

Revive & connect your city from above

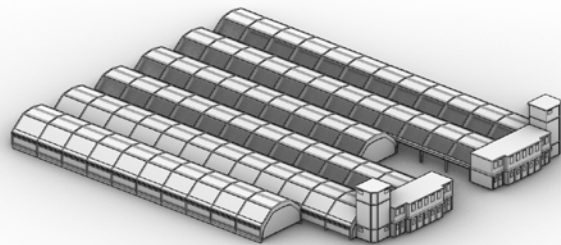
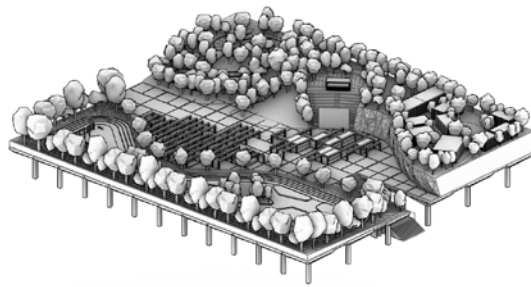


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Assignment

City Above the City: densification and sustainability through secondary layer additions

The aim is to think about how the city can grow, evolve, remain timeless and find new functions - all without increasing its built-up area whilst remaining as sustainable as possible in multiple aspects of a living city. The aim is to search and explore the functions suitable for a specific site, look for possible implementations for houses, typologies or entire neighbourhoods, determine structures that are suitable for expansion in height and envision how future cities could function in future... all while intruding as little as possible on existing undeveloped areas.

The 1960s Metabolist's utopias, such as Yona Friedman, may serve as inspiration. When we think about sustainability and the future of humanity's existence and its built environment on earth, we can't help but realize that no matter how much we do our best, how careful we are, how much we build with the best, most recycled, reusable, and local materials, even if we are carbon neutral to the greatest extent, we will inevitably create a new footprint with any new building. And is that really necessary?

"The greenest building is... the one that's already built."
[Carl Elefante]

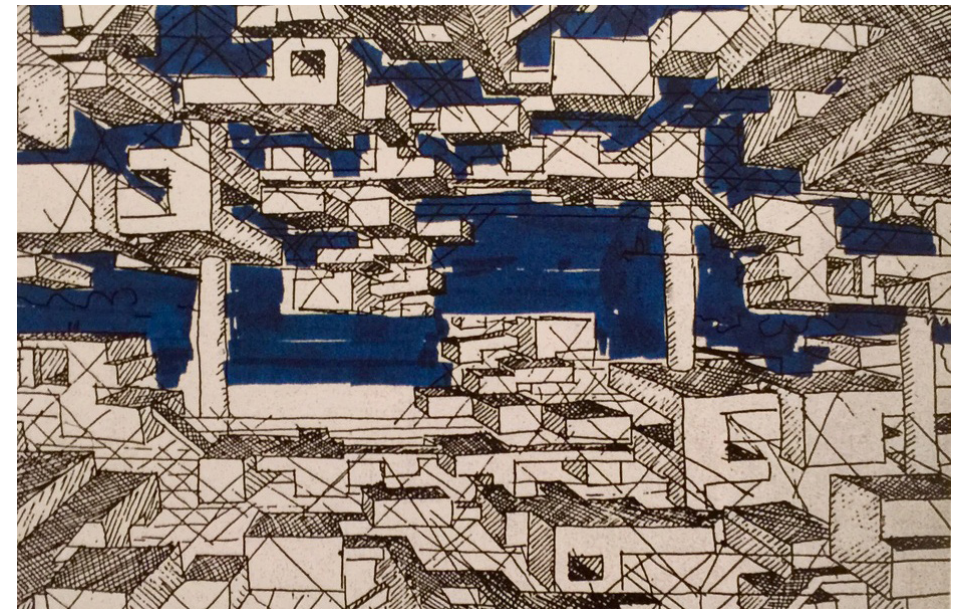
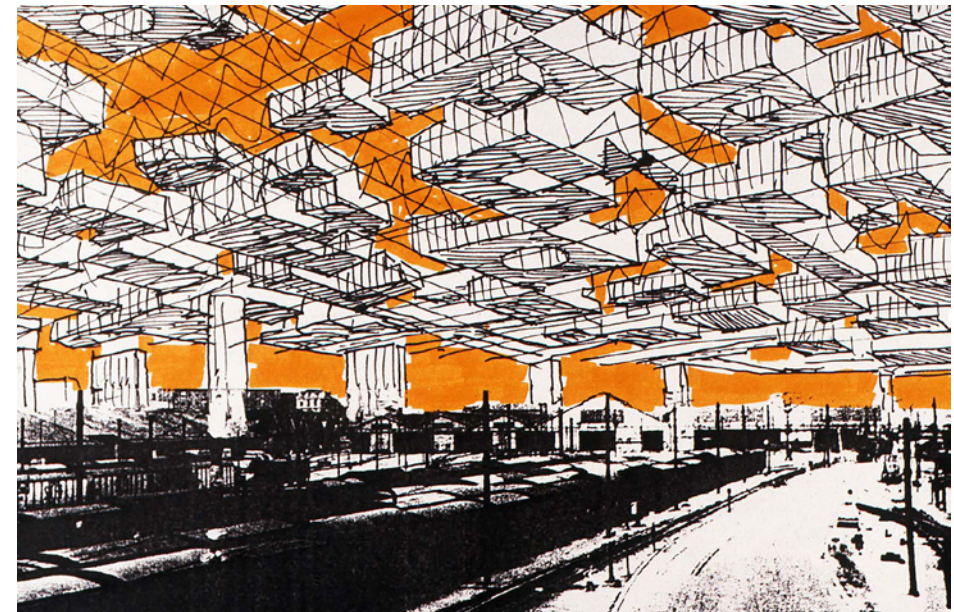
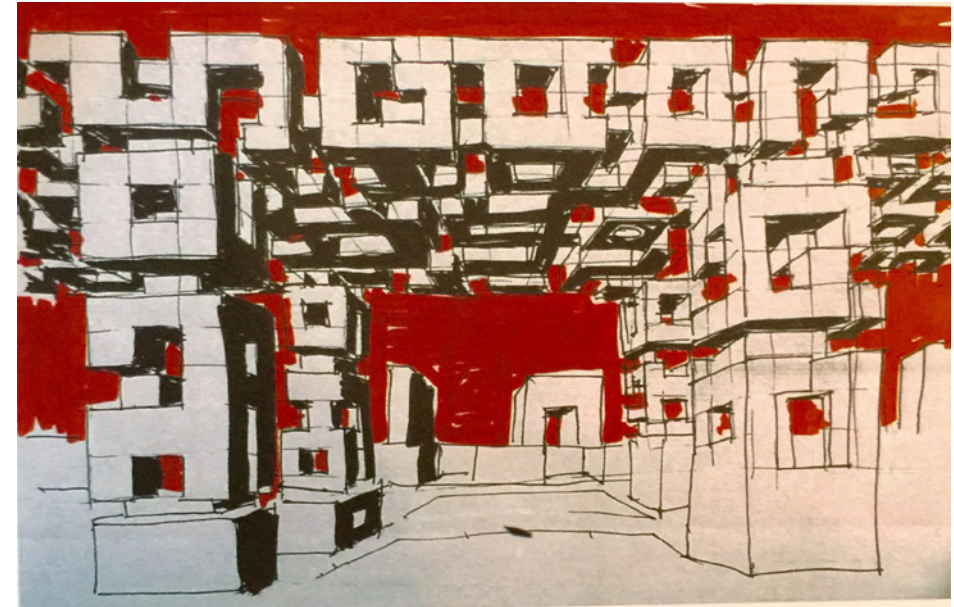
According to the World Green Building Council, half of the buildings that will exist in 2050 are already standing today. Taking care of the existing built environment and individual buildings is therefore essential.

The architect - together with the client - should always carefully consider whether a new building is required in order to respond to the brief. Whether it is possible to re-use, restore, supplement or extend an already existing building in a suitable way. If this is not possible, then at least complement the existing structure. However, the value of existing buildings is not solely economic and ecological. The fact that a building has existed for some time is also important. It is a testimony to its qualities, perhaps even its beauty, which has enabled it to survive.

"There is no Planet B."

But let's try our "Plan B" - the City Above the City.

[edited and translated from "Plán semestru", 2024]



[Yona Friedman, *The Architectural Review*, 2022]

Abstract ENG

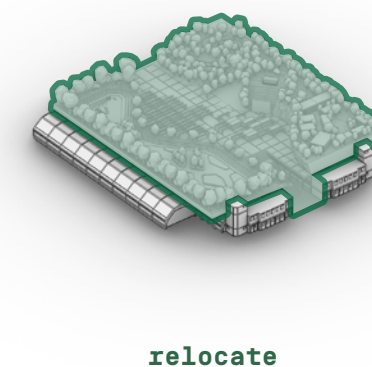
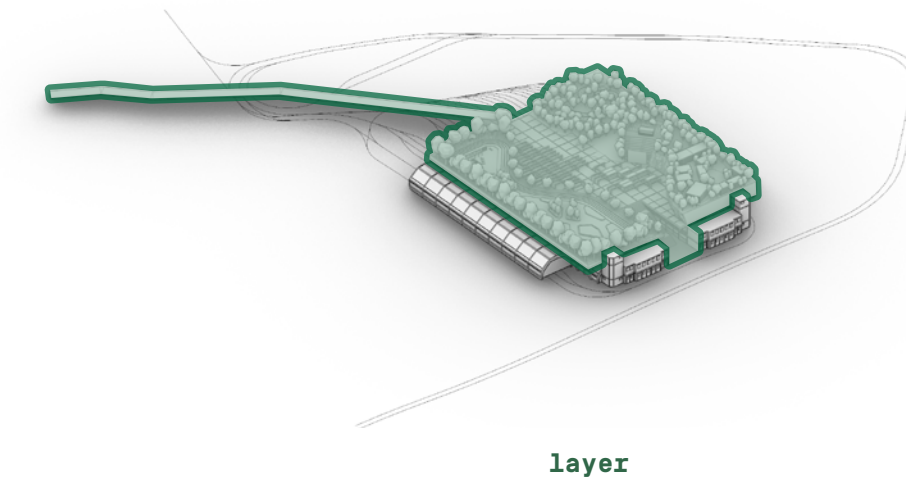
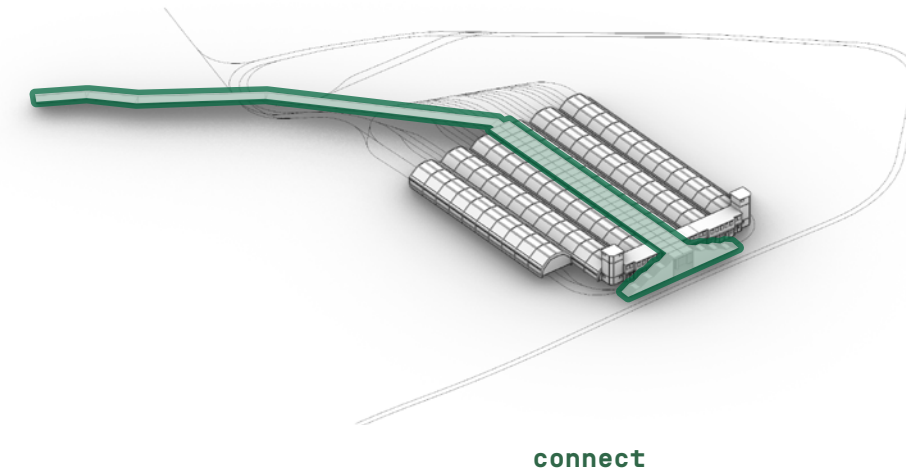
Revive & connect your city from above

As the densification of urban areas presents the potential to lower energy requirements of our activities, this Diploma project envisions the introduction of a secondary layer to existing structures in a city. Through mapping and analysis of potential structures, it was determined to focus on transport depots as many are situated within the fabric of urbanised areas and therefore pose as barriers in walkability of said neighbourhoods. In addition to forming new pedestrian connections, this secondary layer aims to fill in on the missing functions, specific to its surroundings, with accessible green spaces at its core. Considering this proposal as a future vision of transforming the structure of cities, this Diploma project introduces the layer above in three stages - **connect**, **layer** and **relocate**. This phasing allows local residents to gain consciousness of a new zone, and the modularity of the new structure facilitates the potential to reuse its components in multiple sites.

Anotace CZE

Nastartuj & propoj si své město nad městem

Zahušťování neboli densifikace měst představuje potenciál pro snížení energetických potřeb lidských činností. Tento Diplomní projekt tedy nabízí vizi umístit nad vybraně stávající městské struktury sekundární vrstvu. Skrze mapování a analýzy potenciálních struktur byla depa dopravního podniku vybrána jako strategická místa pro umístění této sekundární vrstvy, neboť mnohá z nich se nacházejí v především residenčních oblastech, a představují tak překážku v pěší dostupnosti čtvrtí v jejich okolí. Kromě vytvoření nových pěších propojení má tato sekundární vrstva za cíl doplnit chybějící funkce v kontextu svého okolí, přičemž jejím jádrem jsou přístupné zelené plochy. Vzhledem k tomu, že tento diplomní projekt představuje budoucí vizi proměny struktury měst, je zamýšleno uvést tuto vrstvu nad městem ve třech etapách - **propoj**, **vrstvi** a **přesuň**. Tato etapizace umožní místním obyvatelům získat nový prostor postupně do podvědomí a modularita této nové struktury pak umožní opakovatelné využití komponentů i na dalších pozemcích.



Revive & connect your city from above

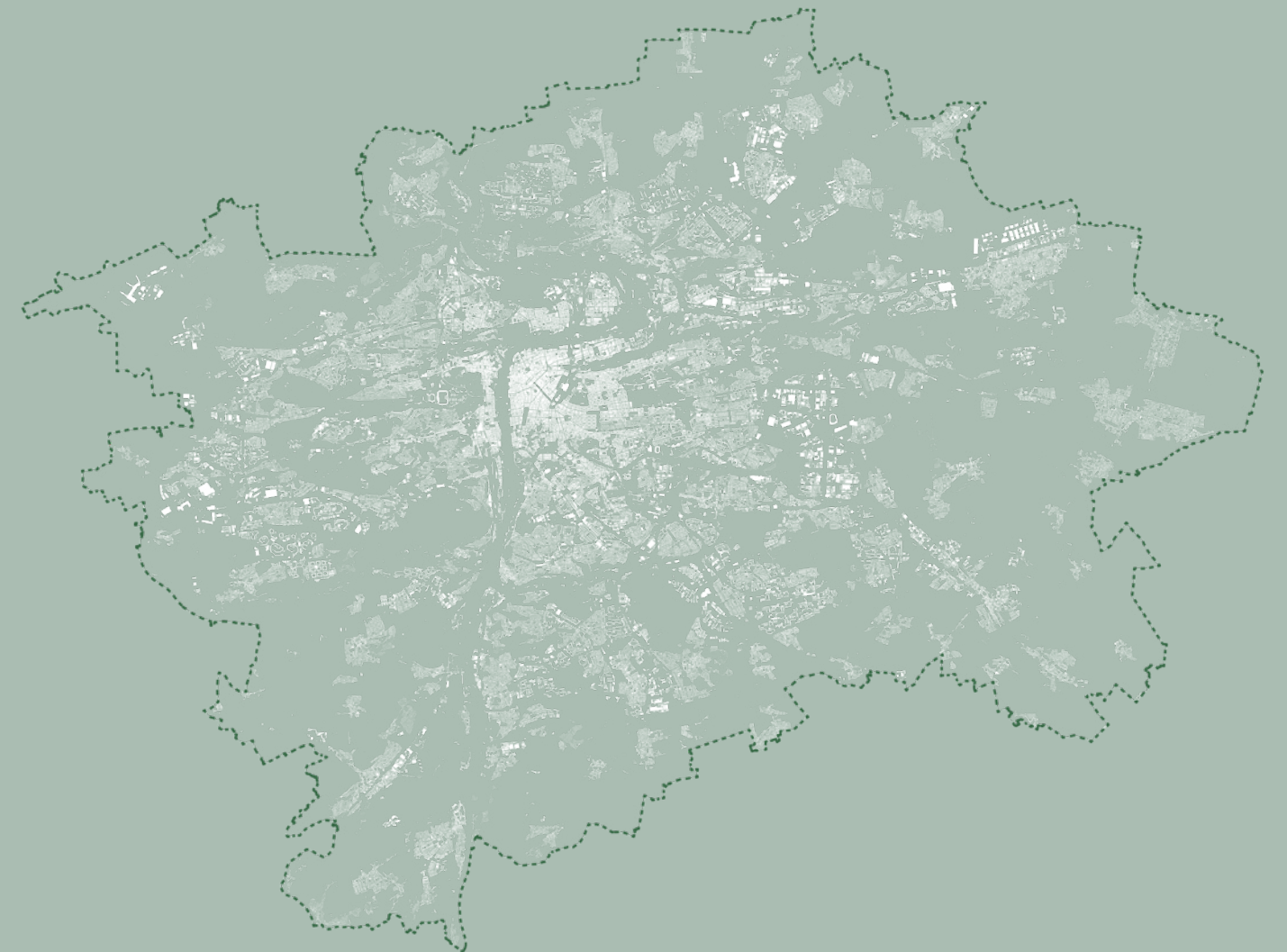
Foreword - Determining a suitable typology

Prague is one of the least densely populated capitals in Europe. This is not, however, only the result of a low total area taken up by housing and accompanying amenities [17.5% for Prague], but largely due to the city's low average building height staying below 10 metres for 56% of all buildings [Znáte Prahu, IPR, 2015].

Therefore, we are presented with two opportunities to densify the city. Either through filling in the empty and unbuilt places, leading to a reduction of green spaces or alternatively, build vertically and further utilise the already built-up spaces i.e. to create another layer of the city above the city. For many residents this may be a difficult reality to imagine: Where should such an additional layer be placed? What will happen to the functions of the city that suddenly find themselves under another structure?

To answer such questions, this Master's Diploma Project focuses not only on the function of aforesaid next layer, but also on how it enters the sites in the city. It draws on references presenting similar approaches of phasing the introduction of new functions into previously disused locations - locations that were not perceived as liveable by the city's residents.

As a result of analysing suitable sites to add new layers above, the focal sites became the plots owned by the Prague City Transport Company [Dopravní podnik hl. m. Prahy] due to the considerably extensive total area their estate covers. Often in urban residential neighbourhoods their depots and other accompanying structures remain impenetrable and act as barriers to the city's connectedness. Additionally, the single-storey light structure halls use artificial lighting, making them a suitable typology to be covered by a secondary urban layer that the local residents can interact with.



Nolli plan of Prague

Part I

Analysis & mapping

Means of getting around Prague

The transport network

Public transport in Prague is often quoted as one of the best worldwide. Consisting of 35 tram lines, 150 bus routes, 2 trolley bus routes, 3 metro lines, a number of river ferries and a cable car, its network covers even the most distant points one can find on Prague's map. However, this primarily linear infrastructure totals 2 771 various vehicles which take up vast plots of land when maintained or during off-peak times.

These tram and metro depots or bus garages are often located in densely populated areas – as a result of Prague's urban sprawl. Their dimensions are determined by their function, as it is impractical to stack rail vehicles vertically. This creates a vast collection of technical infrastructure buildings in the city and can be described as mostly functioning in the two dimensions. Often without the need for access to natural light.

These locations can also be perceived as reserves in the built-up environment of the organism of a city that is only sparsely populated compared to other European cities. At the same time, the locations in question often form barriers that are difficult to overcome for users of urban space, separating otherwise geographically close urban neighbourhoods. This raises the question of whether the third dimension, of these otherwise two-dimensional barriers, is an opportunity to densify the urban fabric.



tram, metro and train lines in Prague

Layers of city growth

01 Where to add a second layer?

Locations of depots and garages in Prague

The Prague City Transport Company owns and actively uses a total of 8 tram depots, 3 metro depots and 5 bus garages in 16 different locations spread across the city of Prague. Based on the time of their construction, they are found in different layers of the city's growth.

