MELT ICE INTO WATER

Transforming a Disused Ice Rink into a Swim and Bath Center

Author: Jiale Huang
Examiner: Walter Unterrainer
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Spring, 2025 | Building Design and Transformation for Sustainability
Chalmers School of Architecture | Department of Architecture & Civil Engineering

Master's Thesis in
Architecture and Planning Beyond Sustainability

CHALMERS
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Abstract

As cities continue to expand, the demand for public facilities increases accordingly. In Gothenburg, the existing indoor swimming pools can no longer accommodate the growing population, making the construction of new swimming facilities an urgent social necessity. However, indoor swimming pools are characterized by high energy consumption and significant environmental impact, posing challenges in terms of sustainability.

This study focuses on the recently demolished, disused ice rink Isdala in Gothenburg. Although the building has already been torn down, its original timber structure and some materials had significant potential for reuse, and the large-span space would have been well-suited to the spatial needs of a swimming facility. In addition, the surrounding community lacks access to public swimming facilities, making the transformation of this site especially meaningful. Therefore, this research takes a hypothetical approach to explore the adaptive reuse of the former building, proposing its transformation into a new indoor swim and bath center.

The theoretical framework of this thesis includes the social and health benefits of bathing architecture, age-inclusive design, and low-energy water treatment technologies. Strategically, the project emphasizes how site conditions influence architectural form, explores the relationship between old and new structures, and considers how user needs shape the internal spatial organization. In addition, the study highlights the role of landscape and natural light in enhancing user health and overall experience.

The final outcome is the creation of a low-energy, low-emission community aquatic center that meets the needs of local residents across different age groups. By repurposing an abandoned building, this project provides a sustainable solution to Gothenburg's swimming facility shortage.

Keywords: *adaptive reuse, bathing architecture, old and new dialogue, age-inclusive, low energy consumption*

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CHAPTER ONE

Introduction

Background

Demand of indoor swim and bath facilities in Gothenburg

Since the 1980s, insufficient new swimming pools have been built to meet the growing population of Gothenburg. The city is currently accelerating efforts to build more swimming pools while also having to renovate or replace old ones (Nybyggnad Och Upprustning Av Simhallar, n.d.-b).

From this map we can see there are currently a total of seven municipally owned swimming and bathing facilities in Gothenburg that are open to the public. These are Valhallabadet, Lundbybadet, Angered Arena, Frölundabadet, Askim's swimming hall, Kärra swimming hall, and Hammarbadet. In addition, there are three municipal swimming and bathing facilities closed to the public and two private swimming and bathing facilities open to the public.

These indoor swimming pools and bathing facilities, most of which were built between 1956 and 1980, face a number of problems, such as outdated facilities, lack of consideration for accessibility, need for renovation and maintenance, and improvement of water purification and ventilation.

In addition, the 15-minute city concept suggests that from any location within the city, it should be easy to walk, bike, or take public transportation for 15 minutes to reach most essential services and amenities, such as work, shopping, education, healthcare, and recreation (Weng et al., 2019).

Therefore, based on the data provided by Mapbox, I created a map showing the 15-minute walking and biking radii around public swimming pools. The map shows that certain areas of Gothenburg such as Östra Göteborg, Angered, Hisingen still lack accessible public indoor swimming facilities.

