, sports fields, and other open spaces can serve as flood retention basins, as demonstrated in the "Room for the River" program (Meyer & Nijhuis, 2014).

- Street-level measures: Elevated sidewalks can

prevent water intrusion into homes during limited flooding. Hollow streets can increase water retention and drainage capacity, directing water elsewhere (Pötz & STOWA, 2014). This strategy has already been implemented in th Waterdriehoek in the past (figure 17).

3. Floating buildings: For areas with frequent flooding, floating buildings are an option. These structures are anchored but can rise and fall with the water level, requiring attention to stability and flexible utility connections. An example is the floating homes in Maasbommel (figure 18). However, high costs due to specialised infrastructure make this solution less practical (Pötz & STOWA, 2014).

4. Dynamic and temporary water barriers: Temporary defences, such as panels and inflatable tubes, can protect entire neighbourhoods while preserving the urban structure, a long-established method. (figure 19). However, they are costly and add no aesthetic value to the city. These solutions offer robust short-term protection (Pötz & STOWA, 2014).

Learning from the past

An example of combining historical and modern strategies is the initiative "The River as a Tidal Park" in the Rotterdam port area. Chapter 2 already highlighted the importance of working with, rather than against, water. This principle is applied today in the "Room for the River" program. This project in Rotterdam demonstrates how dynamic landscapes can be reintroduced to provide ecological benefits, flood mitigation, and recreational opportunities (Hein, 2020). Transforming steep, hard embankments into green wetlands not only strengthens water defences but also restores historical character. Reintroducing dynamic delta elements, such as wetlands and floodplains, should be an essential part of cultural and historical policy, even in urban areas.

Conclusion

Applying these strategies to maritime heritage requires careful consideration of both physical and cultural constraints. While measures like raised platforms and flood barriers offer technical solutions, they must be designed to harmonise with the historical character of the environment. Similarly, restoring natural elements, such as wetlands and tidal zones, enhances resilience while reinforcing the ecological and cultural identity of maritime landscapes. Designing flood-resilient architecture and landscapes in maritime heritage contexts requires a nuanced approach that blends historical preservation with modern resilience strategies. By leveraging adaptive measures, learning from historical practices, and employing robust planning frameworks, it is possible to safeguard these valuable areas against the increasing threats of climate change. Ultimately, successful implementation depends on interdisciplinary collaboration and a commitment to preserving both the cultural and ecological integrity of maritime heritage sites .

figure 17: **Water drainage** on the streetsurface, already implemented in the so called 'stoepen' in Sliedrecht (left).
(Left: Historische Vereniging Sliedrecht, 1962. Edited by my own. Right: Pötz & STOWA, 2014)

figure 18: Floating houses in Maasbommel (Climatescan, n.d.)

figure 19: Flood-resilient panels being tested in Dordrecht in 1955 and 2021. (Left: Regionaal Archief Dordrecht, 1955. Right: D. Koorevaar, 2021)

Conclusion
Final findings

This paper sought to answer the main question —*How can insights from the historical landscape and architectural strategies in the Waterdriehoek inform the design of flood-resilient buildings in the maritime heritage context of this delta?*— through three sub-questions. In addressing these questions, it became evident that designing flood-resilient buildings in the Waterdriehoek, within the context of maritime heritage, requires an integrated approach that acknowledges both historical and contemporary challenges. The delta's transformations and adaptive strategies developed over time provide valuable knowledge, inspiring designs that are both resilient and respectful of cultural and ecological integrity.

The Waterdriehoek's evolving landscape reflects continuous human-water interaction. Communities have historically adapted to water threats, turning challenges into opportunities. Large-scale floods emphasised proactive water management, leading to landscape changes like the formation of the Biesbosch, and innovations such as land reclamation and water-retaining urban structures like Dordrecht's Voorstraat. These adaptations highlight architecture and infrastructure's crucial role in risk reduction.

From elevated structures to adaptive urban architecture, historical solutions offer valuable lessons for modern design. Combining past strategies, such as making space for rivers and restoring wetlands, with innovations like floating structures and temporary water barriers, helps balance safety, sustainability, and heritage conservation. The principle of multi-layer safety provides a structured approach to enhancing resilience at different levels.

Robust planning under uncertainty is also essential. Keeping options open and avoiding rigid decisions allows communities to adapt flexibly. Local solutions tailored to the specific areas enhance resilience while contributing to the spatial and cultural value of the region.

In summary, by integrating historical knowledge with contemporary design principles, the Waterdriehoek can serve as an example of flood-resilient design within the context of maritime

heritage and historical settings. Succes depends on interdisciplinary collaboration and a shared commitment to preserving its cultural and ecological integrity. Only through this integrated vision, the Waterdriehoek can continue its legacy as a source of inspiration for sustainable development.

Design specific conclusion

Not all regions within the Waterdriehoek can adopt the same strategy, nor can the Watertorenterrein in Sliedrecht. Due to its small scale and isolated position, the focus here should primarily be on small-scale landscape interventions and architectural adjustments. One advantage of the site is its minimal existing development, allowing for landscape-oriented measures. Fully elevating the floodplain is not an option due to the existing structures and the character of the floodplain, which must be preserved as much as possible. Its original function can be partially restored by allowing space for the river during high water. This can be achieved by reintroducing the Gantel, an old waterway around the floodplain, simultaneously bringing a piece of history back.

The site could also incorporate green strips with water retention features and as many soft, green embankments as possible. For residential construction, it is important to consider how these homes can be made water resilient. Allowing space for the river—in the past frequently used—could provide a solution. By avoiding essential functions on the ground floor, water can flow through the space if necessary. Thresholds or water-resistant doors can prevent flooding during minor water level rises. Historical techniques, such as a stone base for the house with a lightweight structure on top, could be reintroduced. Slightly elevating main roads ensures that evacuation routes remain available when needed. Roads can also include small interventions, such as channels to divert water to green strips with retention features.

By limiting hard surfaces in the floodplain, the site can reclaim some of its original function. New technologies, such as floating homes, could also be partially applied, provided they do not obstruct the flow of the Merwede. The key for this area, as with others, lies in coordinated interventions across the site. Flexibility for future measures must also be prioritised. Only through close collaboration and a shared vision can the Watertorenterrein be adapted while respecting its historical and ecological context.

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Images and figures - in order of appearance

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De Sint Elisabethsvloed, 18-19 november 1421 met de stad Dordrecht op de achtergrond. (1490). [Oil painting]. Rijksmuseum Amsterdam, Nederland

Figure 2

Regionaal Archief Dordrecht. (1965). *Scheepswerf De Merwede aan de Rivierdijk in Boven-Hardinxveld. Beeldbank* Regionaal Archief Dordrecht. https://beeldbank.regionaalarchiefdordrecht.nl/search/detail/id/BD9BDF17AC8711E489FB00163E535DC5/showbrowse

Figure 3

Topotijdreis: 200 jaar topografische kaarten. (1850). Topotijdreis. Geraadpleegd op 10 januari 2025, van https://www.topotijdreis.nl/kaart/1850/@113639,425876,9.75

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Figure 5

Dyke Ring Alblasserwaard anno 1277. (2024). Sliedrecht24. https://sliedrecht24.nl/lezing-bij-hvs-over-rivieren-in-historisch-perspectief-en-overstromingsrisico/

Figure 6

Sluyter, P. (1560). *Kaart van den verdronken Zuid-Hollandse Waard* [Map]. Regionaal Archief Dordrecht, Nederland.

Figure 7

Topotijdreis: 200 jaar topografische kaarten. (1885). Topotijdreis. Geraadpleegd op 12 januari 2025, van https://www.topotijdreis.nl/kaart/1885/@113183,423133,7.55

Figure 8

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Figure 10
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Figure 11
Van Deventer, J. (1550). *Platte grond van Dordrecht* [Map]. Nederlands Nationaal Archief.

Figure 12
De panden aan de Korte Engelenburgerkade zijn zo gebouwd dat bij hoogwater alleen de kelders onderlopen. (n.d.). Reizen Langs Rivieren. https://reizenlangsrivieren.nl/rivierverhalen/elisabethsvloed-1421-breekt-dordrecht/

Figure 13
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Figure 14
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Figure 15
Providing room for the River. (2015). West8. https://www.west8.com/projects/bridges-and-pumping-stations-of-noordwaard/

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Figure 17
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Figure 18
View of the floating houses in Maasbommel. (1BC). ClimateScan. https://www.climatescan.nl/projects/118/detail

Figure 19
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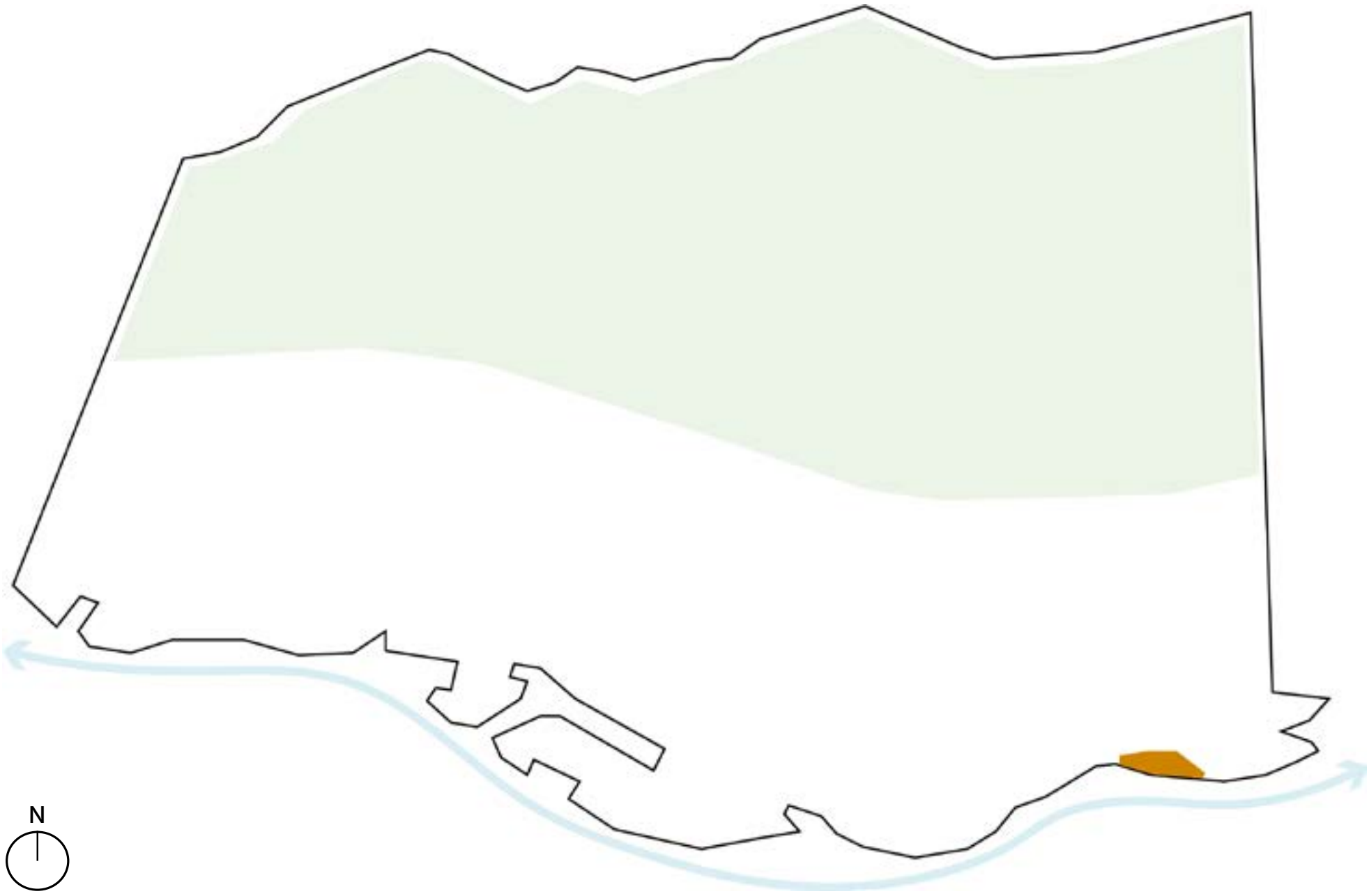
Appendix
A

	High value			Regular value			Low value							
	age value		historical value		art value		commemora-tive value	use value		newness value		rarity value		nostalgic value
surrounding							Watertower is an industrial land-mark for Slie-drecht	Location close to Sliedrecht city centre and uni-que location next to the river				Big empty outer-dike area		Locals see wa-tertower from distance which remembers them of the past
story			Watertower and shipyard marks innovation in water related management				Watertower ter-rain tells the story of the maritime background of Sliedrecht	Showing the typical history of Sliedrecht						Shipyard remem-bers locals of flourishing times of Sliedrecht
site	Gantel water on the site Trees		Strong historical relation with the river that slowly disappears				Terrain is an iconic place for Sliedrecht	A lot of green and close access to the water				Lot of open space		Gantel was used as a recreative and functional water for the inhabitants
structure	The structure of Delta is rusted and damaged in some areas							Structure of watertower tells about the former use of the tower						
space plan								Large open space plan in Delta Shipyard available for re-use						
skin	The facades and roofs of both of the buildings are in big decay or demolished. Lot of rust and vege-tation				Characteristic blue color on fa-cades and iconic doors Characteristic brick pattern in Watertower faca-des		Decayed walls reminds of the shift in maritime industry and wa-ter management	Big doors are iconic and can be re-used				Very old water-tower that is still standing		
service	Old crane rails are still the-re, rusted and overgrown with vegetation							Slope with rails tells about the maritime use of the Delta building						
stuff														
social							Working atmosp-here on Delta Shipyard wharf and close relation with water							

Heritage Value Matrix of the Watertower terrain. Own image, 2024

Chapter 2

Design research



Simplified map of Sliedrecht, own image

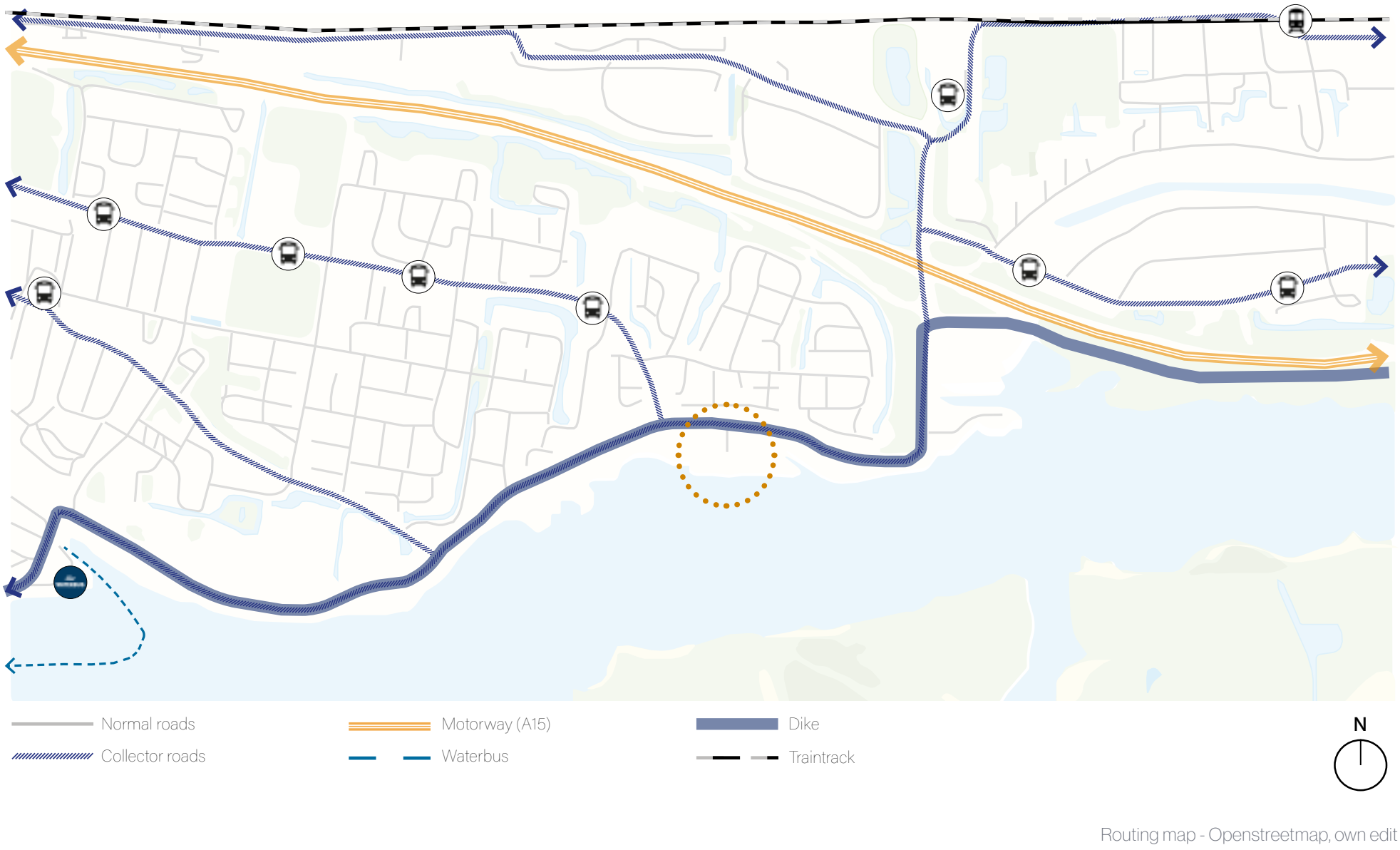
Introduction
Design site

The site of the project is located in Sliedrecht, a small city in the province of South-Holland and part of the conducted area the Waterdriehoek. The design site is located on the eastern edge of the city, on the grounds of a former shipyard and water tower. This strip of land is sandwiched between the Beneden-Merwede river and the Rivierdijk, the very place where Sliedrecht originated. As such, the study area lies outside the dike and was formerly part of the river's floodplain. This ties it to the research presented earlier.

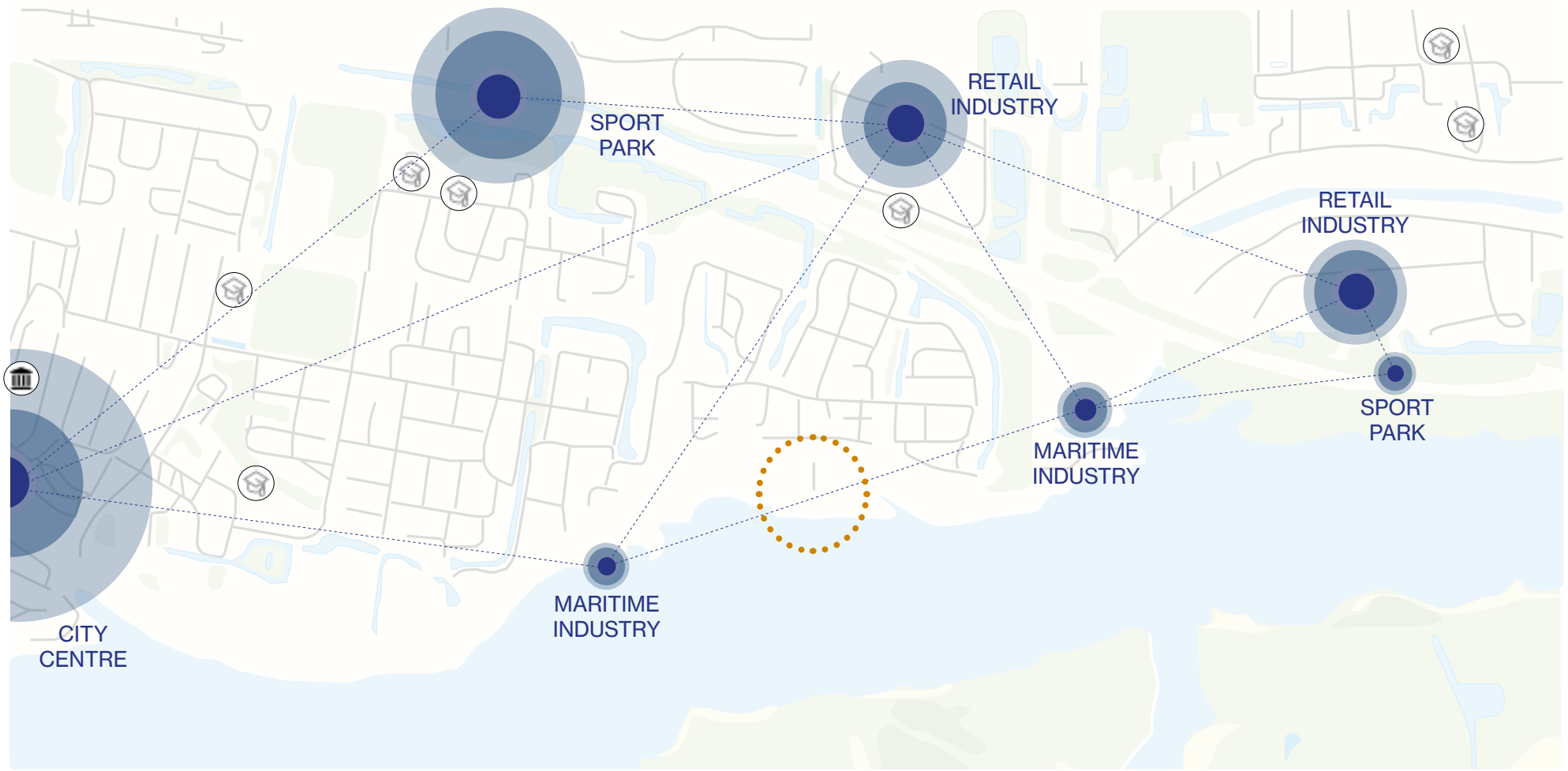
This section of my design booklet focuses on the research conducted for my proposal for the Watertoren site. Various analyses were carried out to better understand the context and ultimately support the final design with a solid foundation. All relevant aspects needed for a thorough analysis of the area are addressed here.