The tram depots were the earliest to appear, with the first depot dating back to 1875 in Karlín - back then housing horse powered carriages. Many of the early depots are still in operation today and as the majority was built in the interwar period, the tram depots are the most embedded in the urban fabric of the city, such as depot Střešovice or depot Pankrác. Relative to the period of their construction, the tram depots started as reinforced concrete structures with decorative elements, which later evolved into more utilitarian light weight steel frame structures.

The second ring in the city is then occupied by the bus garages which closely followed the introduction of trams and thus at the time of their construction were built on the outer edges of what then was the city. The youngest of this typology are the metro depots, of which there are currently three in Prague and are located on the outskirts of the city near industrial areas - defining the third outer ring indicated in the map on the right.



metro, tram and bus depots

m² of the potential under city

Total areas taken up by depots and garages

Upon individual analysis of all buildings belonging to the Prague City Transport Company for housing their vehicles, it turns out the tram depots occupy the smallest area in total – 83 490m². However, being deeply embedded in the urban fabric, they have the potential to make a significant impact on neighbourhood connectivity through the addition of an above layer.

Second in total area taken up are the metro depots with 111 670m² split nearly equally between three locations directly adjacent to the three metro lines. Their locations, with the exception of Kačerov, can be found near industrial zones in the urban periphery of the city and thus this sub-typology is not fully suitable for improving pedestrian connectivity in its immediate surroundings.

The most extensive plots belong to the bus garages at 419 790m² – nearly a half of Stromovka park. This is largely due to the fact they partially exist outdoors, but their large grouping is not suitable for improving the connectivity of the surrounding urban area, together with their locations often existing in industrial areas of the city with low residential function.

01 Where to add a second layer?

| | | | |
|----|------------|----|-------|
| A1 | Hloubětín | 13 | 330m² |
| A2 | Kobylisy | 9 | 860m² |
| A3 | Motol | 12 | 190m² |
| A4 | Pankrác | 13 | 770m² |
| A5 | Strašnice | 9 | 160m² |
| A6 | Střešovice | 6 | 650m² |
| A7 | Vokovice | 10 | 090m² |
| A8 | Žižkov | 8 | 440m² |

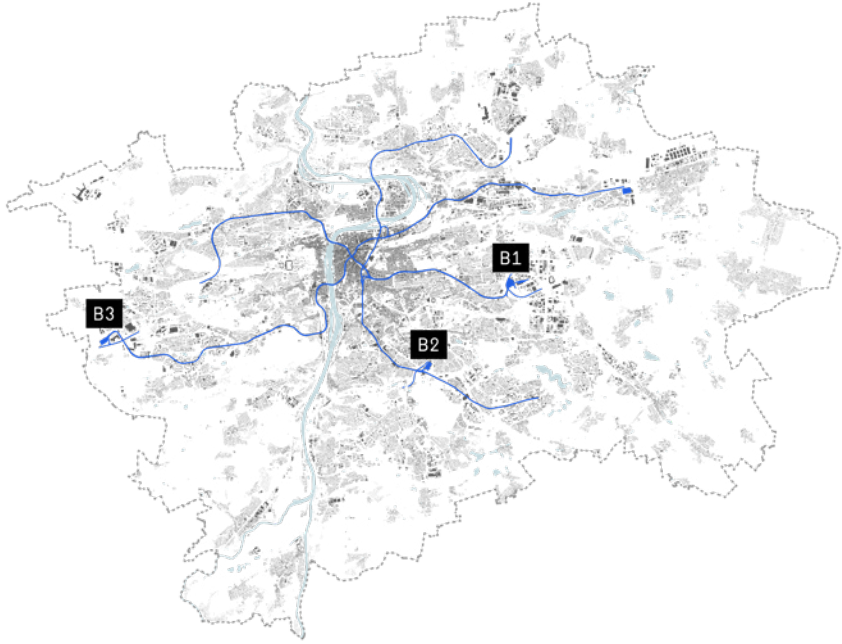
total area 83 490m²



A | tram depots

| | | | |
|----|----------|----|-------|
| B1 | Hostivař | 41 | 770m² |
| B2 | Kačerov | 31 | 790m² |
| B3 | Zličín | 38 | 110m² |

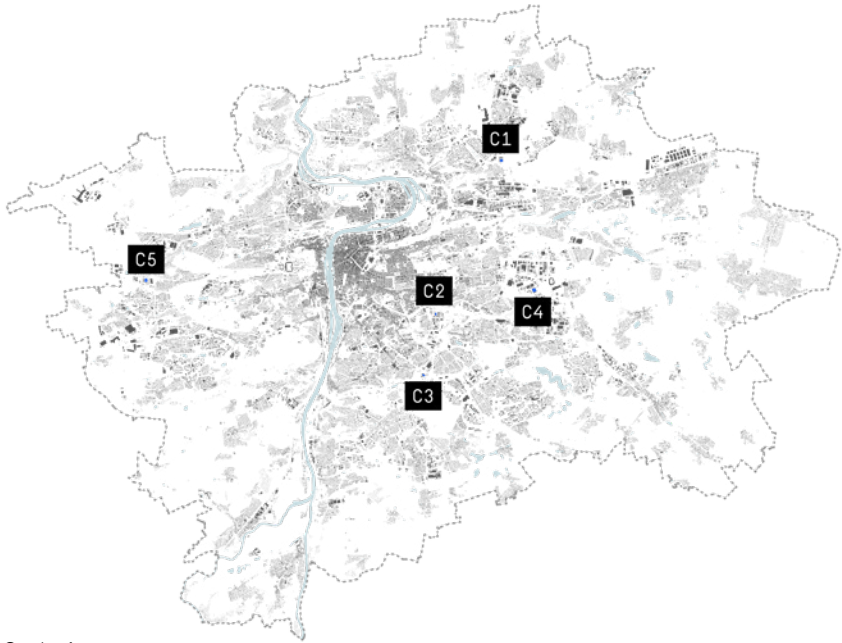
total area 111 670m²



B | metro depots

| | | | |
|----|----------|-----|-------|
| C1 | Klíčov | 66 | 730m² |
| C2 | Vršovice | 40 | 060m² |
| C3 | Kačerov | 85 | 730m² |
| C4 | Hostivař | 164 | 820m² |
| C5 | Řepy | 62 | 450m² |

total area 419 790m²



C | bus garages

The m² put into context

Comparison of the total area covered by the depots of transport infrastructure to a tangible plot

When added, the tram depots, metro depots and bus garages in Prague take up a total area of 614 950 m² – an area equivalent to triple the land occupied by buildings in use or in other ways related to the Czech Technical University in Prague in Dejvice as illustrated on the schematic map on the right.

This coverage constitutes to 0.12% of the total area of the city – a figure that is not insignificant as the total area of the city stands at 496km².

When put into the context of similarly sized European cities and their population densities, we learn just how much space Prague’s residents can really enjoy. With Prague’s population density at 2 500 inhabitants per km2, the 614 950m² of space would house an additional 1 537 people. However, this figure rises nearly ten-fold with the density of Vinohrady – at this residential neighbourhood density we gain space for at least 12 300 people, which highlights just how sparsely Prague is populated.

A graphic in the bottom right corner visualises the differences in population densities across similarly sized European cities.

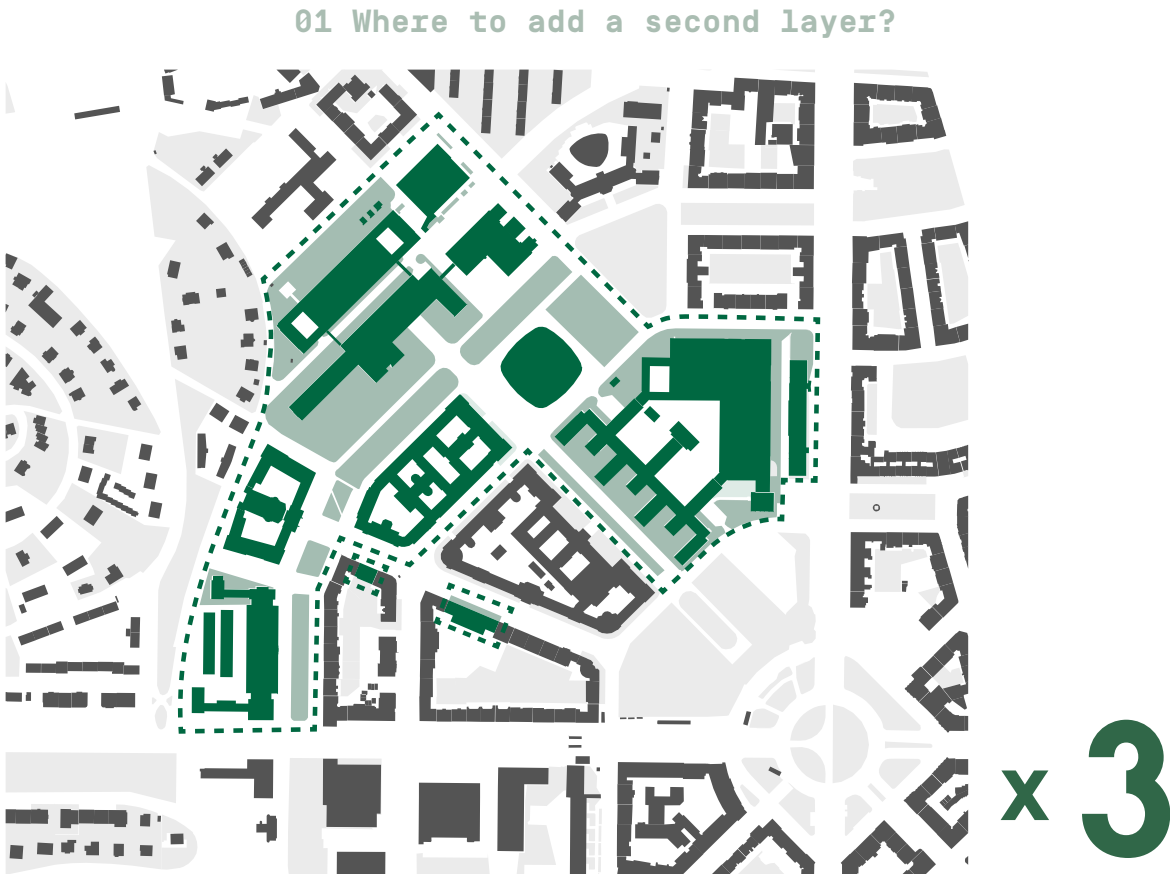
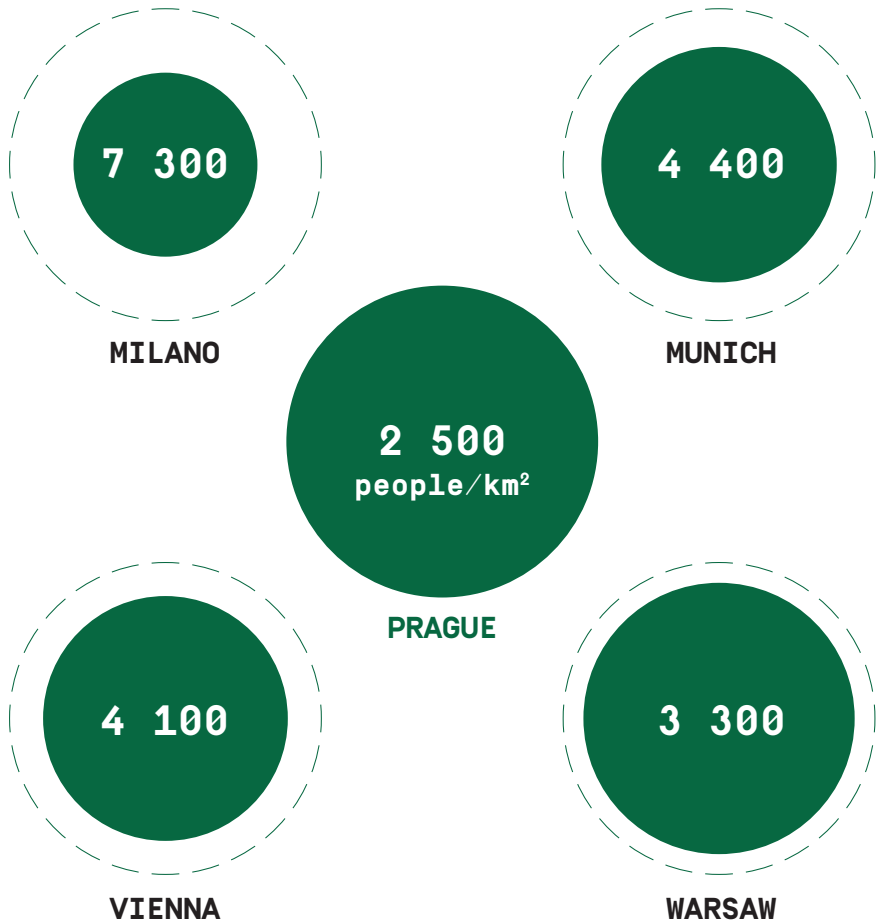


figure ground plan of the CTU campus in Dejvice



visual representation if population density across similarly sized European cities

[wolfamaplh.com, 2024; Do you know Prague? by IPR, 2015]

Tram depot characteristics

Opportunities

01 By design, tram depots sit along major tram routes and therefore the connection to other parts of the city and further modes of transport is at a high level. This poses an incentive for residents to concentrate around these areas because they are likely to provide efficient transport connections.

03 Adding a second layer to an already established site with functioning infrastructure may support the initial stages of the modular system.

Limitations

05 As trams have a defined driving path by their tracks, the placement of additional structures is restricted to the spaces in between. Similar limitation is imposed by their overhead power lines, but those can be modified and potentially attached to any additional structures.

07 Tram depots commonly hold predominantly hard surfaces on their sites and the fact that trams still use sand as a braking abrasive increases the presence of dust in their vicinity.

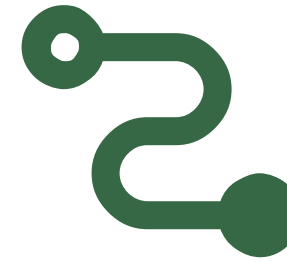
02 The Prague City Transport Company is the sole owner of its depots which poses as a benefit when negotiating alterations to this type of structures and has the potential to facilitate a smoother modification process as vehicles can be temporarily relocated between their locations.

04 By requirements of their function, depots tend to be single storey buildings that often require additional artificial lighting to facilitate maintenance of the parked vehicles inside. Thus making use of their roofs and limiting access to natural light does not pose an issue as with other typologies.

06 Even though the acoustic properties of tram tracks are rapidly improving, the noise emitted by the moving trams in a depot as well as their maintenance can pose as a disadvantage for certain added functions.

08 Since the primary purpose of depots is to provide a sheltered and dry environment for the maintenance and docking of vehicles, the structural systems tend to be lightweight. This poses the challenge of minimally interfering with the existing structural system while reinforcing it in order to facilitate the addition of a secondary layer.

01 Where to add a second layer?



public transport
connection



sole property
owner



existing & functioning
structure



one storey



vehicle path
clearance



emitted noise



dust & air
pollution



limited structural
system

Model site

A suitable test location

One of the earliest tram depots still in operation today is located deep within the Pankrác district south-east of Prague's city centre. It is surrounded by primarily residential buildings and together with Magistrála, the adjacent six-lane highway, and the Pankrác penitentiary it poses as a major barrier to pedestrian movement.

What has the potential to be a lively neighbourhood, based on housing density, is a district lacking multiple amenities such as accessible green infrastructure, sports facilities or active street fronts - further analysed through the site analysis. Local residents use this neighbourhood primarily by night - to reside - and their active city life is required to take place elsewhere. Therefore, the Pankrác depot is a fitting location to add a second layer to an existing part of the city in order to revive and reconnect this modest neighbourhood and form new points of interest for visitors to come here.



Early years

1100-1898

What is known today as the Pankrác district sits on the site of the extinct village of Krušina where a Romanesque rotunda of St. Pankrác from the end of the 11th century was originally located. It was later rebuilt into a Gothic church and the district name originated from this very Saint. The Pankrác plain had witnessed several wars, and it was not until 1840 when more a permanent settlement started to form. As the surrounding town welcomed more residents, in 1898 Pankrác merges with Nusle.

1899-1974

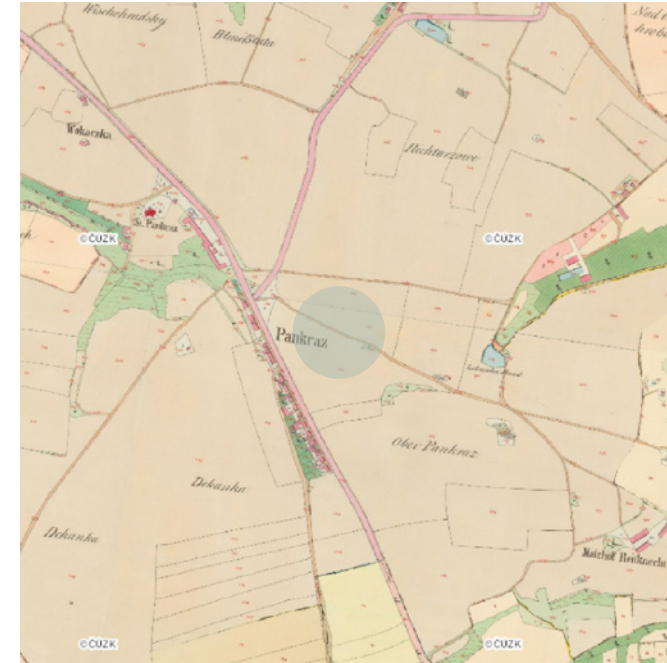
Until 1922 Nusle existed as an independent town, when it joined Greater Prague. In 1925, a tram line was introduced from Nusle to today's Hrdinů square. In 1929, the JaWa motorcycle factory was built in Pankrác and the High Court was added to the detention complex. Throughout the 1920s and 1930s a large-scale housing development took place, which culminated in the construction of the Pankrác I, II and III housing estates. In 1974 the metro C line began its operation and a part of the tram line to Kačеров disappeared.

1975-2024

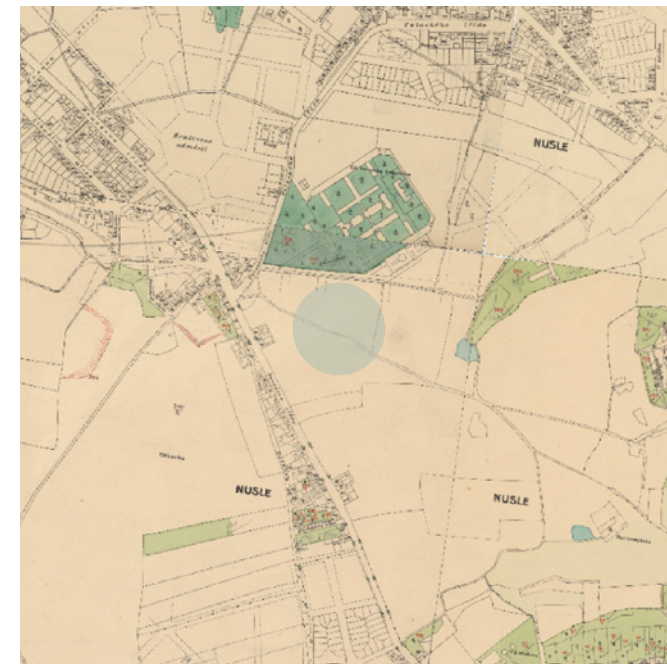
With the introduction of the metro, Pankrác became quickly accessible not only to the centre of Prague, but also to thousands of workers from the Roztyly and Jižní město housing estates. The first ever high-rise development in Prague was built here - Motokov [now City Empiria], Československý rozhlas [now City Tower] or the residential V Tower, which significantly changed the existing scale of residential development.

