

**Bellahøj all year round.  
Unifying through urban nature  
using a time-based approach.**

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Unifying through urban nature  
using a time-based approach.**

A thesis submitted to Lund University in partial fulfilment of the requirements for the degree of Master of Science in Architecture with a specialisation in Sustainable Urban Design, September 25th, 2019.

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**Abstract**

Bellahøj is an area situated in the northwestern part of Copenhagen, Denmark, 5 km away from the inner city. Considering its architectural heritage, abundance of green capital, a wide variety of resident groups and a convenient location, it has a great potential for being a well-functioning neighbourhood, yet, there seems to be a missing piece of puzzle that causes Bellahøj to feel fragmented and somewhat forgotten.

Bellahøjmarken, the project site, which turns into a private campground for 3 months a year and remains an undefined, fenced off field the rest of the time, seems to have a lot to do with that.

The project aims to explore how Bellahøjmarken could unify the neighbourhood and become its year-round asset by activating through new built structure, transforming the existing green structure and employing nature-driven programming using a time-based approach.

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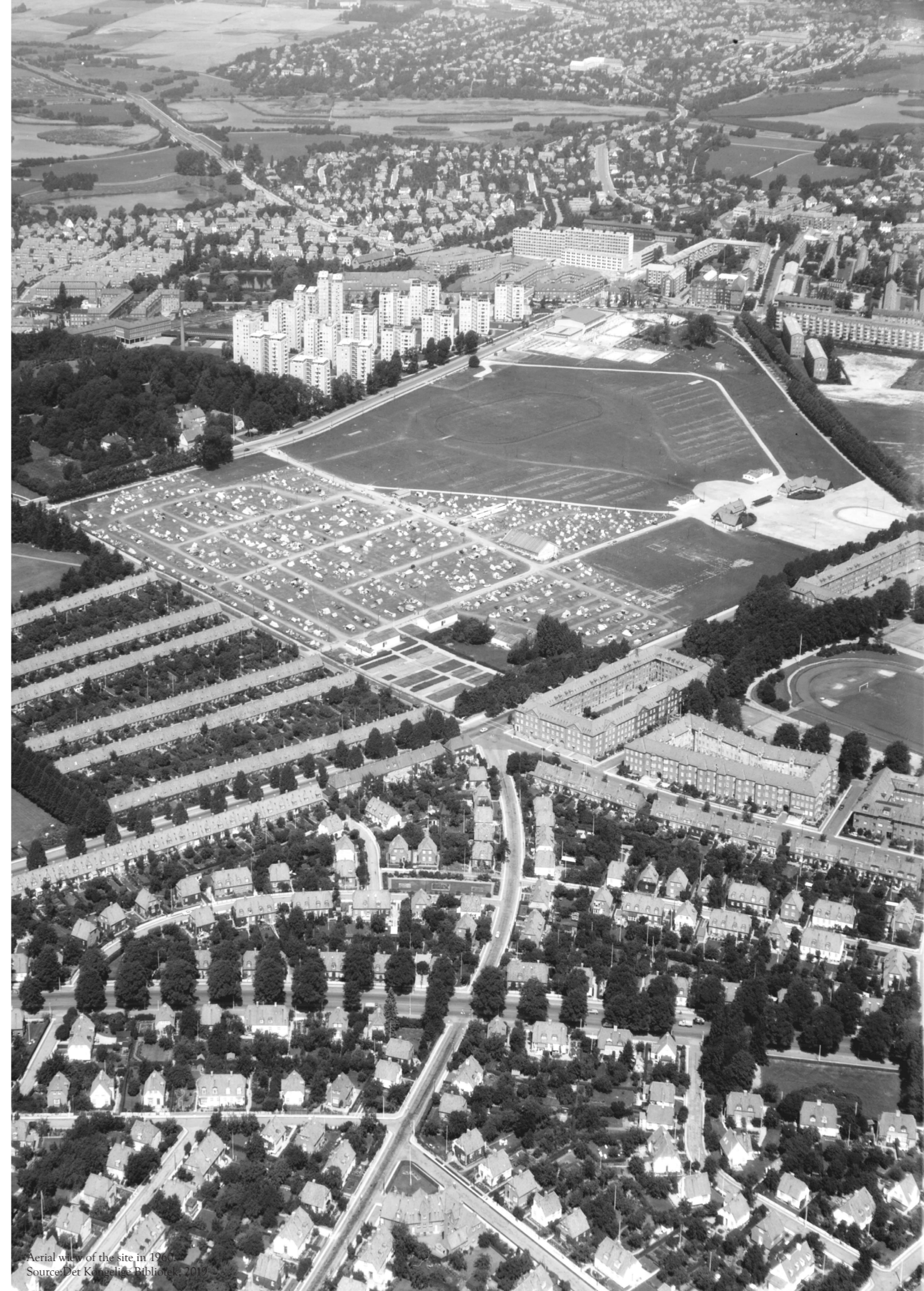
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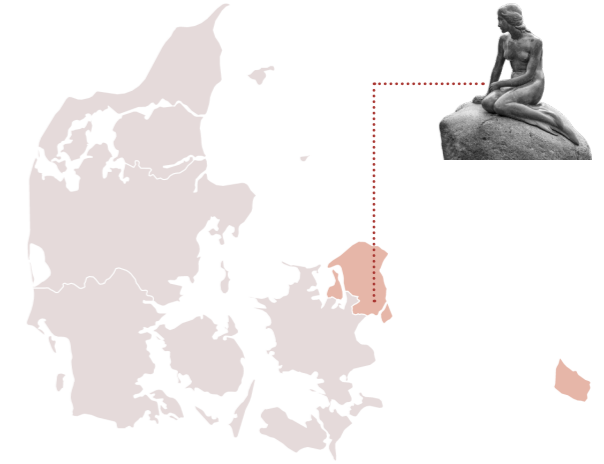
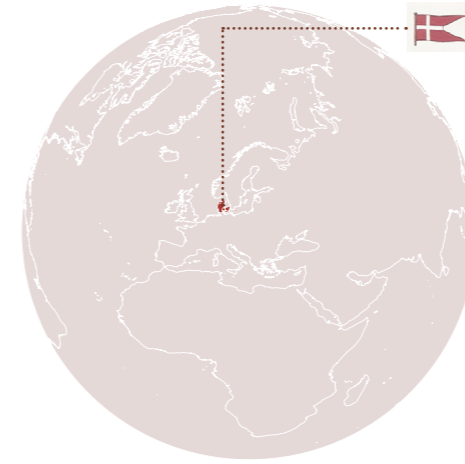


# 1. Introduction

## 1.1. Site placement

Denmark; 56.2639° N, 9.5018° E

Capital Region; Copenhagen



Bellahøj  
📍 5,6 km  
🚲 25 min

Copenhagen Central Station  
📍 5,6 km  
🚲 25 min

Utterslev Mose  
📍 2,5 km  
🚲 10 min

Assistens Kirkegård  
📍 3,2 km  
🚲 15 min

Kongens Nytorv  
📍 5,1 km  
🚲 20 min



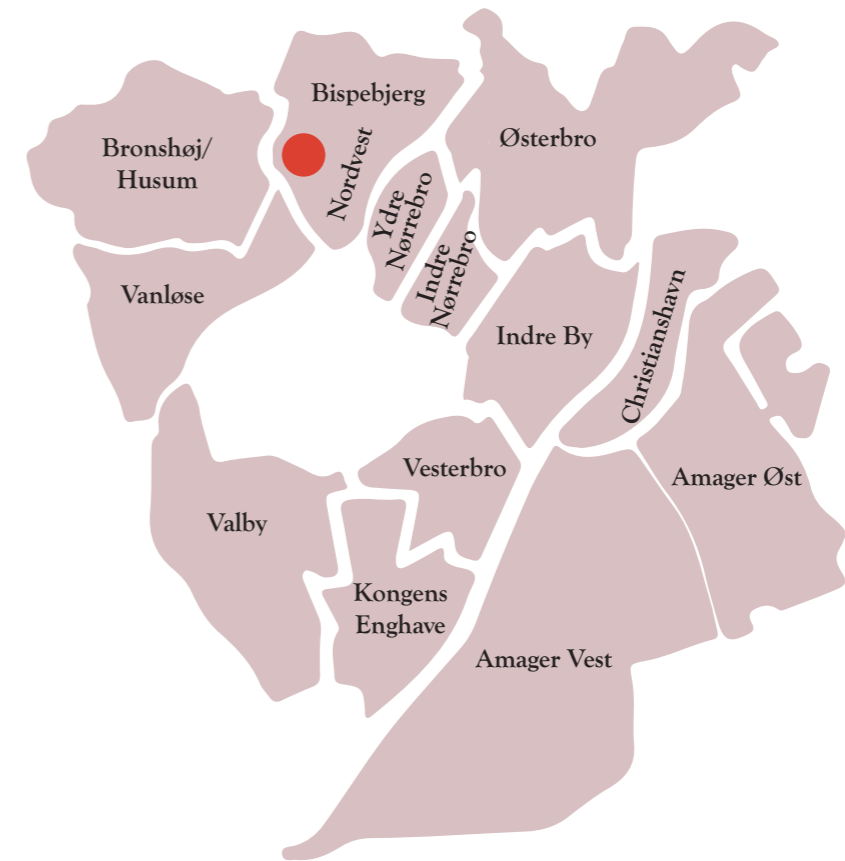
Location of the site in relation to the city.  
Source: Google Earth, 2019

## 1.2. Local characteristics

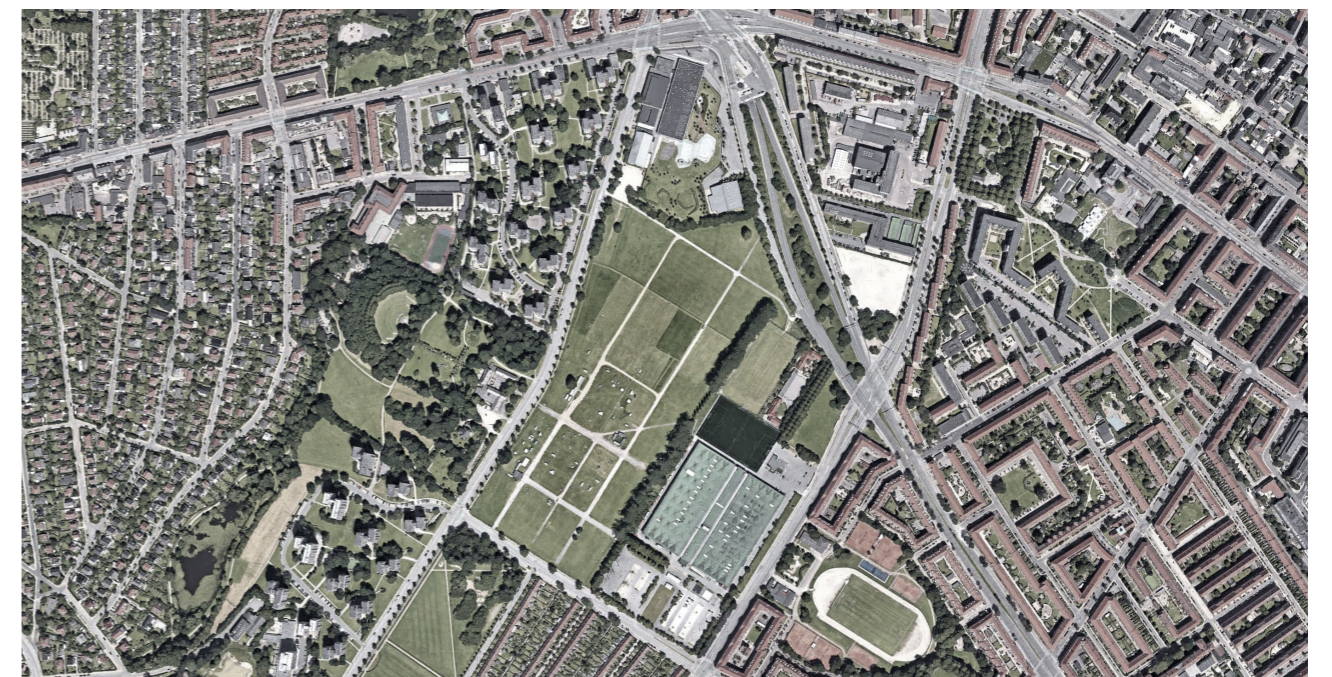


- Site
- Research area
- Park/lawn
- Water feature

The analysed area, commonly known as Bellahøj, belongs to the administrative districts of Vanløse, Brønshøj-Husum and Bispebjerg of the City of Copenhagen. The project site, located in Bispebjerg, has an area of approximately 28ha and consist predominantly of an open lawn - Bellahøjmarken used for multiple purposes such as a circus field, a hawkers' market and a campsite at specific times of the year, two football courts, a few buildings housing sports facilities as well as a kindergarten. Throughout the booklet, the project site will be referred to as *Bellahøjmarken* site for the sake of clarity.



Despite its relative proximity to the inner city as well as to the other boroughs considered *urban* and *central* such as Nørrebro, the Bellahøj site, located right on the northern edge of the Nordvest quarter, is perceived to have a suburban character, as if that is *where the city ends*. As the main contributing factors to this identity can be considered the extensive motorized-transport infrastructure, the scale of the open field - Bellahøjmarken, as well as lack of commercial functions along the main arteries in the area.



Character of the site and the surroundings.  
Source: Google Earth, 2019



View from Hvidkildevej towards Bellahøjhusene.



Western entrance to Grøndal Multicenter.



Project site in March - empty field, fenced off.



Project site in March - empty field, fenced off.



Project site in March - circus caravans parked.



Project site in March - empty field, fenced off.



Grøndal Multicenter - eastern facade.



Football pitch next to Grøndal Multicenter.



View from the site towards Bellahøj Svømmest.



Entrance gate to the site from Bellahøjvej.



View fr. Bellahøjvej towards Frederikssundsvej.



Project site in July - private campsite.



Project site in July - private campsite.



Street crossing - Frederikssundsvej.



Street crossing - Frederikssundsvej.

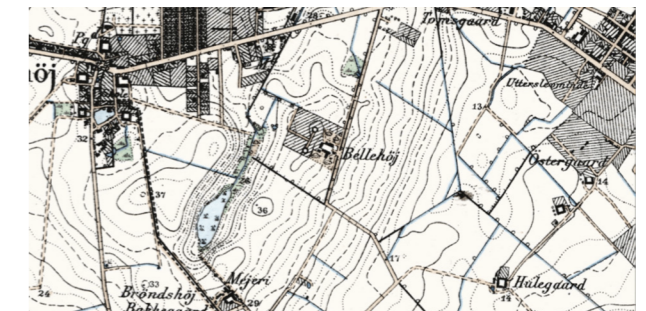
Source: Potoczniak, 2019

### 1.3. Historical context

The landscape of Bellahøj, as it's known today, originated some 14.000 years ago. With its 37 meters above sea level, Bellahøj is the highest point of Copenhagen with a view over the entire city and on a sunny day even reaching Sweden, over the Øresund strait. (Bendsen et. al., 2015)

The local landscape has over time developed from untouched nature, through bronze-age burial mounds (still on the premises of Bellahøjparken) to agricultural fields. At times have there been numerous farmhouses on the site, which had eventually burned down or been demolished. In the XX century, until the establishment of the current residential complex Bellahøjhusene, the site had been used for allotment gardens. (Bendsen et. al., 2015) The name *Bellahøj* originates from Bella f. Henriques, the wife of a trader Moses Levin Martin Leopold Mariboe who in 1792 became the first owner of the property known today as, Bellahøjrestaurant. (FSB, 2013)

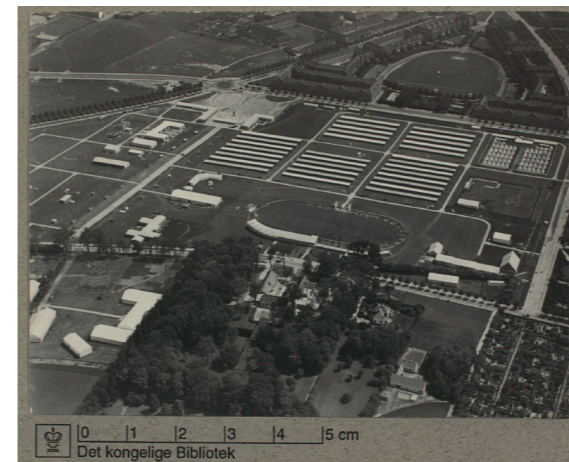
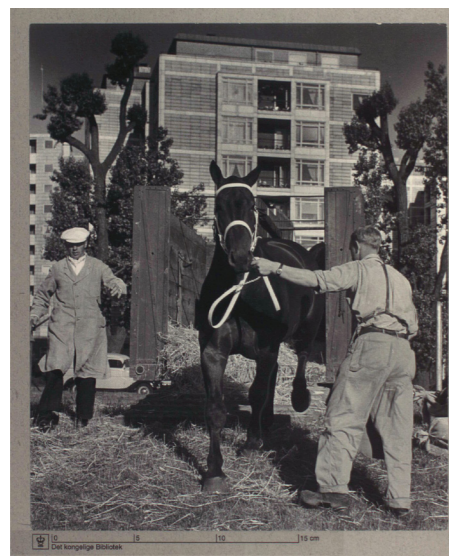
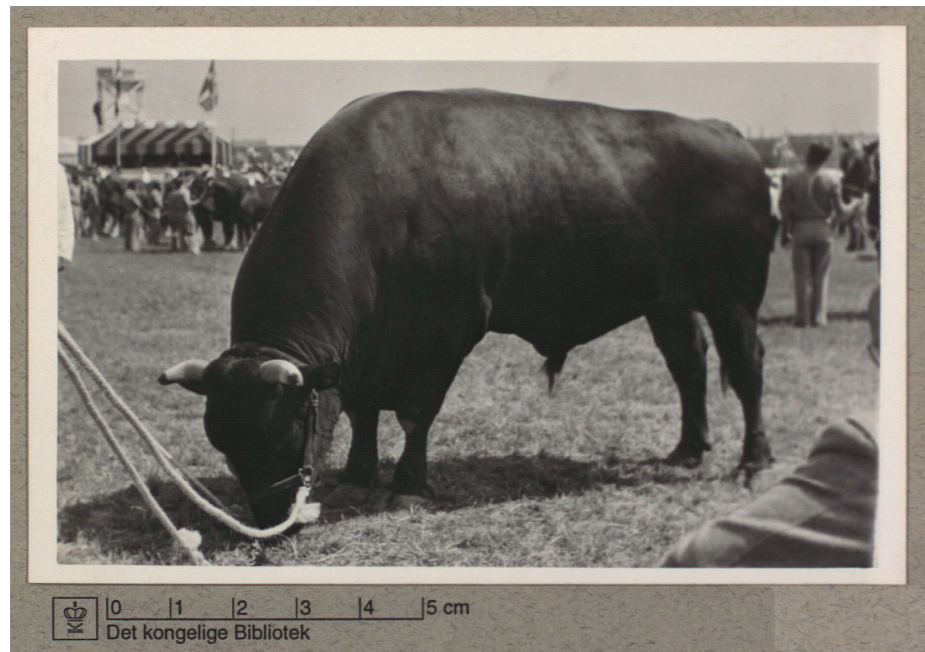
Bellahøjmarken served primarily agricultural purposes throughout the time. In 1938 the first large agricultural exhibition was held on the site which turned into a yearly event taking place until 1967 when it was moved to Roskilde, considered no longer appropriate for a modern city that Copenhagen was becoming. (Bendsen et. al., 2015) Eventually Bellahøjmarken was transformed into a campsite, limiting public access for a couple of months a year, and still functions as one today.



