THE FUTURE
OILSCAPE

The Transformation of the Oil Industry
Area of Pernis in the Harbour of Rotterdam

COLOPHON

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Industrial heritage has become part of a history and identity of the location. But heritage is one step more in-depth. History and heritage are often seen as the same element, but history is an intellectual interest in the past, whereas heritage is a practice where the past is in or adapted to the present. Industrial heritage tells the story about development, great achievements and constructions and the creative genius of human kind.

– Falser, 2001 –

Illustration 1. Location of my house. Source: Google Earth Pro

PERNIS
INDUSTRIAL
AREA

MY HOME

Illustration 2. Chimneys of Pernis. Source: Author

PREFACE

I started this project with the interest in the oil landscape, but at first, I could not explain why. During my research I found out that the interest was always there. The oil landscape and its silhouette was always in the background when I was growing up and bicycling to school. Illustration 1 and 2 show the position of my home and the landscape of oil, Pernis. This changing view with smoke clouds and flames is also the place where my father goes to work. He works for Shell Pernis and his father, my grandfather, did too. The stories about work and experiences they both shared have always been part of my life. This, together with this still mysterious isolated world, arouse my interest.

But how will this future oil landscape look like? Slowly we are getting to know the possibilities of the future. Driving electric vehicles, produce our own electricity with solar panels on our own roofs and recycle as much as possible. Currently, the fossil fuels are still a very big part of our daily life. Companies such as ExxonMobil, Esso and Shell are still very big economic and social drivers. What will happen to the whole social life connected to this? Will this maybe become part of our heritage?

I am very interested in how we can preserve the period of the oil industry in the future since this has been a very big part of our lives.

SUMMARY

The world faces another energy transition. The fossil fuels era slowly transforms into the era of renewable energy. But what happens to the fossil fuel related industries. This project specifically focusses on the oil industry. Previous energy transitions in the Netherlands have given us much industrial heritage. The windmills of Kinderdijk, the Beemster polder and the mines in Limburg are just a few examples of such industrial heritage. Will the oil industry also give us an element to remember?

The PICH Project, which is also included in the research, concluded that with industrial heritage, the physical elements of the site are preserved, but the story that comes with it, is not. Together with the current trend of storytelling and meaning of place, this is implemented in the research and design of the project.

Theoretical research tells us that industrial heritage is not easy. Because of its specific and strange structures and elements, and its huge scale it is not an easy task to transform such sites and preserve them as they are. Many sources tell that re-use of such sites is still the best way to preserve them. The Emscher Park in Germany is the most famous example of industrial areas transformed and re-used in a recreational way.

This project focusses on the harbour of Rotterdam and specifically on Pernis' industrial area. Historical development research showed that the harbour grows out of the city towards the sea and Pernis is therefore the next area to transform when this development continues in the future. Pernis is not only the next area facing transformation, it is also the largest oil refinery in Europe and one of the largest in the world. This also gave a challenge in transformation possibilities in the design.

To know how to deal with the area and what kind of functions are needed, future perspectives of involved stakeholders were analysed. This showed that population growth and renewable energy were subjects that occurred frequently in these reports. Therefore, the design for a masterplan contains a residential area and an energy park.

The design also shows three possibilities of what a certain area of Pernis could look like in the future. A variety of images shows three different uses of how to preserve the oil industry of Pernis based on four core values that came out of the earlier research. Because the oil industry is still needed nowadays, and the future is unsure, despite the predictions of the end of oil, these images show a possibility of how to deal with the remains of the oil industry.

CONTENT

INTRODUCTION

Diving more into the world of oil, already showed the need for renewable energy sources and the next energy transition. Dominant energies and associated prime movers have always left deep, and specific, imprints on society. The ages of peat and wood in the early years and coal a bit later, were the first inexpensive mechanical prime movers that not only replaced many stationary tasks, but also turned dreams of travels into an inexpensive reality. (Smil, 2008) The age of oil is not any different, it has a deep impact on the society that we live in. We use oil as fuel for our transportation, plastics are partly made of oil, medicines and cosmetics, and there is a lot more to mention in the world of oil. But the discussion about the future of oil has been an ongoing discussion for several years now. Are we ready for another energy transition and what will remain in the future?

The topic of this research and design focusses first on the physical elements that remain of the oil industry, especially the large structures of pipelines and storage tanks in the harbour areas. Second, the story of the place is very important. Industries, such as the oil industry, always have a big societal influence. Whole societies are related to the production of the fuel and to the area. The research on why industrial heritage is so important is a big part of the project. The physical elements and the story together tell the complete story of the place.

This report contains my research and design to finalize my master Urbanism at the faculty of Architecture, Urbanism and Building Sciences at the Delft University of Technology. The research group this project belongs in, is the History and Heritage Vector. This research group focusses on redesign of heritage, on transformation of urban structures and buildings, and the balance between old and new. Concerning preservation and renewal in existing structures and values related to history and the current issues of sustainability. (TU Delft, 2017)

The goal of this project is therefore to reframe the oil industry of Pernis in the harbour of Rotterdam. Reframing means preserving the remains of the oil industry in a sustainable way. The way of preserving the oil industry by reframing, is to tell the physical and mental elements of the story. These physical and mental elements will tell the story of the oil industry in a sustainable transformed area. In this way, the oil industry will be remembered, but also used in the current needs of society.

This report will give an inside in the era after the oil industry. The primary objective of the research is to design and develop a framework of the transformation of the oil landscape in the harbour of Rotterdam. In this research and design, the search for heritage value is important. Why do we preserve this, which elements of the oil industry will become heritage and what do we value about the structures of the harbour? The report will also try to tell you why the meaning of the place together with storytelling is so important in the transformation of the area and for future developments.

PROBLEM DEFINITION

This chapter explains the energy transitions The Netherlands have been through the last centuries. It explains how the landscape changed and questions how and when the oil landscape changes in the coming energy transition. The coal industry serves as an example in this transition, because it is already going through such a transition. This chapter concludes with a problem statement and research questions to guide the research and design of this project.

Illustration 3. Energie agenda Dutch Government. Source: Energiemedia, n.d..

1.1 ENERGY TRANSITION OF THE NETHERLANDS

The world comes to a period of energy transition. The energy transition leads the world from fossil fuels to renewable energy. The use and possibilities of fossil fuels brought the world a lot of new inventions and developments, but also consequences that led to climate change and pollution. The energy agreement wants to bring down the CO_2 emissions to 80–95 % in 2050 and made agreements to produce more renewable energy (illustration 3) (Rijksdienst voor het Cultureel Erfgoed, n.d.-a).

But this is not the first energy transition that we are going through. This chapter will explain the energy transition of the Netherlands from 1500 until now (illustration 4) and how the landscape changed. The transition from one energy source to another has a big impact on our environment (Rijksdienst voor het Cultureel Erfgoed, n.d.-a).

The Peat Landscape was the first source to change the landscape since 1500. The exploitation of peat created a lot of canals for the transportation. Most of the peat was transported to the west of the Netherlands and was used as fuel for housing and industry. (Drents Archief, n.d.) In the area between Rotterdam, The Hague and Zoetermeer there are also big peat landscapes. (Van Trikt & Ahrens, n.d.) The peat era had a big impact on the landscape. Whole areas change into lakes and the

employment opportunities caused movement of villages and settlements. (Rijksdienst voor het Cultureel Erfgoed, n.d.-a) Around 1920, the peat era came into a crisis and led to poverty (Drents Archief, n.d.), but this type of industry let to large areas of changed landscape. The Loosdrechtse Plassen near Utrecht for example. These lakes are now used as recreational areas, but used to be peat landscapes.

Coppicing was also a source for fuel. Trees were used, or grown and then used, for fuel. The wood was used for heating houses and was used for tools. The landscape was influenced again, they planted many trees and after ten years they logged them to use as fuel. (Rijksdienst voor het Cultureel Erfgoed, n.d.-a)

With the increase of prosperity, the need for agricultural land increased. The first 'droogmakerijen'

were developed. From 1500 (illustration 4), new technologies made it possible to drain lakes. Windmills were used to create energy for pumping out the water. Not only natural lakes were drained, but also the peat lakes developed through peat exploitation. Around the area that had to be drained, dikes were constructed. Along many dikes villages appeared and farmers build farms for agricultural purposes. (Rijksdienst voor het Cultureel Erfgoed, n.d.-b) This was again a big impact on the environment and landscape. Areas that used to be lake, became flat grass landscapes used to cultivate food.

In the 17th and 18th century (illustration 4), windmills were not only used to drain lakes and land, but also as industrial tools. They were used to press seeds and grain, and to saw wood (Rijksdienst voor het Cultureel

Erfgoed, n.d.-a). This energy source did not change the landscape much. The wind was used to press and saw, and the mills itself did not have that much impact on the surrounding landscapes as the energy resources mentioned before.

In the 20th century (illustration 4), the coal industry became more important in Europe, because of the ongoing industrial developments. The Dutch government became interested in mining, saw the potentials of this and constructed several State mines (Staatsmijnen) in the province of Limburg. The province flourished economically, and the job opportunities had risen. (Rijkheyt: Centrum voor regionale geschiedenis, n.d.) The mining industry had a high status in the province, but the government started closing the mines around 1970. This had a huge impact on the society. Jobs were lost, and the landscape

Peat landscape

Coppice Landscape

Polder Landscape

Wind Energy (Industrial)

1500

1600

1700

Landscape in itself

had changed because of the mining industry. But also, the office buildings, mine workers housing and monuments were of no use anymore. From 1975, there was a clearing of this coal and mining landscape and almost everything was demolished. (Rijkheyt: centrum voor regionale geschiedenis, 2015) In the early days of reconversion, the focus was on 'green' developments and the poor self-image among the community. Also, local authorities regarding tourism potentials were not stimulating to preserve the mining industry. (Jonsen-Verbeke, 1999) The operation 'from black to green' had to repair the landscape which used to be 75 years of mining. Only two shafts of the mining landscape remained, but currently the province and people related to the industry in any way, regret that the industrial and cultural heritage is lost. In the last years, the interest in the mining grew, because it is a

crucial chapter in the history of Limburg. Museums were build, and to this day universities give lectures about the history and expositions are held to honour this period. (Deen, 2003) The neighbourhoods that belonged to the mining industry are now protected, to secure the remains of the mining era. When the neighbourhoods were acknowledged there was a big feast to celebrate it.

Most of the energy transitions gave us many areas and structures that we value and appreciate, and even are World Heritage, such as the mills at Kinderdijk or the most famous polder in the Netherlands, the Beemster (Rijksdienst voor het Cultureel Erfgoed, n.d.-a). The oil industry will be the next to gives us structures to appreciate and remind us about another era with many achievements, but also many stories. As with the energy sources mentioned before, there are many villages

created along or near the energy sources. Any energy source had en large community connected to it, with many stories about the daily life in such environments. The oil industry has also large communities connected to it and with this come many stories about oil and their connection to it.

1.2   THE CHANGE OF THE COAL MINING ERA

Since the mining industry is an industry that is going through the conversion of industry to heritage right now, there will be some more elaboration on this and some more examples of already transformed areas. Mining has been a basis for the development of industrial societies around the world. (Conlin & Jolliffe, 2011) Many societies

Mining Industry

Oil Industry
(Gas, electricity, nuclear energy)

Solar and Wind Energy

1800		1900		2000	
	Peat Landscape and Polder Landscape		*Industrial Landscape*		*Energy Landscape*

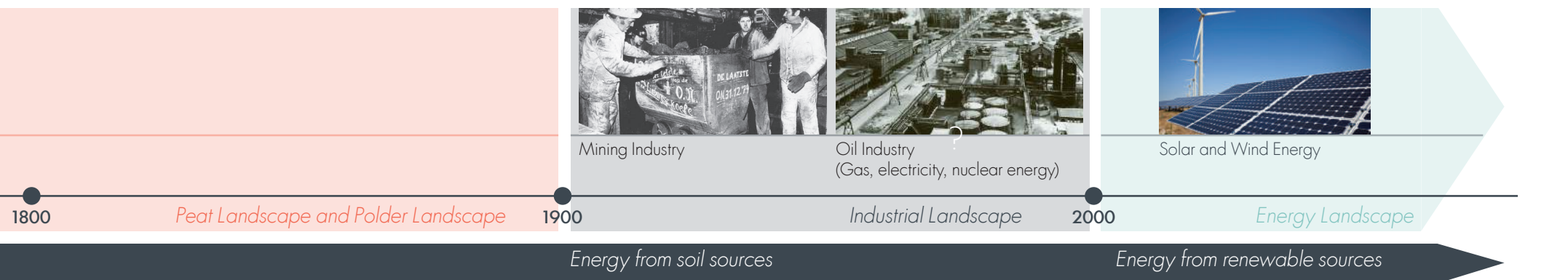*Energy from soil sources*   *Energy from renewable sources*

Illustration 4. Energy Transition Timeline. Source: Author. Information from: Rijksdienst voor het Cultureel Erfgoed, n.d.-a.

are thus related to this category of industry.

Loss of employment and decline in economic activity are some of the negative impacts when a mining site leaves a community. Finding another source to solve the impact is problematic. Restoring the level of economic activity or replacing the jobs lost by transforming the mines into attractions will never completely work, but it can contribute to the development of heritage tourism with benefits to the community. (Conlin & Jolliffe, 2011) Jones & Munday (as cited in Cole, 2004) mentioned that as the mining industry became more redundant, people were willing to accept its economic significance and historical social past. Former mining communities express themselves with mining monuments as a reminder of the conditions in the mines and they place an emotional value on the landscape. (Ballesteros & Ramírez, 2006) Duisburg Nord in Germany, Emscher Park (illustration 5), is one of the most famous examples of such a site. From 1988 to 2000, this new park changed the image of the Emscher Region in Germany. This project was the link between urban development and landscape in a very big scale. In 2007, three regions and thirty-five cities presented a concept for sustainable regional and urban development of the area. (Seltmann, 2007) An important component in projects such as this, is the opportunity for people to learn about the local history and to rediscover industrial heritage. (Jonsen-Verbeke, 1999) The Emscher Park not only honoured the past, but gave directions with the designs to the future of the region. The heritage is used

as a forming power for regional development. (Janssen, Luiten, Renes, & Rouwendal, 2013)

To return to the natural landscape, by erasing all traces of the mining era, is often the first reaction in the period after the closure of a mine. (Jansen-Verbeke as cited in Cole, 2004) But this is not always the answer. When mines close, the area must look for socio-economic alternatives. It is crucial to develop models of identification that provide symbolic elements, community and identity for new activities. (Ballesteros & Ramírez, 2006) Industrial heritage sites nowadays seldom showcase only machines, they represent the stories of the mine workers (Dicks, 2008).

But not only the stories are crucial. Ballard and Banks (as cited in Ballesteros & Ramírez, 2006) mention that industrial sites have their own cultural universe, because of their unique characteristics. Elements of the mining industry are unique in the world, as it is for most of the industrial sites. The sites and objects are specifically designed for this kind of industry and are again a celebration of achievements for the human kind. Interest in reconversion and local appreciation depends on the potential for the re-use of the objects. (Jonsen-Verbeke, 1999) Because the sites are specifically designed for this function, it makes it more difficult to give it a completely different function. Also, because the original mining industry is associated with environmental pollution and unsustainable practices on all fronts, it is harder to convince more people of the value of such sites. (Cole,

Illustration 5. New functions of the Emscher park. Source: Author

Illustration 6. View on Shell Pernis. Source: Port of Rotterdam, n.d.

1.3   THE CHANGE OF THE OIL ERA

The first seven decades of the 20th century witnessed a rapid change in energy production. The production of oil showed an unprecedented and exponential growth in the world. It roughly doubled every 10 years. In 1900 there was a production rate of 435.000 barrels per day and this grew to over 48 million barrels per day in the year 1970. (Hughes & Rudolph, 2011) This brought a lot of financial prosperity to several countries in the world and the introduction of refined oil products marked an important shift in modern energy consumption. The new fuels had higher heat content, were cleaner, easier and safer to use and offered flexibility in use than its predecessors. (Smil, 2008) The introduction of oil brought us a lot of benefits and changed our whole daily life. Although liquid fuels, including oil or petroleum-based products, remain the largest source of world energy consumption, the share of world marketed energy consumption falls from 33% in 2012 to 30% in 2040. (U.S. Energy Information Administration (EIA), 2016) We must accept that the oil era is slowly coming to its end. For over 50 years the capacity to grow and maintain supply has been a constant concern. (Miller & Sorrell, 2014)

Finding oil reserves has not been a very constant occupation anymore and if there is a discovery of these reserves there are three disadvantages; First, new discoveries are smaller than the fields they discovered during the 20th century. Second, new discoveries

Illustration 7. Mathematical relations involved in the complete cycle of production of any exhaustible resource. Source: Hubbert, 1956

limit their long-term production, because of their high depletion rates. In these two ways, the reserves cannot be used for the same long-time rate as the fields a few decades back. Last, new discoveries are almost always positioned in harsh environments which makes production and transportation much riskier and more expensive. The offshore, very deep field in Brazil and fields in the Arctic Ocean are some examples or these harsh environments. (Hughes & Rudolph, 2011)

Of course, the predictions and the coming end of oil has caught a lot of attention. Morel (2016) tells us that within ten years the demand for fossil fuels will definitely peak for the last time and after that only will decrease. Many newspapers tell us that the climate change is a fact and by the year of 2100, all fossil fuels must be banished. (ANP, 2014) The world must shift to renewable energy as soon as possible. Within a few decades we cannot rely on fossil fuels anymore. Many energy users will eventually choose for the more energy-efficient technologies which are currently more expensive. (U.S. Energy Information Administration (EIA), 2016) Rising oil prices would stimulate the discovery of conventional oil, the development of other resources and the diffusion of substitutes such as biofuels without economic disruption. (Miller & Sorrell, 2014) Miller and Sorrell (2014) say that this process will lead to substantial and sustained disruption of the global economy. They say that alternative sources are unable to fill the gap between the 'oil' energy and the renewable energy.

The world's largest companies, such as Shell, BP and Exxon Mobil, have announced a series of green investments; in wind farms, carbon capture and storage and battery storage systems. (Macalister, 2016) Now and in the future these companies must invest in sustainable developments to secure their own future. Sustainable development is broadly defined as living, producing and consuming in a manner that meets the needs of the present without compromising the ability of future generations to meet their own needs. (Twidell & Weir, 2015) In the development, these companies must look further into the future, the future where there is no oil left to produce and distribute.

Hubbert's Theory

In 1956, Hubbert already said that no finite resource can sustain for longer than a brief period such a rate of growth of production. The curve in figure 2 shows the method of this prediction. According to Hubbert, any finite resource follows a bells shaped curve in its production. (Towler, 2014) This means that the production will eventually decrease the same way that it made its way up. This entails that the peak rate and the timing depends on the total reserves that still exist, and the reserves are to be discovered. (Towler, 2014) The same curve is visible in the other figures on the left. If we compare the two lower illustrations, it is striking to see that, even if they were made in 1969 and 2014, the two of them predict the
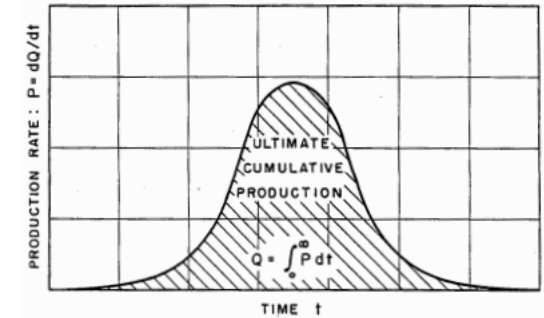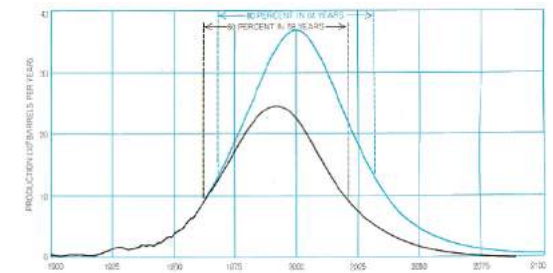

Illustration 8. Hubbert's 1969 Prediction of World Oil Production. Source: Towler, 2014.
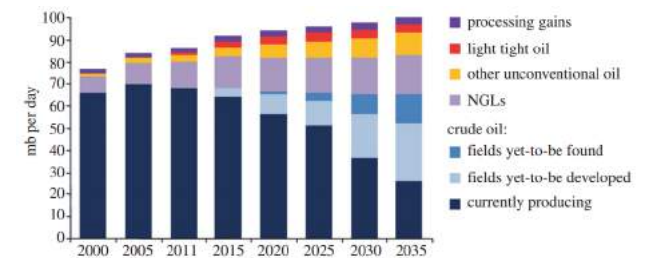

Illustration 9. Prediction of oil production. Source: Miller & Sorrell, 2014.

same. In the year 2035 the oil production will be almost 1/3 of what it is now. Of course, there are oil fields yet to discover and develop, which is also shown in illustration 9. But the world will rapidly change within 20 to 30 years from now.

The Future of Oil

Based on the above-mentioned research there are 2 aspects on oil consumption which need to be addressed. First, the negative news we hear about oil. This news influences the way we look at it and appreciate it. In other words: the outsiders. Second, the story and identity of the place, which are the memories and stories of the insiders.
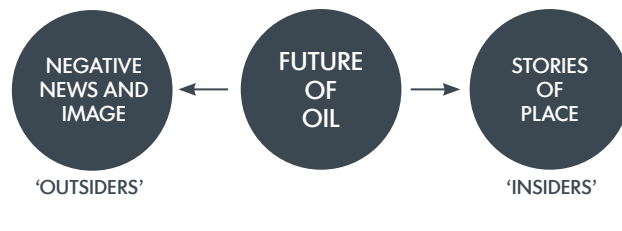
Illustration 10. Future of oil. Source: Author

The need for renewable energy has been made clear by many environmental organizations. According to Greenpeace (n.d.) and World Wildlife Fund (n.d.), extraction of oil and gas goes hand in hand with environmental pollution. Oil and gas exploration is polluting landscapes, powering climate change and costing too much money (Greenpeace, n.d.). New oil exploration can cause oil spills, which can cause extreme environmental pollution which will influence animals and humans depending on that ecosystem (World Wildlife Fund, n.d.).

The newspaper articles on the right show the contradicting image of the oil companies. On the one hand companies such as Shell show the sustainable projects they are working on, and on the other hand all kinds of organisations are against the oil industry. These contradicting facts form an uncertain image of the oil industry. The fact that renewable energy sources may not be ready to take over and many products are still made with oil, means that we still need oil for a few decades.

The aspect of stories of the place is further explained in the theory chapter 2.

SUSTAINABILITY

CORRUPTION & POLLUTION

Illustration 11. Newspaper titles. Source:
Sanoma Digital The Netherlands B.V. NU, n.d. | Schuurman, 2018 | Greenpeace NL, 2018

In the previous paragraphs, there was an introduction on the energy transition of the Netherlands and the future of oil. The current energy transition is from fossil fuels to renewable energy sources, such as sun, wind and water. The theory of Hubbert already stated that in 1956 that there is an end to each finite resource and its production. In 1969 Hubbert predicted the end of the oil production and said that in the year of 2075 the production will stop. Diagrams made in 2014 tell us a comparable story. In 2035 there will be 1/3 left of the current oil production. The current industrial landscape will transform.

My father is working for Shell Pernis in the Port of Rotterdam. Pernis is the largest refinery of Europe and one of the largest in the world (Shell Nederland, n.d.) and the first expansion made for the oil industry. (Shell Nederland Raffinaderij, 2002) The project in this report focusses on this area in the Port of Rotterdam and how sustainable developments and respect for the story of the place can work together to transform the Oil landscape into a Future Oilscape. The following problem statement and research questions will guide the research and design on this project.

1.4   PROBLEM STATEMENT

The Pernis industry area is the first big oil expansion in 1929 in the Port of Rotterdam. It was the first large step into the future of oil and the promising future of the harbour. However, nowadays the oil era is decreasing and its production will, according to several sources, become 1/3 of what it is now in a couple of decades and in the future maybe even disappear. A lot of big structures in the landscape will remain and remind us about oil and cannot be forgotten or demolished because they can be of value for people.
The most value lies with the people working in the oil industry, but the oil industry is a big part of all our lives and must be remembered as a great achievement in human history, where everyone is connected to.

1.5   RESEARCH QUESTIONS

The aim of this research is to build up an understanding of what possible new meaning and function the in the future obsolete oil industry will be. This research is based on one main research question and 5 sub research questions. The main research question is:

How can we transform the Pernis industry area into a new function while maintaining the physical and mental elements of the past oil industry?

To be able to answer the main research question, a series of more specific questions should be answered first.

1. How did the harbour of Rotterdam develop?

2. How did the Pernis Industrial Area develop and what is its story (mental elements)?

3. What physical elements are there, reminding us about oil and how can we use this?

4. How important is the story of a place (mental)?

5. What are the possibilities for a new function (and what is needed)?

THEORY

2

This chapter explains why industrial heritage is important for society. Why people came to value the roughness of industrial heritage and its big structures. A theoretical background is given why this topic is relevant for future developments. Heritage preservation is important for telling the story of such sites and show this to future generations to learn about processes and achievements.

The theory of Lynch, the research on the image of an area, will be explained and used in further research on the characteristics of Pernis. Meaning of place and Storytelling is also discussed in this chapter, together with the research of the Pich Project. This project researched the topic of industrial heritage last year.

INTERMEZZO: PICH PROJECT

During my graduation year, I was asked to work on the PICH Project as a research/student assistant.

This is an: "EU-funded research network that undertakes research in the field of spatial planning and heritage. The governance and regulation of the built environment through town or spatial planning has a determining effect on the quality and vitality of tangible and intangible cultural heritage. The processes and tools of planning vary from place to place and give different degrees of attention to the historic built environment. Our research aims to understand and compare the various approaches and their evolution. Our research questions are concerned with the complex relationships and processes within planning and governance institutions and the interplay with citizens' understandings of place." (PICH Project, n.d.)

The TU Delft team worked on cases such as the historic urban core of Breda, the industrial heritage of RDM in Rotterdam, and the landscape heritage of the New Dutch Waterline. I learned a lot of the discussions we had on comparing the different cases from different countries. One of the general conclusions was, that in heritage projects, the story of the place is never told. The physical elements of the site are preserved, but in none of the cases there was a reference to the former story (stories). Therefore, I tried to implement this in my own project.

The first period of transforming heritage was a bit radical. Churches became libraries or casinos for example. But there is a shift from radical transformation to transformations more respectful to the site. Nowadays the identity of the place becomes more and more important in future developments. The story of the place is told to relate back to the former use of the sites.

CONCLUSIONS ON INDUSTRIAL HERITAGE

"Industrial areas facing transformation are a commonplace feature of many cities as changing demands of industry and economic restructuring make certain locations such as harbours and primary and secondary industrial sites redundant. Industrial heritage may consist of buildings, machinery, sites for processing resources, transport infrastructure and related social facilities (TICCIH 2003). Industrial heritage tends to be more 'at risk' than other kinds of heritage (English Heritage 2014) although it may embody significant intangible heritage dimensions and place identity such as working culture and associated social traditions. The value of these built environment assets is not always recognised, and the urban planning tools are less well developed to consider the impacts on intangible heritage of physical change (Dublin Principles 2011)."
(Alewijn, Piskorek, Kermani, van der Toorn Vrijthoff & Nadin, 2018, p. 4)

"In the 1970s and 1980s we see a growing response to modernism and civic activism that advocated approaching the historic environment with more care. All four countries also saw a growing professional and cultural interest in heritage, both in general and more specifically in industrial heritage. Local governments gained more power to negotiate area-based decisions and partnerships befitting the local situation, and then apply this to post-industrial areas. Negotiations at this stage focused on developing partnerships and area deals with investors and (potential) new users and were government-led. This has continued although more recently, partnerships are unlikely to be government-led though the local state still has a position in the partnerships. All case studies saw a form of partnership development (Public Private Partnership, Triple Helix) that was relatively flexible in its ability to make area deals, negotiate the future use, heritage value, and planning of the area as well as a wider range of financial and heritage management tools, and strategic area development and branding. The post-industrial areas have also become,

to some extent, experimental areas for new approaches though planning traditions and normalised approaches are also strong influences.

Geographically, each of the areas has been historically disconnected from the surrounding urban fabric. This disconnect seems purposeful, as the industrial uses were either located in a place where natural features (water, valley) or artificial structures (walls, railroads) separated these areas from the surrounding city. Their location, is, however inherently urban and the transformation processes they are now experiencing is partly about re-connecting these places with the wider city. Relationally, the historical connection between the different sites and the outside world varied, according to the type of industry. Former industries' focus on water or rail infrastructure connected the respective areas to the wider world relevant to that specific industry and /or mode of transport. This also seems to affect where they look for ideas to take forward current redevelopment. For example, port areas are reflecting and copying regeneration practices from other port cities rather than using models that engage with local planning traditions. They also tent to engage with this wider context in terms of their heritage narrative, relating it to global histories in addition to the more localised industrial past. In the general process of industrial demise and the move of heavy industries outside the city from the 1970s onwards, these areas became largely functionally redundant. From the 1980s development attempts were made, in some cases as the start of a long evolving process, in other cases there has been more fluctuation between dormant and active periods. Either way, economic recessions both in the 1980s and the 2000s have impacted on these processes, and halted development, while at the same time allowing for 'innovation'. The need for decontamination and other the sometimes very challenging conditions (retaining walls, very robust or very fragile ruinous buildings) have also impacted on the transformation processes, slowing them down or bringing them to a halt all together sometimes for several years. All case studies saw some form of partnership development (some form of Public Private Partnership) and following this the introduction / application of a wider range of

financial and heritage management tools. In all cases we see a strategic approach of area development, where there remains space for negotiating heritage values on local level."
(Veldpaus & Pendlebury, 2018, p. 9)

"In all cases, heritage has been commodified and used for place-branding. Industrial aesthetics have been used to create a brand for the 'creative industries' SMEs, with reference to a history of engineering, manufacturing and innovation. New developments are portrayed as seemingly frictionless continuations of a glorious industrial past and much less attention is paid to the trauma of lost industries and jobs. The projects rarely address questions of belonging or, if they do, they ignore the 'sharper edges' of heritage narratives. The aim is to commodify the heritage sites, make them attractive and 'investment worthy' rather than reflect a balanced story of their history. None of the sites provide much interpretation of the heritage, the remnants of the past are assumed to be largely self-explanatory and self-evident."
(PICH Project, 2018)

Illustration 12. Front page Report Pich Project. Source: Nadin, Van der Toorn Vrijthof, Kermani, Piskorek, Alewijn, Mashayekhi, ... Parkinson, n.d..

2.1   WHY INDUSTRIAL HERITAGE?

"During the second half of the twentieth century, care for cultural heritage was fragmented into separate policies regarding monuments and built heritage on the one hand and archaeology on the other (Valetta Treaty, 1992, formalized later on in Wamz 2007). The Monumentenwet (Monuments Act of 1968; revised 1988) enabled the tools of the urban conservation area and listed monuments. The status of urban conservation area enables the municipality to receive funding from central agencies to maintain the heritage character of historic urban cores." (Alewijn, Piskorek, Kermani, Van der Toorn Vrijthoff, & Nadin, 2018)

During the 1990 (Feddes, 1999), heritage became more important in future developments and more elements and structures from the past where appreciated. In 1997, the Belvedere Memorandum was send to the government of the Netherlands to make the relationship between cultural history and spatial developments more important. (Feddes, 1999) The PICH Project did research in this field of knowledge (Intermezzo PICH Project) (Illustration 12). Four European countries researched 3 different cases in which the impact of urban planning and governance on heritage was analysed. Urban heritage, industrial

heritage and landscape heritage was were the three cases focussed on.

These three sorts of heritage became more important with the growing importance of heritage in general. The rules for preservation of such sites became more complex, because of the structure of these sites, which are woven into the urban context and the organically grown layers where components are separately connected to each other. (Janssen, Luiten, Renes, & Rouwendal, 2013)

Industrial heritage is challenging to deal with, because of its technical complexity, its social consequences, economic factor, scale and magnitude, and the negative perceptions that sometimes hinder the appreciation. (Douet, 2012) The technical complexity of such sites is difficult to transform and give a new function to it. The site is specifically designed for the industry which was there, with its factories and pipelines running through the area. But these physical elements are visible and recognizable for everyone. They are the means of understanding the past (Douet, 2012) and the real appreciation of industrial heritage works on a tangible level. (Oevermann & Mieg, 2015) It is therefore important to preserve physical structures of industrial sites. They teach us about the achievements of that period. Such sites also have an enormous effect on the society, because if the industry disappears, for example, lots of jobs get lost and this will have an impact on the economy.

Dealing with industrial heritage is becoming

more important. This relatively new category of heritage appreciates objects of the workplace. It has as much meaning in history as the objects to which more attention is being paid, such as (religious) architecture. Industrial heritage not only includes the factory, but also the engineering and social achievements of the technologies. (Falser, 2001) Industrial heritage always has a social site to its history. Whole communities where bound to the site and moved for their work to live nearby. Awareness of the cultural value of industrial heritage and the appreciation of its landscape is slowly penetrating people's minds. (Jonsen-Verbeke, 1999)

Many sources say that re-use of industrial sites is the best solution to preserve the objects that are of value. (Douet, 2012) Protection could only be achieved by transformation and finding a new destination for these sites. (Janssen et al., 2013) But there are of course many ways to re-use a site. It is important to realise what the designer is dealing with. Re-use has the role of extending the existence of an object, as well as putting it to its best use. (Florentina-Cristina, George-Laurentiu, Andreea-Loreta & Constantin, 2013) Opportunities for re-use must be recognised in such a way, that it highlights the architecture, economic usefulness and culture (Florentina-Cristina, George-Laureniu, Andreea-Loreta, & Constantin, 2013) The historical objects of the industrial past must be treated with respect towards its original structures. Evaluating the capacity of the industrial objects must come before the choice of the new function

and making radical changes or adjustments. (Romeo, Morezzi, & Rudiero, 2015) Carefully thinking about the new functions and transformations is important to respect the former structures of the industrial site and preserve it in its best way.

2.2   IMAGE OF A CITY

The importance of preservation of the structures, together with telling the story of the place is the conclusion from the paragraphs before. To find out which structures are important and recognisable in this area, the theory of Kevin Lynch is used to analyse this.

Lynch wrote a book about 'The Image of the City' that is about the recognition of a city and its characteristics.

According to Lynch (1960), there is a public image of a city which is the combination of many images. The analysis of these images limits itself to the physical effects.

The physical forms can be classified into five types of elements; districts, paths, edges, nodes and landmarks.;

1. "Districts are the medium-to-large sections of the city, conceived of as having two-dimensional extent, which the observer mentally enters "inside of," and which are recognizable as having some common, identifying character. Always

identifiable from the inside, they are also used for exterior reference if visible from the outside." (Lynch, 1960, p. 47)'

2. "Paths are the channels along which the observer customarily, occasionally, or potentially moves. They may be streets, walkways, transit lines, canals, railroads. For many people, these are the predominant elements in their image." (Lynch, 1960, p. 47)

3. "Edges are the linear elements not used or considered as paths by the observer. They are the boundaries between two phases, linear breaks in continuity: shores, railroad cuts, edges of development, walls. They are lateral references rather than coordinate axes." (Lynch, 1960, p. 47)

4. "Nodes are points, the strategic spots in a city into which an observer can enter, and which are the intensive foci to and from which he is traveling. They may be primarily junctions, places of a break in transportation, a crossing or convergence of paths, moments of shift from one structure to another." (Lynch, 1960, p. 47)

5. "Landmarks are another type of point-reference, but in this case the observer does not enter within them, they are external. They are usually a rather simply defined physical object: building, sign, store, or mountain. Their use involves the singling our of one element from a host of possibilities. Some landmarks are distant ones, typically seen from many angles and distances, over the tops of smaller elements, and used as radial references." (Lynch, 1960, p. 48)

The five categories are about the recognition of the area and the image of the area (city) as Lynch mentions in his book. With the help of these five types of elements of a city the area of Pernis can be transformed into a new image of the oil industry. The types will help to determine which layers of the area are important to preserve and which layers are less important and can be transformed.

But the structures of the industrial site are one thing to mention. An other side to re-use is the story element of the place.

2.3   MEANING OF PLACE & STORYTELLING

With the transformation of the oil landscape, the meaning of the place or story is very important. The current issue of the meaning of a place helps with this. People want to visit or live in a place with a story, a meaning of why this place or what happened in this place. Van Iersel (2016) mentions 4 important trends in society that follow the development of storytelling; the need for connection, search for support, back to the core and imagination. This shows that people are connected with their past and thus the activities that they ones or still are related to.

With the help of stories, we can find our own personality. The stories to which we refer to and characterize ourselves with, help us to identify ourselves, help us to make choices, recognize obstacles and understand our lives in a better way. (Koenen, n.d., as cited in Thema, n.d.)
Examples of storytelling in:

Organisations

Heineken is one of the largest beer breweries of the Netherlands. The founder of the company, Alfred Heineken, told the importance of stories in an organisation as followed: the biggest challenge of an entrepreneur is to get people on board. The only possibility to do so is to tell an authentic story, one that people believe in. He said: 'I am not an entrepreneur, I am a storyteller.' (Koenen, n.d., as cited in Thema, n.d.)

Area development

The most important example of a transformed area is the Ruhr area in Germany. This is also an area that uses its identity to promote itself. It does not wipe away its dirty history anymore. It uses its heritage as exiting industrial culture. Every factory transformed into a new function. 'Highovens' turned into a concert hall, you can skate in the Cokes factory and in the 'Ketelhuis' you can dine in style. (Iersel, 2016) All new functions to bring back the life in the area and use it in a sustainable way.

Functions

According to Arie Stoffelen (Idema, 2018), the need for products and services with a story is an societal trend recognisable in many branches. The example of beer breweries is one to mention. A few years ago there were a few big brands, but nowadays there are many microbreweries with their own beer with a story. This story gives more value to the product. (Idema, 2018) Functions such as camping also change into a more story related experience. People prefer a camping site with a story. They prefer a more place related camping site that suits their personal preferences. (Idema, 2018)

The current trend of storytelling in combination with the final conclusions of the PICH Project are the motivation to implement the story of the place in the design. The cases researched in the PICH Project tell us that the story of the place is usually not used in the elaboration of it, which is a shame, because many stories are connected to heritage sites. Because they are heritage or are listed to become heritage, that means that the area is of value for a big group of people.

2.4 REFRAME

The concept of Reframe comes from illustration 13 and is illustrated in illustration 14. The two sites of the future of oil are to contradictory sites.
First, is the current image of the oil industry. In general, the oil industry has a negative image of pollution and corruption around the world. Big companies such as Shell and Exxon Mobil are more and more connected to these negative stories. Therefore, on one site, sustainable developments are needed.
Second, is where the story of the oil industry is important, because industrial heritage tells the story about development, great achievements and constructions and the creative genius of human kind. (Falser, 2001) To respect and remember this, the story of oil can help.
To reframe oil, water is used in the new design principles. Water plays a big role in the Netherlands, the city of Rotterdam and the harbour. Water is also a source of renewable energy, which makes it a perfect replacement for oil and to showcase the former use and way of oil in the new design.

As mentioned before, re-use is the best way to preserve industrial heritage. According to Kolen & Renes (2015), people contribute to their world by a continuous process of reshaping. This happens by simply living their everyday life. To keep the story of the oil industry alive, it should adapt in some way to the current and future issues and developments.

THE NETHERLANDS
continuous fight against water

ROTTERDAM
city along one of the most important transportation rivers

HARBOUR
transportation via water

OIL
fossil fuel

WATER
source of renewable energy

ENERGY TRANSITION

FUTURE OF OIL

NEGATIVE NEWS AND IMAGE

STORIES OF WORKERS

Sustainable developments are necessary

Reframing the Oilscape

Without losing the (hi)story and physical structures of the site

OIL INTO WATER

STORIES PHYSICAL & MENTAL

Illustration 13. Conclusion theoretical research. Source: Author

BEFORE

AFTER
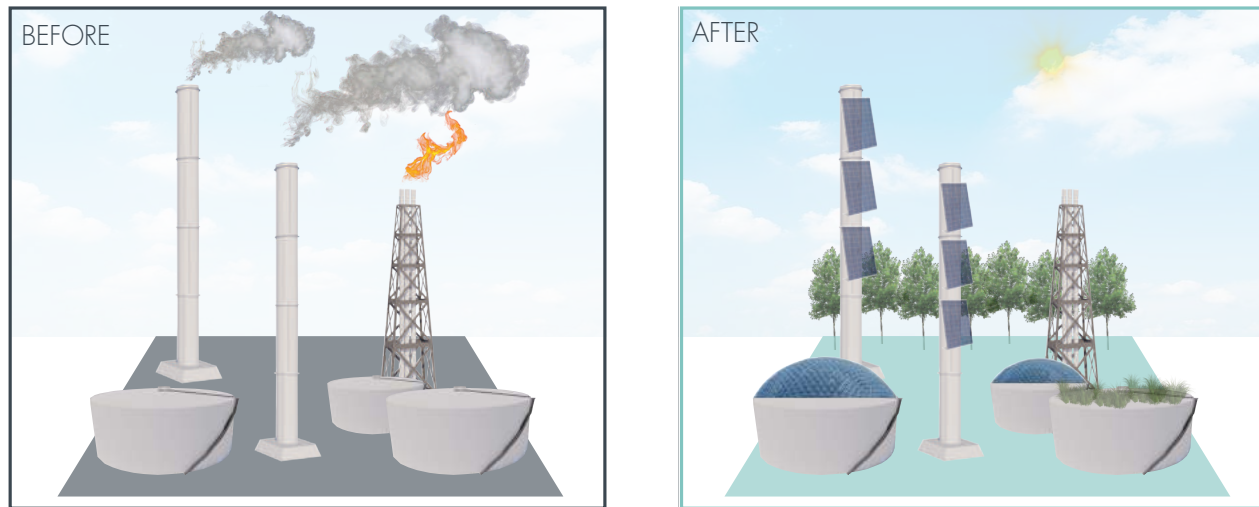
Illustration 14. Concept of Reframe. Source: Author

METHODS

3

This chapter explains the methods used to answer the research questions mentioned in the Problem Definition chapter. Every question comes with its own method.

This chapter also contains the scientific and societal relevance of this project, and an ethical discussion on the topic.

PROBLEM STATEMENT

PROJECT DEFINITION

statement
questions
aims

definition
+
orientation
+
personal interest

THEORETICAL RESEARCH

PRACTICAL RESEARCH

LITERATURE

BIG SCALE

SMALL SCALE

METHODS

Literature review
Case study

Mapping
Opinion
collection
&
analysis

Mapping
Form study
References

WHY PRESERVE?

→ Industrial heritage preservation and appreciation

Energy transition of fossil fuels
- action is needed in some way

Coal mining industry
as an example

- Historical developments - conditions?
- Visions different stakeholders
- Bigger scale contributions of the design?

- Historical developments - structures of former landscapes?
- Scale/Density/Ambiance/Structure
- Transformation possibilities

DESIGN (experiment)

Illustration 15. Methods scheme. Source: Author

3.1 METHODS

In the scheme in illustration 15 is shown how this project is structured. It starts with a project definition, where my personal interest comes together with orientation and a problem definition. This project is about the Pernis industrial area in the harbour of Rotterdam, not only of personal interest, but the Pernis oil refinery is the largest refinery in Europe and one of the largest in the world. The harbour of Rotterdam is also the main harbour to distribute the oil from overseas to Germany, Belgium and the rest of Europe.