02 Pankrác

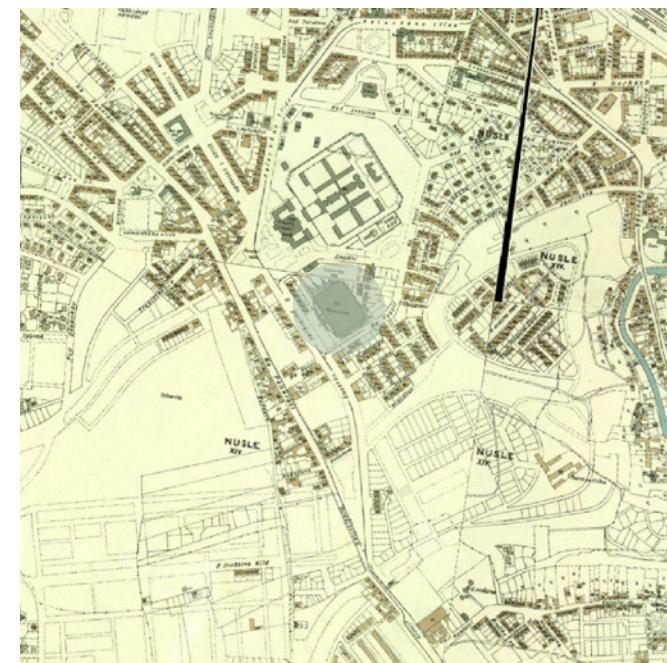
1842



1909



1938



Recent development

1945

In 1945, the Pankrác plain still housed several agricultural fields, none of which still exist today, as back then this was the outskirts of the city. The growing number of housing blocks followed the scale and typology of mid-rise buildings found just opposite in the valley in Vinohrady. These served as convenient residences for workers from the surrounding industry in Pankrác.

1989

Simultaneously with the construction of metro C line, the infamous Magistrála freeway was taking shape. Its construction brought about the demolition of several buildings around the city and it was destined to serve as an arterial road to the city centre over the Nusle valley. A scar that divided city neighbourhoods into separate districts in the era of "cars before pedestrians". Most of the new age high rise housing blocks were finished then, filling the empty lots of this outskirts district on what once used to be green agricultural fields.

2024

At the turn of the 20th and 21st centuries, "Pankrác plain" no longer resembles a plane and sees an increasing number of high-rise buildings that find their refuge outside the historic centre of Prague. It is an intersection of a variety of housing typologies, each rising from a different era. From isolated family houses, terraced houses, larger apartment buildings and tenement houses to apartment blocks, office buildings, shopping centres and glass high-rise buildings.

[Google Earth, 2024]

02 Pankrác

1945



1989



2024





Hrdinů square before 1970 with the Highest court building on the right



front facade of the Pankrác depot after completion in 1927



interior of the depot hall with carriage inspection troughs



collapsed roof structure after an impact of a bombshell in February 1945



aerial view of the depot under construction in 1925



residential buildings by the entrance of the depot, undated



southeastern wall with towering sand silos taken from a field at the edge of the city

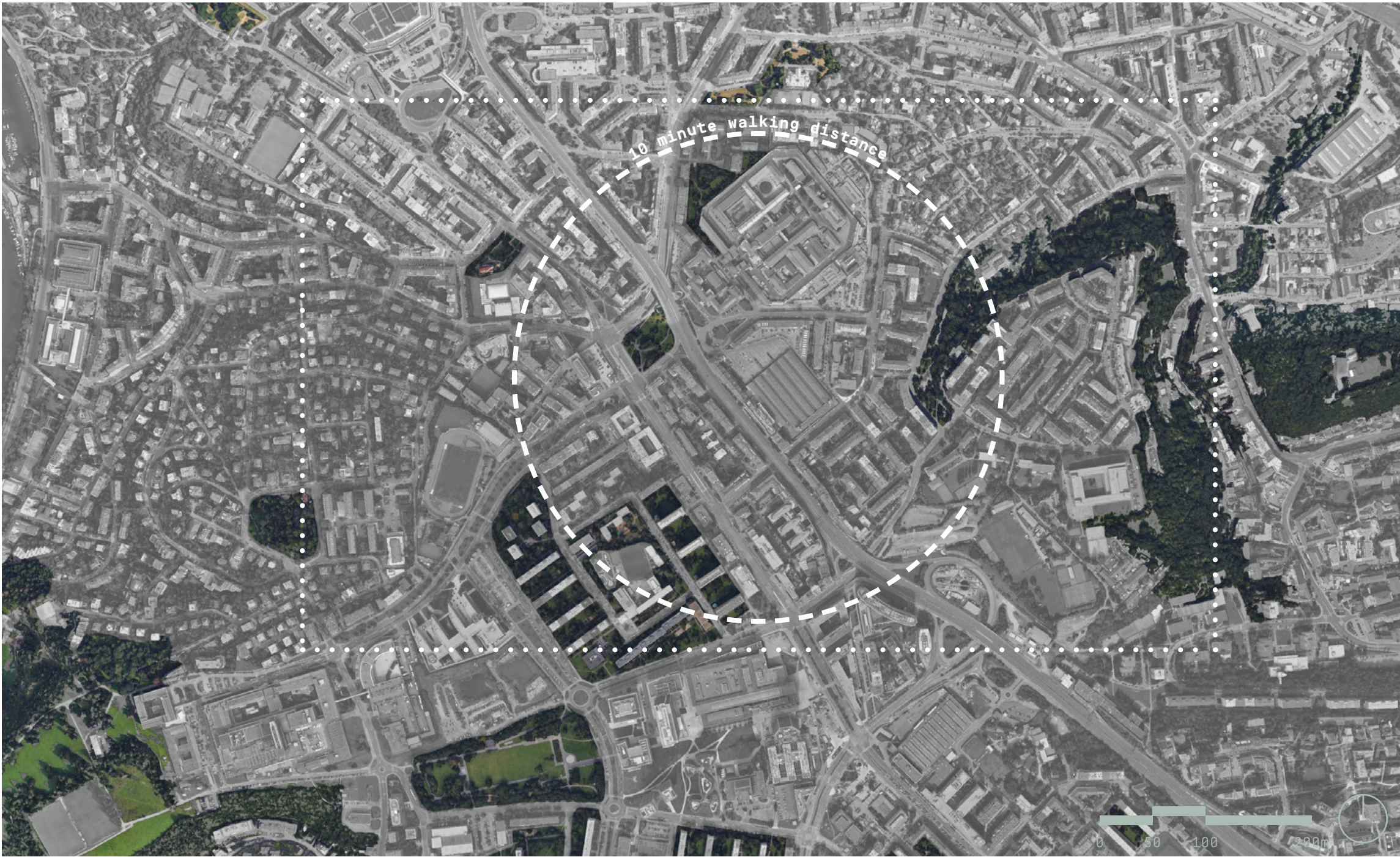


aerial view of the depot under construction in 1925

Lack of accessible green

Public and accessible parks

The filtered satellite image of Pankrác depicts all the public and accessible parks and greenery in the vicinity of the tram depot. Even though there are some green spots around, it becomes clear that for a primarily residential district, the Jezerka and Děkanka park are insufficient as they find themselves outside of the 10 minute walking distance radius.



satellite image with marked public parks

Topography

The tram depot is located on a plain - hilltop - with nearby down sloping valleys. West towards the river through Podolí, north and east into Nusle. This defines the site with an opportunity to reach distant views and outlooks even with minimal rise in height. This is especially beneficial on the northern corner of the tram depot, where it is surrounded by low rise buildings.



Nolli plan with 1m contour lines

Education lacking sport & culture

Public amenities

Apart from a low presence of public and accessible greenery, Pankrác today has a disproportionate balance of public amenities such as sports facilities, cultural sites or small retail which would bring to life the street fronts for its residents. Given this is a higher density neighbourhood with a number of educational facilities, most of the city life is directed towards the nearby shopping centre.



building outlines with public amenities

- N P G S** education - nursery/primary/grammar/specialised
- active street-fronts
- sports facilities
- cultural facilities
- ▲ market hall & shopping centre

Encounters shaped by Magistrála

Public space

Sourced from the Spatial Analytical Documentation, the map differentiates the use of public space in Prague. Unfortunately for Pankrác, the data shows the primary squares and streets are in direct contact with Magistrála, the six-lane freeway bisecting this city district. Similarly for active streetscapes, which are found along this freeway. The rest of the public space is formed by block connections either in monofunctional residential neighbourhoods or around high-rise housing estates constructed around the 1970s.



public space designation

- places of square importance
- streetscapes
- block connections
- additional publicly accessible spaces

At the intersection of transport

Public transport

The tram depot by definition is served by a high number of tram lines that originate from or terminate here. In addition, the nearby stop Pražského povstání serves as a busy interchange between the metro C line, buses and trams. Additionally the southern end of the depot is just a 5 minute walk from Pankrác metro station, which is getting an upgrade with a new metro D interchange in the coming years.



Where the residents cross

Pedestrian movement

This heat map of all foot sports activities logged through the Strava app can also be interpreted to extract information on pedestrian movement through this district. It is evident that residents avoid walking or running along the Magistrála and that it only has three major crossing spots, all of which are dark underpasses, which only underlines what a barrier to the city it poses. The medium intensity areas often lead towards public transport stops or intersections.



heat map of all foot sports in the area

- high pedestrian flow
- medium pedestrian flow
- low pedestrian flow

[edited from Global heat map by strava.com, 2024]

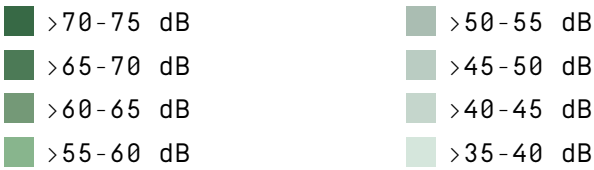
A quiet spot next to Magistrála

Noise pollution

It comes as no surprise that the freeway presents a major source of noise in the neighbourhood along its main route and its exits. A surprising quiet spot arises just above the tram depot as it is also surrounded by multi storey houses on the noisy side and this presents a unique opportunity of adding a second layer to it benefiting from noise isolation.



noise pollution heat map



Place for the high-risers

Building heights

The buildings adjacent to the Pankrác tram depot on the northern, eastern and southern sides do not exceed 4 above ground levels, which poses an opportunity to create a viewpoint from the site overlooking their roofs. This is facilitated by the morphology of the descending valley into Nusle and next to the office building on the western side with 6 levels, it will not be necessary to exceed the local height standard.



Neighbourhood at street level



an exit from the underpass under Magistrála in front of the Highest court



disused dead end turn around track for the depot



main gate to the depot



remaining examples of the first residential blocks when Pankrác was joined with Prague



apartment building on the site of the depot with administrative offices at ground level



back side wall of the depot at Na Veselí street



the backside of the tram depot lacking green, active streetfronts and mainly designated for vehicles



pedestrian unfriendly "no-man's land" at the main depot gate



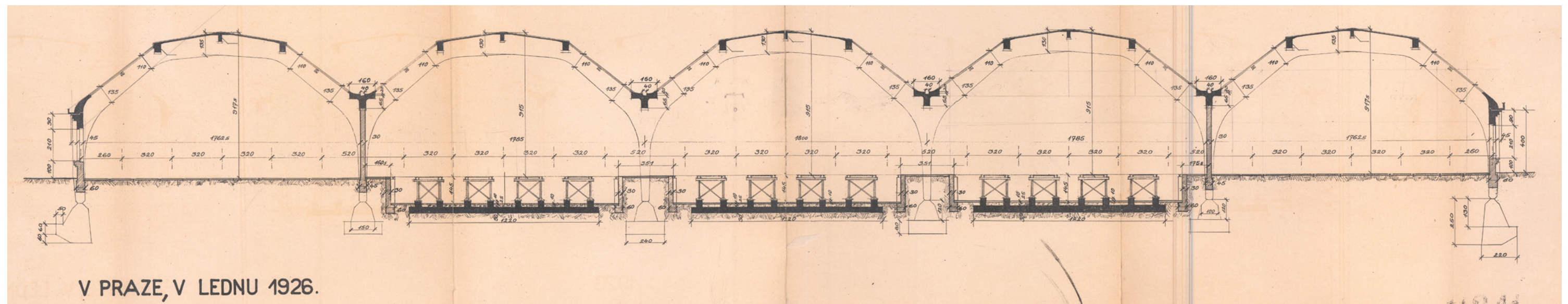
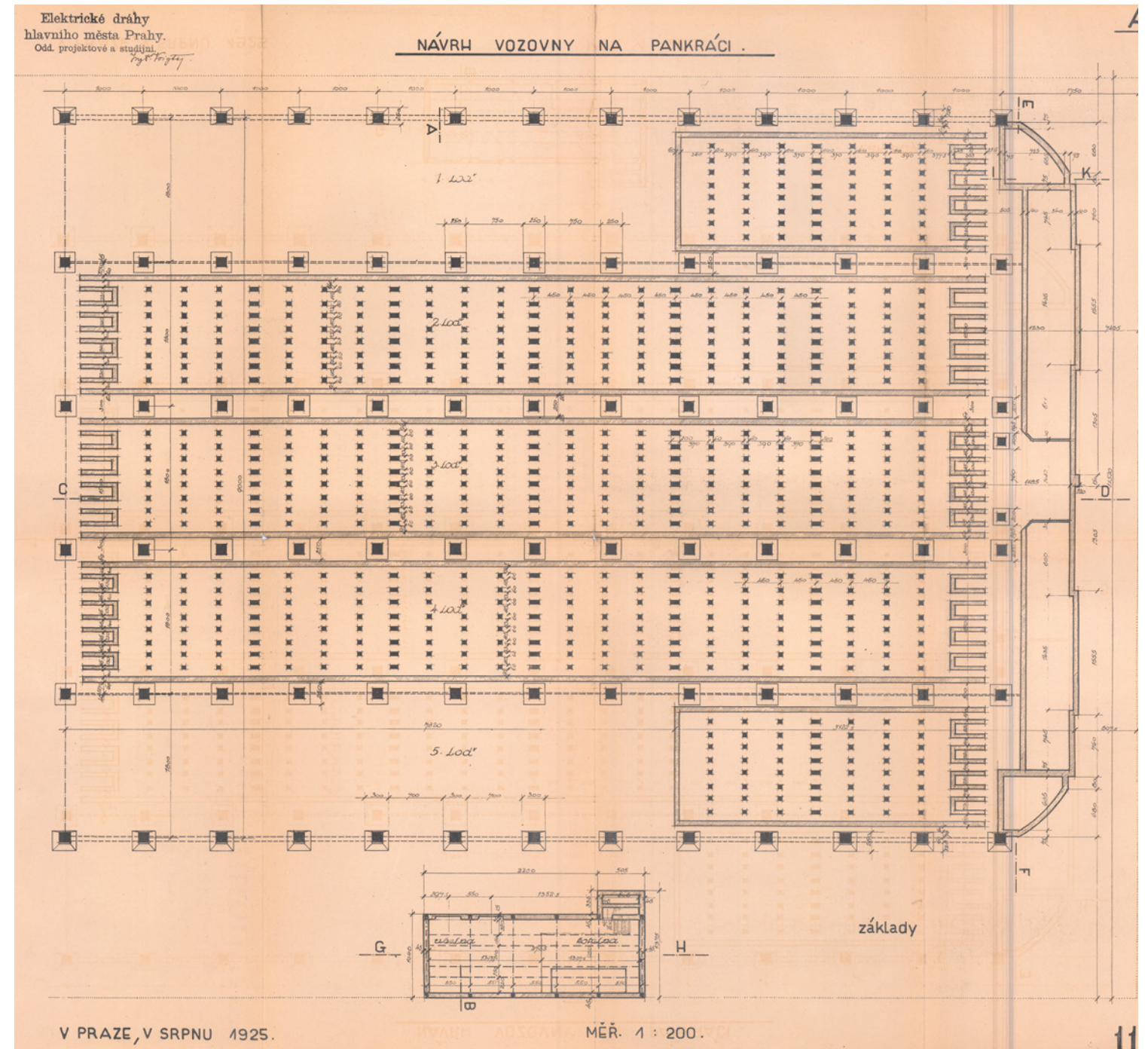
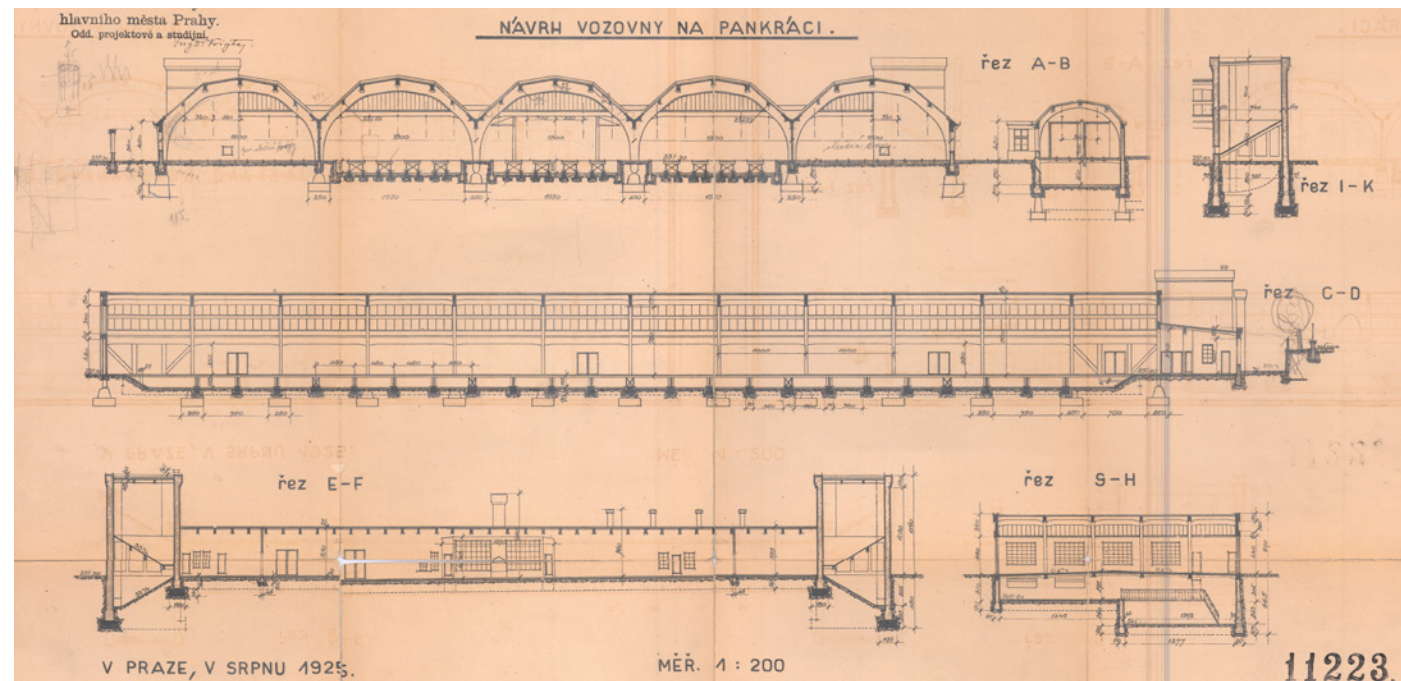
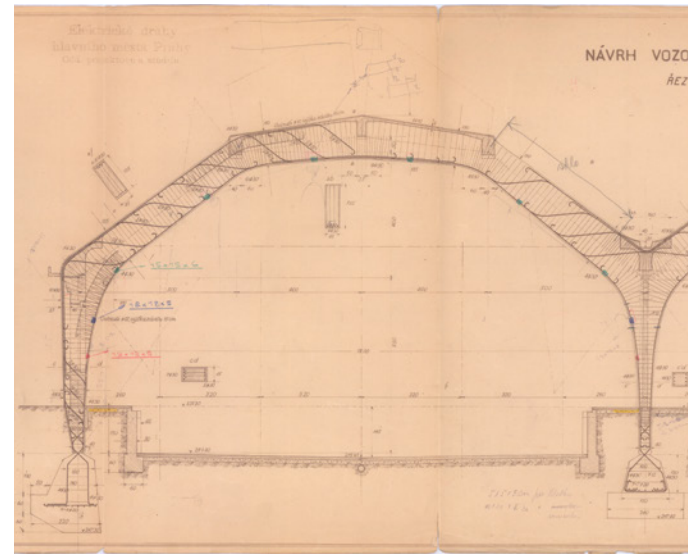
an adjacent residential street



recently renovated street corner in the Na Veselí street

Plans of the current depot

The tram depot standing today has undergone little to no major alterations to its structure, so the drawings from its construction between 1925-27 serve as the cleanest representation to understand its composition. It is a reinforced concrete structure of 5 so called naves, which are now complemented by a larger tram washing station on the south-west. The primary arches span 18 m and are spaced at 10 m from one another.