Historical maps 1677, 1899, 1929, 1939, 1945, 1976 .  
Source: Københavnerkortet, 2019

Bellahøj residential complex is known for its tall, characteristic block towers, located amid a lush green area in the highest point of Copenhagen. The construction had been carried out by the initiative of four housing organisations in the years 1951 - 1957 and was Denmark's first high-rise development. Architects Mogens Irming and Tage Nielsen won the master planning competition in 1944 and are the authors of the project, conducted in collaboration with the renowned C.Th. Sørensen, responsible for designing the landscape. Both Irming, Nielsen and Sørensen, were heavily inspired by the modernist visions popularised by Le Corbusier focusing on large scale, views, access to daylight and fresh air. (GHB, 2014)

The goal for the Bellahøj complex was to become self-sufficient with own kindergartens, laundromats, shops and underground parking. All the daily errands were intended to be dealt with within the premises of the site. At the time, there was a strong sense of pride in living in such a modern way, in Bellahøj - a new city in the city. (GHB, 2014) The high price of the apartments contributed to the exclusivity, quickly earning Bellahøjhusene the name oatmeal houses - after paying the rent, all one could afford to eat was oatmeal. (Kulturarv, 2019)



Historical photos of the site and the surroundings.  
Source: Det Kongelige Bibliotek, 2019

Another characteristic architectural element neighbouring the site are Bakkehusene from 1923. The idea behind the development originated by the housing organisation KAB was *house with a garden for the common people*. The architects Ivar Bentsen and Thorkil Henningsen designed 1,5-storey rowhouses facilitating 171 households, inspired by small townhouses characteristic for provincial towns with a small frontyard and a larger backyard. KAB's director F.C. Boldsen visited England in 1909 on a study trip in the harbour town of Letchworth, inspired by Ebenezer Howards *garden cities* which also might have influenced the creative decisions behind the new residential complex. The buildings have been listed since 1981. (Kulturarv, 2019)



Current views of Bakkehusene.  
Source: Copenhagen by Design, 2019

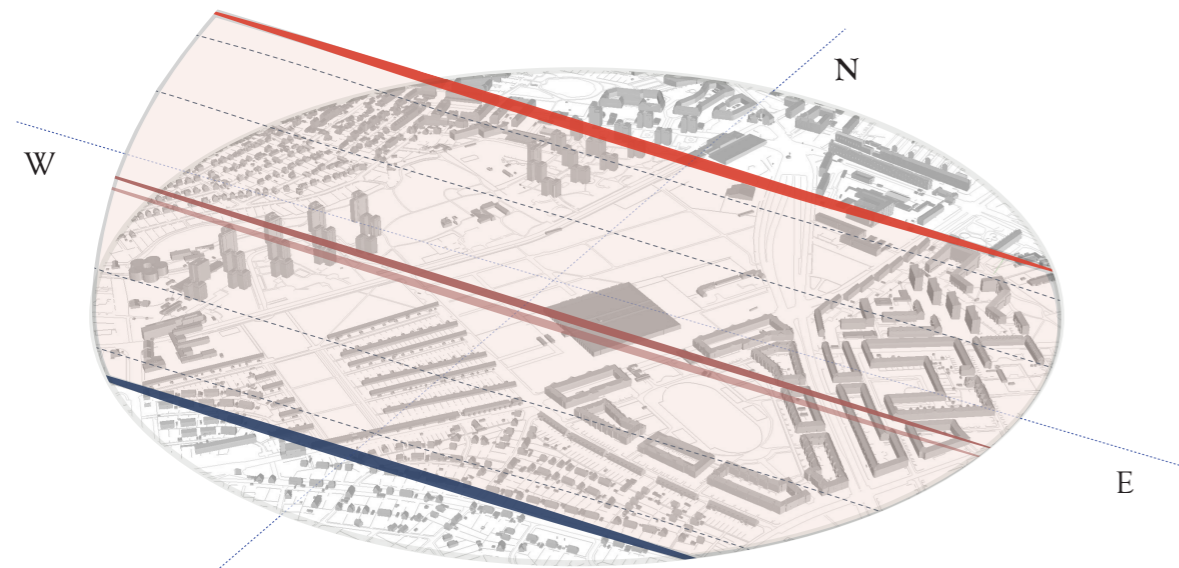
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## 2. Registration and analysis

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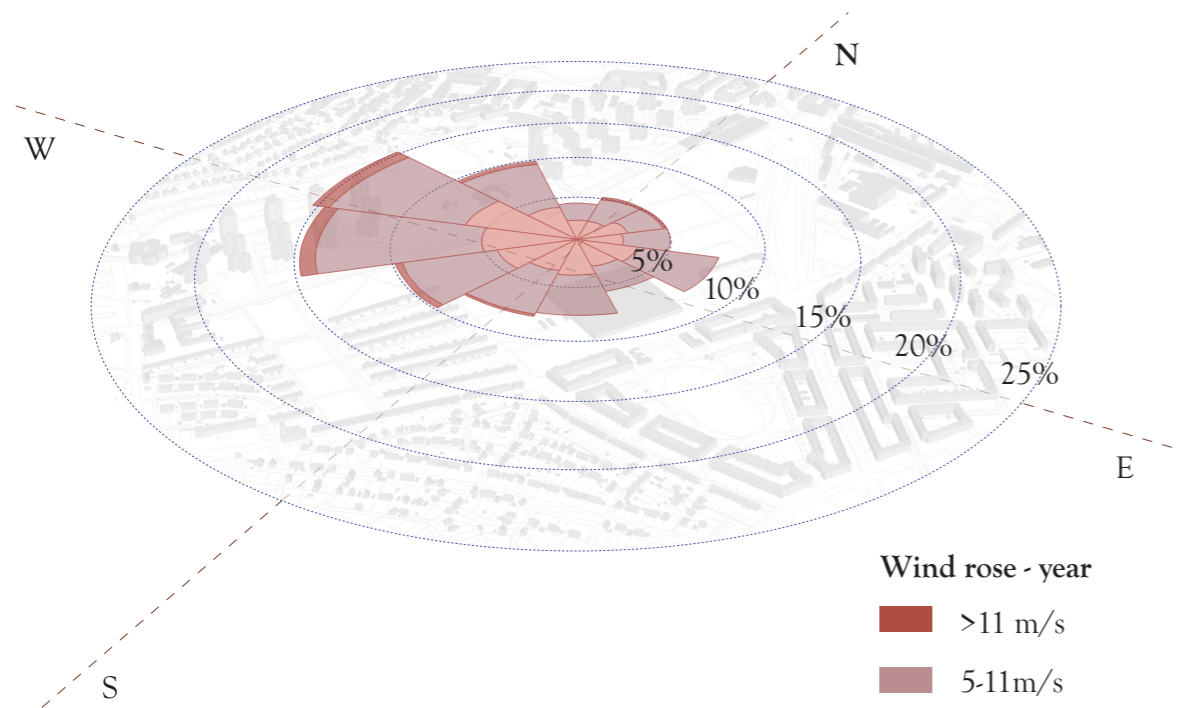
## 2.1. Microclimate



Sun path - year

- Summer solstice
- Spring equinox
- Autumn equinox
- Winter solstice

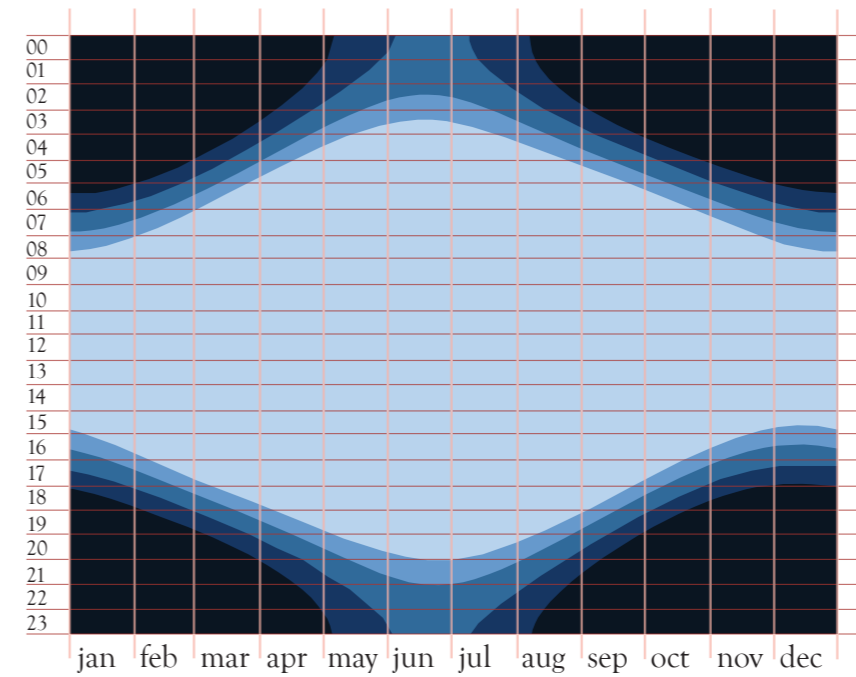
Sun path diagram.  
Source: Potoczniak, 2019 (based on Marsh A., 2012)



Wind rose - year

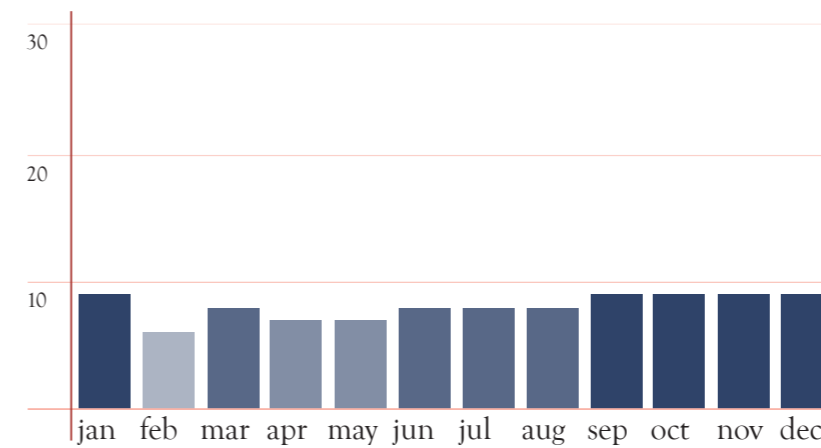
- >11 m/s
- 5-11m/s
- 0-5m/s

Wind rose diagram.  
Source: Potoczniak, 2019 (based on Cappelen J., Jørgensen B., 1999)



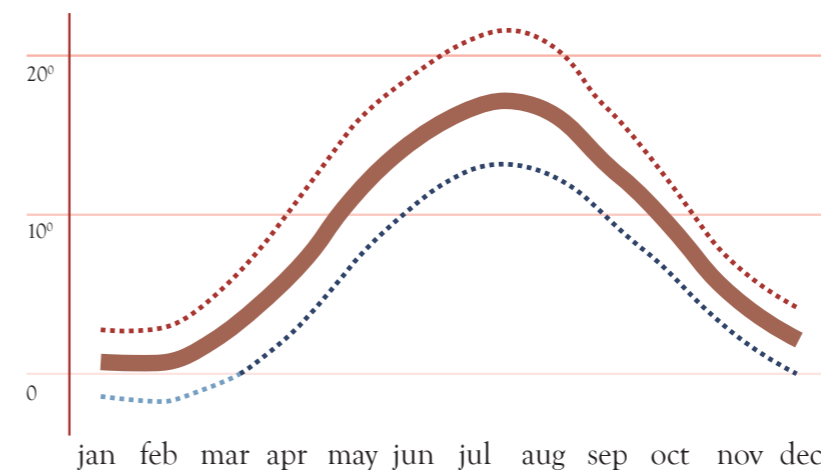
Day-length

The diagram shows the average amount of hours of brightness and hours of darkness during the course of a day across a year. It distinguishes day and night as well as civil twilight, nautical twilight as well as astronomical twilight at dawn and dusk.



Precipitation

The graph shows the average amount of days (24h) with precipitation during a month. When precipitation has surpassed 1mm per day (24h) it is defined as a day with precipitation. The mean period is 1961-1990.



Temperature

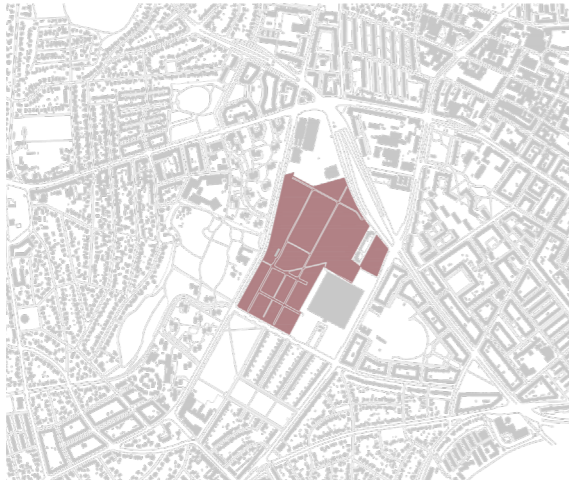
Max temperature: Average max daily per month. Minimum temperature: Average minimum daily per month. Average temperature: Average daily per month. The temperature normals are measured in the period 1961-1990.

Day-length, precipitation and temperature diagrams.  
Source: Potoczniak, 2019 (based on Marsh, 1999 and YR, 2019)

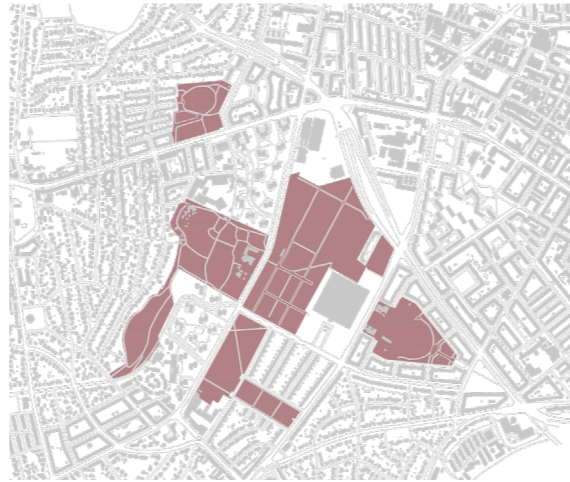
## 2.2. Scale comparison

To comprehend better the size of the project site in comparison to other *urban nature* areas in Copenhagen, a scale study has been conducted. The following sites vary in typology and function and serve merely as a dimensional reference.