From this interest develops a problem statement with a main research questions and several sub research questions about the future of this oil landscape. The project is divided into a theoretical and a practical research on two main scales to be able to answer the main research question. The theoretical research tries to find out why industrial heritage is important to new developments and how these sites can be transformed. The practical research includes a location analysis of the harbour of Rotterdam and the Pernis industrial area, and an experiment on what is possible with the existing structures of the Pernis industrial area. The outcome of these two researches will help formulate a design experiment. This design experiment will concentrate on the possibilities of a new function for the Pernis industrial area. With this design comes a list with design principles on different scales.

In analysing, a lot of methods are used to answer raised questions. In the following chapter, there will be an explanation on how and in what way certain methods of analysing will help to answer the sub research questions mentioned in chapter 1. To answer the main research question, the design experiment is needed in combination with the results of the sub research questions. In this way, a conclusion is drawn on the possibilities for future developments and transformation of the Pernis industrial area.

1. *How did the harbour of Rotterdam develop?*

By mapping how this structure developed and what kind of conditions where already there that made the Port of Rotterdam one of the most important ports in the world, an understanding on how certain structures where developed in certain periods can be developed. In this, it is important to know why the harbour grew the way it did. Conditions of the past are necessary for understanding the possibilities for the future.

2. *How did the Pernis industry area develop and what is its story (mental elements)?*

By mapping the historical structures of the landscape laying underneath the industrial structures of Pernis,

conclusions can be drawn on how current structures have developed in the development of the industry. In analysing the story of Pernis, by searching for old pictures back in the old days, an image of how the community lived and worked is shown. A conclusion can be drawn about how this area was used and what the value is for future developments.

3.   What physical and mental elements are there, reminding us about oil and how can we use this?

The physical elements can be found in the method of mapping. The big structures, such as tank terminals, pipelines and quays are visible on maps and from the air in Google Earth for example. In this analysis, a search for clear and recognizable structures on a map is important, but also if the structure is visible on street level. The (human) scale of such structures is very important to know for the future transformation and function possibilities. Through mapping on different scales, this analysis will explain how the Port of Rotterdam is structured. By drawing a mental map, with the functions of areas and function of different structures I want to show an image, together with the old pictures, of life and working was connected to the physical elements.

4.   How important is the story of a place?

The answer to this question can be found in theory. The previous chapter already showed the importance of storytelling in general. The PICH Project also contributed to this question with the conclusion that in current projects there is no connection to the story of the place. The heritage projects only display the physical elements of the site.

5.   What are the possibilities for a new function (and what is needed)?

The answer to this question can be found through scale studies and future perspective reports of different stakeholders. The scale studies should point out the atmosphere and ambience of the industrial area. Comparative studies of several residentials areas show which atmosphere can be accomplished in future developments. These industrial areas are usually very big scale structures. To transform this into another function, the scale of the existing elements must be explored.
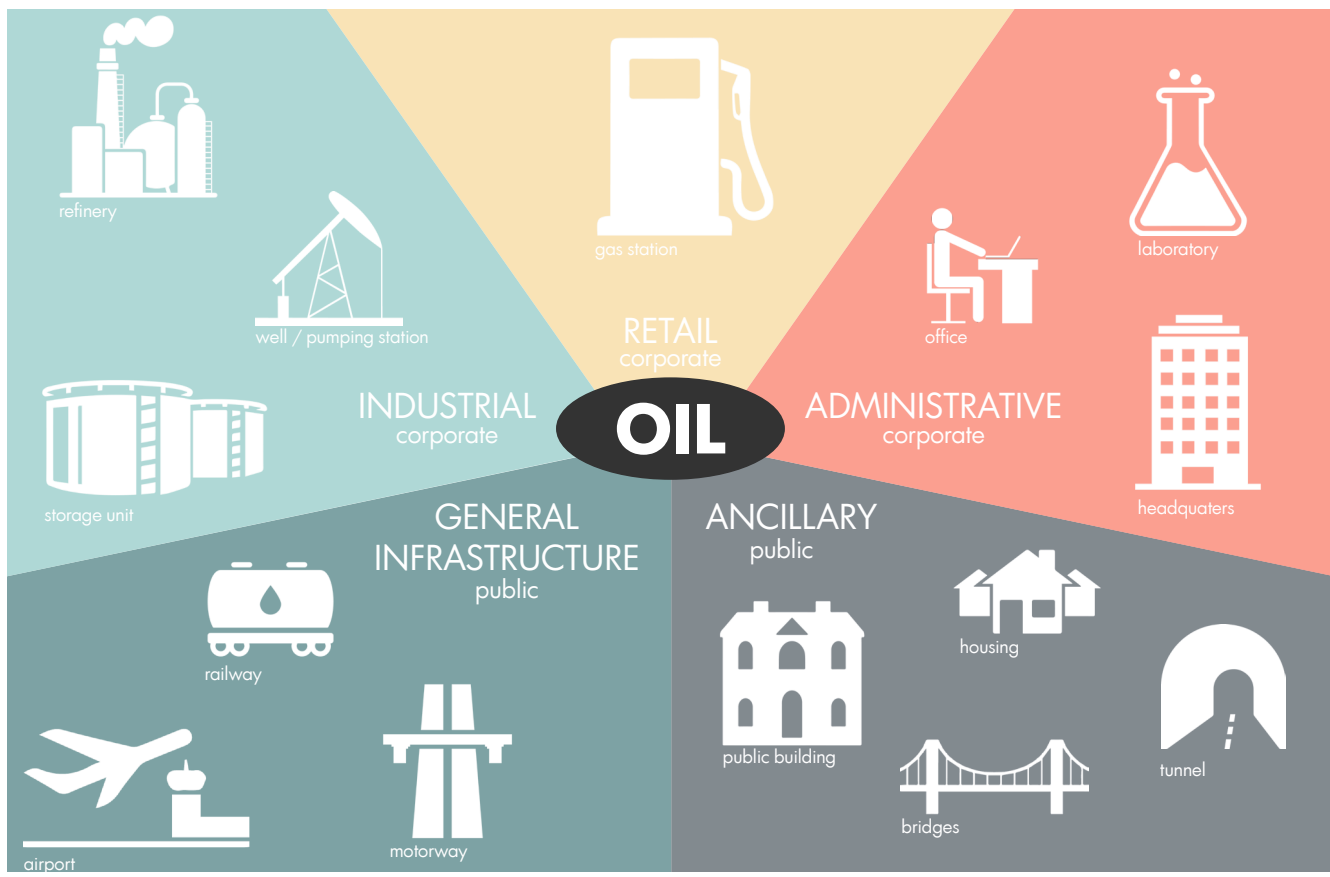
Illustration 16. Physical impacts of oil. Source: Author. Information from: Hein, 2016.

3.2 RELEVANCE

Societal Relevance

According to some sources, also mentioned in the previous chapters, we know that at the end of the twenty-first century there is almost no oil production left in the world. In this era, every single person grew up within the era of oil, where almost every product was made of, produced with or transported with oil. At some point the use and consumption of oil becomes much less, but a lot of physical elements will be still there. The big industrial areas that we all know must transform into something else.

According to Carola Hein (2016) there are five different physical impacts of oil on society shown in the illustration above:
- Industrial
- Retail
- Administrative
- Ancillary
- General infrastructure

First, the industrial footprint of the oil industry consists of storage, transformation and transportation. These structures are huge in both investment and size, and are clearly visible from the air. Second, the retail business consists of gas stations that are spread all over the world along road infrastructures. The gas stations form a more

flexible element in the landscape of oil. The third impact on society are the headquarters and research centres of the oil industry, the administrative impact. (Hein, 2015) The ancillary and the general infrastructure consists of the build structures to support the three impacts mentioned before, such as tunnels, airports, motor/railways, but also housing and public buildings.

The industry of oil has a huge impact on our lives. The impacts mentioned before are just the clear physical impacts, such as visible structures. But there are also mental impacts, also called mindscapes. As Franco Bianchini stated in 2006, a mindscape is something which exists between the physical landscape and people visual and cultural perception of it (Hein, 2015). Changing the mindscape of people is the first thing to do if we want to be free of the fossil fuel landscapes.

Scientific Relevance

In the history of oil, there has already been a lot of literature about the use, consumption, war, and all the aspects of this era. But also, literature about predictions on when this oil production comes to an end. There is a limited stock of oil left in the world and at a certain point we must use other materials for our products and fuels. Fossil fuels of coal, oil and natural gas are called non-renewable energy resources. The energy from these sources is an isolated energy potential. To initiate the supply of energy for practical purposes, external action is required. (Twidell

& Weir, 2015) It is widely recognized that renewable energy supplies, such as solar radiation, wind, biomass, tides, geothermal heat, and other continuing resources, are necessary for security, sustainability and standard of living. (Twidell & Weir, 2015) The future is renewable energy and the industry of the fossil fuels will someday become much less or even disappear, but will still be remembered as an era of great influence.

World Wide Relevance

Oil has a great impact on the whole world around us. Anywhere in the world, oil fields were explored and used as resources. The energy transition from fossil fuels to renewable energy will therefore also have a very big impact on the whole world. The layout of many harbours will change, the gas stations will disappear and many daily products, such as make-up, medicines and plastics will eventually transform.

Illustration 17. Oil Production by Region. Source: BP p.l.c., 2016.

3.3   ETHICAL PARAGRAPH

With the previous research we can conclude that industrial heritage is very important to preserve. When an industrial site gets abandoned, the first reaction is to demolish everything that is related to this function. Especially in the Netherlands, where there is limited space for new developments, municipalities and other authoritative parties prefer to make space for new developments. But the authenticity can be used and always has an attractive influence on people.

The message here is to really think about the way we treat post-industrial sites and think about iconic, characteristic, place branding, future possibilities, before demolishing a site which has a lot of potential. The site can be preserved as an identity.

PORT OF ROTTERDAM
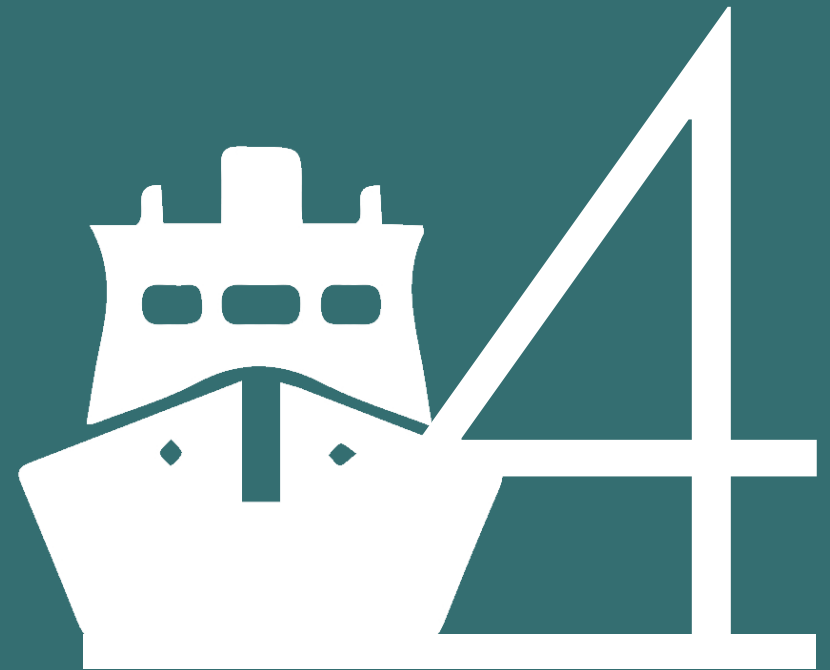
This chapter shows an analysis on the Port of Rotterdam. An short introduction is given to give an image of the port and how large it is. Historical developments together with old pictures sketch an image of how important the port always has been for The Netherlands. And future developments are shown to predict the future of the harbour and how its function grows out of the city towards the sea.
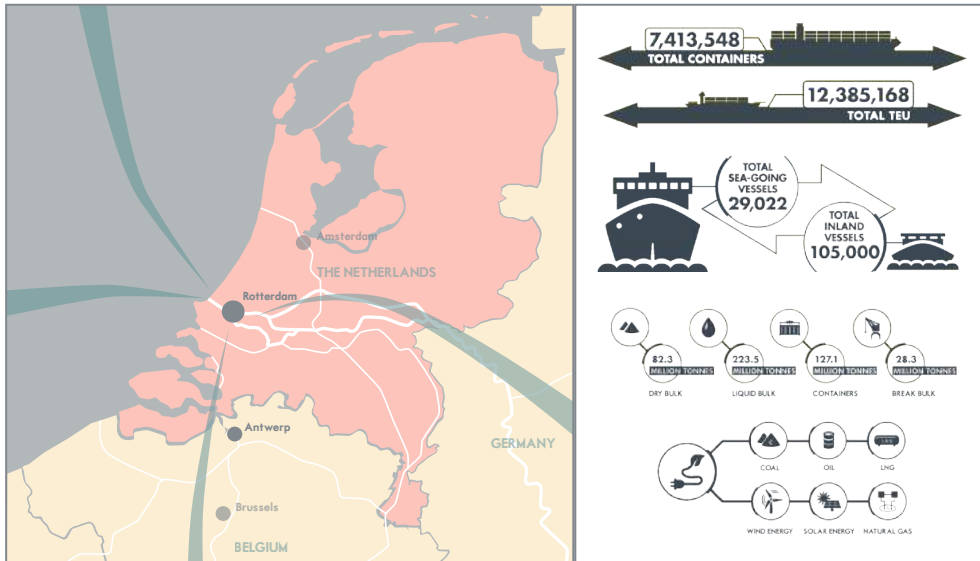
Illustration 18. General facts and figures Port of Rotterdam. Source: Port of Rotterdam Authority, 2017

Total lenght Port	42 km
Total port area	12.643 ha
Total lenght pipelines	1.500 km
Tank Terminals	593
Depth water	24 m
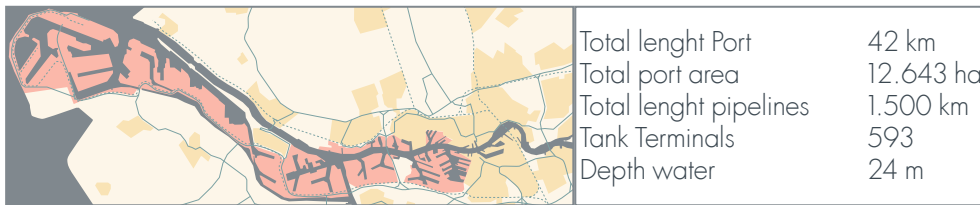
Illustration 19. Facts and figures Port of Rotterdam. Source: Port of Rotterdam Authority, 2017
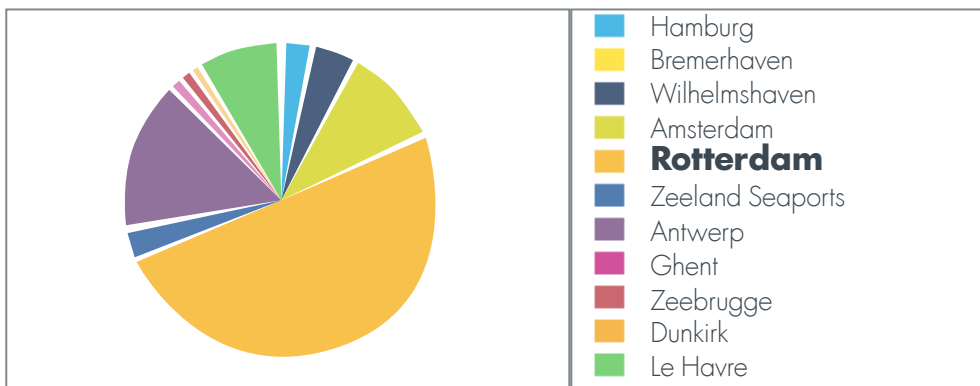
Illustration 20. Liquid Bulk of European harbours. Source: Havenbedrijf Rotterdam N.V., n.d..

4.1   PORT OF ROTTERDAM

The Port of Rotterdam was long known for its title of the largest harbour in the world. Since the economic growth in China, a lot of Chinese ports are nowadays much larger than the Port of Rotterdam. Rotterdam is currently on the 9th place in the list of the worlds' largest harbour. (Port of Rotterdam Authority, 2016)

The Port of Rotterdam is still one of the most important harbours in the world for world's leading chemical and energy companies, because of its excellent maritime access, connections by inland waterways, pipeline, rail and road, and wide range of service providers. (Port of Rotterdam Authority, 2016) The first period of 2017, the port witnessed a strong growth in containers, crude oil and coals. The total transhipment increased with 4%. The supply of oil and coal increased with 9% and 10%. (van Dijk, 2017) From this we can conclude that the Port of Rotterdam is currently still growing in the supply of oil and coals. But the world's largest oil companies have already announced a series of sustainable investments. (Macalister, 2016) The shift to renewable sources slowly becomes visible.

In illustration 18, 19 and 20, are a few of the important numbers of the port. In the numbers and facts of illustration 18, we can see the shift from fossil fuels to renewable energy. From coal, oil and LNG to wind energy, solar energy and natural gas. These fuels get transported by a pipeline network of approximately 1500 kilometres

(illustration 19). This pipeline network offers an efficient, safe and environmentally-friendly transport solution for liquid bulk such as oil. This pipeline network also connects the port to important destinations in Belgium and Germany. (Port of Rotterdam, n.d.)

The Port in the World

The Port of Rotterdam is big in the oil industry. In illustration 20 we can see the position of Rotterdam compared to other ports. Rotterdam is by far the largest port in the liquid bulk (oil) industry and distribution. The refineries in the port get their oil from oil tankers from the North Sea area, Russia or the Middle-East. Through pipelines the oil gets transported to for example Belgium and Germany. (Port of Rotterdam, n.d.) Together with Antwerp, Vlissingen and Godorf, the Port of Rotterdam is one of the three biggest fuel hubs in the world. Rotterdam has become an important hub in the trade of fuels, because of the wide offer of services such as storing the fuels in the port. (Port of Rotterdam, n.d.)

Oil in the Port

The Port of Rotterdam is ideal for the transhipment of oil products, because the port is situated along a lot of international trade flows. The connections by pipeline, rail and road, and inland waterways is excellent. (Port of Rotterdam, n.d.) There are five refineries in the Port of

Rotterdam. These refineries produce fuels such as petrol, diesel, kerosene and materials for the chemical industry. The five refineries belong to big international companies such as Shell, Esso, Exxonmobil, BP and Vopak. These companies are key players in the oil industry (48% of the ports surface is related to oil and oil products) and are also already preparing themselves for the future without oil. When these companies change there will be a big change in the physical and mental structure of the port. (Port of Rotterdam, n.d.)

Future of the Port

The port is already investing in the development of renewable energy and future energy resources. The port has increased its wind energy capacity by 56 MW over the past five years (ambition is 200 MW in 2020). 1 MW is enough to provide 1.000 households with energy at the same time. (Essent, n.d.) So, the increased capacity can provide 56.000 households with energy.
The Port of Rotterdam has its own ambitions and goals, but there is one overall objective;
> "to enhance the port's competitive position as a logistics hub and world-class industrial complex. Not only in terms of size, but also with regard to quality. The core tasks of the Port Authority are to develop, manage and exploit the port in a sustainable way and

to render speedy and safe services for shipping."
(Port of Rotterdam, 2016, p. 55)

The port itself is slowly shifting towards renewable energy and sustainable developments. Because of the Paris agreement on climate change in 2015, where 195 countries came together, the investments in renewable resources are getting bigger than the investments in coal, oil and gas. (Havenbedrijf Rotterdam N.V., n.d.)

"In Rotterdam's vast harbour, a million containers a year are loaded and unloaded. Giant cranes poke towards the sky. Dry docks and oil refineries strech to the horizon. But for all the gigantism of the harbour – the big ships, big machines and big statistics – there is

something missing. **People***."*

(The economist, 1994. Quoted in Stouten, 2010, p. 79)

4.2 HISTORICAL DEVELOPMENT OF THE HARBOUR OF ROTTERDAM

The following few pages show seven maps of the development of the harbour of Rotterdam. This series of maps starts in 1925 were the first 'big' expansion for the oil industry is visible. The jumps to the other maps are were something significant happened in the development of the harbour. With the historical maps the community growth belonging to the oil industry is shown.

The goal of these maps is to find out how the harbour of Rotterdam developed and how it can develop in the future following on the historical developments.

In 1884 there was a complaint that the arrangements for the petroleum harbour were not sufficient for the big developments.

Therefore, there was an experimental plant for asphalt started at the Sluisjesdijk (illustration 21) in 1918. This was the first expansion for the oil industry in the harbour of Rotterdam. In 1919 and 1920, this was followed by a refinery factory. By 1920, it was more economic to ship crude oil and refine it into several products. Because of the economic prosperity and techinical developments, the population got a chance to buy and use a car. Increasing volumes of asphalt were needed for the road building. This is why a separate refinery was built in de Waalhaven (illustration 21). By the end of 1926, it became clear that a new site, an alternative, had to be found for the site of the Sluisjesdijk. (Shell Nederland Raffinaderij, 2002)

10.000 ton

14,15 m (current)

Illustration 21. Situation Harbour of Rotterdam 1925. Source: Author. Information from: http://topotijdreis.nl/

In November 1928, the Board of Management opted in favour of relocation to Pernis. The municipality of Pernis decided to give away their grounds, because they considered it could not remain a separate municipality. Construction of the Eerste Petroleumhaven started in 1929 and in July 1930, the first tanker with a cargo of gasoline arrived in the harbour. The building of the refinery started a few years later and was brought into operation in 1936. In 1930, the site already contained 300 tanks with a total capacity of 600.000 cubic meters. This was enough to cover Dutch oil demand for nine months. (Shell Nederland Raffinaderij, 2002)

23.000 ton

12 m (current)

Pernis

Eerste Petroleumhaven

Waalhaven

0 1 2 3 4 5 km
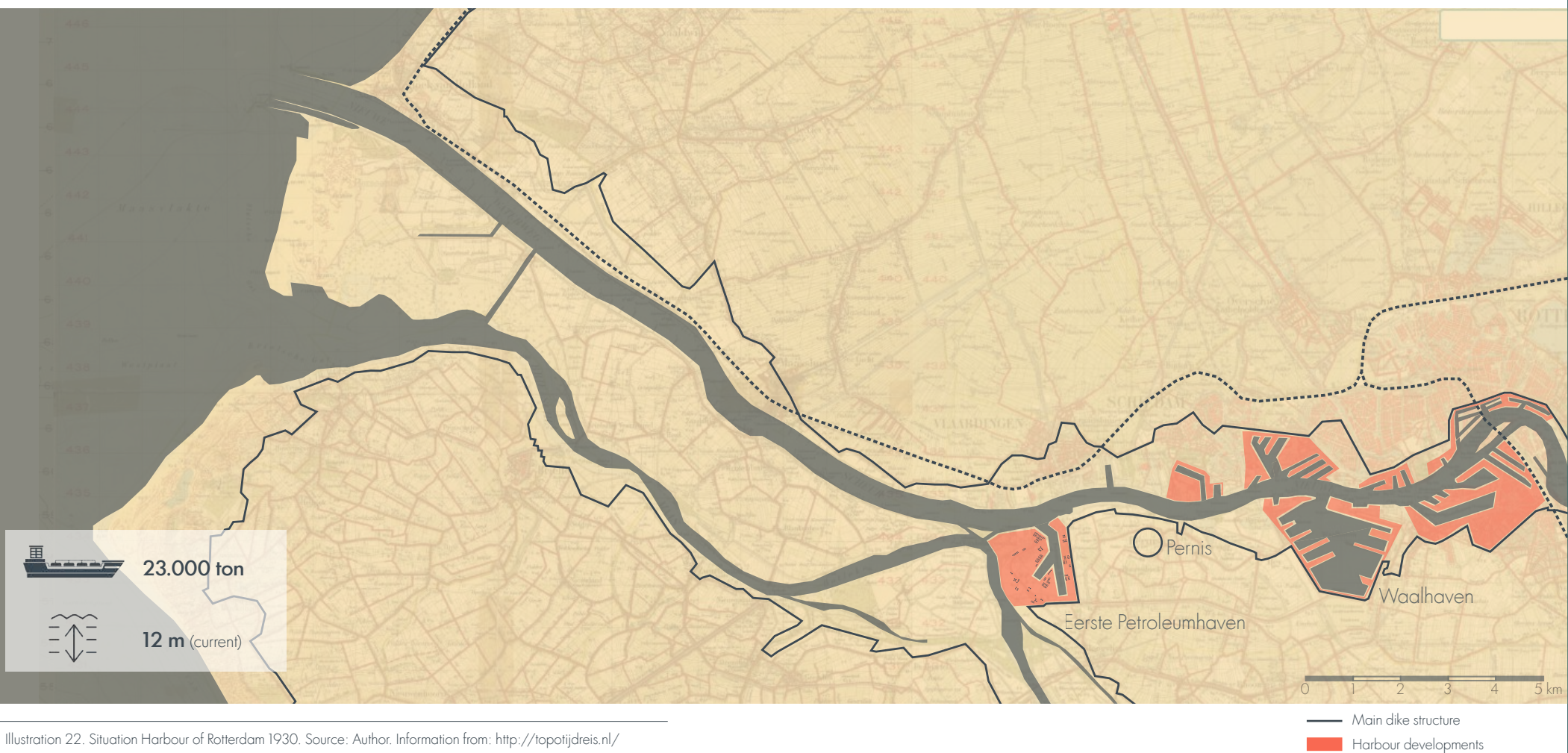
Illustration 22. Situation Harbour of Rotterdam 1930. Source: Author. Information from: http://topotijdreis.nl/

Main dike structure

Harbour developments

Illustration 23. Directors houses in Hoogvliet 1936. Source: Shell Nederland Raffinaderij, 2002.

At the end of the year 1930, the Tweede Petroleumhaven was constructed. This new harbour was constructed next to Eerste Petroleumhaven.

Because of the growth of Pernis, they started to build directors houses nearby (illustration 23). These houses were build in Hoogvliet (illustration 24) and so the first small 'oil' community was born.

28.000 ton

12 m (current)

Tweede Petroleumhaven

Hoogvliet

0 1 2 3 4 5 km
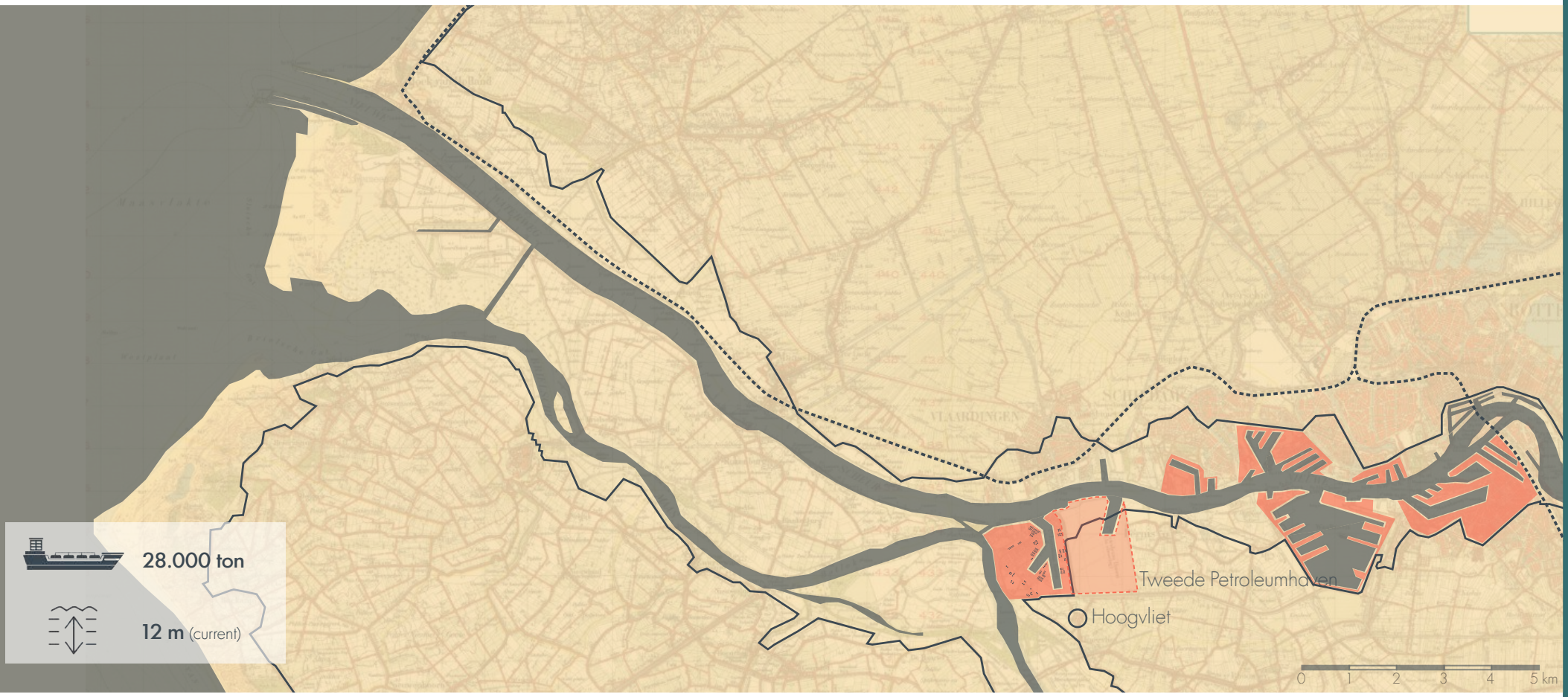
Illustration 24. Situation Harbour of Rotterdam 1938. Source: Author. Information from: http://topotijdreis.nl/

Main dike structure

Harbour developments
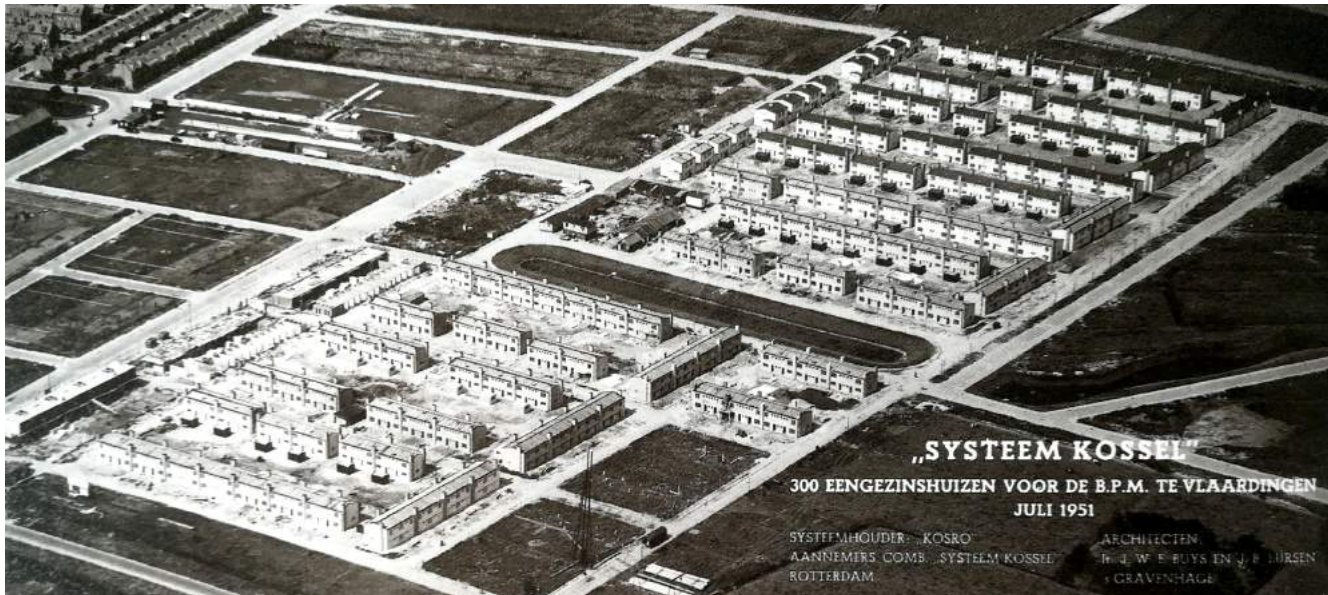
Illustration 25. Houses Vlaardingen 1951. Source: Shell Nederland Raffinaderij, 2002.

Because of the growth of Shell Pernis, communities were also build on the other side of the river Muse, in Vlaardingen in 1951. The expansion plan of these houses is displayed in illustration 25.

The Derde Petroleumhaven was constructed in 1954 (illustration 26) and would later belong to the Botlek area. The original structure of the river was used to realise the harbours.

In 1956 there was pressure on which harbour would be chosen to distribute the oil to Germany from now on. This was a choice between the harbour of Rotterdam and Antwerp. The future of the harbour was unsure. This is why the next expansion areas moved more to the west, where they could easily receive larger ships than in the east.
(Shell Nederland Raffinaderij, 2002)

60.000 ton

13,7 m (current)

Botlek Area

Vlaardingen
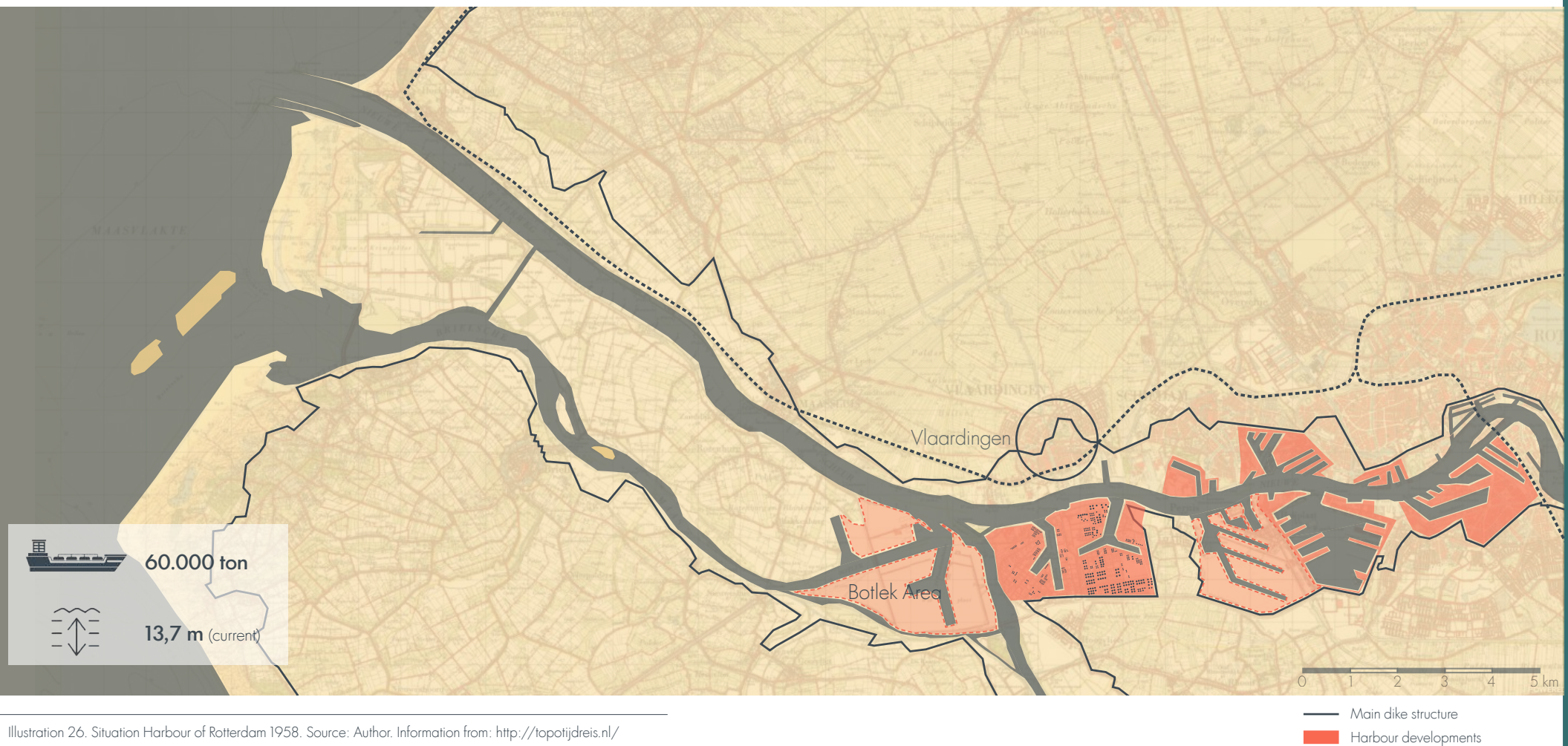
Illustration 26. Situation Harbour of Rotterdam 1958. Source: Author. Information from: http://topotijdreis.nl/

0 1 2 3 4 5 km

—— Main dike structure

Harbour developments

Illustration 27. Housing shortage Spijkenisse 1963. Source: Shell Nederland Raffinaderij, 2002.

Illustration 28. Chimneys of Pernis 1967. Source: Shell Nederland Raffinaderij, 2002.

Because of the large scaling-up of the tankers, the main focus of oil transhipment shifted to the new developments and area of Europoort, which also partly belongs to Shell.

But because of the growth of the harbour and with that the growth of workers. There was a big housing shortage in Spijkenisse (illustration 27 and 29) in 1963. 143 Houses were available at that time, but there were 525 interested people. This shows how many people wanted to move towards their work and live nearby. The villages along the river and industry grew because the people moved to their work. The villages are part of the oil community in the harbour.

In 1967, the two 213 meter high white chimneys of Pernis were build (illustration 28). These chimneys formed a real landmark and are still visible from the whole region. Because there are not yet large urban expansions along this area of the river, the chimneys still form a important landmark of the harbour.

Europoort

Chimneys of Pernis

Spijkenisse

477.000 ton

20,6 m (current)

0 1 2 3 4 5 km
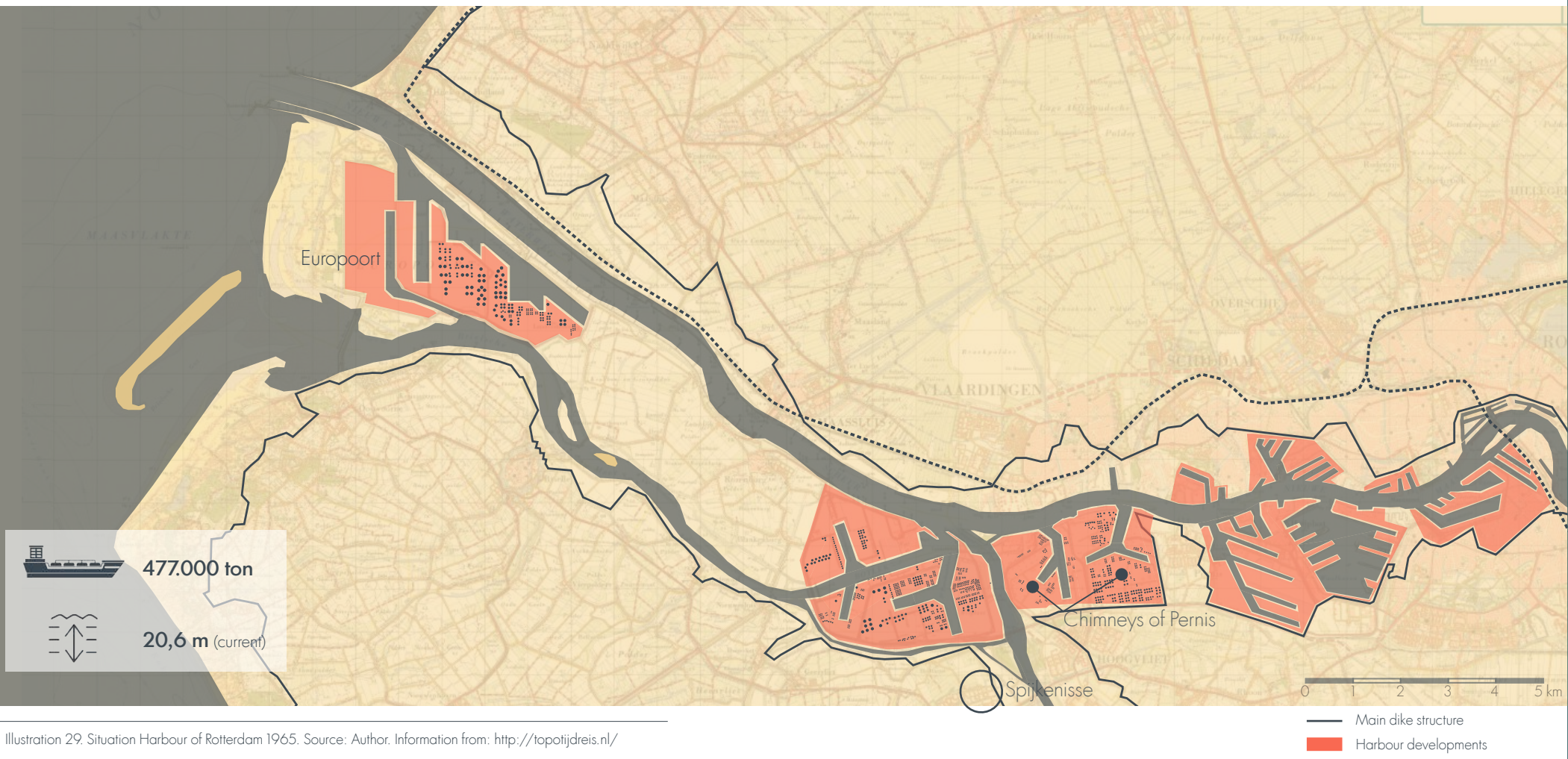
Illustration 29. Situation Harbour of Rotterdam 1965. Source: Author. Information from: http://topotijdreis.nl/

Main dike structure

Harbour developments

Illustration 30. Fitness on the job 1988. Source: Shell Nederland Raffinaderij, 2002.

Illustration 31. Greenpeace blocks the harbour of Pernis 1995. Source: Shell Nederland Raffinaderij, 2002.

Illustration 32. Shell constaintly checking the environment. Source: Shell Nederland Raffinaderij, 2002.

Bigger developments were constructed in 1975. The Maasvlakte became reality and was the new home, together with Europoort for the big scaling up of the transportation of oil.

The company of Shell cares for its employees. Employees were able to go to the gym at work (illustration 30). Everything was done to take care of employees and make sure they were healthy. Shell was also constaintly checking the environment (illustration 32) and making sure that there was not any pollution of the air that could reach surrounding residential areas, since the urban environment of Rotterdam, Vlaardingen, Hoogvliet and Pernis kept on growing and surrounded the Pernis industrial area.

In 1995, there was a big negative image of the oil industry. Greenpeace blocked the harbour and revolted against Shell (illustration 31).