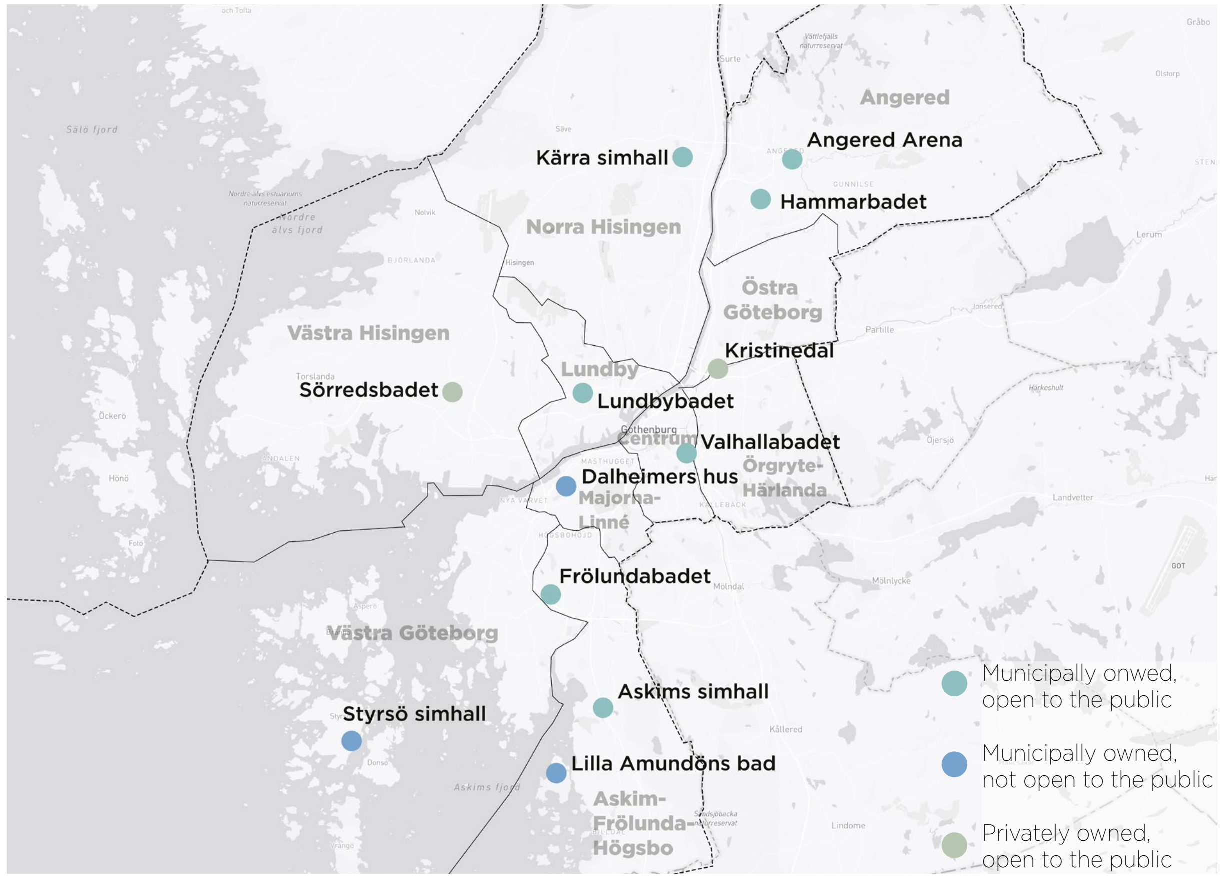


Figure 1.Existing swimming and bathing facilities. (Drawing based on Göteborgs Stad/Strategi för Göteborgs sim- och badanläggningar)

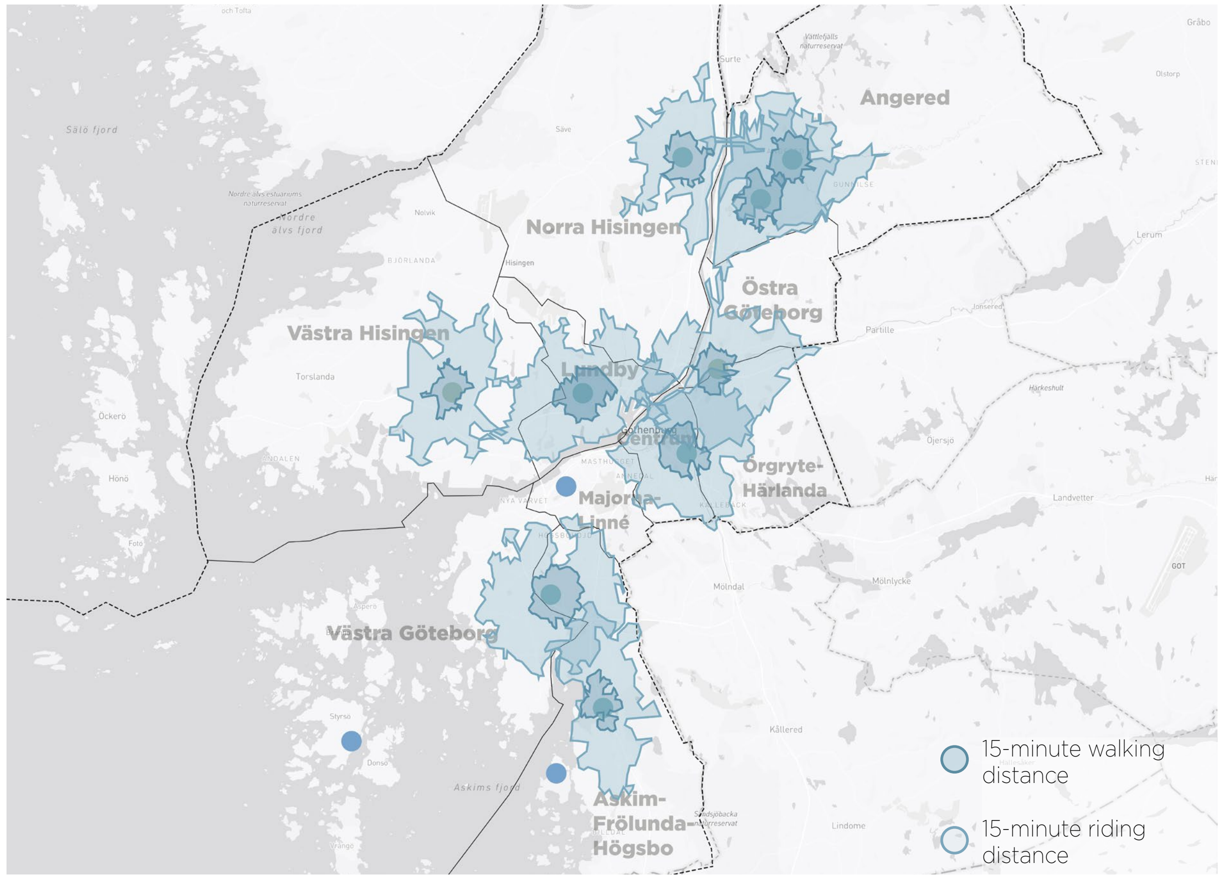


Figure 2. Service area analysis map. (Drawing © Mapbox © OpenStreetMap)