Typology and construction

Little Island Park 2021 - New York, US

Heatherwick Studio + MNLA

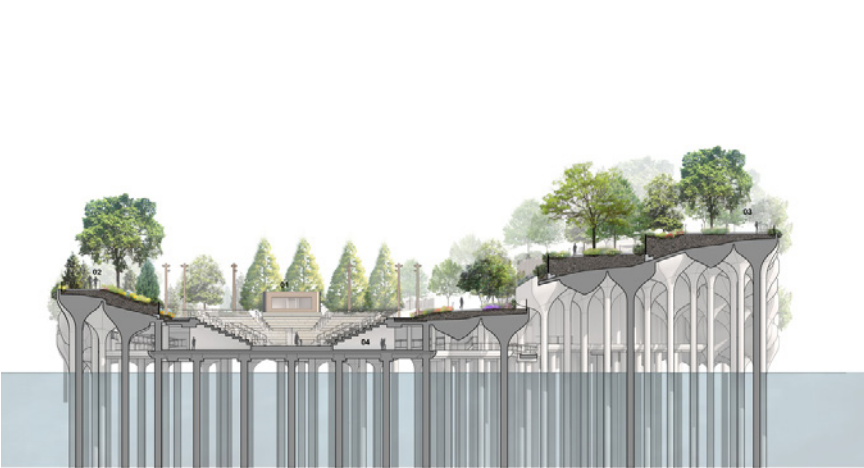
Little Island Park is an extension to Manhattan's Lower West Side in the form of a public park that sits above the river Hudson. Designed as a cluster of sculptural planters, it holds precious piece of green for people and wildlife in an unexpected and busy context of New York. Initially intended as a decorative object in place of a gone pier, the team at Heatherwick Studio saw an opportunity to add a functional piece which can add something that is in shortage on land.

The primary motivation was to design a space where people would feel like they are leaving the city behind and being immersed in a garden like vegetation. Piers by function were traditionally flat, to allow boats to dock, but the design team wanted to create a sheltered space from the wind with a variety of spaces on the inside defined by the new rising topography.

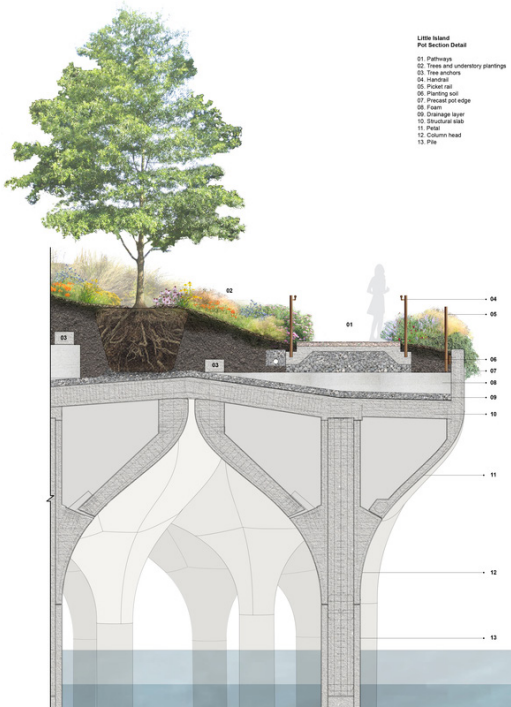
The structure is directly informed by the common construction of pier decks - a grid of wooden piles stuck to the sea or riverbed. The Little Island Park takes this a step further and instead of placing a flat deck, each pile becomes the deck itself as it extends into a planter that joins together to form the curved parked surface. One corner lifts up from the water to let sunlight reach the marine life underneath, which in turn forms a viewpoint and with another hill next to it a space for an amphitheatre.



[Heatherwick Studio, 2024; ArchDaily, 2024]



Little Island
Section B-B
01 The Amphitheatre
02 Northwest Overlook
03 Southwest Overlook
04 Underneath



Little Island
Pier Section Detail
01 Pathways
02 Trees and understory plantings
03 Tree anchors
04 Gravel
05 Planting bed
06 Pier deck
07 Pier deck edge
08 Pier deck
09 Pier deck edge
10 Pier deck edge
11 Pier deck edge
12 Pier deck edge
13 Pier

Development over time

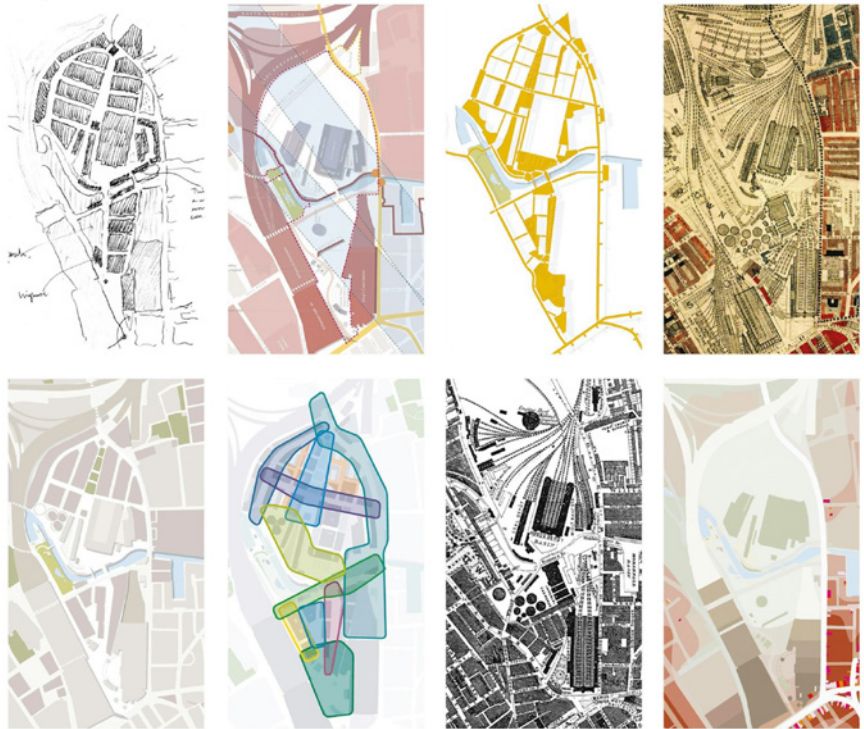
King's Cross district Coal Drops Yard 2011-2021 - London, UK

Allies & Morrison
Porphyrios Associates
Heatherwick Studio
Arup

King's Cross district used to house a major rail yard with granaries and warehouses that received goods from the British Island and supplied London via a network of river canals. Later when this form of shipping was replaced by other means of transport, it became a derelict site and grounds for London's underground nightlife and other modes of illegal entertainment.

This neighbourhood was not a desirable address for business or housing. However, after 2000, through temporary interventions, installations and happenings, it started proving itself to Londoners as a potentially liveable and attractive district. It was a lengthy and slow process to convince residents to even visit this place, let alone to purchase an apartment here.

Nowadays, the 67-acre King's Cross district, sitting next to St Pancras Intl and King's Cross stations, provides over 18 000 jobs, is home to over 120 businesses, has 1 120 homes with further 620 in construction, houses two primary schools and St Martins College of Art & Design with student residences and is visited by a large number of visitors annually for its ever changing cultural programme.



[Google Earth, 2024; Allies & Morrison, 2024; kingscross.co.uk, 2024]

Intensive green roofs

ČSOB hq 2007 - Prague, Czechia

AP Atelier

This building uses a variety of vegetation which decrease the noise travelling from a nearby road and its dust spread, aids to regulate the temperature of the office space itself and has a positive impact on the local microclimate. The soil thickness reaches 1.4 m to accommodate the root network of taller trees and the type selection reflects the surroundings.



[archiweb.cz, 2024]



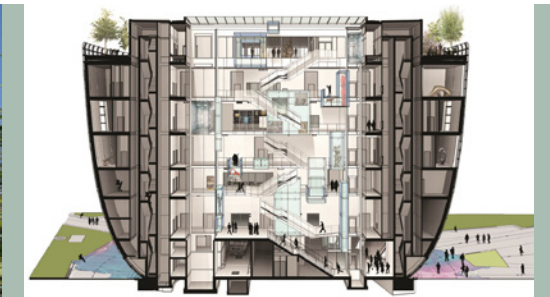
Depot Boijmans van Beuningen 2020 - Rotterdam, Netherlands

MVRDV

To replace the occupied space in the park, this depot's rooftop houses 75 birch trees with fir and tall grasses, that perfectly shield the buzz of the surrounding city. The vegetation was bred in a specialised tree nursery to prepare them for the living conditions of a city rooftop.



[mvrdiv.com, 2024]



IKEA Store 2022 - Vienna, Austria

Querkraft

This IKEA's store placement of potted trees and shrubs at multiple levels along its facades, brings more greenery into a city than a standard ground placement does. Its positive impact is not only on the building itself, which in effect sees reduced cooling needs, but also at pedestrian level with humidified and cooler microclimate.



[archdaily.com, 2024]



Part II

Design proposal

Project description

As Prague is sparsely populated, densification holds the potential to push the city towards the global need of mitigating causes of climate change. In response, this diploma project envisions the introduction of a secondary layer to specific locations of the urban environment. As densification of urban areas holds the potential to concentrate the intensity of human activities to smaller areas, it in turn leads to lower energy consumption by shortening transport distances, need for individual maintenance of infrastructure or use of private vehicles.

One of such mitigation measures is the active use of roof structures to incorporate more vegetation into predominantly hard surface areas in the city. "Revive & connect your city from above" is a design proposal strategy to showcase a modular system of components that can revive sparsely used places in a city. Additionally, to forming new pedestrian connections through these disused areas, the proposal aims to fill in on the functions specific to the place, which have the potential to bring more active users.

Implementation in stages

"Revive & connect your city from above" arrives in three stages to gradually accommodate itself in the existing urban fabric. The first stage - **connect** - implements a modular system of platforms with complementary programme to form walkways above and through a previously impenetrable site - all with minimal intervention to the existing function of the site. The second stage - **layer** - deploys more permanent and larger scale

functions informed by feedback obtained through stage one to fully transform the above layer of a given site into a usable and actively integrated part of the city. Lastly, stage three - **relocate** - challenges the need to accommodate the original function of a site on the ground and its importance to remain. A possible solution for this third stage may be a relocation of the ground level function either to a different site or preferably underground in order to prevent a similar scenario from occurring in the future. This vision is based on the hypothesis of the primary function being a barrier in the urban fabric.

The Diploma Project "Revive & connect your city from above" envisions and concentrates on the resolution of stage two and outlines the schematics of stages one and three.

Pankrác and local urbanism

Pankrác tram depot serves as a suitable location for this model study, as it presents a number of opportunities to add urban features to its neighbourhood. In comparison to, there is a relative lack of accessible and maintained green spaces in the area to serve as recreational or informal gathering places for local residents. Additionally, as was identified through the analysis, there is a shortage of cultural and sports facilities and so the area of the Pankrác tram depot lacks the opportunities for an active urban and social life for its residents.

The new layer above the depot therefore brings a variety of functions - community gardens,

produce and food markets, recreational sport areas such as a running track, outdoor climbing wall and a workout park, sauna corner, an outdoor cinema and a city viewpoint; all nested and surrounded by extensive green spaces, a lawn and various tree species. Users can enter the site through two points - via a bridge over Magistrála stretching from Hrdinů square and using a lift or stairs from Na Veselí street.

The two entrance points were determined to also benefit the walkability of the surrounding area as this location is heavily impacted by the presence of the Magistrála freeway. The Hrdinů square is well connected to metro, bus and tram connections at Pražského povstání station and based on the pedestrian movement heat map, there are currently significant quantities flowing west-east through the Na Veselí street via an underpass.

The raised edges of the new layer above the depot respond to the topography of the surrounding area in order to form a welcoming green oasis for its visitors without intruding on the adjacent buildings, while simultaneously bringing the benefit of shielding the noises of the depot for both the neighbours and the users. The northern corner of the platform is elevated to form a viewing point over the Nusle valley onto Vinohrady as well as a sun lit south facing lawn as a place to relax on summer weekends or sleigh down in winter. The southwestern edge of the platform on the other hand has a more gentle slope so as to allow natural light to enter the adjacent buildings.

Landscaping strategy

The proposal contains a range of plant and tree species selected to fit the urban context, withstand the conditions determined by growing on a raised structure and to benefit the local biodiversity of both plant and animal species.

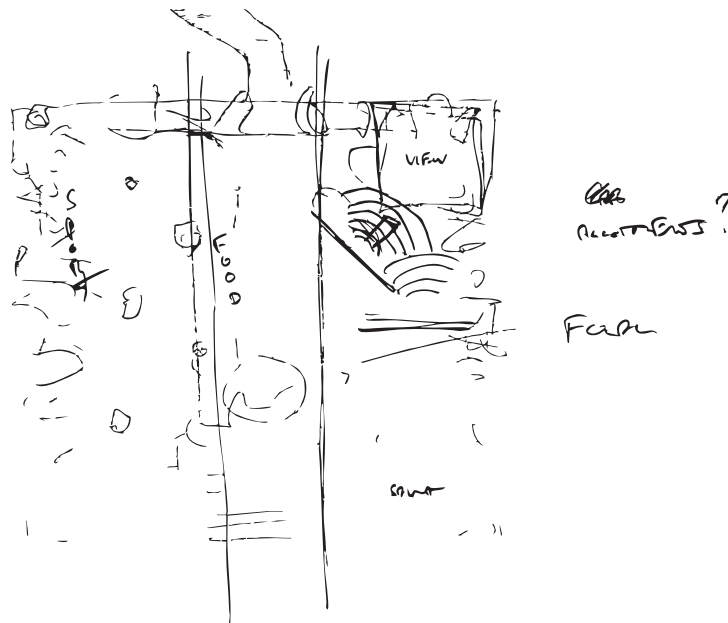
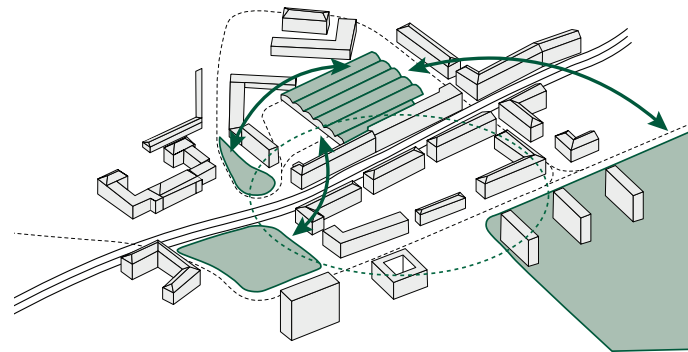
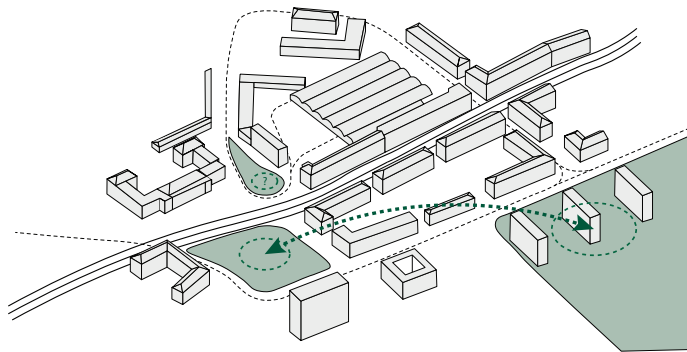
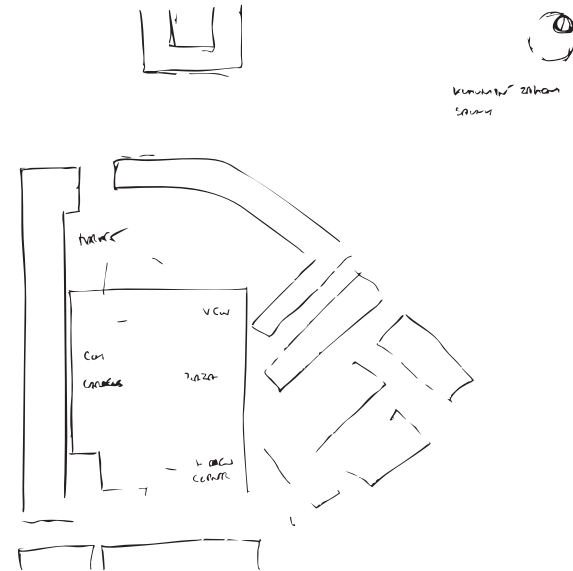
It is worth noting that the accommodation of any vegetation on such an artificial structure will not work as a closed ecosystem, will require substantial resource input in the form of soil enrichment and irrigation to kick-start the living process and will require maintenance throughout its existence. Nevertheless, a tailored variety of species can have a positive impact on the wellbeing of other plants in the neighbourhood as well as the wellbeing of local residents.

The taller tree species will require an intensive type of roof-like soil cover of up to 90cm of substrate, which reflect in the support structure and waterproofing of the platform. The raised bed community garden planters require around 30-40cm of substrate in order to accommodate a variety of small produce yielding plants and herbs.