The site is located in the eastern part of Sliedrecht, in a uniquely positioned area. Its location along the Rivierdijk makes it easily accessible by car, with several major roads nearby and the A15 motorway just a few minutes away. A railway line runs along Sliedrecht and Hardinxveld, placing the site within easy reach of public transport. Several bus stops are located near the area, offering connections to Sliedrecht, Hardinxveld, and beyond. From Sliedrecht's town center, passengers can also take the waterbus, which travels to Dordrecht and even as far as Rotterdam.

In addition, the site is surrounded by various activity hubs. The center of Sliedrecht is close by, offering a wide range of amenities including supermarkets, shops, recreational facilities, and restaurants. Schools and museums are also within reach. Surrounding the water tower site are several industrial zones, sports parks, and large retail outlets. And just across the river lies the Sliedrechtse Biesbosch nature area. All of this places the site in close proximity to a diverse mix of services and facilities.



Routing map - Openstreetmap, own edit



Activity hubs - Openstreetmap, own edit

History
Of the Waterdriehoek

As previously mentioned, the Waterdriehoek is a region that forms part of the Maritime Industry Heritage Line. Within this area, Kinderdijk, the Drecht Cities, and Gorinchem are interconnected, both through their waterways and their shared history with water. The region's long-standing relationship with water management laid the foundation for its development. The cities within the Waterdriehoek grew and evolved through their involvement in the maritime industry. Shipbuilding, peat extraction, and dredging expertise largely originated in this area.

The development of these industries was closely tied to the transformation of the surrounding landscape. The Waterdriehoek is unique due to the convergence of several rivers and the formation of the Biesbosch wetlands in 1421, a dynamic area of fresh and saltwater, with significant tidal differences. Since the early Middle Ages, the inhabitants of these cities have learned to live with the constant threat of water. Over centuries, this has shaped their cities, architecture, and urban planning to be highly adaptive.

The proximity to water also created opportunities for new industries. With the construction of the Nieuwe Waterweg in 1872, these opportunities expanded further. The region took the lead in the construction of industrial ships and became a hub for the dredging industry, which had already been practiced here for many years. This expertise spread across the globe, driving the growth and prosperity of local businesses.

However, with the development of the Maasvlakte expansions and the growing dominance of the Port of Rotterdam, many of these companies gradually relocated away from the Water Triangle. As a result, former industrial sites became vacant and neglected. Infrastructure that was once vital is now abandoned and deteriorating. This presents an opportunity for the future, to reclaim and revitalize this heritage, which must not be allowed to fade into obscurity.

General history timeline

1105

First mention in writing of Papendrecht.

1220

Dordrecht gets given city rights to mark the wedding of Willem I van Holland and Maria van Leuven.

1568-1648

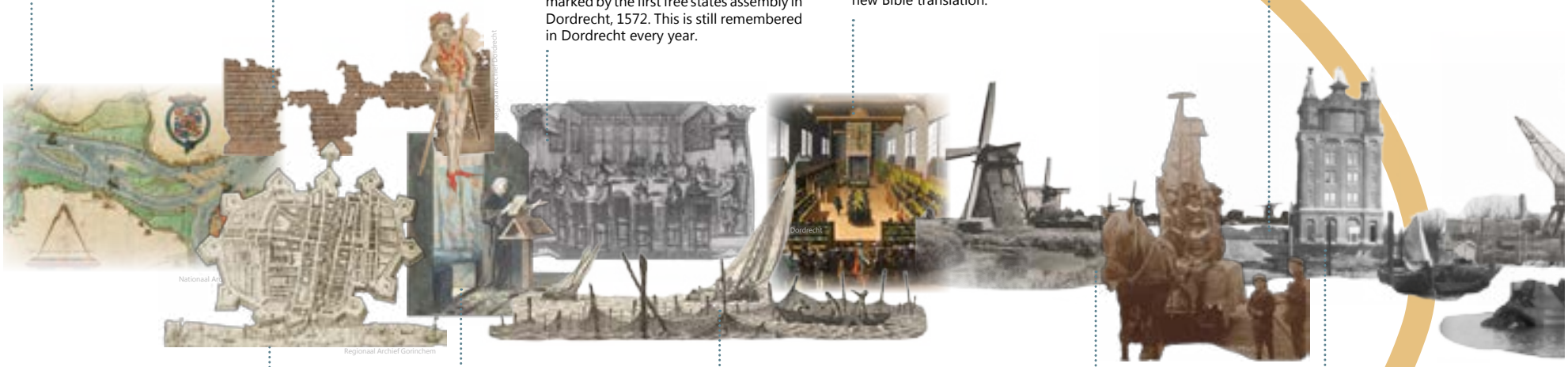
The start of the revolt against Spanish Reign during the Eighty Years War was marked by the first free states assembly in Dordrecht, 1572. This is still remembered in Dordrecht every year.

1618-1619

The synode was held in Dordrecht by the Reformed Church to discuss important affairs under which excluding Remonstrants and the production of a new Bible translation.

1795-1813

Period of French reign over the Netherlands. It was initiated by Dutch patriots supported by the French. The liberation of the French was celebrated during the centenary in 1913



1224

First mention in writing of Gorinchem.

1299

First mention in writing of Alblasserdam by Melis Stoke in his 'Rijmkroniek', one of the first books written in Dutch.

16th and 17th century

From the 16th century cities started catching the large quantities of salmon that were in the Merwede and Biesbosch. This was an important source of income for especially Sliedrecht. Due to pollution, waterworks and overfishing, salmon has disappeared in the area from begin 20th century.

1738-1740

Construction of 17 windmills by two local water boards to regulate water in the Alblasserwaard.

1882

Construction of watertower to allow for waterworks providing fresh water. This was seen necessary after in 1866 cholera took at least 400 lives in Dordrecht. Nowadays the watertower is valued a monument.

Late 19th and 20th century

During the Industrial Revolution the shipbuilding industry developed rapidly. Transition from wood to iron and sails to steam and later diesel engines were seen as opportunities by entrepreneurs in the area. Due to their efforts the local shipbuilding industry became known worldwide.

1953

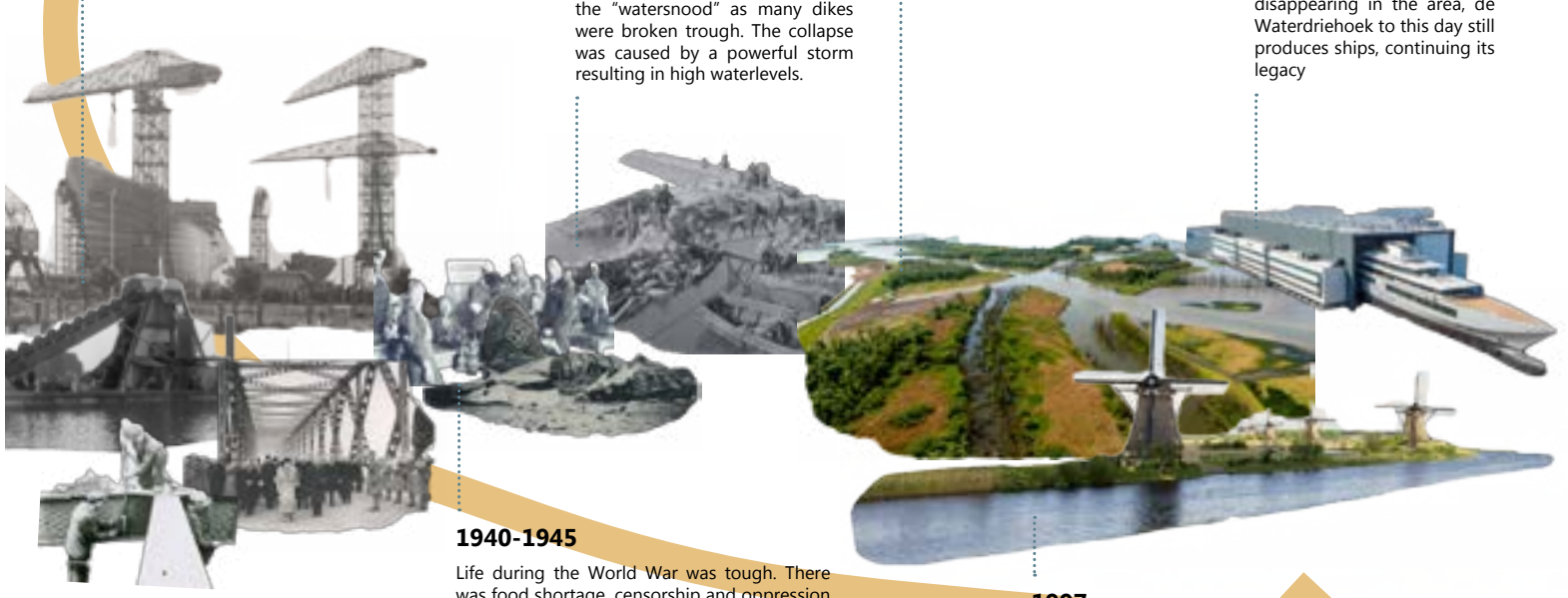
Large area's are flooded during the "watersnood" as many dikes were broken trough. The collapse was caused by a powerful storm resulting in high waterlevels.

1994

De Biesbosch is listed as a National Park. It is therefore a protected nature reserve. It is one of the most important nature sites for biodiversity in The Netherlands.

Today

Although shipyards are disappearing in the area, de Waterdriehoek to this day still produces ships, continuing its legacy



1940-1945

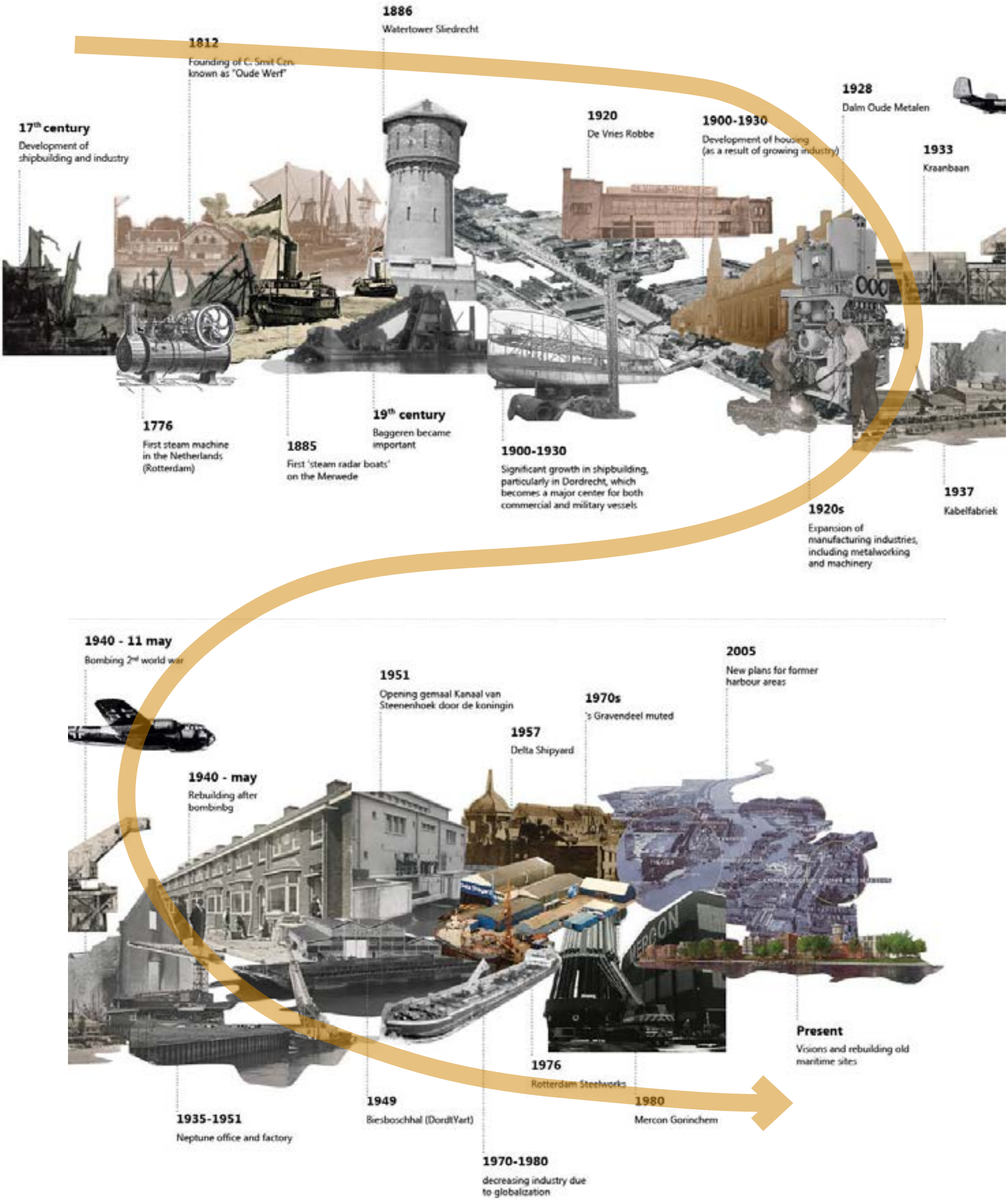
Life during the World War was tough. There was food shortage, censorship and oppression of the Jewish community. Due to the many bridges the Waterdriehoek was a strategic area. Several bombings were executed and Dordrecht is hit heavily.

1997

Kinderdijk is listed as UNESCO World Heritage Site.

Historical timeline of the Waterdriehoek, work by Nino van Dijk

Industrial history timeline



Historical industrial timeline, work by Anne Kikkert

Landscape history timeline

13th century
Swampy area and draining of land for peat.

1277
First ‘afdamming’ river the Alblas.

1280
Second ‘afdamming’ river the Alblas.

1421
Sint Elizabethsflood. Origin of the Biesbosch.

1350-1821
Alblasserdam flooded 32 times.

17th century
Start of ‘inpoldering’ of the Waterdriehoek.

1599
Dam by Alblas moved and replaced by a ‘schutsluis’.

17th century
Peak in peat extraction because of increasing energy demand in Dordrecht and Rotterdam.

17th century
Deepening of channels because of increasing trade activities.

19th century
Significant dike reinforcements.

1840
Construction of railway between Dordrecht and Sliedrecht.

1866-1872
Construction of Nieuwe Waterweg, connecting Rotterdam and the Waterdriehoek with the North Sea.

1883
Railway to Gorinchem added.

1885
Hardinxveld-Giessendam connected to the railway.

1939
Bridge over de Noord from Hendrik-Ido-Ambacht to Alblasserdam.

1939-1941
Opening national highway A15 Ridderkerk - Schelluinen

1967
Construction of Merwedebrug Papendrech.

1991
Construction of the Noordtunnel of the A15. The tunnel has largely replaced the Brug over de Noord.

1997
‘Schutsluis’ at the Alblas changed to a dam again.

Landscape history timeline of the Waterdriehoek, own work

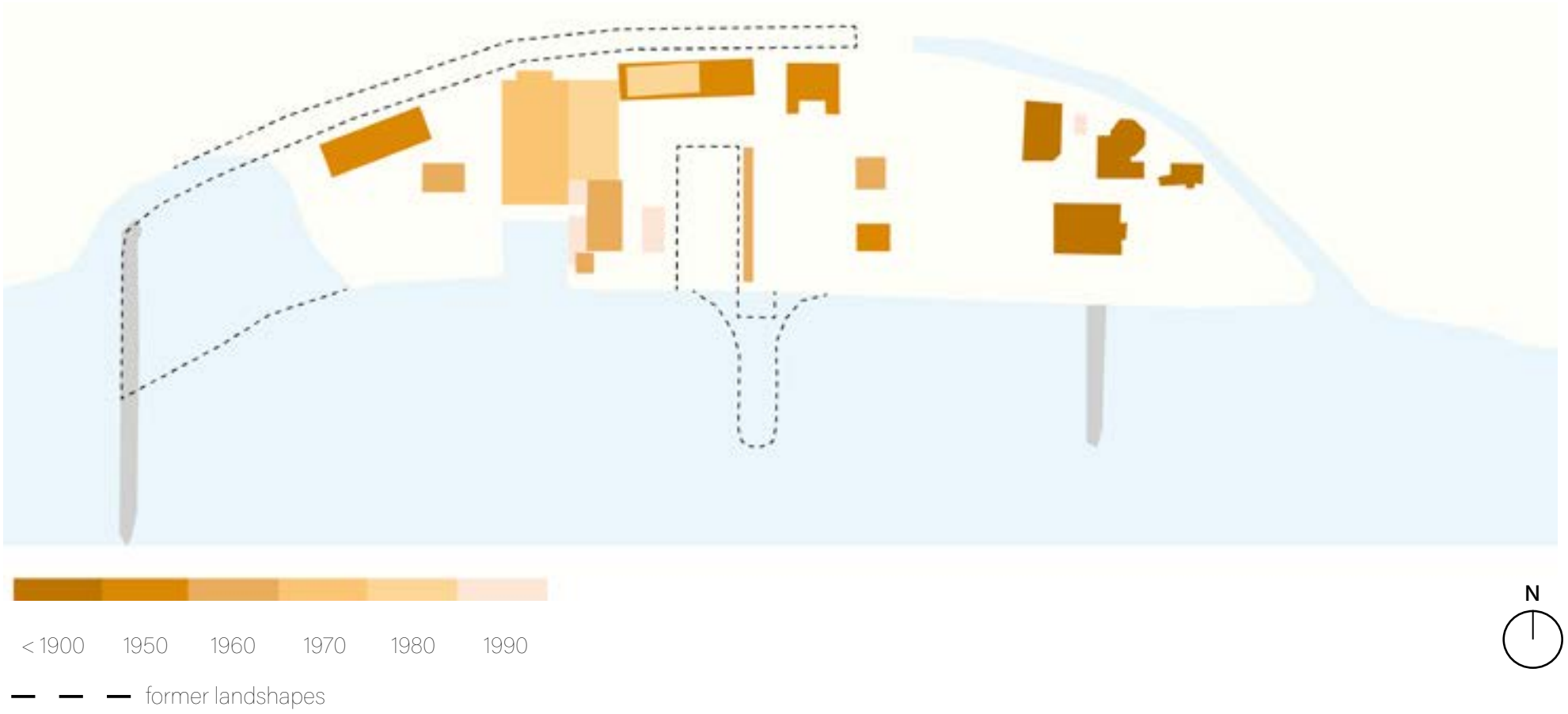
History
Of the Water Tower terrain

Until 1421, Sliedrecht consisted of two parts: Slydregt, on the southern bank of the Merwede, where the Biesbosch wetlands would later emerge, and Over-Slydregt on the northern bank. When the St. Elizabeth's Flood devastated Slydregt in that year, Over-Slydregt continued under the name Sliedrecht.

In the 15th and 16th centuries, Sliedrecht was a typical rural village. Its inhabitants lived off fishing, livestock farming, and some agriculture. Its reputation as a "dredging village" only emerged with the advent of the steam engine. The roots of dredging in Sliedrecht are historically grounded. For centuries, the local population had battled the forces of water. As early as the 13th century, a regional water board was established, ditches were dug every 100 ells to drain the land, and dikes were constructed. Farmers realized that dike construction was more profitable than livestock farming, and many transitioned from herding to working on the dikes. Archival records show that laborers from Sliedrecht were already involved in digging harbours in Dordrecht in the 15th century. Around 1600, the dredging company Prins was founded, where the work was still done by hand. It wasn't until around 1860 that the renowned Sliedrecht native Adriaan Volker introduced the first steam-powered dredging vessel.

One of the areas in Sliedrecht that later developed into a center for maritime industry is the design location for this project. Situated on the eastern edge of the town, the Water Tower site, known locally as 't Zaagje, is located between the Rivierdijk and the Beneden-Merwede river, in an area outside the dike. Originally, it was a typical floodplain: a swampy area prone to flooding, surrounded by a narrow watercourse known as the Gantel. Thanks to its unique location and the maritime activity in the region, this site proved ideal for maritime industry. During the years, the terrain slowly developed from a typical floodplain to and industrial site. Land was added or dug out, a harbour formed, the land was heightened and the Gantel was removed. Buildings were added and demolished during the years as well.

Map of Slydregt and Over-Slydregt - Sliedrecht 24, own edit



Development of the Watertowerterrain during the years - own image

1850

1880

1935

1970

1990

2023

Development of the Watertowerterrain during the years - Topotijdreis.nl

In 1886, the first building was constructed on the former floodplain: a water tower. Designed by architect Jan Schotel, it marked a major advancement in water management for the area. Over the years, the tower itself has remained largely unchanged, aside from the addition and removal of water basins and a few small auxiliary buildings. Although the water tower was restored at one point, it now stands vacant and unused. As a result, the structure is deteriorating and falling into disrepair. A shame, as it is not only an iconic landmark for Sliedrecht, but also one of its oldest buildings. The beautiful brickwork on the façade is slowly being lost.

Historie Sliedrecht - Werkzaamheden bij de watertoren - around 1890


Historie Sliedrecht - 006-136 - Wijk A - Watertoren 1918


Source Unknown - Overview of the Watertower and serivce buildings

In the 1950s, the water tower was joined by the arrival of Van Bennekom's shipyard. It began as a modest wooden shed but quickly grew into a fully developed industrial site. Additional shipbuilding halls were constructed, and the surrounding landscape evolved along with it. The once green and marshy terrain was transformed into an elevated, paved site; even a harbor was excavated. Van Bennekom's shipyard eventually became Delta Shipyard, where large vessels were built for the navy and the offshore sector. These transformations on the site reflect the broader evolution of the maritime industry in this area.

Today, these buildings also stand empty. Demolition has begun, but the process is moving very slowly. With the removal of these structures, a piece of the site's history is disappearing. At the same time, this transformation seems almost fitting—so much has changed here over the years that this shift could be seen as part of the site's ongoing evolution. However, the current redevelopment plans risk losing far too much of the area's historical and cultural value.