Current Status of Public Indoor Swimming Pools in Gothenburg

According to Strategy for Gothenburg's Swimming and Bathing Facilities, there are three levels of pools: local pools, regional pools, and central pools.

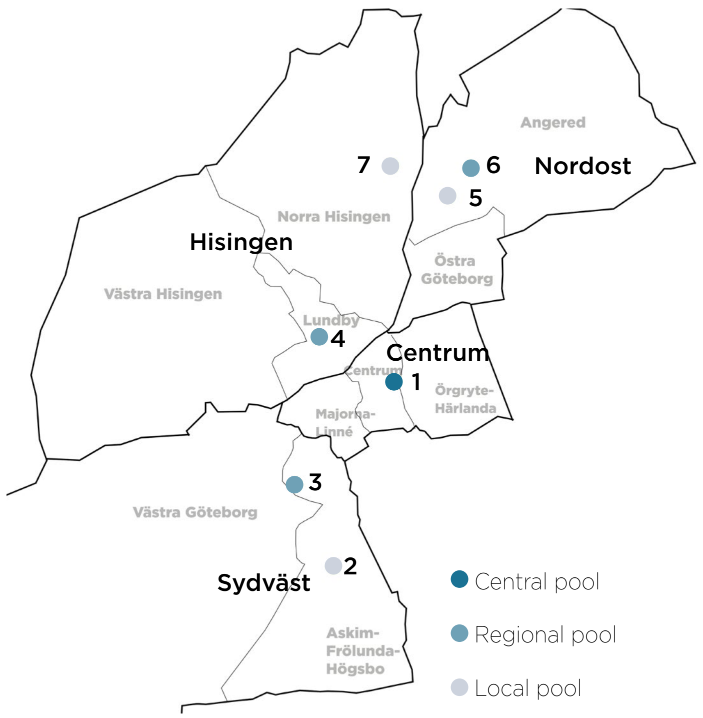
A local swimming pool should be suitable for swimming lessons, youth swimming sports, and fitness activities. A new local pool should therefore include at least a **25-meter pool** and **a teaching/warm pool** with an adjustable floor.

A regional swimming pool should serve **all the functions of a local pool** but also offer more and better amenities for families with children and the general public. Compared to a local pool, a new regional swimming pool also includes **an additional teaching pool and a family area**.

A central pool should be located in the city center, and there should be **one 50-meter pool, one 25 or 50 meter pool with adjustable floor, two teaching or warm pools.** The table on the right shows the facilities available at each public pool in Gothenburg. It clearly indicates the type of each swimming pool, which are:

- Central pool: (1)Valhallabadet(Not yet met the requirements).
- Regional pool: (4)Lundbybadet (6) Angered Arena (3)Frölundabadet
- Local pool: (2)Askims simhall (7)Kärra simhall
- Smaller than local pool: (5)Hammarbadet

Therefore, it is evident that Valhallabadet in the Centrum area needs to be upgraded to meet the requirements of a central pool. In Nordost, Hisingen, and Sydväst, there is already one regional pool in each district. **To address the issue of uneven swimming facility coverage across all areas, more local pools are needed.**