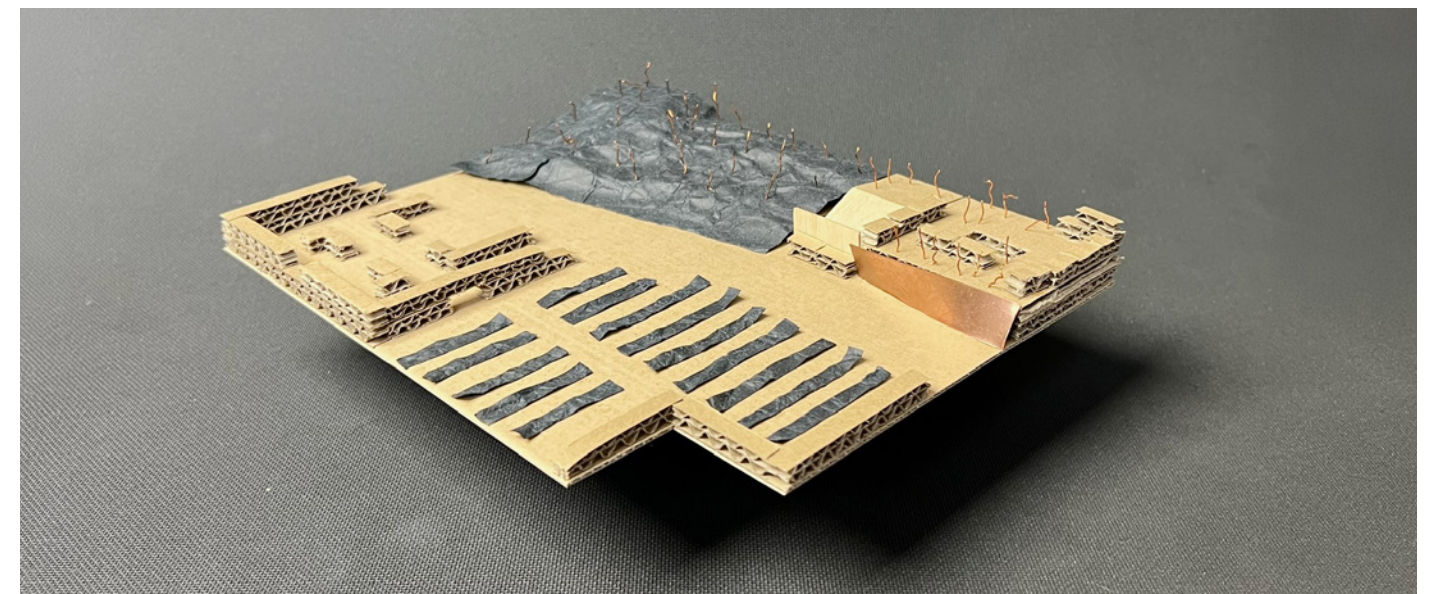
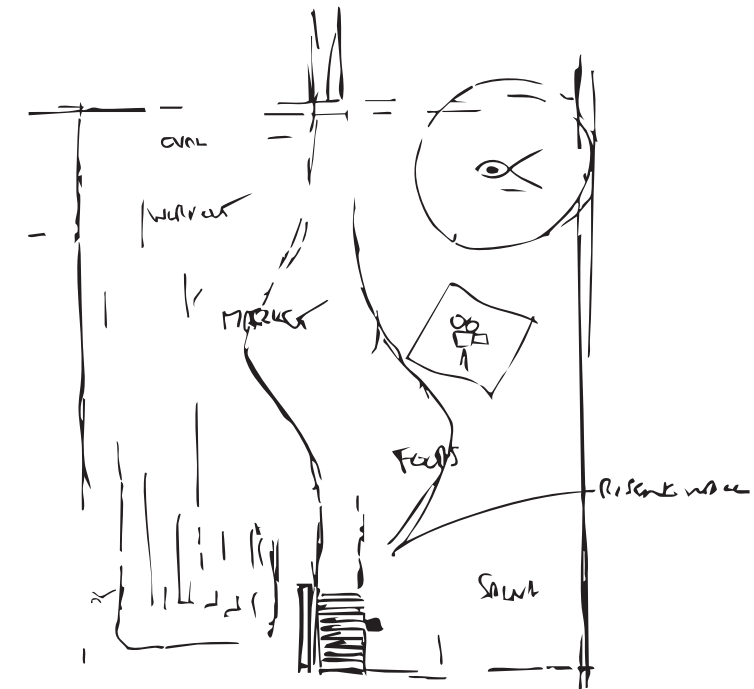
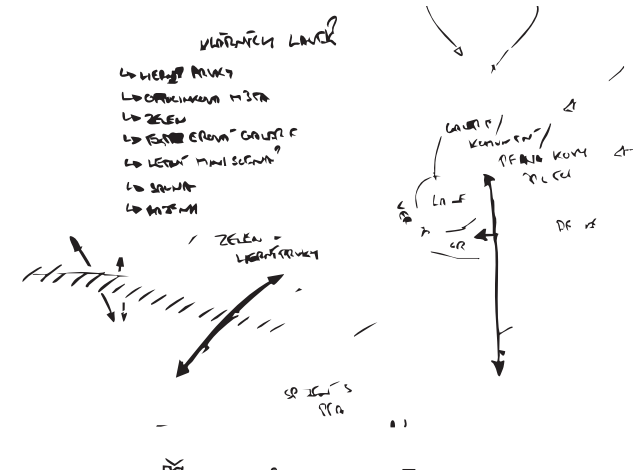
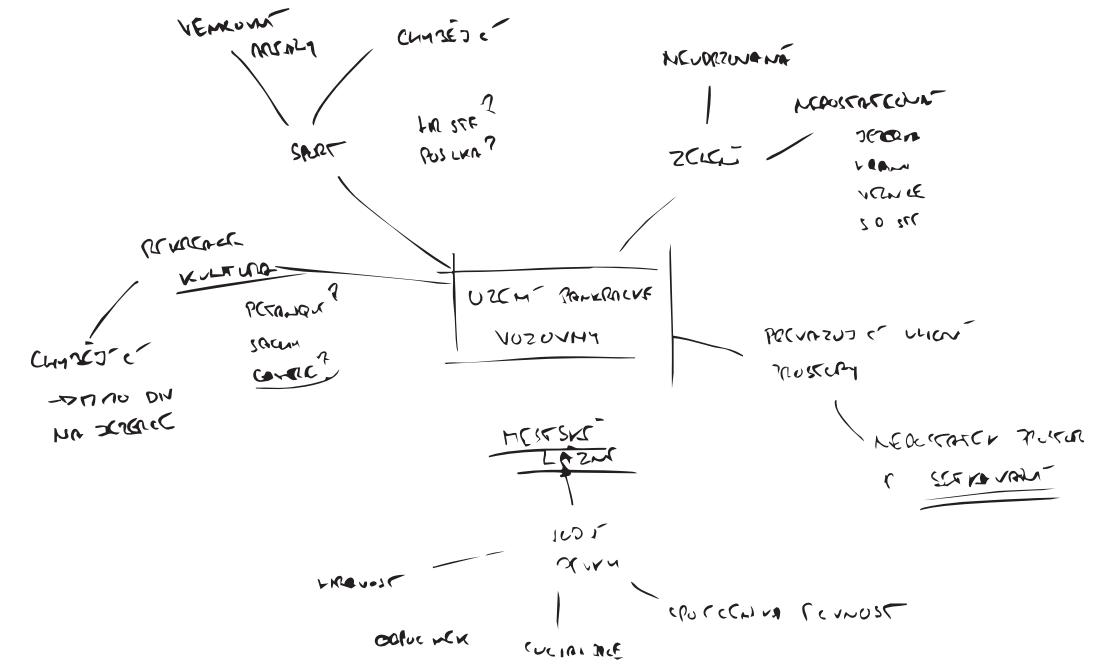
The lawns stretching on both sides of the main walkway can be fitted with a network of sprinklers that will ensure a sufficient supply of irrigation. This system can be connected to a ground water tank reserve embedded under the raising corners of the platform for surface runoff water collection.

Process

In response to the visionary assignment of covering parts of the city by a secondary layer, the initial design proposals began with more modest and smaller interventions. After carefully mapping out the strengths and possible weaknesses of the surrounding neighbourhood, a variety of selected functions were gradually finding its way into what started to become a public piece of green raising above the city.

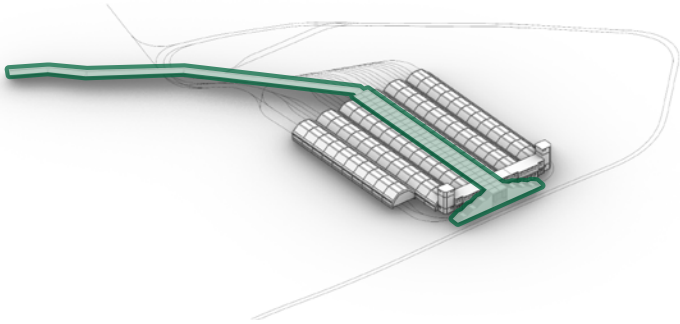


05 Introduction

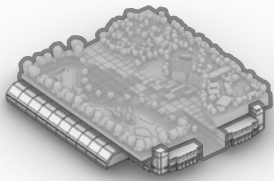
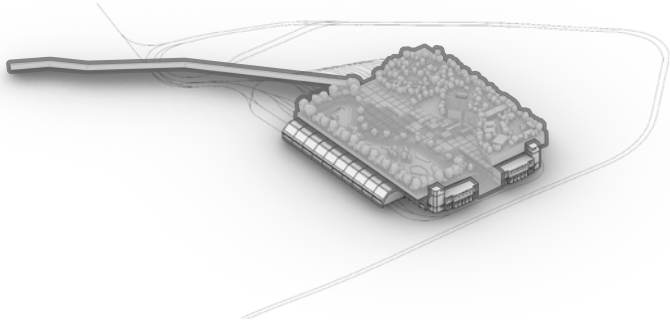


Stage One: connect

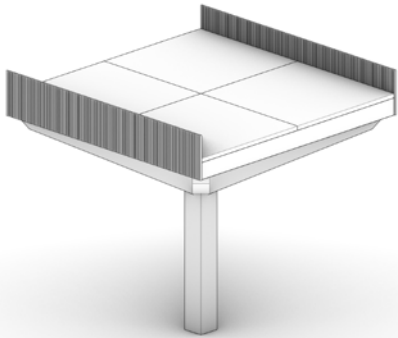
2025
The first stage works with a modular system of platforms that start to form walkways above and through a previously impenetrable site. It comes with a catalogue of functions that can be tailored to complement a given context and fill in on missing amenities a location may be in shortage of. During this first stage, the local residents start to gain consciousness of having the option to not only shorten their commuting distance, but also to use the new features this place may bring. This initial soft intervention also serves as a case study to what works and what does not, for a given location, based on user frequency and that can inform the programme to be delivered in stage two. This approach lowers the initial risk of deploying a full-scale development on a site with which the residents are not previously familiar with.



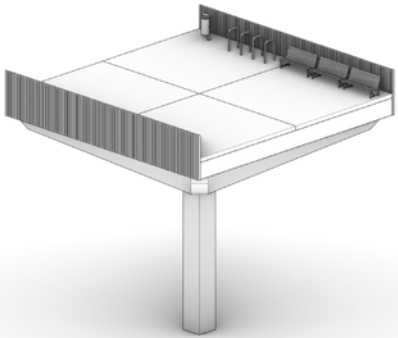
connect



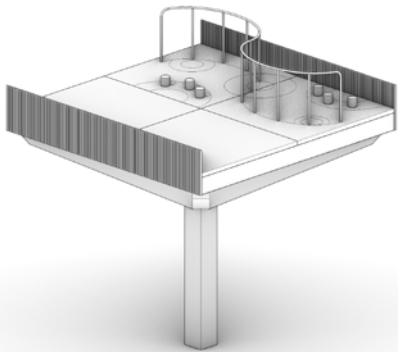
06 Stage One



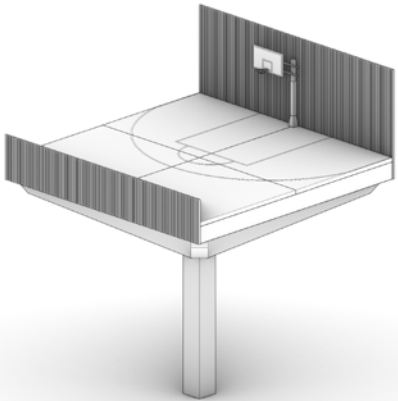
01_walkthrough



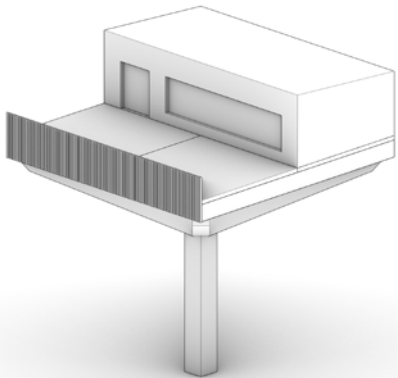
02_leisure



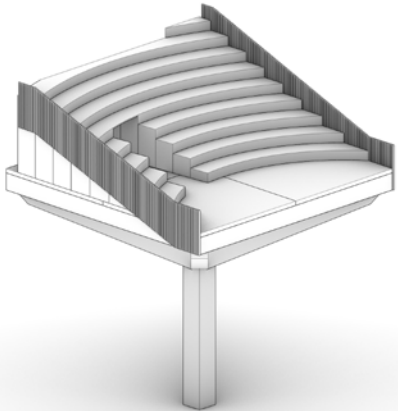
03_playground



04_sports



05_kiosk

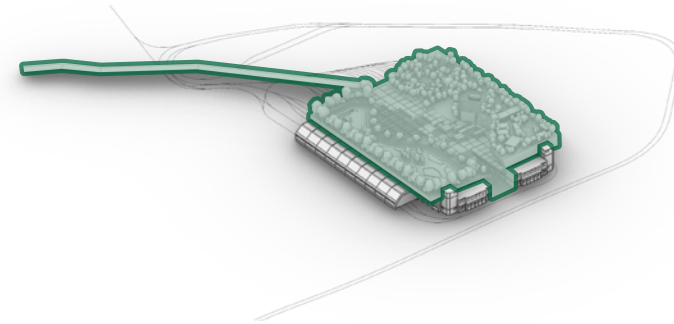
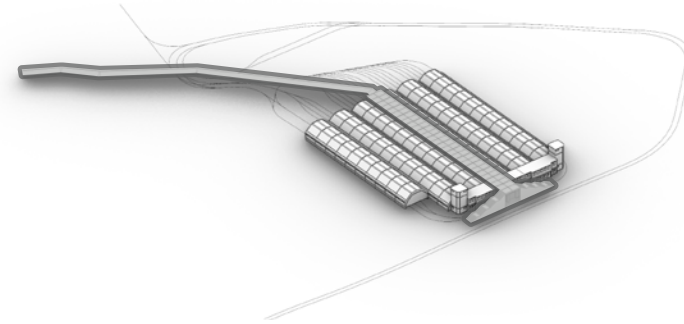


06_events

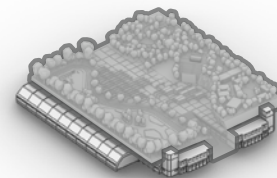
Stage Two: layer

2027

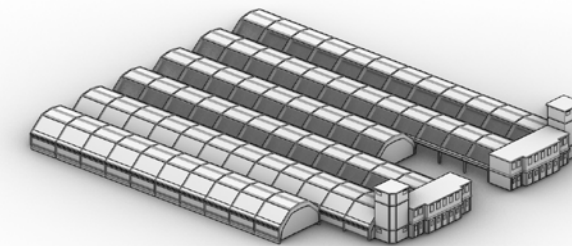
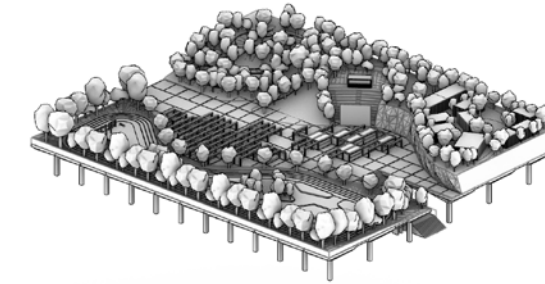
Stage Two develops the modular structure from Stage One into more permanent and extensive set of functions that complement the given context. It learns from the findings tested during the initial stage and benefits from incoming users who already got familiar with this redeveloping area previously. As pedestrian traffic increases not only from the immediate neighbourhood, activities have the potential to grow and attract higher quantities of both users and providers. During this stage the secondary layer becomes an integral part of the city with the primary function still in operation at ground level.



layer



07 Stage Two



Platform in wider context



07 Stage Two

5. května

Táborská

Nám. Hrdinů

Děkanská vinice I

Na Pankráci

Na Veselí

Magistrála

5. května

Hvězdova

0 100 200 400m



Immediate neighbourhood



07 Stage Two

Nám. Hrdinů

5. května

Na Pankrāci

Na Veselí

Magistrála

0 20 40 80m





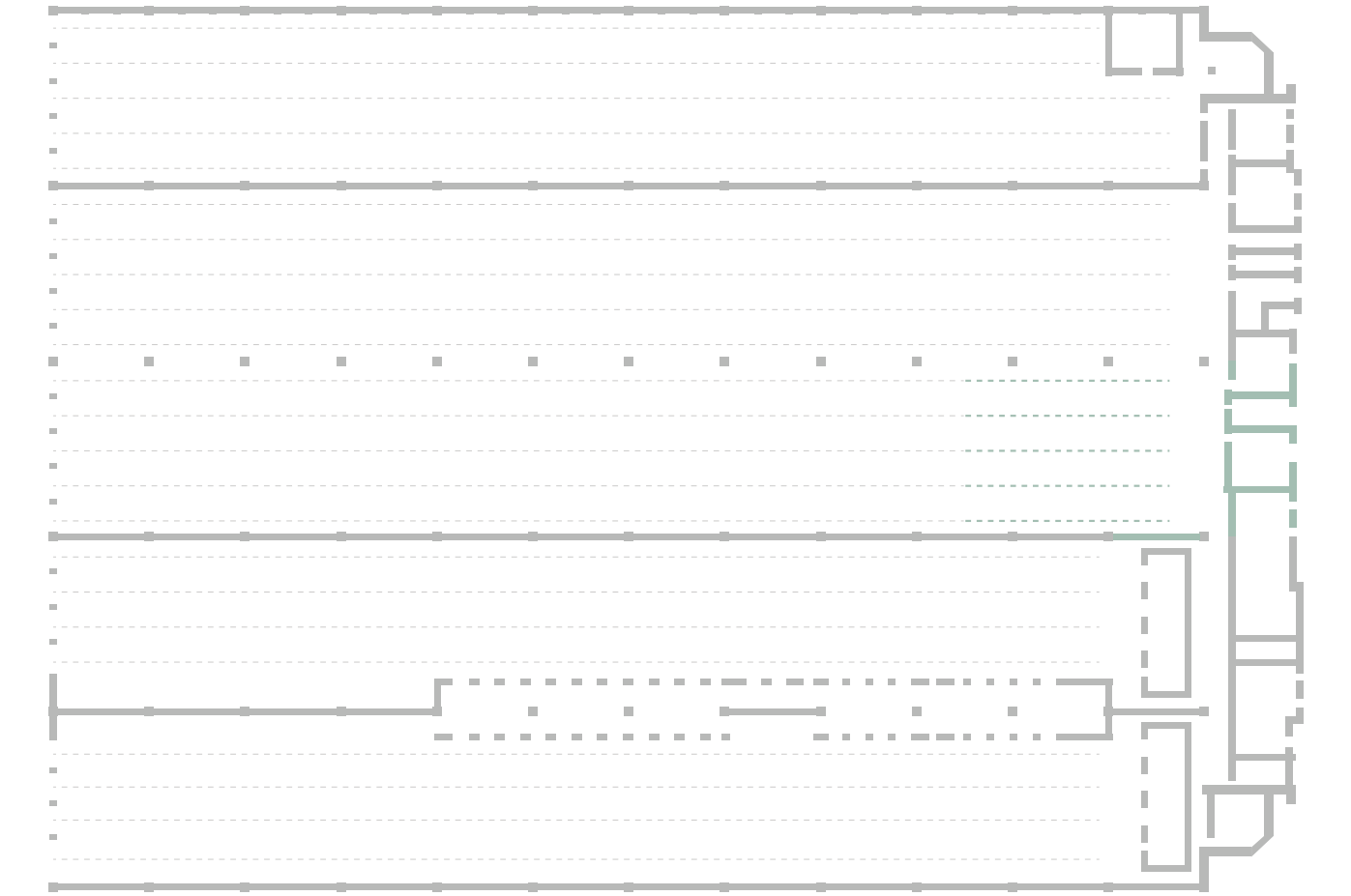
Depot modifications

In order to accommodate the proposed second layer, an additional support structure needs to be inserted within the reinforced concrete load bearing system of the existing depot. With the aim to minimise disruption, the insertion constitutes of an off site manufactured modular structure of glulam beams and cross-laminated timber panels.