Historie Sliedrecht - 006-173a - Scheepswerf van Bennekom - around 1955

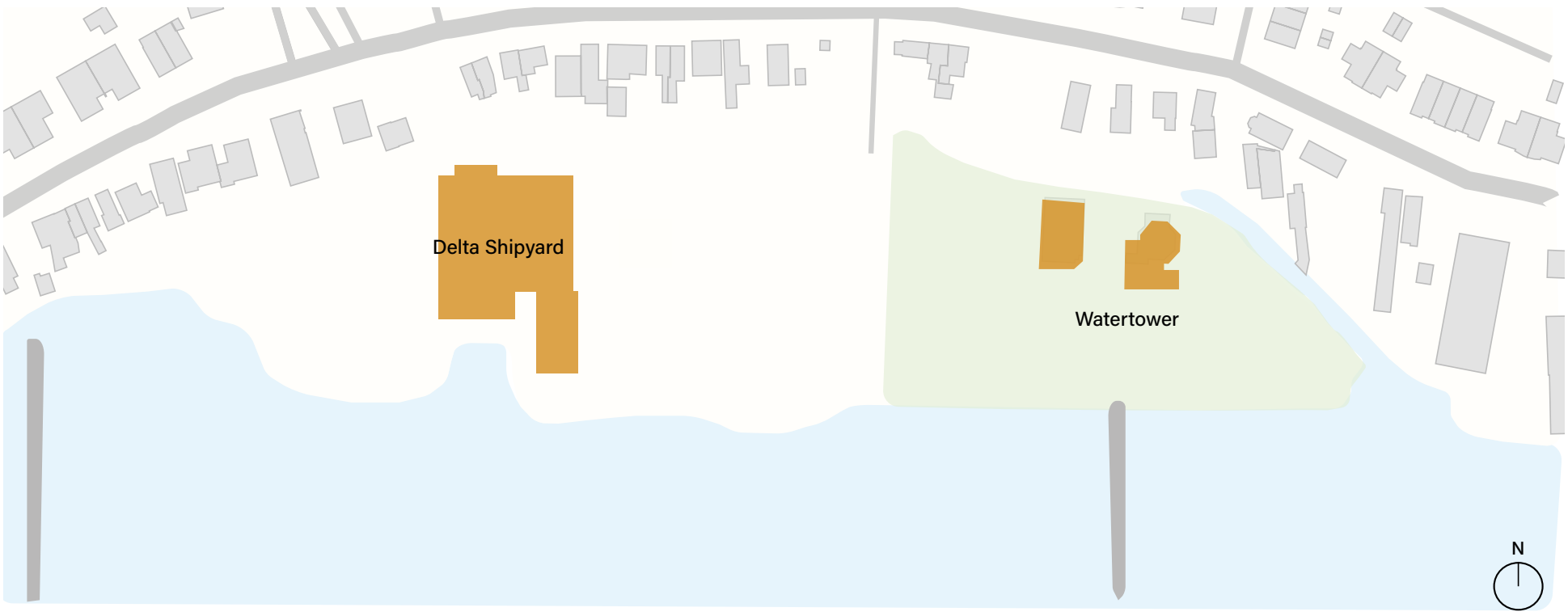

Historie Sliedrecht - 006-174 - Wijk A - Scheepswerf van Bennekum- around 1965


Source unknown - old primary shipyard building - around 1970


Historie Sliedrecht - 006-116 - Wijk A - Scheepswerf around 1990

Current state
Of the Water Tower terrain

Today, the only remaining structures on the site are the skeletal remains of the former shipyard and the decaying water tower—a place rich in history now left neglected. New plans for the area have been drawn up by the design firm West8, commissioned by a private developer. These plans include the removal of the shipyard and the construction of tall buildings surrounding the water tower.

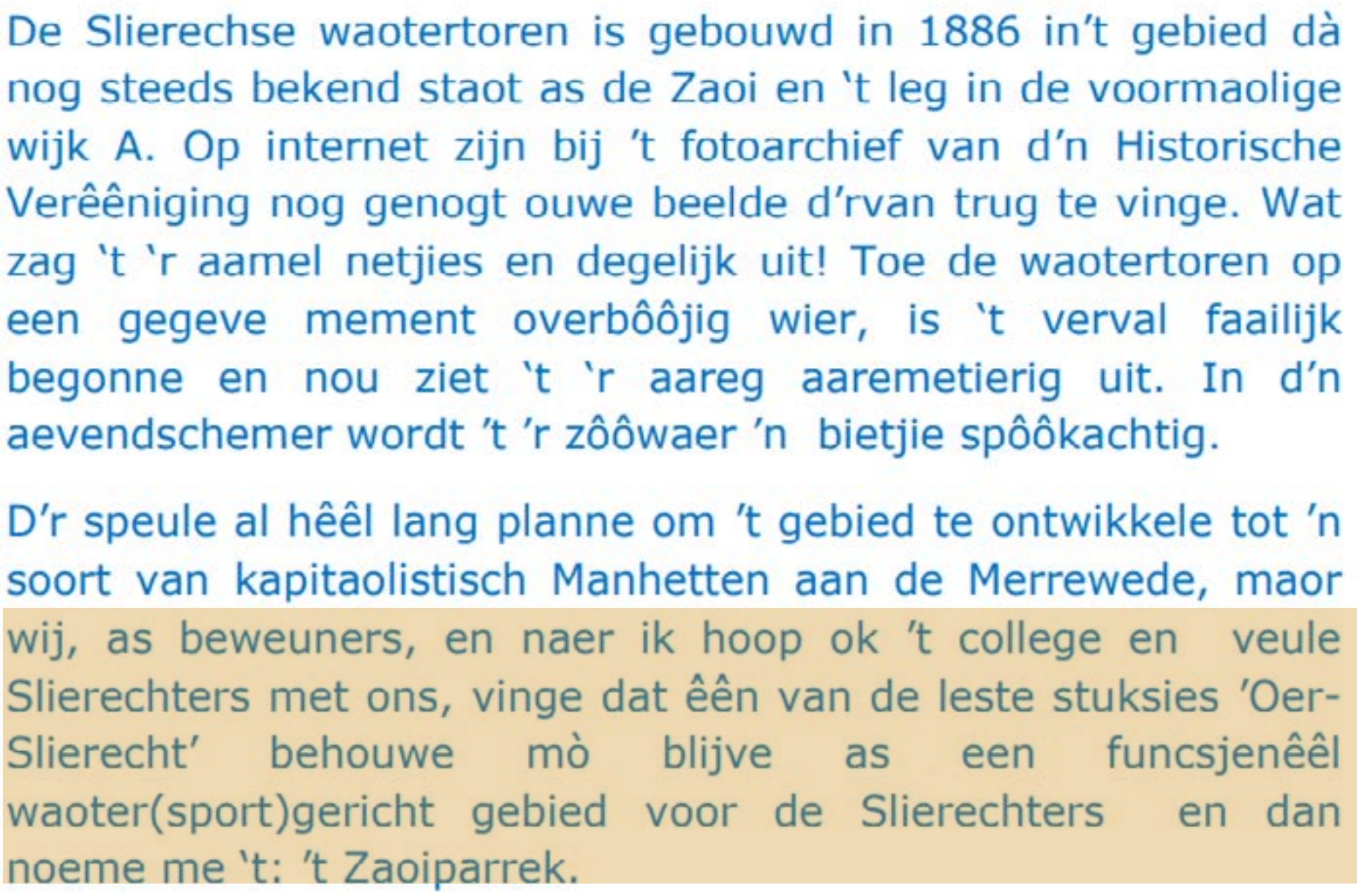


Current buildings on the terrain, own image

Photo's of the current state, sept 2024, own photos

Current vision and plans

Of the Water Tower terrain


De Slierechse waotertoren is gebouwd in 1886 in't gebied dà nog steeds bekend staot as de Zaoi en 't leg in de voormaolige wijk A. Op internet zijn bij 't fotoarchief van d'n Historische Verêêniging nog genogt ouwe beelde d'rvan trug te vinge. Wat zag 't 'r aamel netjies en degelijk uit! Toe de waotertoren op een gegeve mement overbôôjig wier, is 't verval faailijk begonne en nou ziet 't 'r aareg aaremetierig uit. In d'n aevendschemer wordt 't 'r zôôwaer 'n bietjie spôôkachtig.

D'r speule al hêêl lang planne om 't gebied te ontwikkele tot 'n soort van kapitaolistisch Manhetten aan de Merrewede, maor wij, as beweuners, en naer ik hoop ok 't college en veule Sliererechters met ons, vinge dat êên van de leste stuksies 'Oer-Sliererecht' behouwe mò blijve as een funcsjenêêl waoter(sport)gericht gebied voor de Sliererechters en dan noeme me 't: 't Zaoiparrek.

A personal note about 't Zaagje terrain - Historie Sliedrecht

Among current residents of Sliedrecht, there is growing resistance. Many feel the new development lacks livability and fails to connect the site with the rest of the town. There is a strong desire to restore and strengthen the relationship with the river—something that is currently missing in Sliedrecht.

A short piece was written in the Sliedrecht dialect about the former water tower site, reflecting a sentiment shared by many local residents. The inhabitants feel that this is one of last places that are a part of 'Oer Sliedrecht' , like Sliedrecht was back in the days. With the current plans, they feel nothing for the new developments that are planned to be made.

In the Municipality of Sliedrecht's 2020 Recreation Vision, residents were asked to share their thoughts on the future development of the town—including the water tower site. Based on their input, a spatial vision for recreational opportunities in Sliedrecht was developed, outlining what needs to happen to enhance the town's livability.

Residents expressed a clear lack of liveliness and connection in public spaces. The demand for accessible, shared spaces is growing, and such areas are becoming increasingly popular. There is also a strong desire for a better connection to the riverbanks and the river itself. The water tower site was frequently mentioned as a promising location to expand recreational offerings. Ideas such as water sports, leisure activities on the water, boat rentals, a marina, and hospitality venues like cafés and terraces were suggested as potential developments.

Finally, adding more green space was highlighted as a major priority—not only from a sustainability perspective but also for its recreational value. This presents a strong opportunity to combine both aspects, particularly at the water tower site.

- Het charmante havengebied heeft de potentie om als 'rustpunt' tijdens een vaartocht te fungeren of bezienswaardigheid tijdens een bezoek aan Sliedrecht, echter is de **beleefbaarheid nu minimaal**. Er zijn weinig vaarbewegingen, er is weinig reuring en de uitstraling is levenloos.
- De bedrijvigheid aan de oever staat recreatie in de weg. Er is **geen ruimte voor recreatie aan de oever** op dit moment. Nu zijn er nauwelijks recreatieve mogelijkheden, m.u.v. wandelen en fietsen langs het water.
- **Dijk en dijklint zijn onaantrekkelijk voor recreatie**. De verpauperde panden en braakliggende terreinen zorgen voor een onaantrekkelijke uitstraling van de dijk en oever.
- **Druk publieke ruimte neemt toe.** Toenemende druk op de openbare ruimte (parken, natuurgebieden, infrastructuur) i.v.m. verstedelijking, toegenomen gebruik en een toegenomen vraag naar voorzieningen.

- **Aanwezigheid van de rivier.** Sliedrecht ligt direct aan de Beneden Merwede. Waterrecreatie is een populaire vrijetijdsactiviteit. Dit kan worden benut door langs de oever meer recreatiemogelijkheden te bieden: denk aan een strandje, fietsen en wandelen, vissen, varen en evenementen aan/op de rivier. Dat kan op dit moment niet door bedrijvigheid.
- **Watertoren aan de dijk**. De watertoren is een belangrijk herkenningspunt in Sliedrecht en biedt kansen voor een nieuwe bestemming met bijvoorbeeld een recreatieve functie.
- Verschuiving van bezit naar gebruik en beleven. Opkomst van 'deelconcepten'. **Behoefte aan en vraag naar beleefbaarheid neemt toe** o.a. van de openbare ruimte, maar ook van erfgoed, natuur etc.

Ideeën vanuit de inwonersenquête

Nieuwe voorzieningen:

- Klimbos
- Survival
- Klimtoren
- Vissteiger
- Steiger voor in- en uitstappen pleziervaart
- Boothelling
- Boulevard langs de rivier
- Speelgelegenheden bij het water
- Historische wandelingen 'vroeger en nu'
- Cultureel centrum (bijv. in Raadshuis: museum, bibliotheek, theater in een, ondersteunend met bv. horeca)
- Concentreren van groen (faciliteren wandelen en fietsen in de natuur)
- Zorg dat de rivier ook echt bij het dorp hoort: zorg dat bewoners hiervan kunnen genieten (strandje, bankjes, bereikbaar)
- Wandelen langs zowel de rivier, als de polder in

Visie recreatie Gemeente Sliedrecht - Raad Sliedrecht 2020

Visiekaart en ontwikkelingsgebieden - Omgevingsvisie Sliedrecht 2021

In Sliedrecht's 2021 Environmental Vision, the municipality outlines a strategic plan for the spatial development of the town through to 2040. The plan describes how Sliedrecht aims to grow and evolve in terms of housing, employment, and the living environment. Adopted in 2021, the vision serves as a guiding framework for future developments. The Watertoren site is also included in this environmental vision as part of the historical 'Dijklint'.

As a spatial identity carrier, the dike ribbon reinforces the identity of Sliedrecht. The village originated along the dike that protects the land from the high waters of the Merwede River. The construction periods and historical development reveal that the areas outside the dike—particularly the port zones—are a vital part of Sliedrecht's cultural and historical heritage. Sliedrecht first expanded outside the dike, and only later was the area behind the dike ribbon developed.

At the regional level, the dike ribbon also functions as a spatial connector. The dike runs along the Merwede, linking the municipalities within the Drechtsteden region. The combination of high-quality (maritime) industry and concentrated infrastructure on the one hand, and the diverse, village-like residential environments, the open landscapes of the Alblasserwaard, and the recreational potential of the Biesbosch on the other, together define the region's identity and quality.

In the chapter on the "Dijklint" — the historical core where Sliedrecht originated — the municipality expresses its ambition to enhance the area's appeal and strengthen its cultural and historical value. Well-preserved and historically significant sections are designated as protected village heritage zones, and new construction must respect the character of the historic dike ribbon. In the case of future transformations, characteristic shipyard structures such as industrial halls and cranes are to be preserved — something that is not evidently reflected in the current plans for the Watertoren site.

The vision also calls for a stronger emphasis on greenery. This includes restoring natural vegetation and transforming vacant lots. Pedestrian and cycling routes are to be improved by giving them greater attention and reducing traffic speeds. One of the area-specific goals is to create green public spaces along the Beneden-Merwede river. Continued investment is required to maintain the quality of the public space and ensure an urban and architectural design that reflects the historical character of the dike ribbon. This includes allowing for a mix of functions and housing. The area already has a distinctly "Sliedrecht" character due to the interplay of historic residential buildings and maritime industries.

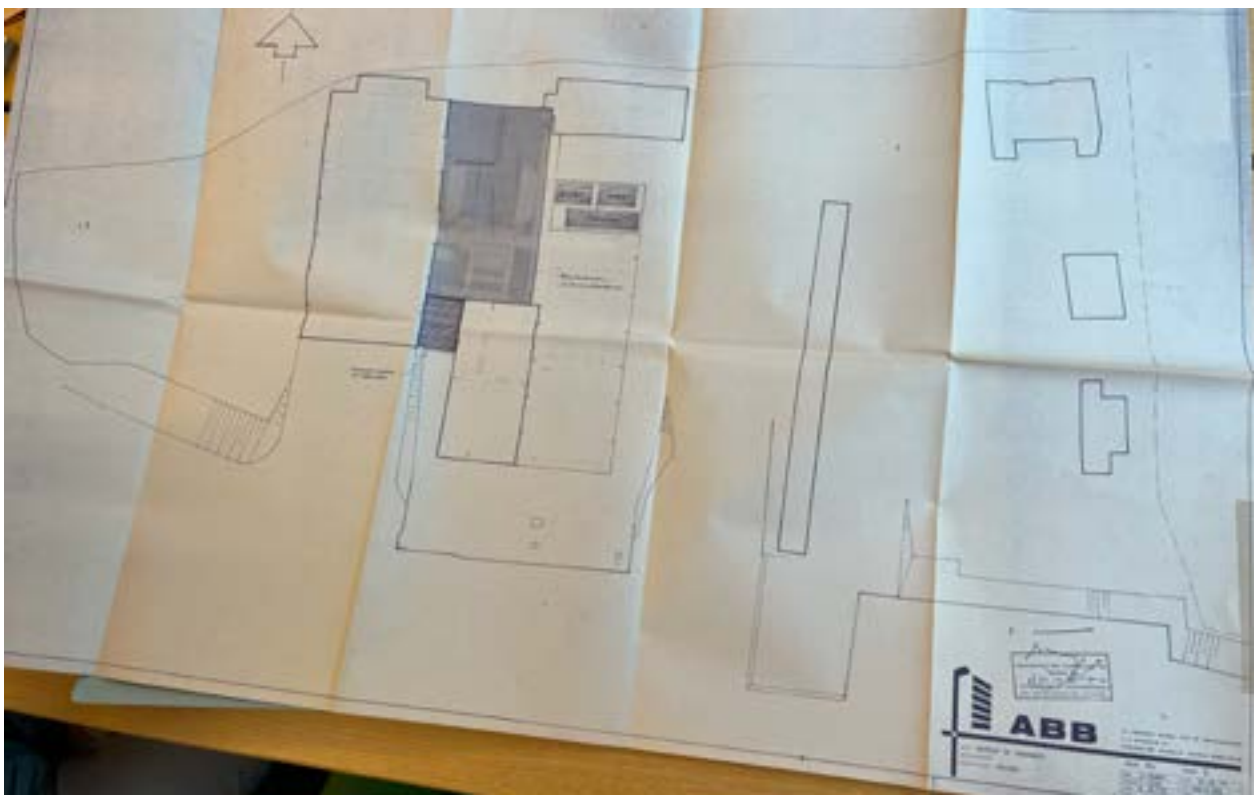
The Watertoren site is identified as a key development location for achieving these objectives. However, the coexistence of housing and industry in the area presents challenges related to environmental quality (e.g., noise, air pollution, odors). To preserve the area's unique character, the environmental quality standards are applied less stringently. Nevertheless, environmental quality remains important for the future and could be actively improved at the Watertoren site, helping to offset impacts in other parts of the dike ribbon area.

Koers per deelgebied - Omgevingsvisie Sliedrecht 2021

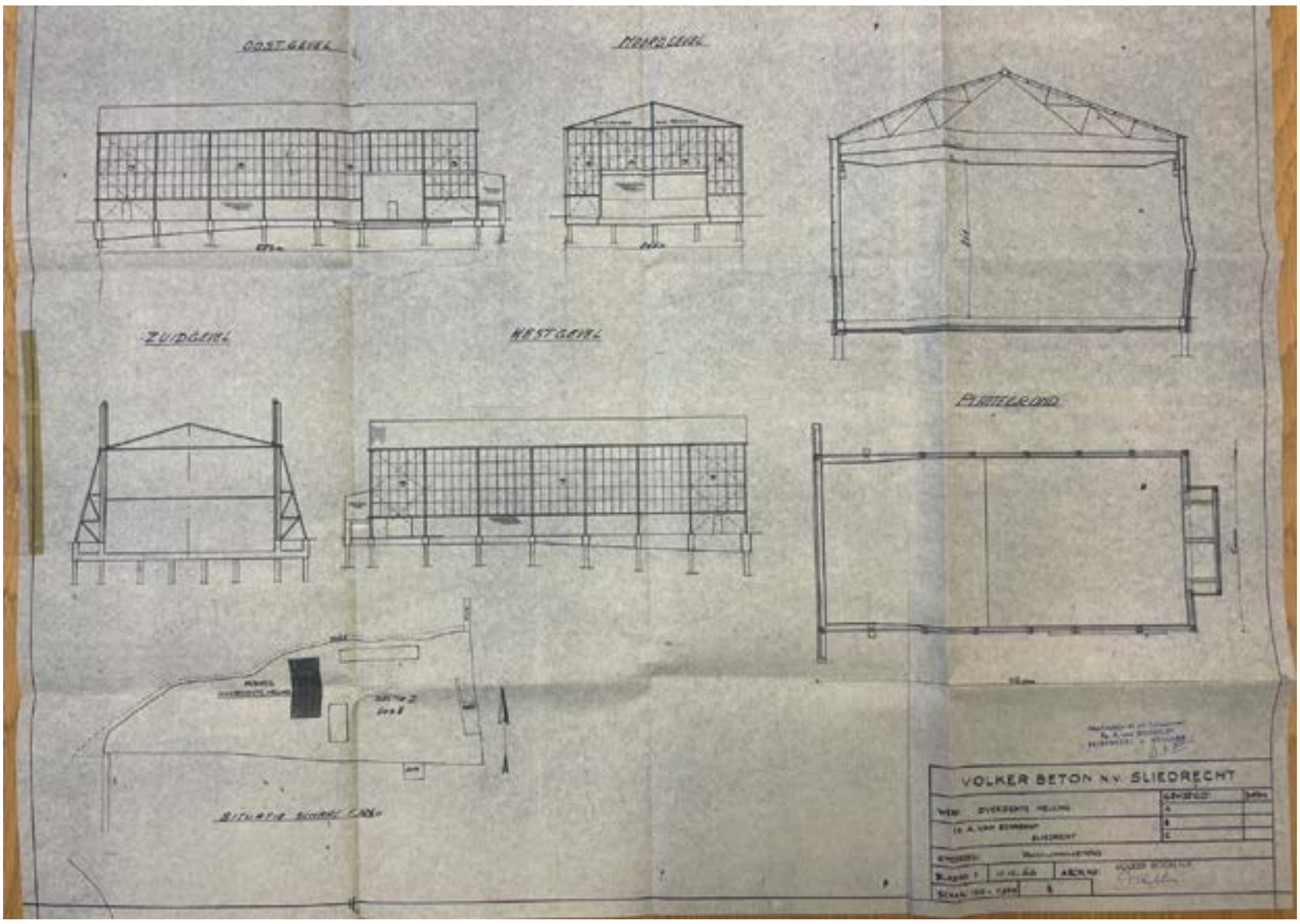
Archival documents
Of the Delta Shipyard

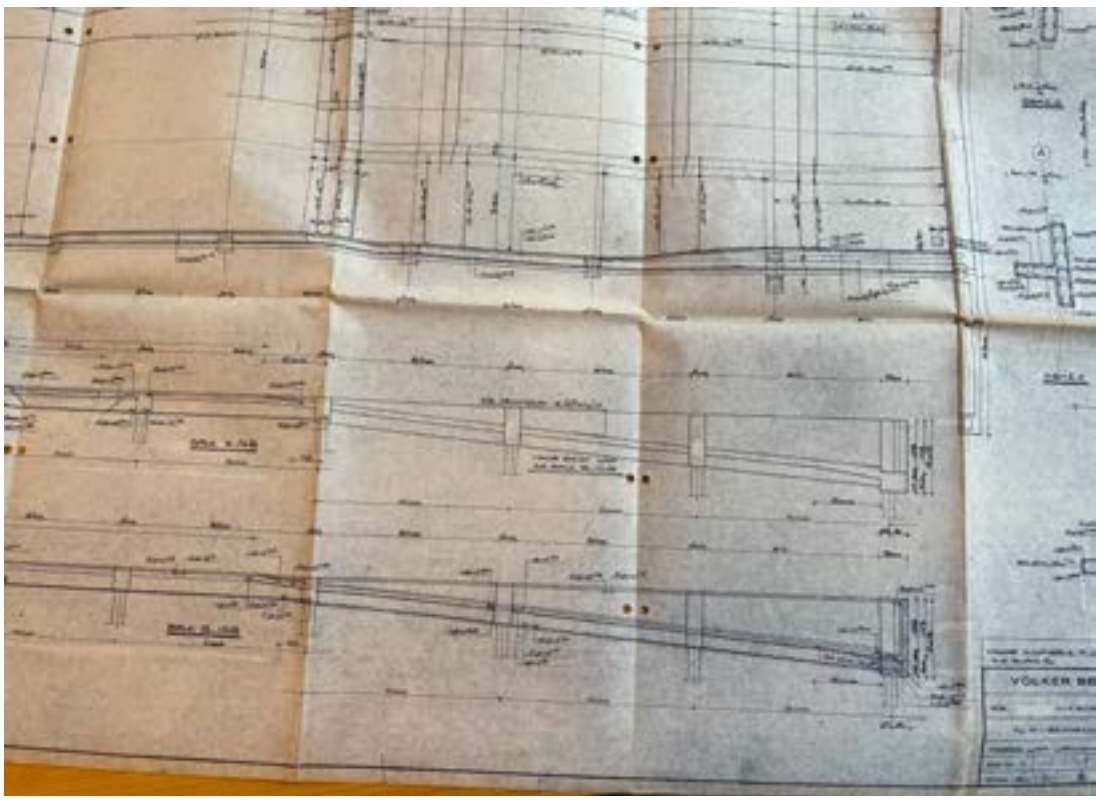
Before the design process for the Delta Shipyard could begin, drawings of the building had to be obtained. A site visit provided some initial insights, but due to the building's severe deterioration, this was far from sufficient. At the Dordrecht Regional Archives, we were able to access extensive documentation, ranging from the original construction of the shipyard to its most recent renovations. These documents not only provided accurate structural dimensions but also offered insight into the building's evolution over time. Documents about the water tower and its systems were also found. A selection of all the drawings are presented on the following pages.