(Shell Nederland Raffinaderij, 2002)

Maasvlakte I

564.764 ton

21 m (current)
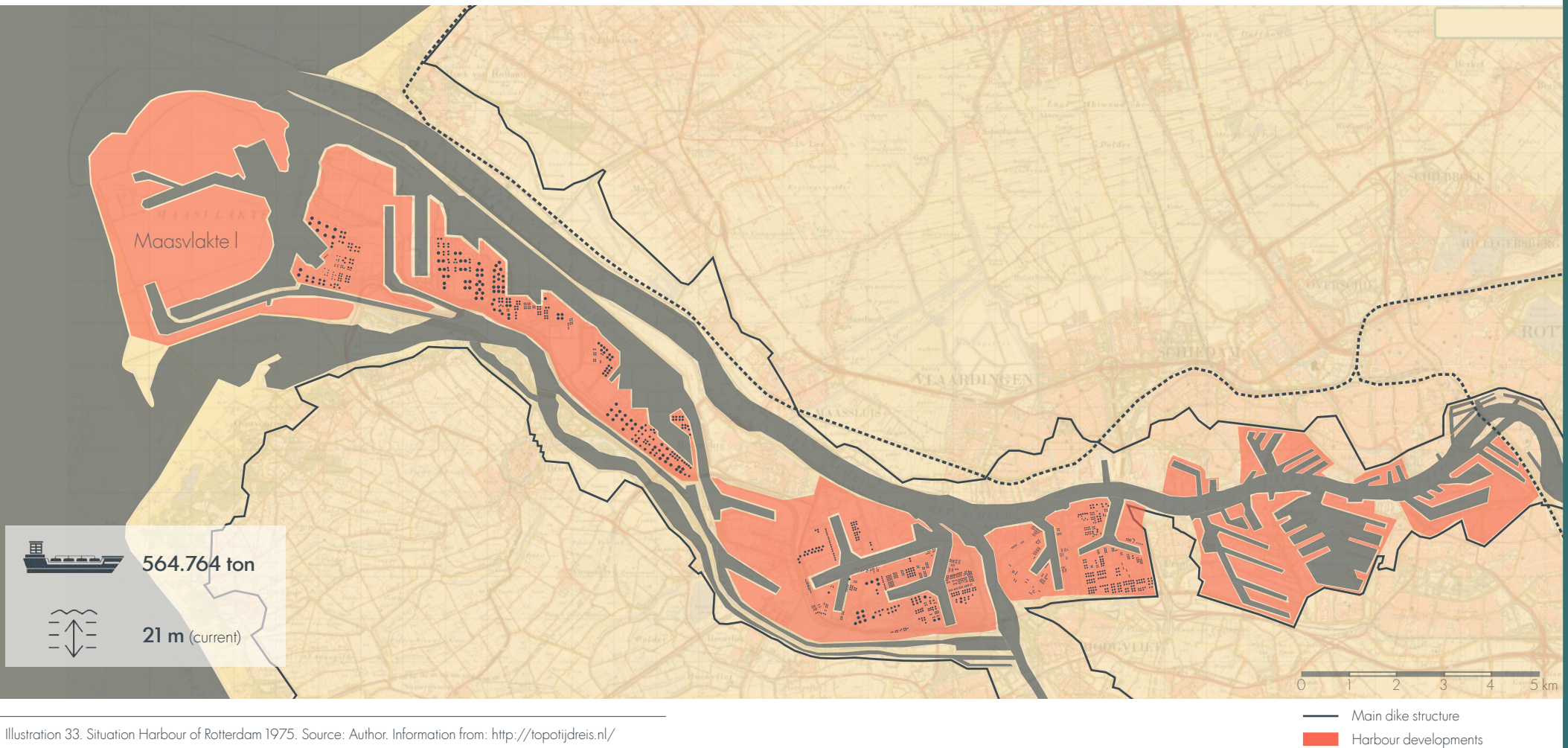
Illustration 33. Situation Harbour of Rotterdam 1975. Source: Author. Information from: http://topotijdreis.nl/

0 1 2 3 4 5 km

—— Main dike structure

Harbour developments

Illustration 34. Burenraad Shell Pernis 1998. Source: Shell Nederland Raffinaderij, 2002.

Illustration 36. Demonstration against sell of Shell 1999. Source: Shell Nederland Raffinaderij, 2002.

Illustration 35. Contribution training program immigrant young people. Source: Shell Nederland Raffinaderij, 2002.

Since the growing of the urban environment around Shell Pernis. Shell started a consultative body, Burenraad, between Shell Pernis and residents in 1998 (illustration 34). This was to give the residents an opportunity to discuss matters of nuisance or to directly intervene if there was any disruption in the environment.

Shell also contributed in a training program for young immigrants. This program belonged to the education area (illustration 37) of Pernis.

Shell took good care of its employees and that is also why they were against the sell of Shell in 1999. (illustration 36)

The Waalhaven and Eemhaven do not belong to the industrial harbour area anymore, and the harbour activities are slowly moving out of the city, towards the sea. (illustration 37)

(Shell Nederland Raffinaderij, 2002)

Maasvlakte II

600.000 ton

22,8 m (current)

Education Shell Pernis

0 1 2 3 4 5 km
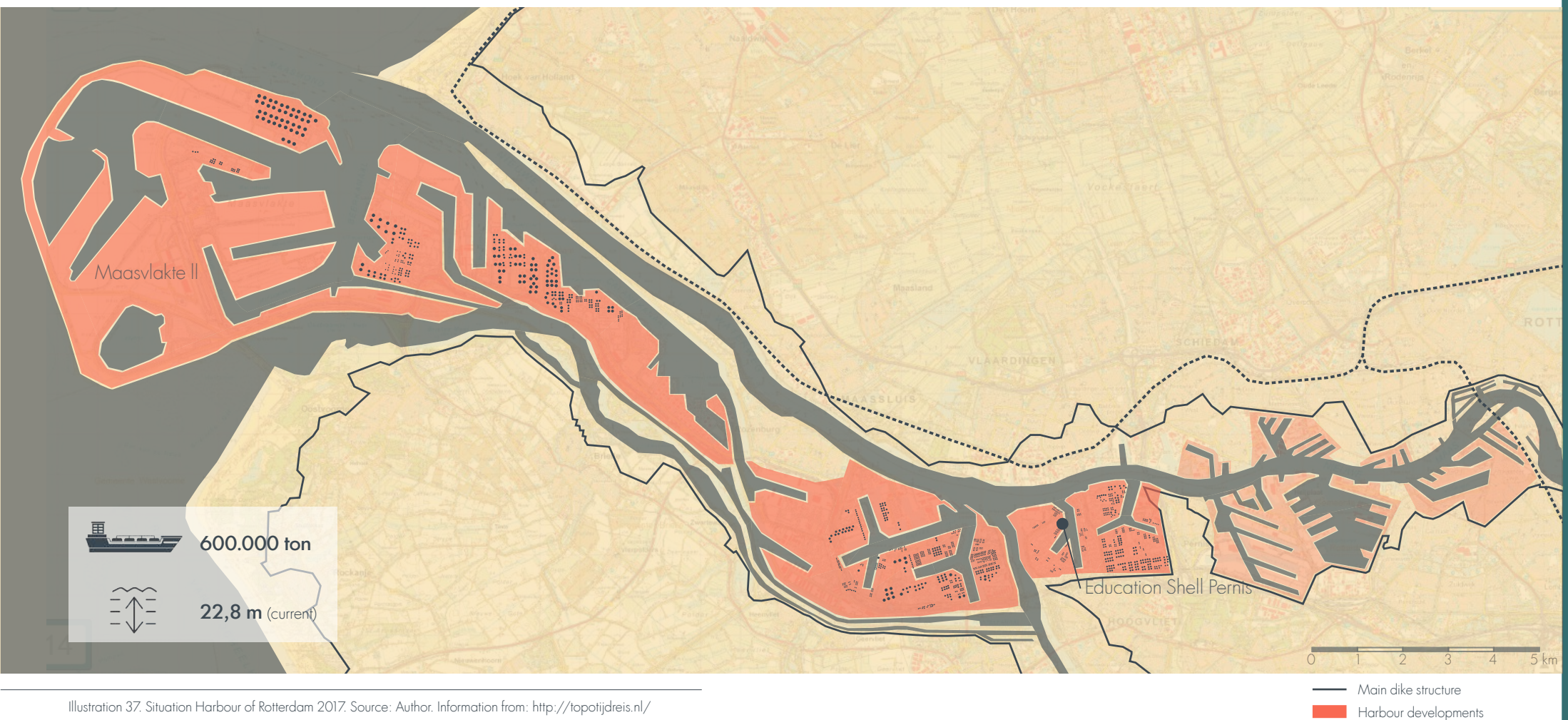
Illustration 37. Situation Harbour of Rotterdam 2017. Source: Author. Information from: http://topotijdreis.nl/

Main dike structure

Harbour developments

Legend:
- Oil & oil products
- Chemicals, biofuels and edible oils
- Gas and power, coal and biomass

WAALHAVEN

EEMHAVEN
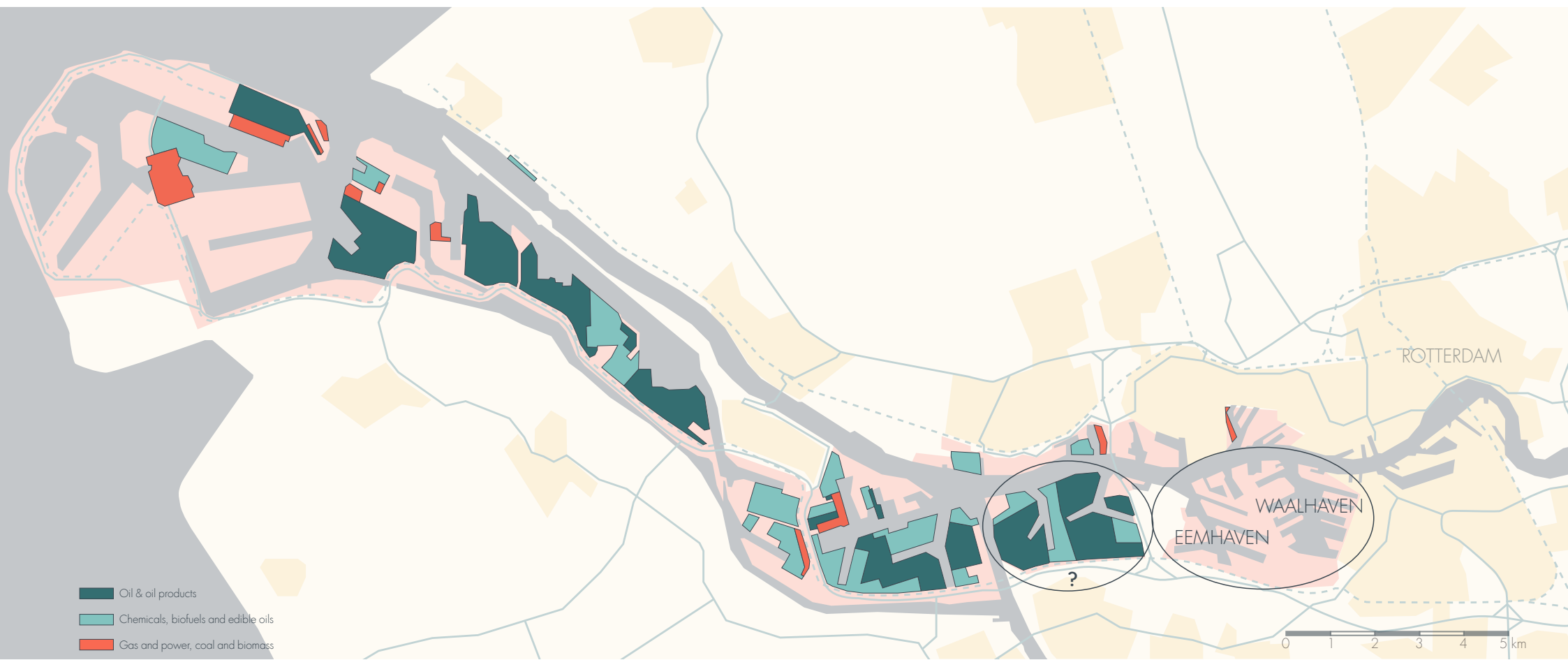
ROTTERDAM

Illustration 38. Oil in the harbour. Source: Author. Information from: Port of Rotterdam, 2017

4.3   DEVELOPMENT OF THE HARBOUR

With the development of the harbour, more space was needed for larger ships and other developments. The harbour of Rotterdam started growing out of the city. The smallest harbours in the city are already transformed for recreational use. This principle of the harbour growing out of the city is also visible in illustration 38. The industrial functions, such as the oil, chemical and gas related sites, start in Pernis and end at the new developments of the Maasvlakte, near the sea.

The Waalhaven and Eemhaven are currently in the phase of transformation. Waalhaven–Eemhaven is part of the four city harbours of Rotterdam. With the metamorphose of the city harbours, stakeholders take into account the three P's; People, Planet and Profit. Developments are good for the social cohesion, quality of life and economic prosperity. With the redevelopment of the city harbours, sustainable building, innovative energy technology, accessibility and support are gaining special attention. The planned developments strengthen each other.

From east to west, intensive harbour activities slowly fade into distribution, technological activity and services. A gradual transition develops to the adjacent residential area of Oud-Charlois. Sustainable facilities originate by efficient use of land, decrease of energy use, accessibility for local residents and clean transportation. (Gemeente Rotterdam, 2009)

With this development we can see that the harbour is definitely growing out of the city towards the sea. The harbour also tries to transform into a sustainable harbour which also is made clear with the developments of the Waalhaven and the Eemhaven.

PERNIS' INDUSTRIAL AREA

This chapter shows an analysis on the industrial area of Pernis. A few facts are given of the industrial area and how Pernis relates to the region. Historical developments together with the situation now, form an image of the site to use in the design.
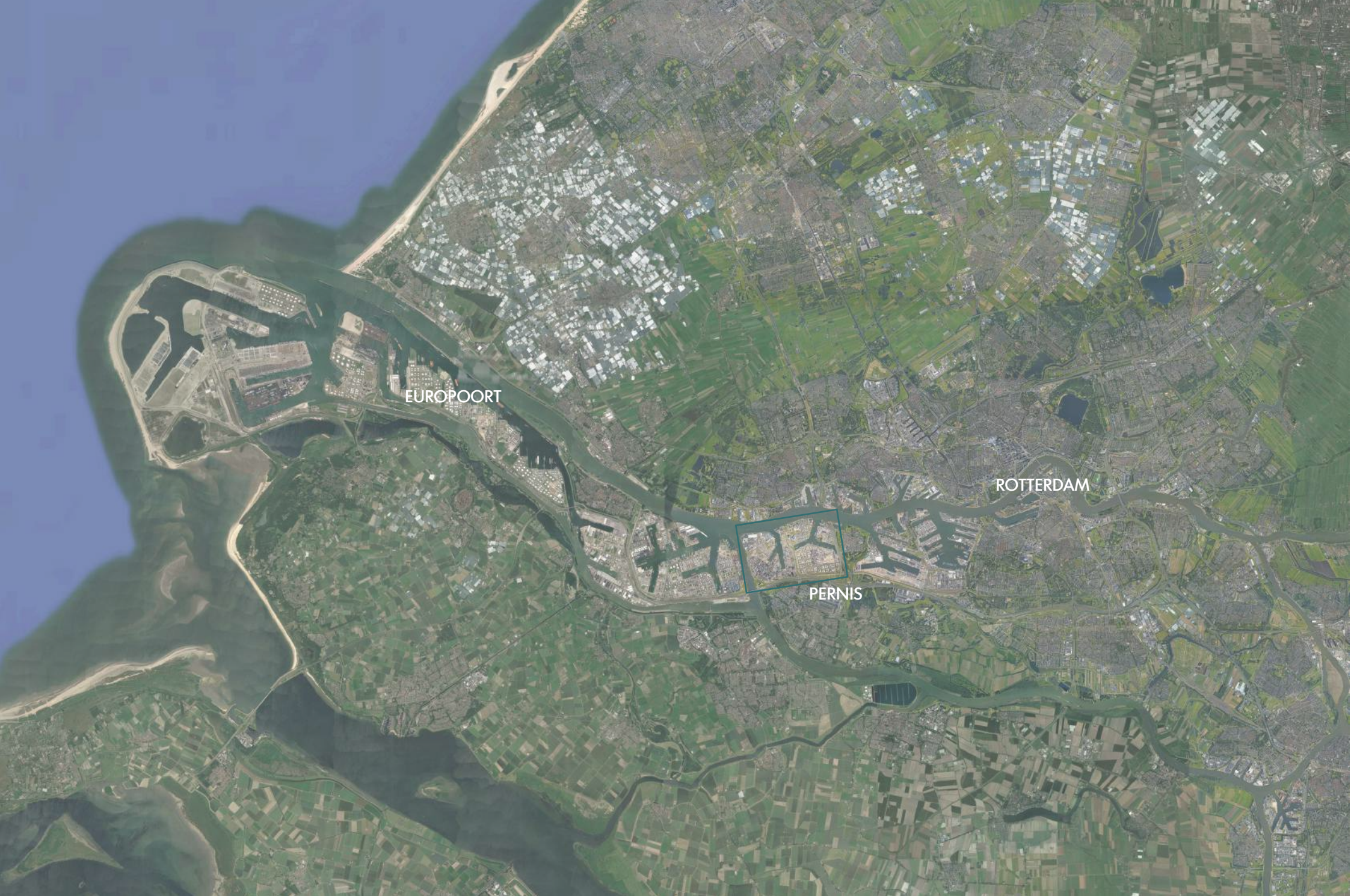
EUROPOORT

ROTTERDAM

PERNIS

5.1   PERNIS' INDUSTRIAL AREA

The Refinery

Shell Pernis is the largest refinery of Europe and one of the largest of the world. The site offers not only oil processing factories, but also chemical factories from Shell and other companies. In short: this site is a big and important complex in the harbour of Rotterdam. In around 60 different factories, oil products and basic chemicals are produced based on crude oil. The largest part of the sites is owned by Shell and its refinery factories. The terminal in Europoort (illustration 39) is also part of the refinery. This location takes care of the arrival, storage and pumping of crude oil and nafta. From this terminal on, the products can be transported to overseas markets. Shell Pernis is the name for the factories of Shell near the villages of Pernis and Hoogvliet. The total surface of the site is 550 hectares and as big as 1.000 football fields. (Shell Nederland, n.d.)

Why is Pernis so Special?

The refinery of Pernis is very flexible. It can process a lot of different kinds of crude oil, very light, but also very heavy oil. Next to that, the refinery can make a lot of special products. The refinery also has a big desulfurization factory which provides the need for cleaner fuels.
In the Pernis industry area, 404.000 barrels of oil are processed. This is 20 million ton a year. When the factories run full speed, 750 liter of crude oil is processed per second. The products are transported through pipelines. The total length of these pipelines is 160.000 kilometers. To illustrate, there is a pipeline going directly to Schiphol to provide the airplanes of fuel. (Shell Nederland, n.d.)

The following pages show how the Pernis industrial area is positioned in the region. The characteristics of Pernis on this scale when compared to the rest of the region and the goal is to find out how the Pernis industrial area could fit into the future region and how the developments fit the future developments of the region itself with its different stakeholders.
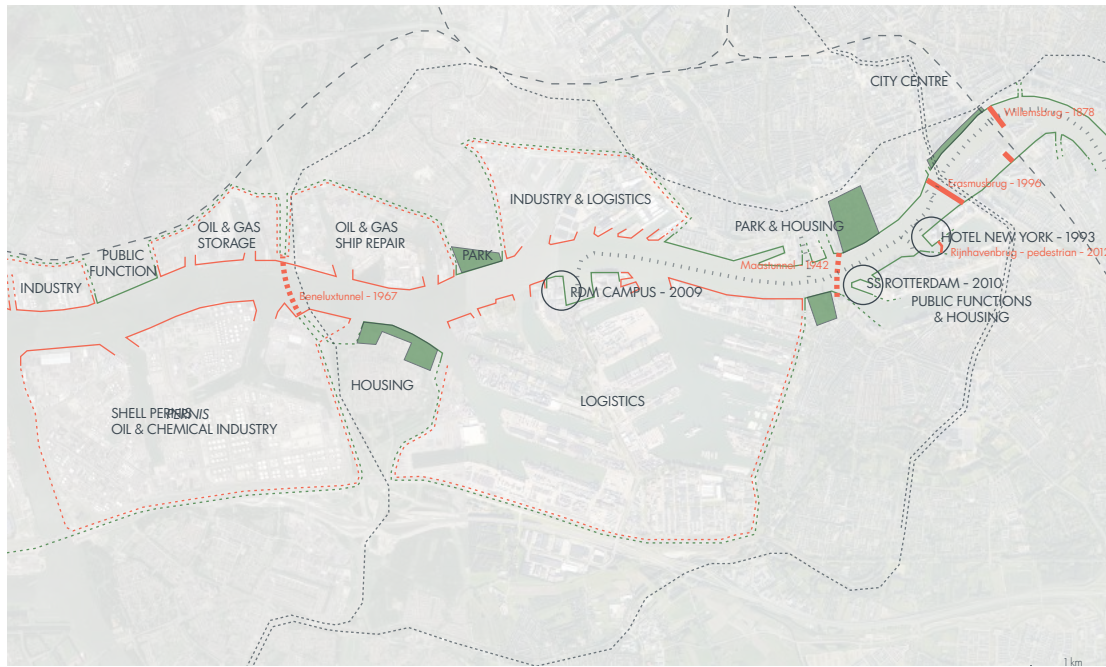
Illustration 40. Functions. Source: Author. Information: Google maps

Functions

Along the river muse, there are not many public functions. Except for the City area of Rotterdam.

Along the south bank of the river there are a few heritage related elements. Hotel New York was one of the first acknowledged on the south bank of Rotterdam. Together with the SS Rotterdam, which is a former cruise ship, and the RDM campus, which is a former ship yard, these three represent the image of the harbour of Rotterdam.
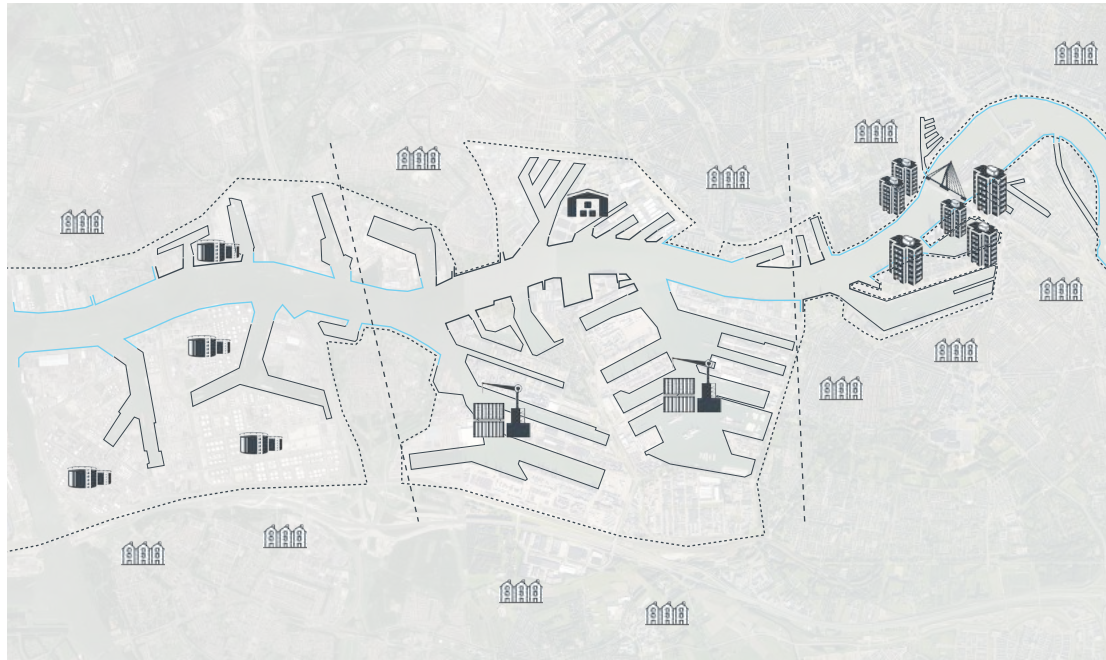
Illustration 41. Overall morphology. Source: Author.

Overall morphology of the region

The overall morphology of this map can roughly be divided into three main themes (illustration 41). The city area with its high appartement and office buildings. The Waalhaven and Eemhaven are more dedicated to logistics and containers, and the Pernis industrial area is dedicated to the oil industry with storage tanks and pipelines. This brings three very different morphological structures.

Illustration 42. Quays structures. Source: Author. Information: Google maps
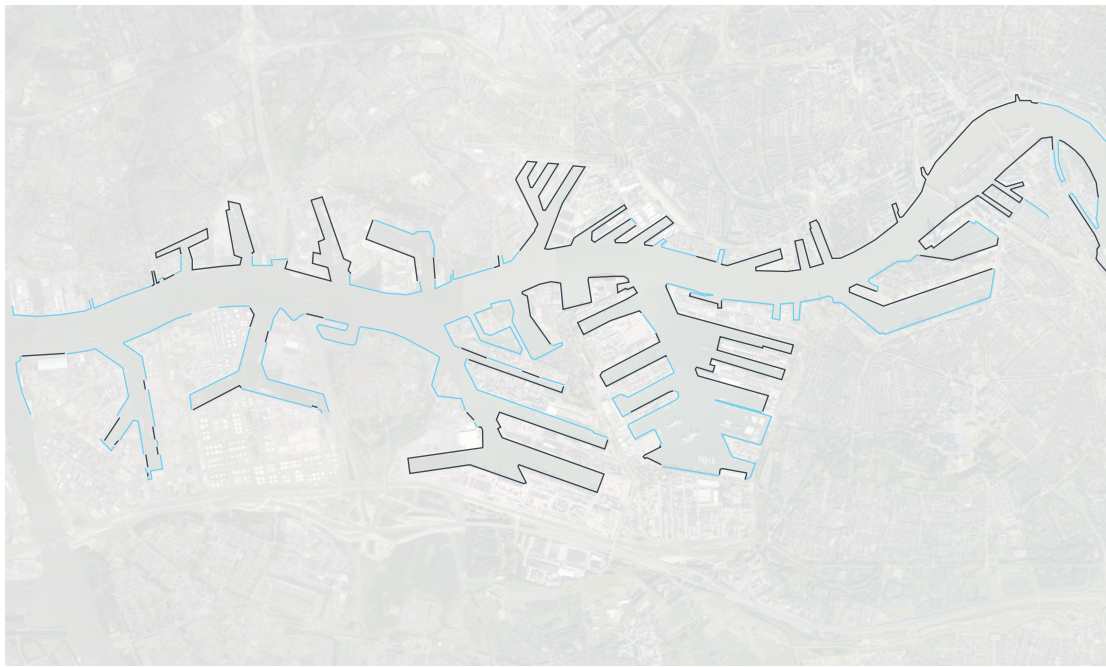
Quays

In this region, there are two different quays. One is sloping and the other one is straight down. Most of the quays are straight down (illustration 42) because this is easier for ships to anchor. But the quays in Pernis are mostly sloping.

Sloping ——

Straight down ——
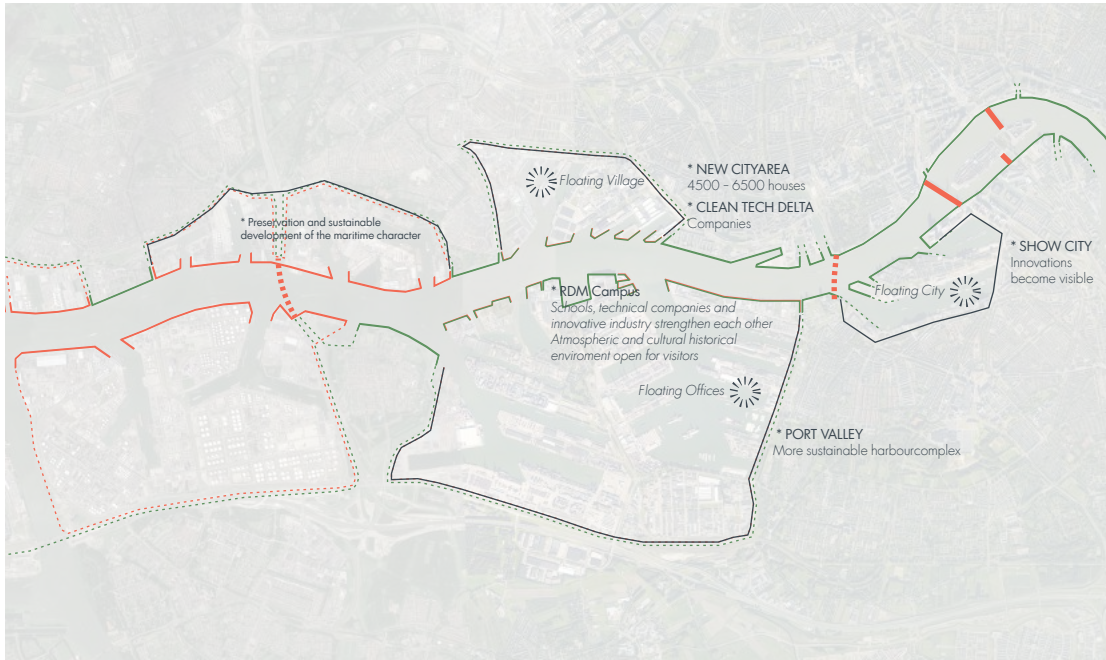
Illustration 43. Future Perspective. Source: Author

Future Perspective

More and more public functions should appear along the river area. Former private industrial areas become public and display the (former) use of the harbour for visitors, such as the RDM Campus. This former shipyard is transformed into an innovation and education area.

1951
Vlaardingen

1995
Greenpeace
blocks the
harbour

1988
Fitness on the
job

1998
'Burenraad'
Consultative
body between
Shell Pernis
and residents

1995
Contribution
training pro-
gram immigrant
young people

1999
Demonstrations
against sell of
Shell - People
only want the
work for Shell

1995
Shell is
constaintly
checking the
environment

1967
Chimney Pernis

Storage tanks

Let's go
camping

1995
Travelling
home after a
day of work

1936
22 Directors
houses in
Hoogvliet

1963
Housing short-
ge
Spijkenisse
143 houses
525 interested

Illustration 44. (Hi)Story of Pernis. Source: Author. Information from: Shell Nederland Raffinaderij, 2002.

0   0,2   0,4   0,6   0,8   1,0 km

1925

1940

1958

1970

1980

2016

5.2 (HI)STORY OF PERNIS INDUSTRIAL AREA

In this historical analysis, the focus is on the structures of former dikes and clear lines in the landscape. The objective of the analysis is to find out if the current structures of the Pernis industry area have anything to do with the former landscape. In the maps of illustration 46, we can see, that the large addition to the landscape structure, such as the new highway in 1940 and 1958. It looks like these were just 'random' additions to the landscape to connect the new developments with the city of Rotterdam.

The only historical lines left in the current landscape are the ones of the village of Pernis.

Illustration 45 shows the summary of the mental (hi)story of Shell Pernis. The explanation of the old pictures is displayed in chapter 4.2 on page 48. But all of the stories from the site come from the stories of the oil industry. Relating back to the former structure of the landscape is not possible.

Illustration 45. Historical development of Pernis. Source: Author. Information from: topotijdreis.nl

ROTTERDAM

PERNIS
(VILLAGE)

HOOGVLIET

Illustration 46. Shell Pernis, Pernis, Hoogvliet and Rotterdam. Source: Google Earth Pro.

	PERNIS	HOOGVLIET	ROTTERDAM
Trash in the streets	65%	54%	59%
Noise nuisance	53%	36%	41%
Environmental load traffic	28%	30%	38,5%
Air pollution	**61%**	62%	33%
Smell nuisance	**49%**	44%	27%
Degradation of green	20%	19%	31%
Light nuisance	**19%**	7%	9,5%
Risk industry	**68%**	56%	11%
Water pollution	5%*	9%	6%
Soil pollution	0%*	5%	5%

Illustration 47. Numbers on pollution in Pernis, Hoogvliet and Rotterdam. Source: Peeters, 2007

5.3   PROBLEM, EFFECT, CHANCE

In the next few pages a variety of maps is shown about the problems of the Pernis industry area, the current effects and the chances of the area for transformation.

The problem maps are partially based on the table in illustration 47. This table is about the health and environment in Pernis and mentioned in a document of the GGD Rotterdam-Rijnmond.

The bold numbers in the column of Pernis are significantly higher than in Hoogvliet and Rotterdam. The industry areas certainly have a big impact on the surrounding residential areas. Air pollution, light nuisance and the risk of industry are concerning impacts.

The effect of the area are neither positive or negative, but could have a positive or negative impact when the area transforms into a new function.

Of course the area also has chances for transformation. These are also shown and could have a positive impact on new developments.

Soil Pollution (0 / -1 m)
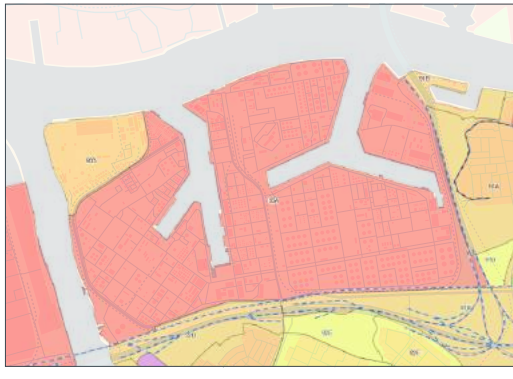
In the upper part of the soil, the soil pollution is moderately polluted. It is the same in the rest of the harbour area, where there is also industry. If the area is going to transform into a new function, the soil must be remediated.

- 🟩 Natuur (Schoon)
- 🟨 Landbouw (Zeer licht verontreinigd)
- 🟧 Wonen (Licht verontreinigd)
- 🟥 Industrie (Matig verontreinigd)
- 🟪 Verontreinigd (Sterk Verontreinigd)

Illustration 48. Soil Pollution. Source: Author

Soil Pollution (-1/-2 m)
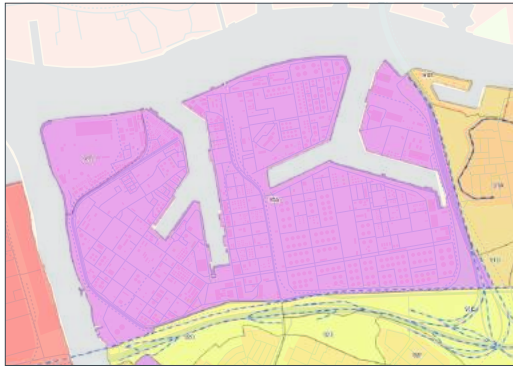
The soil pollution in the area -1 to -2 meter is the highest pollution in the whole region. Pernis industry area was the first expansion for the oil industry in 1929 and it could be that they were not very careful with coping with oil.

- 🟩 Natuur (Schoon)
- 🟨 Landbouw (Zeer licht verontreinigd)
- 🟧 Wonen (Licht verontreinigd)
- 🟥 Industrie (Matig verontreinigd)
- 🟪 Verontreinigd (Sterk Verontreinigd)

Illustration 49. Soil Pollution. Source: Author

Traffic Noise
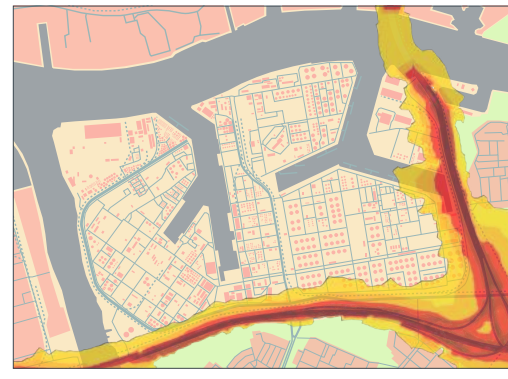
The Pernis industry area is surrounded by a highway which runs along the whole harbour area and connects it to Rotterdam and the South of the Netherlands. The highway produces a lot of noise and must be taken into consideration when a new function is applied to the area.

- 🟨 55 – 60 dB Matig
- 🟧 60 – 65 dB Zeer matig
- 🟥 65 – 70 dB Onvoldoende
- 🟥 70 – 75 dB Ruim onvoldoende
- 🟥 >= 75 dB Zeer onvoldoende

Illustration 50. Traffic noise. Source: Author

Noise Industries

The industry itself produces also a lot of noise which 'pollutes' the surrounding city and villages. For further developments, this pollution will eventually disappear. But the remaining industry in the harbour will still produce noise.

- ⬜ <= 1% ernstige hinder
- 🟧 1,0 – 1,5
- 🟧 1,5 – 2,0
- 🟧 2,0 – 2,5
- 🟧 2,5 – 3,0
- 🟧 > 3% ernstige hinder

Illustration 51. Noise. Source: Author

* The maps on this page are made based on the information found on the following website:
http://www.gis.rotterdam.nl/gisweb2/default.aspx
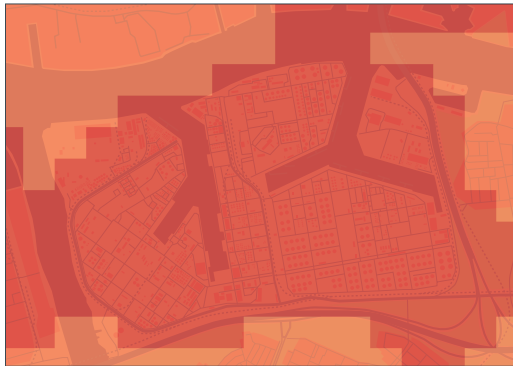
Light Pollution

The Pernis industry area is of course part of the harbour of Rotterdam. The harbour of Rotterdam is part of the Randstad structure which produces a lot of light pollution. This is shown on the two maps on the left. By transforming the site to a new function, it is possible to make this light polluting area smaller.

(E-10 Watt/cm2/steradiaal)
< 5
5 – 25
25 – 50
50 – 100
100 – 200
200 – 400
> 400

Illustration 52. Light pollution. Source: Author

Risk Industries

Living and working, near or in an industry area such as oil industry always has its risks. Since the city of Rotterdam is still growing and the villages surrounding the Pernis industry area are too. It is not unlikely to consider to move the harbour and industry area out of the bigger city regions.
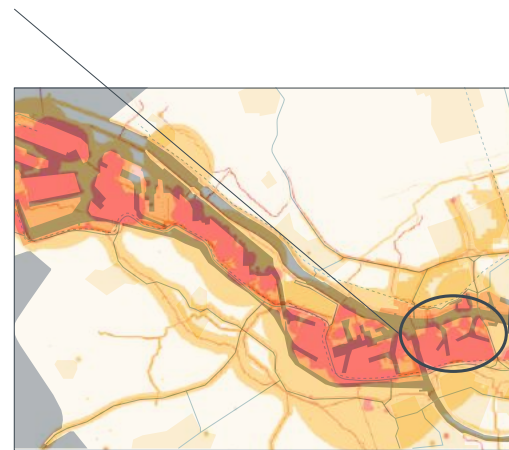
Illustration 53. Risk. Source: Author

The soil of Pernis is heavily polluted, because this was the first expansion of the oil industry in the harbour of Rotterdam. Perhaps they did not know about the polluting consequences of oil. The more you move to the west, to the sea, the newer the area and less polluted. Pernis also becomes an issue in other polluting problems. The city grows more and more around this industrial area, so the more problems there will be.
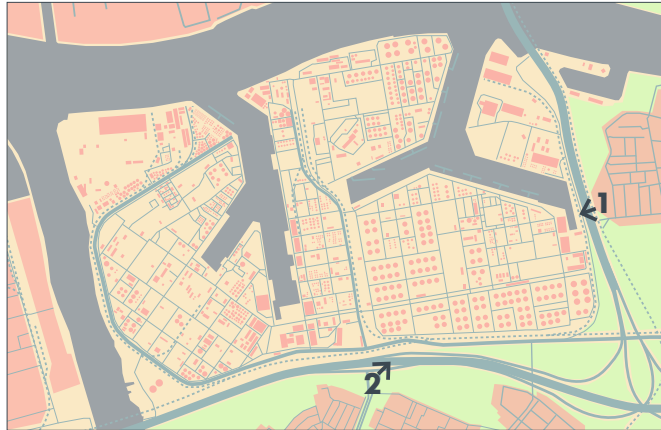
The effect analysis of the Pernis industry area are neither positive or negative points of consideration. When the area transforms into a new function which becomes more public, these effects of the area could be improved.

Edges

The Pernis industry area itself and the river form a big barrier between the city of Rotterdam and the residential areas in the South. This barrier is strengthened by the large highway (2) in the South and East.

The metro station of Pernis (1) is the end of the road, which then again runs into a barrier between the industrial area and the residential areas. For now this is not a negative point, because of the different functions and the public and non-public relation. But when the industrial area transforms into a new function, these barriers must be mitigated.
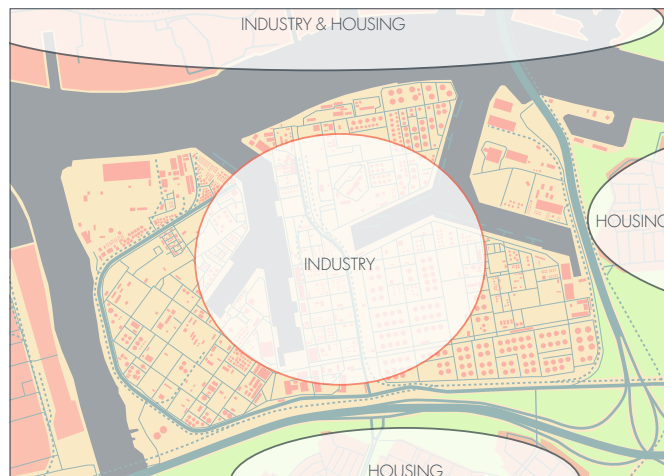
Illustration 54. Effect. Source: Author & Google Street view
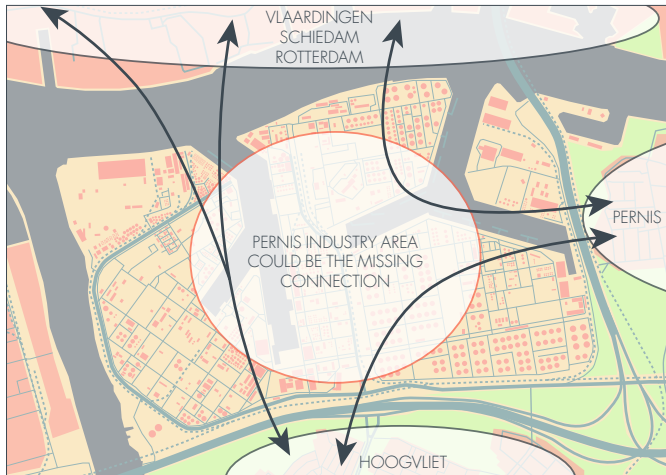
Connections

The municipality of Rotterdam mentions that they want to connect villages as Pernis, Hoogvliet and Rozenburg more to the city. The Pernis industry area could be the perfect site to make this connection.
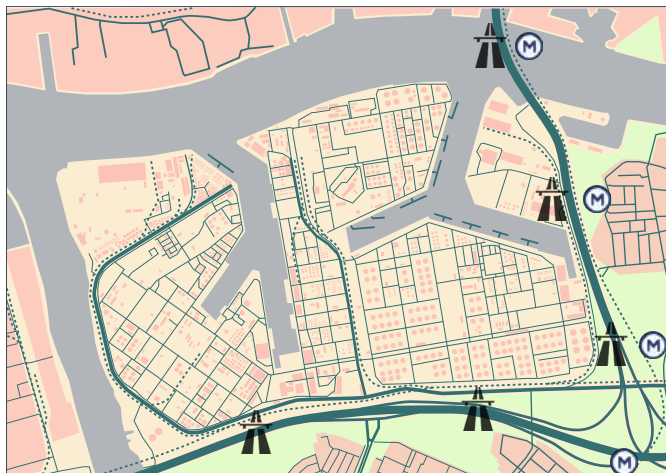
Infrastructure & Accessibility

The current infrastructure could be used in the new developments. The site is very well connected to the rest of the region, as highways, waterways, metros and even railways are already there.
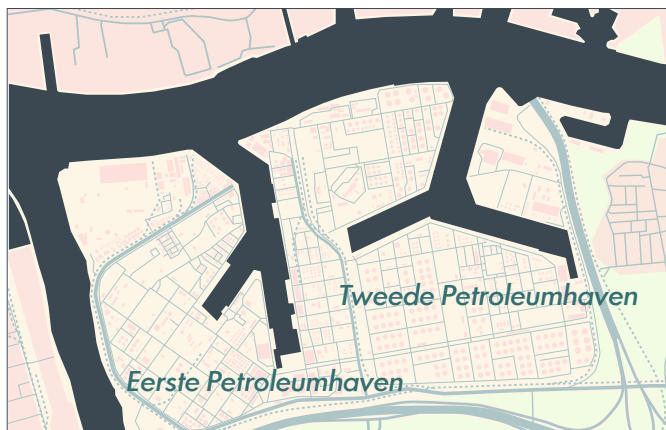
Water

The water of the Eerste Petroleumhaven and the Tweede Petroleumhaven could be transformed into recreational use. Water always gives a certain value to an area.