The schematic ground level plan of the depot shows the minimum current structures that require demolition. This results in a loss of two

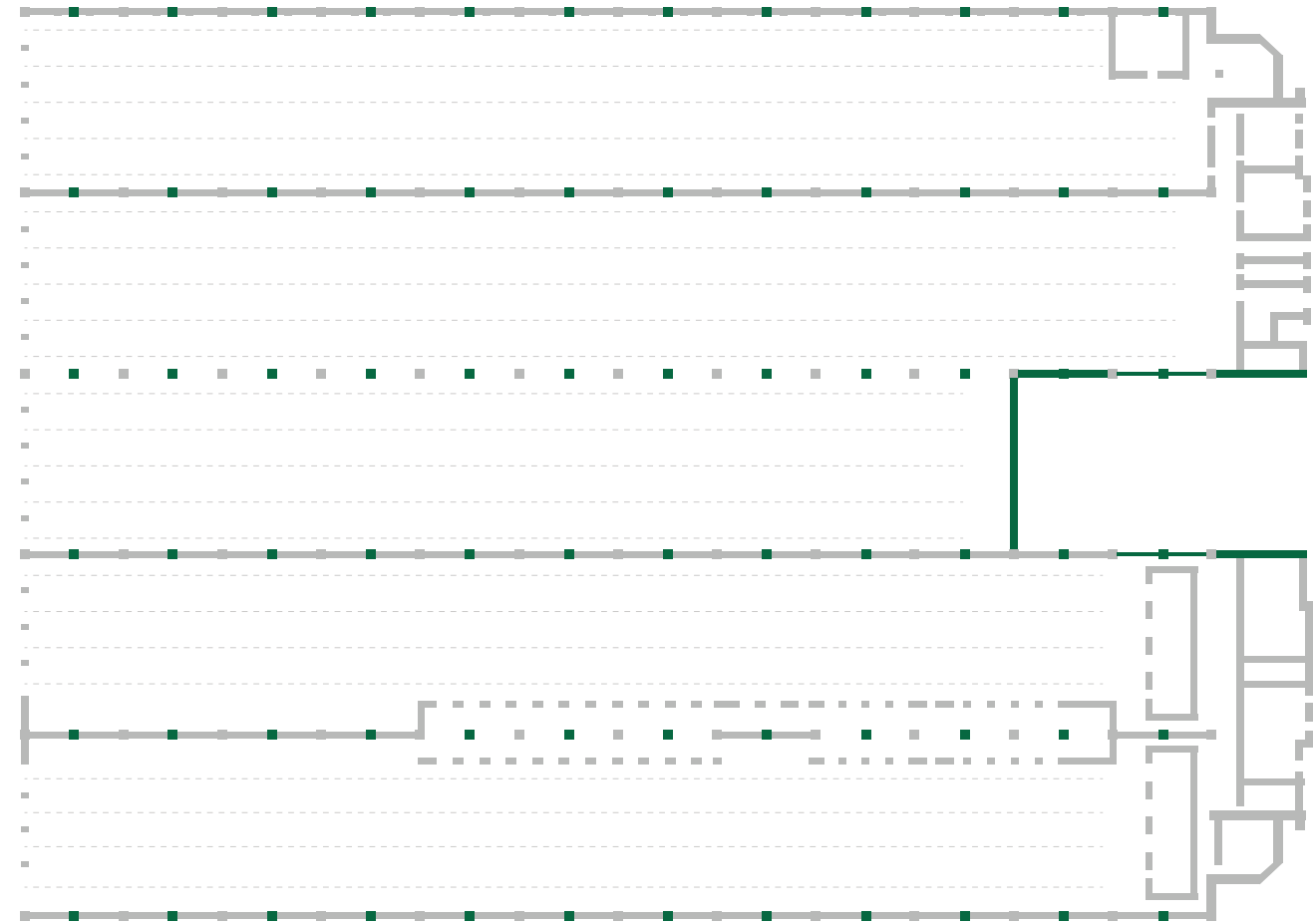
storage spaces located in the administrative area and five short garage spaces from the depot. For context, the depot's maximum garage capacity is over 108 trams, so the reduction accounts to roughly 5%.

The additional columns to support the platform above the depot are strategically placed in between the column grid of the long span arches. This approach was determined to be the least invasive and it can also be implemented in stages and with minimum disruption to the depot's operations.



before modifications

- existing structures
- demolitions
- additions



after modifications

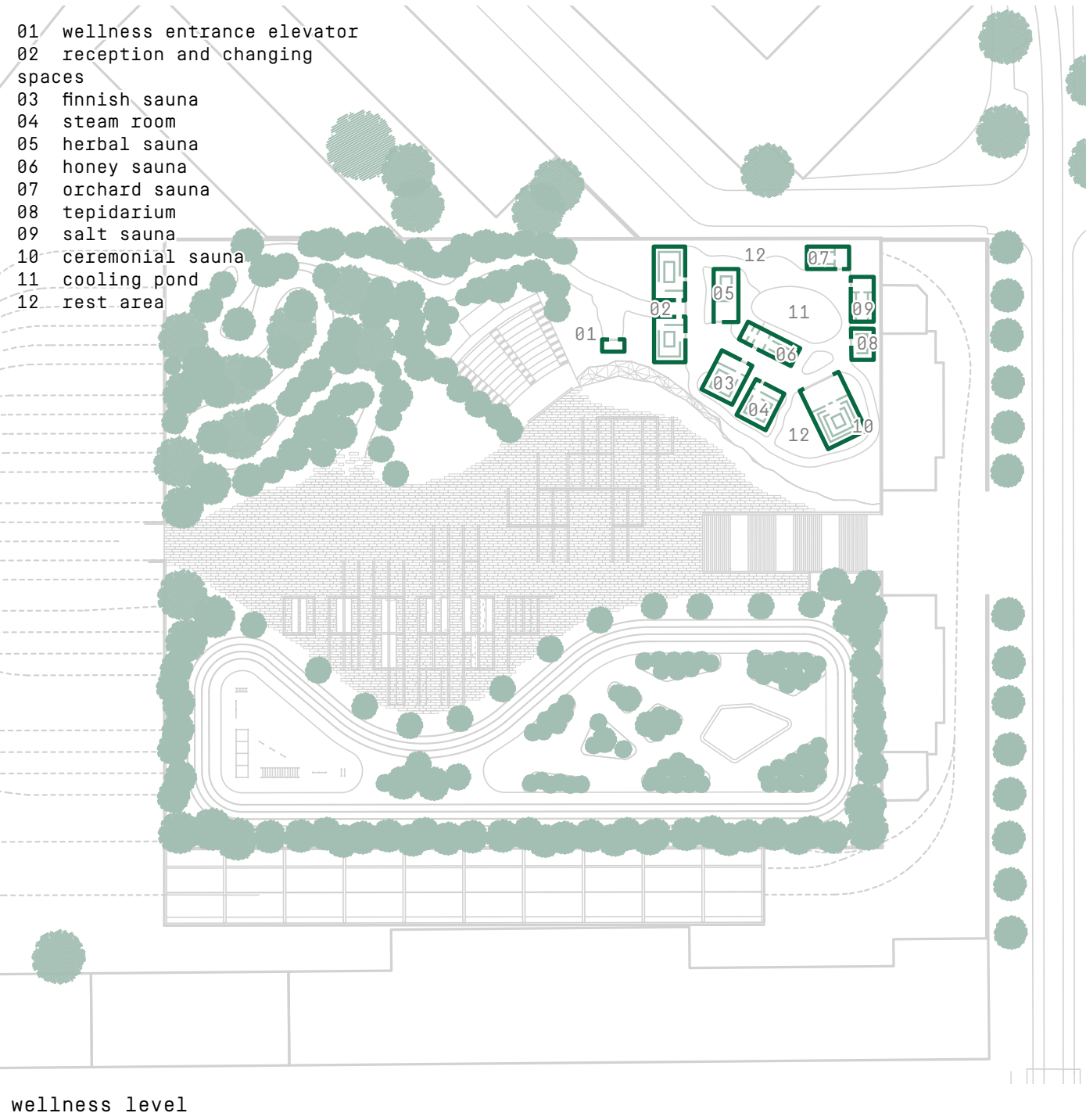
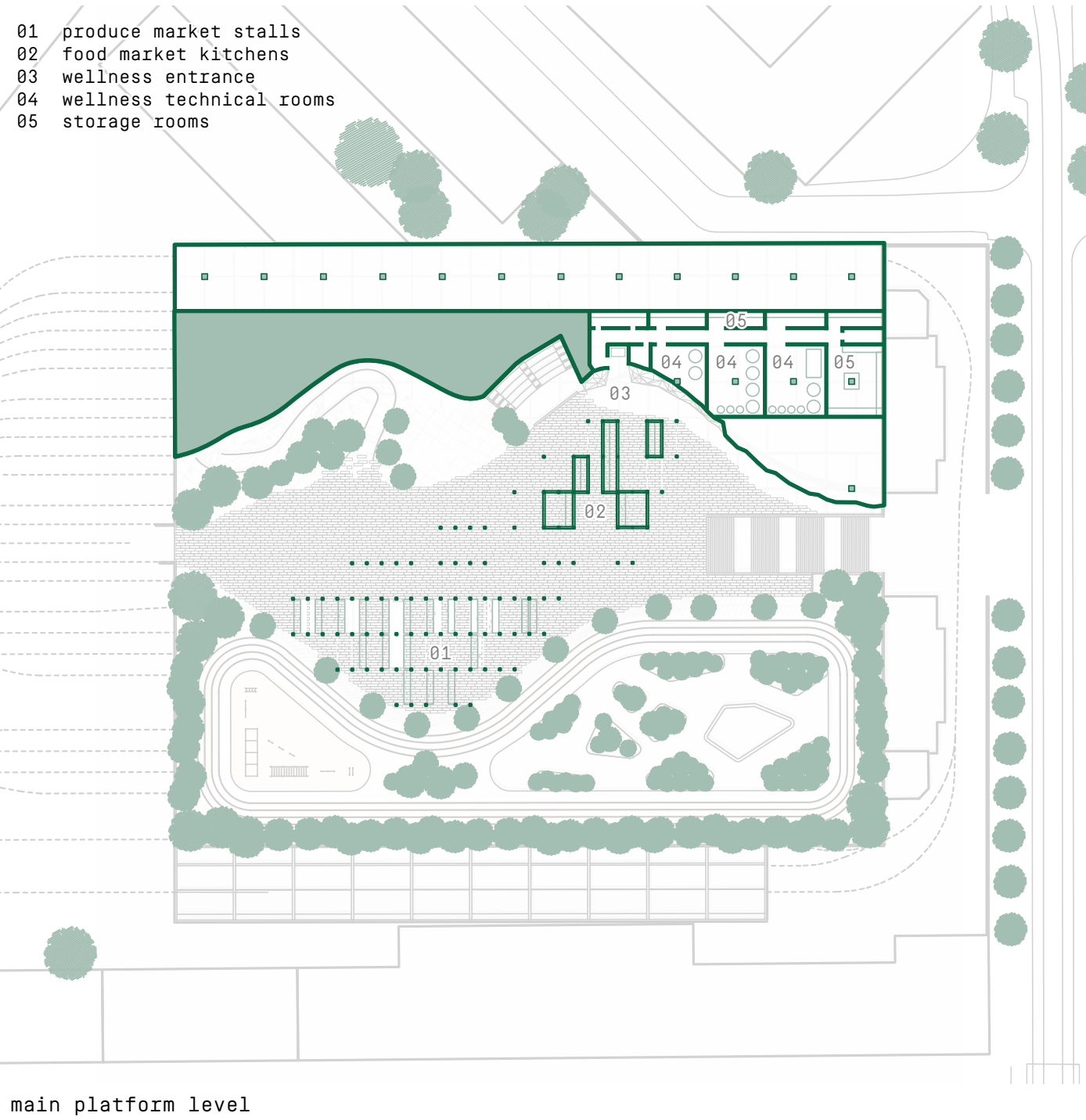


Bird's eye view of the platform

07 Stage Two

- 01 forest trail
- 02 viewpoint
- 03 main lawn
- 04 outdoor cinema
- 05 elevator to wellness
- 06 wellness corner
- 07 climbing wall
- 08 climbing wall reception
- 09 food market
- 10 produce market
- 11 elevator from street level
- 12 access from nām. Hrdinū
- 13 access from Na Veseli
- 14 seating areas
- 15 free running track
- 16 public workout park
- 17 raised bed comm. gardens
- 18 water feature

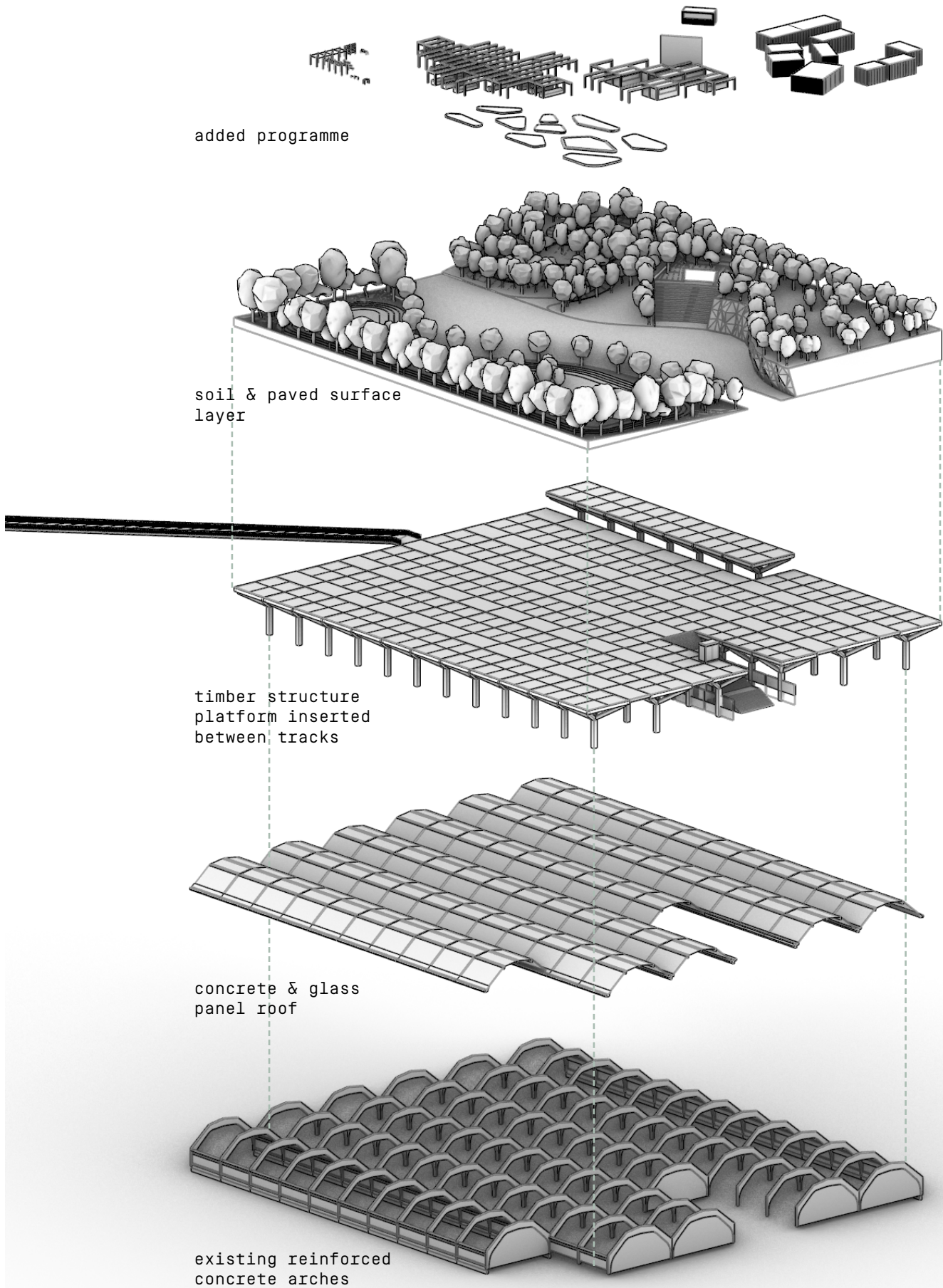
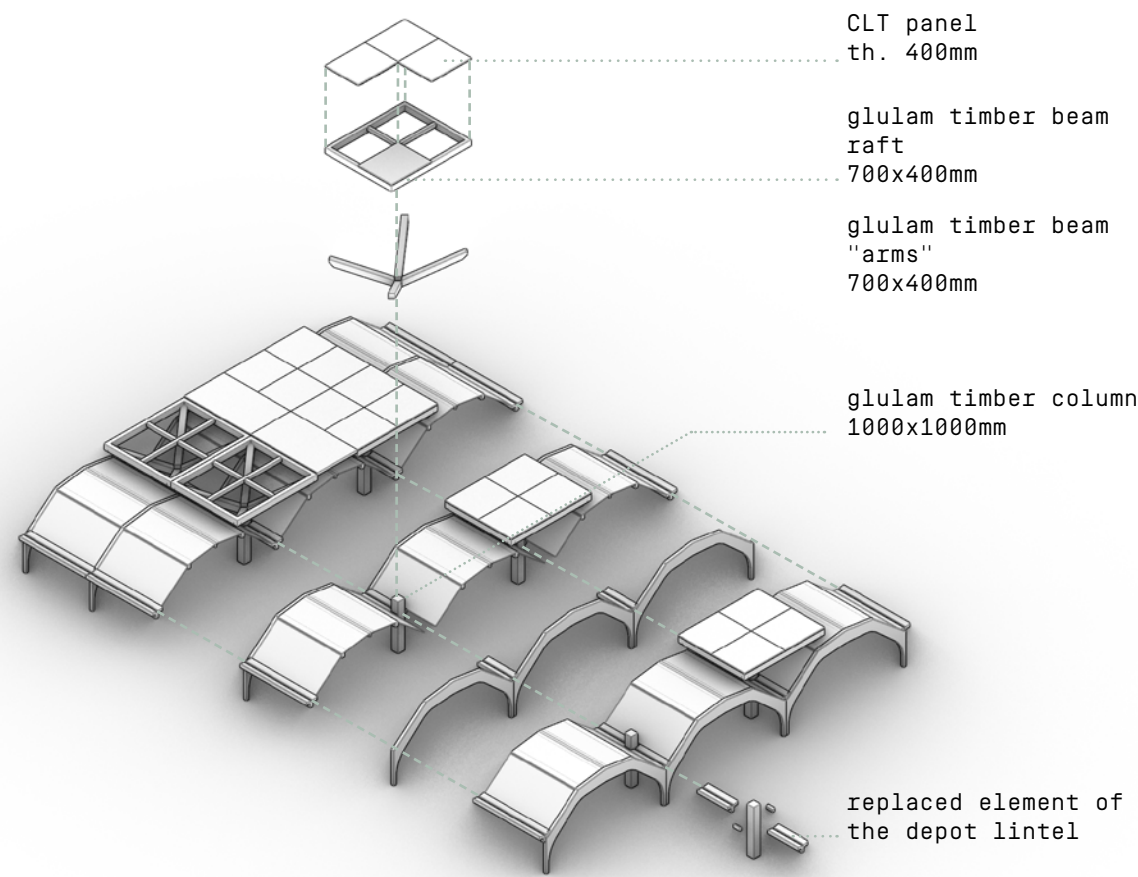




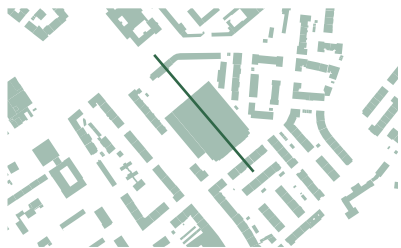
Structural strategy above an operational depot

The new layer above the depot is assembled from timber components to facilitate a fast and minimally invasive process of construction on site. This is achieved by manufacturing the glulam timber columns or beams and cross-laminated timber panels off site, which shortens the requirements for assembly time on site as the individual components are mounted together through connectors,