Name	Location	Popolation	Facilities	Tem-perature (°C)	Maximum people per hour	property
1. Valhallabadet	Centrum	195769	50 metres, 25 metres and eight smaller pools. Sauna, Relaxadet.	/	/	Central pool
2. Askims simhall	Askim-Frölunda-Högsbo, (Sydväst)	130430	A 25-meter pool with a slide (25X12.5X0.9-2m)	26	50 (Max 8 ppl/lane)	Local pool
			Teaching pool (12.5X6X0.5-0.9m)	32	30	
			A gym	/	/	
			Changing rooms with Sauna	/	/	
3. Frölundabadet	Askim-Frölunda-Högsbo, (Sydväst)	130430	Under renovation (A 400sqm extension will include a new teaching pool with a height-adjustable floor, more changing rooms, accessibility consideration, gender-neutral changing rooms.) Swimming lessons are provided here for students in grades three to six from various parts of western Gothenburg.			Riginal pool
4. Lundbybadet	Lundby, (Hisingen)	89522	A 25-meter pool (25X12.5X0.9-3m), 6 lanes	26	66 (Max 11 ppl/lane)	Riginal pool
			A teaching pool(10X6X0.7-0.9m)	26	23	
			A warm pool(13X8X1.2-1.5m)	34	30	
			A gym	/	/	
			Changing rooms with Sauna	/	/	
			(Outdoor pool/ Summer): A 50-meter pool (50X16X1.2-1.9m)	23-25	/	
			(Outdoor pool/ Summer): A splash pool (Φ6.5m, depth 30cm)	28	/	
5. Hammarbadet	Angered, (Nordost)	55266	Only one pool 17X12X0.8-1.2m primarily used for swimming lessons, sometimes open to the public. Changing rooms with Sauna	29	40	Smaller than local pool
6. Angered Arena	Angered, (Nordost)	55266	A 25-meter pool (25X20X1.2-2m), 9 lanes	26	113 (Max 12 ppl/lane)	Riginal pool
			The activity pool (17X7X1.5m)	27	44	
			The diving pool (11X10X3.8m)	27	26	
			A splash pool (for little children, depth 17cm)	30	15	
			A children's pool (for older children, depth 75cm)	30	28	
			Teaching and rehabilitation pool(13X8X0-1.8m, raiseable and lowerable bottom)	34	50	
			Relaxation area with saunas, a hot tub and a cold water pool.	/	/	
7. Kärra simhall	Norra Hisingen, (Hisingen)	54544	A 25-meter pool (25X12.5X1-2m)	27	67 (Max 11 ppl/lane)	Local pool
			Teaching pool (12.5X5X0.5-0.9m)	32	20	
			Changing rooms with Sauna	/	/	

Table 1.Public swimming pool in Gothenburg (Göteborgsbladet, 2024; Göteborgs Stad).

High Energy Consumption

Swimming pools require significant amounts of energy and this energy usage contributes to carbon emissions and increased operational costs. **Table 2** compares the usage of gas energy and electricity across different building types.

Indoor swimming pools consume significantly more gas energy and electricity compared to other types of buildings.

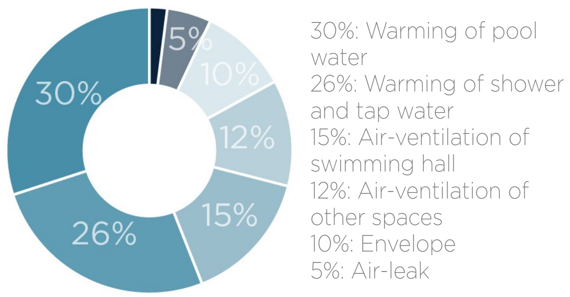
It is evident that while the thermal energy consumption of other buildings ranges between 100-390 kWh/m^2 per year, swimming pools consume 1130 kWh/m^2. Similarly, for electricity consumption, other buildings fall within the range of 30-190 kWh/m^2, whereas swimming pools reach as high as 245 kWh/m^2. Regardless of the type of energy, swimming pools consistently maintain the highest consumption levels.

In one study undertaken in Finland, Saari and Sekki (2008) calculated consumption data in a Finnish recently built public swimming bath. From Table 3, it can be seen that maintaining indoor and pool water temperatures, indoor ventilation, and water purification account for a significant portion of the energy consumption in swimming facilities.

Therefore, future designs could focus on enhancing natural ventilation, improving the building's thermal insulation performance, and selecting energy-efficient water purification systems to reduce the overall energy consumption of swimming facilities.

Building Type	Thermal Energy (kWh/m^2)	Electricity (kWh/m^2)	Year/Source
Education	180-230	50-70	2018/CBECS
Healthcare	240-320	80-100	2018/CBECS
Industrial	100-170	40-60	2018/CBECS
Office	190-250	70-80	2018/CBECS
Residential	120-170	30-50	2018/CBECS
Retail	300-390	100-190	2018/CBECS
Sports centers	330	95	2008/CIBSE
Swimming pool	1130	245	2008/CIBSE

Table 2. Comparison of energy usage for different buildings.(diagram based on Papadakis et al., 2023; CBECS, 2018; CIBSE, 2008.)



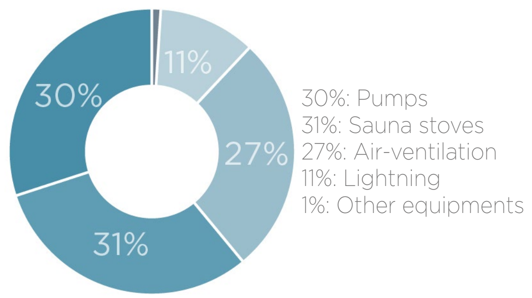


Figure 3.Annual Heating and Electrical Energy need of one swimming bath. (diagram based on Saari and Sekki, 2008)

Water Consumption

Generally, the two main categories of water usage in a swimming pool are directly related to the pool itself and its auxiliary facilities. Water used directly for the pool includes filling the pool initially, daily evaporation, splashes, and backwashing. Water related to auxiliary facilities includes bathing, flushing toilets, and washing hands, etc.