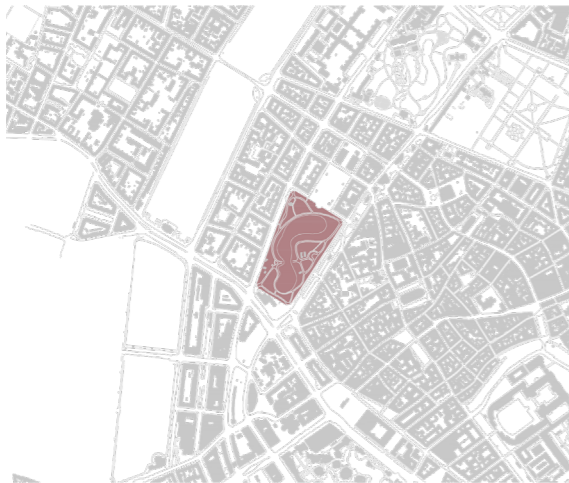
Project site - 14,5ha



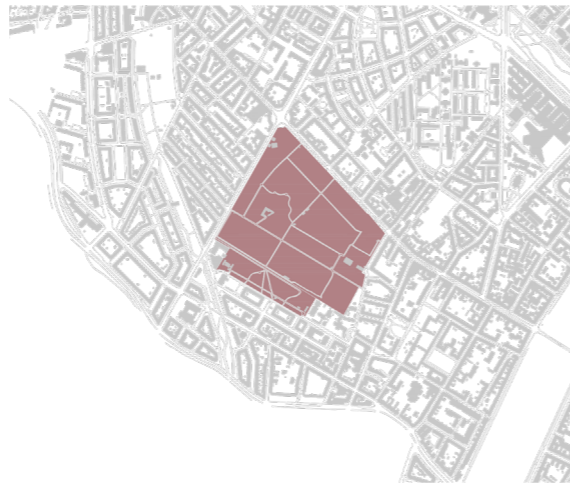
Bellahøj Parks - 39,3ha



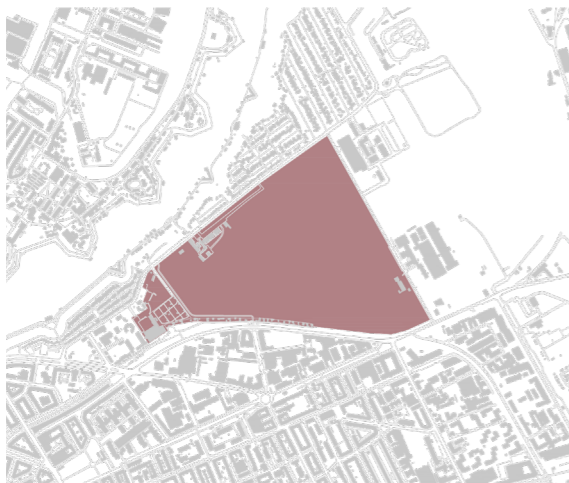
Ørstedsparken - 6,3ha



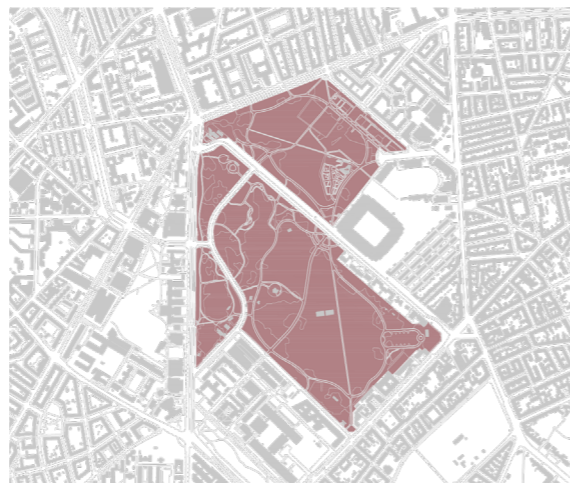
Assistens Kirkegård - 23,5ha



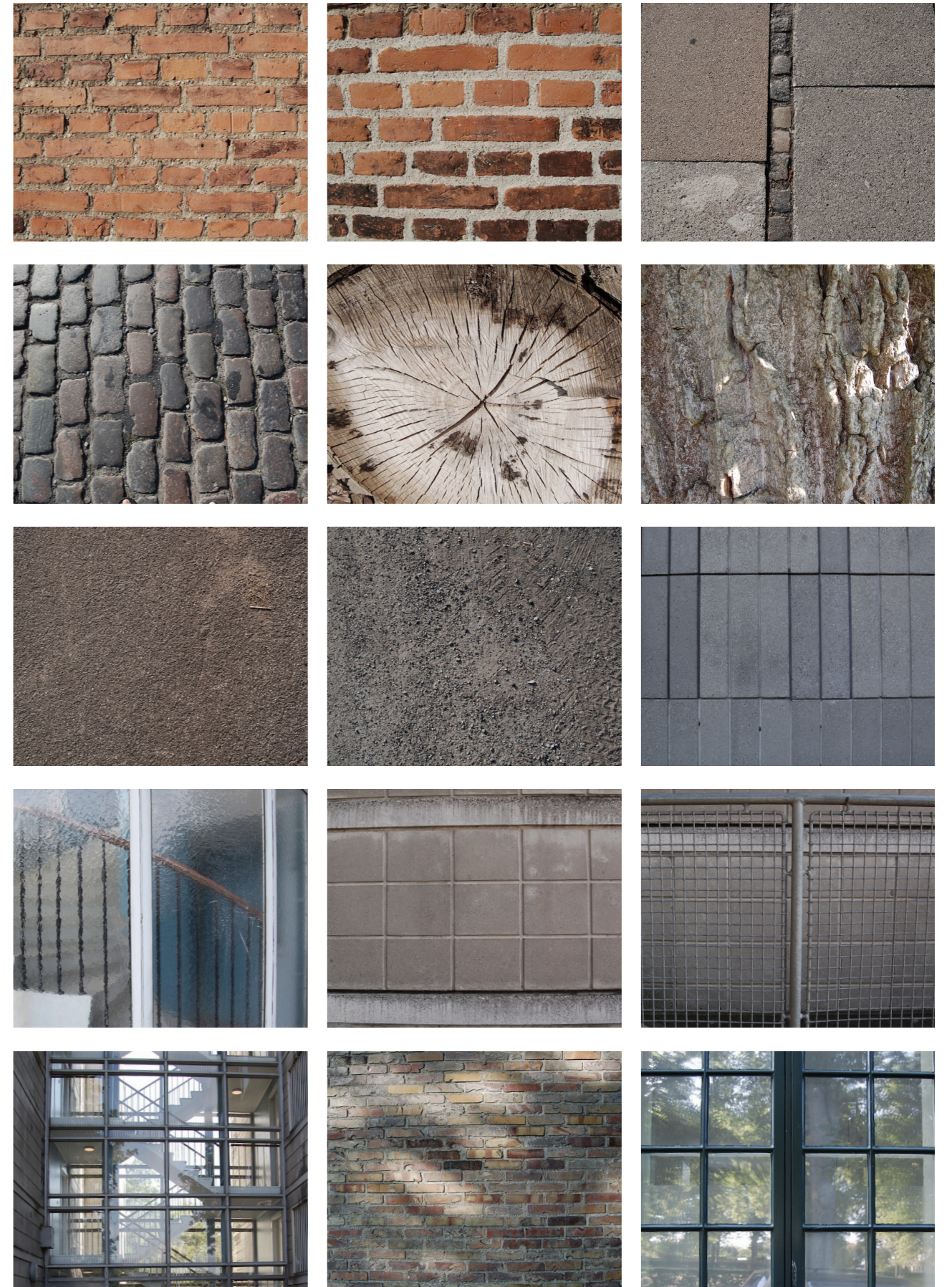
Kløvermarken - 40,8ha



Fælledparken - 62,4ha

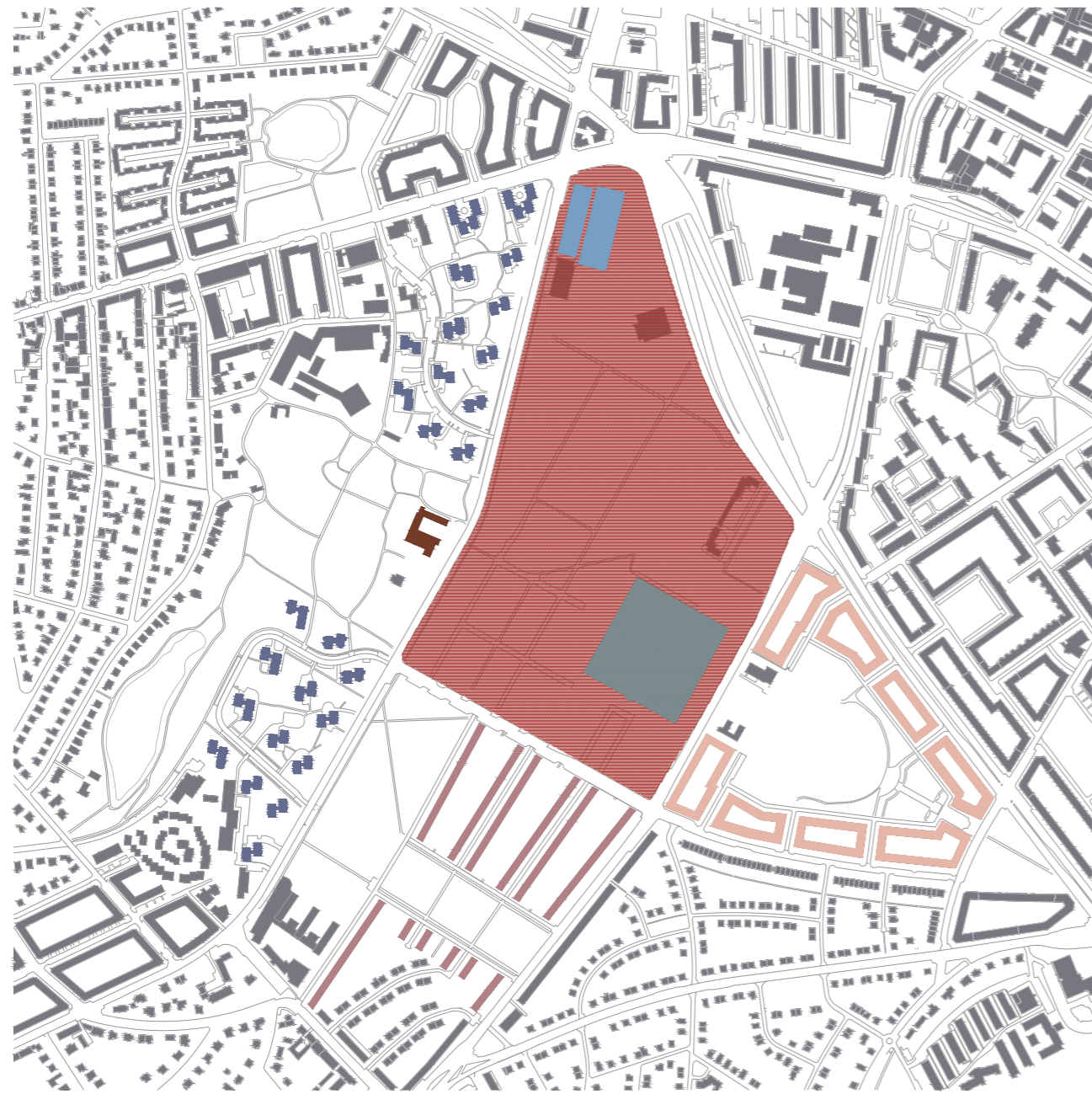


## 2.3. Materiality



Registration of materials on the site and in the surroundings.  
Source: Potoczniak, 2019

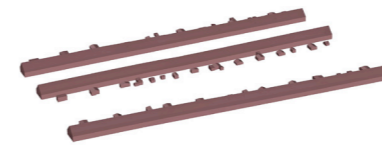
## 2.4. Built structure



The built structure around the site is characterized by a wide variety in terms of typology, function as well as the time of construction. Several buildings and developments have a particular architectural value and facilitate public functions, especially sports activities, contributing to the social life and identity of the neighbourhood.

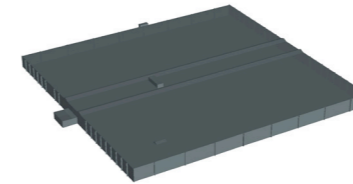
Regarding housing, the immediate surroundings offer both social as well as ownership-based options and vary between single detached homes, rowhouses, closed blocks, high rise blocks and others, which is reflected in the diversity among inhabitants.

Bakkehusene



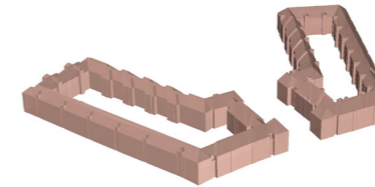
**Year of completion:**  
1923 (listed 1982)  
**Architect:**  
T. Henningsen, I. Bentsen  
**Function:**  
Residential  
**Typology:**  
Rowhouses

Grøndal Multicenter



**Year of completion:**  
1965  
**Architect:**  
Erik Møller  
**Function:**  
Sports facility  
**Typology:**  
Isolated rectangular block

EF Tønderhus



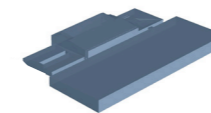
**Year of completion:**  
ca. 1928  
**Architect:**  
T. Hjejle og N. Rosenkjær  
**Function:**  
Residential (ownership)  
**Typology:**  
Closed city block

Restaurant Bellahøj



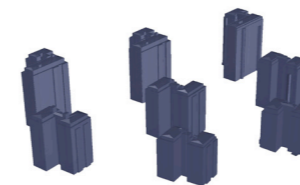
**Year of completion:**  
ca. 1800 (listed 1982)  
**Architect:**  
(unknown)  
**Function:**  
Restaurant  
**Typology:**  
Detached house

Bellahøjhallerne



**Year of completion:**  
1959z/2010  
**Architect:**  
(unknown), Arkitema  
**Function:**  
Sports facility  
**Typology:**  
Grouped blocks

Bellahøjhusene



**Year of completion:**  
1950s (listing plans)  
**Architect:**  
T. Nielsen, M. Irming  
**Function:**  
Residential (social)  
**Typology:**  
High-rise group blocks

Photos of the analysed buildings.  
Source: Copenhagen by Design, 2019; Rasmussen, 2017; EF Tønder, 2019; Arkark, 2019; Nash 2012

## 2.5. Use



- |  |   |
|--|---|
|  Site                       |  Retail and service            |
|  Camping/event area/vacancy |  Place for public arrangements |
|  Education and care         |  Playground                    |
|  Public park                |  Restaurant                    |
|  Water feature              |  Supermarket                   |
|  Institution                |  Sports facility               |
|  Main commercial artery     |  Residential                   |

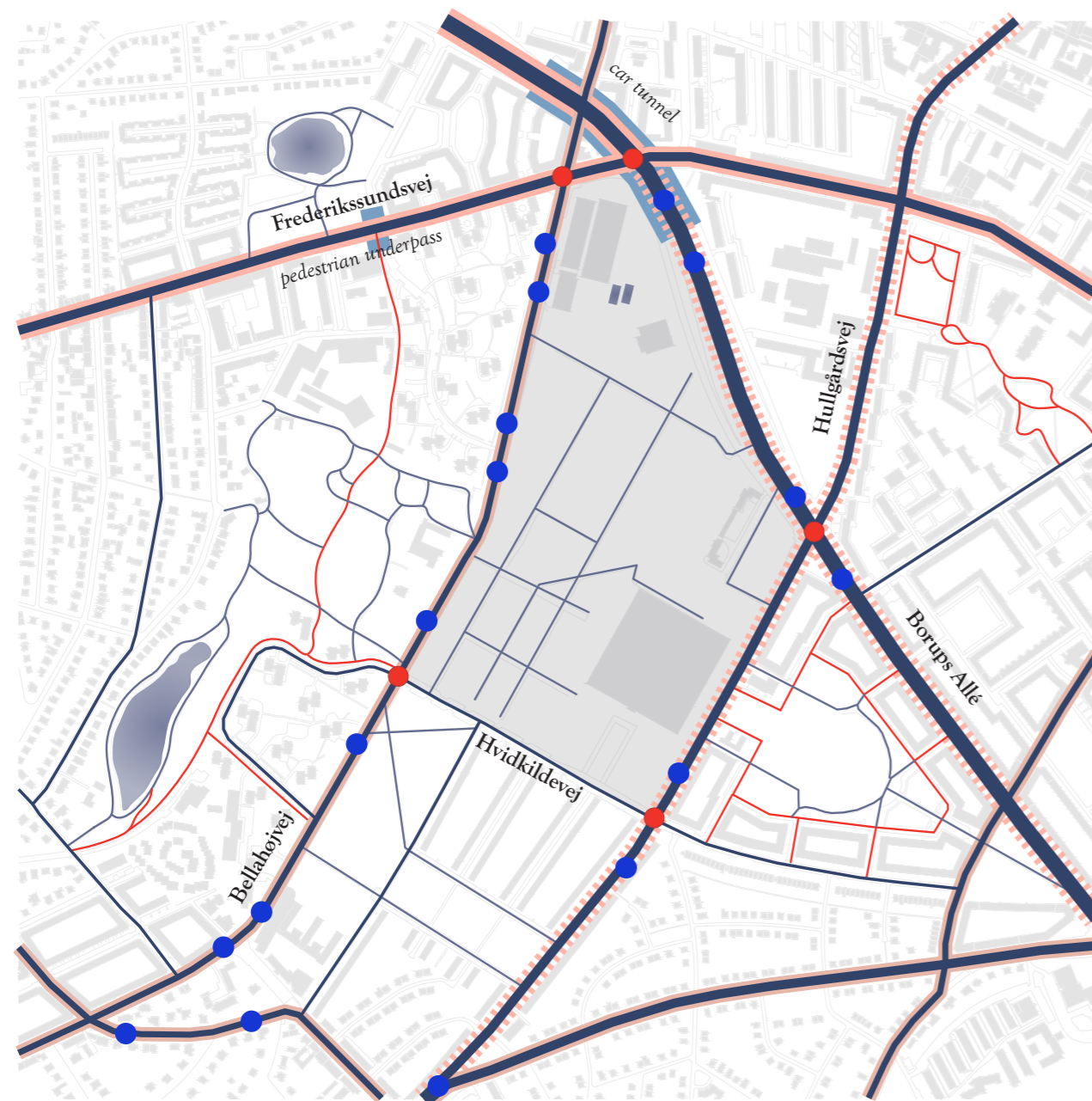
The immediate surroundings of the site are rich in sports facilities, both indoor and outdoor, as well as education and care institutions of various kinds, serving the many residents of the predominantly residential area. Such a large extent of public parks is a unique quality and adds a great value to the life in the neighbourhood.

Other than that, the commercial and service-oriented offer is fairly poor and monotonous, focused strictly on the main artery - Frederikssundsvej. The outdoor activities are season-based and mostly take place in the warmer months, except the multi-use football field in Genforeningspladsen. Bellahøjmarken, the project site, is a particular case, serving as a private campsite between June and August as well as a market ground in April and a circus square a few times a year. For the remaining months, it is open to the residents but fenced off, serving mostly dog-walkers.



Activities on site over the course of the year.  
Source: 2700-Netavisen, 2019; Bellahøjmarken, 2019; Potoczniak, 2019

## 2.6. Infrastructure & flow



The site is demarcated by wide roads from all sides - 4 lanes in the south-east (Hullgårdsvej), 2 lanes with perpendicular street parking in the south-west (Hvidkildevej), 2 lanes with parallel parking in the north-west (Bellahøjvej) as well as up to 9 lanes, including Frederikssundsvejs tunnel entrance, with parallel street parking on the north-east (Borups Allé). As visible in the diagram, Hvidkildevej is not as busy as the width would suggest, used mostly as an internal road for the inhabitants of Bakkehusene and a shortcut to Bellahøjhusene development. Borups Allé is a major artery in the northwestern part of inner Copenhagen and the first leg of the National Road 16.

Pedestrian crosswalks are located exclusively at the large street crossings which results in extremely limited permeability and clear barriers. The pedestrian's and cyclist's experience, particularly along car-dominated, passive-ground-floor Borups Allé and Hullgårdsvej is rather unfavourable. The cycling infrastructure itself is well-developed and includes existing as well as planned Supercykelstier (bicycle highway network of greater Copenhagen). The network of pedestrian paths with a recreational potential is quite rich but lacks connectivity and is predominantly unlit therefore unlikely to be preferred in the hours of darkness. The site has a fair amount of bus connections but does not directly connect to other means of public transport.

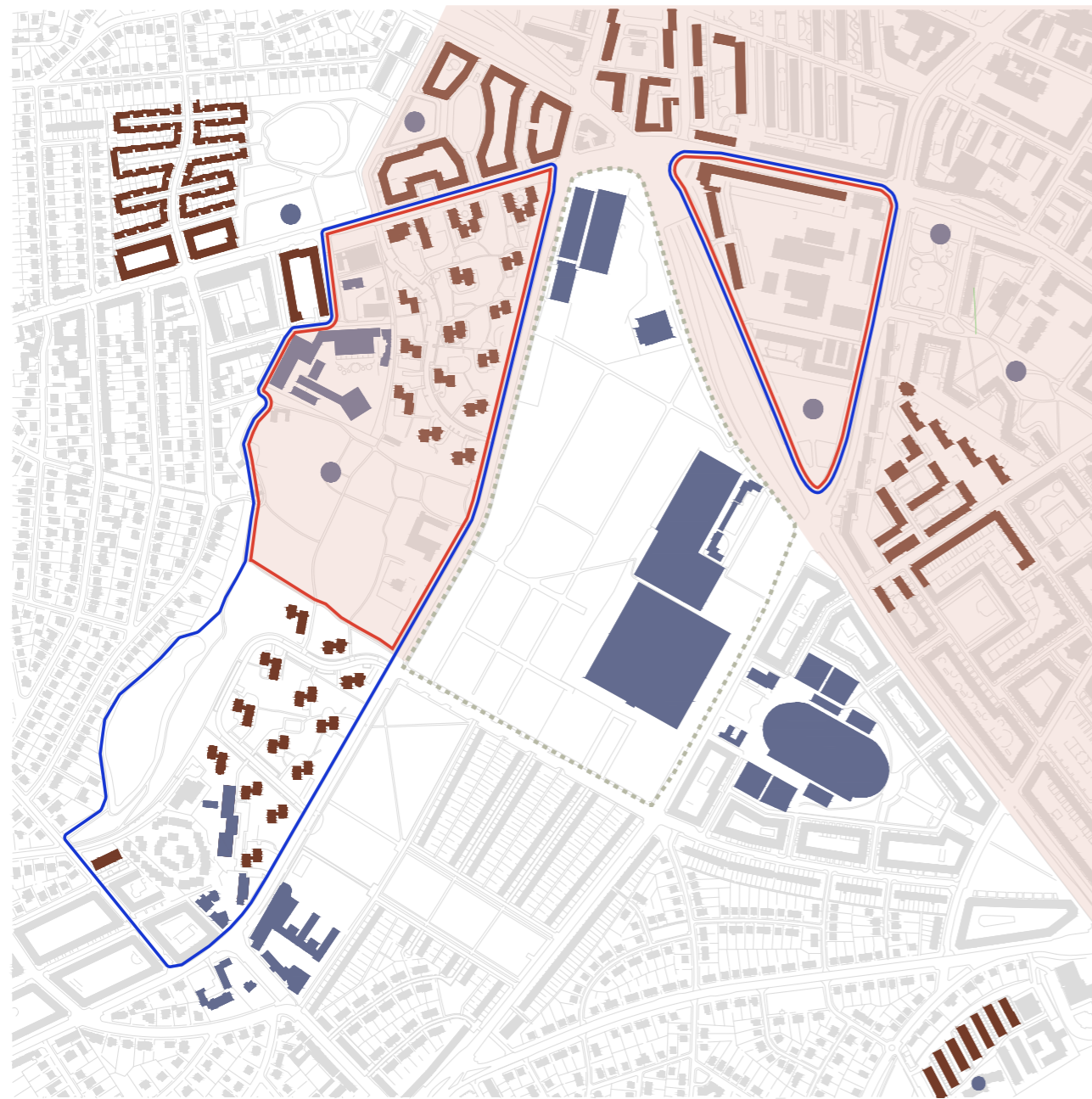


Frederikssundsvejstunnel in 1969.  
Source: Københavns Stadsarkiv, 1969



Pedestrian underpass on Frederikssundsvej.  
Source: Potoczniak, 2019

## 2.7. Socioeconomical context



- Site
- Facilities contributing to social life
- Social housing (source: Kbhkort, 2015)
- Areas qualified as socially disadvantaged (source: Kbhkort, 2015)
- Over 35% with basic education or less (source: Kbhkort, 2015)
- Over 21,2% unemployed (source: Kbhkort, 2015)

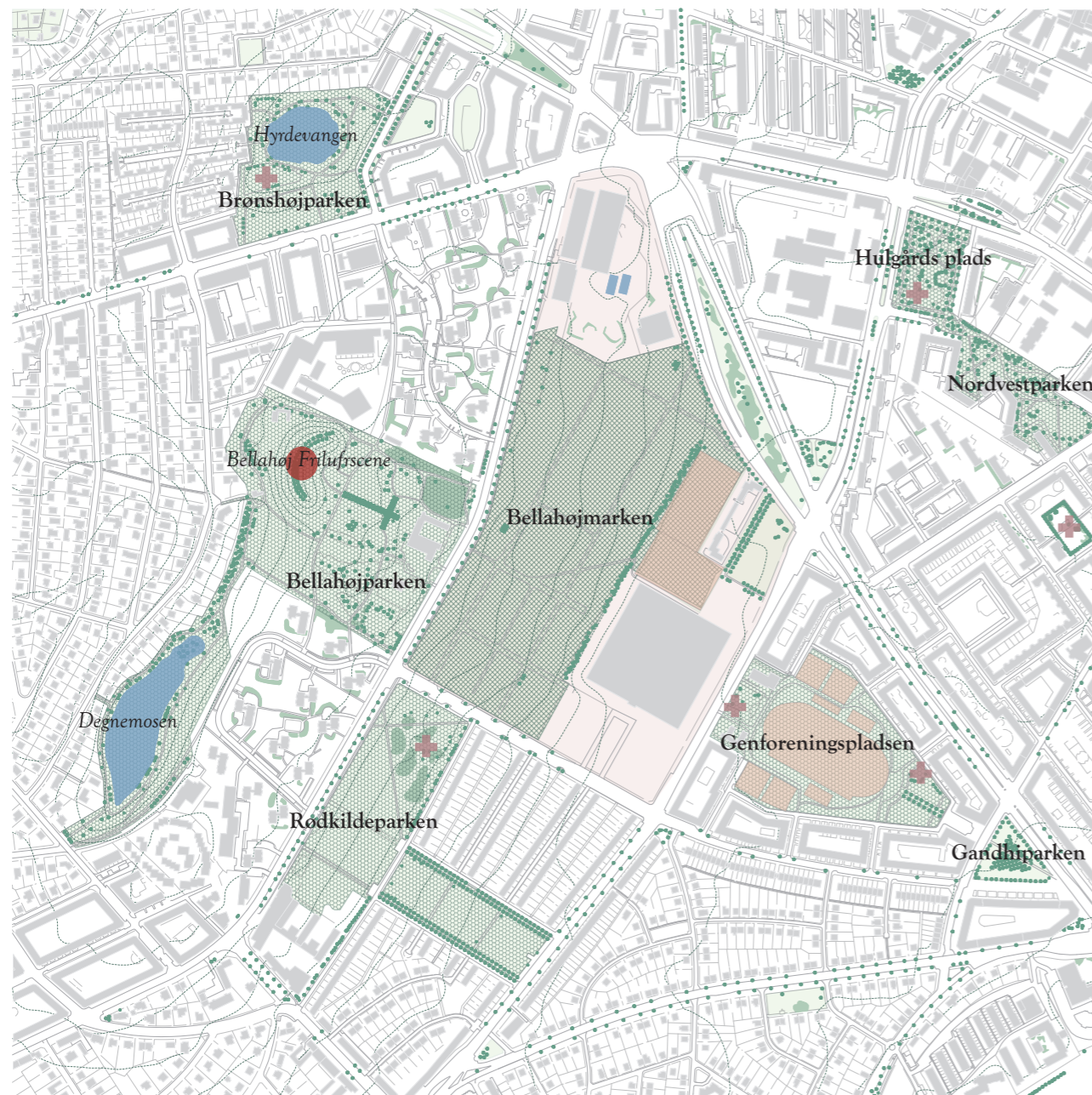
Several areas around the site are qualified as socially disadvantaged. Bellahøjhusene social housing complex has been particularly exposed to media attention due to more or less serious criminal activities and nearly landing on the governmental *ghetto list* which distinguishes certain residential areas as particularly problematic based on criteria such as: unemployment ratio, share of residents convicted of crime, share of residents who only have a basic education, average gross income. (Regeringen, 2019)











The areas that fulfil the criteria gain access to new tools designated to help them improve their standing, though both the criteria and particularly the rhetorics of the phrase have been heavily discussed. Currently, none of the areas around the site are listed as ghetto and social housing organisations are actively pursuing social mixing of inhabitants. There are also several social, citizen-driven initiatives running actively, especially among the youth, such as Projekt Bella or Sammen om Bellahøj.