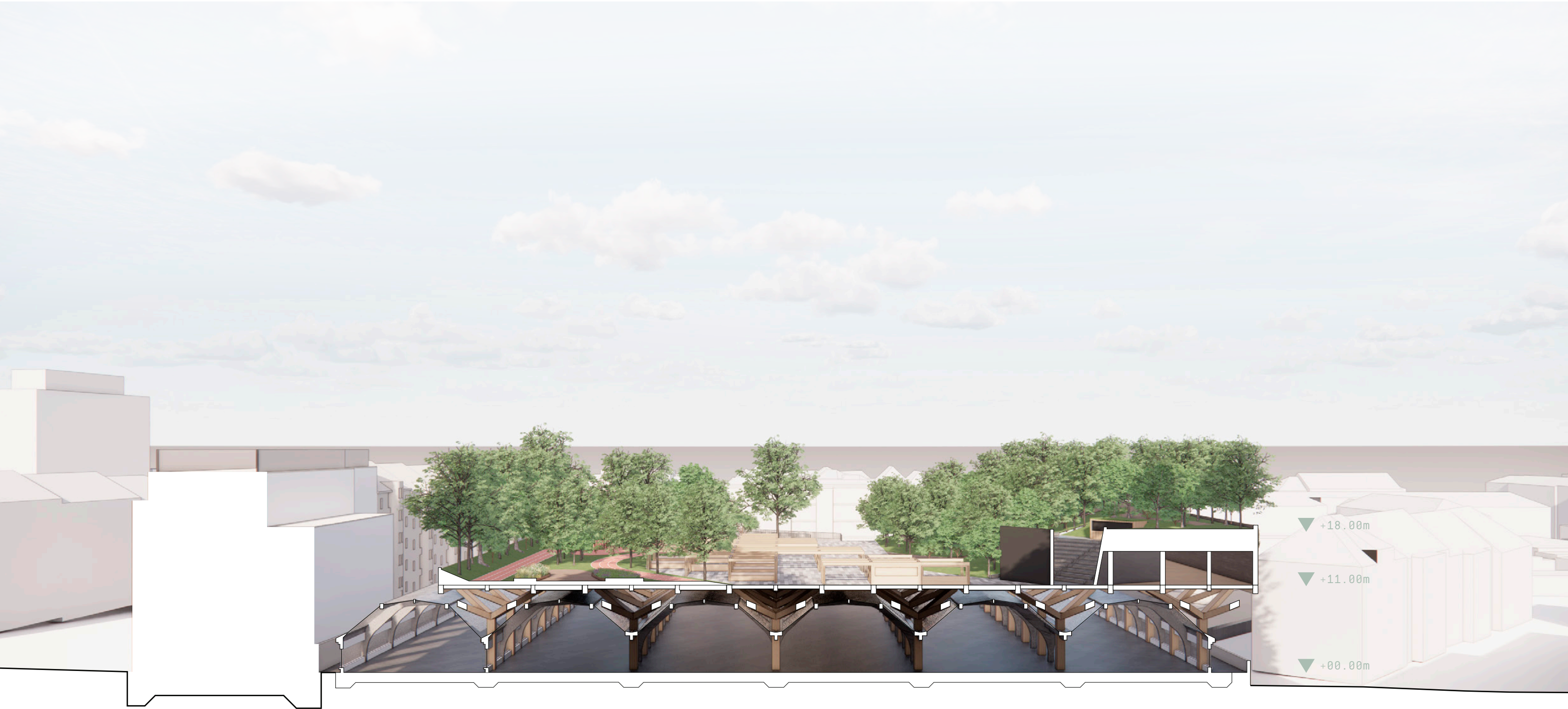
which exclude time consuming wet processes. After the main platform above the depot is constructed, it is possible to accommodate prefabricated concrete profiles with waterproofing which will contain the soil. Any electrical or plumbing installations can be fitted to the underside of the platform and joined with existing city services present on site.



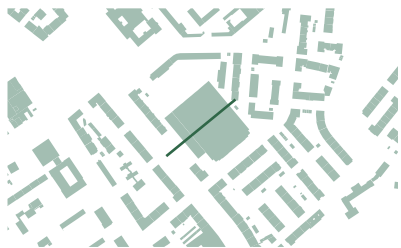
Section through the main walkway



Section through the new layer and the old depot



▼ +18.00m
▼ +11.00m
▼ +00.00m





morning at the running track



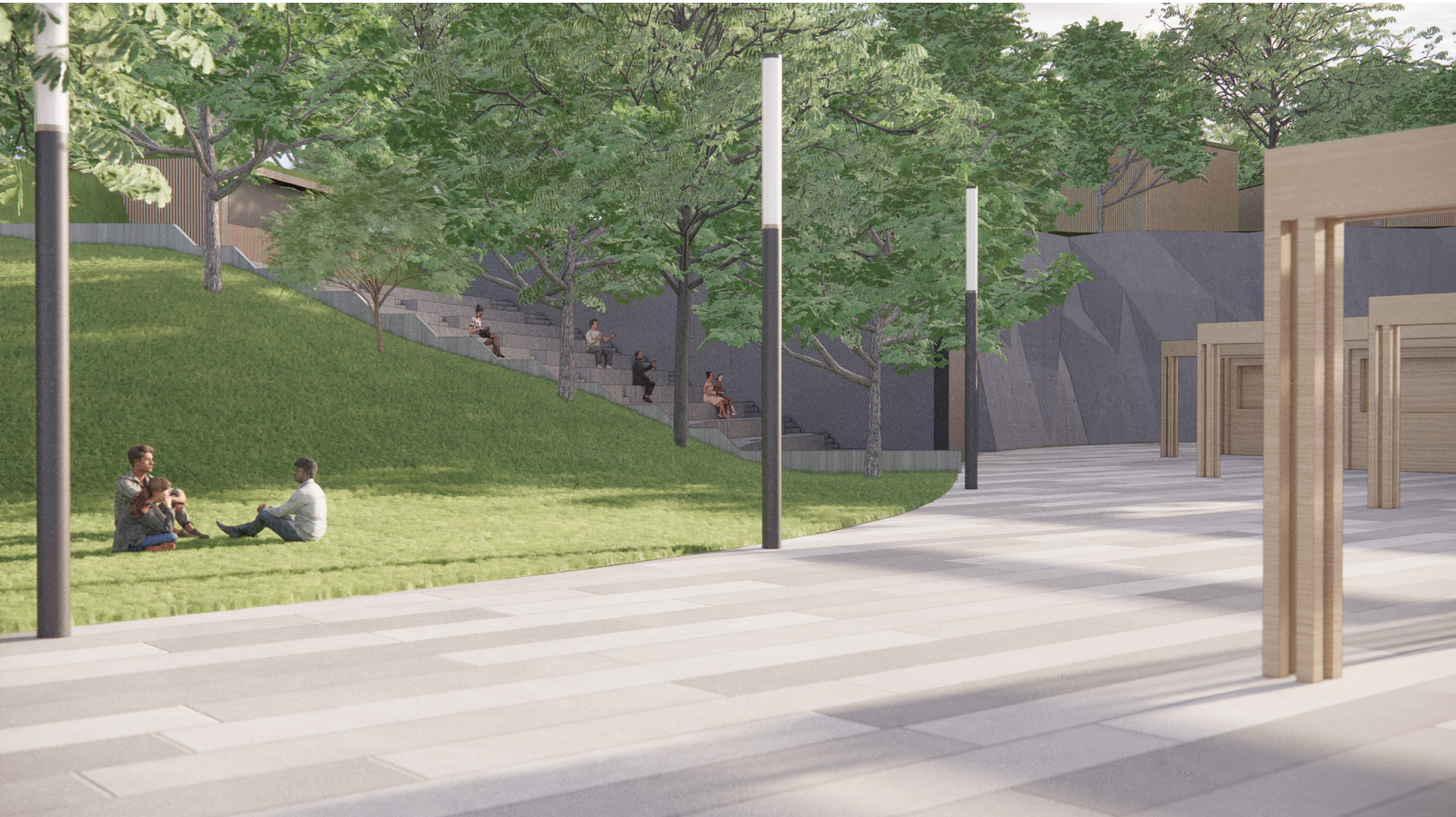
raised community gardens next to the running track



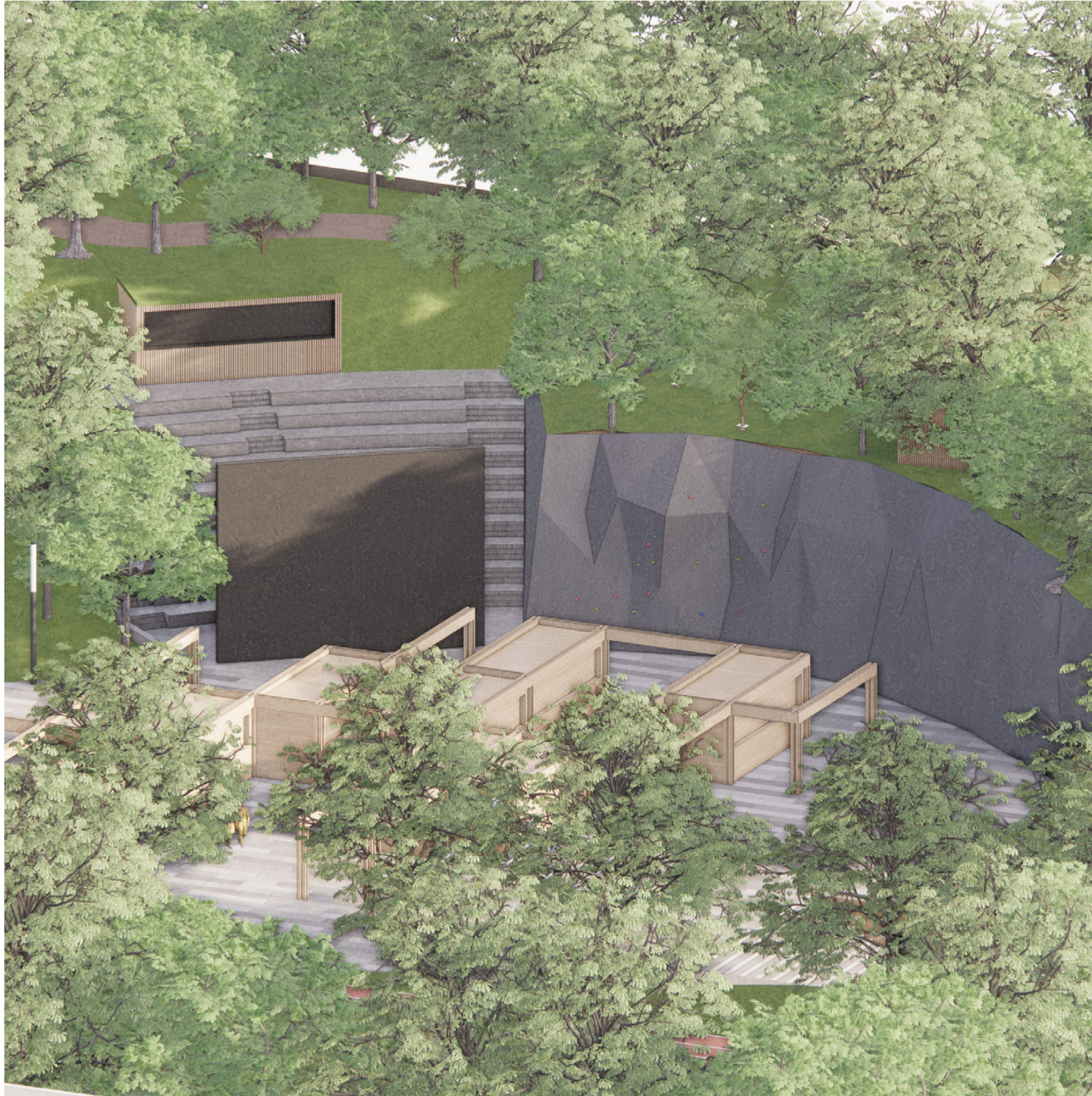
outdoor cinema and food market



forest trail to the viewpoint



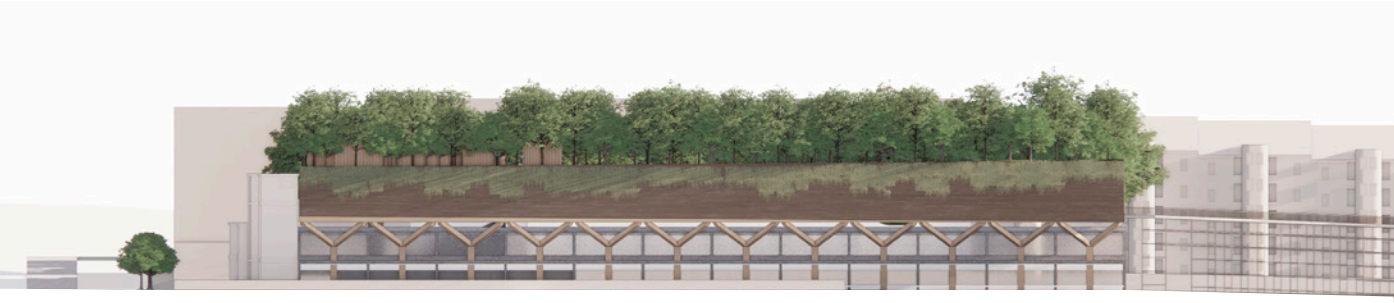
outdoor cinema with climbing wall in a distance



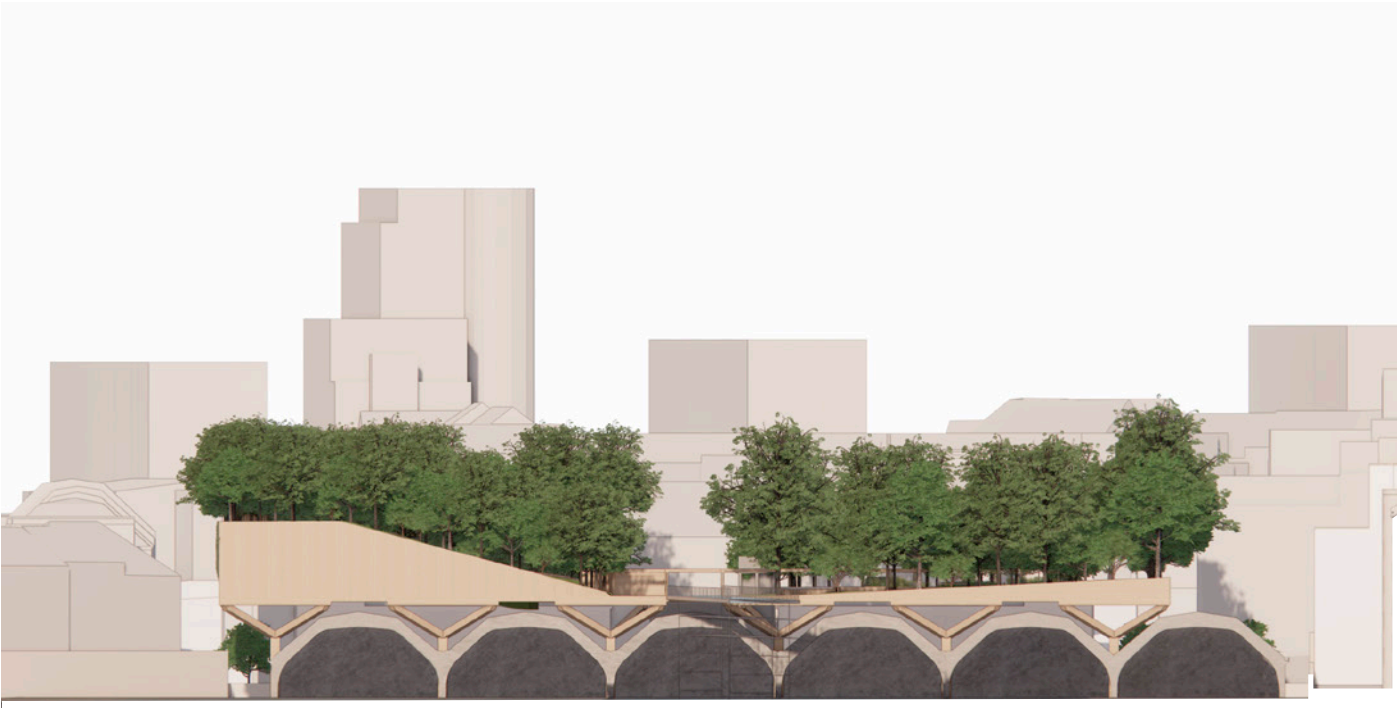
climbing wall, food market and outdoor cinema

Elevations in its neighbourhood

07 Stage Two



northeast



northwest



southwest



southeast



Environmental strategies

07 Stage Two

wildlife refuge

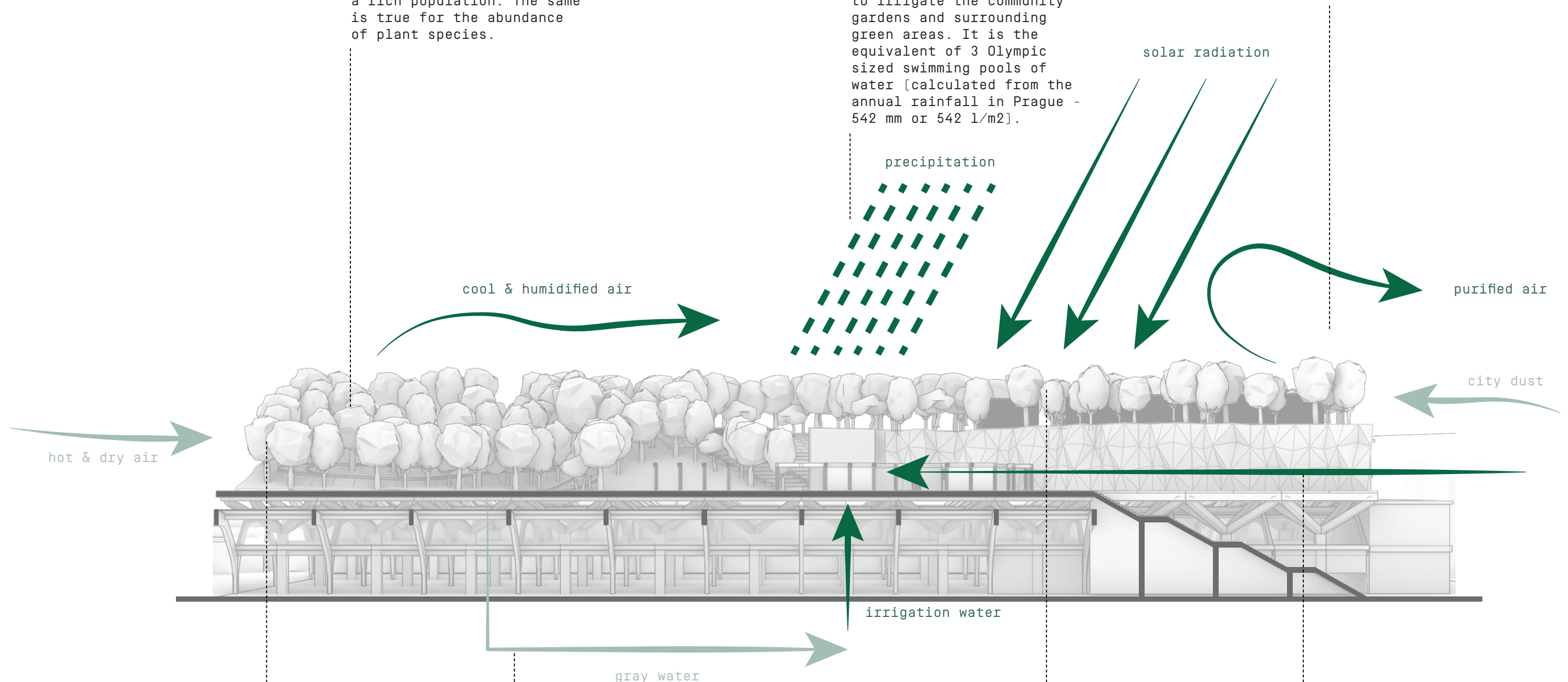
The treetops high above the dog walkways provide a safe refuge for thousands of bird species, allowing them to breed and maintain a rich population. The same is true for the abundance of plant species.

precipitation

An extensive area of the platform has the ability to collect up to 7 805 000 litres of rainwater annually, which can be used to irrigate the community gardens and surrounding green areas. It is the equivalent of 3 Olympic sized swimming pools of water [calculated from the annual rainfall in Prague - 542 mm or 542 l/m²].

city dust

Tall greenery and grasses trap small particles of urban dust, creating a more pleasant environment in and around the platform.



microclimate

The vegetation on the platform humidifies and cools the surrounding air, creating a pleasant environment both up and at the street level, especially in the warmer months.

root water filtration

After initial filtration, the waste greywater from the food market can be passed through root treatment stations in the raised beds of the community garden and reused later for irrigation and similar.

heat island effect

Green surfaces in general have a higher solar radiation absorption than hard surfaces of the streets and roofs, which in turn lowers the heat emission to the surrounding city.