Silva et al. (2021) did some calculations of the average annual water consumption in swimming pools in Portugal (Table 3). We can see that

Pools consume large volumes of water for filling, filters backwashing as well as showers.

They also mentioned that despite the current impossiblity of reducing water consumption in pools and filter back washing, it is feasible to promote more efficient use of water through reducing water consumption by adopting simple water-saving initiatives for showers, taps, and flushing cisterns.

Equipment/ Activity	Consumption (m^3/year)	Percentage (%)
Flushing cisterns	413.6	2.5
Showers	5751.5	34.72
Taps	1950.2	11.78
Urinals	4.3	0.03
Pools	4243.2	25.62
Filters backwashing	4197.6	25.35
Total	16,560.4	100

Table 3.Average annual water consumption in swimming pools. (diagram based on Silva et al. 2021)

Chemical Use

In general, swimming pool water is treated by adding chlorine, bromine, or other disinfectants to kill bacteria, viruses, algae, and other contaminants, while adjusting the pH level to prevent water quality degradation. The most commonly used disinfectant, chlorine, not only exists freely in the water but also reacts with substances introduced by swimmers, such as hair, saliva, sweat, urine, skincare lotions, and sunscreen, to form chlorinated by-products (CBPs). Common volatile CBPs include trihalomethanes (THMs) and trichloramine (NCl3).

Bessonneau et al. (2011) summarized several studies demonstrating a link between exposure to elevated levels of THMs and adverse health effects, including irritations (eyes, skin, nose, and throat), certain types of cancer, and reproductive issues. Additionally, much research on indoor swimming pool air contamination has focused on exposure to NCl3, which has been associated with asthma in both swimming pool workers and visitors, as well as increased lung epithelium permeability in young children.

Therefore, to protect users' health, in addition to raising swimmers' hygiene awareness—such as requiring showers before entering the pool, wearing swim caps, and prohibiting urination in the pool—new swimming facilities should aim to minimize the use of chemicals in water treatment processes. Furthermore, it is important to explore newer, more environmentally friendly, and less harmful treatment technologies.

Purpose

The aim of this master's thesis is to explore how abandoned community sports facilities in Gothenburg can be adaptively reused by transforming the Istara Ice Rink into a low-energy swimming and bathing center. Responding to the city's strategic goals of reducing carbon emissions and promoting material reuse, this study investigates how existing buildings can be reused to address the shortage of public swimming facilities while minimizing environmental impact.

Swimming pools are one of the most energy-intensive building types and face significant challenges in terms of sustainability. Therefore, this project explored strategies to preserve and reuse the existing wood structure and materials of the Istara Ice Rink while integrating low-energy water treatment technologies. The aim of the renovation was to create a modern, multigenerational swimming center with improved accessibility, functionality and environmental performance.

In summary, this research takes the reuse of existing buildings as a starting point to address the shortage of public swimming facilities in Gothenburg. Driven by the goals of meeting community needs and reducing the energy consumption of modern swimming halls, it explores the transformation of Isdala Ishall into a modern aquatic sports center. Through this investigation, the study aims to provide new perspectives on repurposing abandoned buildings into low-carbon public spaces that cater to contemporary demands.

Delimitations

Building Type
This study focuses on the functional transformation and reuse of non-historic public buildings, with the Isdala Ice Hall in Kortedala as the primary case study. The findings specifically address the adaptive reuse of buildings that lack significant historical or cultural value and may not be applicable to heritage buildings. Additionally, the study does not delve into topics related to the conservation, restoration, or preservation of cultural heritage in historic structures.

Material Reuse
Since the building has already been demolished, and the only known fact is that the glulam beams were repurposed for another new residential project, this design project can only ensure the preservation of the glulam beams. It is not possible to conduct an on-site investigation of the old building's other materials or assess whether as many existing materials as possible can be retained or reused. The only way to estimate the materials of the old building is by analyzing previous elevation drawings.

Fictional Proposal
Since the building was demolished in 2023, my master thesis project is only a fictional proposal that explores how to transform a skating rink into a swimming pool without demolition and while preserving as much of the original building as possible.

Questions

Main question
How can the adaptive reuse of a non-historic community building such as an ice rink be designed to create a sustainable and functional swim and bath center to address the shortage of swimming facilities in Gothenburg?

Sub-questions
1. How can the swim and bath centers promote health and well-being, serve people of all ages, and become a gathering place for the local community?