Arrangements in Bellahøj.  
Source: Brønshøj-Husum Avis, 2018

## 2.8. Landscape



	Site		Playground
	Camping		Tree
	Sports facility		Bush/hedge
	Green area		Water feature
	Park		Highest point of Copenhagen

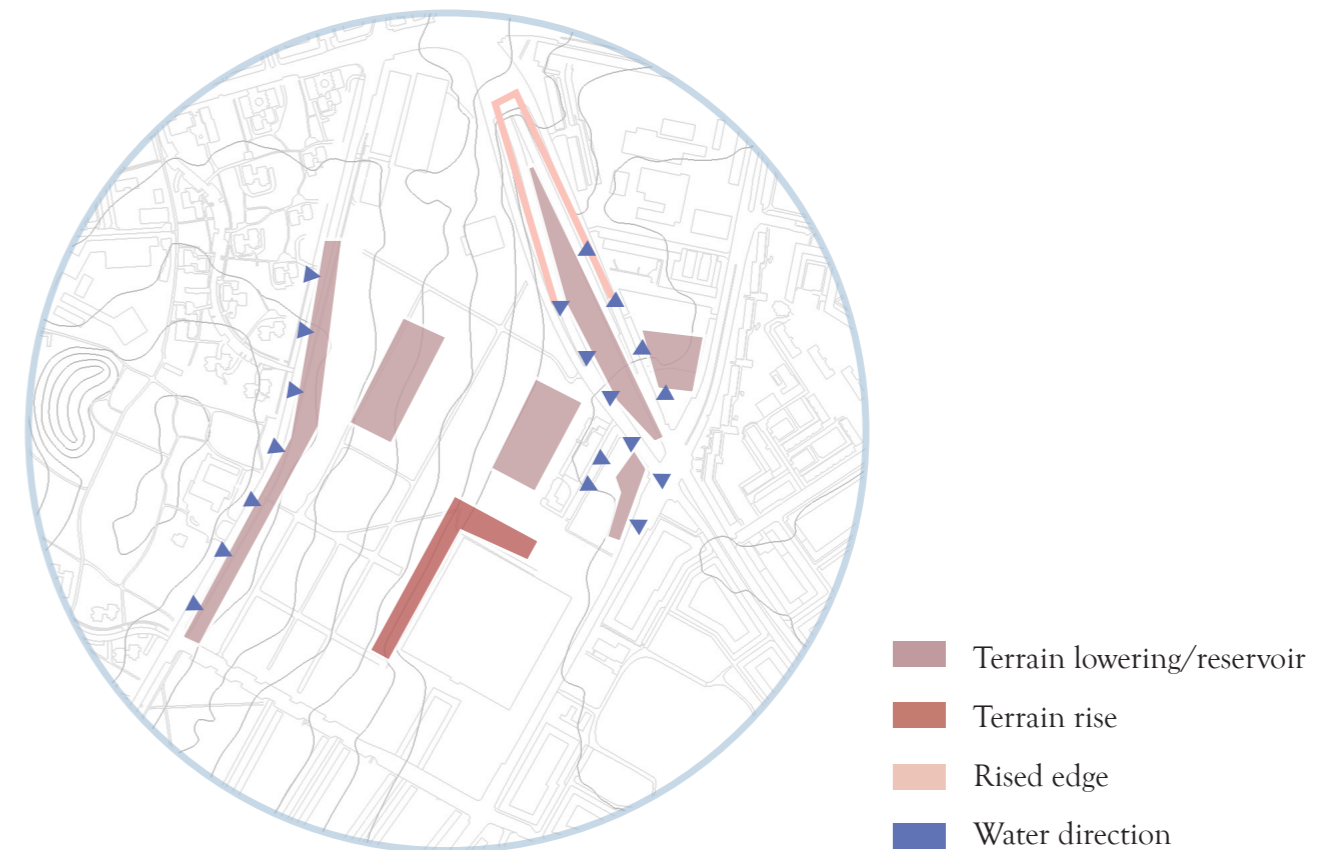
Bellahøj overlooks the predominantly flat inner city due to its topographic condition, including the highest point of Copenhagen - 41,5 above sea level measure on top of the Bellahøj Friluftscene (amphitheatre). In the many parks surrounding the site the vegetation is abundant, particularly old trees with a high preservation value as well as natural water features such as Degnemosen and Hyrdevangen. The green areas vary greatly in character and function as well as the time they were initiated:

- Brønshøjparken\* - 1930
- Bellahøjparken\* - 1950s
- Rødkildeparken\* - 1928
- Bellahøjmarken\* - (as a campsite - unknown)
- Genforeningspladsen\* - 1977
- Hulgårds plads - (-)
- Nordvestparken - 2010
- Gandhiparken - 1985

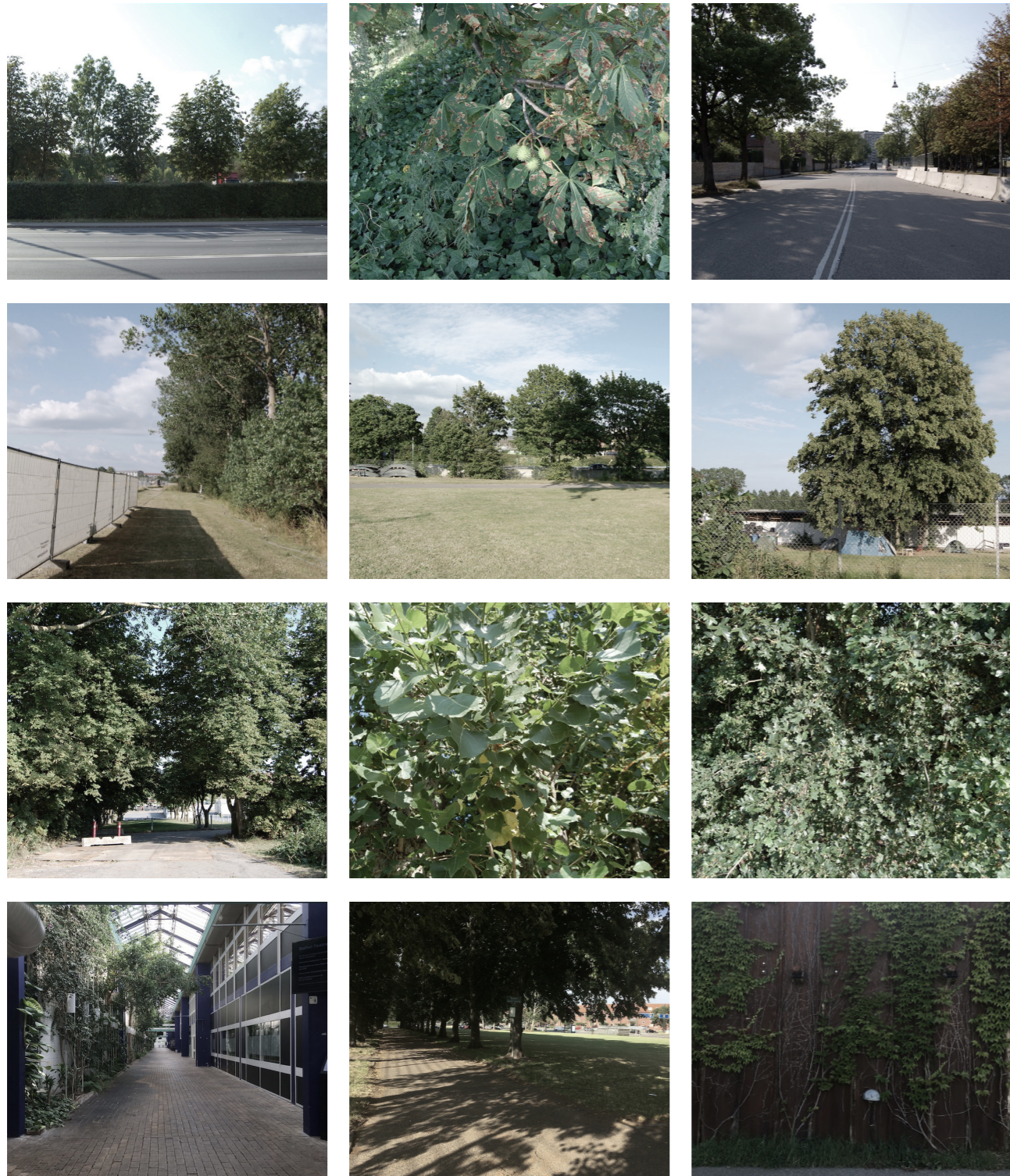
\*listed

### Stormwater management, municipal programme

As part of the extensive climate adaptation plan, Copenhagen Municipality developed prevention plans covering most of the areas of the city. Bellahøj is expected to be mostly exposed to excessive rainwater fall due to cloud bursts, therefore, terrain work methods have been proposed. None of the solutions have been implemented by now.



Stormwater management diagram.  
Source: Potoczniak, 2019 (based on Københavns Kommune, 2013)



Registration of vegetation on the site.  
Source: Potoczniak, 2019



Registration of vegetation in the surroundings.  
Source: Potoczniak, 2019



## 2.9. Camping



Camping in Denmark is only allowed in designated areas - overnight stay in a vehicle or a caravan as well as pitching a tent in parks and green areas outside campsites or free shelters is forbidden.

There are several campsites within Greater Copenhagen, however, Bellahøj Camping is by far the most centrally located-one with uniquely urban surroundings. The location of the site is an advantage although the site itself is an open field without any trees providing shelter or lighting at night. Moreover, the temporary sanitary facilities are of a low standard and obsolete construction trailers serve as rental cabins. As mentioned in the reviews on the following page, the guests appreciate the proximity to the city but are not content with the quality of the service as well as the general condition of the campsite. Bellahøj Campsite scored 2.5/5 average rating on Trip Advisor.



Registration of the campsite in July, 2019.  
Source: Potoczniak, 2019



### super cheap and nice!

"Stayed there for a few days. The place is very nice, though the toilets and kitchen are not the best. The staff was nice and gave a good service. Definitely recommend this place, if you are looking for something cheap and close to the centre."



### Budget option a basic service

"I stayed here just a single night and the place was fine to just put up a tent and crash. The toilets and showers were basic with free hot water and the wifi was free but only usable near the main building. The lack of decent lighting at night could be a problem for anyone without a decent torch. There's a bus stop just by the entrance so you can get into the main city center very easily. Basically, cheap and cheerful"



### Disgusting place, never more

"It was the worst camping in our life , if you have an opportunity find another one please do it , it was dangerous for health to go to the toilet and shower , when it's dark you can't see nothing because they decided to safe money to do 2-3 lights at list on the main road "use the light of the car" they told us . It's not a level of this country ..."

Reviews of Bellahøj Camping from Trip Advisor.  
Source: Trip Advisor, 2019

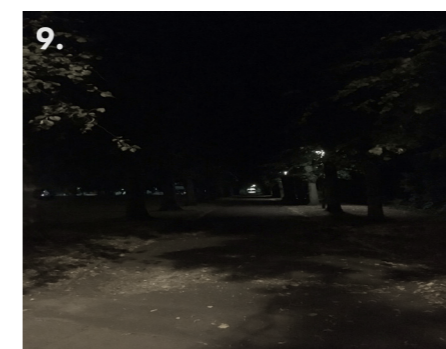
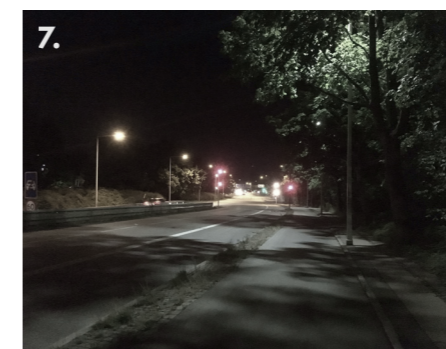
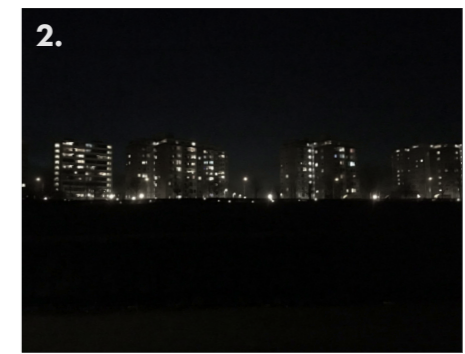
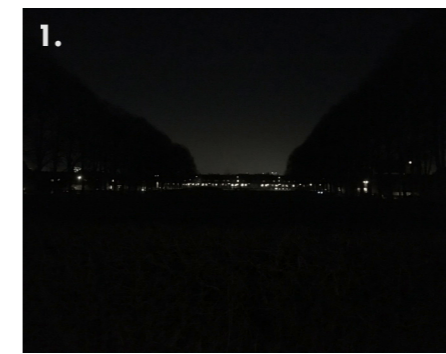
## 2.10. Situation in the hours of darkness



- Site/view
- Lighting\*

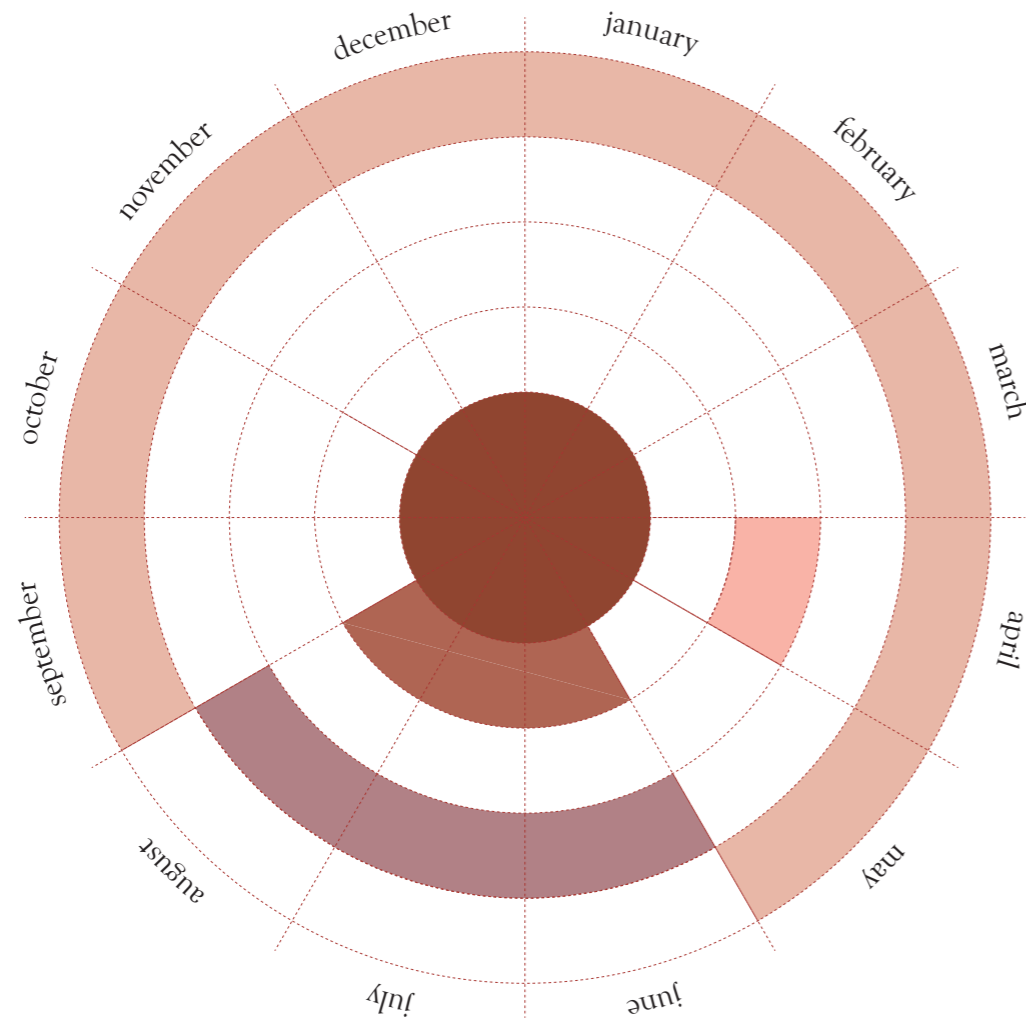
\*The white dots represent location of installation points incl. lighting, Outside of the project site it is not verified which exact ones mark lighting in use. (source: KK)

The project site lacks lighting of any sort therefore during the hours of darkness outside of the camping season it is perceived as a vast dark plot (similarly as Rødkildeparken). When the campsite is active, the only light sources are the sanitary facilities in the middle of the field. The parking lot in front of Grøndal Multicenter is also predominantly unlit except the main road leading to the entrance. Considering the wide roads surrounding the site, there is a lot of light spillage of street lighting which only enhances the contrast and therefore feeling of insecurity in the unlit areas. Lit glass staircases of Bellahøjhusene create a unique effect and give illumination to the surroundings though might obstruct the interior of the apartments and the darkness experience of the residents.



Registration of the situation at nighttime on the site and in the surroundings.  
Source: Potoczniak, 2019

## 2.11. Outdoor activities schedule



- Football
- Outdoor pool
- Hawkers' market
- Camping
- Closed camping - open field

Currently, the programming of the project site is focused on the warm months of the year. Particularly the camping ground, which constitutes a predominant part of the project site, turns into an empty, fenced off field used mostly for dog walking. Besides the camping, the site is also used for a large hawkers' market (Bellahøj Kræmmermarked) taking place on one of the weekends in the month of April. The surrounding parks serve a recreational purpose year-round though the lack of lighting drastically limits their use in the autumn and winter months.