Illustration 55. Chance. Source: Author

LOCATION ANALYSIS

6
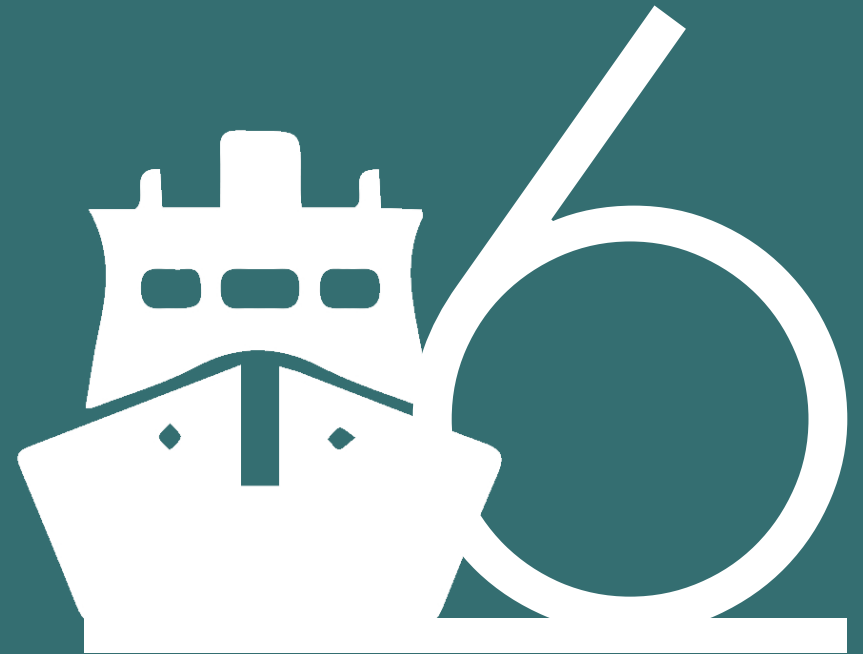
This chapter shows the characteristics of the Pernis industrial area and what characteristics are of value. It concludes with the core values that are going to support the design.
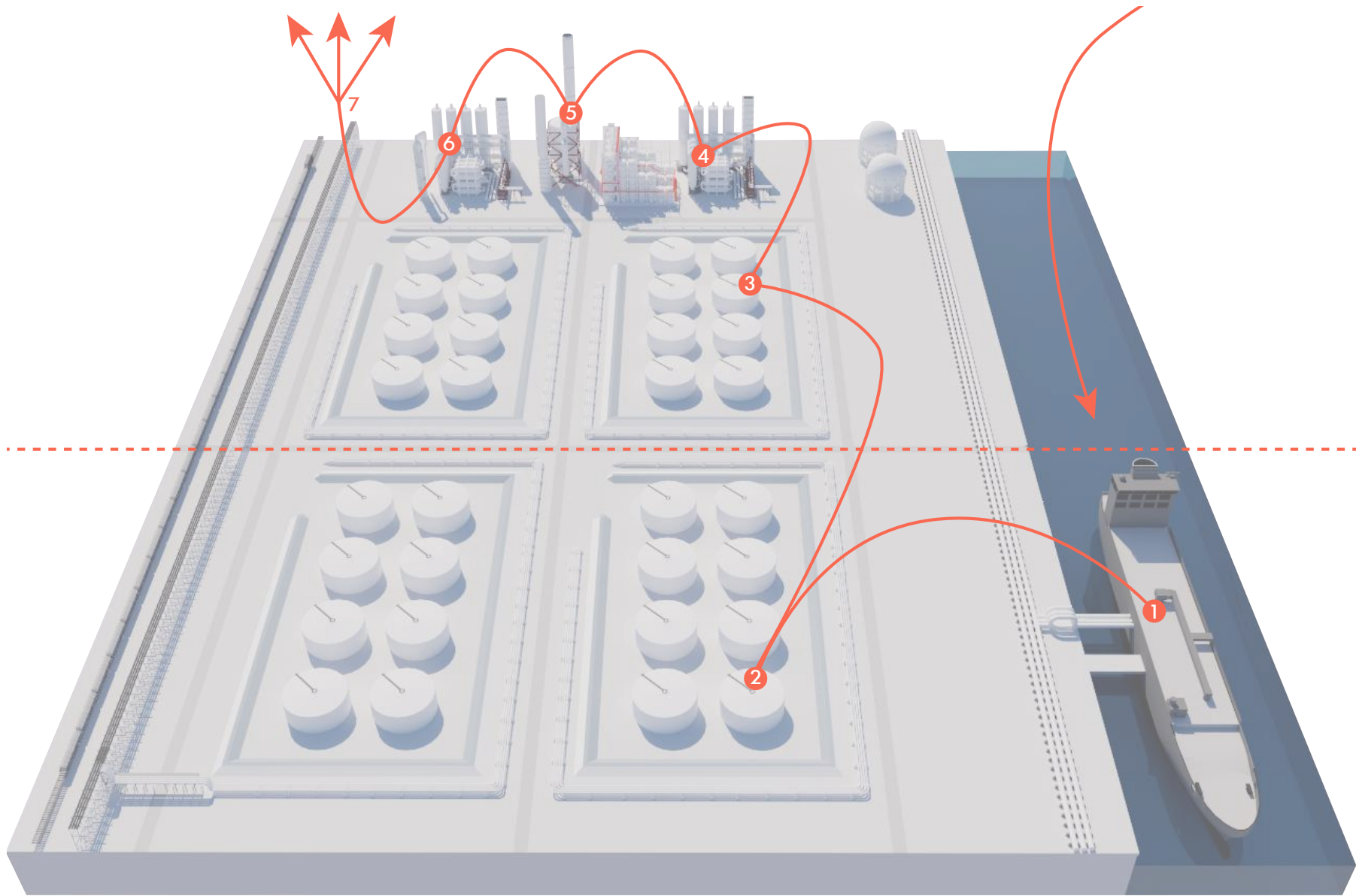
Illustration 56. Way of Oil. Source: Author

1 Overseas Tanker Arrives with Crude Oil

Oil tanker arrives from the North Sea with oil.

2 Main Storage

From this oil tanker, the crude oil get pumped into storage tanks.

3 Tank Terminal

From these storage tanks, it gets pumped into another storage facility.

4 CAT-Cracker

Cracking is the chemical process where strings of the molecules in crude oil get torn apart. By cracking the molecules you can make benzine. (Museon, n.d.)

5 Destillation Tower

In the distillation tower, the crude oil gets divided into different substances. By heating the oil to 350 degrees centigrade, different substances evaporate at different temperatures. (Museon, n.d.)

6 Blending Section

By blending they make the molecules longer and stick them together, to create fuel or even a solid substances out of gas. (Museon, n.d.)

7 Further transport by pipeline, train or truck

Oil leaves the area by pipeline, train, truck and also again by ship. The oil gets transported to Belgium, Germany and beyond.

6.1 THE WAY OF OIL

By analysing the way of oil through the area, an image is created how the area is used. Oil gets transported throught the area and comes in via the water. The water of the harbour and the quays plays a big role in the transformation of the area. Since this is such a important factor of the use now, this is also a way to tell the physical story of the place. The use and way throught the area can also contribute to telling the mental site of the story.
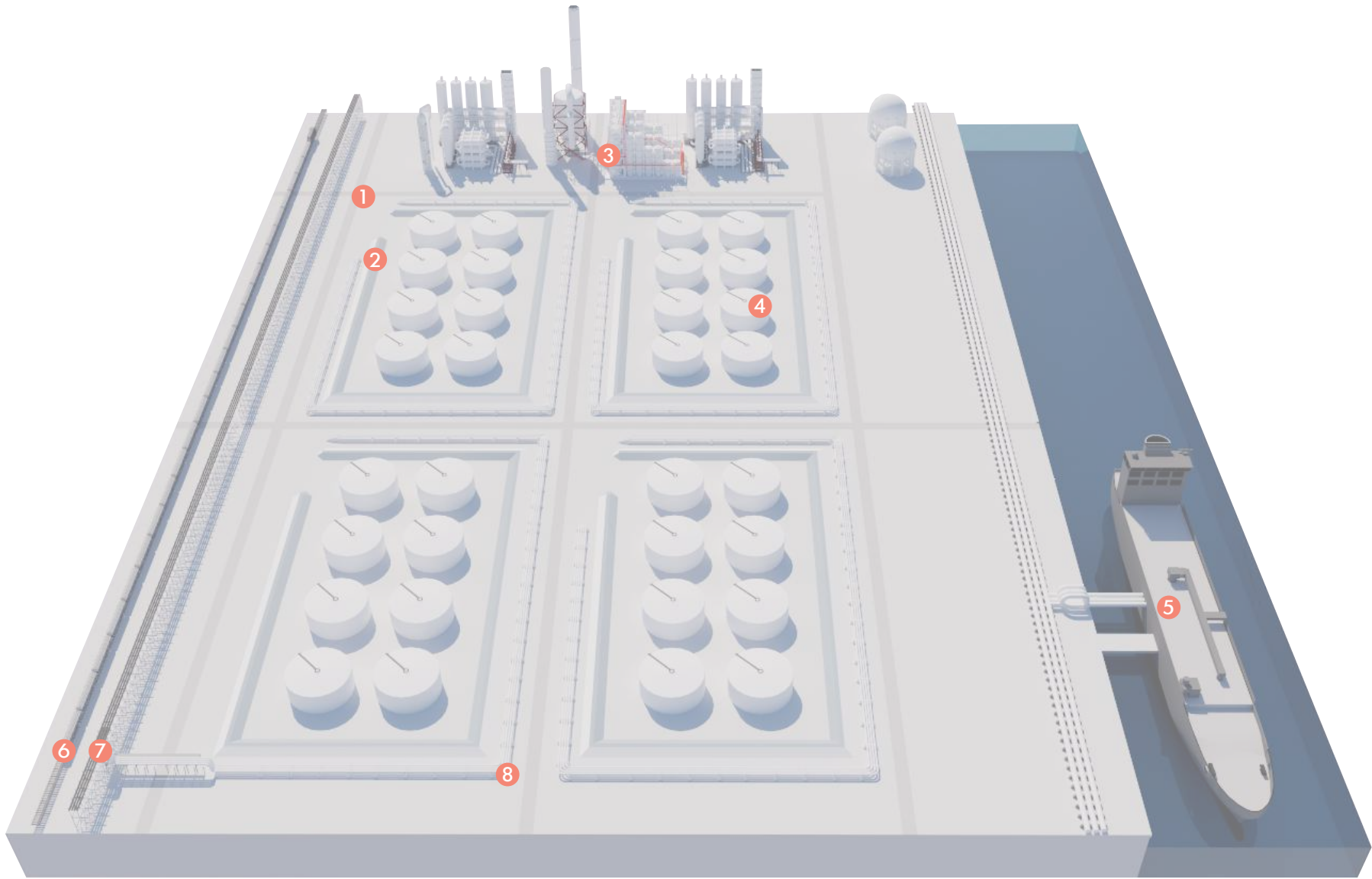
Illustration 57. Characteristics of oil. Source: Author

1 Grid (structure)
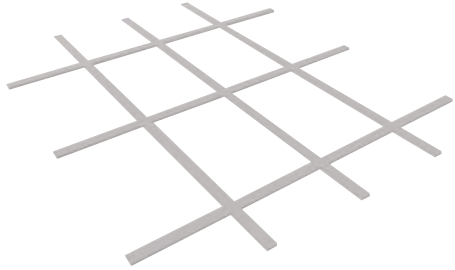
2 Dike (structure)
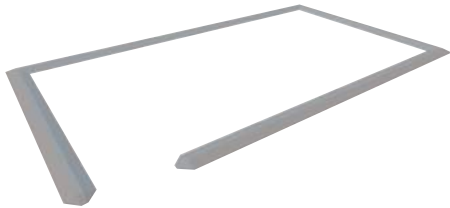
3 Factory (oil process)
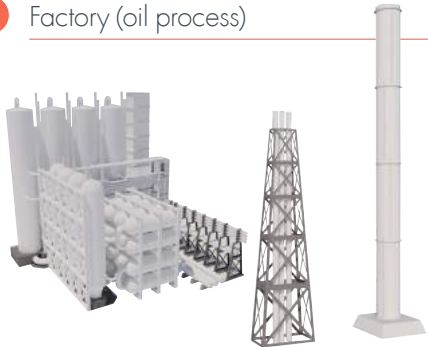
4 Tank (storage)

5 Tanker (transportation)

6 Train (transportation)

7 Pipelines (transportation)

8 Pipelines (transportation)

Illustration 58. Characteristics of oil elements. Source: Author

6.2   CHARACTERISTICS OF OIL

Every area has its characteristics, elements that are recognisable for people to say that it belongs to that particularly area. The oil industry has these characteristics as well. Illustration 57 and 58 show these characteristics. As mentioned in the previous paragraph the oil comes into the area from the North sea by tanker. After that it comes into the storage tank and is processed and stored again, waiting to get transported again. The characteristics can be divided into structure, process and storage, and transportation. The characteristics can play a role in telling the story of the place, while transforming them.

1 Grid

- Rectangular

- Access

2 Dike
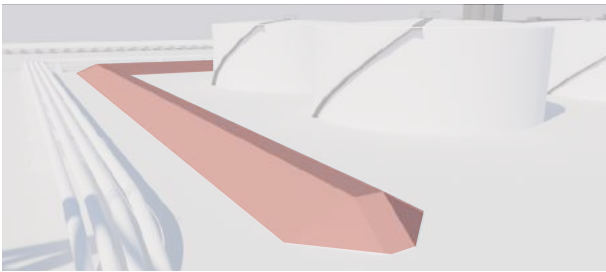
- Rectangular shape around tanks

- Protection

- Height: 2 m

main characteristic

3 Oil Process

213 m

Oil

Oil
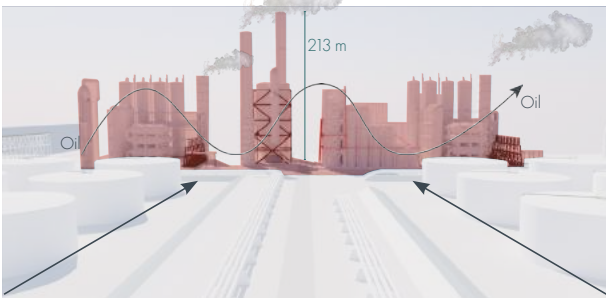
- Process

- Decor

'…rough and landscape of movement…'

Theatrical Scenery

main characteristic

4 Storage Tank

Oil

Oil

Oil

Oil

Oil

Oil

25 m

40 m
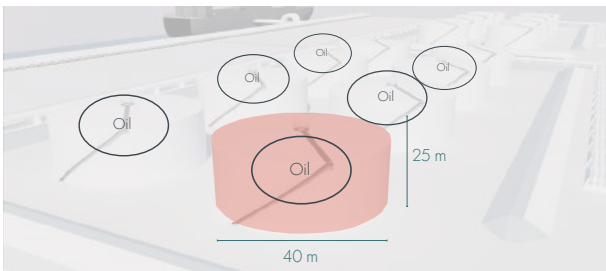
- Repetition

- Structure

- Width: 5 – 40 m

- Height: +/-25 m

'…quiet and almost peaceful landscape…'

Repetition and Structure

main characteristic

Illustration 59. Characteristics of oil elements. Source: Author
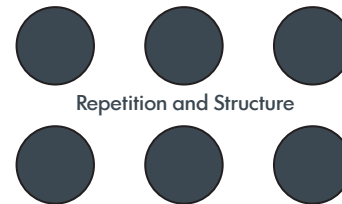
5 Tanker
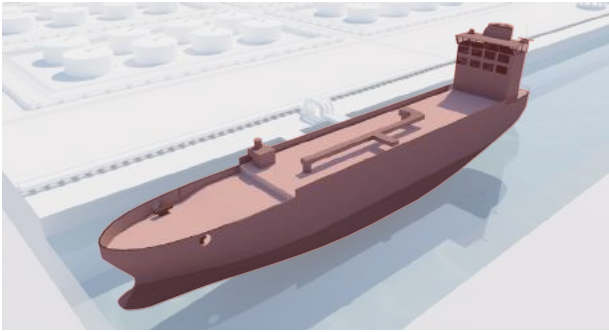
- Oil transportation

- Moving object

- length: +/-120 - 180 m

6 Pipelines
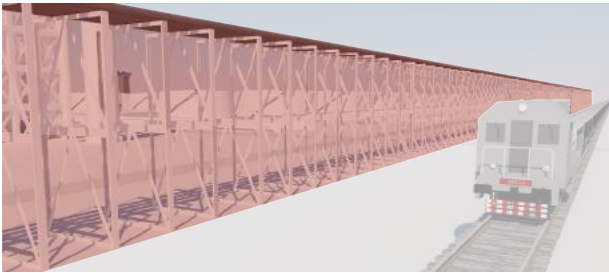
- Oil transportation

- Height: 20 m

- Transparant

- Line

7 Train
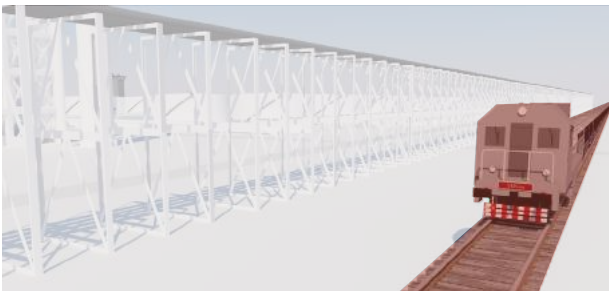
- Oil Transportation

- Line

8 Pipelines

- Oil Transportation

- Rectangular shape around tanks

The characteristics of illustration 59 are the most recognisable features of the Pernis industrial area. With every features the characteristics and measurements are mentioned. This is to keep in mind how big the scale of this area is.

The main characteristics are the ones seen from a distance and forming the image of the oil industry. They are unique and recognisable for the oil industry.

structures
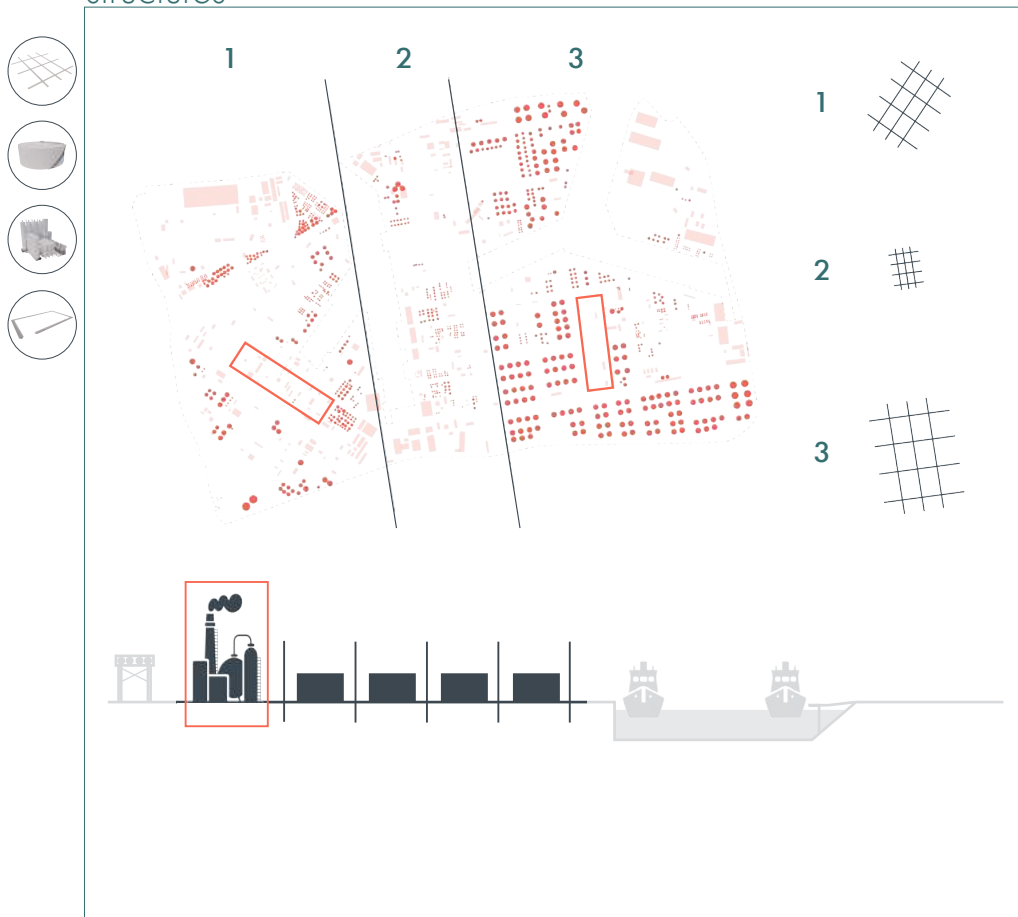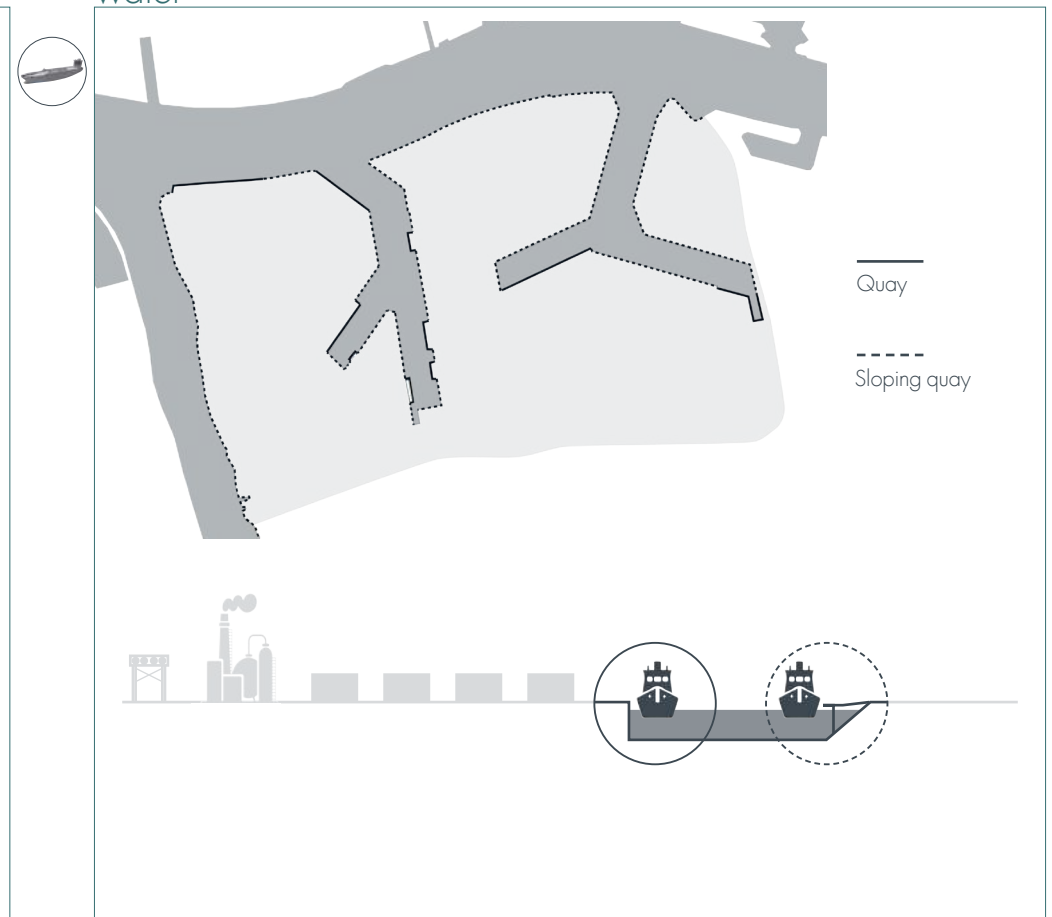
1   2   3

1

2

3

water

Quay

- - - - -
Sloping quay

infrastructure

Tracée

Infrastructure

Main infrastructure

DANGEROUS
PIPES
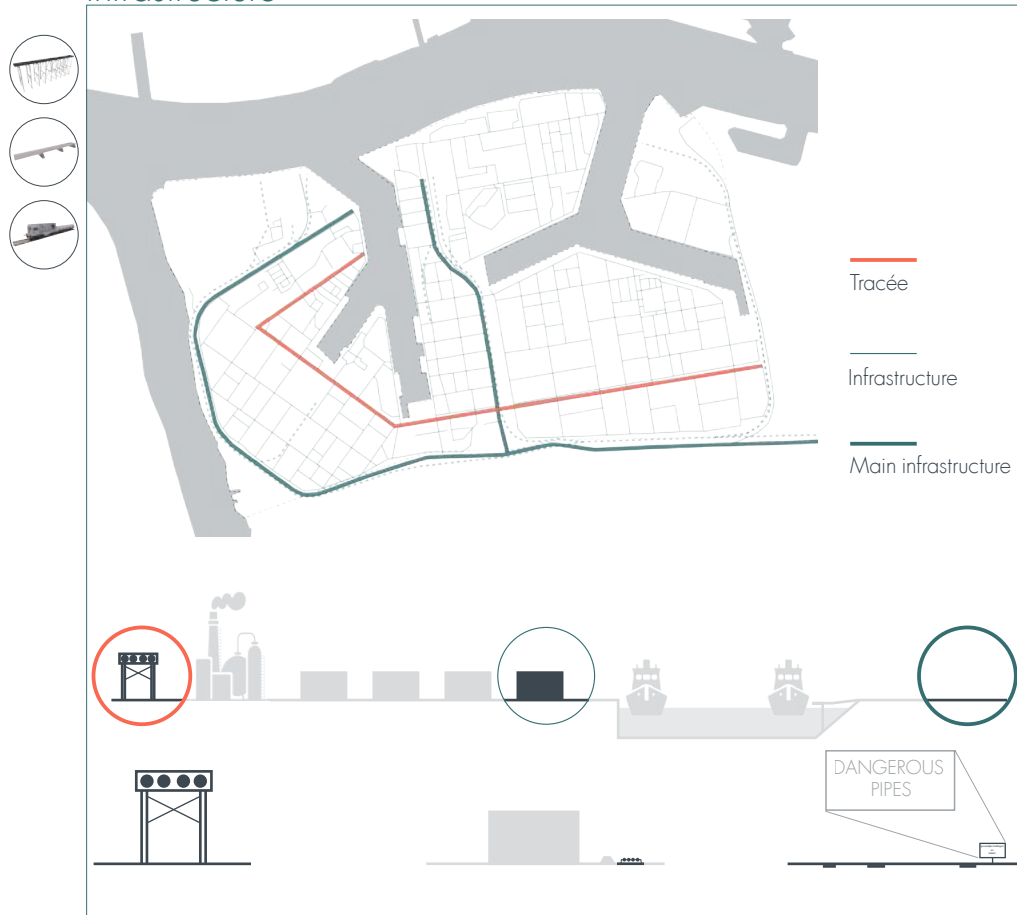
6.3 CHARACTERISTICS OF PERNIS

The previous paragraph mentioned the characteristic objects of oil and therefore the Pernis industrial area. This paragraph shows the bigger scale characteristics of the Pernis area. These characteristics are divided into three layers (illustration 60); structures, water and infrastructure.
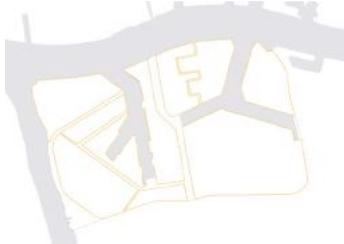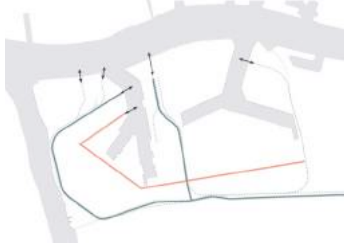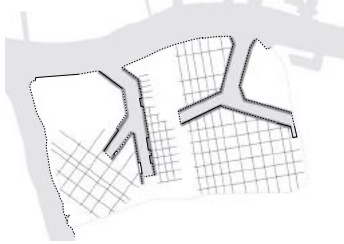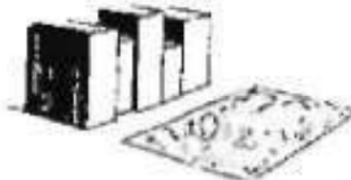
1. Structures
The area of Pernis has a very clear grid and division in functions. Through the grid, the factory and storage areas are divided and have their own specific space.

2. Water
The quays form the relationship between water and land. The sloping quay is the most occuring quay in this industrial area. Ships anchor away from the quay, as shown on illustration 60.

3. Infrastructure
The infrastructure has two main roads; tracée (above ground pipelines) and main infrastructure (underground pipelines, car, railway). In this section, the three infrastructure networks are displayed. The tracée infrastructure consists of above ground pipelines that run through the Pernis area, the infrastructure network is just streets that make the storage and factory areas accessible. The main infrastructure is more special. The main infrastructure transports the oil through and out of the

Pernis		Lynch 'Image of the City'	
Districts		Districts	
Lines		Paths	
Structures		Edges	
Places		Nodes	
Objects		Landmarks	

Illustration 61. Lynch elements. Source: Author & Lynch, 1960

area through underground pipelines and railway. Since the pipeline system runs underground, small information signs are placed along the main infrastructure, warning that it is dangerous and no digging is allowed there. These little signs are along the route every 20-30 meters.

Layers of Pernis

To make sure that the characteristics are recognisable, the theory of 'The Image of the City' of Kevin Lynch is compared to the layers of Pernis. (chapter 2.4)
The physical forms can be classified into five types of elements; districts, paths, edges, nodes and landmarks.
In illustration 61 is shown which structures are which elements. While compairing the five types of elements from Lynch with the layers of Pernis, a clear image is drawn of how the future oilscape can be shaped. The five types of elements are the ones most recognisable of a city image, so the five layers of Pernis should become valuable in the design.

Silhouette

The oil industry has become a landscape. According to Kolen & Renes (2015), landscape stands for a part of the world that one can perceive from a particular point of view. The oil landscape is formed by many points in the surrounding visible. This landscape silhouette is therefore important to preserve, because it forms the image of the

oil industry (illustration 61) from a human scale and point of view from outside the area. This image is the image most people have of the oil industry.

1 & 2 View from the A15 highway (by car)
The highway runs along the southside of Shell Pernis. The storage tanks and chimneys are clearly visible on these silhouettes. The headquarters of Shell Pernis is positioned next to the highway and easily accessible.

3 & 4 View from the metro line (by metro)
The metro line runs along the east site of Shell Pernis. Again, the storage tanks and chimneys are clearly visible. The refinery, which is located more into the centre of the area, is mostly visible on view 3.

1.
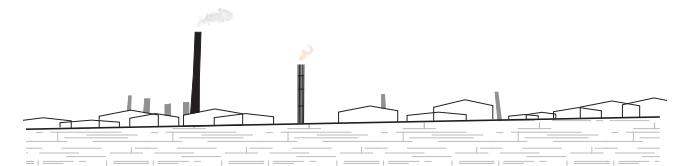
2.
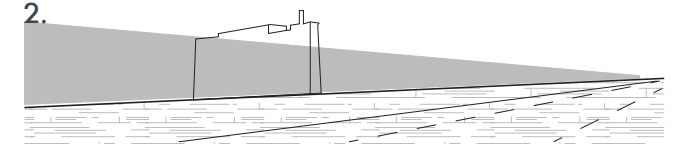
3.
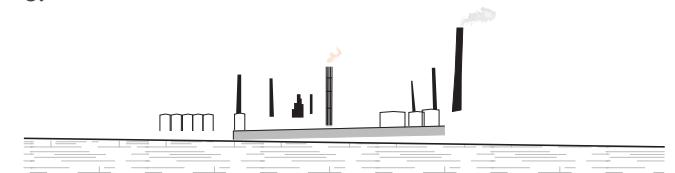
4.

Illustration 62. Silhouette. Source: Author

Illustration 63. Combination of layers. Source: Author
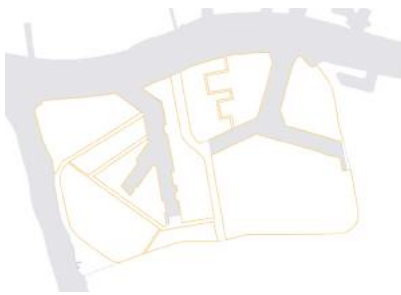
Districts

Based on the structures of the area there is a division made in districts or areas in the industrial site of Pernis.
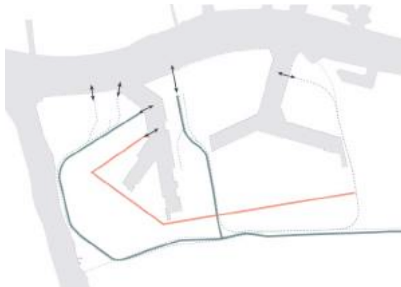
Lines

Lines all end or begin at a waterfront. These lines connect the area with the river Muse. These lines also have a unique characteristic shown on page 87.
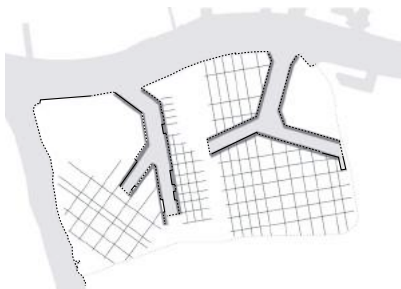
Structures

There is a clear grid division in the area. This grid was just made to be functional and does not come from the former polderstructure lying underneath.

Places

Are related to gates and (former) clear functions. The gates are the place were employees have to check in to go to work. These are the only entrances were you can get into the area.
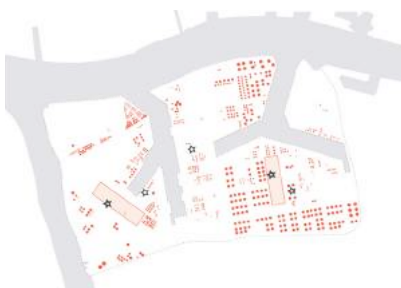
Objects

Objects with physical characteristics, such as chimneys and storage tanks. The storage tanks of the area are the most appearing objects together with the two chimneys are the landmarks

Illustration 64. Physical layers of Pernis. Source: Author

6.4 VALUE

Now that the characteristics of Pernis are analysed, a different layer adds to this, the layer of value. The value map combines the characteristics of Pernis and shows the most important structures. The characteristics are divided into five layers; districts, lines, structures, places and objects, and are combined in one map (illustration 63) The design will be based on these five layers.
This map will help with the design. It shows the important structures to design with and which elements are important to keep the physical heritage alive in future developments.

The layers of Pernis will also help to tell the story of the place. Its former use can transform together with the use of the area. Each of the five layers has a characteristic that adds to telling the story of the place. The gates, for example, can still be the entrances to the area, by keeping the entrance through the gates it adds to the experience of the former function.

Value of Objects

Illustration 65 tells the value of the objects or structures. Facing a transformation, the objects have to be valued before they transform. This illustration shows the objects and elements that have to remain as they are now. These objects must be preserved to keep the story of oil recognizable in the area. (dark blue highlighted elements) The light blue highlighted elements are the ones that can

Illustration 65. Valuemap of Pernis. Source: Author

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be transformed, if the silhouette is preserved. The structure of infrastructure can be transformed, if the structure is kept straight and does not become organic.

By making this map, a distinction is made between the image of the area from outside and inside. The landmarks and the main infrastructure are the main elements that make the area recognisable from a distance, this is why they have to be preserved. The light blue highlighted elements make the structure of the area and complete the image from inside.

Mental map

After the analysis, a drawing was made to conclude the site, with this drawing (illustration 66), the most important thing was to find out if the analysis was of value. This drawing was made without looking at any of the maps or analysis and confirms that the valuable objects and structures that were found were the right characteristics.

To get more grip on the mental site of telling the story of Pernis industrial area, this mental map is drawn. The map tells the different processes going on in the area. Infrastructure and the gates to enter the area are also part of this map. They play a big role in telling the story of the flow of people and products through the area.

The illustration tells the image I have in my mind about the area. This illustration strenghtens the map on page 92, with the value of the area.

Illustration 66. Mental map. Source: Author
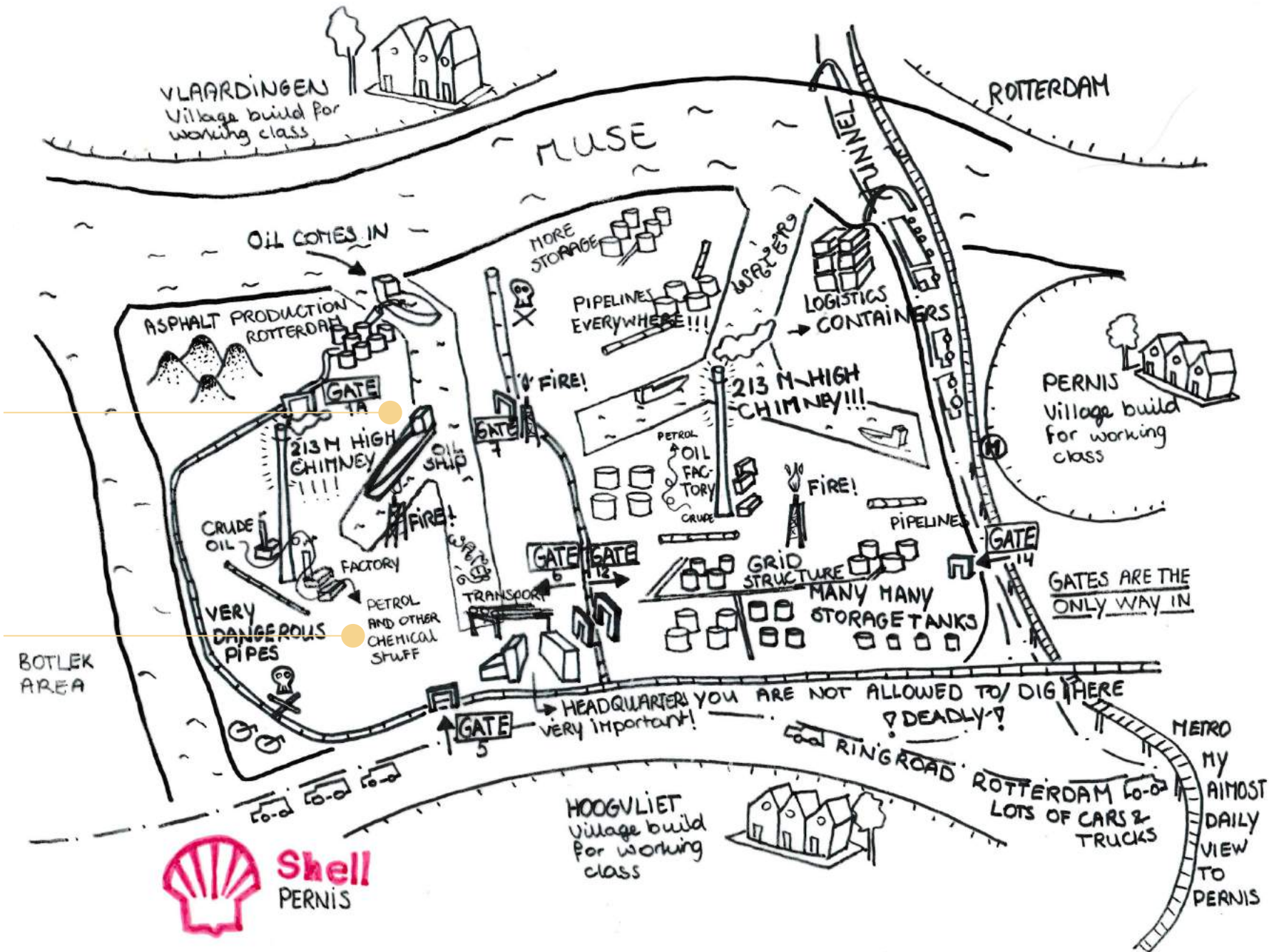
Former Education centre where my grandfather worked

My father's office

VLAARDINGEN
Village build for working class

MUSE

ROTTERDAM

TUNNEL

OIL COMES IN

MORE STORAGE

PIPELINES EVERYWHERE!!!

WATER

LOGISTICS CONTAINERS

ASPHALT PRODUCTION ROTTERDAM

GATE A

FIRE!

GATE

213 M HIGH CHIMNEY!!!!

PETROL OIL FACTORY

PERNIS
Village build for working class

213 M HIGH CHIMNEY !!!!

OIL SHIP

CRUDE

FIRE!

CRUDE OIL

FACTORY

FIRE!

PIPELINES

GATE 14

FACTORY

PETROL AND OTHER CHEMICAL STUFF

GATE 6 GATE 12

GRID STRUCTURE

GATES ARE THE ONLY WAY IN

VERY DANGEROUS PIPES

TRANSPORT

MANY MANY STORAGE TANKS

BOTLEK AREA

HEADQUARTER very important!

YOU ARE NOT ALLOWED TO/ DIG THERE ? DEADLY ?!

METRO MY AIMOST DAILY VIEW TO PERNIS

GATE 5

RINGROAD ROTTERDAM
LOTS OF CARS & TRUCKS

HOOGVLIET
Village build for working class

Shell
PERNIS

▽ AUTHORIZED ACCESS ONLY ▽

6.5   CORE VALUES

Before starting the design, it is crucial to decide where the design is based on. From the previous research, the next core values appeared. (illustration 67)

1. Preserve Existing Structures
The oil industry has certain characteristics. The area exists of several characteristic elements mentioned in paragraph 6.4. The value map of page 92 tells what value these characteristics have and how to cope with them.

2. Preserve Silhouette
The oil industry has become a landscape. The silhouette of the industry is one of the characteristics known for 'outsiders'. It is the physical image people have of the oil industry. Therefor this silhouette must stay as it is. Within the silhouette there is many room for transformations as long as the silhouette stays as it is now.

3. Relationship with Water
Harbour areas are always closely related to water. The transportation of goods happens via the river. When the function of the harbour area disappears, it is important to preserve this very significant relationship. Illustration 68 shows how this relationship is preserved in future developments. This relationship also plays a role in telling the story of the place.

4. Recognition
With the transformation of the oil industry of Pernis, it is important to keep in mind that the area should remind of the oil industry. It is important to keep the image of oil alive. By preserving the structures (physical) and the story (mental), the image will always be recognizable. This value relates also to telling the story of the place in a physical and mental way.