2. How can the design connect the old building with new additions in a clear and harmonious way?

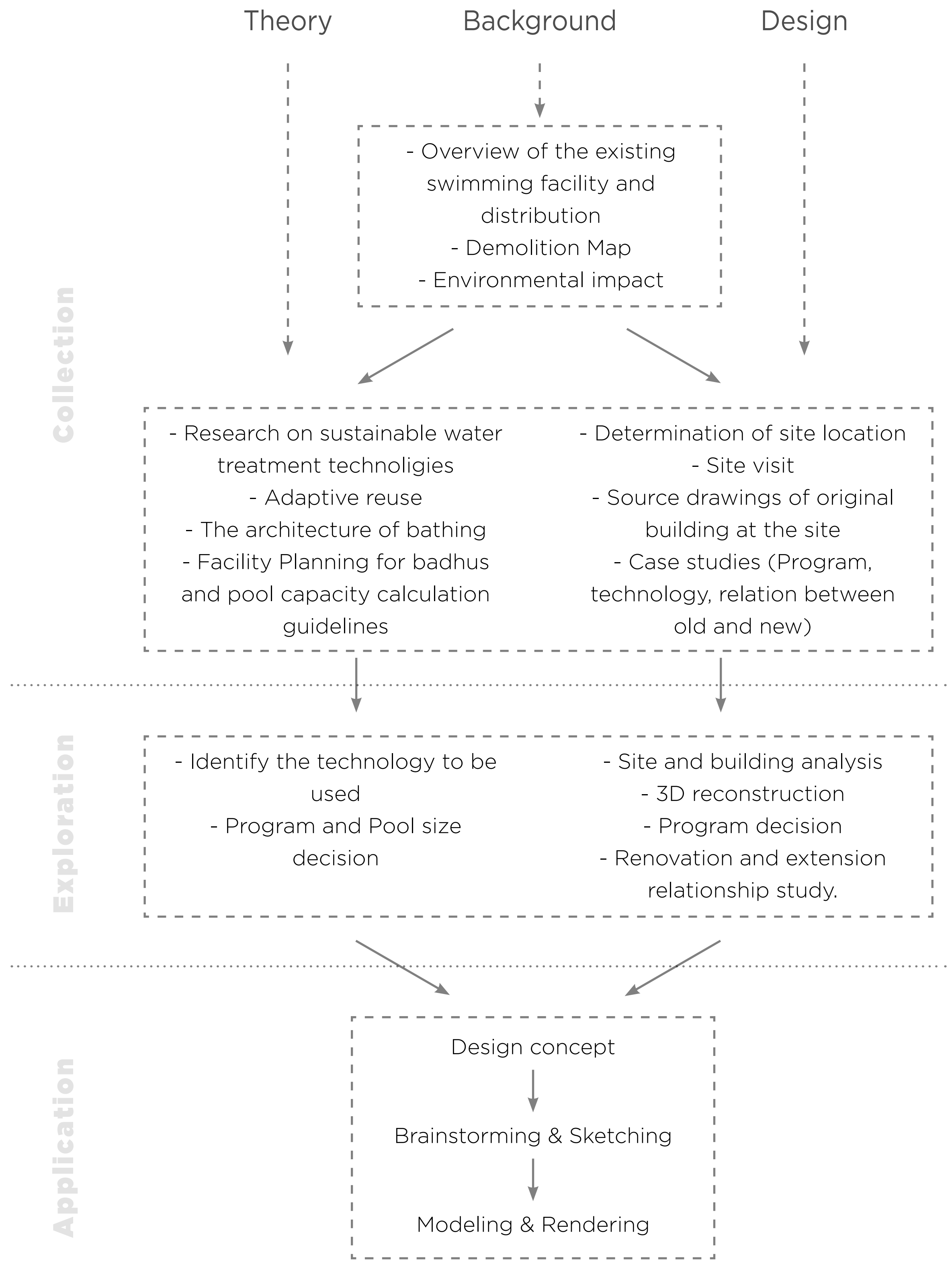
Methods

This thesis begins with an analysis of the existing conditions and background, aiming to guide the adaptive reuse of an abandoned building through theoretical research and precedent studies. The research process is divided into three main phases: information collection, information processing, and information application.

Collection
This phase involves gathering data on the urban context, public needs, and demolition maps in order to identify a suitable site. Following site selection, further actions include a site visit and collection of original architectural drawings. Based on the current environmental impact of the swimming facility, theoretical studies are conducted on possible improvement strategies and sustainable technologies.

Exploration
In this phase, collected information is evaluated and synthesized. Theoretical insights are extracted to inform the design approach. On the design side, this phase includes site analysis, reconstruction of the original building model, and preliminary determination of spatial functions and area requirements.

Application
Based on the previous research, design concepts are developed and explored through sketches and physical/digital models. One proposal is then selected and further developed in detail.



Theory

The Architecture of Bathing

Gathering Community
Public baths are not only places for communal bathing, but also important venues for social interaction. As early as the Roman period, the process of going to the baths could be described as a cross between working out at the gym, going to the spa, meeting friends for social activities, and bathing.(Henderson, 2008) This was because Roman bathhouses included rooms with different temperatures, swimming pools, and spaces for reading, relaxation, and social interaction.

In *The Architecture of Bathing,* Pearson (2020) mentions that "The aquatics center is perhaps the Roman thermae of our times, integrating diverse traditions and functions into a complex new creation. The swimming pool can draw to itself a dozen architectures of bathing within its enclosure, from waterslides to saunas, and function as a true community center anchoring social exchange in a neighborhood or a city."