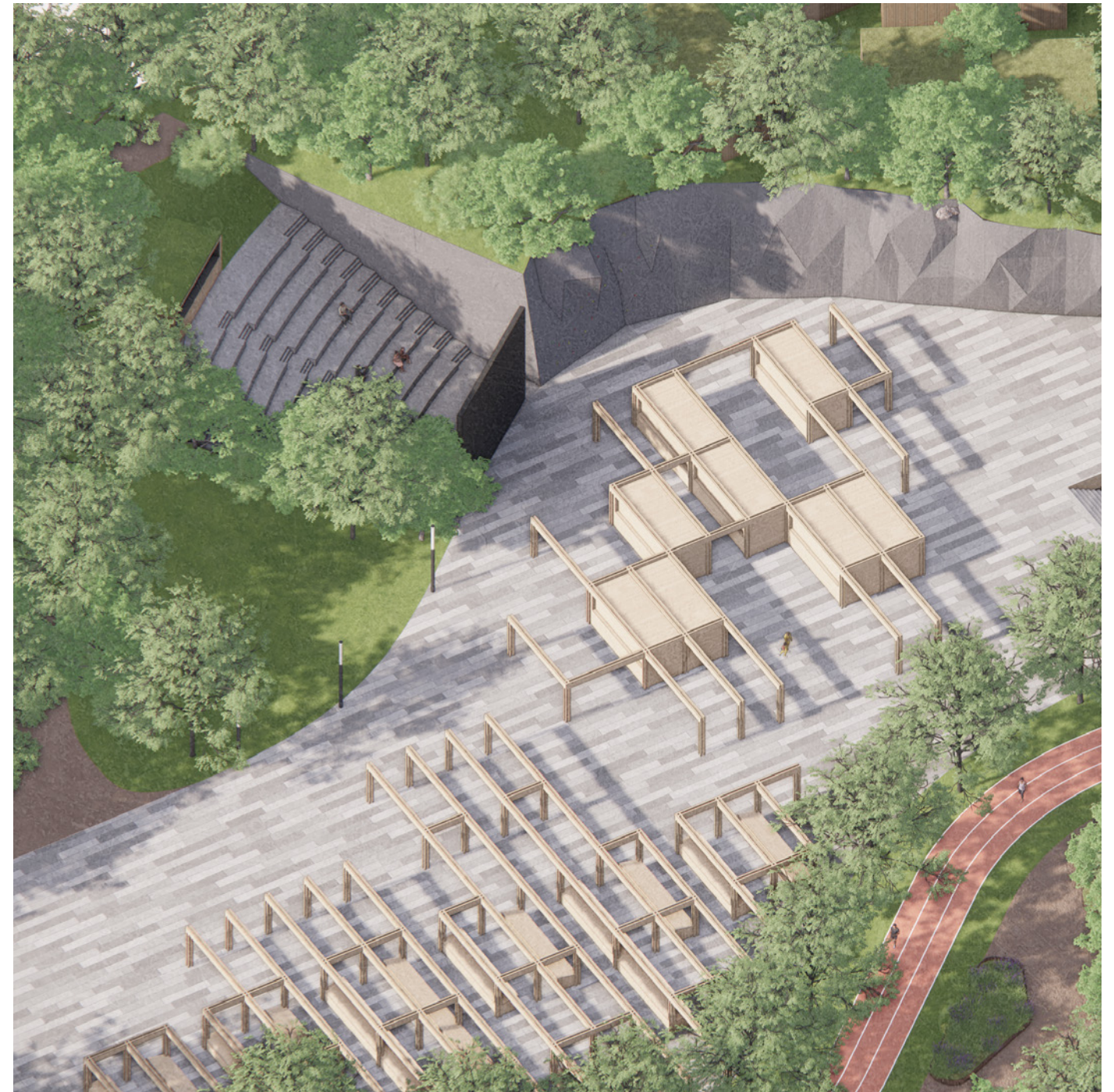
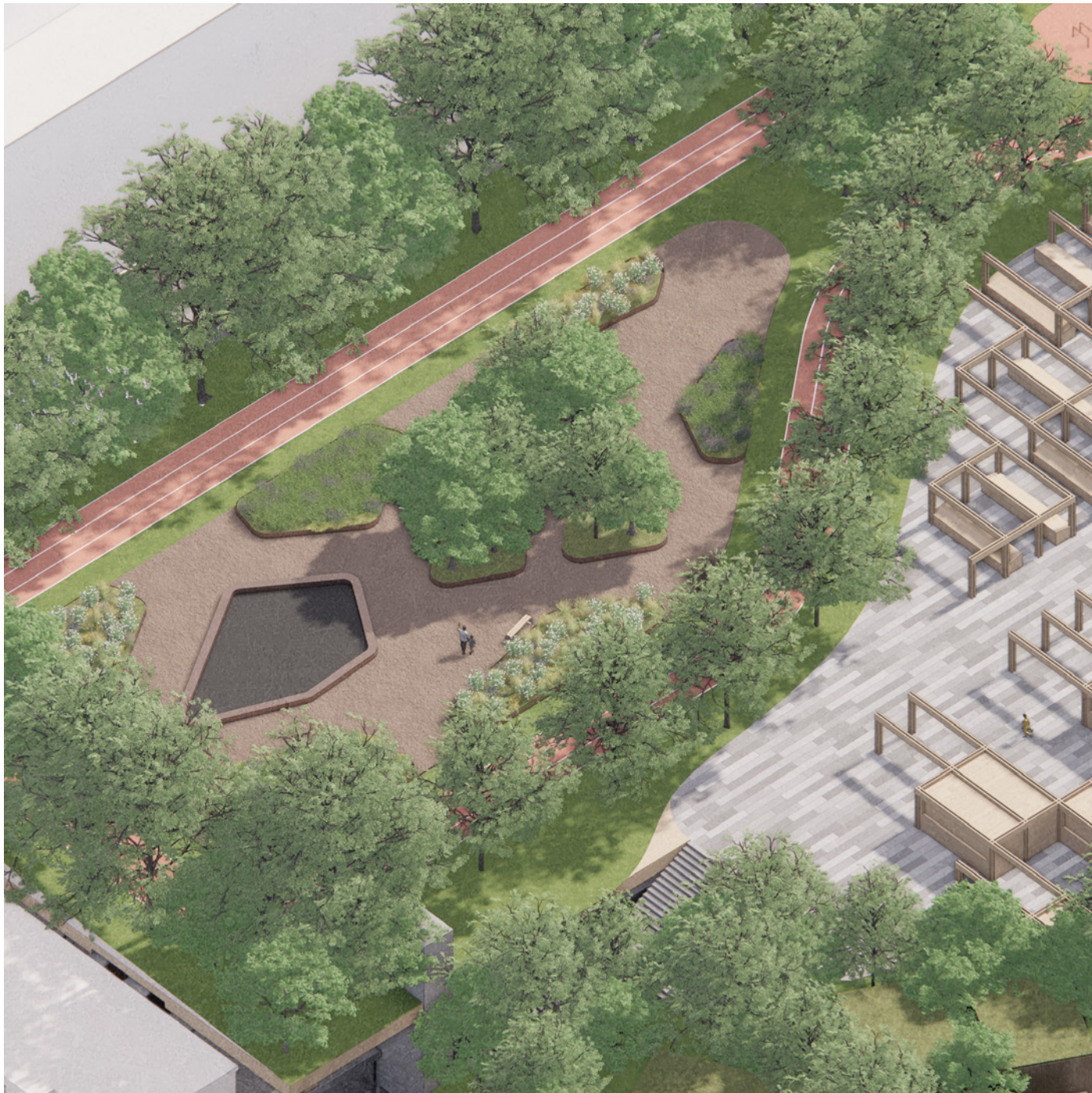
pollination

A rich variety of plants in the beds will allow bees to pick up pollen and disperse it around the surrounding area in the city, thus increasing the overall biodiversity in the surrounding area.



raised community gardens with a water feature

community gardens surrounded by the running track



produce and food markets at the central walkway



public workout park corner



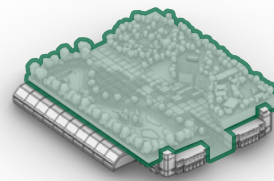
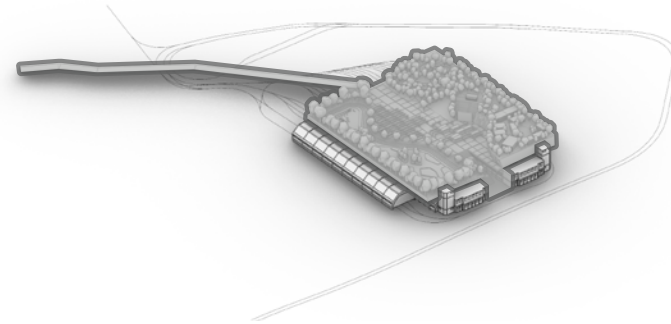
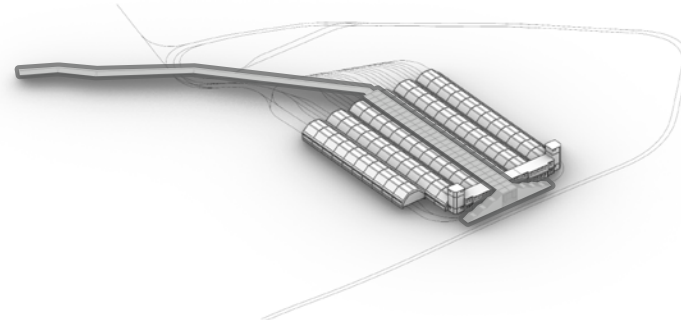
morning at the running track



Stage Three: relocate

2035

Stage Three is a far future scenario, which questions the placement of the original ground level function in the urban context – a tram depot. Should these technical structures be in the way of actively using the ground level in our cities? Given that tram depots would work similarly without access to daylight, can we place them underground? This third stage entertains the solution of placing this typology of infrastructures below ground level in order to extend the function of the secondary layer as an active urban space even at ground level.



relocate

Conclusion

08 Stage Three

"Revive & connect your city from above" is a theoretical study that has explored and tested a potential application of a secondary structure above an existing occupied site in the urban neighbourhood of Prague. Specifically, it proposes a new green layer above the Pankrác tram depot.

The proposal builds on the lacking and missing amenities of its context, which were determined as insufficient accessible maintained green spaces and a shortage of recreational, sports and cultural institutions. Therefore, the proposed second layer raised above the depot clusters a selection of these functions in order to form new points of interest for the residential community of the surrounding neighbourhood. Aside from aiming to attract residents to a previously inaccessible extensive stretch of land, the new layer offers a shorter and more comfortable pedestrian connection between the public transport at Pražského povstání and surrounding residential blocks across Magistrála.

This new public green space area has the potential to strengthen not only the local community, but also to attract more active users to Pankrác to kickstart the neighbourhood as a more liveable and affordable district not far

from the city centre. Nevertheless, after viewing this study as a visionary proposal, there is room for integrating this secondary layer more seamlessly into the fabric of an active industrial site. Similarly, the connection between the old building of the depot, as an exemplary technical structure, and this new green layer has the potential to communicate more effectively in order to make its users aware of the activities taking place at ground level.

And now the question that remains: what actions, in the real built environment, will we take to push similar visions for more integrated, pedestrian centred and liveable cities to find their way into reality?

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Formal assignment



České vysoké učení technické v Praze, Fakulta architektury

Zadání diplomové práce

Mgr. program navazující

Jméno a příjmení: BA. Michal Zapletal
datum narození: 9. září 1998
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téma diplomové práce: Město nad městem – Densifikace a udržitelnost města prostřednictvím nástaveb

zadání diplomové práce:

1/ popis zadání projektu a očekávaného cíle řešení

Cílem je prověřit možnou funkci / výstavbu nad vozovnou Pankrác. Vozovny jsou plošně extenzivní, ale v zásadě jen jednopodlažní stavby, často skeletové, obvykle „pohlčené“ okolním městem. Diplomní práce naváže na diplomní seminář, v rámci kterého jsme zkoumali, jak by se mohlo město rozrůstat, vyvíjet, nestárnout, nacházet nové funkce, aniž by se zvětšovala jeho zastavěná plocha a tak, aby proces vývoje byl co nejvíce udržitelný po všech stránkách.

2/

Nalézt vhodnou funkci pro prostor tramvajové vozovny Pankrác, která by zároveň mohla být umístěna do druhé vrstvy společně se zachováním alespoň částečného provozu vozovny. Očekávaným řešením je návrh doplňkové stavby, jejíž stavba/montáž co nejméně naruší provoz tramvajové vozovny a nevhodněji obohatí oblast Pankrác v již existující zástavbě.

3/ popis závěrečného výsledku, výstupy a měřítko zpracování

Odevzdány budou postery v rozsahu dle požadavků FA ČVUT a 2 vytištěná portfolia (jedno bude archivováno na ústavu). Diplomová práce bude zveřejněna dle požadavků studijního oddělení FA.

Bude zpracováno urbanistické řešení vč. návaznosti na okolí a řešení veřejného prostoru, podrobně navrhovaná budova pak na úrovni detailní studie. Součástí projektu bude:

Analytická, textová část a koncepční část

- Autorský text; analytická část; koncept řešení znázorněný pomocí schémat
Urbanistické řešení

- Situace širších vztahů 1:2500, urbanistické řešení prezentované na situacích, axonometrii a celkových vizualizacích

Vybraná část na úrovni detailní studie

- Půdorysy typických podlaží 1:200; typické řezy (příp. perspektivní řezy) včetně návaznosti na nejbližší okolí 1:200, pohledy; návrh interiéru zvoleného prostoru nebo interiéru veřejného prostoru; principy technického a konstrukčního řešení, principy udržitelnosti, detail (řez, pohled) vybraného segmentu fasády 1:20; vizualizace (exteriér, interiér, příp. zákresy do fotografie) dostatečně vysvětlující návrh (nejméně 7 pohledů).

Součástí projektu mohou být i další výstupy potřebné pro prezentaci návrhu. Výstupy a jejich měřítko mohou být vzhledem k vývoji práce upraveny dle dohody s vedoucím DP.

4/ seznam dalších dohodnutých částí projektu (model)

Model v min. měřítku 1:500 včetně nejbližšího okolí.



Datum a podpis studenta

16. září 2024

Datum a podpis vedoucího DP

Datum a podpis děkana FA ČVUT

registrováno studijním oddělením dne

16/9/24 Krug

Author ' s Declaration

CZECH TECHNICAL UNIVERSITY IN PRAGUE
Faculty of Architecture

International Office
Thákurova 9, 166 34 Prague 6, Czech Republic



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| CZECH TECHNICAL UNIVERSITY IN PRAGUE FACULTY OF ARCHITECTURE | |
| AUTOR, DIPLOMANT: Michal Zapletal AUTHOR OF THE DIPLOMA WORK / DIPLOMA PROJECT Academic Year 2024/2025 Semester Winter | |
| TITLE OF THE DIPLOMA WORK / DIPLOMA PROJECT (IN CZECH LANGUAGE) Nastartuj & propoj si své město nad městem | |
| TITLE OF THE DIPLOMA WORK / DIPLOMA PROJECT (IN ENGLISH LANGUAGE) Revive & connect your city from above | |
| LANGUAGE OF THE DIPLOMA WORK / DIPLOMA PROJECT: English | |
| Diploma Work / Diploma Project Supervisor | Department of Architectural Design II Dalibor Hlaváček |
| Diploma Work / Diploma Project Opponent | Winy Maas |
| Key Words (Czech) | densification, public infrastructure, urban layers, city barriers, biodiversity, green spaces |
| Abstract [English] | As the densification of urban areas presents the potential to lower energy requirements of our activities, this Diploma project envisions the introduction of a secondary layer to existing structures in a city. Through mapping and analysis of potential structures, it was determined to focus on transport depots as many are situated within the fabric of urbanised areas and therefore pose as barriers in walkability of said neighbourhoods. In addition to forming new pedestrian connections, this secondary layer aims to fill in on the missing functions, specific to its surroundings, with accessible green spaces at its core. Considering this proposal as a future vision of transforming the structure of cities, this Diploma project introduces the layer above in three stages - connect, layer and relocate. This phasing allows local residents to gain consciousness of a new zone, and the modularity of the new structure facilitates the potential to reuse its components in multiple sites. |
| Anotace [Česky] | Zahušťování neboli densifikace měst představuje potenciál pro snížení energetických potřeb lidských činností. Tento Diplomní projekt tedy nabízí vizi umístit nad vybrané stávající městské struktury sekundární vrstvu. Skrze mapování a analýzy potenciálních struktur byla depa dopravního podniku vybrána jako strategická místa pro umístění této sekundární vrstvy, neboť mnohá z nich se nacházejí v především residenčních oblastech, a představují tak překážku v pěší dostupnosti čtvrtí v jejich okolí. Kromě vytvoření nových pěších propojení má tato sekundární vrstva za cíl doplnit chybějící funkce v kontextu svého okolí, přičemž jejím jádrem jsou přístupné zelené plochy. Vzhledem k tomu, že tento diplomní projekt představuje budoucí vizi proměny struktury měst, je zamýšleno uvést tuto vrstvu nad městem ve třech etapách - propoj, vrstvi a přesuň. Tato etapizace umožní místním obyvatelům získat nový prostor postupně do podvědomí a modularita této nové struktury pak umožní opakovatelné využití komponentů i na dalších pozemcích. |

The Author's Declaration
I declare that I have elaborated the submitted diploma work / diploma project independently and that I have stated all the used information sources in coherence with the "Methodological Instruction for Ethical Preparation of University Final Works".
(The complete text of the methodological instruction is available for download on <http://www.fa.cvut.cz/En>)

In Prague on Sat 28th December 2024  Signature of the Diploma Project Author

This document is an essential and obligatory part of the diploma project / portfolio / CD.

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I would like to extend my gratitude to my diploma supervisors Dalibor, Martin and Veronika, for their resourceful and insightful incentives which always pushed this work forward, and for the opportunity to develop this engaging assignment that is not always the most straightforward to provide feedback on.

Thank you to my fellow diploma friends, with whom we share the experience of having designed and built a functioning bridge, for a welcoming work environment; my family for this unique opportunity to study Architecture in multiple locations around the world, but foremost my best friend Louis for providing me with continuous support and a supply of great coffee along this long journey.

You all have a part in this diploma project without which it would be an even greater challenge to put together.

Revive & connect your city from above

Master's Diploma Project by Michal Zapletal

ateliér Hlaváček-Čeněk-Tichá
winter semester 2024-2025

Czech Technical University in Prague | Faculty of Architecture
Department of Architectural Design II



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