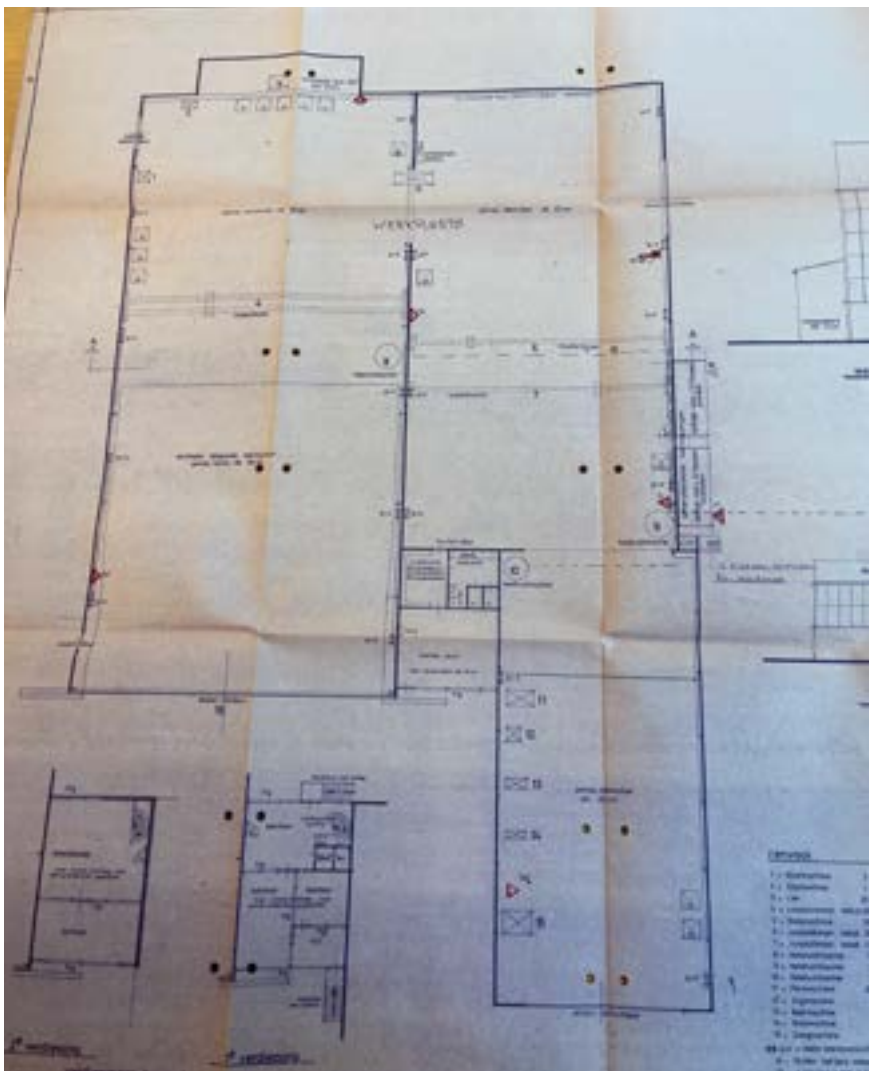
This information can be used to inform the design and the subsequent value assessments. Not all drawings are equally legible, and their accuracy may be uncertain, but they offer a reliable foundation for understanding the overall structure.



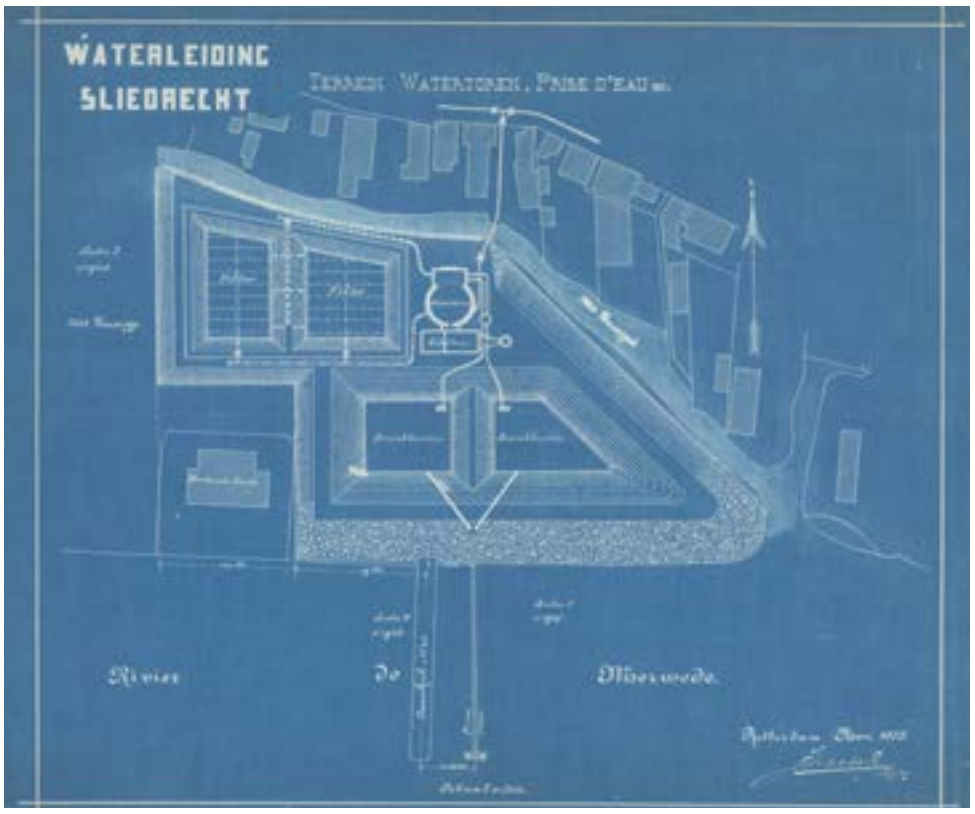
Documents of the Delta Shipyard from the Regional Archives in Dordrecht - own pictures

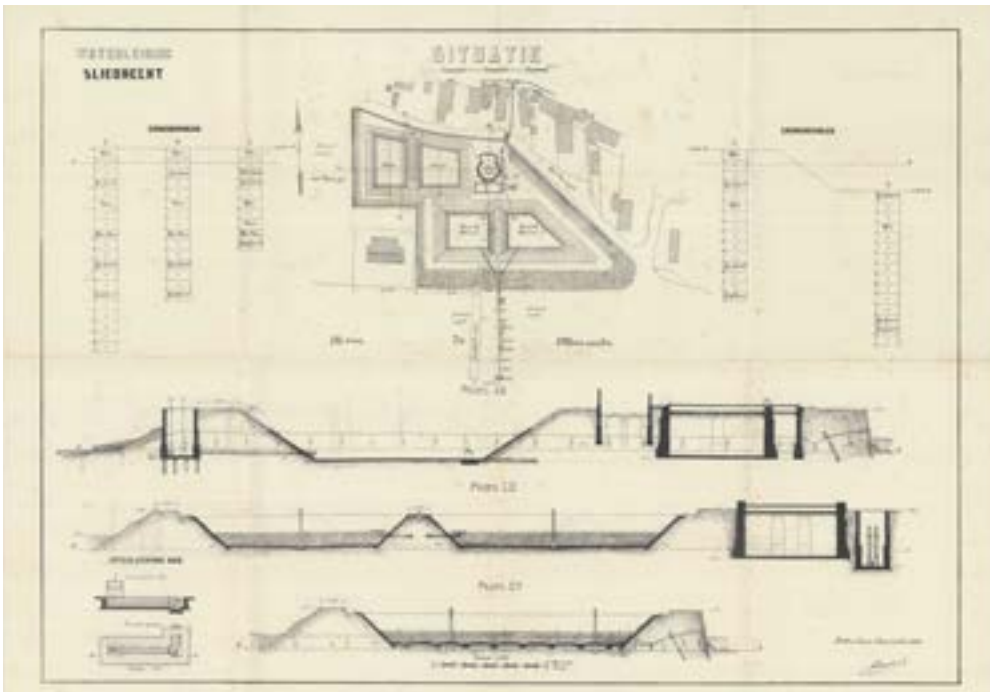


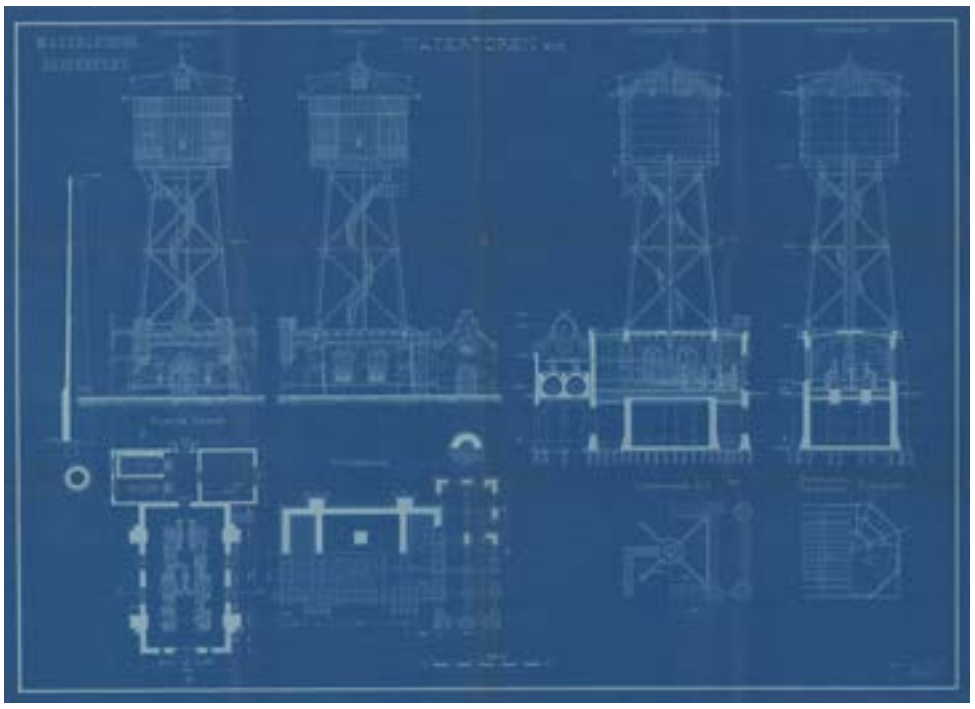


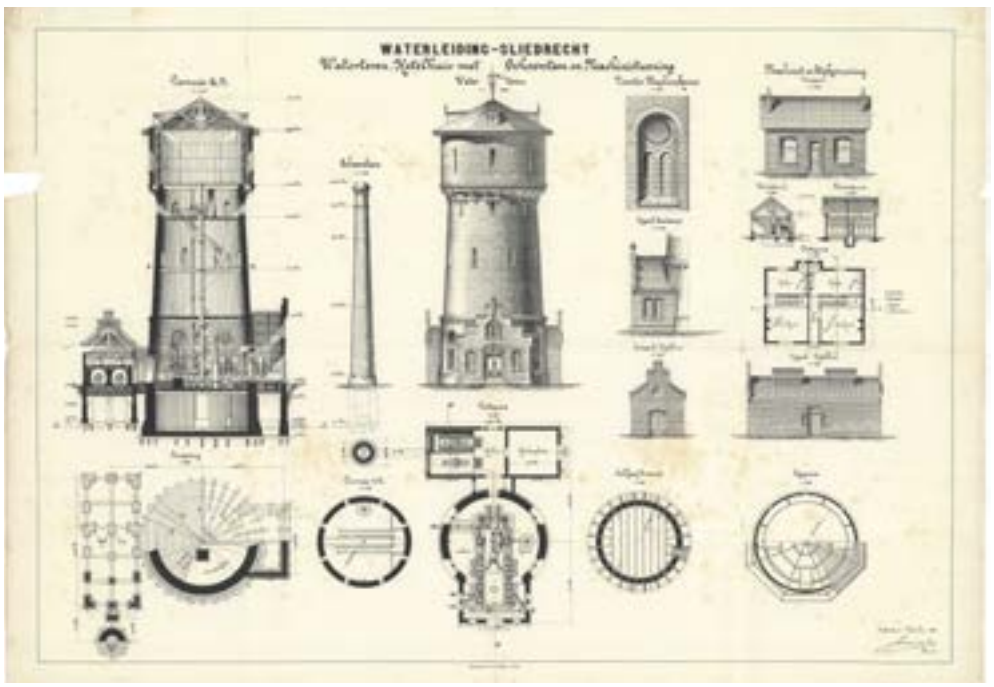


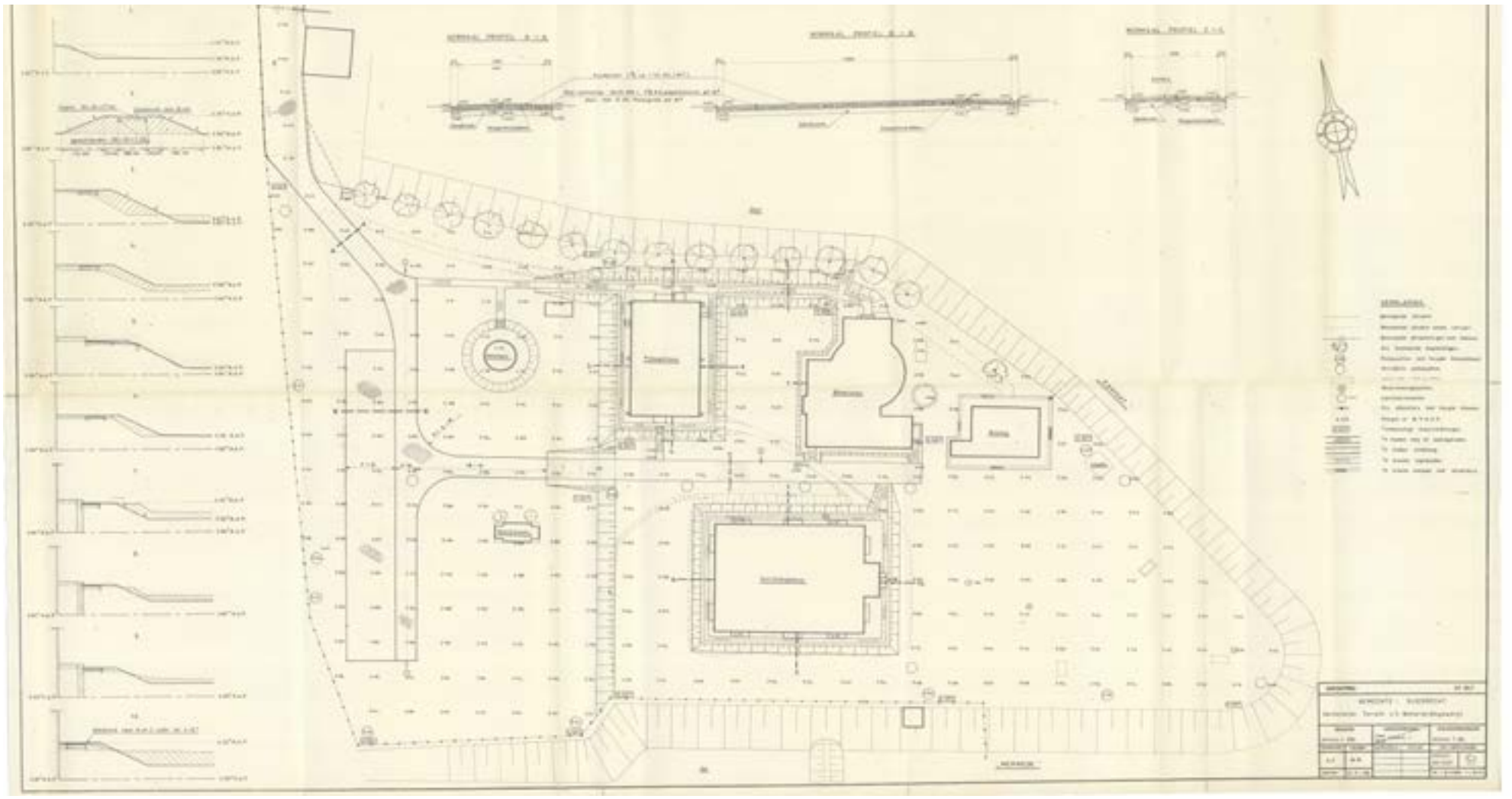
Documents of the Delta Shipyard from the Regional Archives in Dordrecht - own pictures











Documents of the original water tower, from the Regional Archives in Dordrecht - own pictures

Value assessment
Of the Water Tower terrain

After conducting research on how to future-proof the Waterdriehoek area, the question arose of how the Watertoren site could be made resilient in this context. Achieving this requires a careful balance between heritage, safety, and sustainability. To do so specifically for this site, it is first necessary to assess which heritage aspects are significant and valuable enough to be carried forward into the next design phase.

This can be done through a value assessment using the Cultural Value Matrix, developed by the Heritage & Architecture department of the Faculty of Architecture at TU Delft. In this matrix, the tangible and intangible elements of a built artifact—based on Brand's Layer Framework—are mapped on one axis, while the values assigned to them—based on Alois Riegl's dialectic value set—are placed on the other. Although the foundations of the matrix are drawn from Riegl and Brand, additional layers and values can be added based on what the assessor deems relevant or meaningful.

BRAND + / RIEGL +	AGE value	HISTORICAL value	INTENTINAL COMMEMORATIVE value	NON INTENDED COMMEMORATIVE value	USE value	NEW-NESS value	(relative) ART value	RARITY value [+]	OTHER relevant values [+]
SURROUNDINGS / SETTING [+]									
SITE									
SKIN (exterior)									
STRUCTURE									
SPACE PLAN									
SURFACES (interior) [+]									
SERVICES									
STUFF									
SPIRIT of PLACE [+]									

Cultural value matrix - Marieke Kuipers and Wessel de Jonge, *Designing from Heritage: Strategies for Conservation and Conversion* (Delft: TU Delft - Heritage & Architecture, 2016), 87.

	age value	historical value	art value	commemorative value	use value	newness value	rarity value	nostalgic value
surrounding				Watertower is an industrial land-mark for Sliedrecht	Location close to Sliedrecht city centre and unique location next to the river		Big empty outerdi-ke area	Locals see watertower from distance which remembers them of the past
story		Watertower and shipyard marks in-novation in water related manage-ment		Watertower terrain tells the story of the maritime background of Sliedrecht	Showing the typical history of Sliedrecht			Shipyard remem-bers locals of flourishing times of Sliedrecht
site	Gantel water on the site Trees	Strong historical relation with the river that slowly disap-pears		Terrain is an iconic place for Slie-drecht Typical Dutch Uiterwaarde	A lot of green and close access to the water		Lot of open space	Gantel was used as a recreative and functional water for the inhabitants
structure	The structure of Delta is rusted and damaged in some areas				Structure of water-tower tells about the former use of the tower			
space plan					Large open space plan in Delta Shipyard available for re-use			
skin	The facades and roofs of both of the buildings are in big decay or demolis-hed. Lot of rust and vegetation		Characteristic blue sliding doors Characteristic brick pattern in Watertower facades	Decayed walls reminds of the shift in maritime industry and water management	Big doors are iconic and can be re-used		Very old water-tower that is still standing	
service	Old crane rails are still there, rusted and overgrown with vegetation Loopkatkraan				Slope with rails tells about the ma-ritime use of the Delta building			
stuff								
social				Working atmosp-here on Delta Shipyard wharf and close relation with water				

high value
medium value
low valuee

values Delta

values water tower

values terrain

Cultural value matrix of the Water tower terrain - own work

For the Watertoren site specifically, I have made a selection of applicable values and layers.