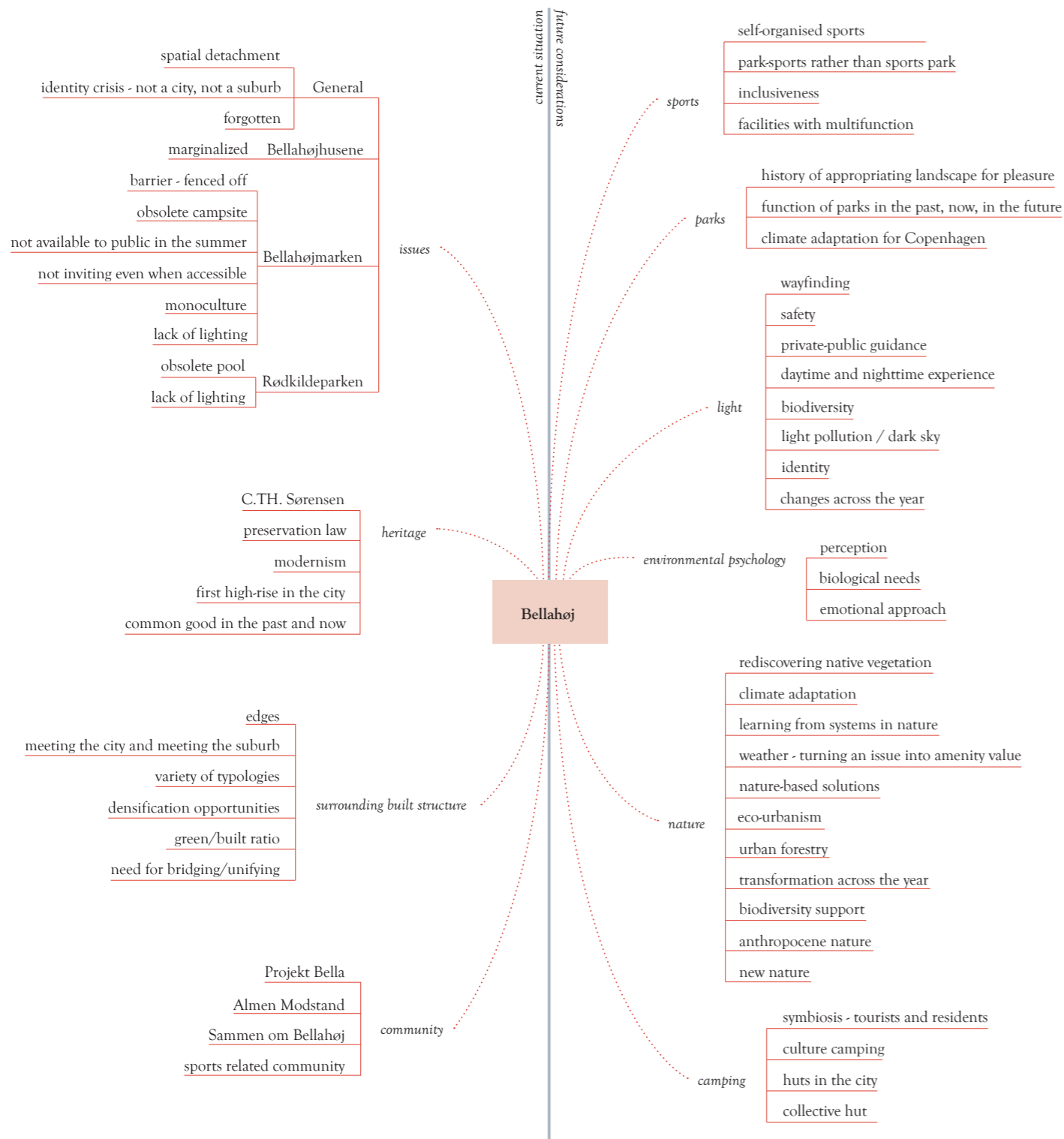
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## 3. Vision and strategy

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Briefly concluding from the preceding two chapters describing the site, Bellahøjmarken, despite its convenient location and attractive surroundings, gives an impression of a disconnected, uninviting leftover space. It has a seasonal character, serving as a private campsite for 3 months a year, which significantly limits public access, and remaining an undefined, fenced off field for the other 8 months. In the hours of darkness, the site is a vast, unlit plot, making it even less accessible in the months with limited hours of daylight. The whole Bellahøj area due to that feels fragmented with Bellahøjmarken being the missing piece of puzzle.

Dealing with 28ha of land in such an attractive location in a city like Copenhagen, which suffers from a notorious lack of affordable housing, provoked many questions in regards to the direction the project should take and the intended use of the site. The initial thoughts narrowed down into a mindmap:



Being concerned about particularly environmental and social sustainability, however, quite early in the process, the research leaned towards urban nature and its incomparable value. One of the most important figures for the theoretical background of the thesis project was Ian McHarg who in 1969 published a manifesto-book *Design with Nature*, which could not be more accurate, still 50 years later.

McHarg believed that “the way we occupy and modify the earth is best when it is planned and designed with careful regard to both the ecology and the character of the landscape. In this way, he argued that our cities, industries and farms could avoid major natural hazards and become truly regenerative. More deeply, McHarg believed that by living with rather than against the more powerful forces and flows of the landscape, communities would gain a stronger sense of place and identity.” (Fleming W. et.al., 2019)

After centuries of refusing to acknowledge that landscape cannot be exploited without consequence, we have now reached a point of awakening to extreme climate changes - rising sea levels, resource depletion, desertification, migration of ecosystems and extinction of species at an unprecedented rate. The environmental changes have an impact on everyone, everywhere along with the global accelerating consumption, booming urbanisation and rising inequity. (Fleming W. et. al, 2019)

Choosing to dedicate a significant part of the 28ha of land in Bellahøj to a park and strengthen the green network through integrating vegetation in the streets and courtyards is one humble step towards “designing with nature” for the mutual benefit. First and foremost, trees have been proven to be by far the most effective and economically friendly mean to tackle the climate crisis as they absorb and store the carbon dioxide emissions that are driving global heating (Carrington, 2019). Besides that, trees, as well as other types of vegetation, not only play an important role in increasing biodiversity, managing rainwater, clearing contaminated soil, preventing from Urban Heat Island effect, minimising airborne pollution or reducing noise but also improve microclimate by providing shelter, breaking the wind and dampening turbulence. (SLA, 2015)

Regarding human wellbeing and social benefits of urban nature, as cities become increasingly dense, contact with nature fundamentally improves the quality of life by increasing the likelihood of maintaining regular physical activity in the outdoors, providing opportunities for social interaction, helping to address mental health issues and many others. (EUROPARC, 2010)

The park of Bellahøjmarken, to amplify the wellbeing and social benefits, is also intended to incorporate sports and recreational functions, strengthening the existing identity of the site. Today the variety of both indoor and outdoor facilities have proven to be key to activating the neighbourhood, yet none of them are publicly available and they are mostly limited to housing disciplines that induce a sense of exclusivity, which suggests room for improvement. The aim is to offer all the new activities to the general public and democratise the sports by introducing more inclusive disciplines and placing the different facilities near each other for social exchange.

One of the greatest assets of the neighbourhood nowadays is a wide variety of residents, believed to be a result of the different typologies and a reasonable ratio of owned to rented apartments. To preserve

this value as well as maintain spatial continuity with respect for the surroundings, the new built structure is intended to mimic the qualities of the existing buildings.

The strongly season-based character of the site also gives a great opportunity to use Bellahøjmarken as a case to explore further the topic of seasonality, particularly relevant in northern climate, where life quality in cities is particularly prone to being affected. The natural aspects having an impact on the perception of outdoor in the course of a calendar year are a combination of weather conditions, seasons as well as ratio of day-/night-time. (Pressman, 1995 & Linnebjerg, 2016)

The sociological study conducted in 2013 for the Lighting Masterplan for Copenhagen, lists several findings in regards to the challenged use of the urban outdoor affecting residents:

- Users adjust their behaviours to the changing seasons, but would appreciate better opportunities to exercise in the winter.
- Adjusted behaviour includes, for example, changing transportation habits according to the season. Many interviewees give up cycling in the winter due to darkness.
- Runners would appreciate better lighting of paths in parks and nature areas.
- Families with children experience insecurity at playgrounds in the hours of darkness.
- Users wish they could use sports facilities across the year, also in the hours of darkness
- Streets and squares are popular hot spots during the summer, but users express that they tend to use them less / or not at all in winter.

(Urgent Agency, 2013 & Linnebjerg, 2016)

In addition to the points listed above, it is inevitable to mention how the hours of darkness affect safety and the use of public space for a particular group of residents - women. It is sadly an amply documented fact that women face greater amounts of street harassment and violence than men and the relationship between poor street lighting and gender-based violence is global and widespread. (Hazelton, 2017)

As much as weather conditions and seasons can only be accepted and facilitated, how the ratio of hours of ambient darkness and hours of ambient light affects the experience of the city can be actively influenced. The first street lights appeared in the middle of the 16th century. In the first half of the 19th century the large European cities such as London and Paris began to use gas lighting, eventually replaced by oil lamps. Electric light first became common in the first two decades of the 20th century, with Edison's invention of the incandescent lamp. The incandescent lamp also provided significantly more brightness than gas or oil. The light revolution turned upside down the public space and forms of socialising. (Keucheyan, 2019)

Light, though, is not a risk-free entertainment feature and a universal cure, that can be used without limits and careful consideration. Abundance of uncontrolled artificial glow can, for example, confuse migratory birds. It causes them to leave the wintering location prematurely or to fly around until they collapse of exhaustion. Natural light also regulates the behaviour of many types of insects, which are attracted to or emit light. Light intensity and duration indicate the seasons for vegetation species and extended brightness can delay their biochemical preparation for winter. (Keucheyan, 2019)

Light pollution harms not only the environment, fauna and flora but also people, delaying the release of the "sleep hormone" melatonin, which can lead to sleep deprivation. The human body has several biological clocks, with cycles following the alternation between day and night, which in turn form the basis of monthly cycles and seasonal cycles - the circadian rhythms. The disruption of these rhythms affects several parts of our metabolism: blood pressure, stress, fatigue, appetite, irritability, or attention. (Keucheyan, 2019)

Only a considerate and humble approach to lighting design can ensure balance between facilitating human use, accommodating circadian rhythm, minimising conflicts with biodiversity, respecting qualities of different seasons and preserving darkness of the sky.

The common understanding of day and night and what activities are dedicated to them seems unsuitable in a northern context where in the summer many go to sleep when it is still bright outside while in the winter one might get up before the sunrise and get out of work when the sun has already set again. The further up geographical north, the more irrelevant the concept seems and some take as drastic measures as the Norwegian island of Sommarøy. Sommarøy from November to January is wrapped by darkness of the sky, yet from May to the end of August the sun does not set at all. Even though the widespread news from earlier this year, claiming that the residents of the island opted for becoming a time-free zone turned out to be a publicity stunt, it sheds light on a relevant matter. (Henley, 2019) Additionally, taking into account rapid climatic changes worldwide, one may speculate that the patterns of using urban outdoor will shift due to rising temperature during the daytime in the summer months. Therefore, throughout the project, the 24-hour cycle will be divided into the *hours of (ambient) brightness* and the *hours of (ambient) darkness* referring to the natural condition of the sky.

The project's research question stemming from the above-mentioned considerations is:  
How can Bellahøjmarken unify the neighbourhood and become its year-round asset?

In order to summarise the motivation, tools and the key aim of the project, an alternated version of the *what, why, how* tool has been used:

Why:

- values: location, heritage, green capital, variety of characters
- challenges: leftover space, untapped potential, disconnection

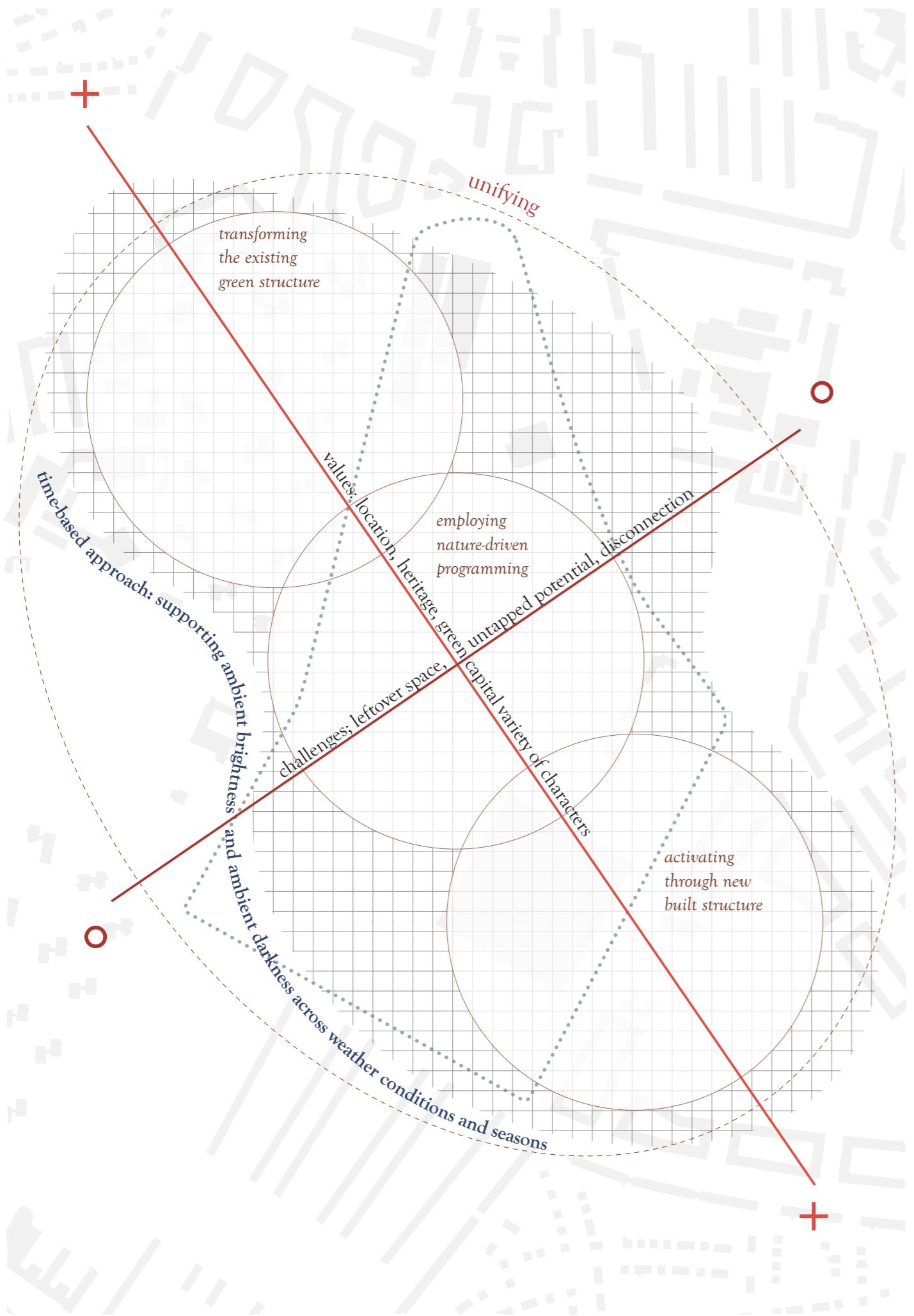
How:

- transforming the existing green structure
- employing nature-driven programming
- activating through new built structure

Using a time-based approach - supporting ambient brightness and ambient darkness across weather conditions and seasons.

What:

- unifying



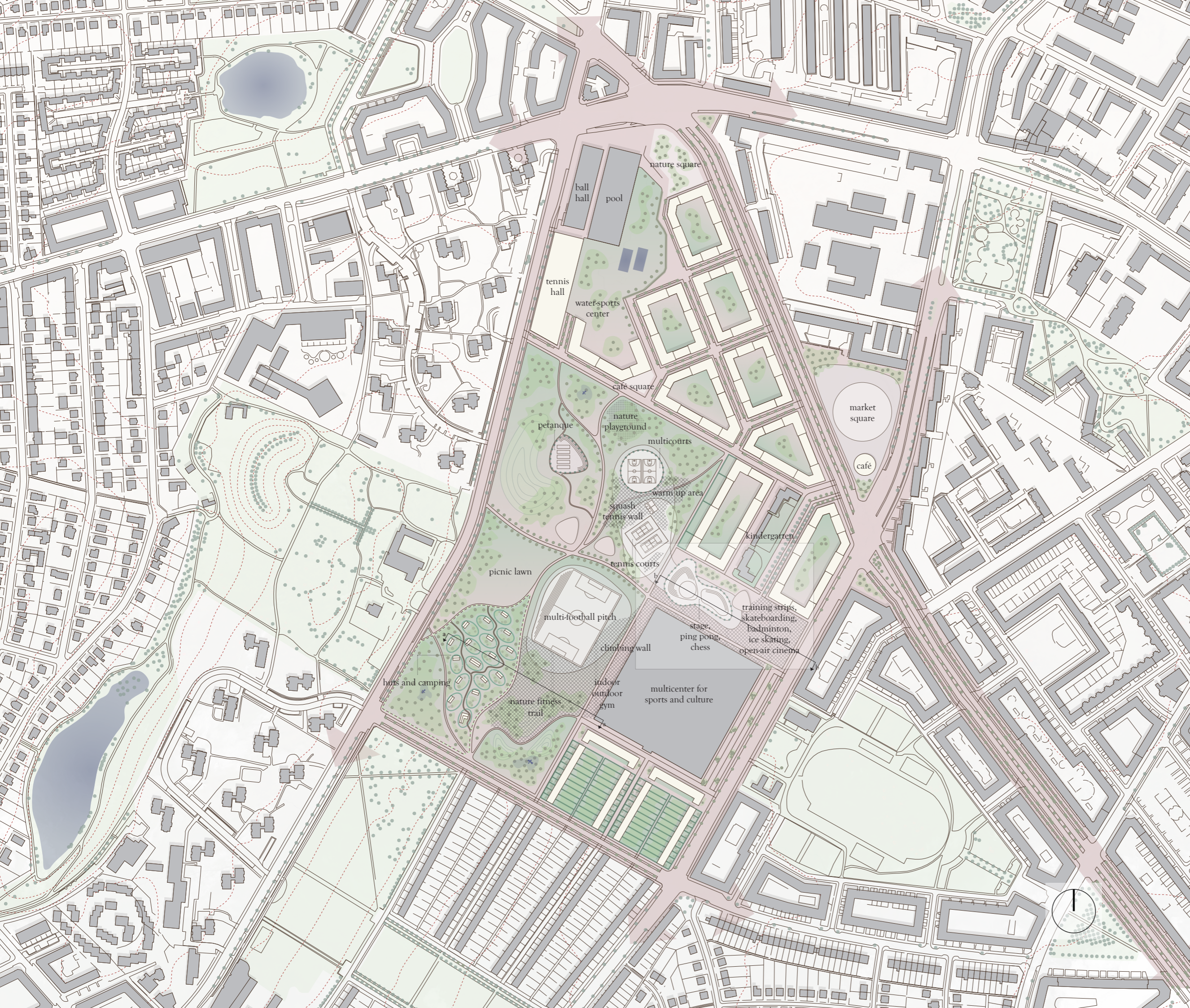
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## 4. Proposal

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# Situation plan 1:4000

- Project scope
- Existing building
- New building
- Existing tree
- New tree
- Existing park
- New green area
- Informal sports
- Pavilion
- Playground
- New vegetation
- New terrain
- Water feature
- Stormwater management
- Hedge
- Optional camping fence
- ✕ Artwork



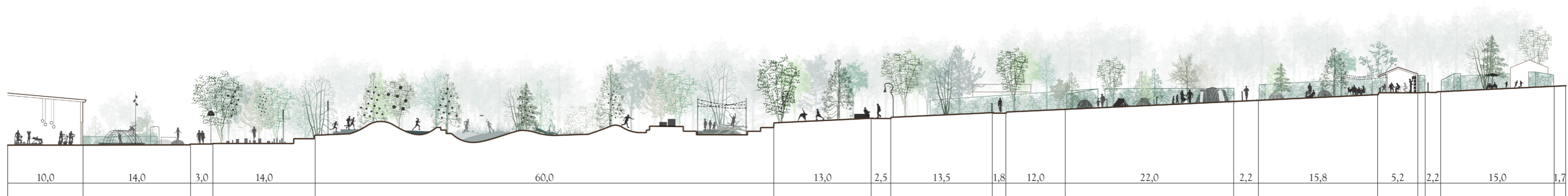
The design proposal for the site reflects the vision of unifying through the use of urban nature and unfolds further through the time-based approach, exploring how the new neighbourhood could be utilised to its fullest all year round. The site has been primarily dedicated to establishing a new public park incorporating a number of sports and recreational activities, enhancing the function of the existing hub - Grøndal Multicenter. The newly introduced built structure respects the existing context and aims for a similar blend of a wide range of residents.