Illustration 67. Core values. Source: Author
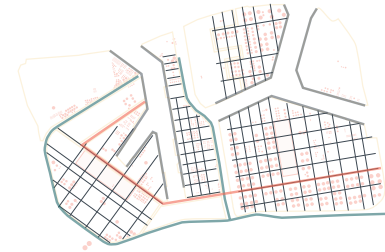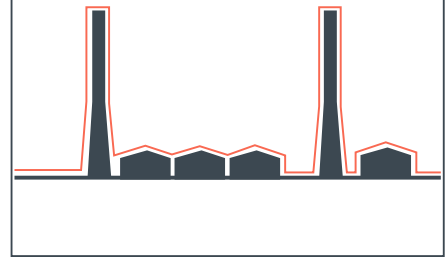
6.6   HOW TO TELL THE STORY?

In telling the story, the history of the place plays an important role. Current shifts in public appreciation demand new approaches. Contemporary issues such as social identification, quality of life and sustainable developments should be linked to knowledge of the past (Kolen & Renes, 2015). The story of the place and the meaning and former use is becoming more important in future developments. Old landscapes should be transformed from defenceless landscapes into resilient and socially vital landscapes by bringing insight into historical narratives and processes (Kolen & Renes, 2015). But how do we translate this into a design? By now it is clear that including the story is becoming more important in future developments.

Telling a story can be physical or mental (illustration 68). The physical storytelling is with the help of the physical characteristics. In the case of the oil industry, oil has a way of moving through the area (which is mentioned in chapter 6.1) First it comes into the harbour by an oil tanker and via a process of storing and processing it leaves the area by ship, train, truck or pipeline. The physical story can be told by showing this way of oil.

The mental storytelling is a bit harder to tell. Mental storytelling means telling a story through memories and emotions. While the physical storytelling is objective, the mental storytelling is subjective. This makes it harder to determine what to tell. They say that an illustration says

more than a thousand words, so in this project, the way to tell the mental story is through photographs. The old photographs of the area tell a lot of stories which are worth telling. The current negative image of oil, also had, or even has, a positive site. These old photographs tell a story of how the area was used. The former function thus also plays a big role in the design in telling the story.
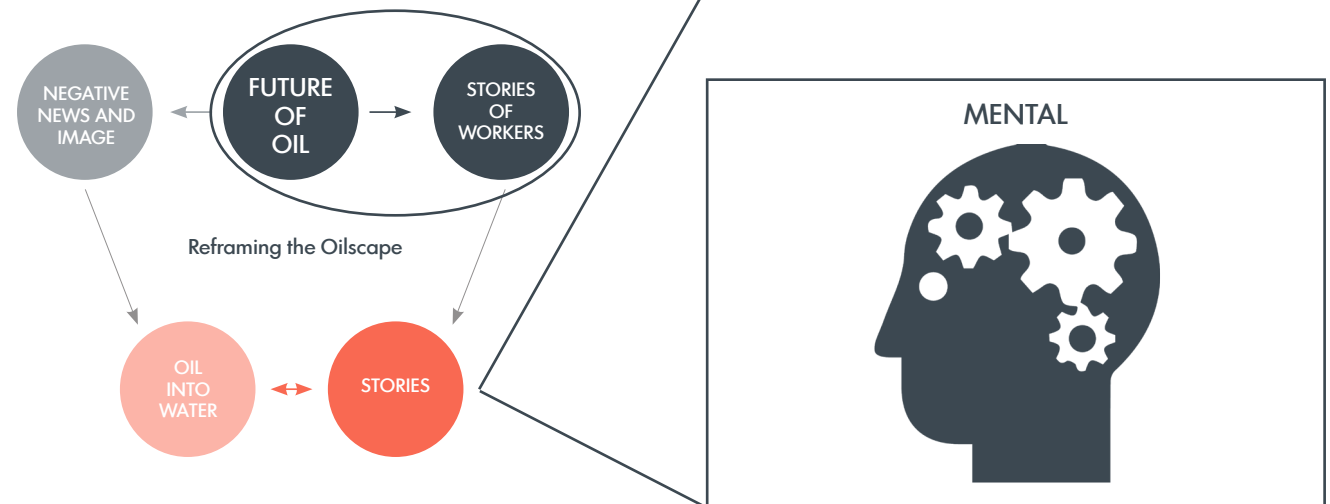
Illustration 68. Tell the story. Source: Author

POSSIBILITIES

7
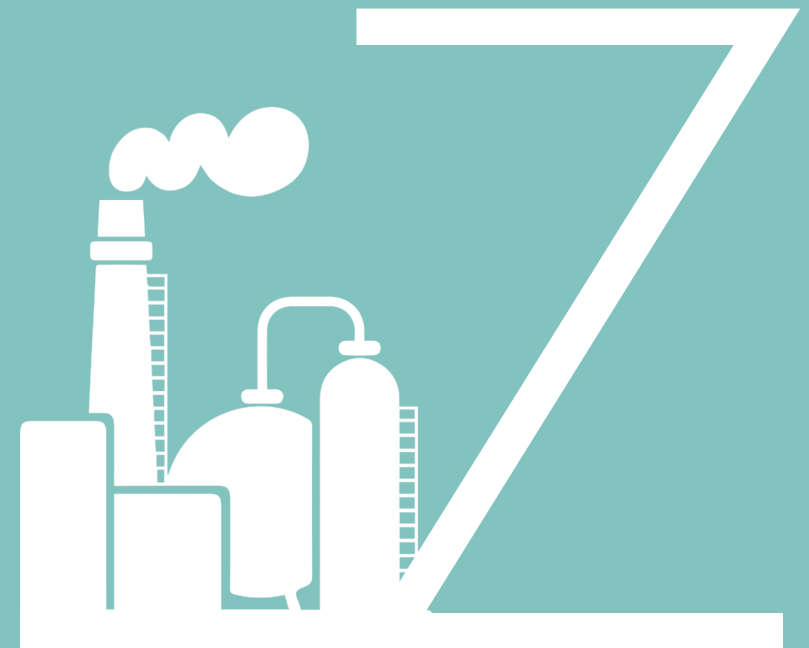
This chapter explains the possibilities for the future developments of the Pernis industrial area. The visions of different stakeholders are analysed and from there, the functions used in the design are chosen. In these possibilities, the scale and comparison analysis is also important to determine if the area is suitable for the functions resulted from the visions analysis.

Illustration 69. Gemeente Rotterdam. Source: Gemeente Rotterdam, n.d.

Illustration 70. Port of Rotterdam. Source: Port of Rotterdam, n.d.

Illustration 71. Shell. Source: SafetyNet Nederland, n.d..

7.1   FUTURE PERSPECTIVES

To find out what new function could suit the area or is needed in the region, the visions of several stakeholders are analysed. The stakeholders involved in this analysis are the municipality of Rotterdam, Port of Rotterdam and Shell (illustrations 69, 70, 71).

From this analysis, a few focus points developed; population growth, renewable energy, efficient use of land, watermanagement and innovation. Population growth and renewable energy are nowadays very important words. The world is coping with a population growth and we need to consider this in new developments. The world is growing, but it is also facing another energy transition (chapter 1.1), the transition from fossil fuels to renewable energy. Since the harbour of Rotterdam mostly consists of oil producing and transporting companies, it also faces a big change. Efficient use of land comes together with population growth. The population is growing and therefore we must be careful and cautious with the use of land. Watermanagement in the surrounding city areas is becoming a challenge because of the growing city, there is no room anymore for water and enough water storage is required.

Population growth
The city of Rotterdam copes with a density task of 56.000 houses, while the municipality of Pernis copes with a population shrinkage. Because of the industry positioned next to the village of Pernis, people do not want to live there because of the risks. (Gemeente Rotterdam, 2008) Shell composed a report with scenarios for the future. In this report they also mention population. The driver in the scenarios remain prosperity and population. (Shell International BV, 2011) In their developments they try to take into account the importance of people living near the developments of industrial sites.

Renewable energy
The municipality of Rotterdam finds innovation in energy use and production very important. (Gemeente Rotterdam, 2008) New developments are welcomed with open arms. The harbour of Rotterdam thinks the same, despite the many fossil fuel related companies. They mention for example, that the refineries could transform into high-tech industry parks. (Havenbedrijf Rotterdam,2011) Also Shell mentions that targeting climate change and CO2 alone is insufficient. (Shell International BV, 2011) Which states that the fossil fuel related companies are also willing to get along with the energy transition and are searching for sustainable ways.

Efficient use of land
The municipality of Rotterdam mentions the value of heritage sites. Catalysator for developments are architectonic quality and redevelopment of cultural historical heritage. (Gemeente Rotterdam, 2008) Which relates to the efficient use of land by re-use of the land.

Super-efficient land use makes it possible to acknowledge the request for space. (Havenbedrijf Rotterdam,2011) The harbour is also searching for a way to make the harbour more space efficient. Parts of the harbour are completely modernised and make use of robots instead of people. Less space is needed fo such a development.

Watermanagement
As the city grows, it is searching for water storage. The city can not store the rain water anymore, if it rains for a few days. Water squares and storage is needed to store this water. (Gemeente Rotterdam, 2008)

Innovation
The municipality of Rotterdam and its harbour both have a clear vision of the future. The municipality wants a strong economy and an attractive living city. (Gemeente Rotterdam, 2008) Whilst the harbour of Rotterdam sees Rotterdam as a worldwide showcase of innovation and value.

It is clear that the subjects of population growth and energy transition in combination with innovation and water management are two developments to focus on in the following analysis.

On the following pages are some examples of energy parks and residential areas, which are comparable to the structures of the Pernis industrial area, to see if the storage tanks could function as a appartment building.

Illustration 72. Gardens by the bay. Source: Marina Bay Sands, n.d..

Illustration 73. Energy roof. Source: Bouroullec & Bouroullec, 2017.

Illustration 74. Water roof. Source: Meinhold, 2012.

Illustration 75. Solar energy. Source: Mellino, 2015.

Illustration 76. Wind wall Source: Lee, 2006.

7.2 ENERGY PARK

In a simple case study on energy possibilities, I found a few inspiring projects. The Gardens by the Bay in Singapore is maybe the most famous example of such a park (illustration 76). The other projects are examples of elements that produce or store energy that could be implemented in the Pernis area. Solar roofs and wind walls could appear in many forms, so in the further design easy to implement.

Illustration 77. Hakka Houses China. Source: Pham, 2011.

Illustration 78. Tietgenkollet Copenhagen. Source:Tietgenkollegiet, n.d..

7.3   RESIDENTIAL AREA

Round towers as housing are not usually used. The two projects on this page show that people used it for a long time.

In the Southwest of the Fujian province in China the communities shown in illustration 74 are settled. These communities are known as Tulou. They are designed as fortresses in either round or square shapes. The walls of the fortresses are up to six meters thick and measure three to four floors high. They are able to house up around 80 families. In 2008, the Tulou buildings gained the UNESCO world heritage status, because they are exceptional examples of functional and unique building traditions. (Pham, 2011)

A project which is inspired by the Hakka architecture in China is the student housing project in Copenhagen, Tietgenkollegiet (illustration 78). This project has become an international reference work that attracts attention from the whole world and won several awards. Tietgenkollegiet represents the future of student residences. A type of residence that supports and develops an attractive housing and student area with a so far unheard of focus on prioritising of the community in combination with the individual. (Tietgenkollegiet, n.d.)
Round shapes in building bring people together, the apartments face each other which stimulates connection with the people living in your building. It really feels like a community living together.

To be able to use such examples in the design a scale analysis is made of the elements of Pernis, to find out if such housing areas are even possible. This scale analysis can be found in appendix 1 on page 182.

DESIGN
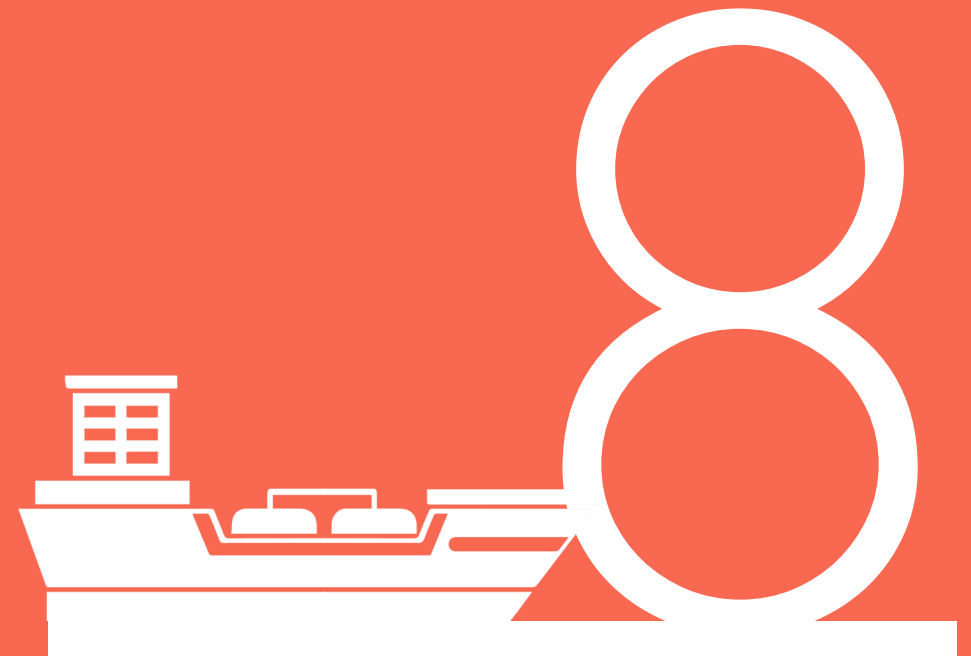
8

Within the design experiment it is showed how the results of both theoretical and location analysis try determine a right balance between old and new, preservation and development, and how this could be used to create a design which showcases different uses of industrial oil heritage.

1. Preserve Existing Structures

2. Preserve Silhouette

3. Relationship with Water

4. Recognition

OIL

Illustration 79. Core values. Source: Author
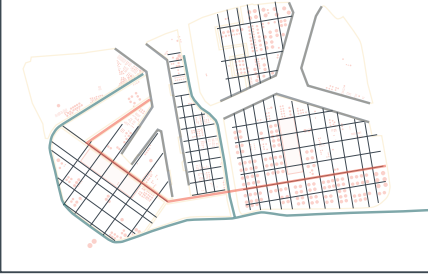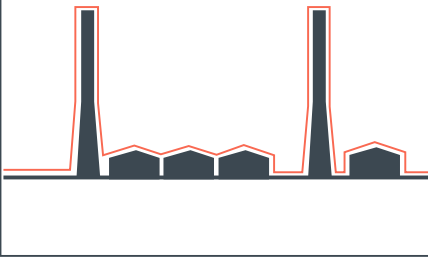
DESIGN ASSIGNMENT

In the design, the core values of chapter 6.5 are used to test the result of the design. A zoning plan is made for the region and the industrial area of Pernis. As a more detailed design, 3 variations are shown of how this particular area could look like in the future to show the possibilities of the oil industry.
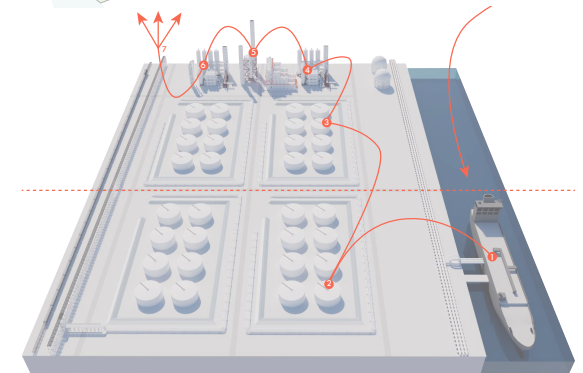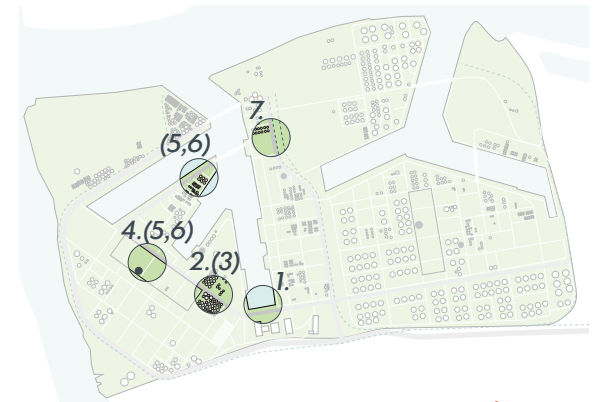
1. Overseas Tanker Arrives with Crude Oil
2. Main Storage
3. Tank Terminal
4. CAT-Cracker
5. Destillation Tower
6. Blending Section
7. Further Transport by Pipeline, Train or Truck

Illustration 80. Physical storytelling. Source: Author

8.1 STORYTELLING

Story telling plays an important role in the design. This storytelling is divided in a physical and a mental part.

Physical Storytelling

Physical storytelling is done, by showing the way of oil (illustration 80). The way how oil gets transported and stored in the area and the elements that belong to this process are preserved and will get a new function in future developments.

Mental Storytelling

The mental storytelling is done, by reframing old pictures. Many functions in the masterplan are therefore related to the illustration 81. Many events occurred in the decades oil existed in the harbour of Rotterdam and therefore there are many relations to make to memories and stories people have at this site.
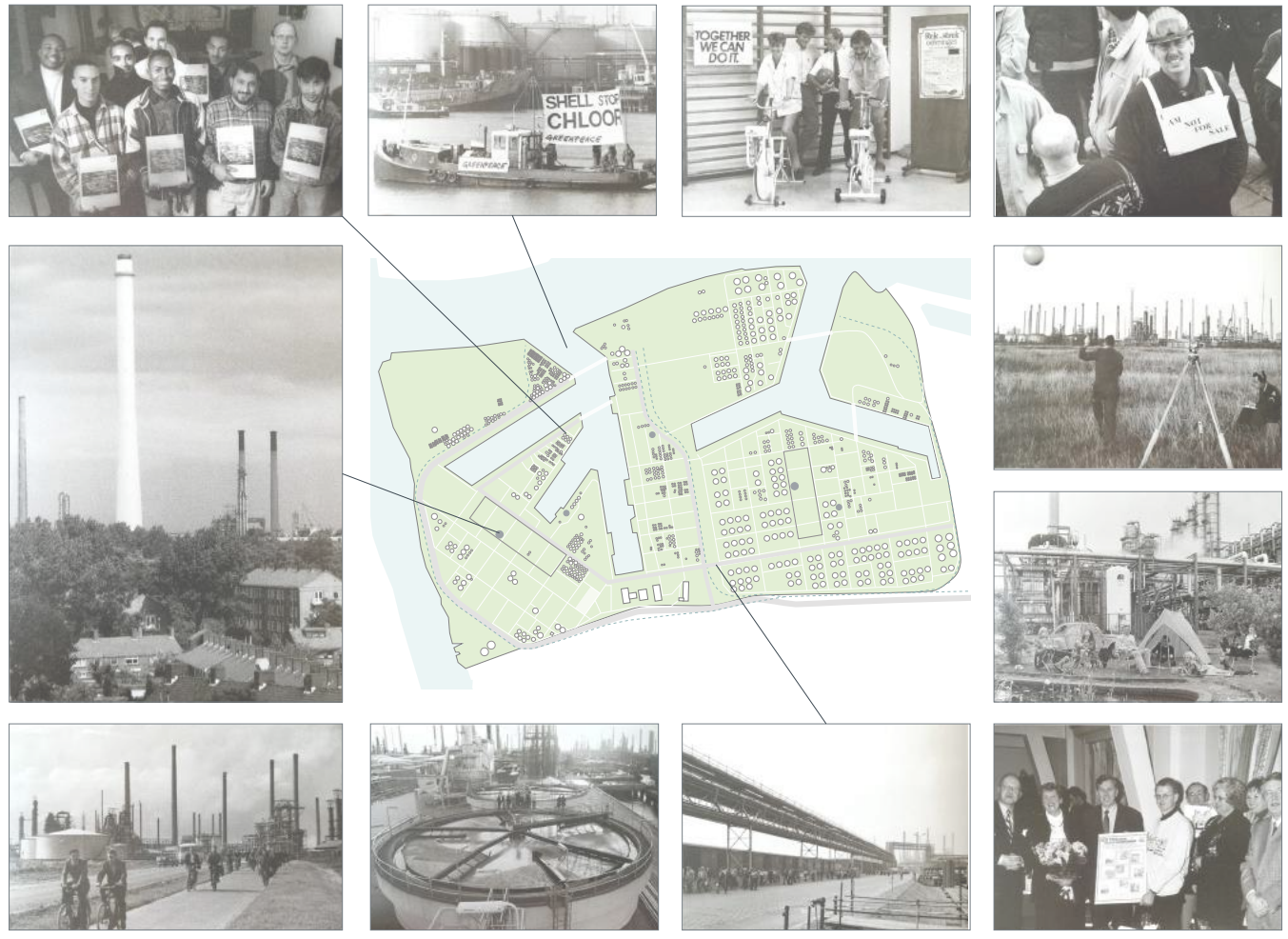
Illustration 81. Mental storytelling. Source: Author Pictures: Shell Nederland Raffinaderij, 2002

Rotterdam Centraal

Schiedam Centrum

Beurs

Floating Village

NEW CITYAREA
4500 – 6500 houses

CLEAN TECH DELTA
Companies

Vlaardingen

* Preservation and
sustainable development
of the maritime character

Floating City

SHOW CITY
Innovations
become visible

River Muse

* RDM Campus

Zuidplein

**ENERGY
PARK**

Pernis

PORT VALLEY
More sustainable
harbourcomplex

Floating Offices

Pernis

**RESIDENTIAL
AREA**

Hoogvliet

Rhoon

Legend

— — Train

- - - - - Metro

- - - - - Future metroline

' ' ' ' Waterbus

' ' ' ' Future waterbusline

▬▬ Ringroad Rotterdam

▬▬ Bridge

△△ Erasmus Bridge

▮▮▮ Tunnel

▭ Harbour area

▭ Residential area

∴∴∴ City areas

▭ Park

1 km

Illustration 82. Zoning plan region.

Source: Author
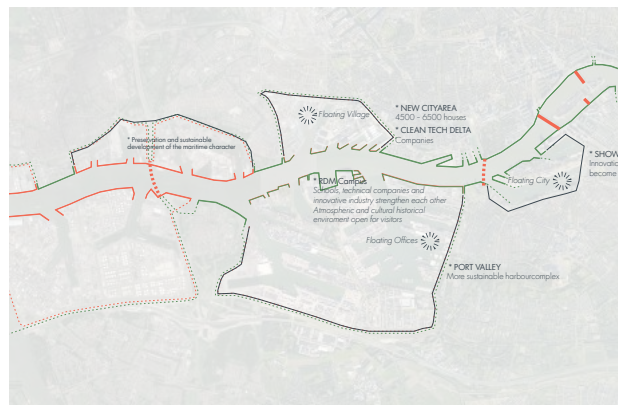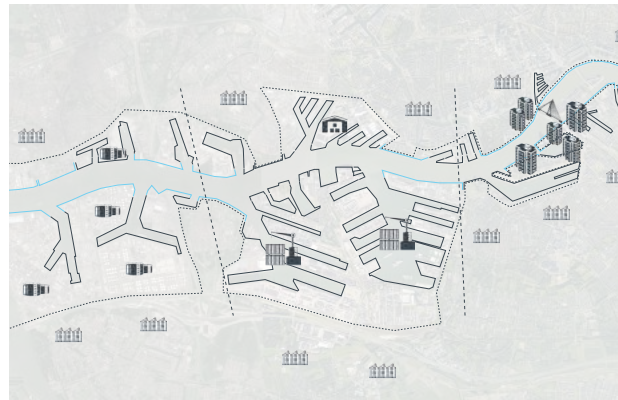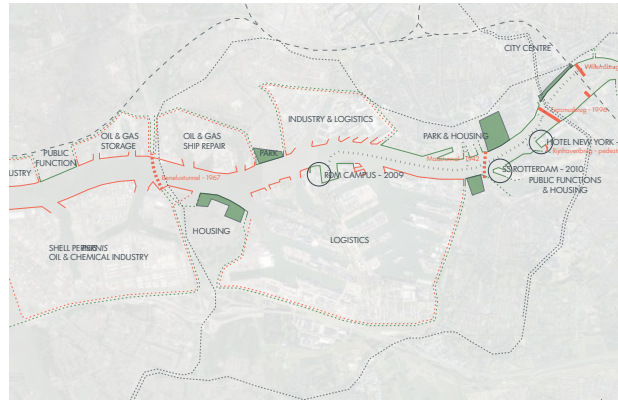
8.2 ZONING PLAN CITY & REGION

The historical analysis from chapter 4 already showed that the harbour activities are slowly growing out of the city. Illustration 82 show the future perspectives on the harbour areas right of Pernis, such as the Waalhaven, Eemhaven and Wilhelminahaven. These areas will become much more public and residential areas are added to these areas. (illustration 83 shows this aswell) Illustration 82 also shows how Pernis could fit into this future perspective. The residential area of Penris will give more space to the village of Pernis, that was laying in between two very large industrial areas. The public transport will make the Pernis area better accessible. And the energy park will produce energy for the region and becomes part of the future perspective of the Port of Rotterdam and how they want to make the harbour a showcase of sustainable developments.

Illustration 83. Region around Pernis.
Source: Author

8.3   ZONING PLAN

The future zoning plan of Pernis combines the previous research into one map (illustration 86). Illustration 84 had a great impact on the future plans for Pernis. As the illustration is showing; Authorized access only!. The area was not accessible for 'normal' people. You could only entre if you were allowed to or worked there. Illustration 85 shows an abstract version of the zoningplan. This abstract map shows the infrastrutural ring of Pernis, which relates back to the isolated feeling of Pernis, the different zones/functions, with the former factory areas function as new center. The new centre consists of sports activities, shops and other facilities.

      The layers that belong to this zoning plan are discussed on the following pages and will explain in more depth how this zoning plan developed.

Illustration 84. Mental map chapter 6.4. Source: Author
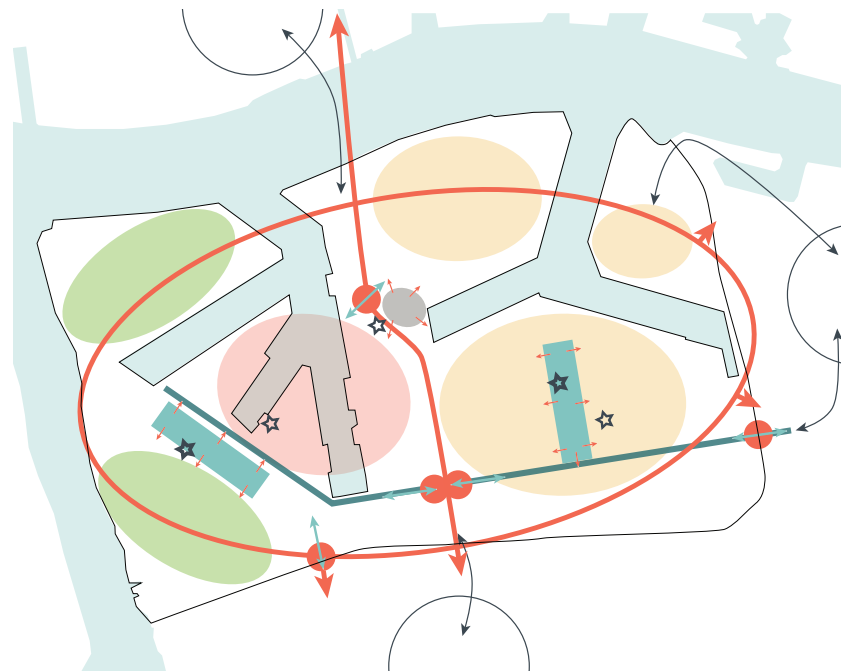
Illustration 85. Zoning plan abstract. Source: Author

Illustration 86. Zoning plan. Source: Author

Legend:
- Residential area
- Information Centre
- Public Transport Hub
- Sports & Recreation
- Shopping Centre
- Energy Park
- Park
- Recreation/Park
- Existing Slow Traffic
- Slow Traffic
- Existing Public Transport (Metro)
- Public Transport (Metro)
- Public Transport (Waterbus)
- Secondary Traffic
- Primary Traffic
- Future Connection to Botlek Area
- Nature Friendly Shore
- Public Transport Station
- Gate area
- Landmark (chimney)
- Viewpoint
- Storage Tank
- Oil Tanker
- Noise Barrier

VLAARDINGEN

SCHIEDAM

GATE 1A

GATE 7

METRO/WATERBUS
STATION
GATE 7

PERNIS

METRO
STATION
PERNIS

Pernispark

GATE 14

GATE 6

GATE 12

BOTLEK

GATE 5

Oudelandsepark

Bonairepark

HOOGVLIET

Map labels (as they appear on the illustration):

VLAARDINGEN
SCHIEDAM
PERNIS
BOTLEK
HOOGVLIET
Bonairepark
Oudelandsepark
Perniserpark

METRO / WATERBUS STATION GATE 7
METRO STATION PERNIS

GATE 1A
GATE 7
GATE 5
GATE 6
GATE 1?
GATE 14

Districts

Paths

Edges

Nodes

Landmarks

Illustration 87. Layers of the design. Source: Author

8.4   LAYERS OF DESIGN

The five layers of the research on the characteristics of the area are again important in the design. The five layers represent the most important elements of the physical story. The five layers together form the masterplan for the Pernis industrial area.

The next pages will explain how these five layers work separatly. The zoning plan is a combination of these layers.

Illustration 88. Layer of infrastructure. Source: Author

5 km

4 km

3 km

2 km

'Green Route'   Car – Main Route

'Blue Route' Biking & Walking – Main Route

Biking & Walking Routes 'Experience Area'

Illustration 89. Paths. Source: Author

Green Route

Used to be dangerous pipelines
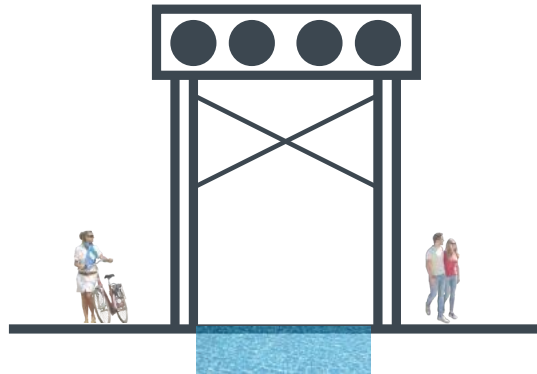
Illustration 90. Section Paths. Source: Author

Blue Route

The first layer is the infrastructure layer (illustration 88). The ring strenghtens the feeling of the area being isolated. The axes, going through the area from north to south, connects the area to the already existing highway, and makes a new connection to Vlaardingen, on the other side of the river.

Paths

The most important paths in the area are the now Green and Blue routes.

The Blue route was a tracée of pipelines running through the area. The new function of the line will be a guiding and water experience element. As explained in chapter 6, oil will turn into water. Since these pipelines transported the oil, water will be the new source of renewable energy in the area. To show this, the Blue route will be a walking water experience route, guiding visitors through the area.

The Green route was an area of dangerous pipelines and nothing was allowed (no digging, no trees and so on) here except for transportation. The road, bicycle route and railway were running here, but the rest was grass. Since this was an untouchable area, this route will keep its former function as transportation line through the area.

Illustration 91. Layer of entrances and gates. Source: Author

Illustration 92. Layer of public transport. Source: Author

Illustration 94. Gate 5 Pernis. Source: Google Maps Streetview.

Nodes

The second layer (illustration 91), is the one with the former gates. The gates (nodes) were the access point of the area and add to the physical storytelling. The gates are the only entrances to the area, they make it a private area and you are not allowed to enter without identification. The gates are there to check-in and go to work. They will remain the acces point to the area, and the inside infrastructure will connect to them. Illustration 94 shows how the gate areas look like nowadays.

The other nodes in the map, show former functions or current interesting function in the area. These functions are also reframed in a sustainable way to try to tell the story of Pernis.

The third layer (illustration 92), is the one of public transport. The area gets a new hub of public transport. There is already a waterbus going through Rotterdam, from the RDM campus all the way to Dordrecht along the Muse. Pernis will be connected to this waterbus network. The Rotterdam metro line will also be extended to Pernis. (see illustration 82 on page 107 how this public transport connects to the existing network)

ASPHALT
PRODUCTION
RIJNMOND

LOGISTICS
AREA

FORMER
PLASTIC FACTORY

ENERGY
COMPANY
RIJNMOND

GATE 1A

FORMER
EDUCATION
CENTRE

GATE 7

FORMER
RUBBER FACTORY

GATE 12

GATE 14

GATE 6

GATE 5

Illustration 93. Nodes. Source: Author

Illustration 94. Layer of the noise barrier. Source: Author

ENERGY PARK
TIDAL ENERGY

HOUSING

PARK
HOUSING

LEARN ABOUT WATER

HOUSING

ENTERTAINMENT

ENERGY PARK
SOLAR TOWERS

INFORMATION
CENTRE

Illustration 95. Edges. Source: Author

The fourth layer, is the one of the noise barrier in the east side of the area. This barrier protects the new residential areas from the noise and nuisance of the highway. The soil of this barrier comes from the remediated soil of the area. The soil of Pernis is heavily polluted, so this must be remediated in some way. The soil of the future park areas can be used in the noise barrier.

Edges

The edges are the divisions between different functions. In illustration 95 on the left, an overview of possible new functions in the area is given. The new functions are related to the visions of the stakeholders and the physical and mental storytelling methods. The information centre is the position of the current headquarters of Shell Pernis.

Illustration 96. Layer of landmarks. Source: Author

Illustration 97. Landmarks. Source: Author

1. Chimney
   Height: 213 m
   New Function:
   Landmark &
   Solar Tower

2. Industrial Torch
   Height: 100 –150 m
   New Function:
   Viewpoint

Storage Tank
Height: +/- 25 m
Width: 10 – 40 m
New Function:
Apartment Block
Energy Garden
Water Storage

Landmarks

The landmarks in the area are very clear and form the fifth layer of the zoning plan. They are visible from everywhere and will therefore keep the function as they have now. The two identical 213 m high chimneys and the three industrial torches of 100–150 m high. The two identical chimneys are used as new landmarks and showcase the function of the site. The three industrial torches are used as a viewpoint along the different walking routes through the area and are perfect to view the different uses of the new site.

Illustration 98. Landmark elements. Source: Author

Illustration 99. Layer of function. Source: Author

ENERGY
PARK

EXPERIENCE

HOUSING

Districts

Based on the analysis of the visions of stakeholders in chapter 6.1, this division is made in the area. Population growth and renewable energy were the two main outcomes. The experience centre in the site is to tell the story of the place in a sustainable way.

The sixth layer, is the one of the functions. The division between three different areas is made and this is were the function map is based on.

The ships along the quays will stay and will have temporary functions in or on them. Expositions or dance shows will be given on them.

Illustration 100. Districts. Source: Author
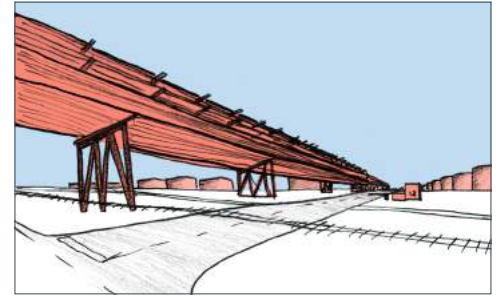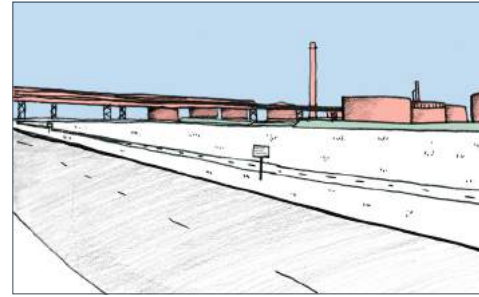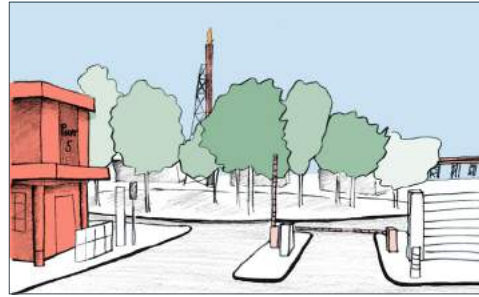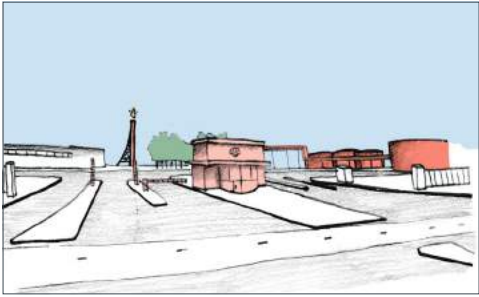
Illustration 101. How someone entres the area. Source: Author
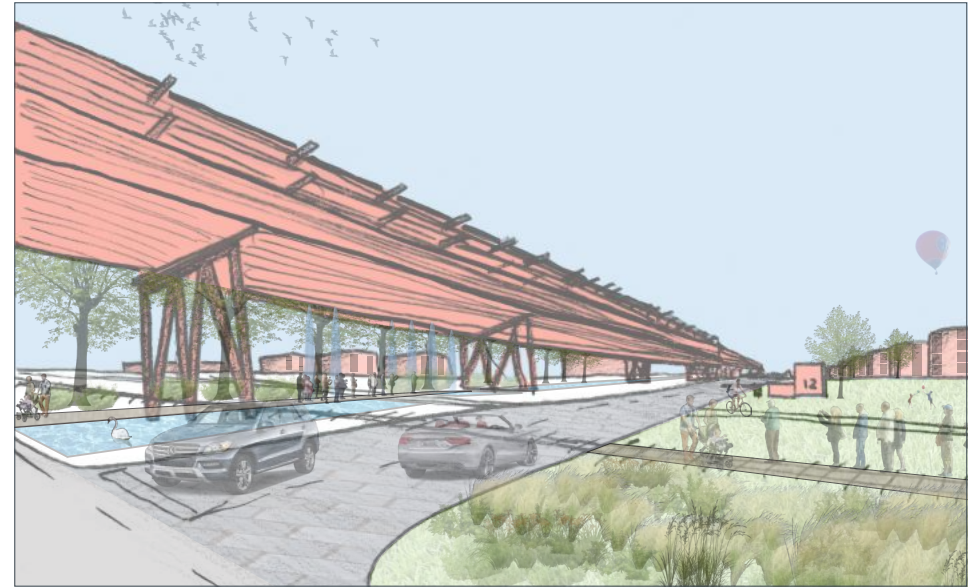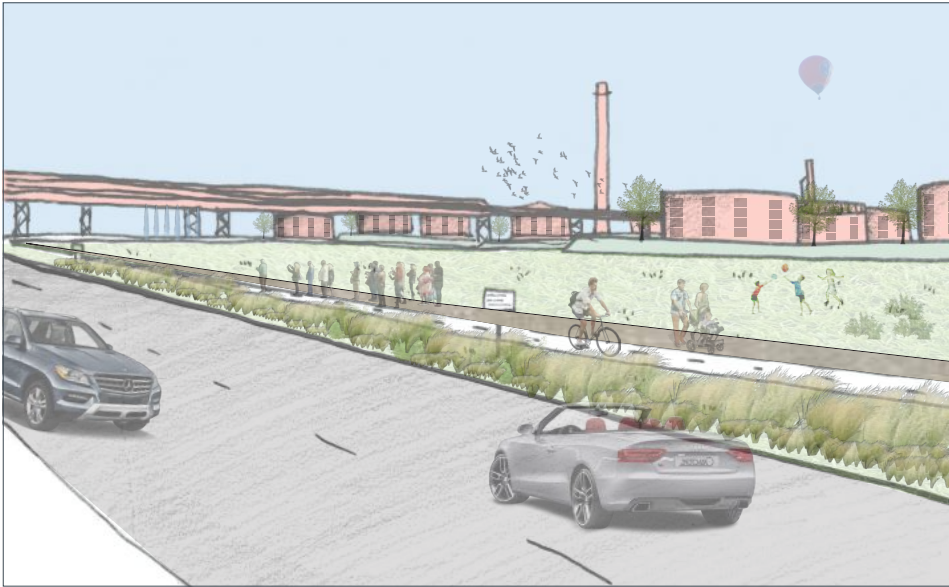
8.5   HOW TO ENTER