In the value assessment above, I have categorised all low, medium, and high values according to their type and layer. This assessment was carried out not only for the Watertoren site itself, but also for the remaining structures of the Delta Shipyard and the old water tower—both tangible and intangible elements. These values are distinguished using different colors and outlines, as indicated in the legend, to clearly show the differences.

What primarily guided my classification of high-value elements were the unique characteristics that make this location so special, features that cannot easily be recreated or replaced, or aspects that hold untapped potential for future use. In this way, a clear overview has been created of which elements are essential to consider in the research and design phases, and which are of lesser importance.

After completing this value assessment, I went on to organize all the medium and high values for myself. I evaluated which ones truly matter and grouped them loosely by location and theme. From this process, I identified four core values of my own: **nature, history, own character**, and **water connection**. These values will serve as guiding principles throughout the entire design phase, reminding me of what I find important and what should remain central.

During the design process, it can be quite easy to lose sight of these priorities—so having these core values in place helps keep everything on track.

Nature value - own image

Nature

The nature value focuses on preserving and restoring the original character of the floodplain. Maintaining green spaces and restoring the local ecology are key priorities. This also helps to reconnect with the site's past and with the Biesbosch landscape across the river. In the design, greenery can act as a connector, strengthening spatial coherence. Additionally, it can create room for water, providing an extra layer of protection.

History value - own image

History

This value calls for actively strengthening the connection with the past and the history of this iconic part of Sliedrecht—what could be described as the "original Sliedrecht." This is achieved by restoring the water tower as a local landmark, drawing attention to the site's historical significance. The Gantel is also being brought back for the same reason. In addition, it can serve recreational purposes while creating more space for water and ecology.

The Delta Shipyard has the potential to revive the area's maritime industrial heritage through its new function and architectural expression..

Own character

The own-character value emphasizes expressing the unique identity of Sliedrecht. This is already partly achieved by reinforcing the site's historical elements, but it can also be reflected in the architecture of the new housing. These homes will echo the traditional dike houses—known locally as stoepwoningen—with pitched roofs and a combination of wood and brick materials. In doing so, a small village is created along the Merwede, nestled within the surrounding maritime industries.

Additional space is reserved for small businesses, helping to foster the hardworking spirit that characterizes this industrial area.

Character value - own image

Water connection

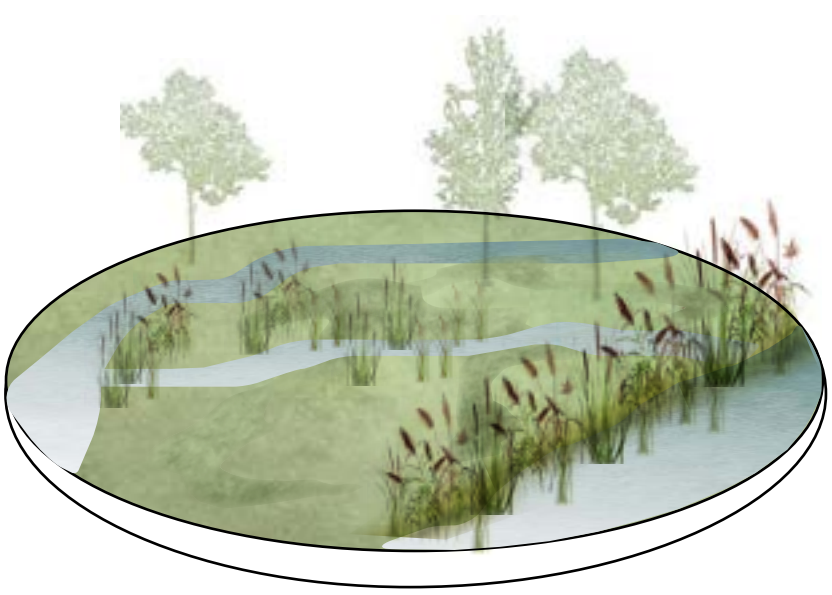
This value focuses on restoring the once-strong connection with the water. Currently, this connection has been completely lost on the site, and throughout the rest of Sliedrecht it is gradually fading—even though the need for it remains significant. The aim is to re-establish this bond in both tangible and intangible ways; any form of water connection is welcome.

This can be achieved by making the water physically accessible to the people of Sliedrecht, thereby also increasing the potential for water-related activities. In addition, the Delta Shipyard will be given a new water-oriented function—one that echoes its maritime past, but with a renewed and contemporary character.

Water value - own image

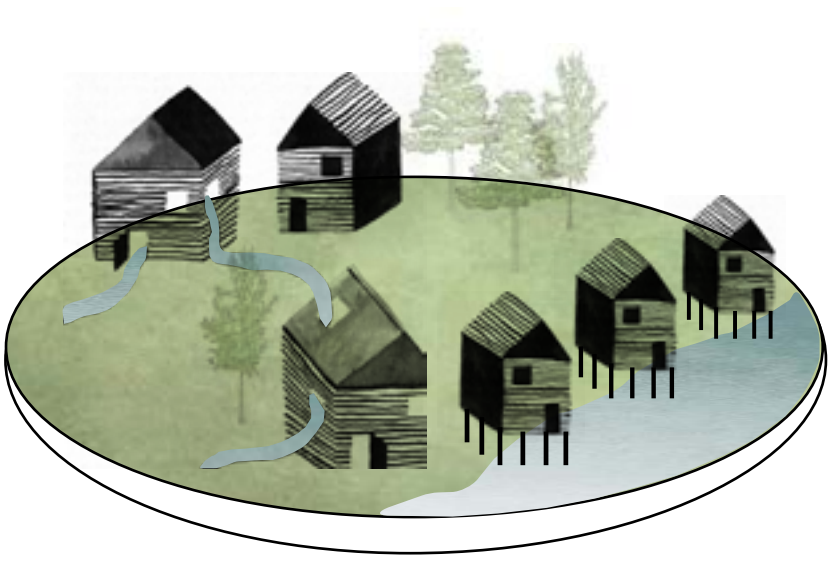
After defining these values and concluding my research, it became possible to establish appropriate design guidelines. These were primarily aimed at the masterplan and the overall architectural direction. Ultimately, however, they served as a guiding framework for the new design of the Delta Shipyard. Of course, the area in question is smaller than the Waterdriehoek as a whole, and the interventions are modest in terms of landscape and urban design. However, they are still significant for the future of the floodplain itself.

SPACE FOR WATER



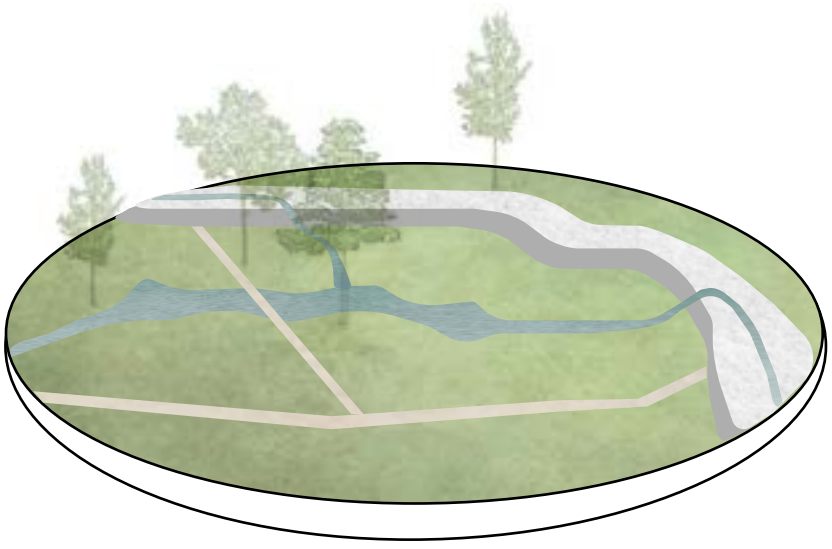
- bringing back Gantel
- soft embankments
- blue green strips
- respecting floodplain character

RESILIENT BUILDINGS



- room for river between buildings
- houses on poles
- water resistant base with light construction

STREETSCAPE



- elevating main roads
- water drainage in roads to green strips
- limiting hard surfaces

Value & research outcomes - own image

Chapter 3

Design

Destination
Of the Delta Shipyard

After conducting the initial analysis and visiting the site, I quickly developed the idea of giving the building a new, water-related function. My aim was to restore its historic connection to water and offer the former shipyard a renewed narrative. At the same time, I didn't want to ignore the site's original identity, so the new function had to resonate with its past.

During the site visit, I was immediately drawn to a few key elements. Although much of the original building was gone, what truly impressed me was the remaining structure and its form and in particularly the large blue sliding doors. The most striking of these was the main door that opens directly onto the river with the Biesbosch unfolding like a theatrical background. This is a unique feature, one I was determined to incorporate in a meaningful way. The sloped ramp leading up to this door was another element that made the space feel so distinctive.

This led me to the idea of giving the ramp a second life—as a swimming pool. In doing so, I introduced a new kind of connection to water. The extraordinary view of the river, along with the site's proximity to nature, inspired me to include a spa as well. This addition reinforced the concept of connecting with the outdoors, nature, water, and creating a place of calm and restoration.

In this way, the old building and its historic surroundings are honored through their transformation into a natural swimming pool and spa.

Site visit - own photo's

Masterplan
Of the Water Tower terrain

Following all the preliminary research and analyses, the masterplan shown below was developed. The previously defined values are reflected throughout the design. Paved surfaces have been kept to a minimum in order to maximize space for greenery. A green corridor runs between the buildings, serving as a water retention zone and ecological area. Additionally, it functions as a shared garden and a connecting path between the Water Tower and the Delta Shipyard.

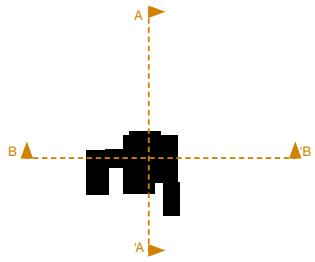
The amount of built space is limited and divided into two housing types: single-family homes and apartment buildings. The apartments are located on the north side of the masterplan and will never exceed three stories in height, so as not to obstruct the view from the dike houses. The single-family homes reflect the characteristics described in the core values.

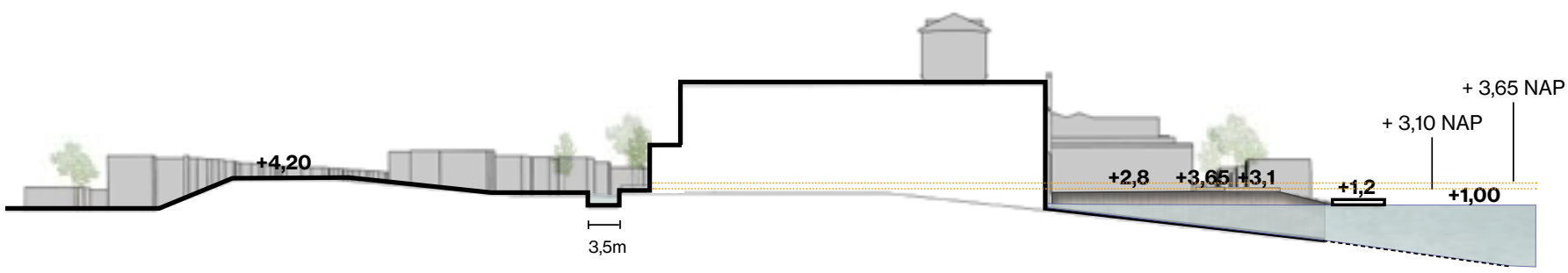
Along the waterfront, a boulevard invites people to walk along the river. It connects to a jetty where boats can moor. Small buildings are situated along this boulevard, housing businesses or shops. Since these buildings are positioned on the edge of the floodplain, they are partially elevated on stilts. The shoreline itself is green and marshy, creating a softer, more natural riverbank.

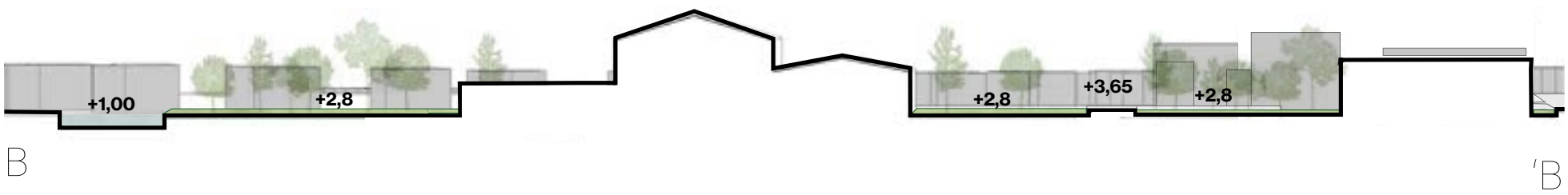
The water tower has been given a communal function and now serves as both a shared community house and a lookout point. As a public building, it tells the story of the area's history. The Delta Shipyard has been given a new water-related function: a swimming pool and spa. As a public facility, it draws attention to the site's maritime industrial heritage and reintroduces it to visitors and residents alike.

Masterplan 1:1000 (scaled down) - own image

Maximum high water = + 3,10 NAP
Predicted water level raise = + 0,55 m = + 3,65 NAP







Masterplan cross sections - own drawings

The cross-section of the masterplan shows the various elevation levels within the landscape in relation to the water. The boulevard and roads are elevated compared to the rest of the land. This design ensures that even under the maximum expected water level, the roads remain accessible, allowing for evacuation if necessary. In this way, the boulevard also functions as a small dike, providing a first line of defense against high water.

Moreover, this layout allows water to flow between paved areas toward retention zones located between the buildings. Here, the water has the opportunity to infiltrate into the ground, preventing flooding or nuisance.

The height of the roads has been designed in anticipation of future maximum water levels, making the infrastructure climate-resilient and future-proof.

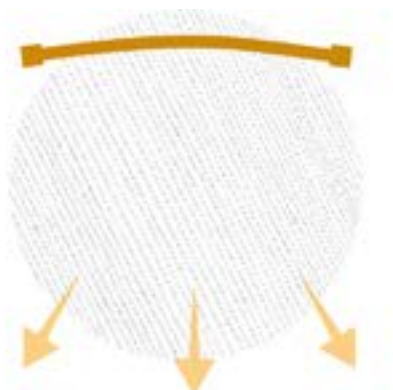
Design schemes

Strategies to define the design layout

Before I could begin designing, I first needed to create diagrams for myself to determine how I wanted to organize the Delta Shipyard. I started by listing the environmental aspects that had to be taken into account. The site is unique, as it is sandwiched between the dike with residential housing on one side and the openness of the river on the other. On the western edge of the floodplain, a small remnant of natural landscape still remained, which also played a role in determining what should go where.

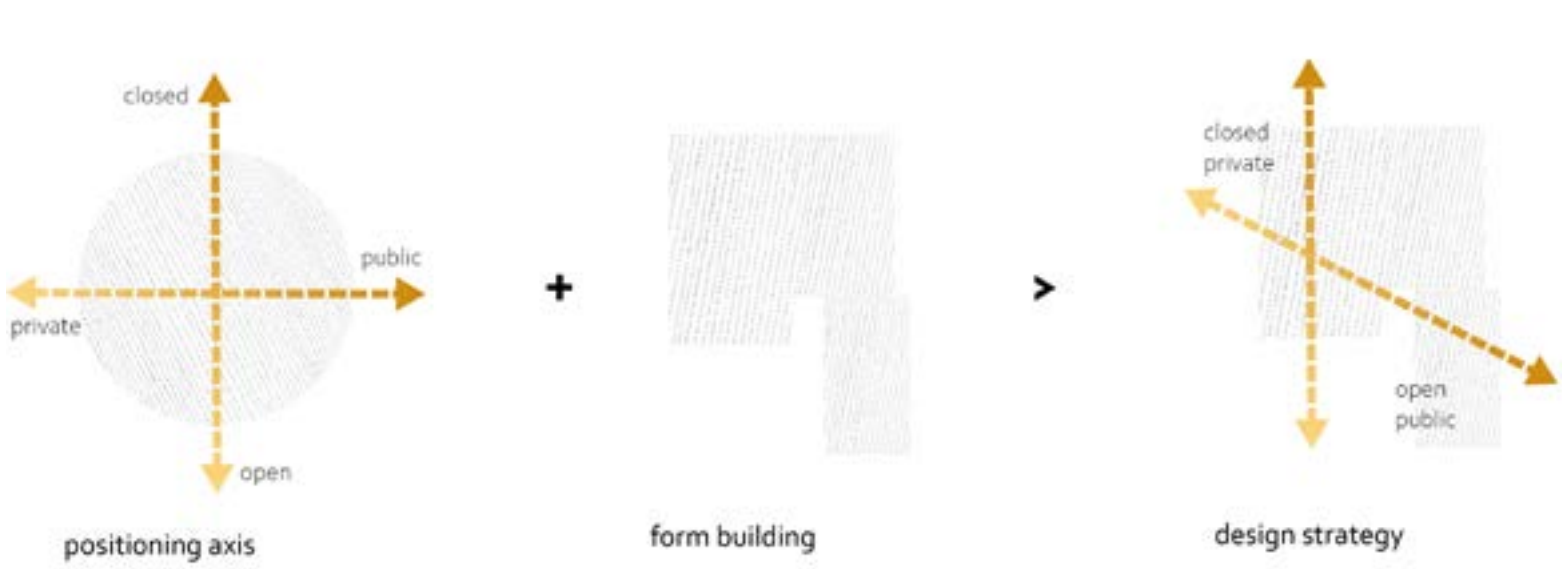
Together, these aspects formed an axis in my mind—ranging from private to public, and from closed to open. By laying this axis onto the shape of the existing building, I was able to establish a foundation for organizing the functions within the structure.

borders
dike // river

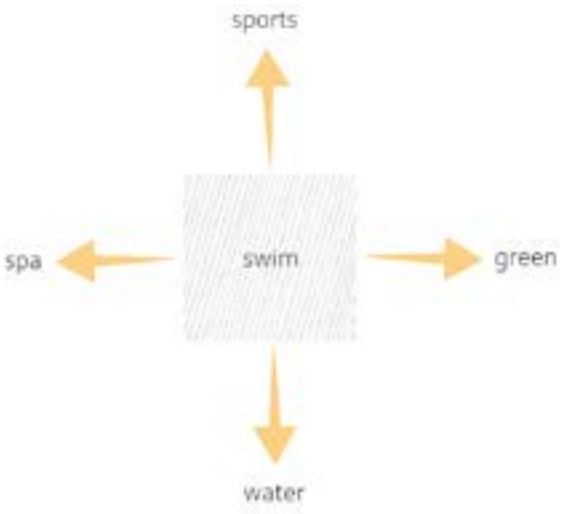


privacy
closed // open

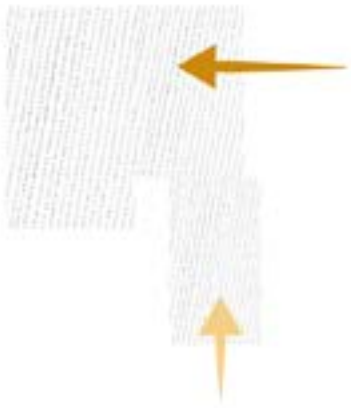
zones
green // urban



Design strategy - own image

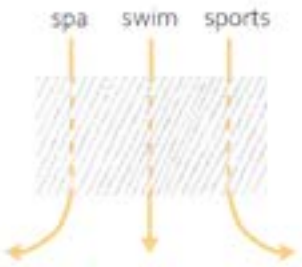


grouping
swimming pool functions
as centre of the complex

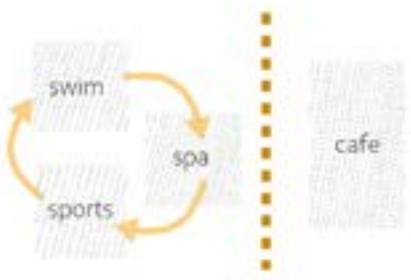


main entrance
most public //
well connected side

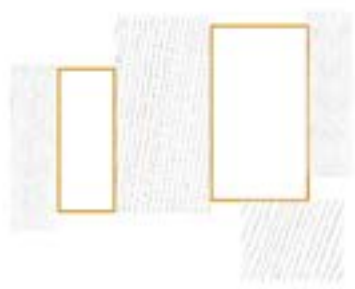
boundaries
limitations and options
for extensions



filterzone
entering functions only
via changing rooms



routing
functions well connected
cafe separate

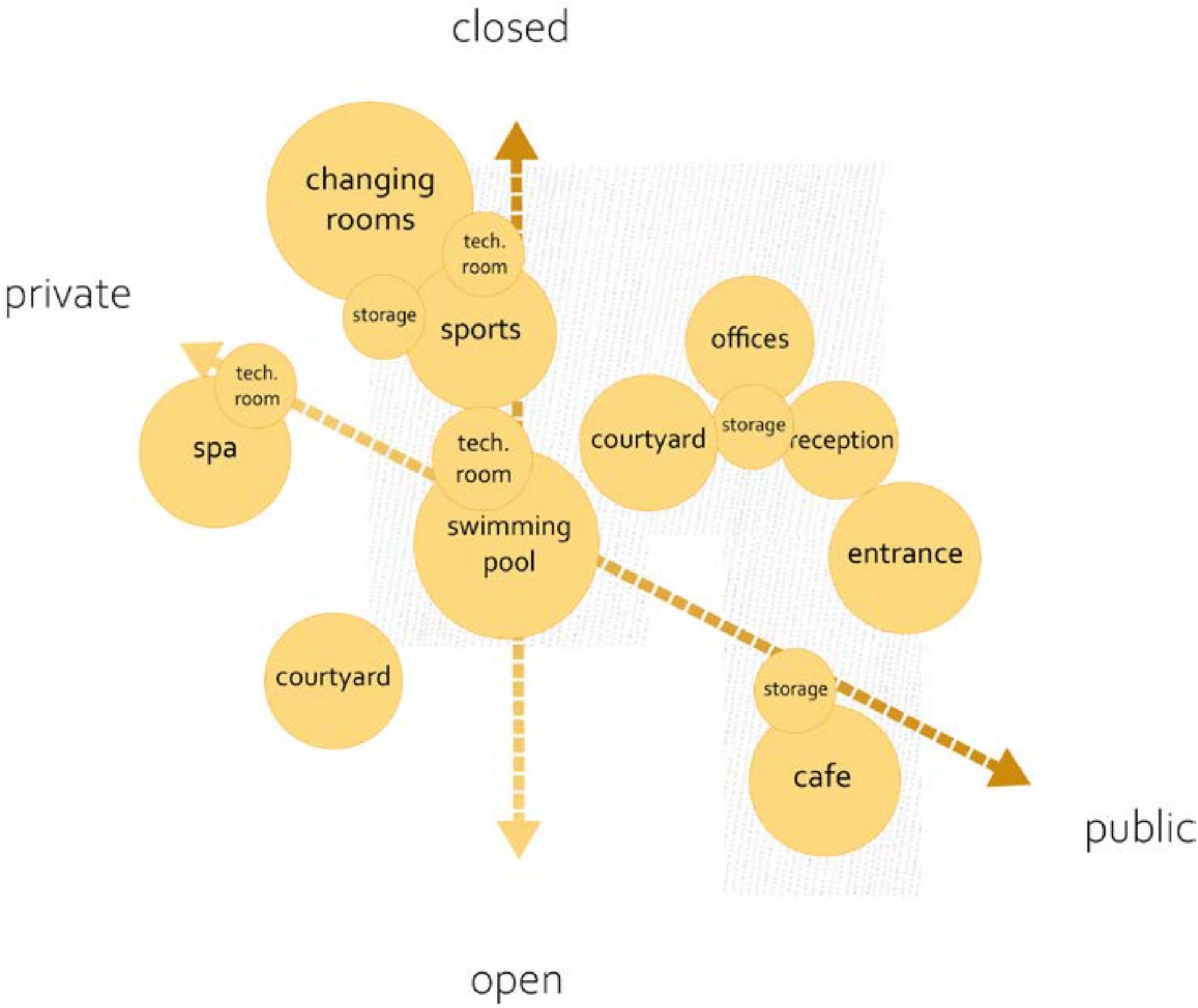


zoning
creating courtyards for extra
outside connection and daylight

Design principles - own image

Next, I considered which design principles were important to me and what requirements the building's new function would need to meet. What needs to be included? What is essential for the building to function properly? For example, the main entrance had to be located on the most public-facing side; the restaurant needed to be able to operate independently from the rest of the building; the swimming pool would become the central feature; and courtyards were necessary to bring in daylight and create a connection to the outdoors.