## Section a:a, 1:500

Grøndal indoor/outdoor gym

nature fitness trail

huts and camping



## Section b:b, 1:500

Hulgårdsvej

parking

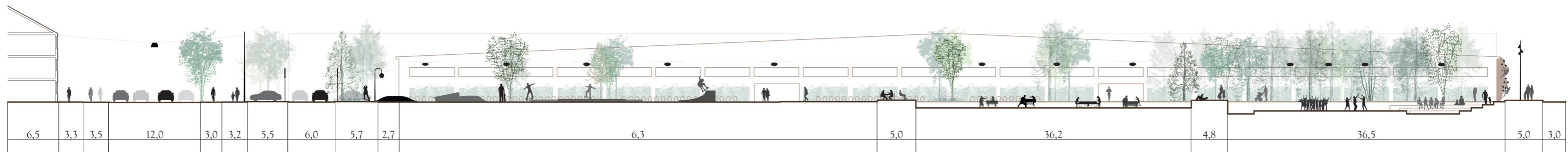
skateboarding zone

chess tables

ping pong / rainwater basin

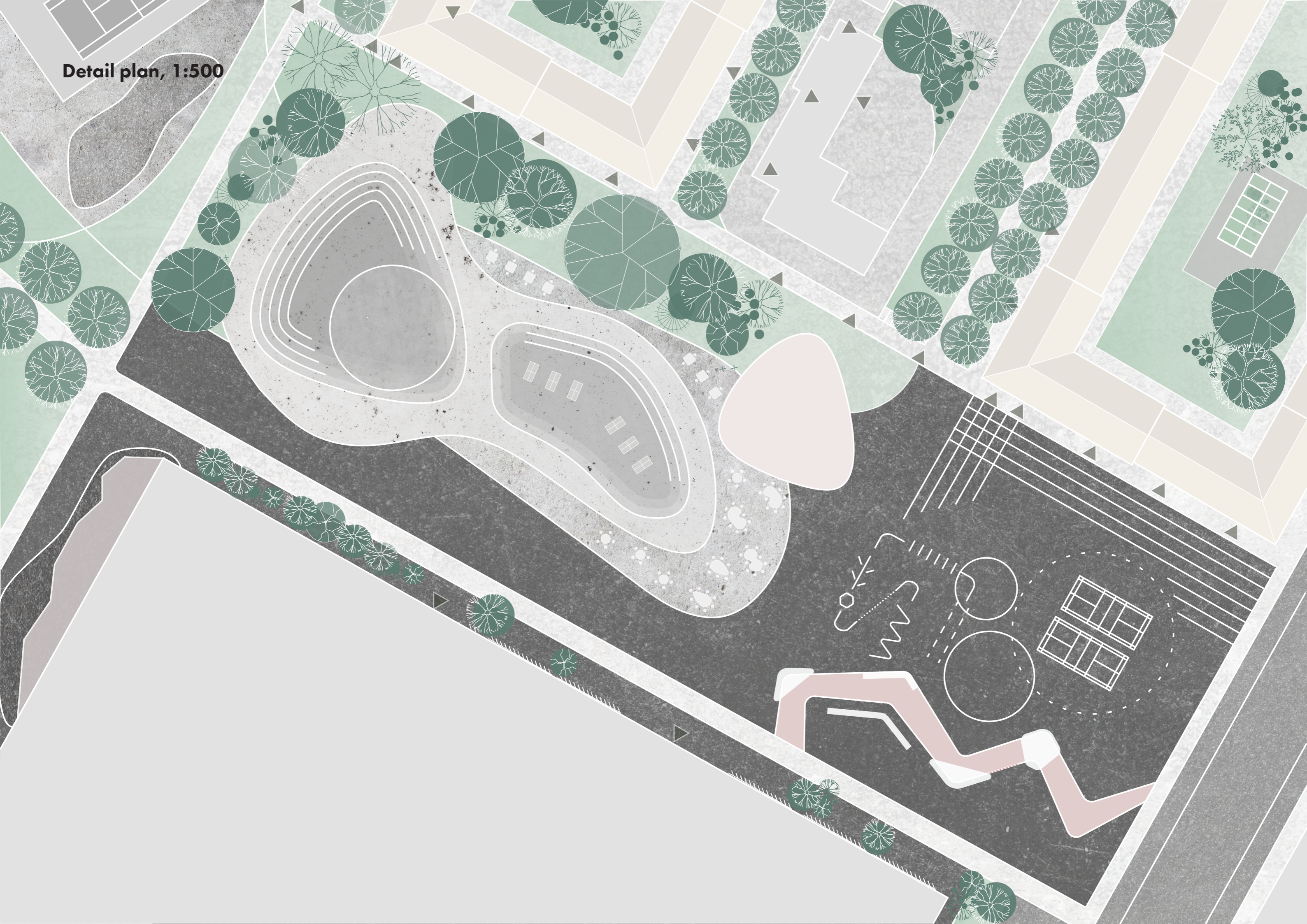
stage / rainwater basin

climbing wall

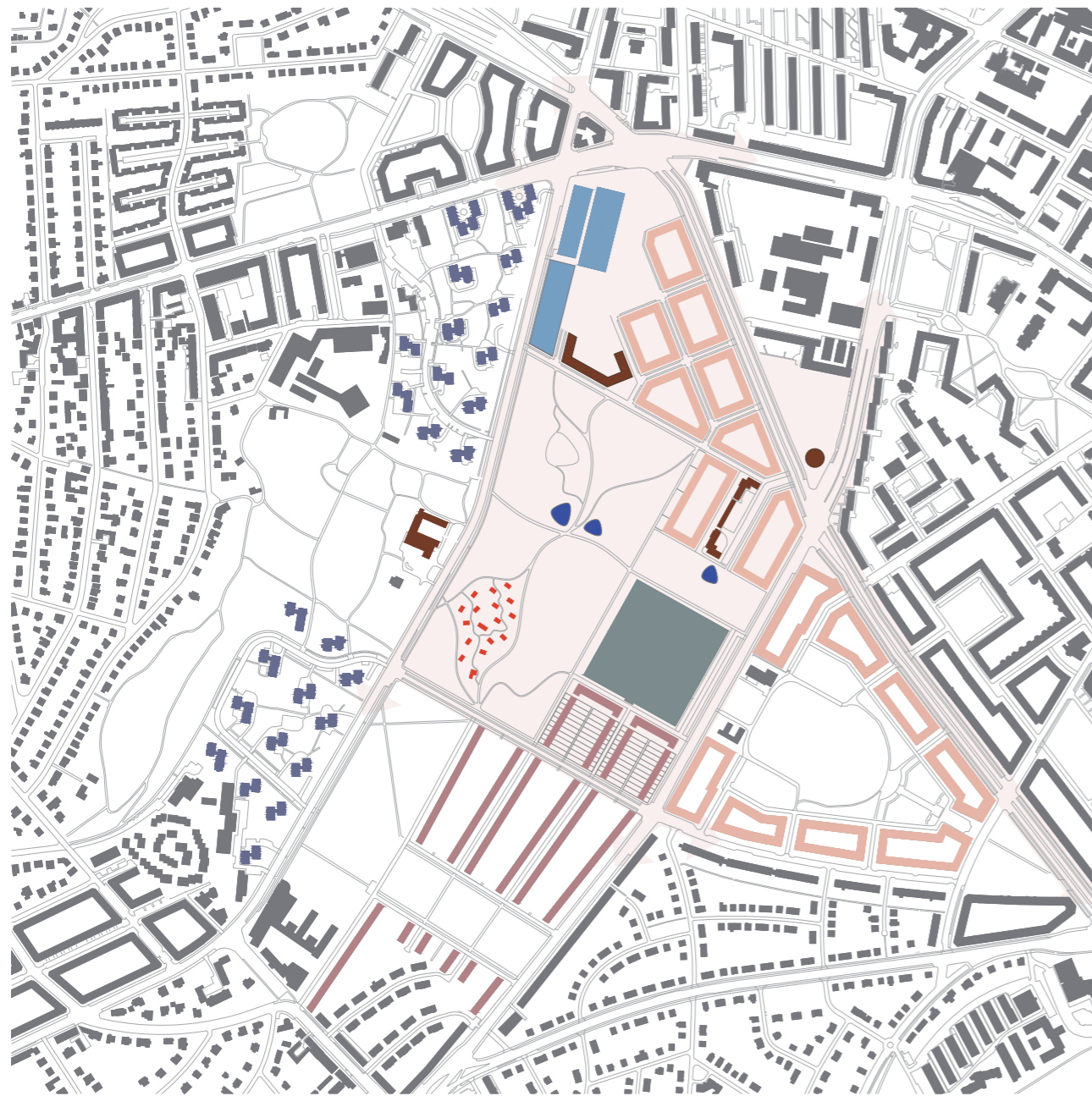




Detail plan, 1:500



## Built structure



- |  |  |
|--|--|
| <span style="display:inline-block; width:15px; height:15px; background-color:#c8a28c; border:1px solid #000;"></span> Rowhouse                   | <span style="display:inline-block; width:15px; height:15px; background-color:#4a86e8; border:1px solid #000;"></span> Grouped blocks         |
| <span style="display:inline-block; width:15px; height:15px; background-color:#408040; border:1px solid #000;"></span> Isolated rectangular block | <span style="display:inline-block; width:15px; height:15px; background-color:#2e4060; border:1px solid #000;"></span> High-rise group blocks |
| <span style="display:inline-block; width:15px; height:15px; background-color:#e69d00; border:1px solid #000;"></span> Closed city block          | <span style="display:inline-block; width:15px; height:15px; background-color:#e60000; border:1px solid #000;"></span> Camping hut            |
| <span style="display:inline-block; width:15px; height:15px; background-color:#654321; border:1px solid #000;"></span> Detached building          | <span style="display:inline-block; width:15px; height:15px; background-color:#007bff; border:1px solid #000;"></span> Open pavilion          |

The new built structure aims for spatial coherence and a similar mix of residents to the current situation, therefore, the typologies mimic the existing rowhouses (2 storeys) as well as the closed city block (4/5 storeys). Besides, there are 2 new detached buildings introduced - a public building facing the park and the outdoor swimming pool and a café/restaurant at the market square. There are also 3 open pavilions in the park acting as a shelter/event space as well as a group of year-round convertible camping huts.

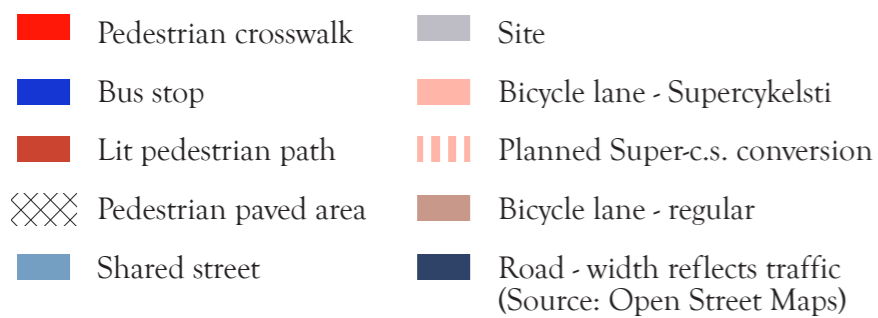
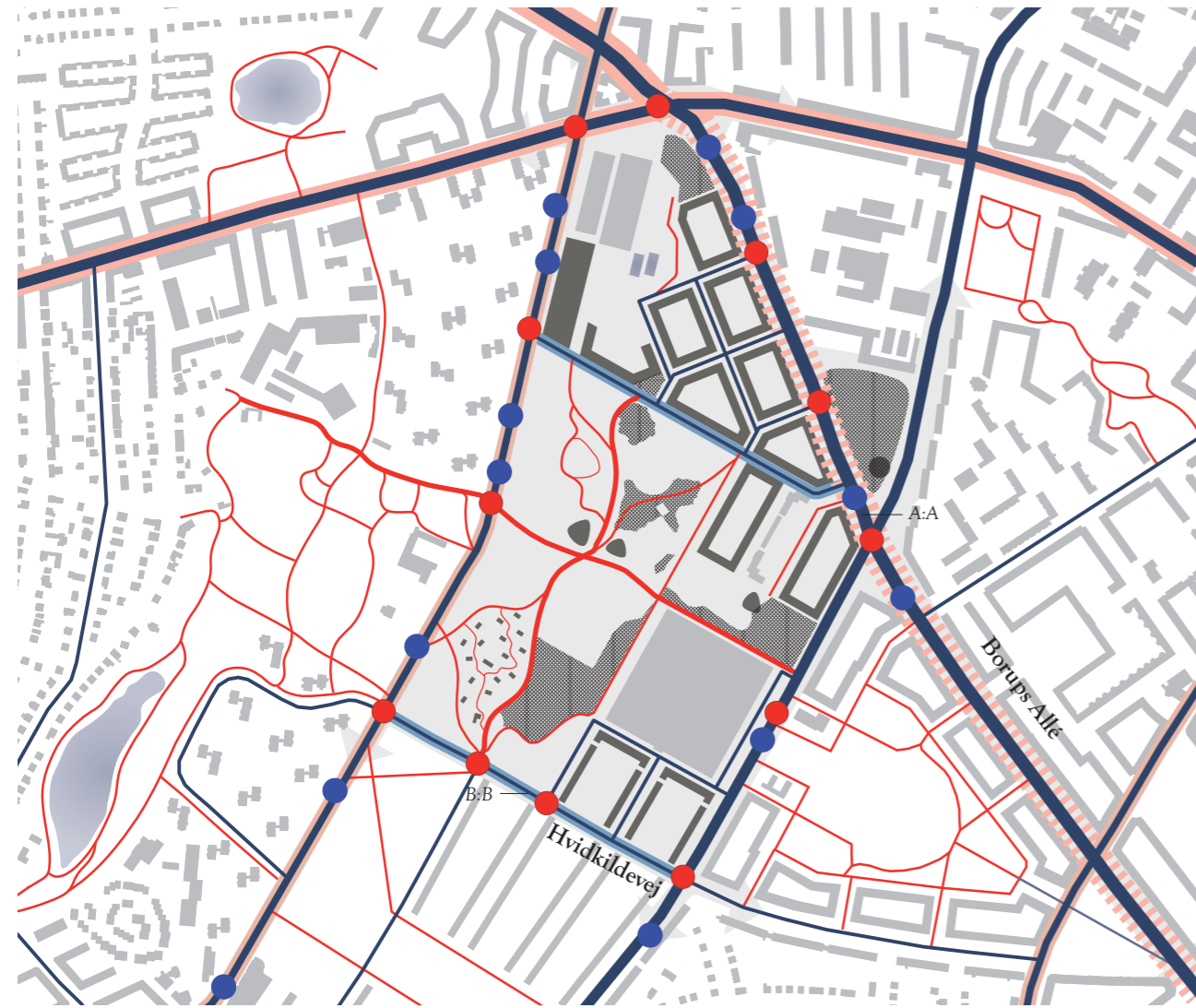
## Use



- |  |   |
|--|---|
| <span style="display:inline-block; width:15px; height:15px; background-color:#007bff; border:1px solid #000;"></span> Pavilion               | <span style="display:inline-block; width:15px; height:15px; background-color:#654321; border:1px solid #000;"></span> Retail and service            |
| <span style="display:inline-block; width:15px; height:15px; background-color:#e60000; border:1px solid #000;"></span> Camping huts           | <span style="display:inline-block; width:15px; height:15px; background-color:#c8a28c; border:1px solid #000;"></span> Place for public arrangements |
| <span style="display:inline-block; width:15px; height:15px; background-color:#800000; border:1px solid #000;"></span> Education and care     | <span style="display:inline-block; width:15px; height:15px; background-color:#2e4060; border:1px solid #000;"></span> Playground                    |
| <span style="display:inline-block; width:15px; height:15px; background-color:#408040; border:1px solid #000;"></span> Public park            | <span style="display:inline-block; width:15px; height:15px; background-color:#e69d00; border:1px solid #000;"></span> Restaurant                    |
| <span style="display:inline-block; width:15px; height:15px; background-color:#4a86e8; border:1px solid #000;"></span> Water feature          | <span style="display:inline-block; width:15px; height:15px; background-color:#654321; border:1px solid #000;"></span> Supermarket                   |
| <span style="display:inline-block; width:15px; height:15px; background-color:#654321; border:1px solid #000;"></span> Institution            | <span style="display:inline-block; width:15px; height:15px; background-color:#1a522a; border:1px solid #000;"></span> Sports facility               |
| <span style="display:inline-block; width:15px; height:15px; background-color:#f08080; border:1px solid #000;"></span> Main commercial artery | <span style="display:inline-block; width:15px; height:15px; background-color:#607d8b; border:1px solid #000;"></span> Residential                   |

To activate the area, there is a number of new features introduced in regards to use such as active groundfloors in both residential and public buildings, sports facilities, pavilions and camping huts.

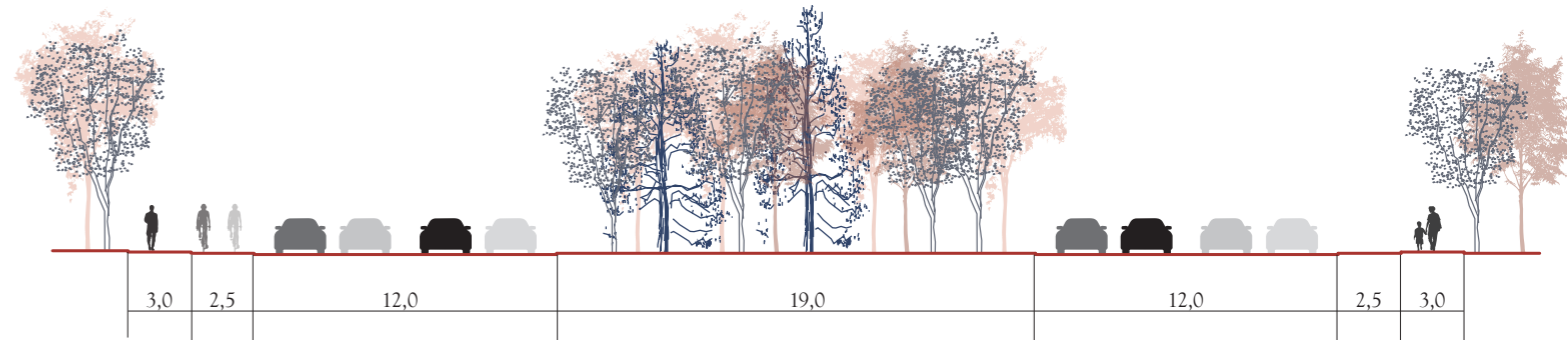
## Infrastructure & flow



The physical barrier caused by the extensive motorized transport infrastructure demarcating the site is optimized by limiting the number of lanes on the stretch of Borups Allé directly neighbouring the site, introducing pedestrian-priority streets (Hvidkildevej and the new street situated at the north edge of the park) as well as establishing a number of new pedestrian crosswalks. Besides, all the new or remodelled streets have been equipped with a wide sidewalk on both sides and in many cases parallel street parking, permeated by green islands, in order to enhance the safety of the pedestrians. The network of shared pedestrian/cycling paths has been established in the new park, connecting the site to the neighbouring green areas and enabling coherent non-motorized mobility.