Moreover, whether in Nordic countries, Islamic countries, or in Asian countries such as China and Japan, various forms of public bathing spaces have existed. Despite their cultural differences, they all share the common function of promoting physical hygiene, mental relaxation, social interaction, and a sense of communal belonging.

Healing and Health
In addition to offering spaces for social interaction and mental well-being, the architecture of bathing also contributes to physical health. Swimming is well known for strengthening the body, boosting the immune system, and helping to prevent colds. Likewise, soaking in hot water or spending time in a sauna provides a range of physical benefits.

For example, the Romans used the hot thermal waters to relieve their suffering from rheumatism, arthritis, and overindulgence in food and drink. (Paige & Soullière, 1988)

"In Sweden, the sauna is not just a luxury; it's a way of life that promotes health and well-being," says Hans Hägglund, known as "the Sauna Doctor" of Sweden. "Regular sauna use can strengthen the immune system, improve circulation, and promote relaxation, contributing to a healthier, happier life."

As early as the Three Kingdoms period, the Chinese book *Shuijingzhu*(Li Daoyuan) noted the healing power of hot springs: "The imperial spring at Mount Lu can cook rice; drinking and bathing in it cures all ailments. Taoist practitioners bathe three times daily, and after forty days, their illnesses are gone."

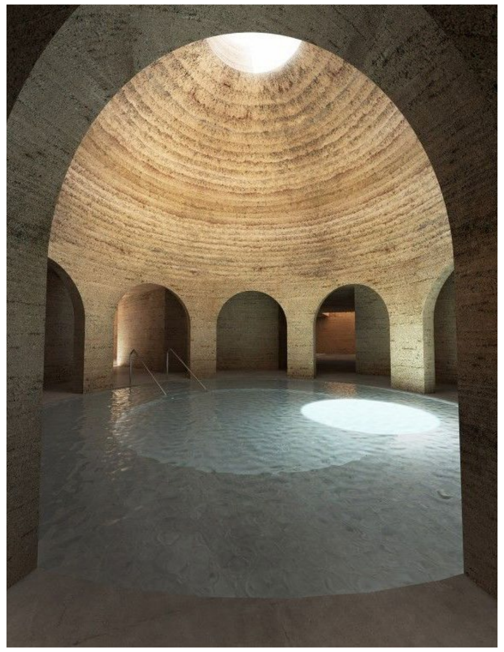


Figure 5. Contemporary reinterpretation of a Roman bath.

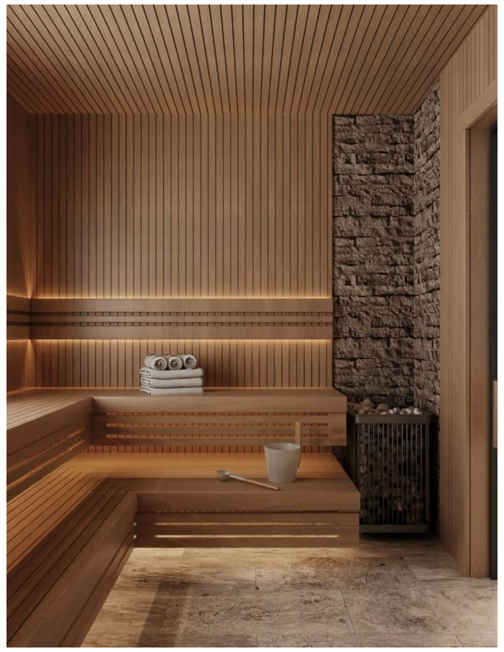


Figure 6. Nordic sauna.

Figure 7. Asian hot spring.

Figure 8. Islamic hammam (Turkish bath).

Theory

Water Treatment

The water treatment of swimming pools mainly consists of two parts: filtration and disinfection. Filtration is primarily used to remove suspended particles from the water. Common filtration methods include Drum Filter, Membrane Filtration, and Sand Filtration. Disinfection is intended to eliminate bacteria, viruses, and other microorganisms in the water. Common disinfection methods include Chlorination, Salt Water Chlorination, UV Disinfection, and Ozone Disinfection.

FITRATION

1. Drum Filter with Gravity Filtration

Drum filters from InBlue operate by gravity, reducing the energy used by pumps and saving up to 95% of energy compared to traditional filtration methods. Filters particles with 5-micron filter technology, where particles are continually filtered out instead of being dissolved by chlorine and hot water. The system automatically backwashes when waste accumulates on the mesh screen, draining the dirt away.

2. Ceramic Membrane

A company called LIQTECH has proposed a ceramic membrane technology filtration system that reduces backwash water consumption and chlorine consumption.

3. Slow Sand Filtration

It is a filter filled with sand. The working principle is that water flows from top to bottom through the sand bed, typically using multiple layers of different grain sizes to remove various suspended particles. To prevent clogging, the sand filter also requires backwashing after a certain period. Its advantages include simple operation, low maintenance requirements, and reduced use of chemical agents. However, the main drawbacks are the slow filtration rate, the large volume of water required for cleaning sand filters, making it less energy efficient, and its limited ability to remove bacteria, pathogens, and viruses.