These principles formed the foundation for both my design and the building's function.



Design axis - own image

Once the axis was established and the design principles were defined, I began sketching out a rough spatial layout of the required functions—creating a kind of bubble diagram. The size of each circle indicated either the importance of the function or the approximate space it would need. This diagram served as a base layer before developing the actual floor plan, with the private-public and open-closed qualities always in mind throughout the process.

Delta Shipyard
In relation to its surroundings

The final floor plan in relation to its surroundings is shown in the image below. It clearly illustrates that the main entrance is located on the public-facing side, in the same place as the original entrance to the hall. An old sliding door is still present here, which is considered one of the high-value elements identified in the value assessment.

The clear separation between the restaurant and the pool and spa is also visible. These function completely independently, and visitors are not required to experience them together. After walking along the gallery that runs through the old structure, visitors reach the reception desk, where towels are handed out. From there, they pass through the changing rooms before entering the pool area.

The swimming pool forms the heart of the building and is located exactly where the original slipway used to be.

The spa is also accessible from the pool area. It opens up to the remaining section of floodplain still present on the site. This area functions both as a natural water filtration system for the building's water use and as a garden for walking and relaxation. Once again, the connection to nature and water becomes clearly visible.

From above, the positioning of the two courtyards is also evident: the left one is private and natural, while the right one is public and more urban. The swimming pool remains the central element that ties these contrasting spaces together.

Masterplan 1:500 (scaled down) - own drawing

Floorplans
Of the Delta Shipyard

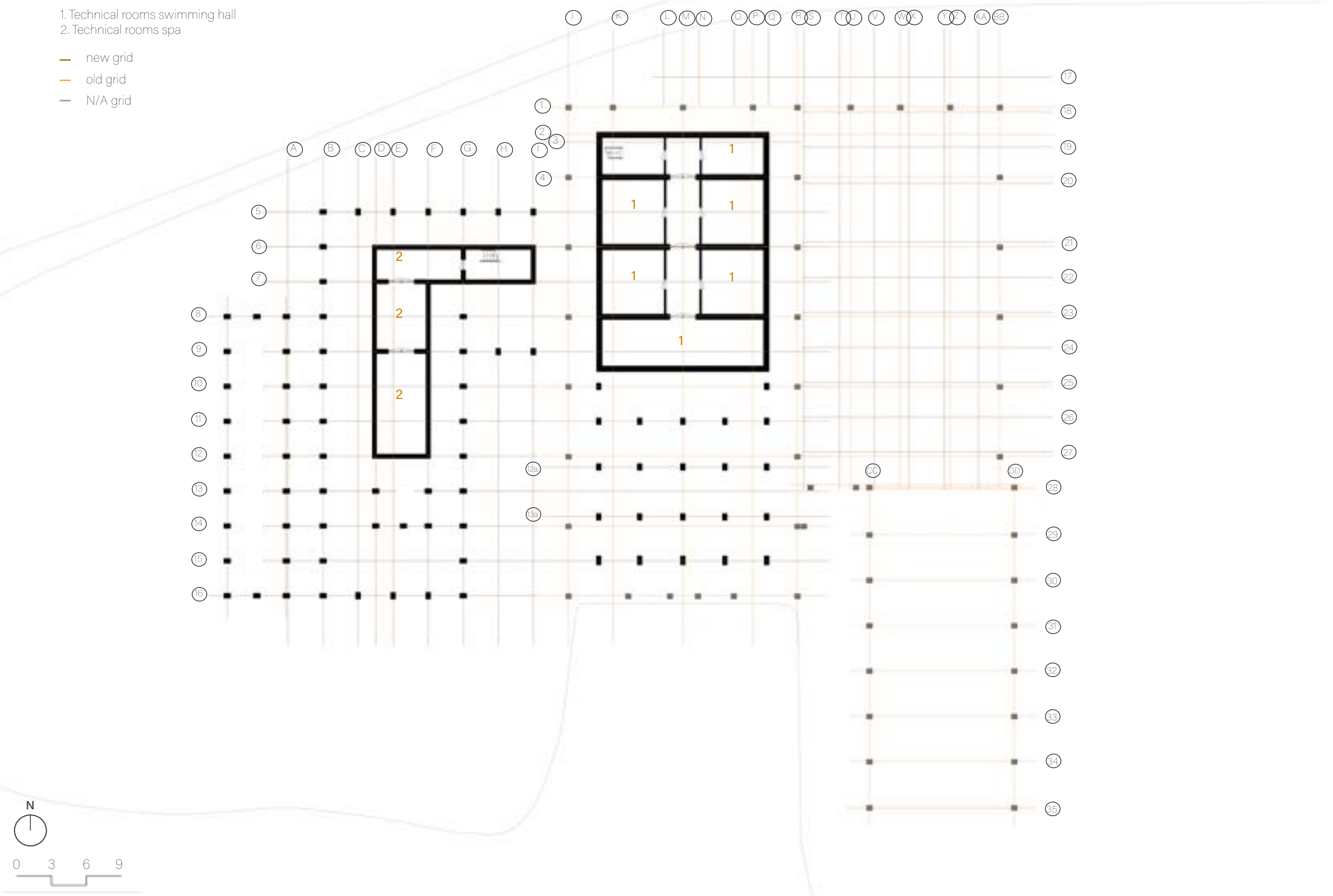
Below is the floor plan of level -1. This is the lowest level of the building and contains the technical basements and the foundations for the swimming pools. The basements house all technical installations necessary for climate control within the building and for the maintenance of the pools. The pools themselves are supported by additional foundations, designed to carry the heavy water basins. The foundations for the basements and swimming pools are built on anchor piles. This prevents the structure from being pushed upward in the event of rising groundwater levels.

All newly constructed basements and foundations are placed at least 2.5 meters away from the existing foundations to avoid any interference with the original structure.

Floorplan level -1

1. Technical rooms swimming hall
2. Technical rooms spa

— new grid
— old grid
— N/A grid

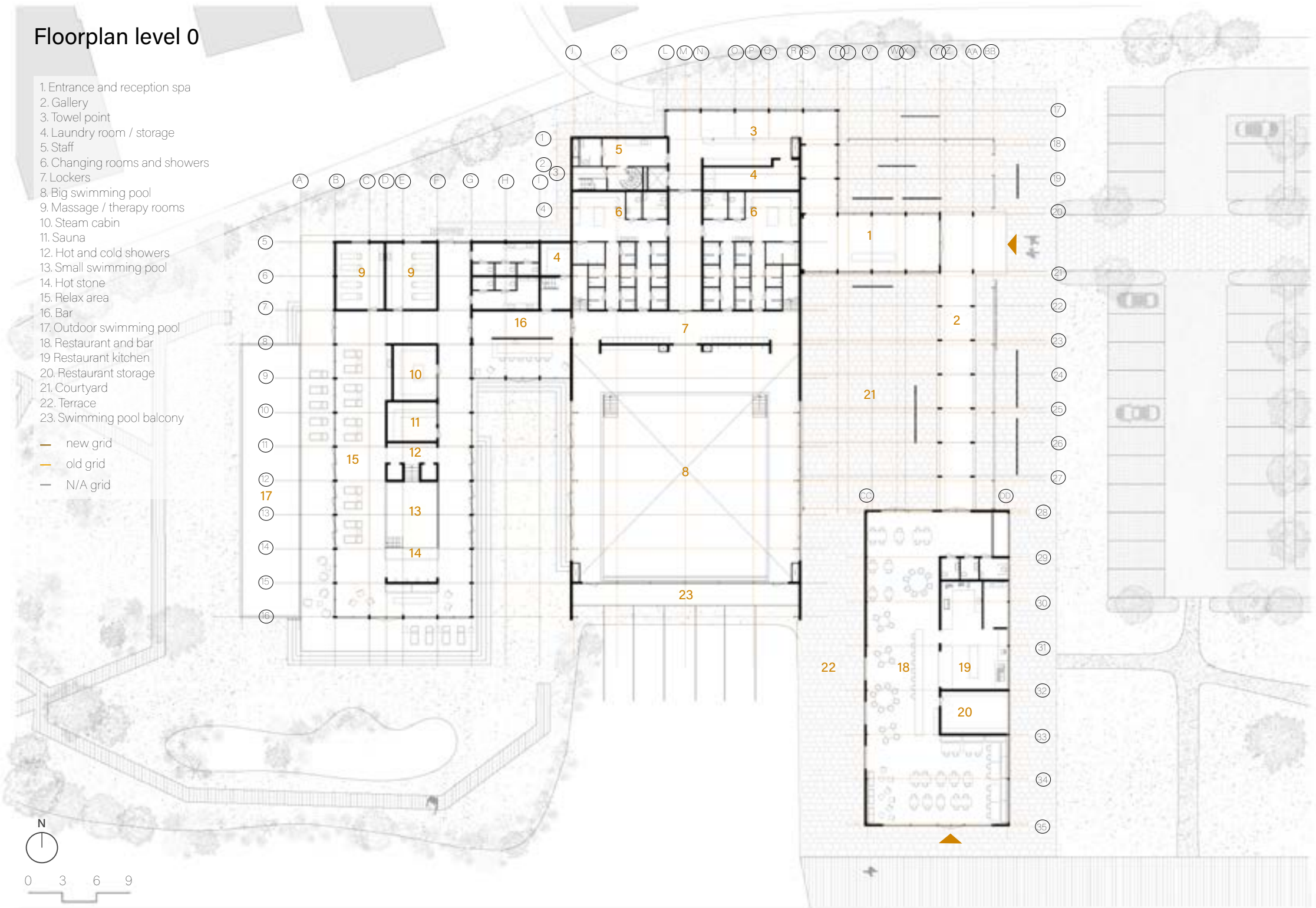


1:200 Floorplan level -1 (scaled down) - own drawing

Floorplan level 0

1. Entrance and reception spa
2. Gallery
3. Towel point
4. Laundry room / storage
5. Staff
6. Changing rooms and showers
7. Lockers
8. Big swimming pool
9. Massage / therapy rooms
10. Steam cabin
11. Sauna
12. Hot and cold showers
13. Small swimming pool
14. Hot stone
15. Relax area
16. Bar
17. Outdoor swimming pool
18. Restaurant and bar
19 Restaurant kitchen
20. Restaurant storage
21. Courtyard
22. Terrace
23. Swimming pool balcony

— new grid
— old grid
— N/A grid



1:200 Floorplan level 0 (scaled down) - own drawing

The floor plan of the current ground level once again highlights how the swimming pool forms the heart of the building, with the spa located on the left and the restaurant and gallery on the right. Both the spa and the gallery follow a similar structural rhythm and feature numerous openings in their façades. This is because both parts of the building are intended to open up to their surroundings— the spa towards nature, and the gallery towards the historic structure.

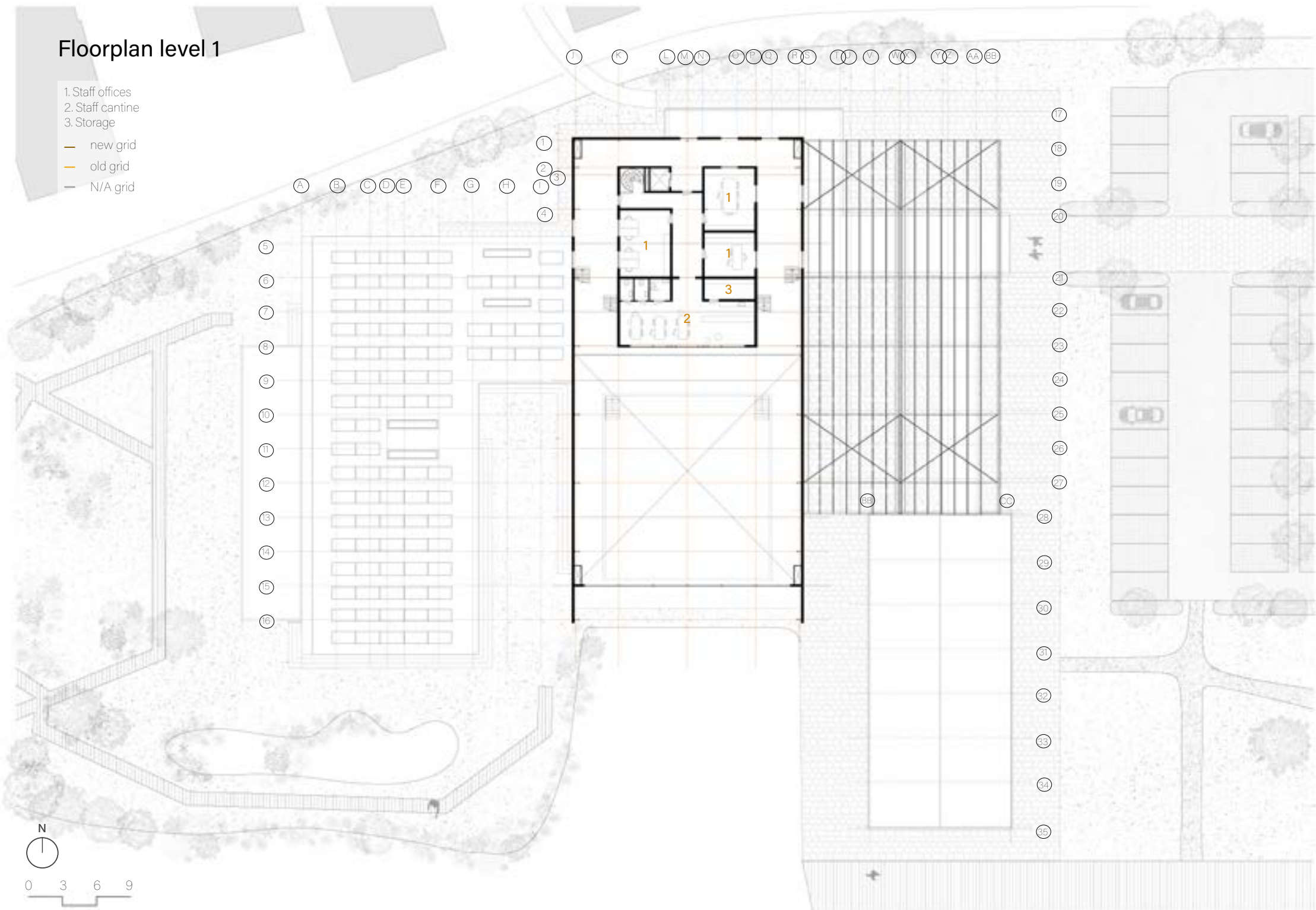
The pool is bordered by a large glass curtain wall, allowing the river to visually flow into the pool water, with the Biesbosch forming a scenic backdrop. Large doors open outwards, further enhancing the connection to the outdoors. Façade areas that require daylight while maintaining privacy are partially covered with slatted cladding elements. This occurs, for instance, on the north side of the building, which faces the neighboring houses, as well as in the windows overlooking the public garden.

In the restaurant, remnants of the original brick walls have been preserved. Together with the exposed historic structure, they remain visible from the interior and evoke the atmosphere of the old industrial hall.

Floorplan level 1

1. Staff offices
2. Staff cantine
3. Storage

— new grid
— old grid
— N/A grid



1:200 Floorplan level 1 (scaled down) - own drawing

The second floor houses the staff areas, including spaces such as meeting rooms, offices, and a canteen. These rooms are located in the center of the floor and therefore have no direct contact with the outside. They are all mechanically ventilated and fitted with interior windows that follow the same grid as the exterior windows. Since these openings are positioned high up, they still allow ample daylight to enter.

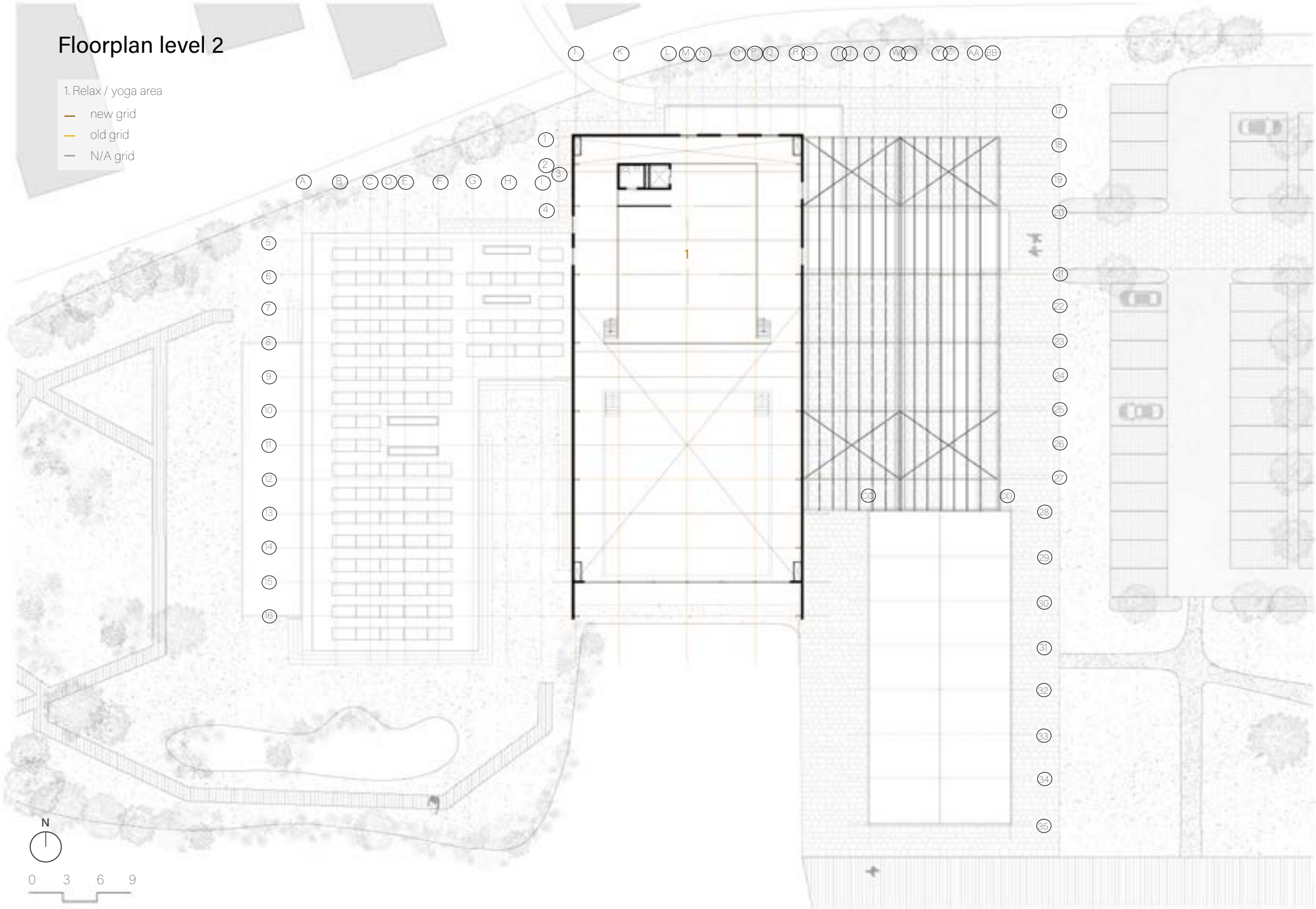
Additionally, the canteen features a large window facing the swimming pool and the glass curtain wall. These spaces are accessible to staff only and are connected to a secure area below via a dedicated staff staircase. Visitors can walk around the perimeter of these rooms. This circulation route allows them to observe the structural elements up close and enjoy views of the surrounding landscape through the large windows. From this level, they can also continue upward to the top floor.

As shown, the roof of the spa features several skylights. These are positioned above spaces that have no exterior windows, such as the spa area, the steam room, and the restrooms. This allows natural light to enter while still ensuring privacy.