## Street sections 1:300

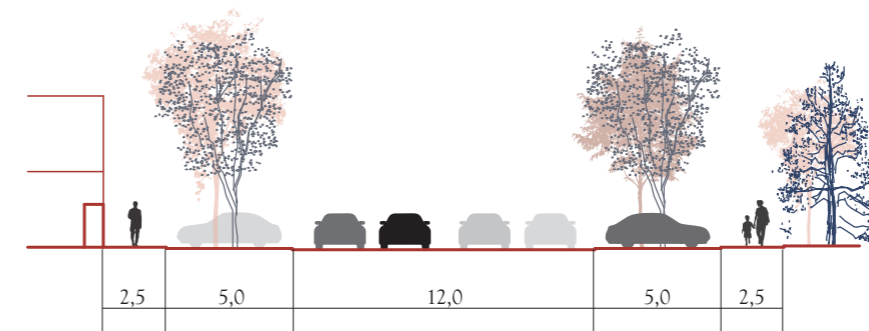
A:A: Borups Allé - current status



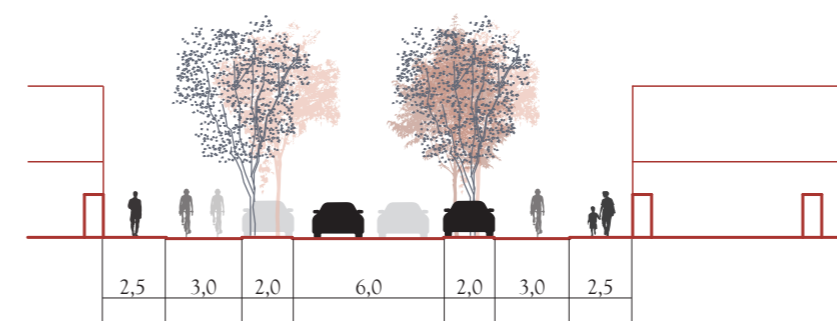
A:A: Borups Allé - future



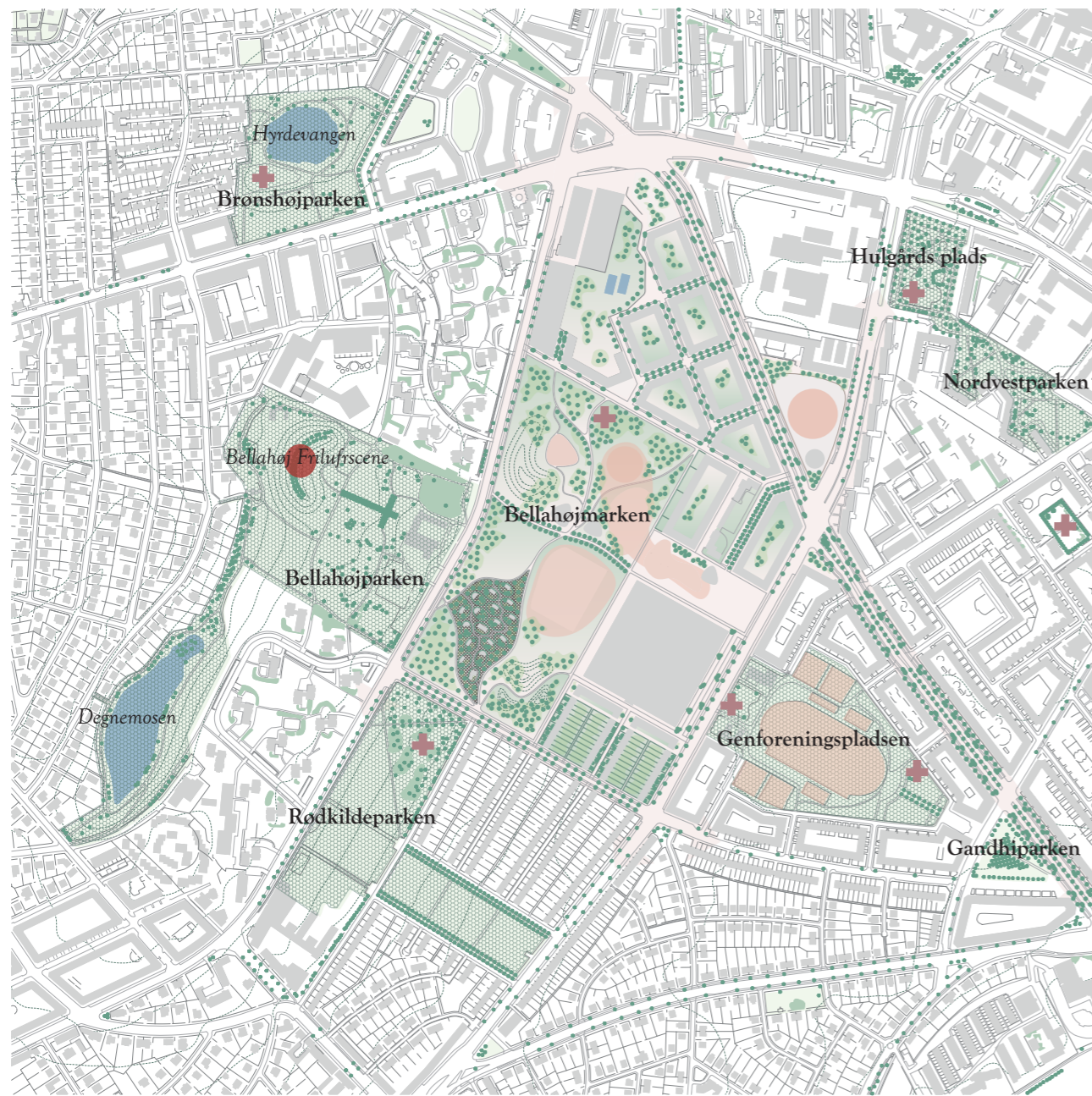
B:B: Hvidkildevej - current status



B:B: Hvidkildevej - future

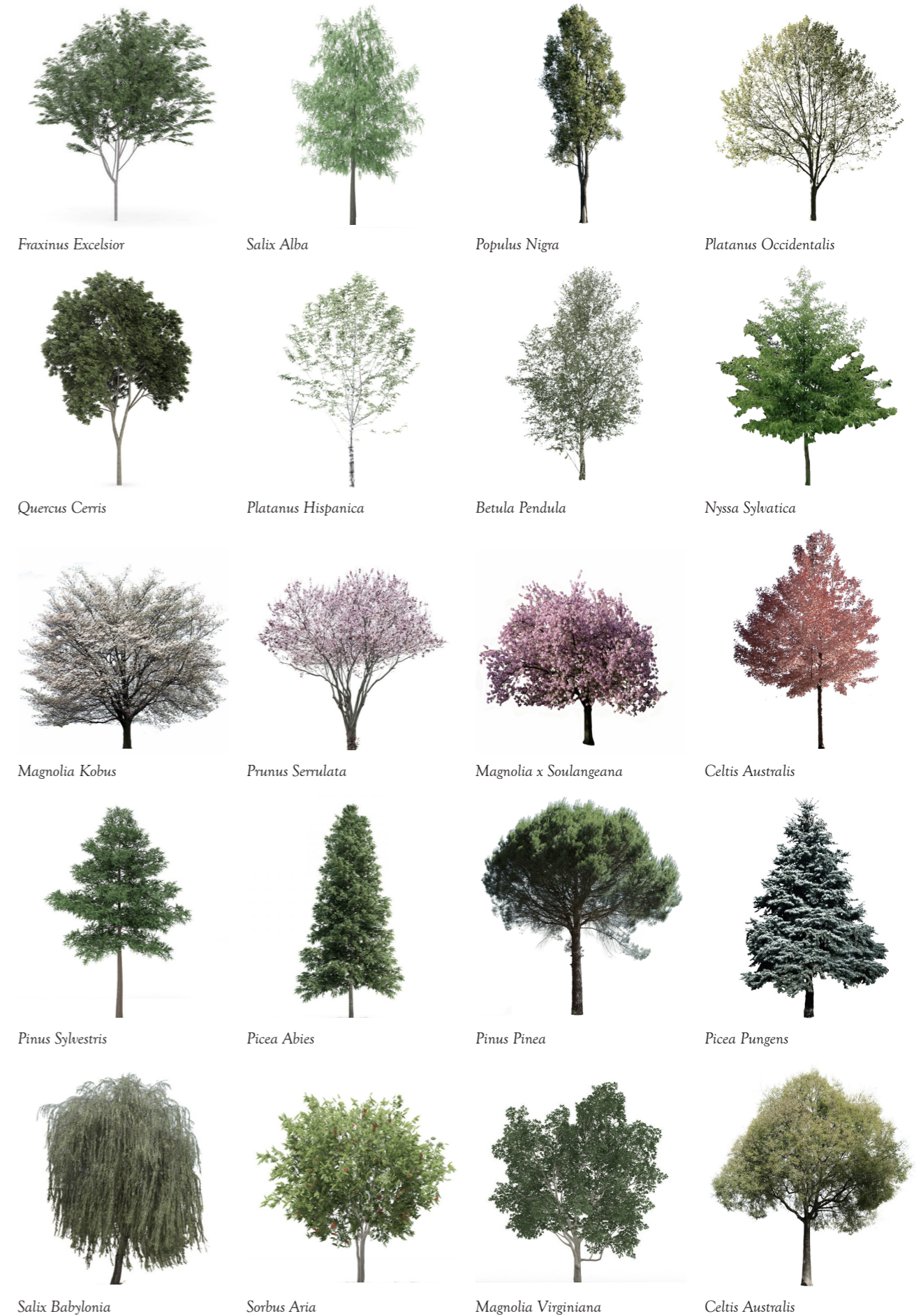


# Landscape



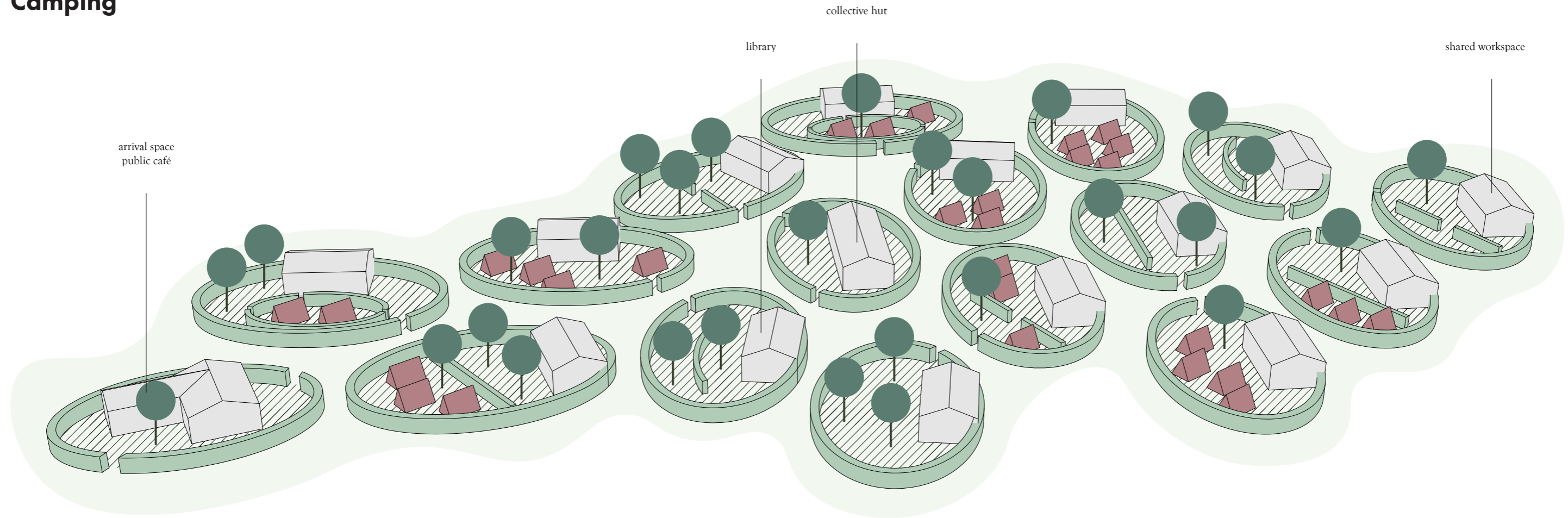
- Site
- Playground
- Camping
- Tree
- Sports facility
- Bush/hedge
- Green area
- Water feature
- Park
- Highest point of Copenhagen

The landscape of Bellahøj becomes significantly greener with the establishment of a new park in Bellahøjmarken as well as supplying the surrounding streets with road trees and green islands. Both deciduous and evergreen trees are introduced together with shrubs and wild grasses. Selecting species, the desired levels of visibility should be particularly taken into account. Dense foliage can emphasize the feeling of insecurity, therefore should be avoided especially along the main transit axes.



Moodboard of tree species.  
Source: various, 2019

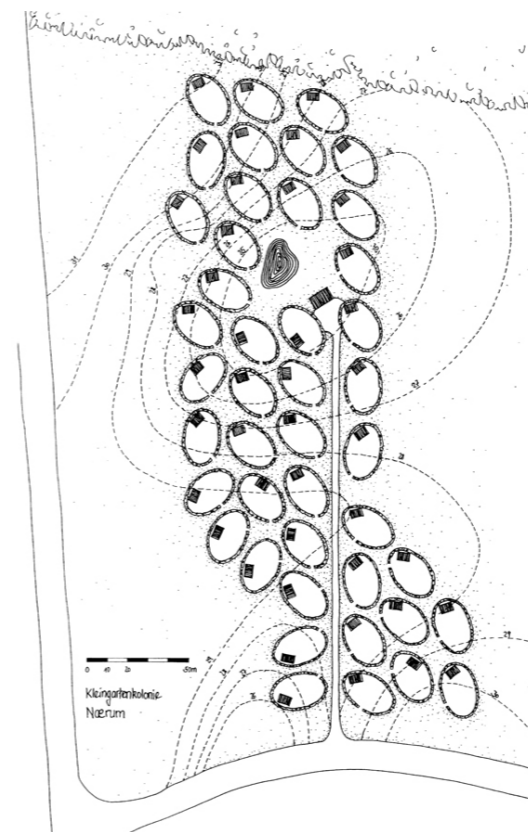
# Camping



Camping has been an important element of the identity of Bellahøjmarken since the mid-XX century and even though it does not seem to fulfil its role adequately today, it is still considered vital to be taken into account in the new proposal. The new form of the campground takes direct inspiration from the project of C.Th. Sørensen “De Runde Haver” (The Oval Gardens) in Nærum, 20 km north from Copenhagen.

“De Runde Haver” is the name of an allotment garden association. The individual plots are demarcated by a thick hedge of an elliptical shape creating an enclosed room around the hut and providing privacy. The space in-between, plain short-trimmed grass, is intended for informal meetings between the neighbours. The complex has been listed since 1991. (Arkitekturbilleder, 2019)

C.Th. Sørensen is a renowned figure in landscape architecture and particularly significant for the development of Bellahøj, as the main designer behind the outdoor spaces of the modernist complex Bellahøjhusene. Even though “De Runde Haver” serve a different purpose, studying their functionality closer gave birth to the idea of using the same spatial principle to incorporate year-round camping huts and campgrounds in Bellahøjmarken, which also can be considered a tribute to C.Th. Sørensen for his contribution to the area. The individual plots give an opportunity of avoiding a fence creating a barrier, allow for a flexibility of rental options as well as reusing the plot and some of the huts for other purposes outside the camping season such as shared workspace, café, library etc. Additionally, the space between the ellipses create a maze-like experience which is open to public all year long.



Situation plan and photos of “De Runde Haver”.  
Source: Arkitekturbilleder, 2019

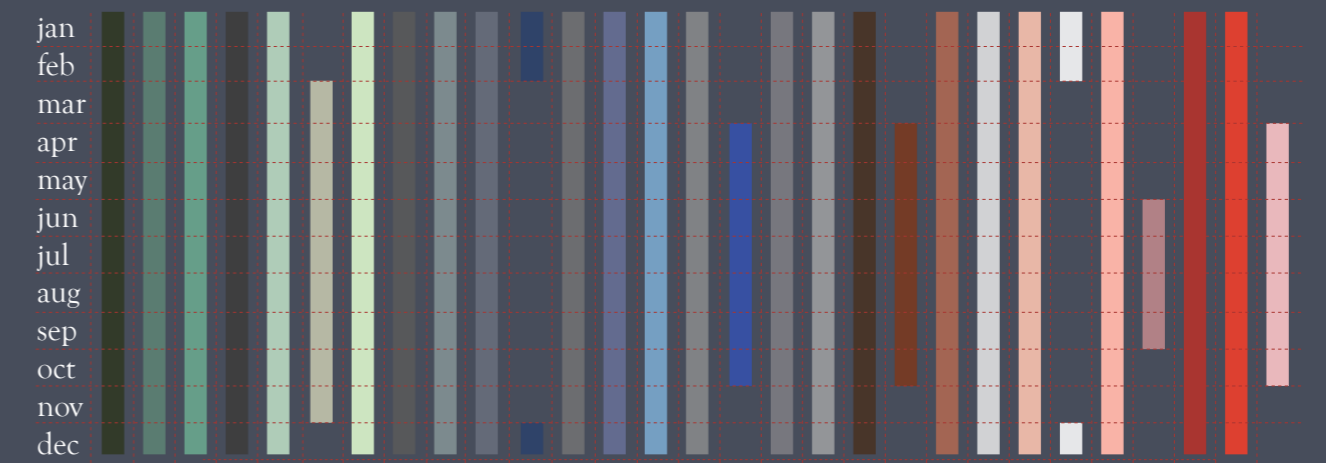
# Programming



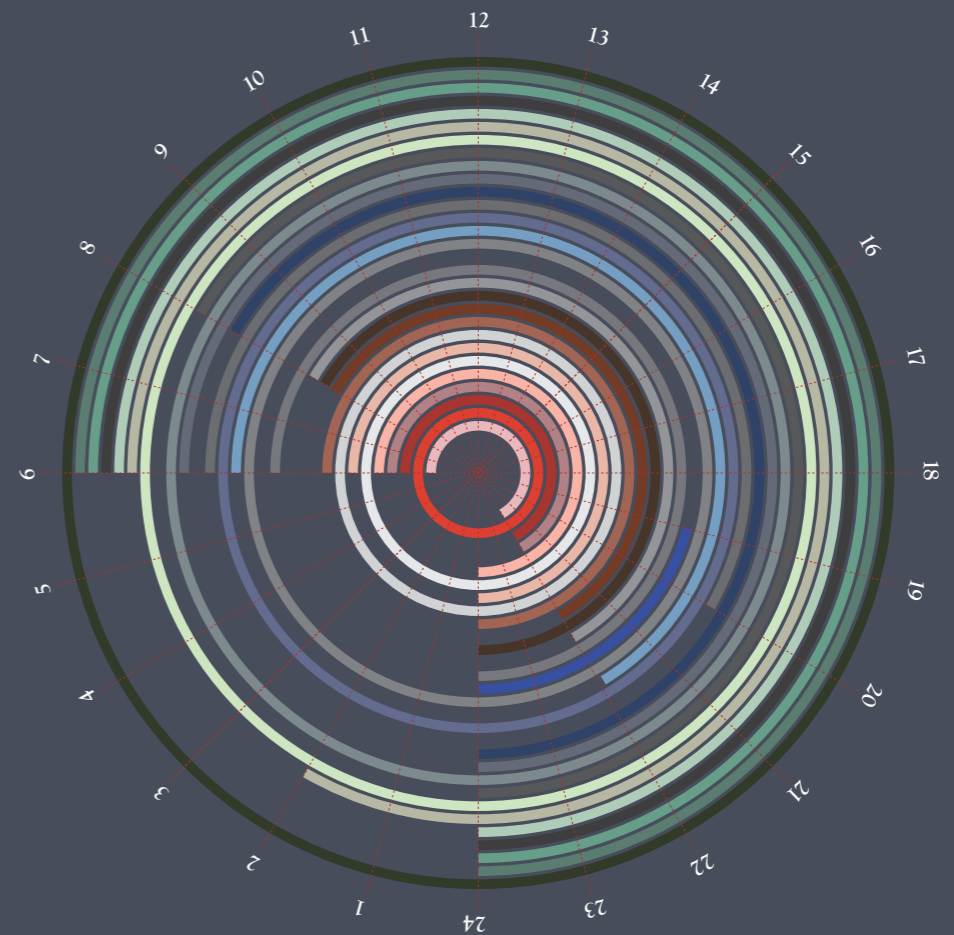
- culture trail
- aerobic stripes
- badminton
- basketball
- bouldering
- café
- camping
- chess
- fauna & flora
- football
- ice skating
- market
- fitness trail
- playground
- nordic walking
- outdoor cinema
- outdoor gym
- petanque
- performance
- picnic
- ping pong
- running
- skateboarding
- sledding
- squash
- swimming
- tennis
- walking
- yoga

Programming plays an important role in unifying the area, acting as the main facilitator of the exchange of the current and new residents as well as visitors from other parts of the city. The park is open 24-hours, 7 days a week, all year round and is not demarcated by physical barriers. All the facilities are entirely public and have extended use hours enabled by lighting, adjusted to the time of the year and week. The following year- and day-activity schedule define the approximate time of use that can be adjusted accordingly to weekdays and weekends.

Schedule of activities across the year



Schedule of activities across the day



Activities icons (previous page).  
Source: Nounproject, 2019

## Dark plan 1:4000

The main aim of the design proposal serving the hours of ambient darkness across the year is to tackle the contradictions and paradoxes characteristic of this particular subject-matter:

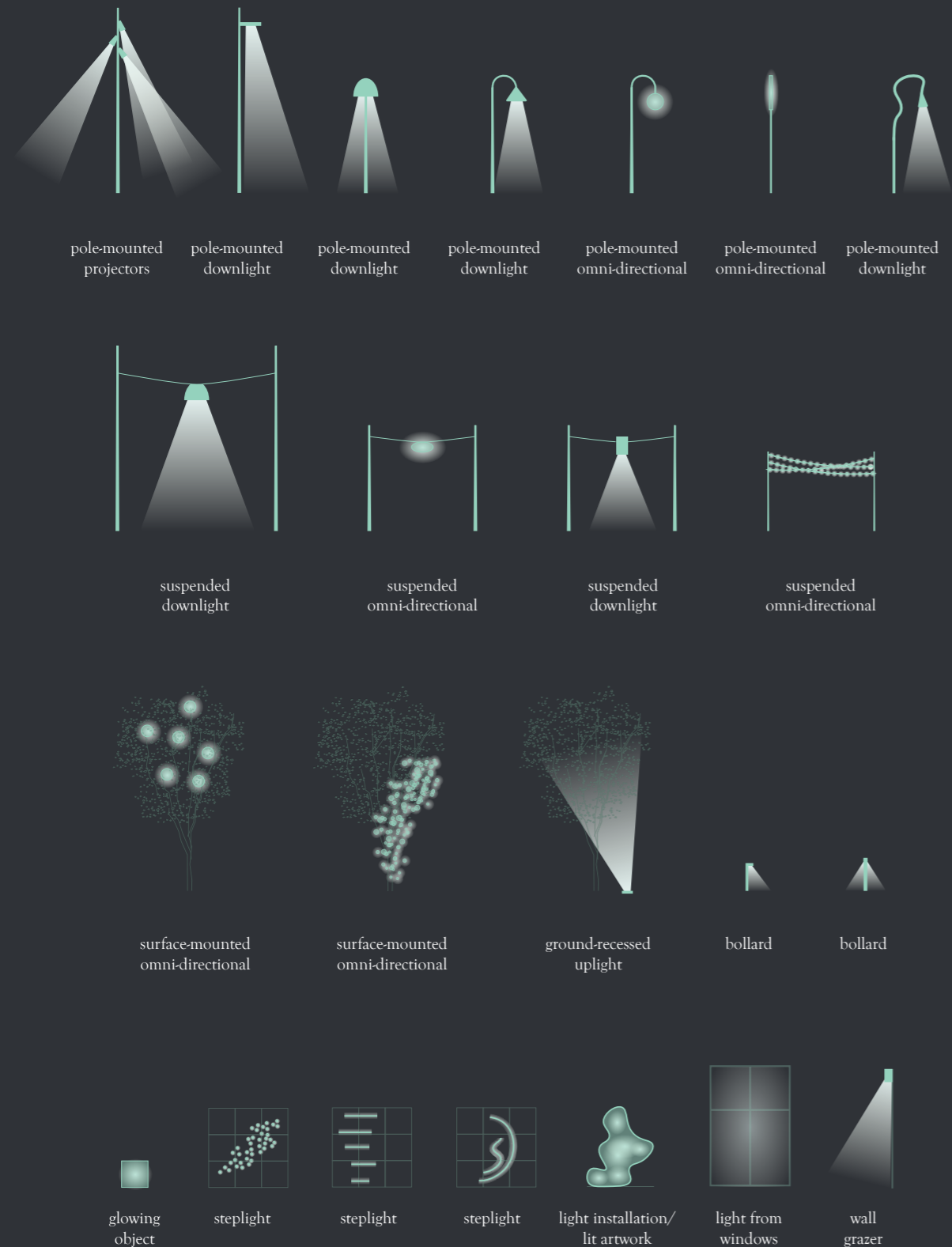
- making the ambient darkness accessible for all, including particularly concerned groups such as women, while preserving its identity;
- developing the ambient darkness without creating new conflicts of use such as obstruction for biodiversity or neighbouring residential areas;
- reconciling the “right to the city” with the “right to ambient darkness”. (Gwiazdzinski, 2015)

Lighting has been divided into four layers which can overlap and extend beyond the definition of the category:

- **Activity** - lighting supporting primarily a defined activity such as football, skateboarding, performance, play etc.
- **Wayfinding** - lighting supporting primarily visibility and recognition in transit areas.
- **Accent** - lighting supporting primarily accentuation of a specific feature such as vegetation or artwork and landmark creation.
- **Ambient** - lighting supporting primarily ambient atmosphere and visibility in a particular space.