This series of collages show the old and new way to entre the area. As mentioned before the gates were the only way to enter or leave the private area. These gates will remain the entrances to the new residential and recreational area in the future. Here begins the experience of the story. Through the physical elements, the story of the former use of the area is told. The visitor or resident follows in the footsteps of the workers who went to work in the days of the oil industry.
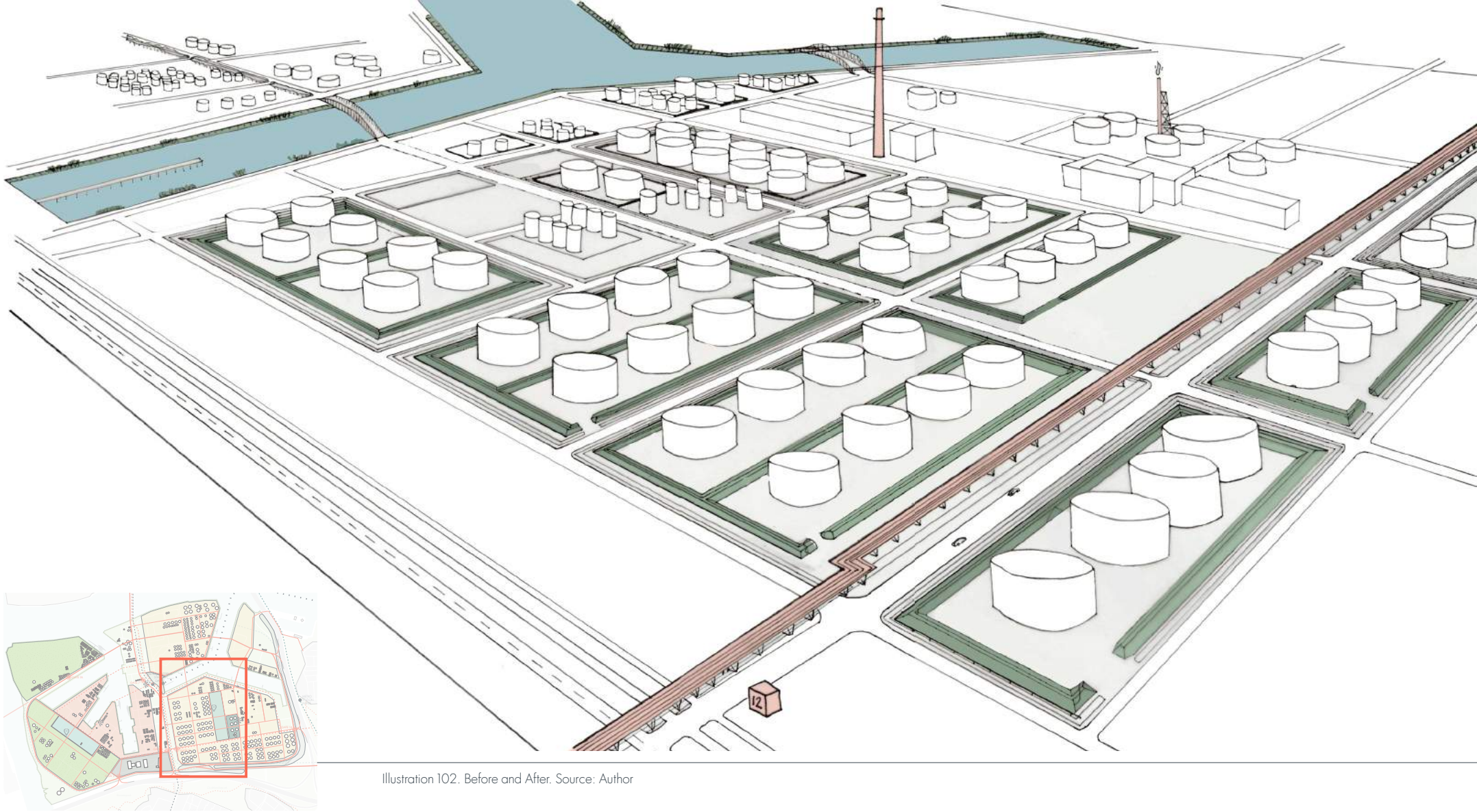
Illustration 102. Before and After. Source: Author
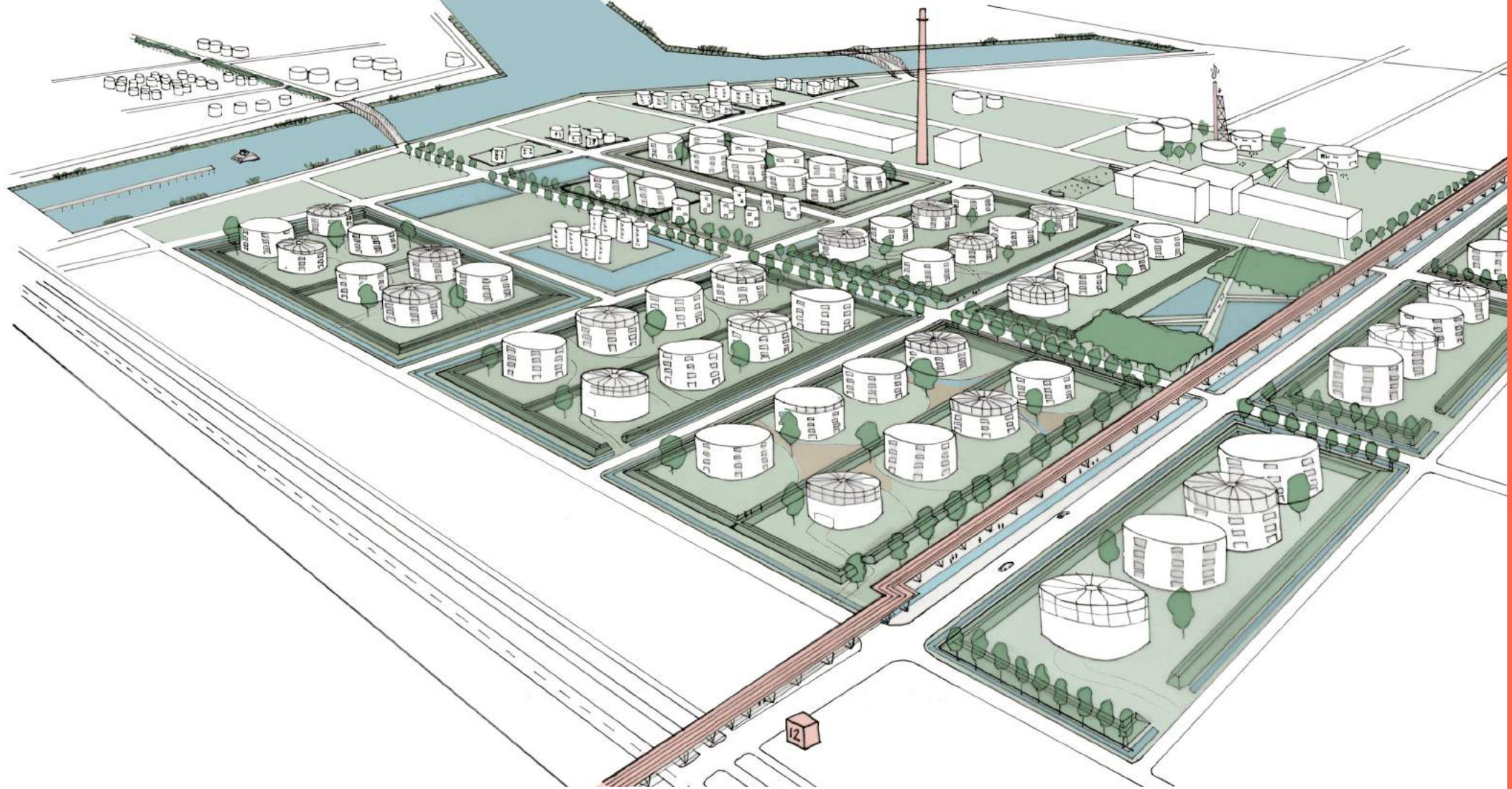
8.6   IMPRESSION OVERVIEW

The before and after overviews of a part of the area show how the area looks like after transformation. The 'after' view displays a view over a new residential area. This view shows a greener area, but the physical elements are still recognisable. The harbour structure is still recognisable and transformed into a nature friendly area. The chimney and industrial torch, which are now orientation point and viewpoint are in the middle of a new centre area. This

centre area consists of sport facilities and a new shopping centre. A park structure connects this new centre with the blue route, the walking route along the tracée with above ground pipelines. This walking route takes you on a journey along the various areas of the former industrial area of Pernis. The water combined with the pipelines guide you through. The rest of the pipeline structures of the area are also now urban waterways and also tell a part of the story of Pernis.
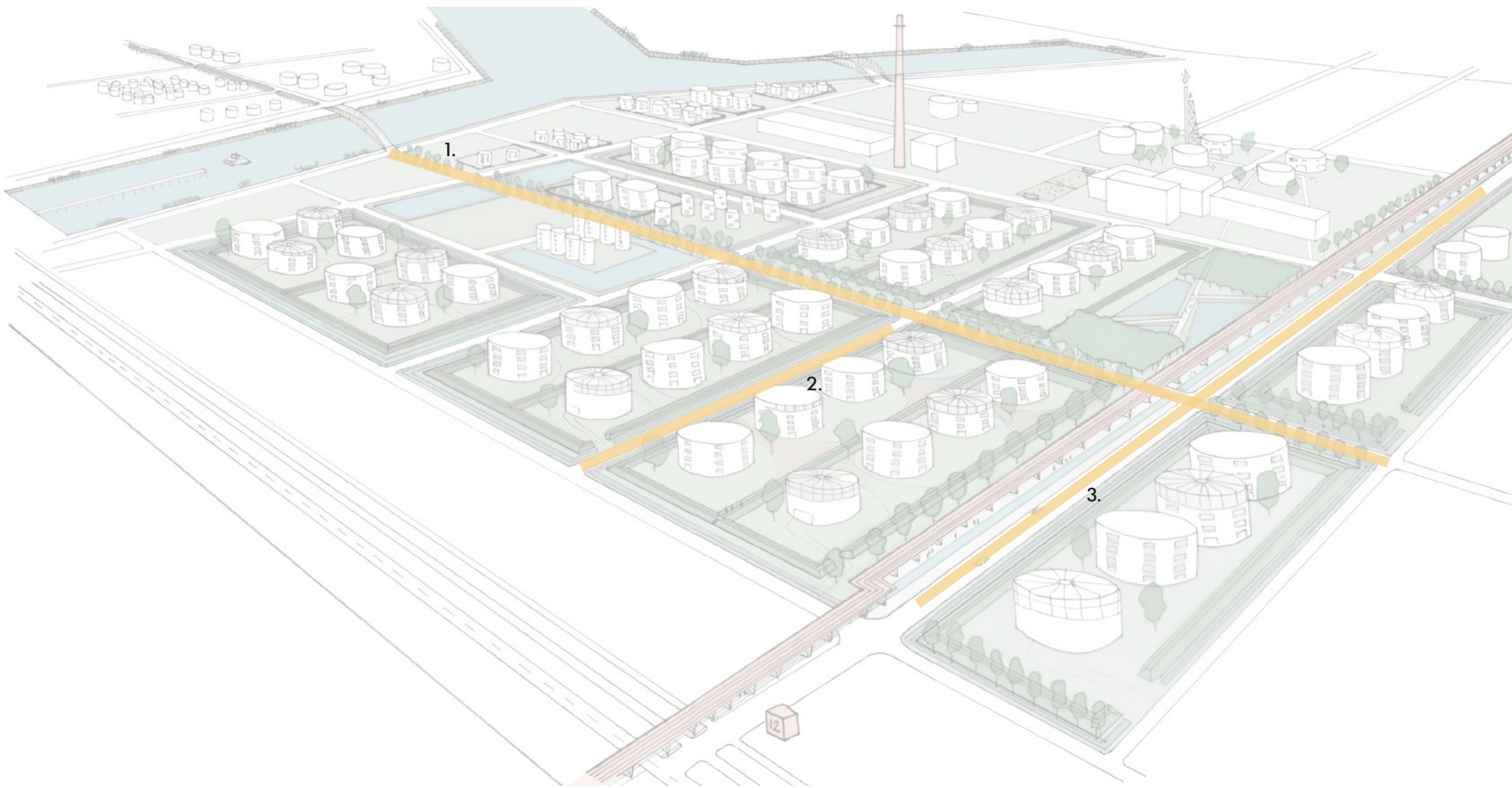
Illustration 103. Streetprofiles. Source: Author

8.7   STREET PROFILE

The streetprofiles of this new residential area are shown in illustration 104. Streetprofile 1 guides the visitor or resident through to the other side of the water. This route is like an avenue with trees and crosses with the Blue route. This blue route is streetprofile number 3. The illustration show a wide avenue under the pipelines to go on a stroll and walk the dog. Streetprofile 2 is the profile used between blocks. This profile allows visitor to park their car on the side of the road. Residents can park their cars is on of the parking towers, which is shown later on page 145.

Illustration 104. Three streetprofiles. Source: Author

Soil Pollution (0 / -1 m)

- Natuur (Schoon)
- Landbouw (Zeer licht verontreinigd)
- Wonen (Licht verontreinigd)
- Industrie (Matig verontreinigd)
- Verontreinigd (Sterk Verontreinigd)

Soil Pollution (-1/-2 m)

- Natuur (Schoon)
- Landbouw (Zeer licht verontreinigd)
- Wonen (Licht verontreinigd)
- Industrie (Matig verontreinigd)
- Verontreinigd (Sterk Verontreinigd)

Illustration 105. Soil Pollution. Source: ...
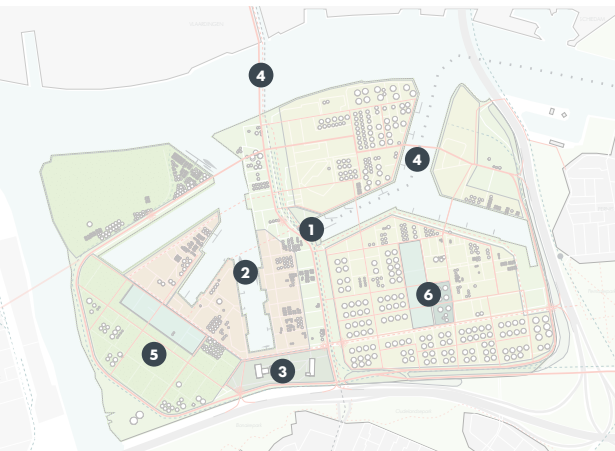
Illustration 106. Phasing map. Source: Author
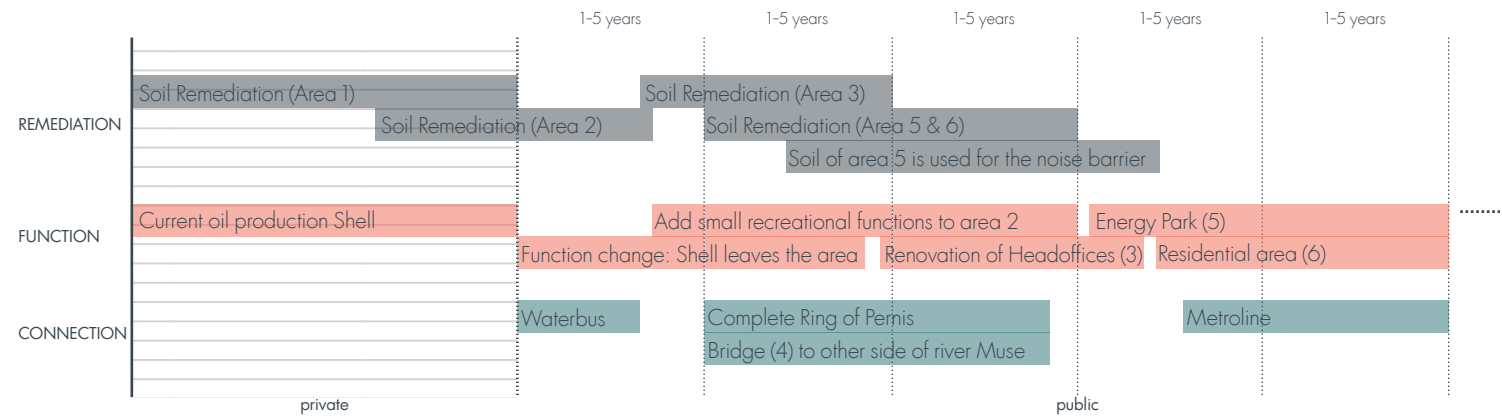
Illustration 107. Phasing. Source: Author

8.8   PHASING

Phasing is a important thing to look at in projects such as this. Since the area is so big, phasing is important to decide which area or which function must be completed first to attract attention. Phasing is also very important, because the area is so heavily polluted. The pollution is shown on illustration 105 and is explained in chapter 5.
The map of illustration 106 supports the phases indicated in the table of illustration 107. Before Shell is leaving the area, remediation could already start in area 1 (illustration 106). In the phasing of this area, accessibility is very important. Gain attention and show that the area is public is the first step, together with adding some smaller recreational functions. The renovation of the head offices, which will function as a information centre starts next. The infrastructure is also completed to connect Pernis to the other side of the river. The energy park and residential areas are the ones that need to be remediated the best come later in the phasing and will be the last ones to complete as they are also the biggest.
        The column on the right explains what kind of remediation methods there are.

SOIL REMEDIATION METHODS

Soil remediation consists of two main methods; ex-situ and in-situ remediation. Ex-situ remediation means that the polluted soil is being removed from the site. It is an expensive, but very fast and effective way of remediation. In-situ remediation means that the pollution is removed through several soil remediation techniques, without removing the soil. In this way, the soil structure and the above lying buildings and infrastructure will be preserved.

Ex-situ Remediation

In-situ Remediation
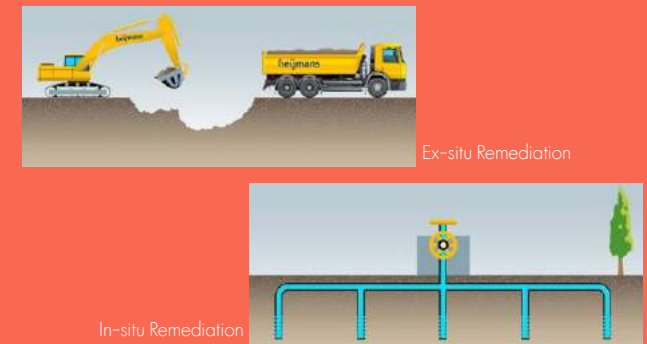
Illustration 108. Methods of Soil Remediation. Source: Heijmans, (n.d.)

The Ex-situ remediation method is easy, the soil is being removed from site and remediation takes place somewhere else.
The In-situ remediation method consists of different methods. Some examples of In-situ remediation are:

1.   Biodegradation (with the help of bacteria)
2.   Chemical oxidation (filters in the soil chemically convert the pollution into water, oxygen and CO_2)
3.   Groundwater extraction and infiltration (groundwater is pumped up and cleaned above ground)

Source text:
Heijmans. (n.d.). In-situ & ex-situ sanering. Retrieved September 14, 2018, from   https://www.heijmans.nl/nl/activiteiten/bodemspecialismen/saneringstechnieken-in-situ-ex-situ/
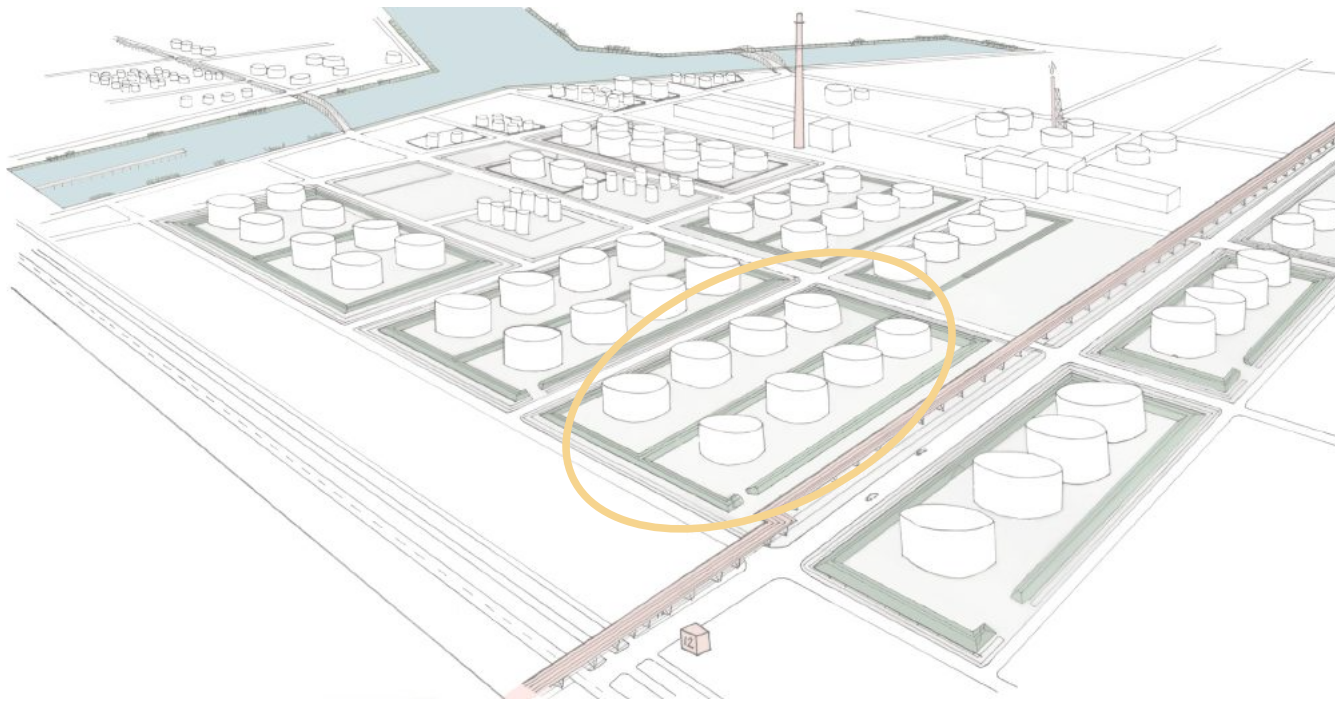
Illustration 109. Design part. Source: Author

3 POSSIBLE DESIGNS

The goal of the three possible designs is to sketch an image of what the future oil landscape could look like. This is to show a range of possibilities for this one particular area of the oil landscape of Pernis. The three outcomes are tested on the core values of the previous research.
The design is made for the area shown on illustrations 109 and 110. Because the Pernis area is so private and unaccessible, this is the only area where it is sure what it looks like.
Three designs are made for this particular area:

1.   Monumental

2.   Residential area

3.   (Energy) Park
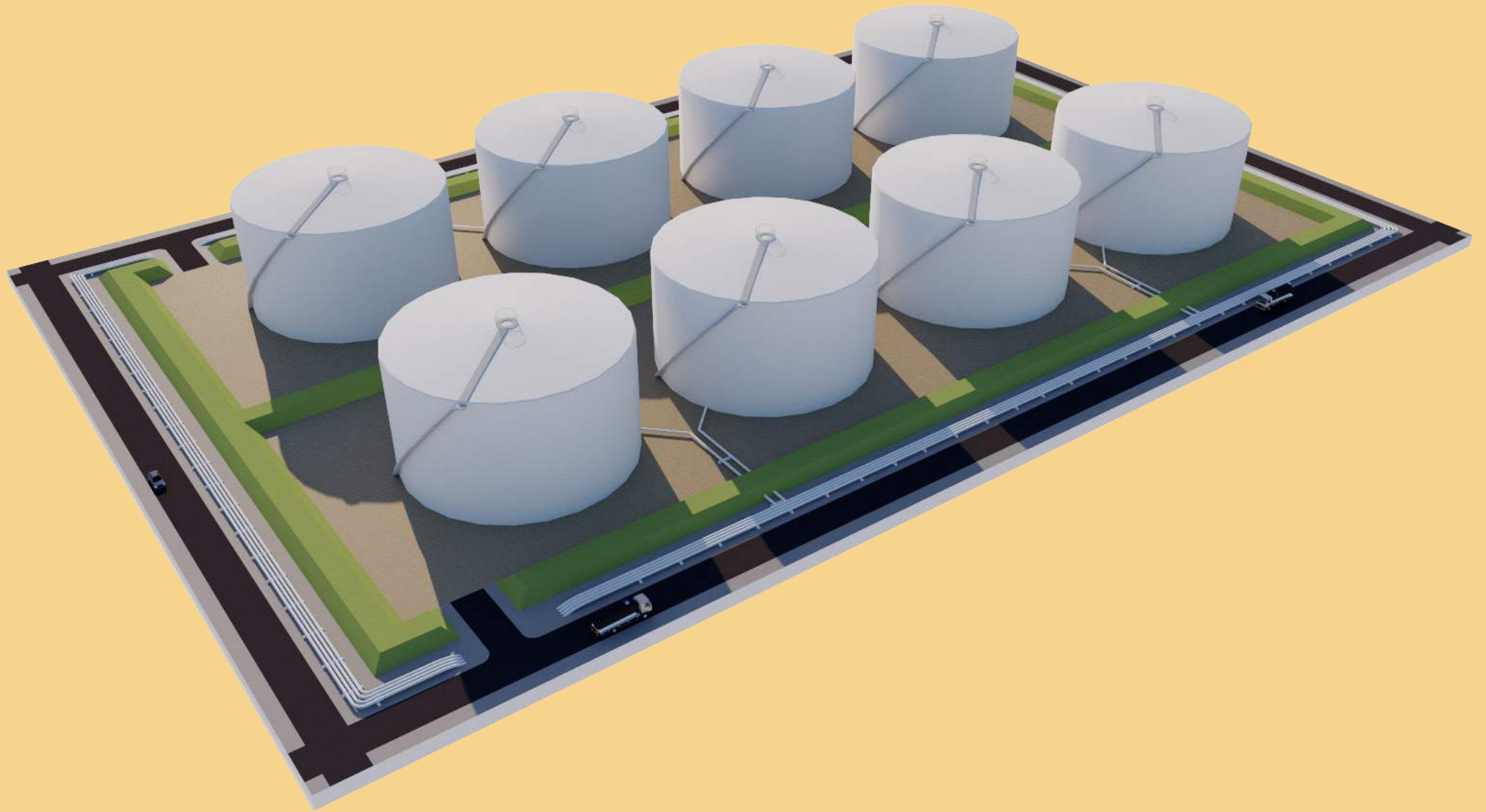
Illustration 110. Current situation. Source: Author

1. Preserve Existing Structures
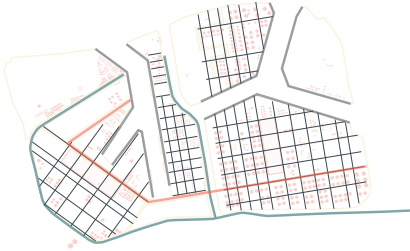
2. Preserve Silhouette
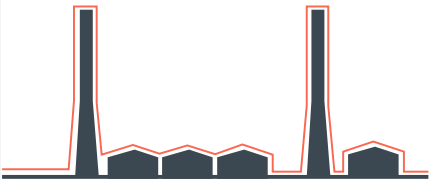
3. Relationship with Water

4. Recognition

Illustration 111. Core values. Source: Author

Illustration 112. Valuemap of Pernis. Source: Author

VALUE CONDITIONS

To be able to make a design some rules have to be made. The core values from chapter 6 are a start. Based on the value map in illustration 112, the value conditions of illustration 113 are made. These conditions are made on three scales.

The first one is the combination of different blocks. Public spaces inside the dike structures should connect to public spaces in other blocks around.

The second scale is the scale of the block itself. Public spaces, building areas and the dike structures are the valuable elements of the blocks and should stay recognisable. Fast traffic finds its ways around the block, while slow traffic goes through the blocks. In this way the block is experienced from two different points of view.

The third scale is the one of the object itself. The tank has several measurements that need to be preserved. A storage tank is 25 meters high and 40 meters wide. This silhouette should stay visible in case of the storage tanks. To keep the silhouette also recognisable, the form must be at least be filled for 10%.

With these value conditions kept in mind, the three design possibilities are made on the next few pages.
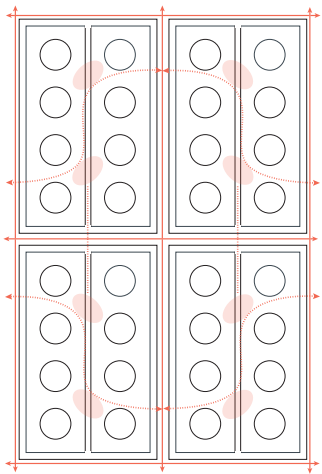
Every Block should have a meeting place to connect to another meeting place in another block

Public spaces

Building area

Dike structure which defines the area. This rectangular shape is to be kept as this dike structure
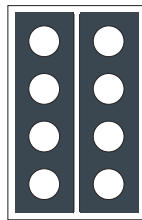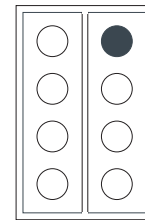
In case of parking needed, one storage tank can be turned into a parking tower.
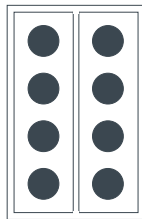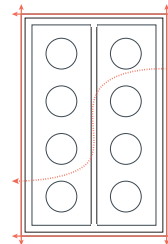
fast traffic goes around the area.
slow traffic goes through the area.
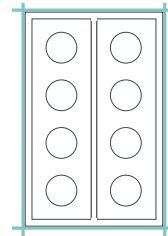
Oil turns into water, so the pipeline structures become urban waterways.

25 m

The transformation should stay on the height of 25 m.

40 m
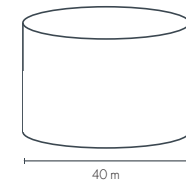
The transformation should stay on the width of 40 m.

> 10 %
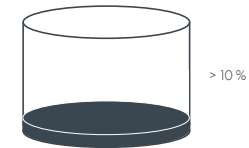
The storage tank should be at least filled for 10%

! Threats: Soil Remediation, because of heavily polluted soil the structures or elements could be in danger of not being able to keep them.

! Threats: Construction of the building could be useless and not strong enough for transformation.

Illustration 113. Value conditions. Source: Author
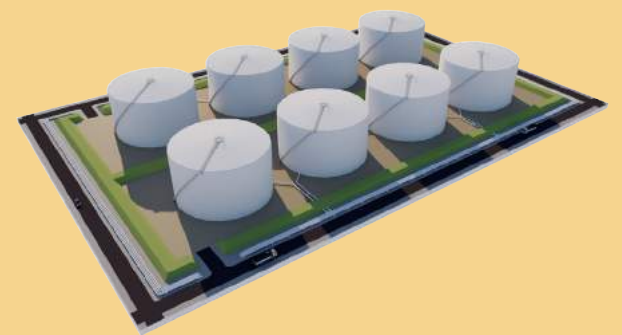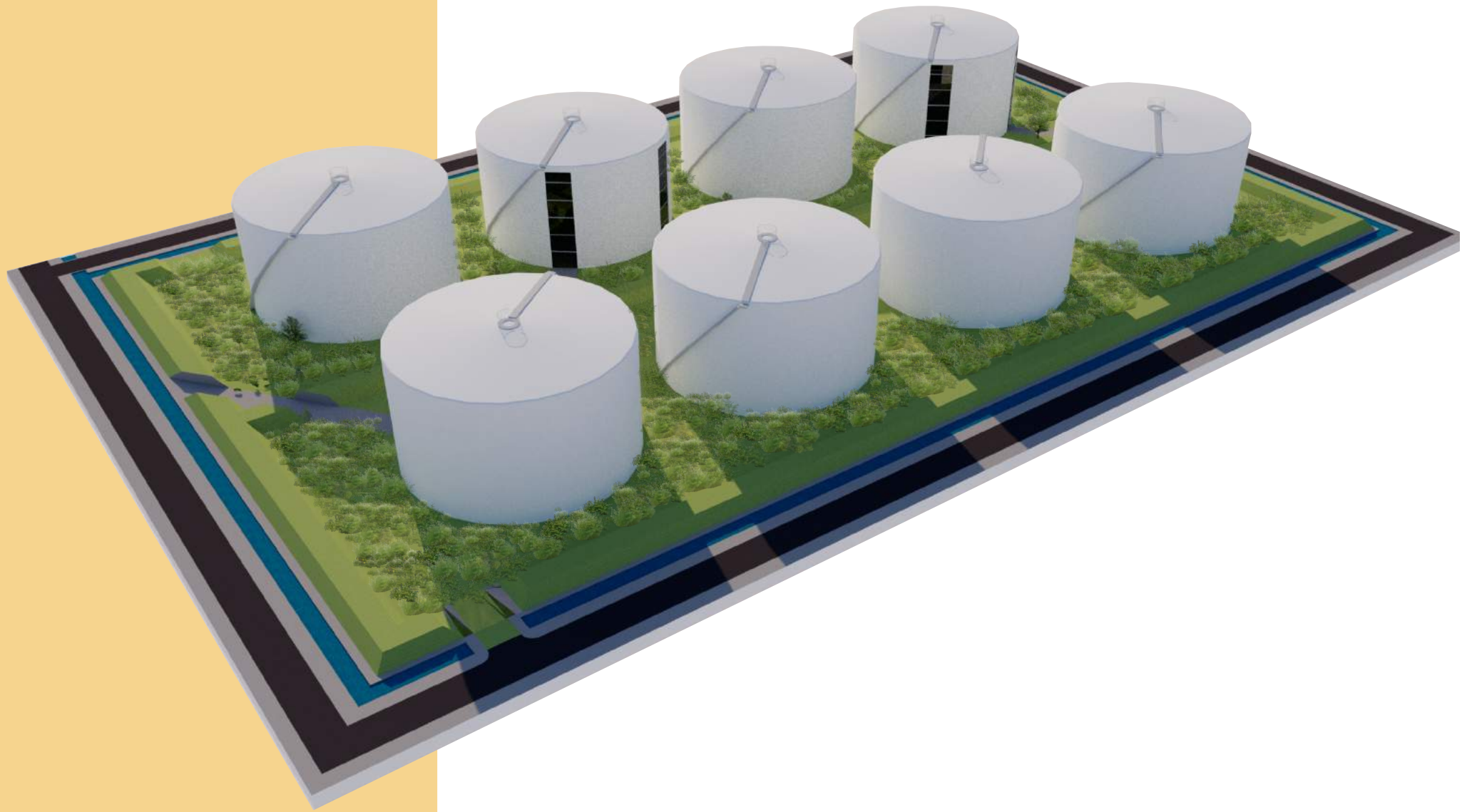
MONUMENTAL

Illustration 114. Monumental design. Source: Author

Illustration 115. Impression monumental gardens. Source: Author

This design is trying to make the least interventions in the original structure. By making it a water storage and purification and museum area not much interventions are needed. A pathway leads the visitor through the museum gardens from museum building to museum building. The gardens and view on the tanks (illustration 115) are quite and peaceful, just like the former site used to be.

Urban Waterway

Museum

Path through gardens

Water storage and purification tanks
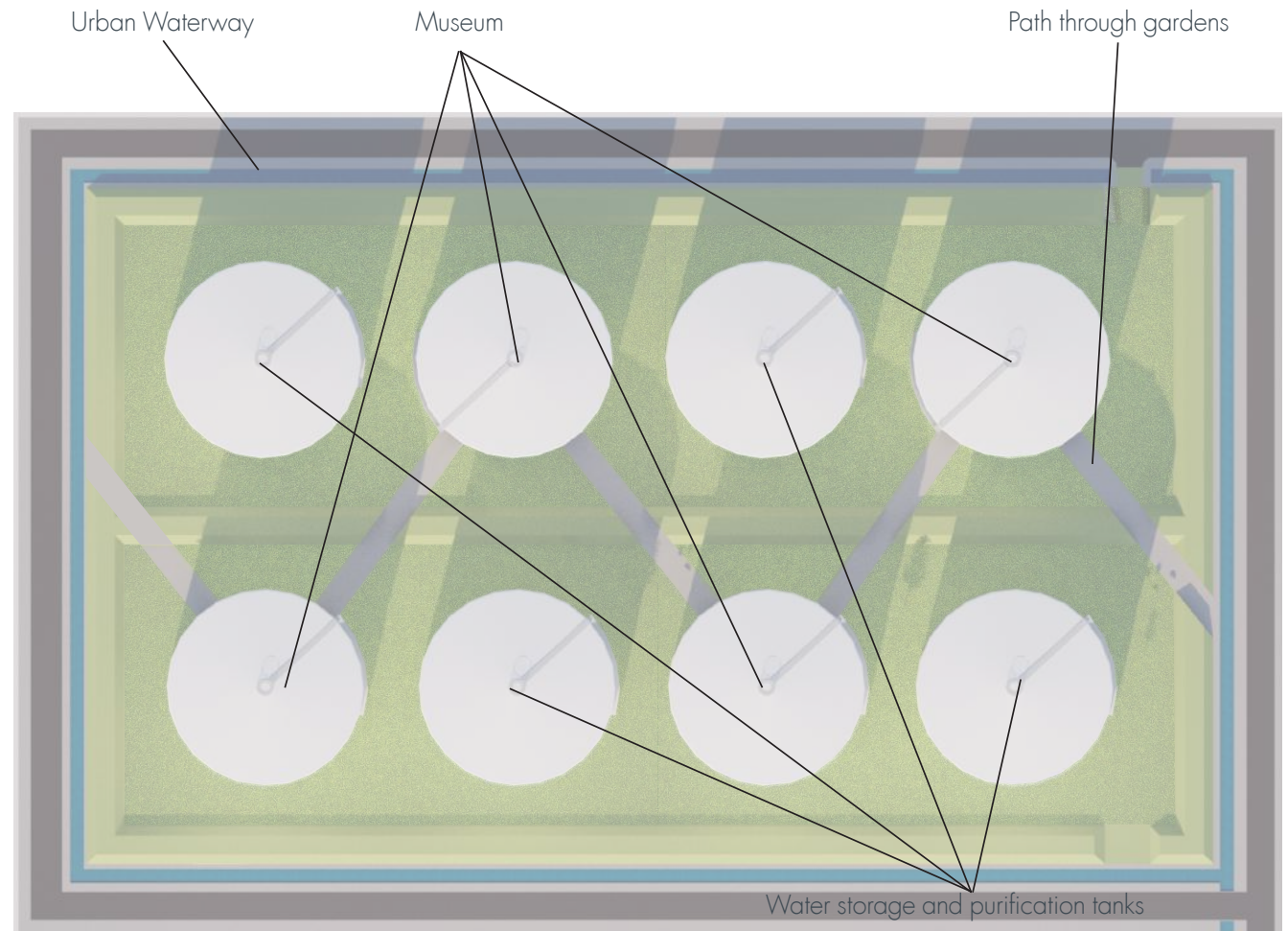
Illustration 116. Map monumental design. Source: Author

Illustration 117. Monumental design overview. Source: Author

1. Preserve Existing Structures

2. Preserve Silhouette

3. Relationship with Water

4. Recognition

OIL
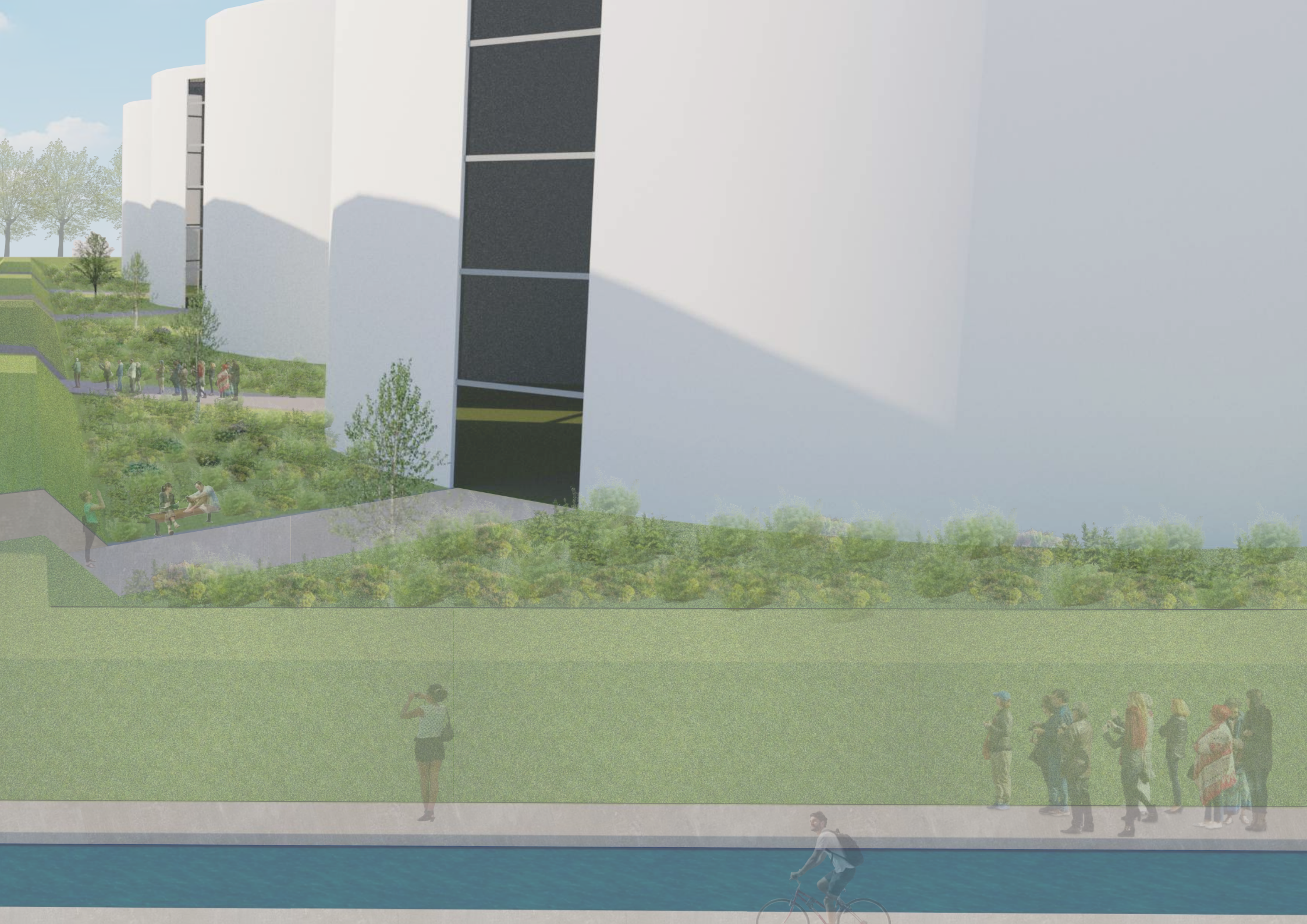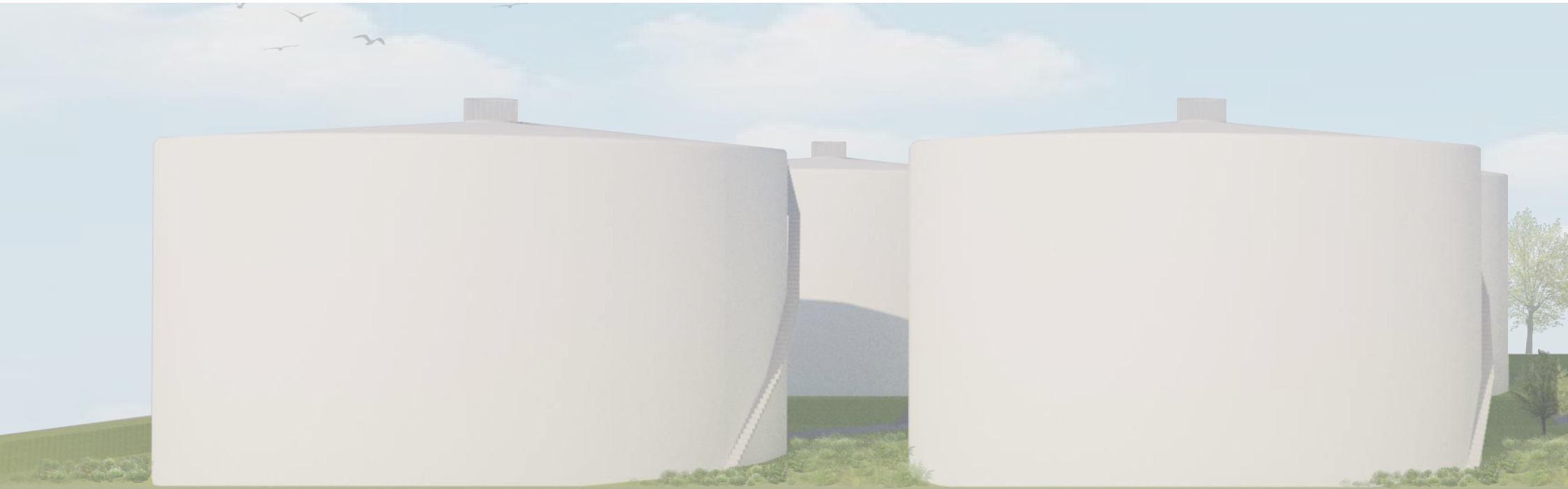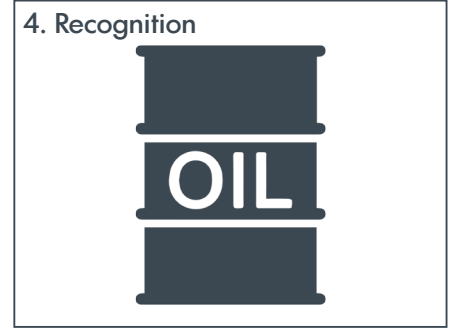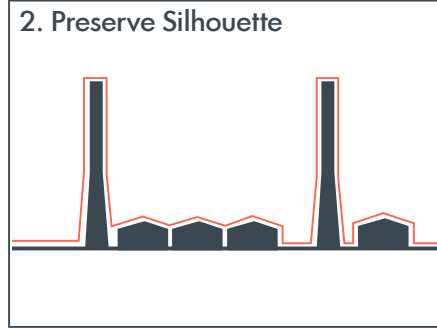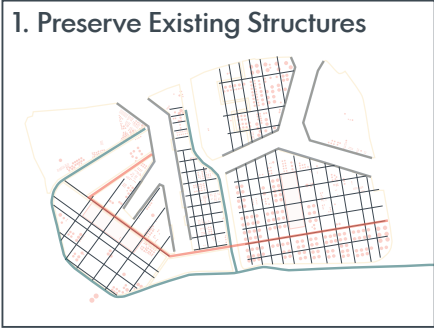
Illustration 118. View from the side. Source: Author