Floorplan level 2

1. Relax / yoga area

— new grid
— old grid
— N/A grid



1:200 Floorplan level 1 (scaled down) - own drawing

The second and top floor is a large open space without interior walls. It opens up to the swimming pool below and is designed as a platform for sports, yoga, or relaxation. Beneath the trusses of the roof structure, the construction can be experienced even more directly. Curtains suspended from ceiling-mounted rails allow for the creation of more intimate settings when desired.

Thanks to the large skylights in the roof of the main hall, the space is still bathed in natural light, offering views of the sky above while sitting on the platform.

Elevations and materials

Of the Delta Shipyard

The façades of the building are presented on the following page. To maintain a natural atmosphere and bring a sense of calm to the rather intense ruin that remains of the original hall, a selection of calm and natural materials was chosen. This approach draws attention to the historic structure and its doors, while the new materials provide a subtle contrast. The concept involves wrapping the old halls in a new outer layer—creating a fresh skin over the existing structure.

This allows the original construction to be experienced clearly from the inside, while appearing more restrained from the outside, in harmony with the surrounding nature. The façades transition seamlessly from wall to roof, creating a soft and continuous surface. The architectural language of the gallery and spa is consistent in style, rhythm, and material. A warmer-toned wood was selected for these areas to contrast with the cooler hues of the original halls.

Over time, all of the wood will naturally weather and change color. Rather than being seen as a flaw, this process expresses the building's relationship with time and nature—something that aligns with the project's core values.

Blue tiles are used as a subtle reference to the characteristic blue of the former shipyard, still visible in the original doors. In the pools, green-blue tiles were chosen to evoke the feeling of bathing in natural water. The floors are finished with ceramic natural stone tiles. These contribute to the natural material palette and are anti-slip, making them safe for use around the swimming pool. They also perform well in humid conditions and are compatible with underfloor heating. In addition to wood, the walls feature tadelakt—a natural plaster made from lime, traditionally used in bathhouses. It adds to the tactile and natural atmosphere of the interior.

The foundations and basements are constructed in concrete. This concrete structure forms the building's base, upon which a lighter wooden frame and façade are built. This construction method references the traditional ways in which people in the Water Triangle region once built their homes, as described in my research.

Material inspiration - own collage

East elevation

South elevation

West elevation

North elevation

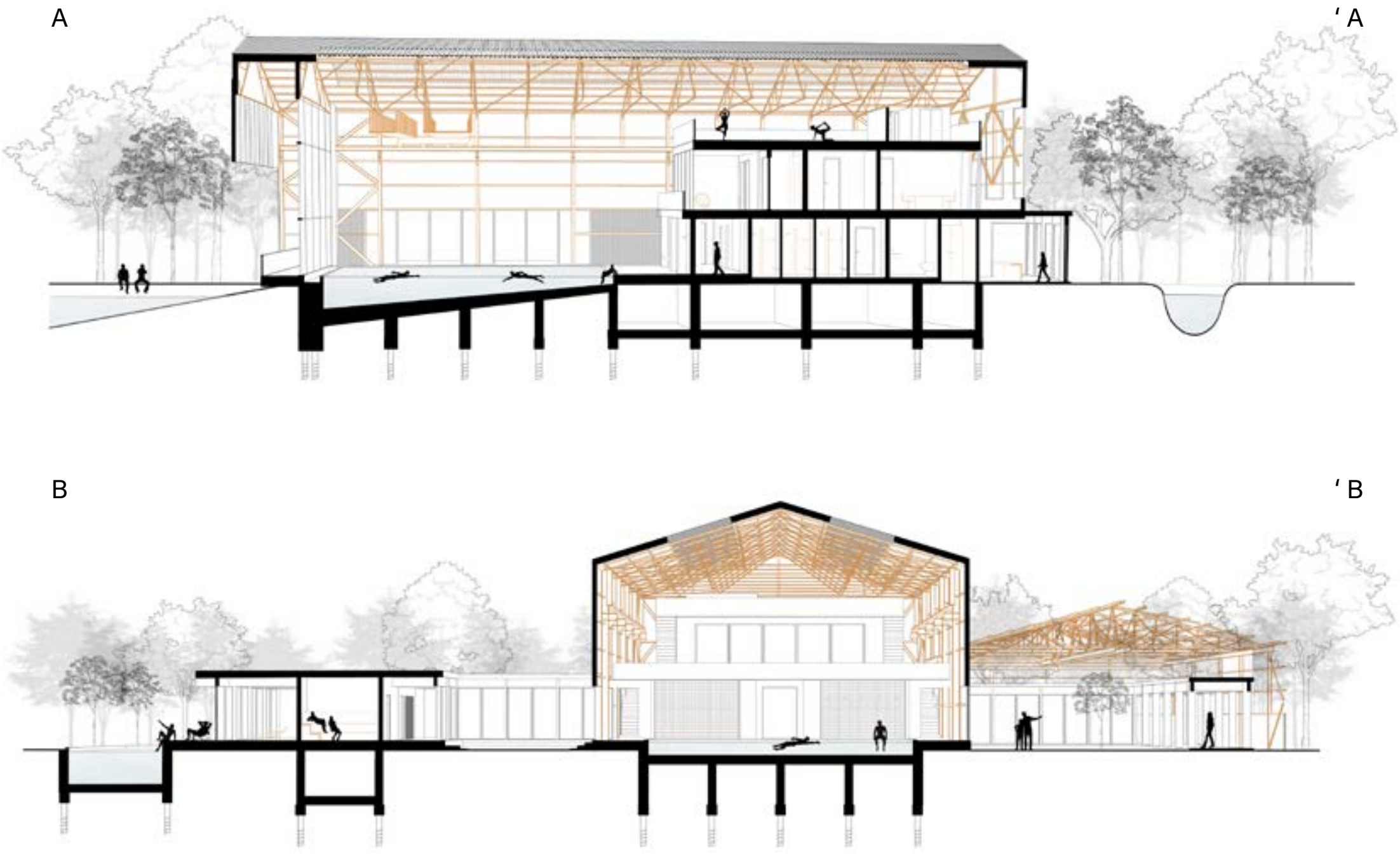
1:200 Elevations (scaled down) - own drawings

Cross sections
Of the Delta Shipyard

The cross sections clearly illustrate how the structure relates to the rest of the building. They also emphasize how the swimming pool once again forms the central element, from which the construction can be fully experienced. The loopkatkraan (overhead crane) is also clearly visible here. The glass curtain wall is set one structural bay behind the original grid. This design choice was made not only to preserve the historic sliding door but also to reduce the amount of direct sunlight entering the space and to avoid overheating. The infinity edge of the swimming pool is also visible at this curtain wall, enhancing the sensation of swimming directly in the river.

On the north side of the building, the vertical development is clearly visible, along with the various functional zones. The sections also reveal how the floor level on the south side is higher than on the north side—a measure against high water levels. The floor gently slopes downward, making the space accessible and wheelchair-friendly.

The cross sections further highlight how the architectural language of the gallery and the spa corresponds, both of them situated alongside interior gardens.



1:200 cross sections (scaled down) - own drawings

Chapter 4

Technical design

Technical detailing
1:5 and 1:20 scale

The following pages contain the technical details of the building. First, three 1:5 details are presented, followed by a 1:20 façade fragment including both horizontal and vertical sections. All drawings have been rescaled to fit the pages of this booklet, but they are detailed according to the scales indicated.

The 1:5 details are shown in both their 'existing' (old) condition and the 'new' design situation. As much of the original building has been lost in its current state, the old details are sometimes quite minimal. One of the details is even entirely empty in the old situation, as there was no wall or structure present at that location. Nevertheless, including this was important to clearly demonstrate that a new construction element has since been added.

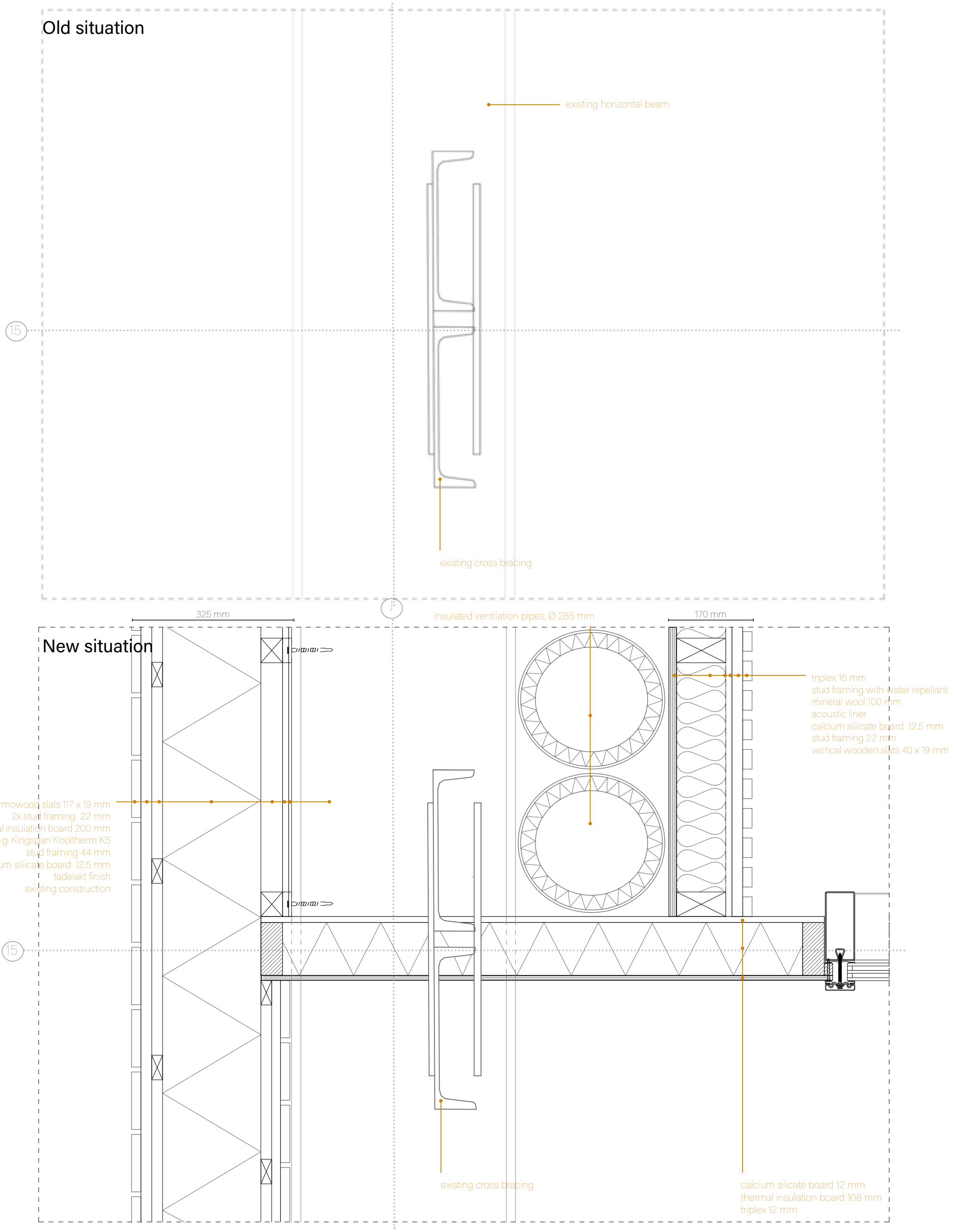
The details highlight three distinct and crucial moments in the building: places where the new structure interrupts the old—or vice versa—where new and existing walls meet, or where interior and exterior elements intersect. In this way, the drawings clarify the different architectural relationships within the building.

The 1:20 section presents the most significant fragment of the façade, including a detailed section of the building. This is the point where the pool edge meets the wall and transitions into the exterior. It shows how these junctions are formed, and how an open spatial experience is created through the placement of windows and doors in the building's base. The drawings also clearly show how the old structure is wrapped in a new 'skin'—the façade system. The height difference between the hall and the swimming pool is also made apparent.

Information on materials, dimensions, and further explanations are included directly within the drawings.

Horizontal detail 1:5 (scaled down)

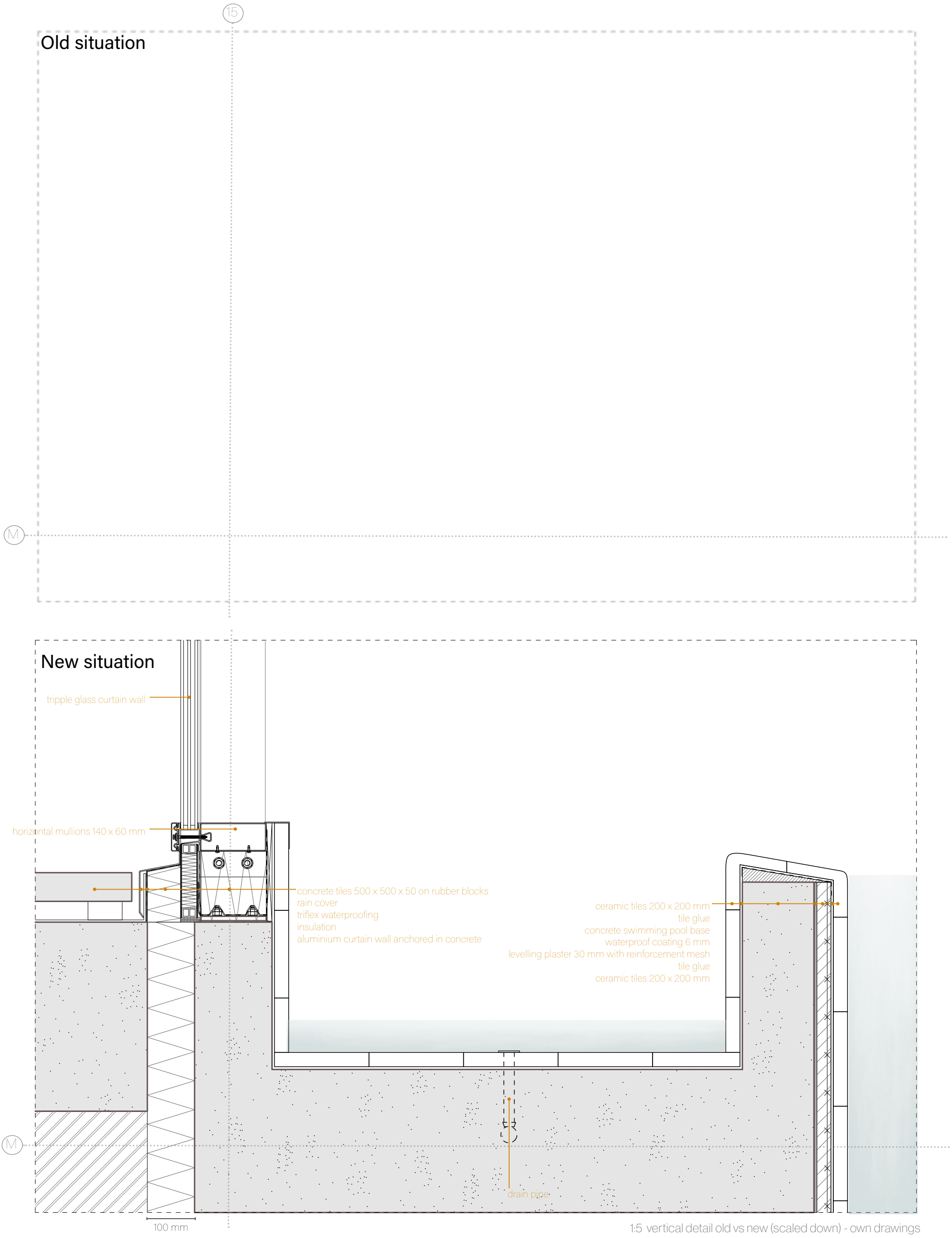
New wall meets cross bracing



1:5 horizontal detail old vs new (scaled down) - own drawings

Vertical detail 1:5 (scaled down)

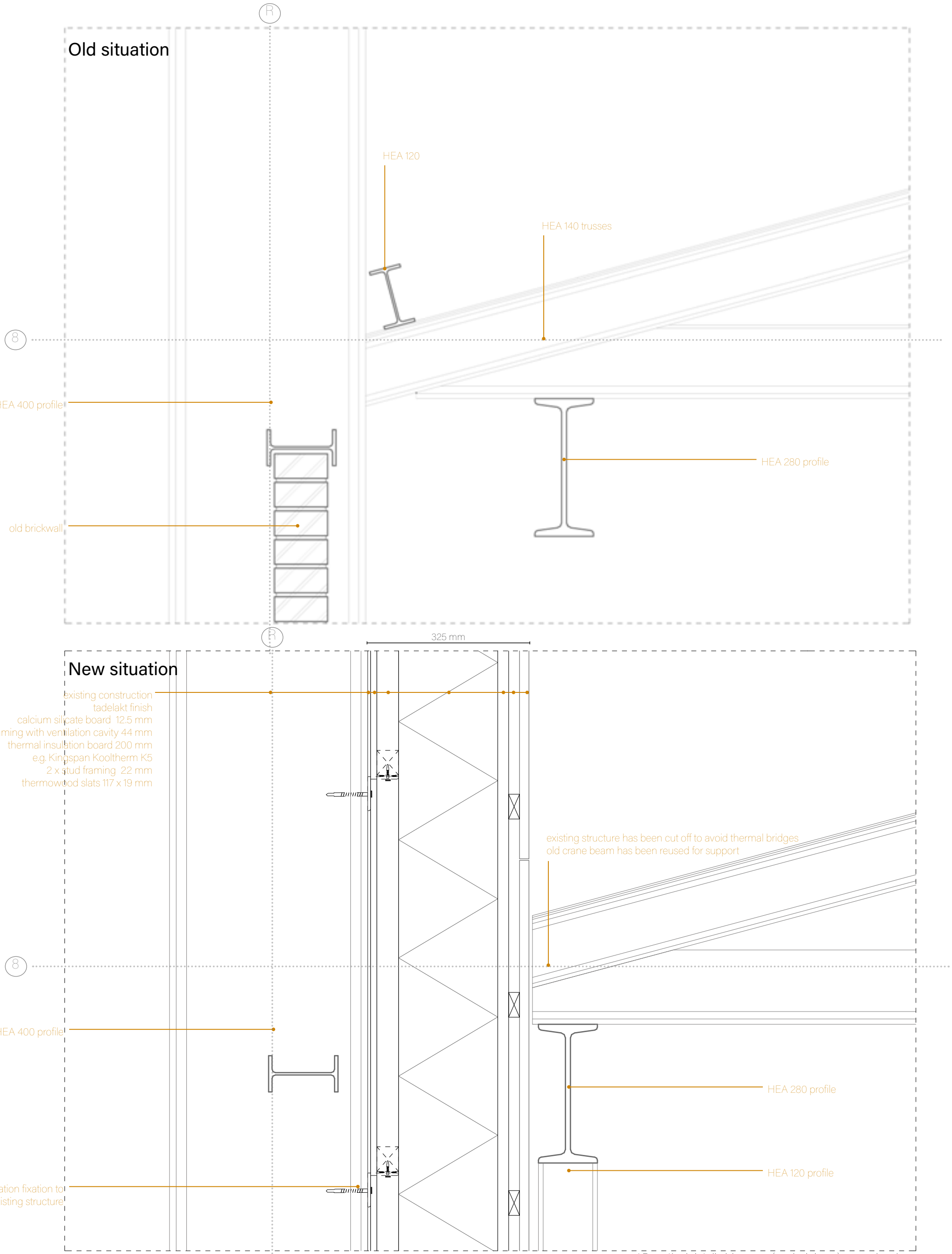
Edge of infinity pool meets curtain wall



1:5 vertical detail old vs new (scaled down) - own drawings

Vertical detail 1:5 (scaled down)

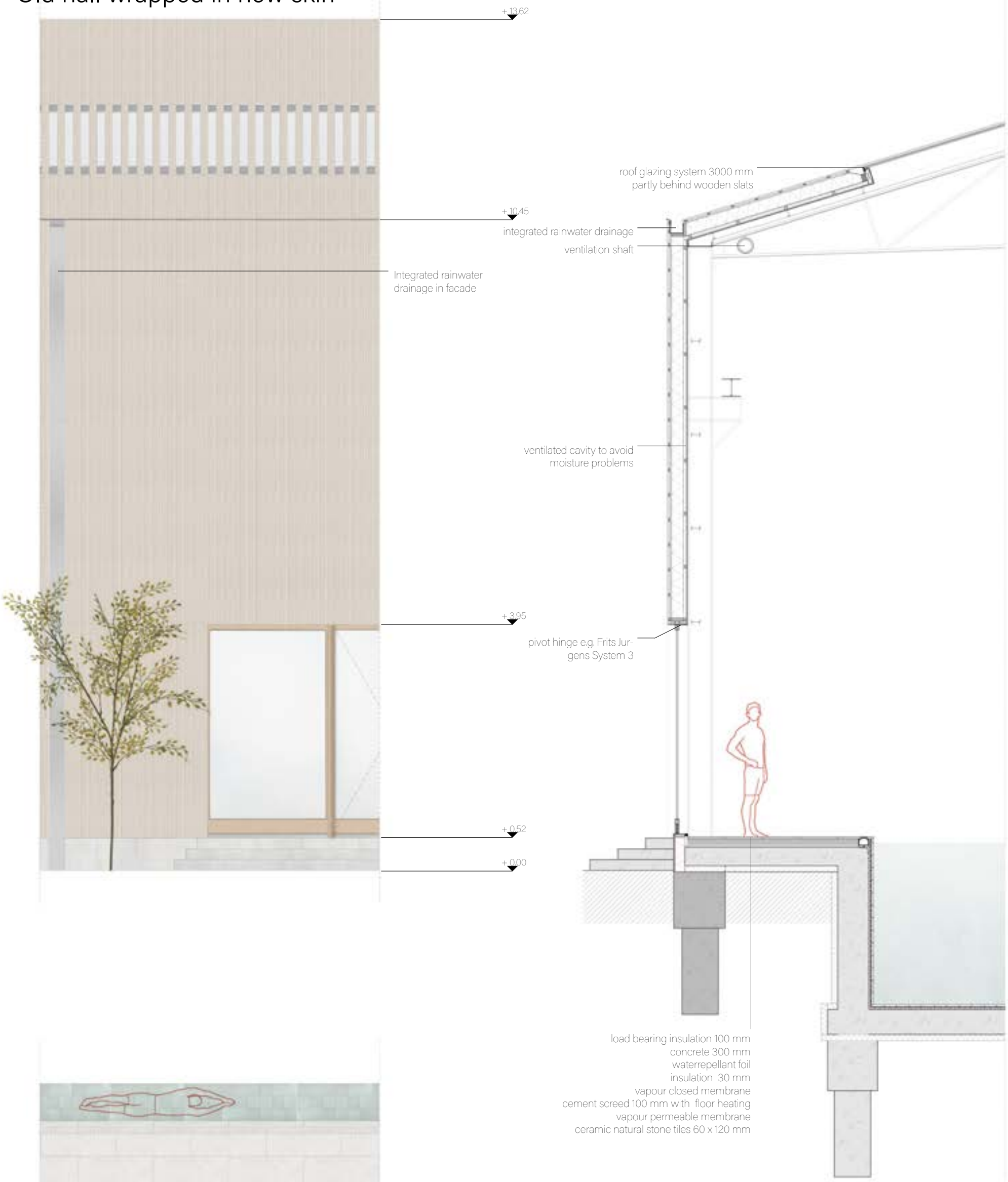
New skin interrupts old construction



1:5 vertical detail old vs new (scaled down) - own drawings

Facade fragment 1:20 (scaled down)