## Tools for illumination



## Controllable aspects of light

Ability to direct light, natural as well as artificial, to achieve certain effects comes from the knowledge on its controllable aspects such as intensity, colour, distribution, direction, technology used to produce the light, beam edge softness or hardness, location, depth of shadows and numerous others. (Livingston, 2014) For the purpose of the Bellahøj project, the following two aspects are described further:

### Intensity

Intensity is the most apparent controllable aspect of light, determined by the luminous flux of the luminaires. The intensity of light in a space affects the expectations about types of activities and overall experience. High illumination levels indicate high levels of activity while low illumination levels often signal reduced levels of activity. (Livingston, 2014) Brightness can draw interest, trigger attention and evoke the feeling of security while darkness attracts activities seeking privacy and intimacy and can negatively affect perceived safety.

When given a choice of turning left or right at a 'T' intersection, the brighter path is chosen more than half percent of time, which implies that light levels can influence movement patterns in spaces. (Livingston, 2014) High intensity alone, however, does not contribute to the feeling of safety and comfort. Consistent and layered solutions with multiple light sources and surfaces with different reflective values prove the most beneficial and reduce the "floodlit effect", the sharp drop-off of light beyond the path, and the potential for glare and contrast to blind and disorientate. (Kalms, 2019)

On the Bellahøj site, varying degrees of intensity have been used to determine the hierarchy of use during the hours of ambient darkness, while simultaneously minimizing light pollution. When planning for street lighting, light from the buildings contributing to the general illumination level has been taken into account. Intensity of the path lighting in the park distinguishes main connections on the two opposite axes and is supported by the choice of vegetation which ensures good visibility further into the premises of the park, contributing to the perceived safety. Lighting supporting facilities intended for specific activities is controlled based on the use-times throughout the course of the year.

### Colour

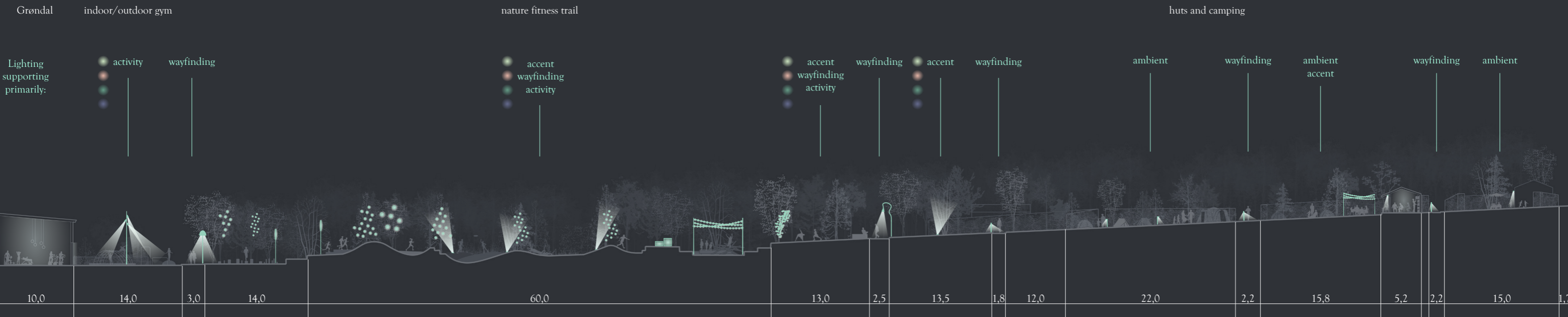
Colour considerations include the warmth or coolness of white light - colour temperature measured in kelvin [K] as well as tint of coloured light. Both white and coloured light have the ability to build a peculiar identity and affect orientation in the place.

The controlled use of colour can intensify the experience of an environment or induce extreme emotion. Moreover, different colours tend to elicit different psychological responses. The careful choice and use of colour can shape occupants' memories of a space by provoking psychological responses in situ. (Descottes and Ramos, 2011)

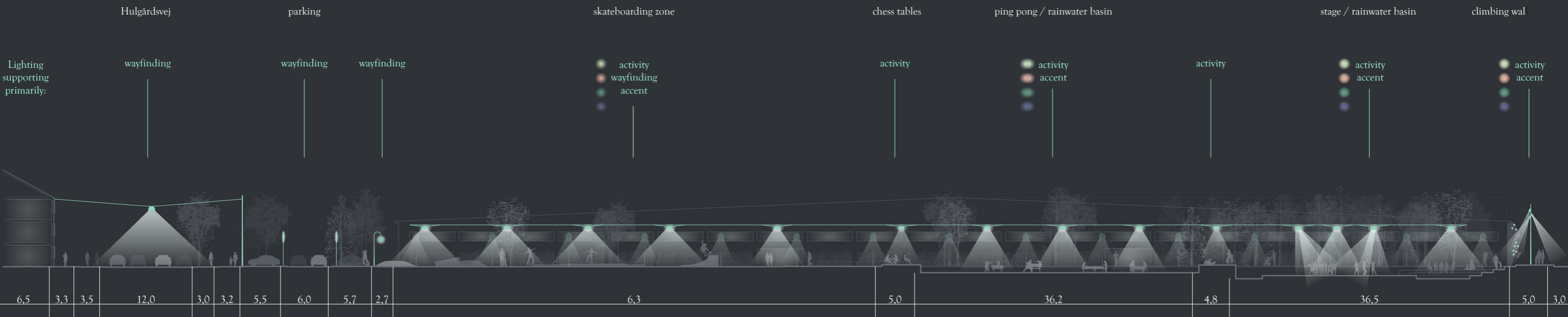
The primary white lighting of Bellahøjmarken site is warm/neutral of colour temperature 3000K. Specific areas are accentuated by coloured lighting with different scenarios designed according to the seasons.



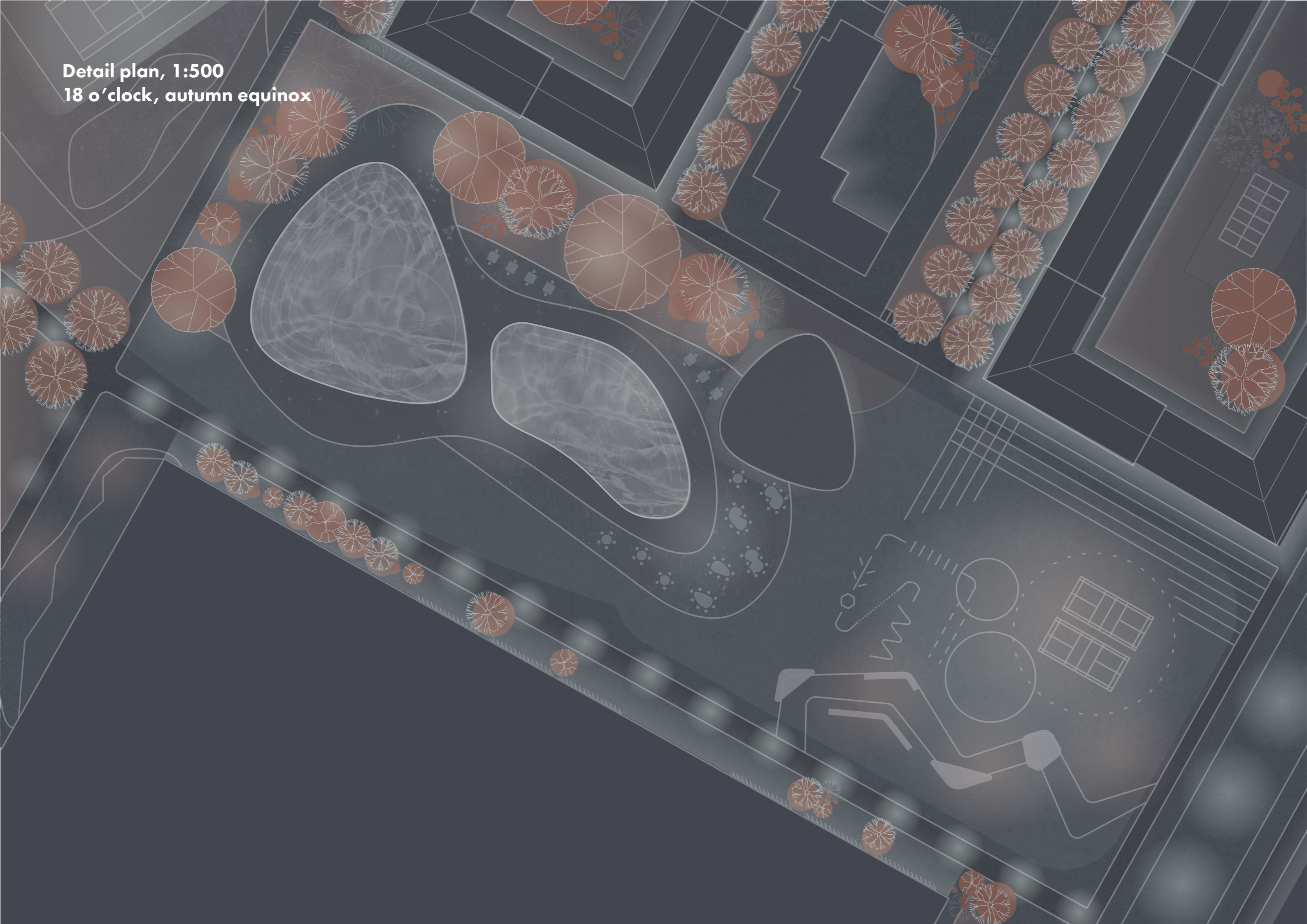
# Dark section a:a, 1:500



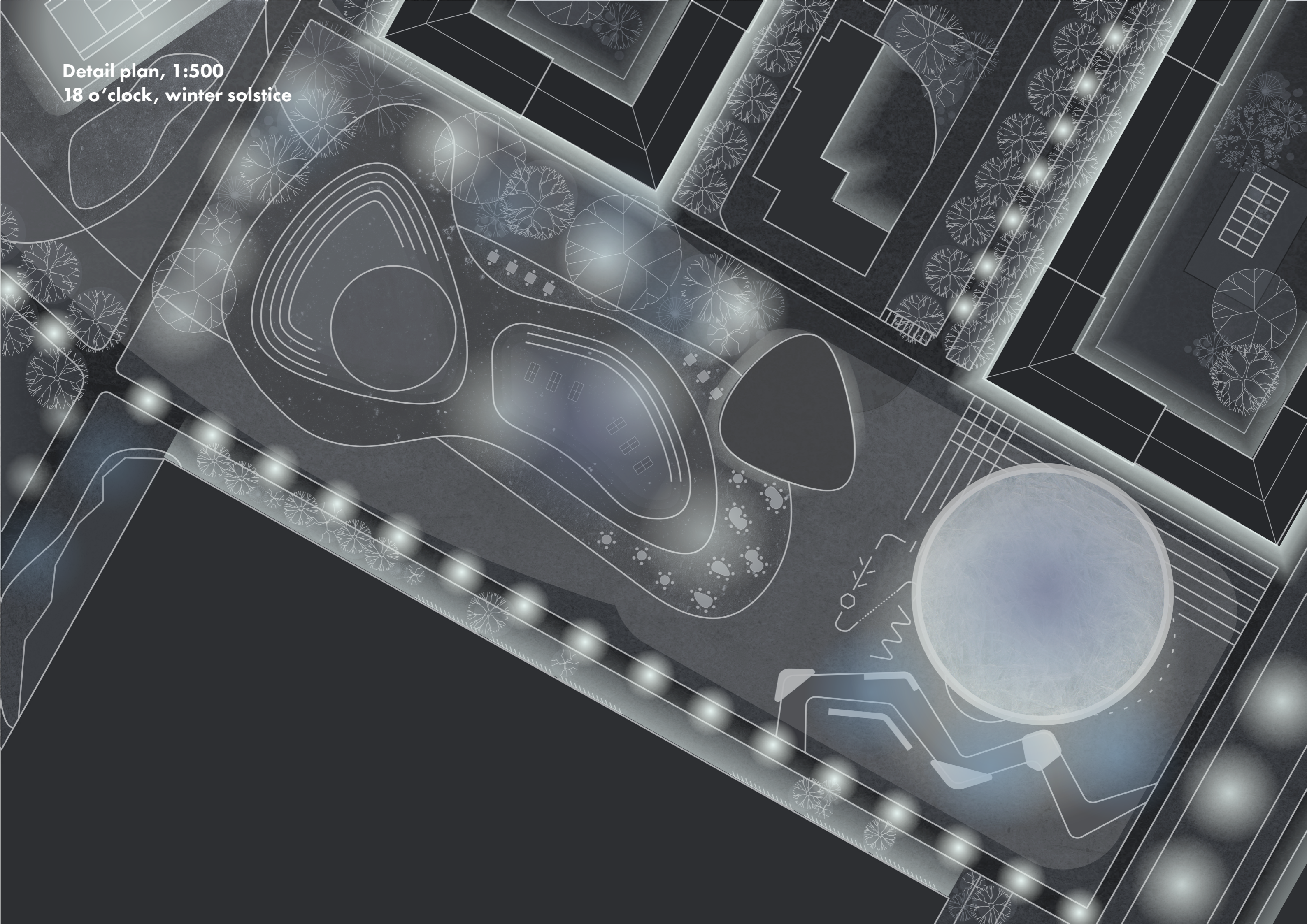
# Dark section b:b, 1:500



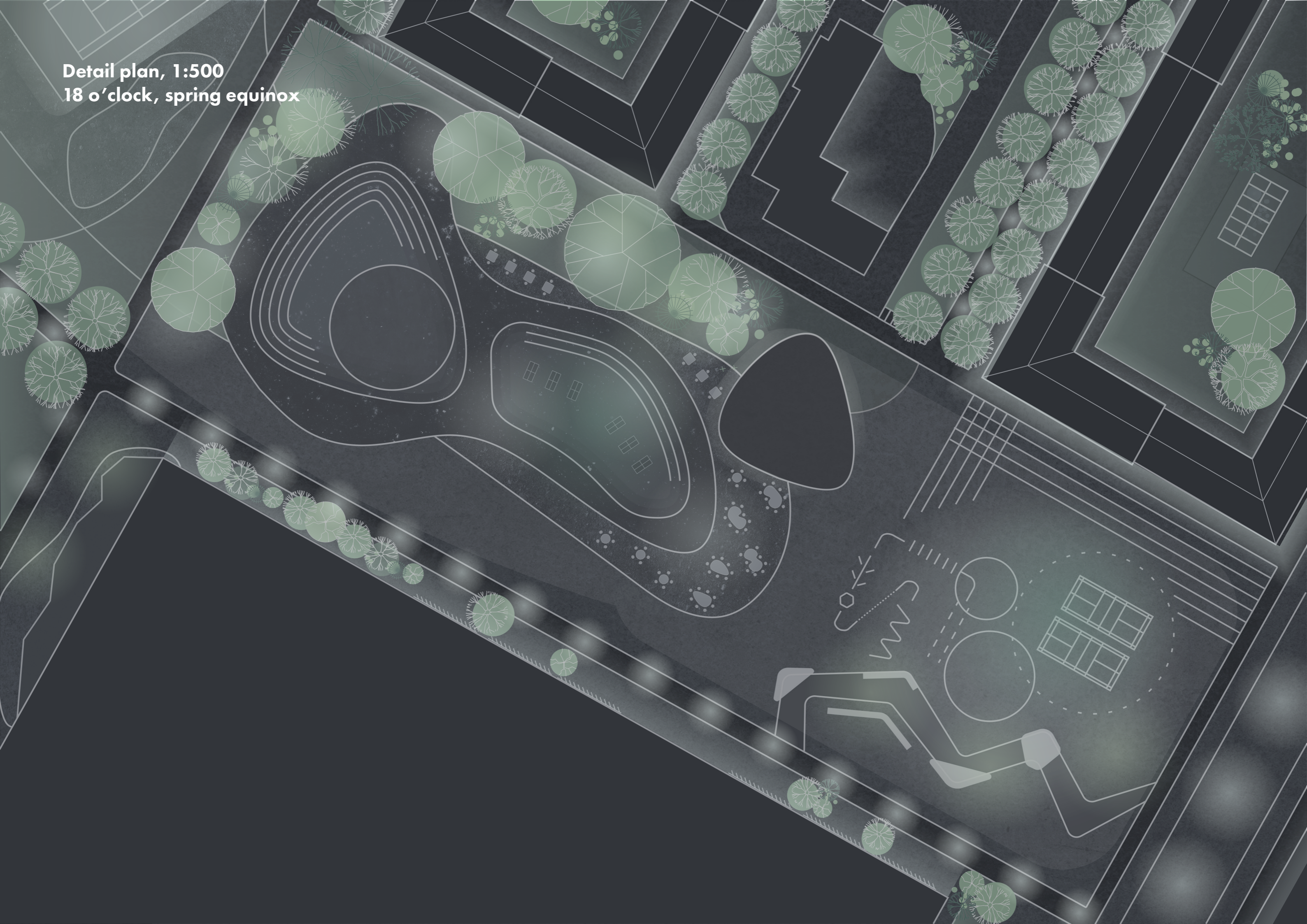
Detail plan, 1:500  
18 o'clock, autumn equinox



Detail plan, 1:500  
18 o'clock, winter solstice



Detail plan, 1:500  
18 o'clock, spring equinox



Spring, afternoon



Autumn, evening



Winter, morning



Summer, night





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## Reflections

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The project *Bellahøj all year round. Unifying through urban nature using a time-based approach.* touches upon a range of urban problematics such as leftover space, disconnection, heritage or green capital. Through several strategies including transforming the green structure, employing nature-driven programming and activating through new built structure, it aims to address these challenges and potentials. Additionally, the project site Bellahøjmarken, was used as a case to explore the *time-based approach*, which intends to support hours of ambient brightness and ambient darkness across weather conditions and seasons.

Reflecting on the analysis process, the project could have benefitted from an additional input from the current residents of the area to measure their perception of the site, with a focus on the seasonality aspect - the use of the site across seasons, weathers and course of brightness and darkness.

In regards to the design proposal, a more detailed study of the municipal plans for the development of the city of Copenhagen and the region would have perhaps helped verify if the ratio of built to green structure and private to public realm ratio are optimal. In order to test the proposal, there could have been conducted pilot studies using prototypes to observe the residents' reactions to, for instance, activating the site in the hours of darkness or introducing new recreational activities.

Nonetheless, the key aim of the project - *unifying* the area of Bellahøj and turning Bellahøjmarken into its year-round asset, seems to have been adequately addressed and dealt with within the framework of the assignment by producing a democratic, nature-driven space, respecting the context, with room for a social mix of new and current inhabitants.

The *time-based approach* is believed to have drawn attention to a relevant issue, especially in the northern climate and for the specific typology of urban realm - outdoor recreational areas, particularly prone to the impact of weather, seasons and illumination. Exploring the time-based approach through other cases could most probably lead to creating universal knowledge on the topics of seasonality, urban brightness and darkness, safety and equal access to public realm.

Both the site-specific analysis and the design proposal provoke discussion and leave room for engaging in further exploration from either the same or entirely different angles, proving the choice of the site and the direction were meaningful, which can be considered the ultimate goal for taking up the project.

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