This design has the least interventions of the three designs. Which is why it is not difficult to test this design on the four core values. In illustration 118 is shown how much this design looks like the original structure. Every intervention is made on the inside of the block. The silhouette is still like the silhouette of the original state. The pipelines that were around the dike structure are now urban waterways, to make the museum more unaccessible. This relates to the area as a whole, which was also unaccessible for outsiders.
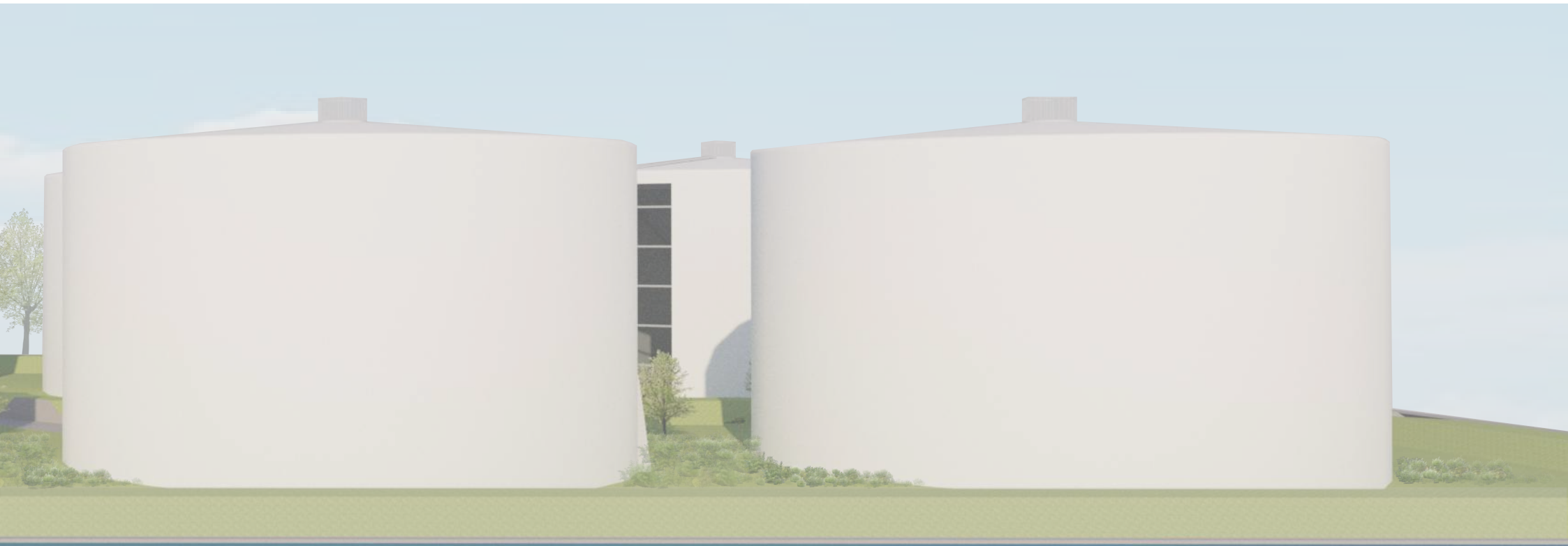
Illustration 119. Impression residential area. Source: Author

RESIDENTIAL AREA
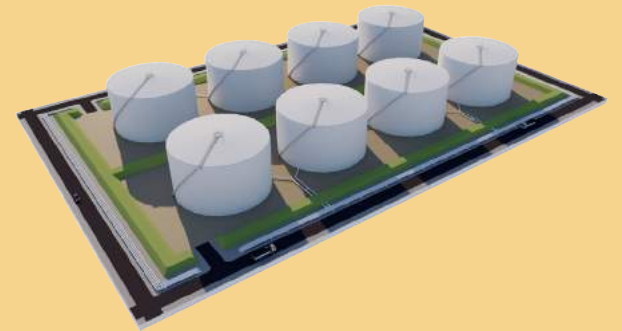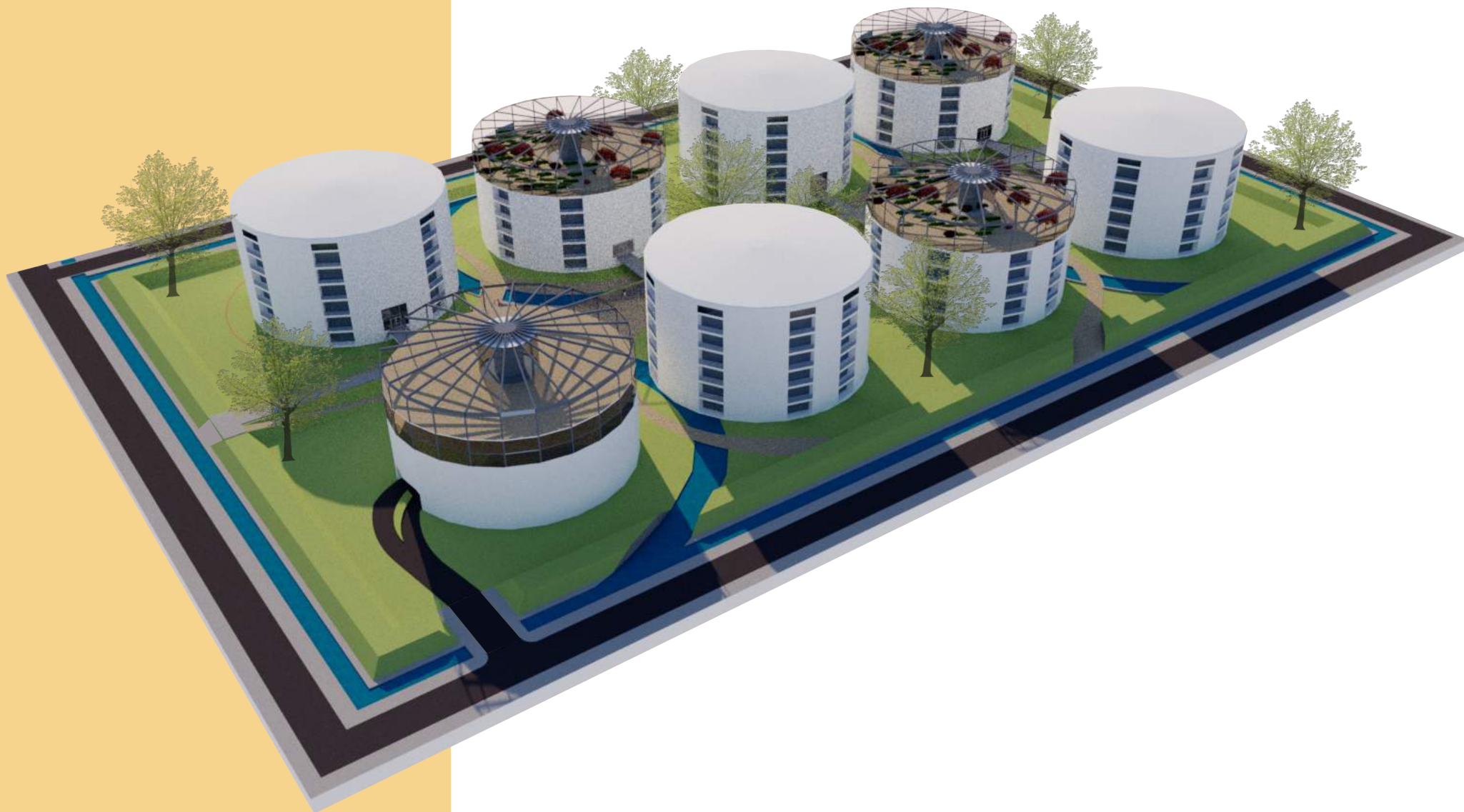
Illustration 120. Residential area. Source: Author

Illustration 121. Overview Residential area. Source: Author

The second design takes a bit more risks in interventions. Two squares form the public space of the residential block. Water and paths connects these squares to the outside of the block and to other blocks next to this one. One of the storage tanks is dedicated as parking tower. (illustration 122) (see appendix 1) To make the design a bit more playfull, roof gardens are created to also let in the light in between the buildings and the appartments. The balconies of the appartments are faced inwards, to keep the silhouette in its original state.

Parking Tower   Urban Waterway   2 Squares   Entrances
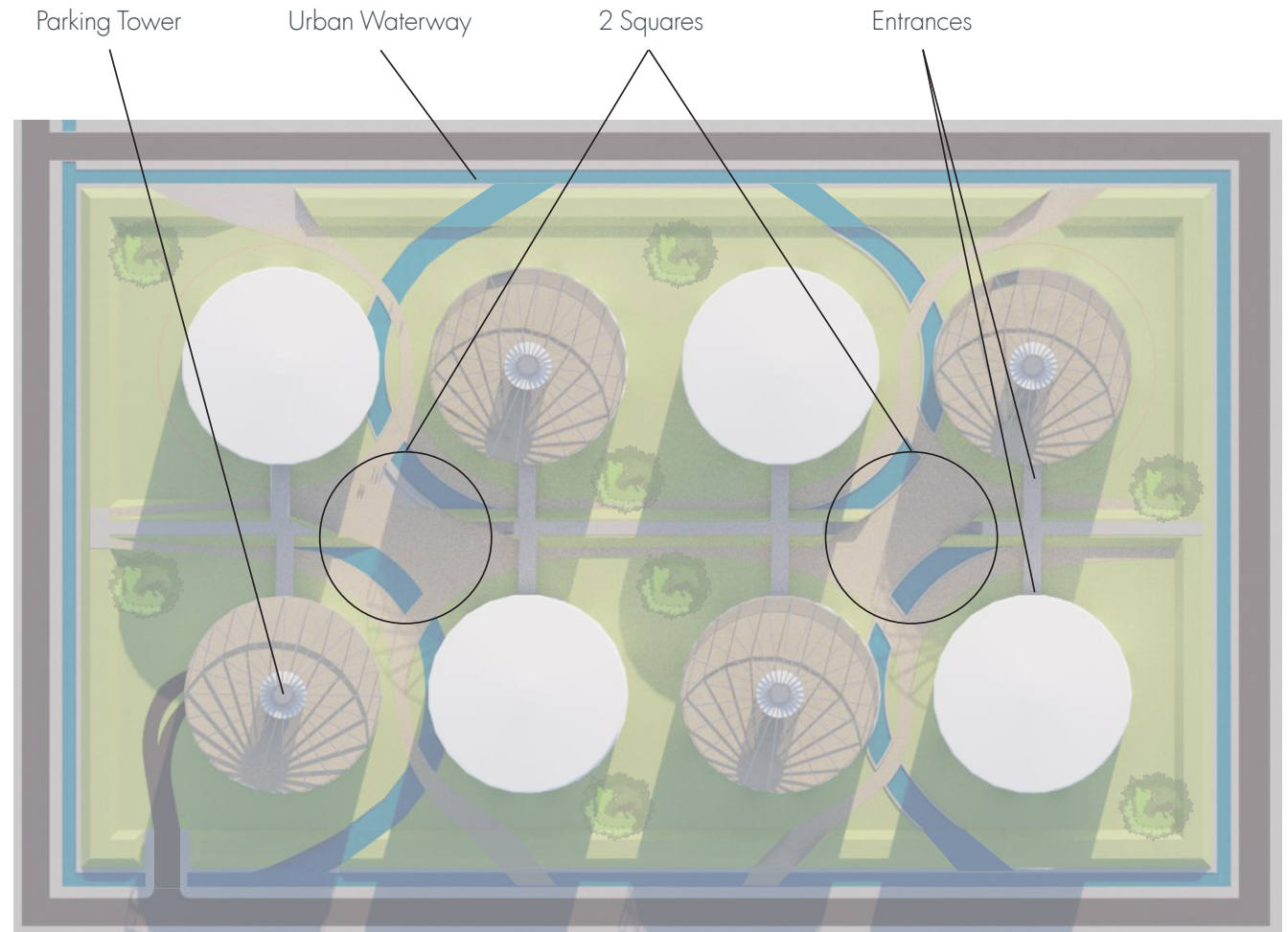
Illustration 122. Map residential area. Source: Author
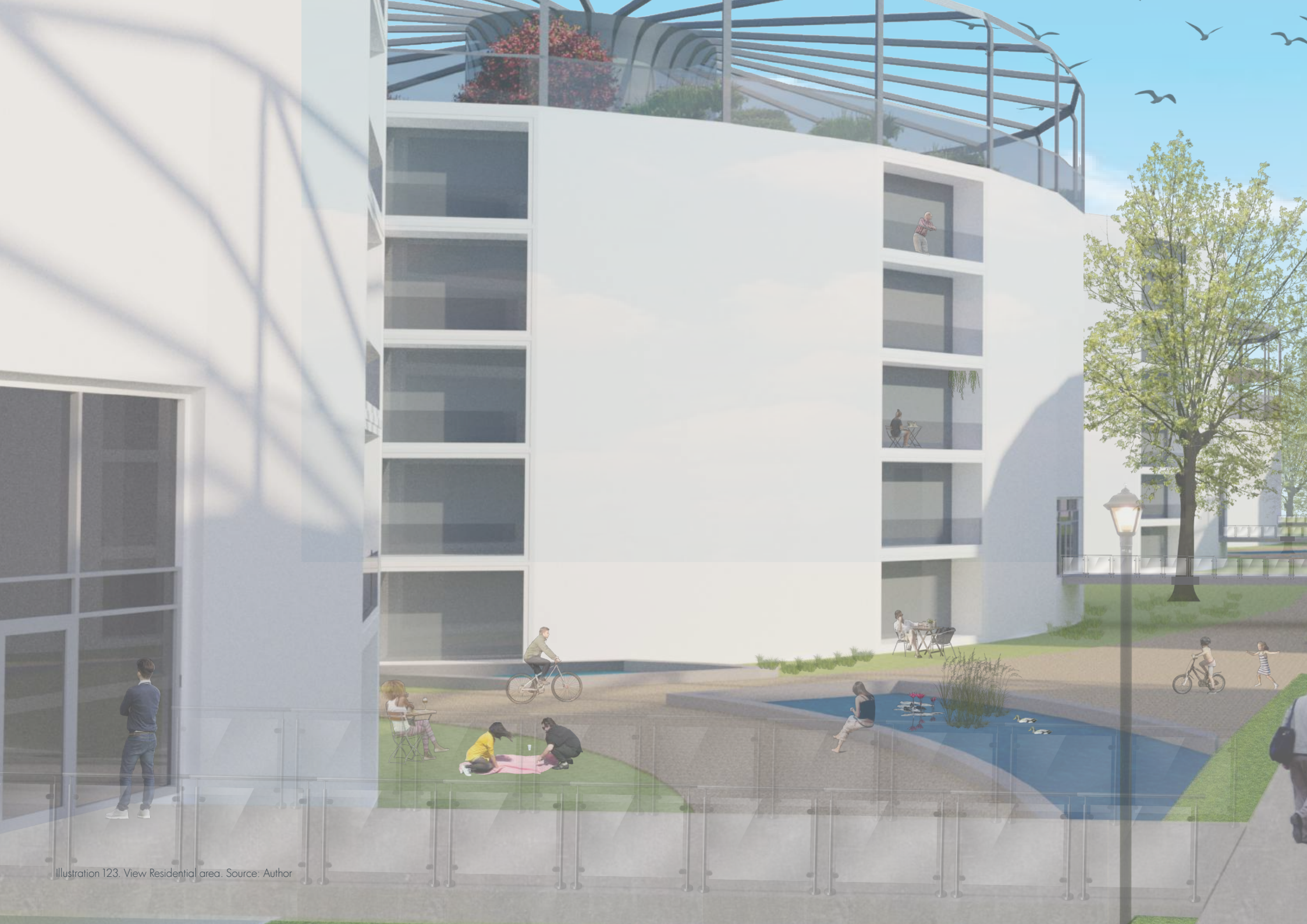
Illustration 123. View Residential area. Source: Author

1. Preserve Existing Structures

2. Preserve Silhouette

3. Relationship with Water

4. Recognition

OIL
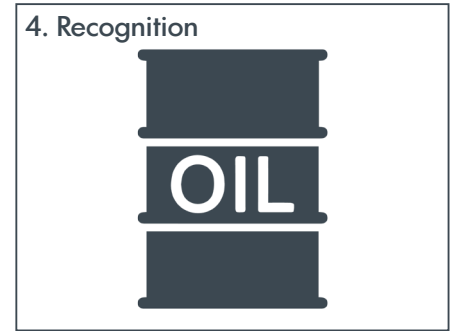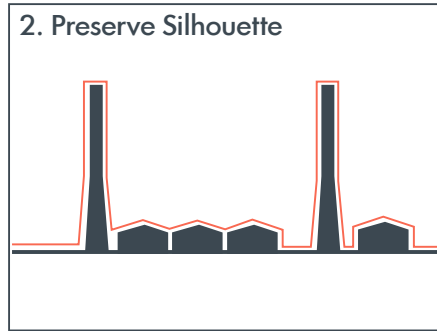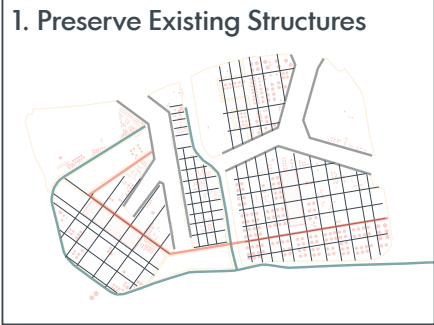
Illustration 124. View from the side residential area. Source: Author

The second design still preserves the existing structures, but plays with them a bit more. The height of the fill of the tanks differs which lets in the light in between the towers. The roofgardens are shielded by a frame which preserves the silhouette of the original structures. Urban waterways are situated where the oil came into and left the block of storage tanks. In this way it shows the story of the place.
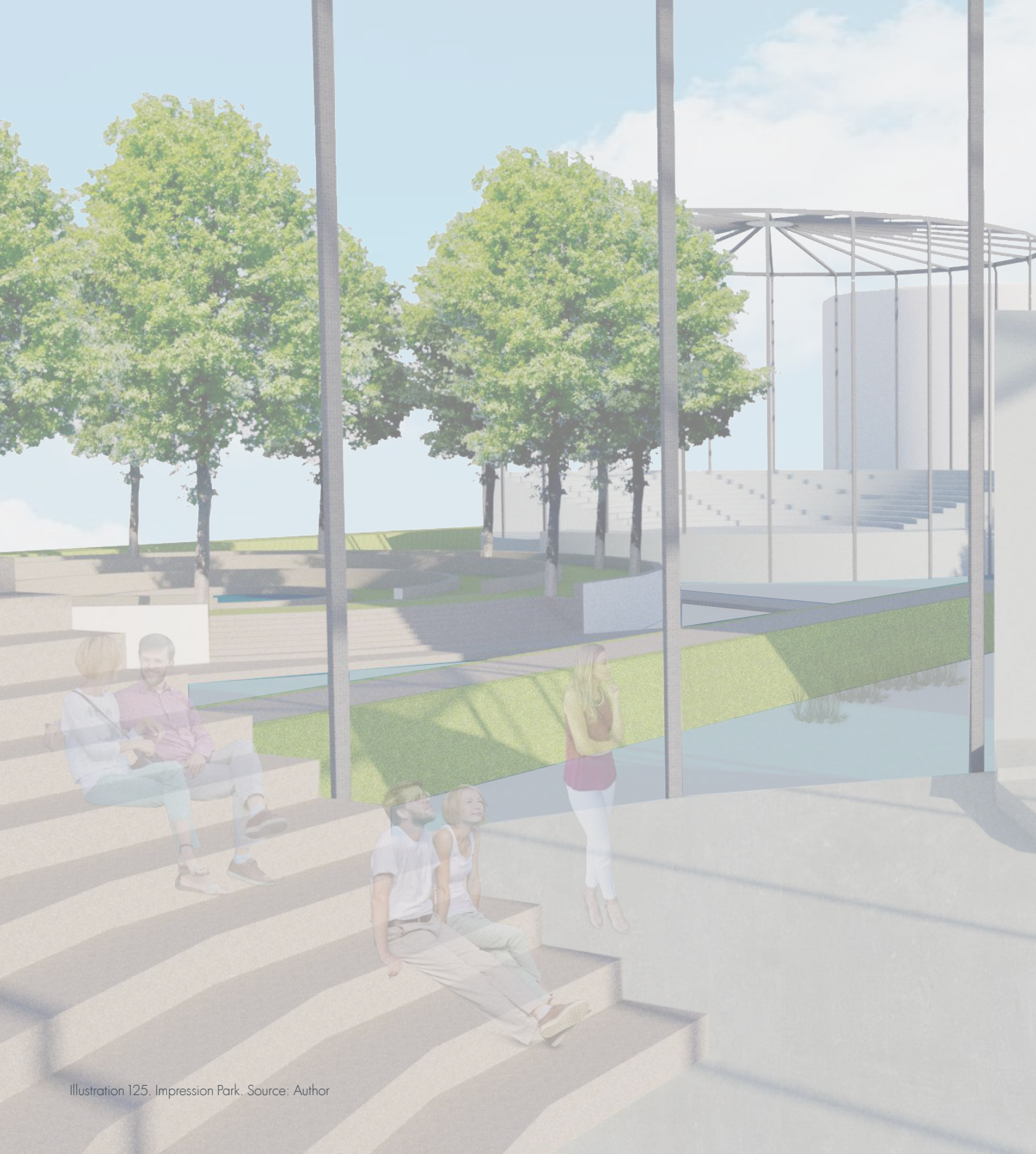
(Energy) PARK

Illustration 125. Impression Park. Source: Author
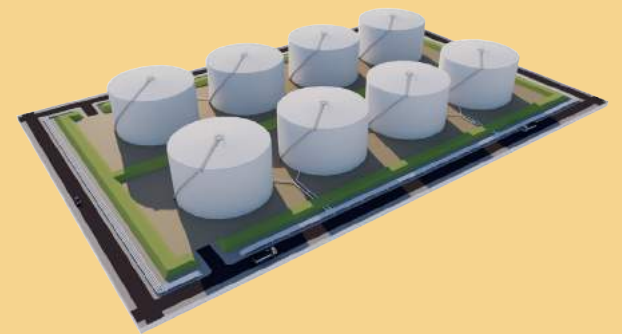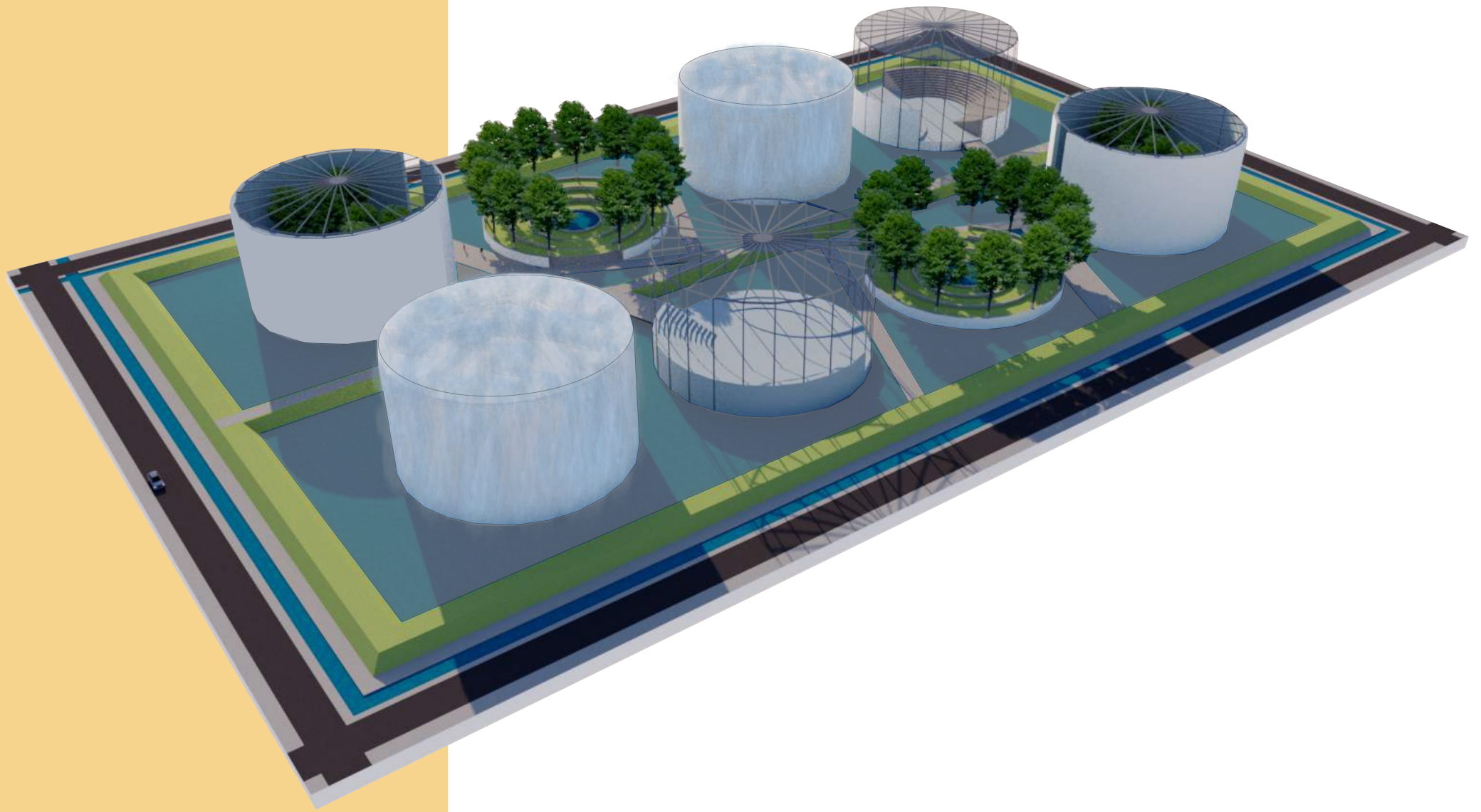
The third design is the most outspoken. It tries to see how far the design can go to still keep the core values in mind. The design consists of several island. The dike structures where there to keep the oil from leaking away if a tank was leaking. The water around the storage tanks islands relates to this site of the story. The park also produces energy. The water towers produce energy with running water. Next to the fact that it produces power, it also creates a special experience for visitors. Two of the towers are dedicated as a glass house. This glass house can produce and store heat in summer and use it during winter time. This is not enough to produce must heat, but it is to showcase the possibilities of renewable energy. The open stage towers have a solar panel roof. The energy which is needed for small show comes from the roof.

Water tower
water power & storage

Glass house
heat production in summer

Water

Open stage
solar power
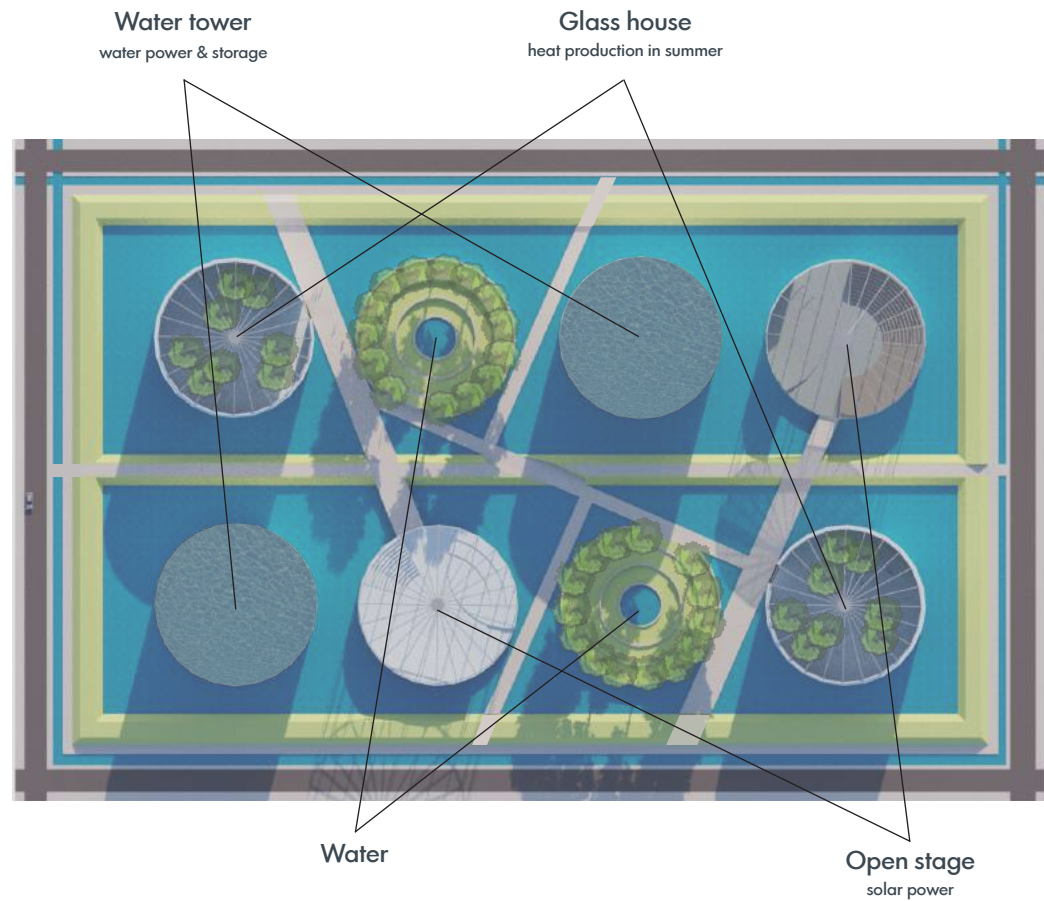
Illustration 127. Map Park. Source: Author
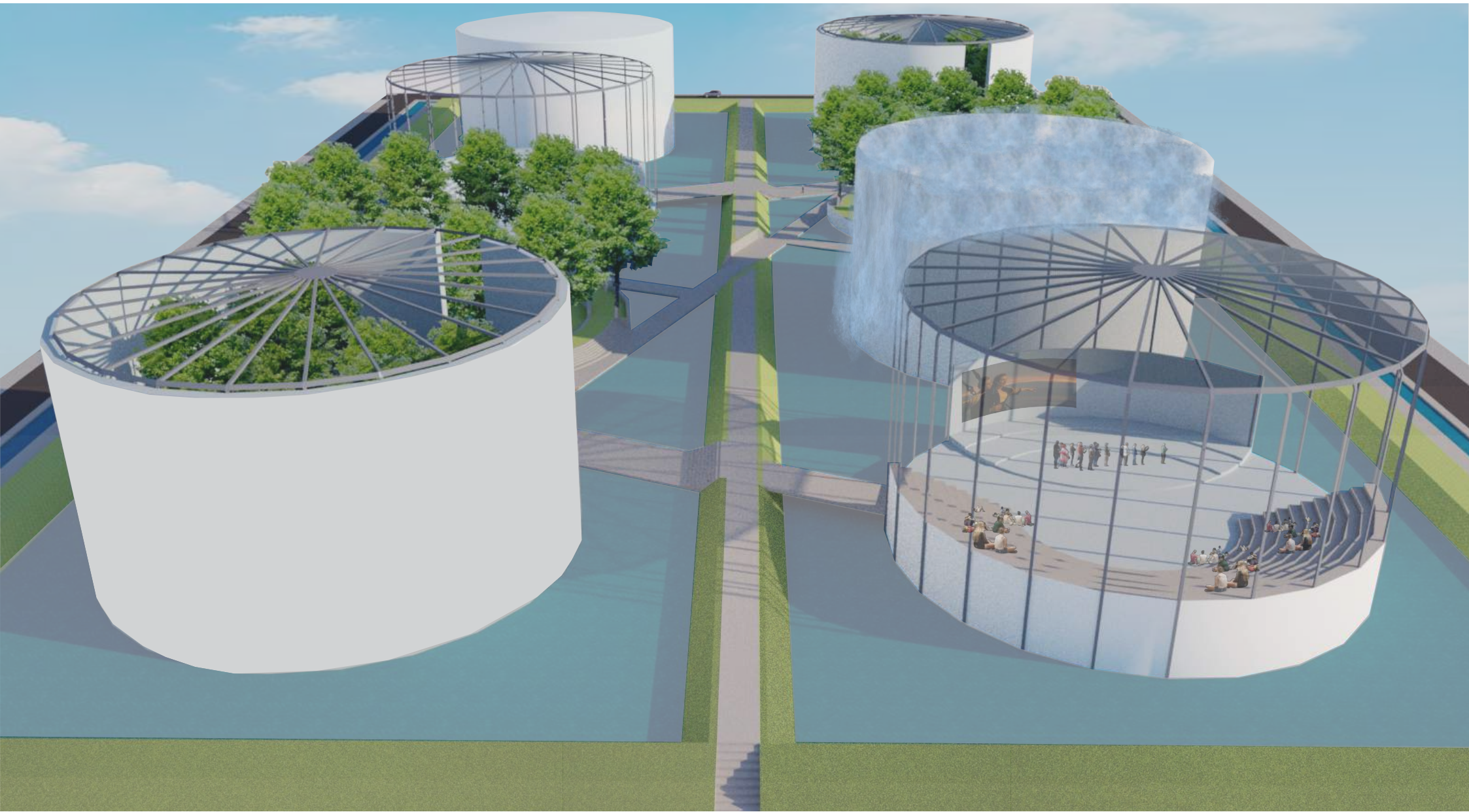
Illustration 128. Overview park. Source: Author
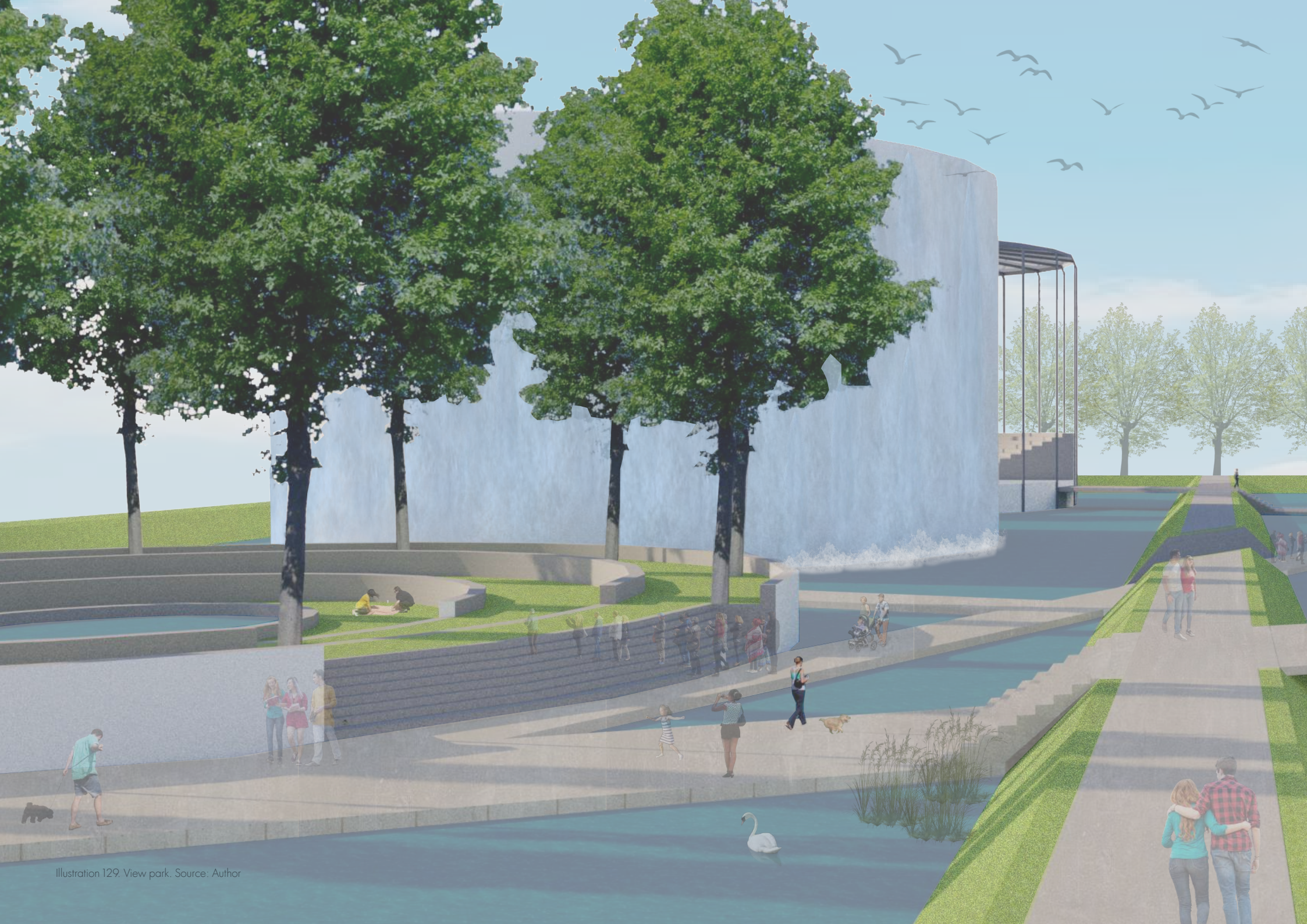
Illustration 129. View park. Source: Author

1. Preserve Existing Structures	2. Preserve Silhouette	3. Relationship with Water	4. Recognition
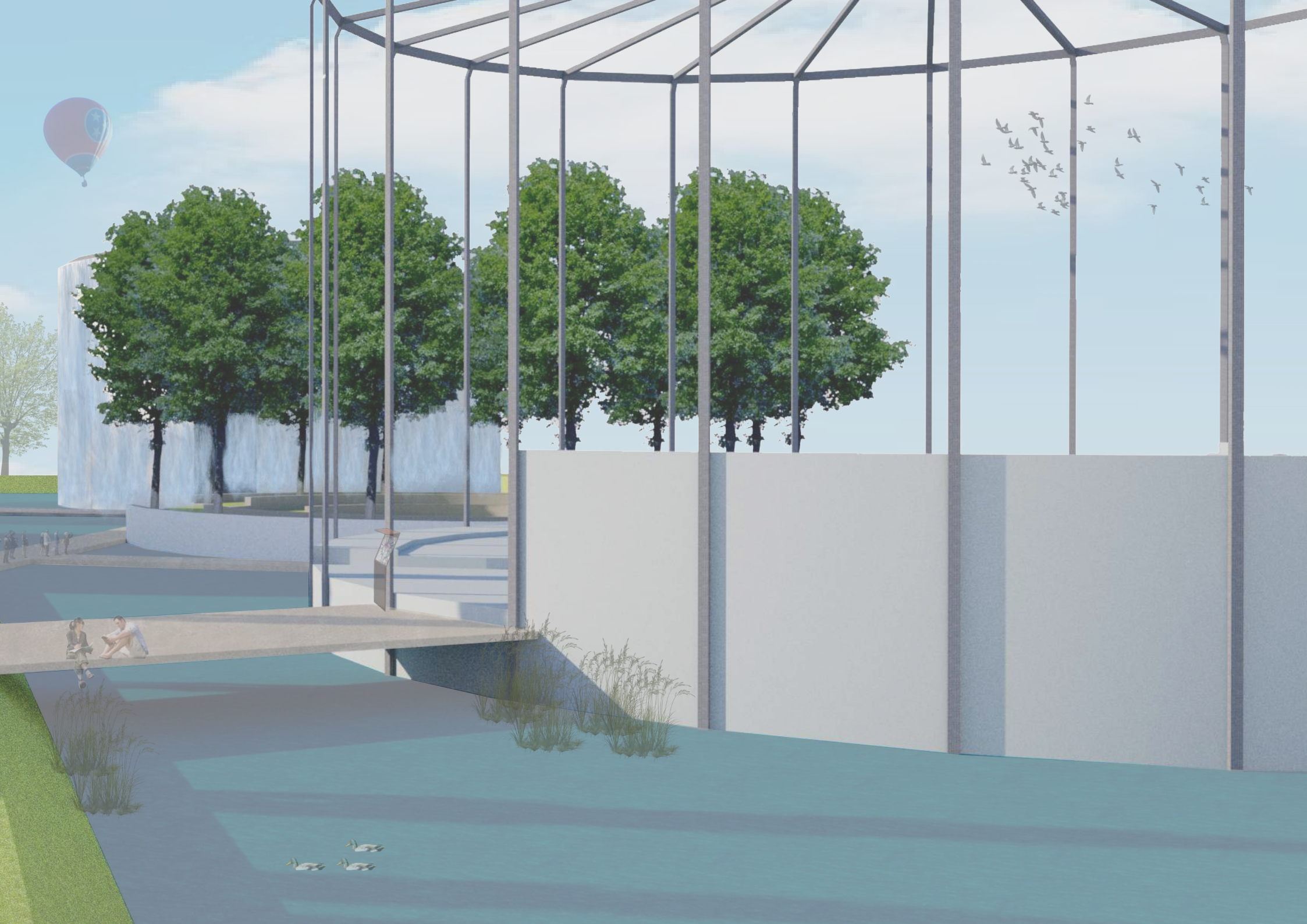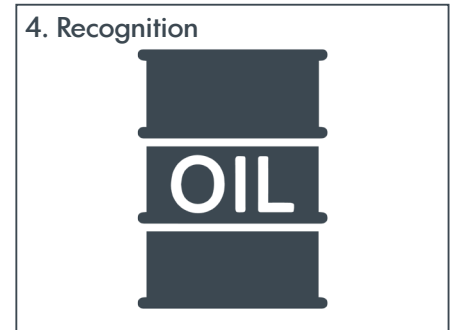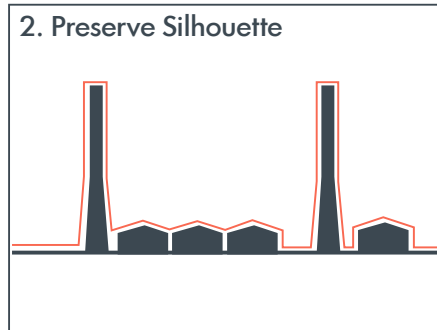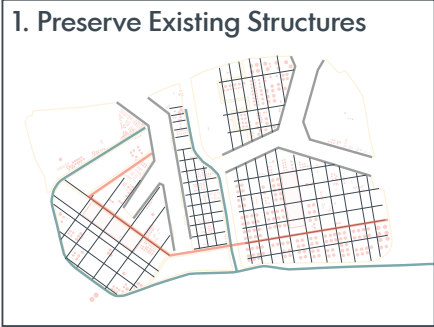
Illustration 130. Park side view. Source: Author

The existing structures are affected most in this design. The rhythm of the tanks stays the same. The silhouette is still recognisable (illustration 130). Although many of the tanks are affected, the structure and silhouette is still recognisable and visible. The water, as mentioned before, relates to the function of the dike structure. The tanks become park island in a sea of 'oil' because of the leaking tanks.
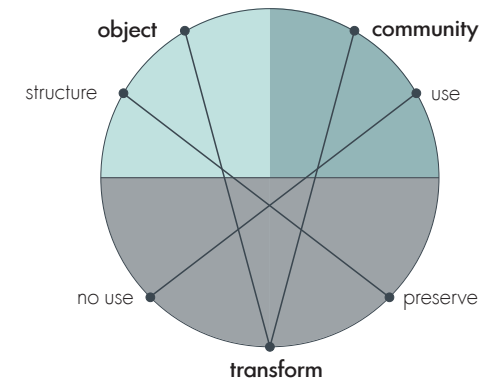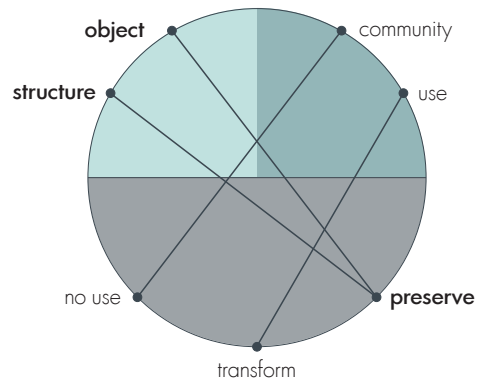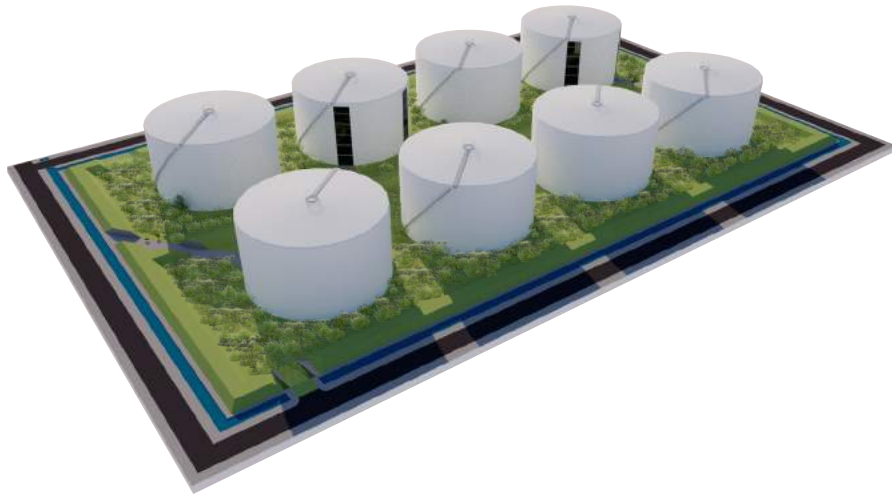
Illustration 131. Design comparison. Source: Author
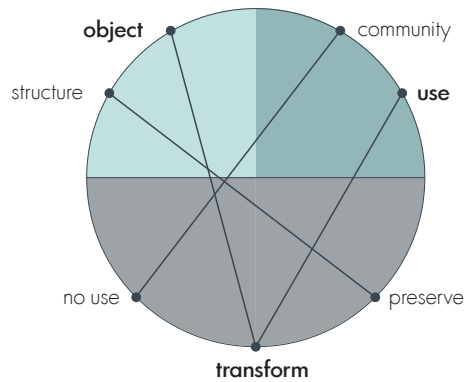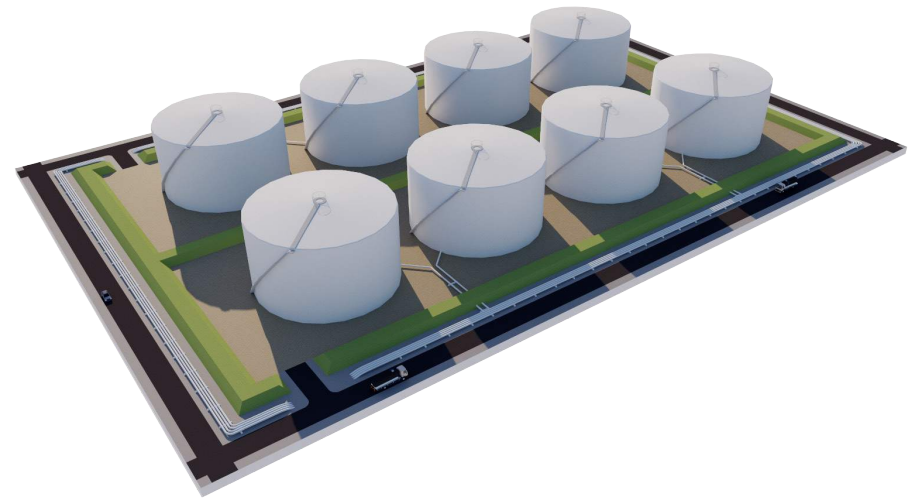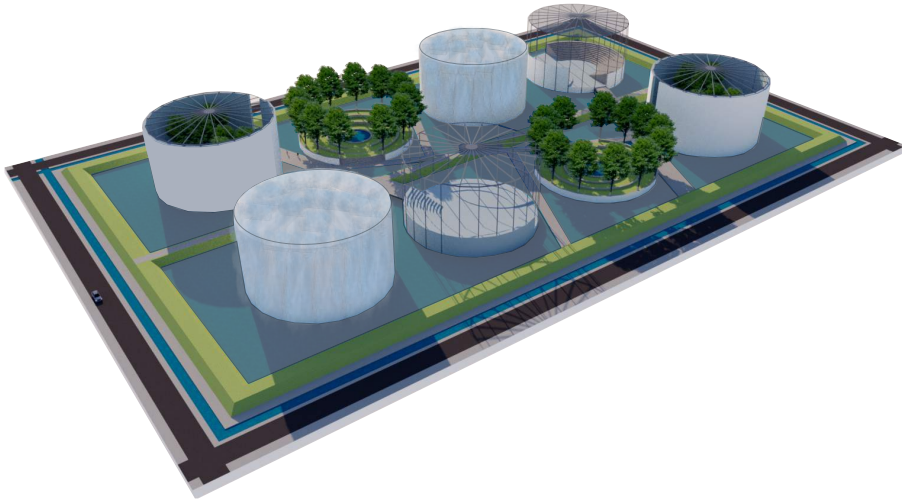
DESIGN COMPARISON

The goal of the three designs was to show three different images of what the area could look like in the future. The goal was to create three images which gradually went from a safe design to an extreme design. Seeing the three designs next to each other shows how different they are in function and in interventions. The graphic showed beneath the models shows where the design is focussed on and concludes if the design was about structure and object, community and use, and if the outcome was transformation or preservation. The first design was the design where the conclusion was to preserve rather than transform. The second and third design were more about transformation and how to transform with the core values kept in mind.