Old hall wrapped in new skin



1:20 vertical and horizontal facade fragment (scaled down) - own drawings

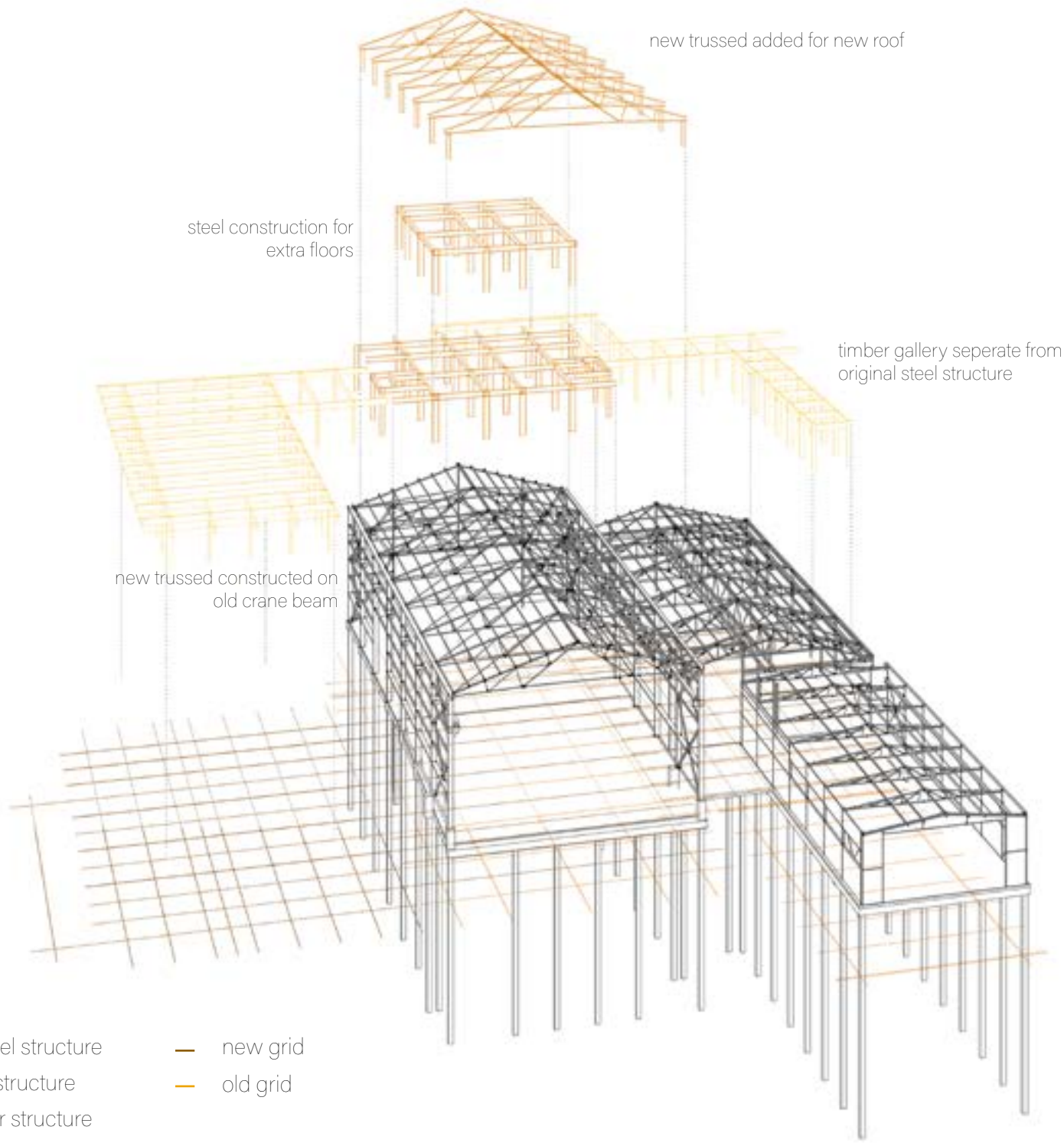
Construction

Axonometric drawing

A new structural system was required to accommodate the additional floors within the building. A steel column structure was chosen for these new levels, allowing for a flexible layout, slender profiles across the full floor plans, and a visual balance with the already complex existing structure of the hall. This steel frame is supported by the basement foundation structure.

For the roof, additional trusses were introduced to carry the new roof assembly. These trusses are doubled up and rest on a large beam that originally served to carry heavy loads via the overhead crane. This approach eliminates the need for additional vertical columns.

For the construction of the spa and gallery, a timber structure was selected. This choice reflects the natural character of the design—wood is a renewable material, offers improved sustainability, and conveys a warm and calming aesthetic. It also helps to prevent thermal bridging, which would otherwise occur due to the cantilevered elements and extensive glazing. These timber structures follow their own structural grid, but remain in rhythm with the original layout, responding to it thoughtfully. As a result, they stand independently while maintaining a sense of harmony and cohesion.



Axonometric drawing construction of the halls - own drawing

Climate schemes
Winter situation

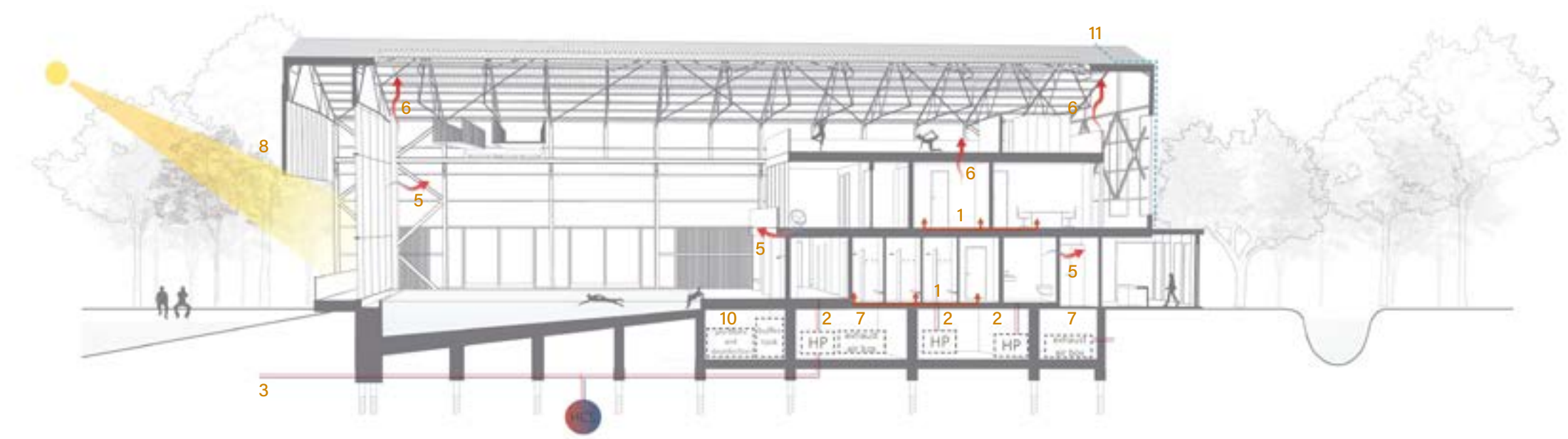
Climate control in a transformed building poses a significant challenge—especially when converting a former shipyard into a spa and swimming facility. The original function required no more than protection from wind and rain, while the new program demands a carefully controlled indoor climate.

In addition to a new façade system with high-performance insulation, several measures have been implemented.

To heat the building, underfloor heating has been installed to provide a comfortable indoor environment. Warm air and fresh air are also supplied through the ventilation system, with ducts integrated into the walls to keep the roof structure as visually open as possible. During the winter, solar gain through the large glass curtain wall will also contribute to passive heating.

The heat pump system operates on a water-to-water basis and draws thermal energy from the river, stored and distributed via an aquifer thermal energy storage (ATES) system. PV(T) panels further support the heating system and contribute to powering the climate installations.

The swimming pool itself is set deeper into the ground, which helps retain heat more efficiently.



1 low temperature floor heating

2 water - water heatpump for swimming pool water, shower water, cooling the buildings

3 aquathermal energy system, heat-cold storage is connected to the river

4 pv(t) panels for electricity and warm water

5 inlet fresh and warm air through walls

6 outlet saturated air through roof

7 air handling unit with heat recovery

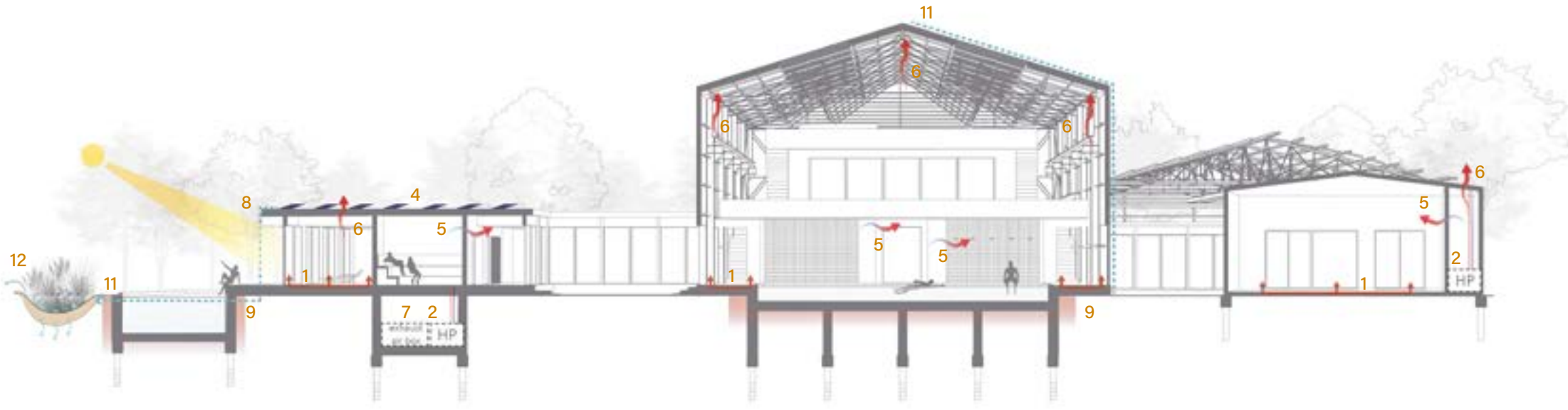
8 low winter suns warms the building

9 swimming pool buried in the ground limits heat loss

10 pool water filtering systems

11 rain water collection for toilet use

12 constructed wetlands for natural water filtering and delayed water infiltration



Climate scheme, winter situation - own drawings

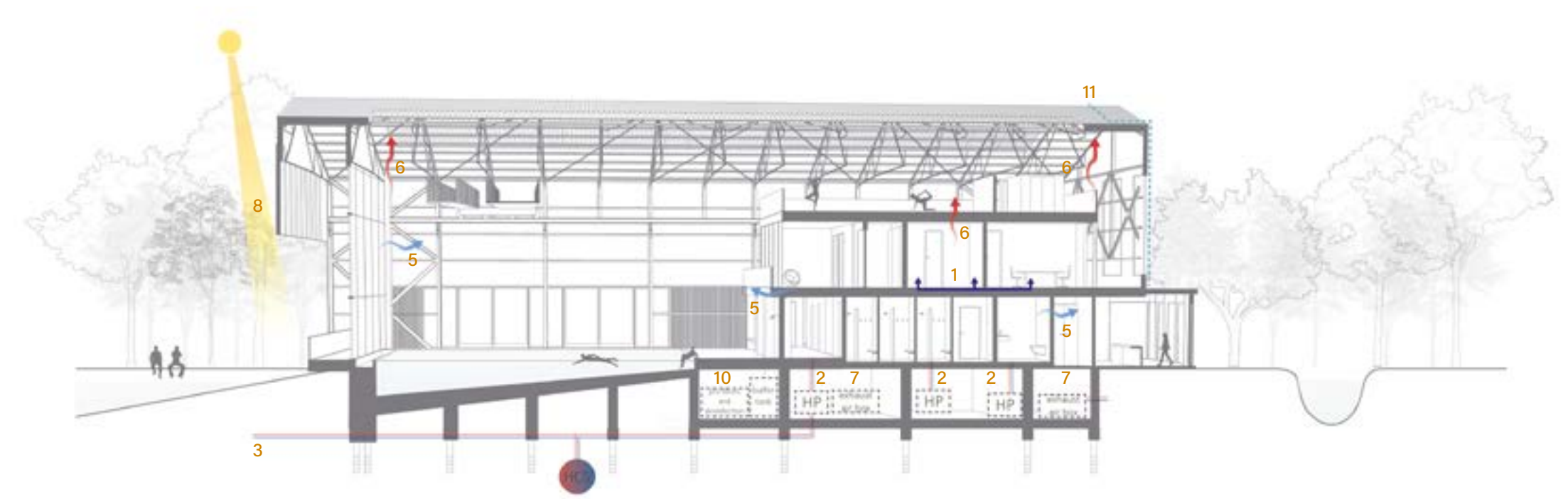
Climate schemes

Summer situation

In summer, the space is cooled using the same system as for heating. Thanks to the high angle of the summer sun, the large sliding door in front of the curtain wall helps prevent additional heat gain. In the spa area, the roof overhang provides similar protection against overheating.

Warm air is extracted internally through ceiling-mounted shafts and expelled outdoors. The heat is recovered via a heat exchanger, transferring it to water that requires heating, such as for showers or the swimming pool. On particularly warm days, large pivot doors in the façade can be opened to allow fresh air to circulate naturally through the space.

Rainwater is collected through roof gutters and garden surfaces and is directed to helophyte filters located in the garden. In this way, rainwater is naturally and energy-efficiently purified, then either returned to nature or reused for toilet flushing—supporting a zero-energy, sustainable water cycle.



1 floor cooling

2 water - water heatpump for swimming pool water, shower water, cooling the buildings

3 aquathermal energy system, heat-cold storage is connected to the river

4 pv(t) panels for electricity and warm water

5 inlet fresh and cool air through walls

6 outlet saturated air through roof

7 air handling unit with heat recovery

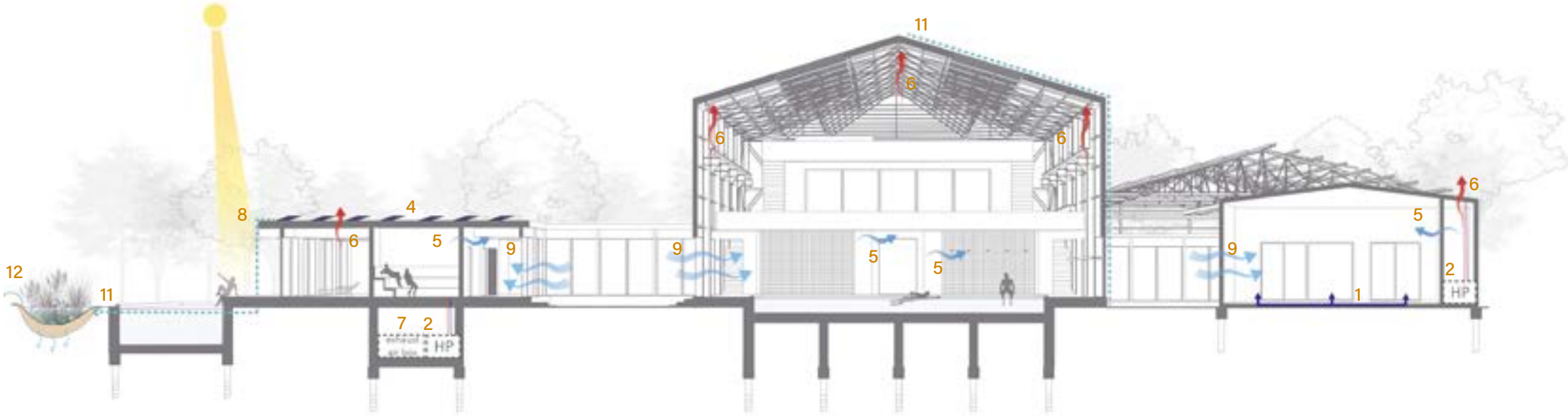
8 overhang protects again sunheat

9 opening doors and windows for natural ventilation

10 pool water filtering systems

11 rain water collection for toilet use

12 constructed wetlands for natural water filtering and delayed water infiltration



Climate scheme, summer situation - own drawings

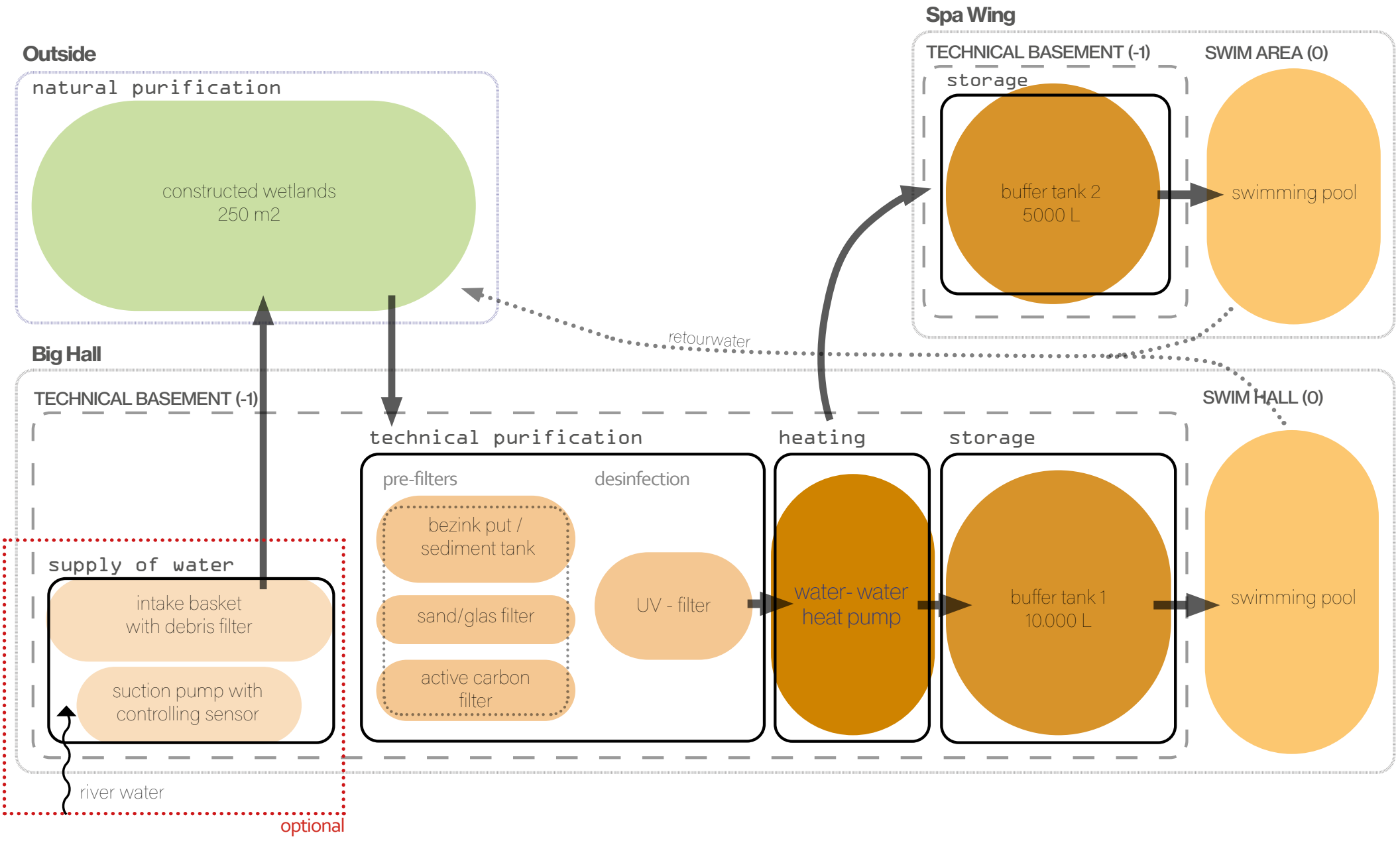
Water circulation

Filtering scheme poolwater

One option is to filter the pool water in a natural way, potentially even drawing it from the nearby river. This would perfectly align with the values of nature and water connection, further strengthening the concept behind the pool. However, this approach can be complex—and possibly unnecessary—especially when it involves using river water. The river is heavily polluted due to cargo ship traffic, so it would require thorough filtration. Once the pools are filled, such intensive filtering is no longer needed, meaning that much of the system would go unused.

Nonetheless, part of the filtration system can still be employed—for example, by channeling return water through constructed wetlands before it passes through the standard filtration process again. This still supports the nature value, as the water is partly treated through a natural system. It also reinforces the connection between land, water, and people. In this way, no chemical additives such as chlorine are needed, and the water remains environmentally friendly.

Below is a diagram illustrating how this filtration system could work. The step involving river water is optional and can be omitted if it proves too demanding or unfeasible.



Water filtering scheme - own diagram

Chapter 5

Renders