9

CONCLUSION

The first seven decades of the 20th century witnessed a rapid change in energy production. The production of oil showed an unprecedented and exponential growth in the world. Oil has a great impact on the whole world around us. Anywhere in the world, oil fields were explored and used as resources. The energy transition from fossil fuels to renewable energy will therefore also have a very big impact on the whole world. The layout of many harbours will change, the gas stations will disappear, and many daily products will eventually transform. Morel (2016) tells us that within ten years the demand for fossil fuels will definitely peak for the last time and after that only will decrease. The world must shift to renewable energy as soon as possible. Within a few decades we cannot rely on fossil fuels anymore. The oil industry is facing a transition and maybe becomes our new industrial heritage. Many sources say that re-use of industrial sites is the best solution to preserve the objects that are of value. (Douet, 2012) Protection could only be achieved by transformation and finding a new destination for these sites. (Janssen et al., 2013) But there are of course many ways to re-use a site. It is important to realise what the designer is dealing with. Re-use has the role of extending the existence of an object, as well as putting it to its best use. (Florentina-Cristina, George-Laurentiu, Andreea-Loreta & Constantin, 2013) Opportunities for re-use must be recognised in such a way, that it highlights the architecture, economic usefulness and culture (Florentina-Cristina, George-Laureniu, Andreea-Loreta, & Constantin, 2013) The historical objects of the industrial past must be treated with respect towards its original structures. Case studies of industrial heritage have been commodified and used for place-branding. Industrial aesthetics have been used to create a brand for the 'creative industries' SMEs, with reference to a history of engineering, manufacturing and innovation. New developments are portrayed as seemingly frictionless continuations of a glorious industrial past and much less attention is paid to the trauma of lost industries and jobs. The projects rarely address questions of belonging or, if they do, they ignore the 'sharper edges' of heritage narratives. The aim is to commodify the heritage sites, make them attractive and 'investment worthy' rather than reflect a balanced story of their history. None of the sites provide much interpretation of the heritage, the remnants of the past are assumed to be largely self-explanatory and self-evident. (PICH Project, 2018)

This project focusses on the industrial area of Pernis in the harbour of Rotterdam. It tries to find an answer to this mentioned transition of the oil industry. The main research question is therefore:

How can we transform Pernis' industrial area into a new function while maintaining the physical and mental elements of the past oil industry?

To conclude this question, the sub research questions must be answered first.

1. How did the harbour of Rotterdam develop?

With the development of the harbour, more space was needed for larger ships and other developments. The harbour of Rotterdam started growing out of the city. The smallest harbours in the city are already transformed into recreational use. The industrial functions, such as the oil, chemical and gas related sites, start in Pernis and end at the new developments of the Maasvlakte, near the sea.

2. How did the Pernis Industrial Area develop and what is its story (mental elements)?

Pernis' industrial area did not follow any of the former polder structures in its development. The developments where radical and quick to situate a new refinery along the river Muse to answer the growing question for asphalt. The stories of Pernis are thus very much related to the people who worked and work there. The industrial area of Pernis belongs to Shell and Shell always cared for its employees and residents around the industrial area. This relationship is a big part of the mental site of the story. The way people used the area also belongs to this storytelling.

Chances Pernis:
The municipality of Rotterdam mentions that they want to

connect villages as Pernis, Hoogvliet and Rozenburg more to the city. The Pernis industry area could be the perfect site to make this connection. The current infrastructure could be used in the new developments. The site is very well connected to the rest of the region, by highway, waterway, metro and even railways are already there. The water of the Eerste Petroleumhaven and the Tweede Petroleumhaven could be transformed into recreational use. Water always gives a certain value to an area.

3. What physical elements are there, reminding us about oil and how can we use this?

The oil industry has become a landscape. According to Kolen & Renes (2015), landscape stands for a part of the world that one can perceive from a particular point of view. The oil landscape is from many points in the surrounding visible. This landscape silhouette is therefore important to preserve, because it forms the image of the oil industry from a human scale and point of view from outside the area. This image is the image most people have of the oil industry. This silhouette consists of characteristics of the oil industry. To make sure that the characteristics stay recognisable, the theory of 'The Image of the City' of Kevin Lynch is compared to the layers of Pernis. The physical characteristics can be classified into five types of elements; districts, paths, edges, nodes and landmarks. While comparing the five types of elements from Lynch with the layers of Pernis, a clear image is drawn of how

the future oilscape can be shaped. The five types of elements are the ones most recognisable of a city image, so the five layers of Pernis should become valuable in the design.
From this physical research came four core values to use for the design: Preserve existing structures, preserve silhouette, relationship with water and recognition.

4. How important is the story of a place (mental)?

The current trend of storytelling in combination with the final conclusions of the PICH Project are the motivation to implement the story of the place in the design. The cases researched in the PICH Project tell us that the story of the place is usually not used in the elaboration of it, which is a shame, because many stories are connected to heritage sites. Because they are heritage or are listed to become heritage, that means that the area is of value for a big group of people.
        Van Iersel (2016) mentions 4 important trends in society that follow the development of storytelling; the need for connection, search for support, back to the core and imagination. This shows that people are connected with their past and thus the activities that they ones or still are related to. Telling their story means that they feel appreciated for the work they have done.

5. What are the possibilities for a new function (and what is needed)?

An analysis on the future perspectives of several stakeholders involved in the region around Pernis showed that population growth and renewable energy are subjects to consider important in future developments. Residential possibilities and possibilities for an energy park are analysed and proven that it is possible (scale wise) to create such area in Pernis.

By answering the previous sub research questions, an answer can be given to the main research question:

        How can we transform the Pernis industry area into a new function while maintaining the physical and mental elements of the past oil industry?

Re-use of industrial sites is the best solution to preserve the objects that are of value. Protection could only be achieved by transformation and finding a new destination for these sites. The area transforms into a residential area and energy park to fulfil the needs of the region.
The physical storytelling is with the help of the physical characteristics. In the case of the oil industry, oil has a way of moving through the area. First it comes into the harbour by oil tanker and via a process of storing and processing it leaves the area by ship, train, truck or pipeline. The physical story can be told by showing this way of oil and

the former use of the area.

The mental storytelling is a bit harder to tell. Mental storytelling means telling a story through memories and emotions. While the physical storytelling is objective, the mental storytelling is subjective. This makes it harder to determine what to tell. They say that an illustration says more than a thousand words, so in this project, the way to tell the mental story is through photographs. The old photographs of the area tell a lot of stories which a worth telling. These old photographs tell a story of how the area was used. The former function therefore also plays a big role in the design in telling the story.

Design in three scales:

Region Scale:
The historical analysis showed that the harbour activities are slowly growing out of the city. The harbour areas will become much more public and residential areas are added to these areas. The residential area of Penris will give more space to the village of Pernis, that was laying in between two very large industrial areas. The public transport will make the Pernis area better accessible. And the energy park will produce energy for the region and becomes part of the future perspective of the Port of Rotterdam and how they want to make the harbour a showcase of sustainable developments.

Area scale:
The infrastructural ring of Pernis, which relates back to the isolated feeling of Pernis, becomes the accessibility of the area. It follows the former structure of the main infrastructure of the industrial area. The different zones/ functions, with the former factory areas, function as new center. The new centre consists of sports activities, shops and other facilities. These new centres are surrounded by energy parks, residential areas and recreational areas.

Small scale:
The goal of making three designs was to show three different images of what the area could look like in the future. The goal was to create three images which gradually went from a safe design to an extreme design. Seeing the three designs next to each other shows how different they are in function and in interventions. The first design was the design where the conclusion was to preserve rather than transform. The second and third design were more about transformation and how to transform with the core values kept in mind.

Future research/recommendations

Because this project only lasted for a year, there was not enough time to look at the whole area in more detail. With the three small scale design possibilities, an image is shown of how the future oilscape could look like. Because this industrial area of Pernis is such an inaccessible area, the only structure clear to me was this small-scale block of tanks. In future research, I would recommend trying to find out how the area works on a normal working day. This is of course not easy, because only people who are allowed to can enter the area. But this normal working day program influences the storytelling of the place. In this project the storytelling is through old pictures and physical characteristics, but the life here and now adds a different level to this storytelling aspect.

In this project is also mentioned that an energy park is added to the area. The main renewable energy source is water, but how can this be implemented in real life is also a subject I was interested in. This can also be a very interested research.

REFLECTION

This design and research project addresses the possibilities for the transformation of the oil industry. According to some sources, we know that at the end of the twenty-first century there is almost no oil production left in the world. In this era, every single person grew up within the era of oil, where almost every product was made of, produced with or transported with oil. At some point the use and consumption of oil becomes much less, but a lot of physical elements will be still there. According to Carola Hein (2016) there are five different physical impacts of oil on society: Industrial, retail, administrative, ancillary and general infrastructure. The industrial impact/footprint is addressed in this project and consists of storage, transformation and transportation. These structures are huge in both investment and size, and are clearly visible from the air.

The industry of oil has a huge impact on our lives. The impacts mentioned before are just the clear physical impacts, such as visible structures. But there are also mental impacts, also called mindscapes. As Franco Bianchini stated in 2006, mindscape is something which exists between the physical landscape and people visual and cultural perception of it (Hein, 2015). The mindscape can also be called the identity of the place and the (hi) stories connected to this industry.

In the history of oil, there has already been a lot of literature about the use, consumption, war, and other aspects of this era. But also, literature about predictions on when this oil production comes to an end. It is widely recognized that renewable energy supplies, such as solar radiation, wind, biomass, tides, geothermal heat, and other continuing resources, are necessary for security, sustainability and standard of living. (Twidell & Weir, 2015) The future is renewable energy and the industry of the fossil fuels will someday become much less or even disappear, but will still be remembered as an era of great influence.

In this future of oil, I stated that there are two sites; the negative image and the stories/identity of the place. The negative image is the image we see in the news about corruption and pollution. The identity of the place shows the memories and emotions related to the industry of the employees and people related to this. This method of designing with two different sites of the story was quite challenging. The physical site was the easiest to elaborate. The identity or the mental site was the challenging part, were there is the mental experience I had to grasp, while knowing not much about the area, except my father's stories, because he works there.

My role as urban designer is to show the possibilities of the future of this oil landscape, and progress in a sustainable way, while preserving the elements of value. The energy transition from fossil fuels to renewable energy is not the first one. There have been many energy transitions which brought us also valuable objects and stories. Some objects are even listed as World Heritage, such as the windmills in Kinderdijk. This project has attempted to contribute to the transformation possibilities of industrial heritage and finding the valuable objects of the oil industry, and a suitable and needed new function. This has been attempted through theoretical research on industrial heritage and value, a location analysis on the Pernis industrial area in the harbour of Rotterdam, and a design experiment on transformation. The research in value relates to the research studio I choose. The History and Heritage research group focusses on redesign of heritage, on transformation of structures and the balance between the old and new (Graduation Manual, 2017). Finding out which elements are of value was a challenging part of the research and took me a while. The four core values that came out of this research are I think representing the value of the oil landscape quite well.

The way this project relates to the master track of Urbanism is by finding out how this industrial area can be transformed into an urban environment. Scale comparisons with existing urban environments were made to find out if this could work. With analysis how many people could live there, placing the facilities and adding connections to the urban environment around Pernis add to the research within the Urbanism track.

The theoretical research has revealed important knowledge about the transformation of an industrial heritage site. Many sources state that re-use of an industrial site is the best way to preserve it. Industrial sites usually consist of structures specially made for industry,

which makes re-use a challenging factor. Together with the fact that identity of the place is usually forgotten in transforming the site, makes it even more challenging.

In my search to re-use Pernis, I came up with the concept of reframing. Reframing, in this case, means using the old structures and transform them in a sustainable way. The location analysis showed that the objects and structures of the oil industry could be divided into five layers. These layers are the characteristics of Pernis and are used to preserve the structures in the design experiment. In the research on the identity of the place, I searched for old pictures to reframe the memories and stories of the place. In my opinion, this was a visual way to include the identity of the place in the design.

Within the design experiment it is showed how the results of both theoretical and location analysis determine a right balance between old and new, preservation and development, and how this could be used to create a design which showcases different uses of industrial oil heritage.

In the final part of my graduation period, I want to work out my design and analyse how the design experiments that I made are relating to the balance between preservation and development. Showing the possibilities of sustainable developments, while preserving the existing structures and characteristics of the Pernis industrial site.

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LIST OF ILLUSTRATIONS

Illustration 6#. Fitness on the job. Source: Shell Nederland Raffinaderij. (2002). 100 jaar Shell Pernis. Ede, The Netherlands: Veenman drukkers.
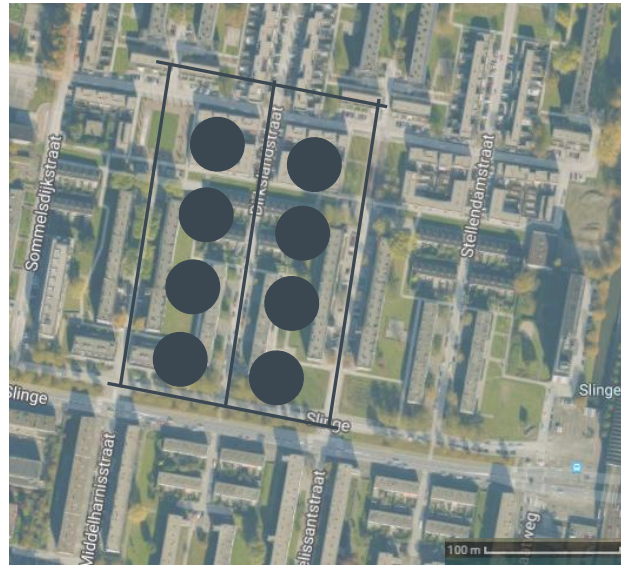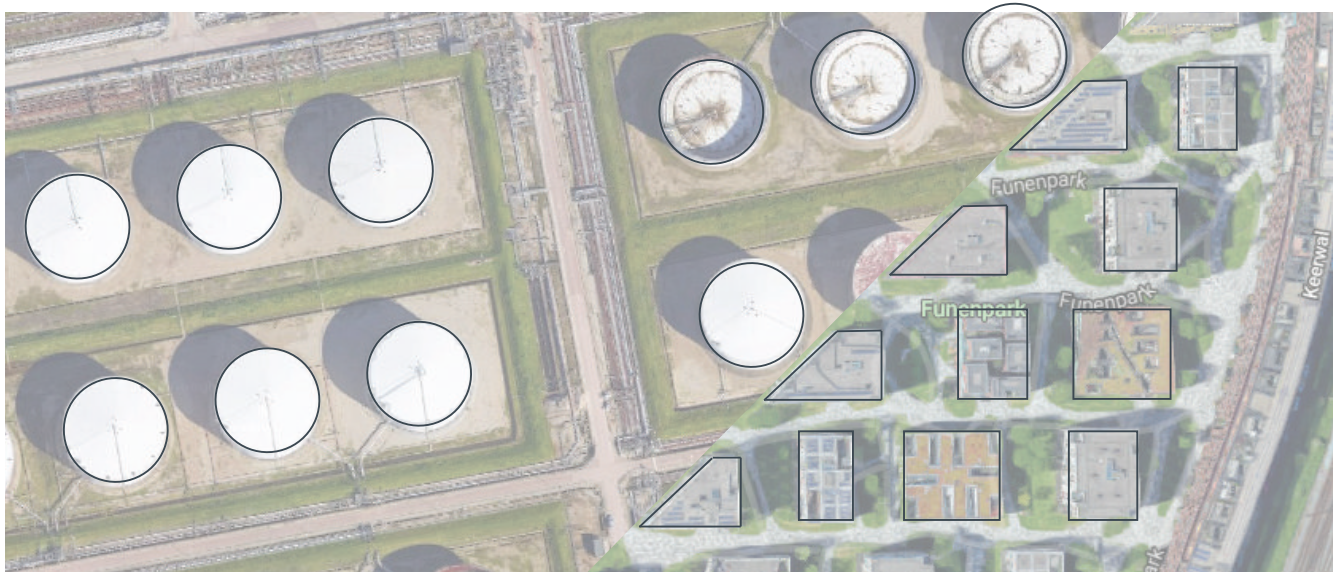
APPENDIX

APPENDIX 1
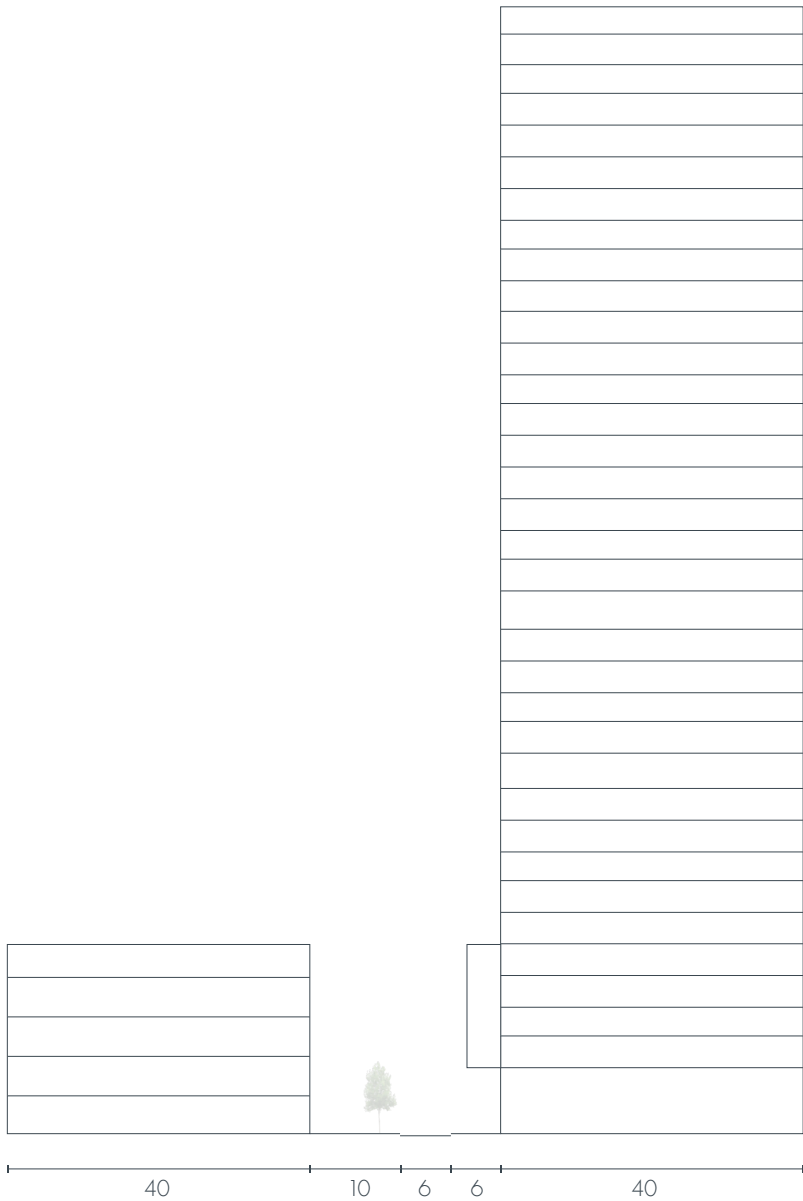
(Scale) Comparisons

Pernis

Pendrecht

Shell versus Funenpark Amsterdam

Source: Google Maps

SCALE COMPARISON

The first step into the direction of the possibilities to become a residential area is scale. In image on the left, a comparison is made between a part of the Pernis industrial area and the neighbourhood of Pendrecht in Rotterdam. Two blocks of Pendrecht are almost equal to one block of the storage tanks of Pernis. Through this, we can conclude that the storage tanks of Pernis and its current structure could easily be used for the development of a residential area.

Wilhelminakade, Rotterdam
Source: Google Maps Streetview

SCALE COMPARISON SECTIONS

The next scale comparison is about the section of public space. The Funenpark project in Amsterdam comes close to the residential situation which will be realised in the area of Pernis. The goal of this scale comparison was to find out what the public space of the new situation of Pernis would look like and to what existing project it could relate to.
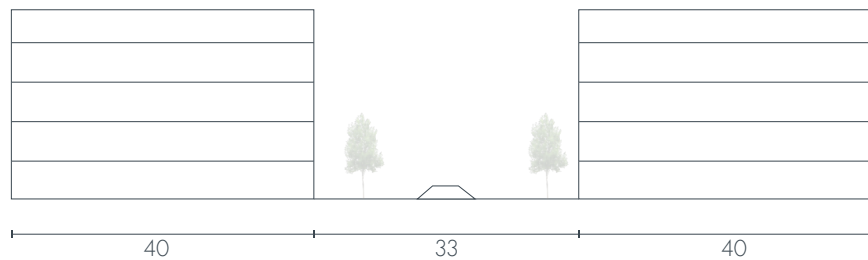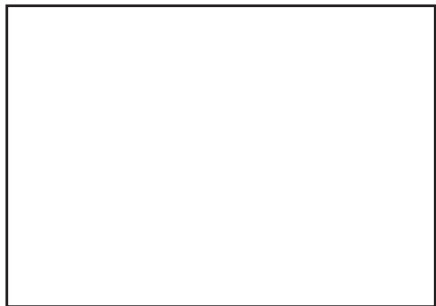
40	10	6	6	40
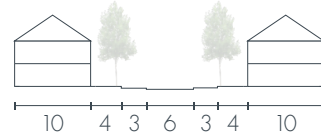
Rowhouses, General Source: Google streetview.
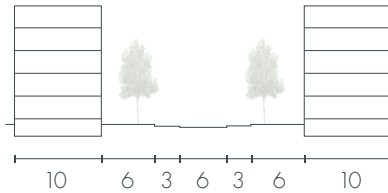
Pendrecht, Rotterdam – Source: Louwers Uitgeversorganisatie BV. (n.d.). De Karakteristieke Waarde van Pendrecht in ere hersteld. Retrieved June 5, 2018, from https://www.stedenbouw.nl/artikel/de-karakteristieke-waarde-van-pendrecht-in-ere-hersteld/
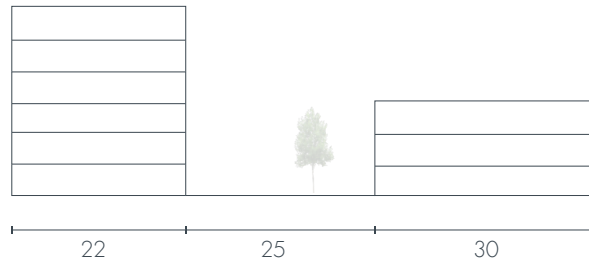
Funenpark, Amsterdam – Source: Amsterdam Rainproof. (2016). Funenpark. Retrieved May 6, 2018, from https://www.rainproof.nl/funenpark

New Situation, Pernis

NOLENSTRAAT

Amsterdam

ISLAND		FABRIC	
A	2.8 ha	A	3.9 ha
FSI	1.25	FSI	0.89
GSI	0.23	GSI	0.16
OSR	0.62	OSR	0.94
L	5.47	L	5.47
		N	0.019 /m
		w	105 m
		b	16 m
		T	28 %

BORRELL I SOLIER

Barcelona

ISLAND		FABRIC	
A	1.4 ha	A	1.9 ha
FSI	1.21	FSI	0.90
GSI	0.24	GSI	0.18
OSR	0.63	OSR	0.91
L	4.96	L	4.96
		N	0.016 /m
		w	122 m
		b	16 m
		T	25 %

GRAZER DAMM

Berlin

ISLAND		FABRIC	
A	8.7 ha	A	11.7 ha
FSI	1.21	FSI	0.90
GSI	0.24	GSI	0.18
OSR	0.62	OSR	0.91
L	5.00	L	5.00
		N	0.012 /m
		w	165 m
		b	23 m
		T	25 %

Spacematrix FSI GSI. Source: Berghauser Pont, 2010

surface 1 tower = 6.280 m²   **8 towers = 50.240 m²**

surface ground = 40.625 m²

$$FSI \quad = \quad \frac{F}{A} \quad = \quad \frac{50.240}{40.625} \quad = \quad 1,23$$

$$GSI \quad = \quad \frac{B}{A} \quad = \quad \frac{10.048}{40.625} \quad = \quad 0,25$$
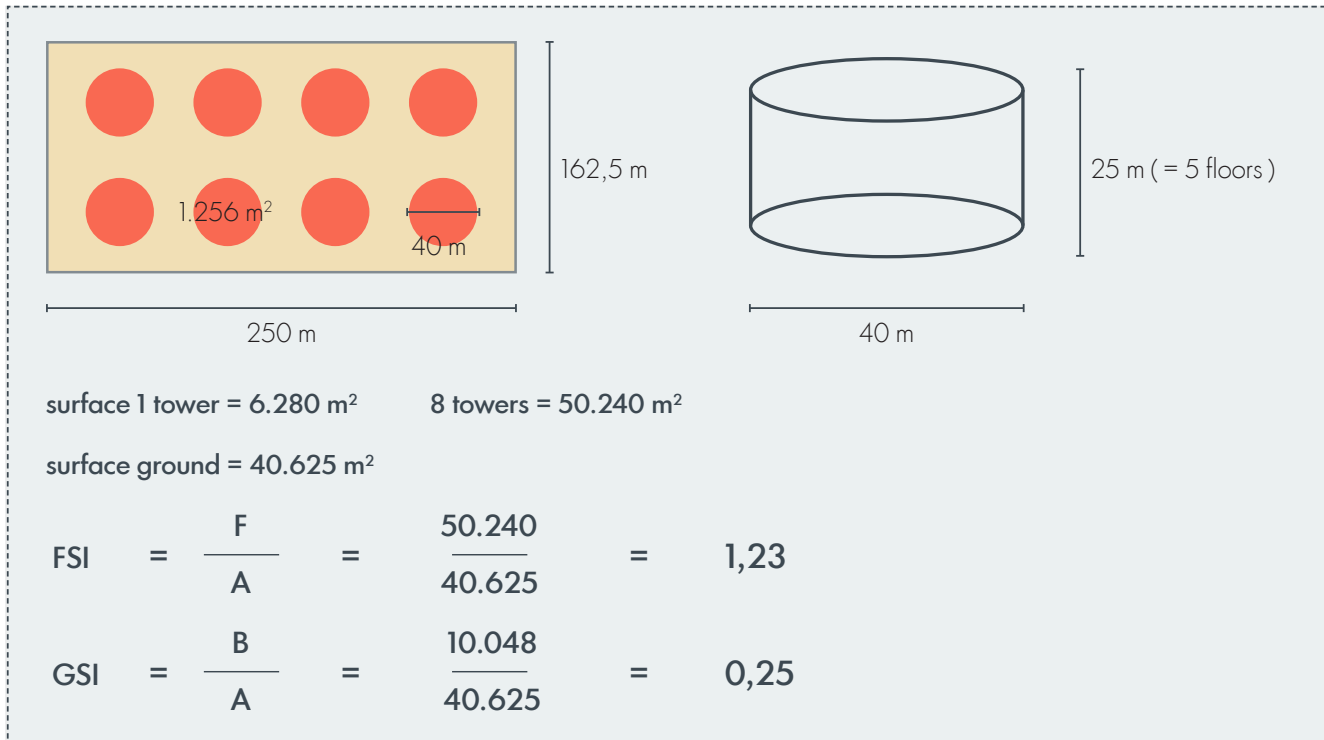
FSI - GSI

For further analysis on how the density and ambiance of the future residential area could be, an analysis is made based on floor space index and ground space index. The calculations of the FSI and GSI are made in the image on the left. The FSI of the new residential area would become 1,23 and the GSI 0,25.

To know how this would look like, a selection is made of three existing projects which have more or less the same FSI and GSI. The project of Borell I Soler is one of them. In the image, we can see that the block of the design is almost the same as the storage tanks. There are several towers of apartments next to each other, which creates the same ambiance possible with new developments.

1

25 m
(= 5
floors)

10 m

40 m

Principle of the 'gallerijflat'

1 floor is 1.256 m²
– atrium of 103 m²

6 appartments of around 192 m²

8 appartments of around 144 m²

10 appartments of around 115 m²

Total of 30 - 50 appartments in one tower

2

25 m
(= 5
floors)

40 m

Principle of the 'portiekflat'

1 floor is 1.256 m²
– access space of 20 m²

6 appartments of around 190 m²

8 appartments of around 130 m²

10 appartments of around 110 m²

Total of 30 - 50 appartments in one tower

3

25 m
(= 5
floors)

40 m

Principle of the 'gallerijflat'

1 floor is 1.256 m²

6 appartments of around 190 m²

8 appartments of around 130 m²

10 appartments of around 110 m²

Total of 30 - 50 appartments in one tower

POSSIBLE TOWERS

To go even more into the possibilities of a residentials area, this analysis is made. Which analyses almost the smallest scale in the area. How can a storage tank transform into an appartment building and how many apartments would be there? In the analysis on the left, three possibilities are given.

Option 1 shows an atrium inside the tanks with a diameter of 10 m. The galleries are surrounding this atrium and provide entrance to the apartments. On the outside of the tank is the possibility to create balconies.
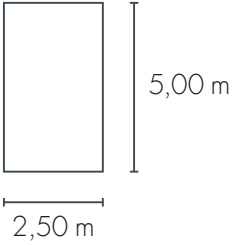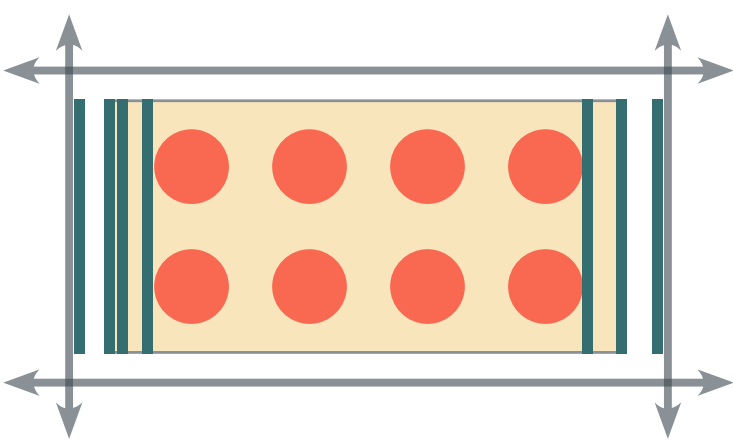
Option 2 shows us the principle of the 'portiekflat'. In this principle, the accessibility of the apartments is by a staircase which connects two apartments on one level together and provides in this case 10 apartments access by using one stair.

Option 3 shows us the possibility to have the gallery and access on the outside of the tank.

Option 1 provides the best living quality because of the light it lets into the whole building. In this option, the light comes into the apartments from to ways. In this option, it is also a positive effect that the life in the tank is on the outside and inside of the tank. Constant view on the public space is a way to make it feel safe and pleasant.
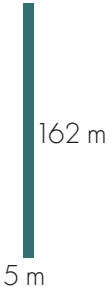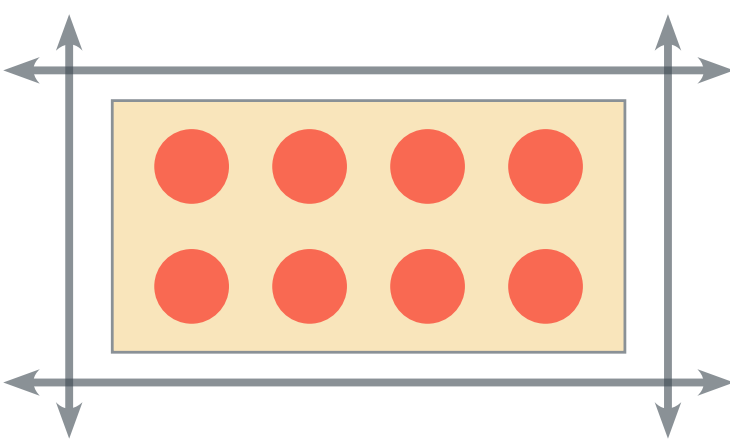
40 apartments per tank

per block = 8 tanks

8 * 40 = 320 apartments

car per apartment = 1,4

parkingspace needed = 320*1,4 = 448 nowadays

5,00 m

2,50 m

1

Parking strips

8 * 40 = 320 * 1,4 = 448

162 / 2,5 = 64,8 cars on one strip

448 / 64,8 = 7 strips needed

162 m

5 m

PARKING SOLUTIONS

With housing comes parking and this is usually one of the biggest spaces taken in the public space. A few options are given, with the calculations, on how to solve the problem of parking in one block of apartment buildings.
A parking tower gives the best solution for parking. (Assuming that there will still be a vehicle that looks like a car in the future) This solution gives life in the plint of the rest of the towers.

2

Parking on ground level of tank
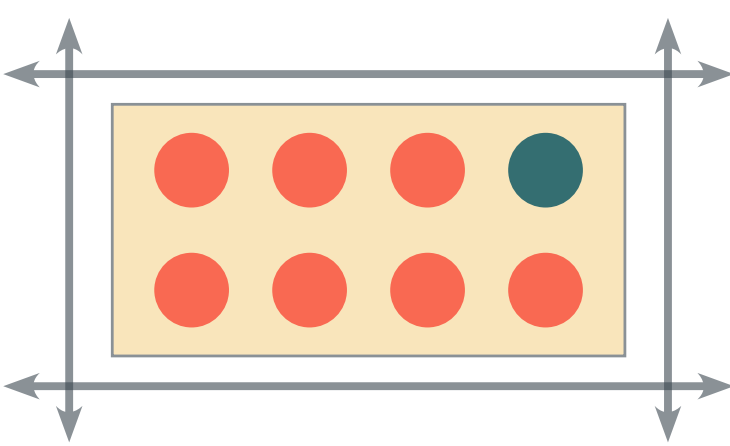
32 apartments per tank
32 * 1,4 = 45 needed

diameter = 40 m
diameter left = 30 m
circumference = 30 * π = 94,2
94,2 / 2,2 = 43 possible on ground level
(or more if double ring of parking is used)

single

double

3

Parking Tower (one tank devoded to parking)

height per level = 2 m   (9 levels)
depth needed for car = 5 m
diameter = 40 m
diameter left = 30 m
circumference = 30 * π = 94,2
94,2 / 2,2 = **43** needed per level

parking spaces needed = 7 * 40 * 1,4 = 392
per level = 392/9 = **43** possible per level

Groene tunnel IJburg
Source: Google maps Streetview

⊢—⊣ 40 m

Binnenmaas
Source: Google maps Streetview

⊢————————⊣ 360 m

Scheepsmakershaven Rotterdam
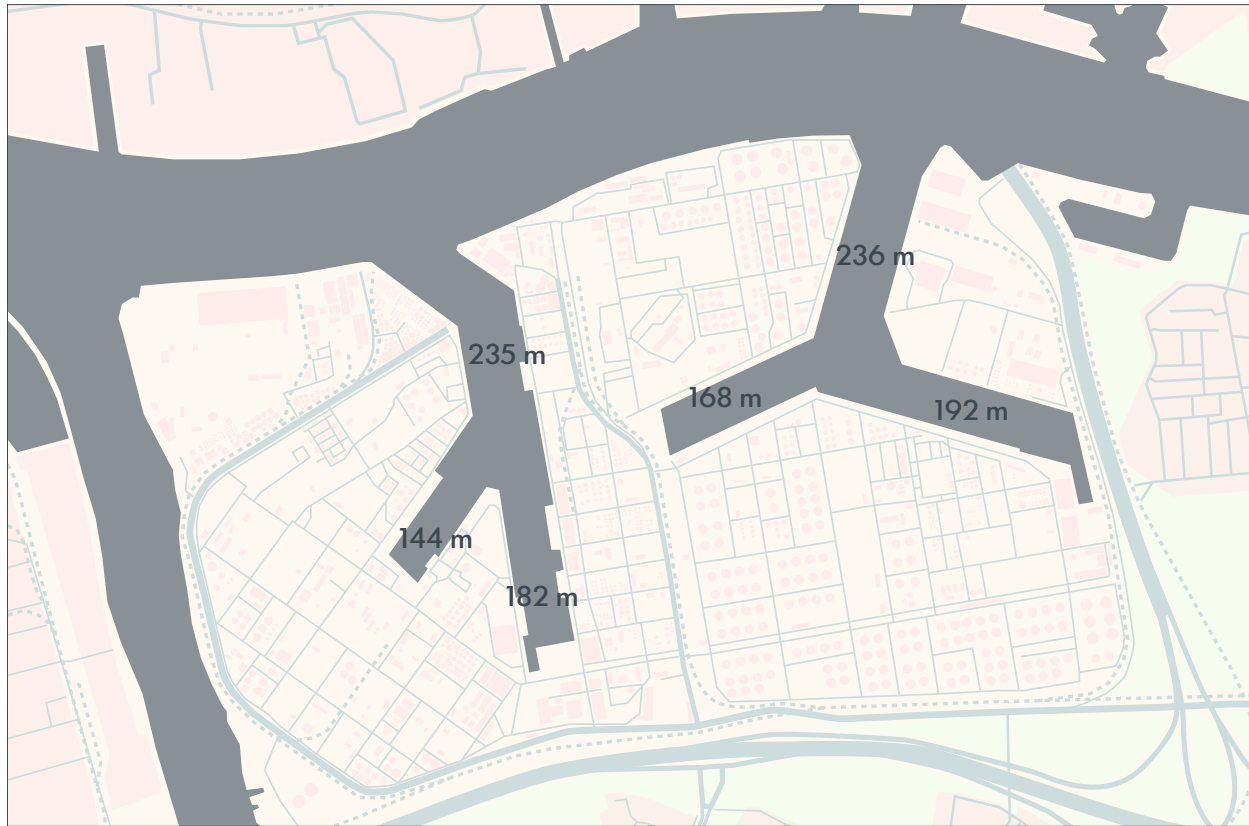Source: Google maps Streetview

⊢—⊣ 40 m

IJhaven Amsterdam
Source: Google maps Streetview

⊢————⊣ 211 m

WATER

Water in the area is of big meaning. Since this will be a former harbour area, the width of the canals is quit large. A scale comparison is made on the left with existing projects. The Ijhaven in Amsterdam comes close to the Pernis harbours. In this analysis, there is now a clear image of how the harbours could look like in the future.

APPENDIX 2

Photographic Report Pernis

APPENDIX 3

Photographic Report Emscher Park