Since Slow Sand Filtration takes up a lot of space and consumes a lot of water, I will not consider using it for this project. In order to compare the other two filtration systems, I looked at two different companies, and the table below shows the advantages and disadvantages more clearly.

	Drum Filter with Gravity Filtration / InBlue	**Ceramic Membrane / LIQTECH**
Occupied Floor Area	Available in various sizes	Footprint: $1.9m^2$-$4.7m^2$ - Commercial spa (24-72 m^3/h): $1.9m^2$ footprint - Teaching pool (96-114 m^3/h): $2.8m^2$ footprint - Traditional public pool (168-216 m^3/h): $3.8m^2$ footprint - Diving pool (240-288 m^3/h): 4.7 m2 footprint
Water Consumption for Backwash	Reduces by apx. 50% compared to sand filters.	50% less water consumption for backwash.
Chlorine By-products	Very low	By-products can be reduced by 40%. Chemical consumption can be reduced by 30 %
Filters down to	5 micron	3 micron
removal of	More than 90% of the particles	99% microorganisms

Table 6. Comparision of two filtration methods. (Data from InBlue, LIQTECH)

DISINFECTION

1. Chlorination

Chlorination involves adding chlorine to water to kill microorganisms. It is one of the oldest and most widely used methods of water disinfection. It is easy to use and cost-effective. However, as mentioned earlier, chlorination produces chlorinated by-products, which not only create an irritating odor but can also have long-term adverse effects on users' health.

2. Salt Water Chlorination

The salt chlorination system is based on the electrolysis of salt water. This process converts the salt dissolved in the water into chlorine, which is then used to disinfect the pool automatically. It offers a more swimmer-friendly alternative with automatic chlorine generation, though it comes with a higher initial cost.

3. UV Disinfection

The UV system is a sustainable water treatment solution that inactivates bacteria, viruses, and protozoa by exposing the water to UV light. This method does not produce harmful chlorinated by-products that can affect human health. However, UV lamps require regular replacement.

4. Ozone Disinfection

Ozone disinfection is the most efficient water treatment method, utilizing the strong oxidizing properties of ozone to react with and eliminate contaminants.

The data from Garcia-Ivars et al. (2016) shows that the total disinfection cost per square meter of wastewater follows the order: Ozone > UV > Chlorine, with significant differences between them. The running cost per square meter of wastewater follows the order: UV > Ozone > Chlorine, but the differences are not as large. So from an economic point of view, the order of preference is chlorine, followed by salt water chlorination, UV, and finally ozone. From an environmentally friendly and sustainable perspective, UV and ozone disinfection methods are more appropriate, as both significantly reduce harmful chemical by-products. Although salt water chlorination is slightly more eco-friendly than traditional chlorination, it still produces chlorinated by-products. The table below provides a more comprehensive comparison of the advantages and disadvantages of the four disinfection methods. Overall, UV disinfection seems like the most balanced option in terms of performance and cost.

Chlorination	Pros	- Cost-effective - Easy to use - Residual Protection
	Cons	- Chemical By-Products may cause health problems - Chemical Smell - Environmental Impact
Salt Water Chlorination	Pros	- Less Chlorine By-Products - Automatic Chlorine Generation - Residual Protection
	Cons	- High Initial Cost - High Corrosion Risk
UV Disinfection	Pros	- No Chemical By-Products - Lower Chemical Usage - Moderate Initial Cost - Effective Against a Wide Range of Microorganisms
	Cons	- Requires Regular Maintenance - No Residual Protection
Ozone Disinfection	Pros	- Powerful disinfection - No Chemical By-Products
	Cons	- High Initial Cost - Requires Regular Maintenance - Residual Protection

Table 7. Comparision of four disinfection methods.

Case Study

1. Das Stadtbad Dornbirn

Architects: cukrowicz.nachbaur architekten
Area: 2780m2 (New construction part)
Year: 1969(Built), 2005(Renovated)
Location: Dornbirn, Austria
Type: Swimming Pool, Renovation
Building capacity: around 1000 people

Dornbirn's indoor swimming center was originally built in the late 1960s in a parkland area, and has since become one of the city's most iconic landmarks. During the expansion, sports pools and parent-and-child pools were added, linking them with the original multi-purpose and non-swimmer pools. The old and new parts are unified by an open gallery, which serves both as a rest area and spectator seating. The changing rooms and shower facilities have been renovated and expanded to include a restaurant. Additionally, a new wellness area has been built, featuring a separate sauna space and various bathing and relaxation facilities. The zoning of the project is very clear and can be seen in the functional plan.

Visitor numbers of the old pool stabilized at around 130,000 per year. After the renovation in 2005, the Dornbirn Stadtbad achieved an above-average annual result in the 2012/13 fiscal year: A total of 185,000 visitors were recorded. January is the most popular month for swimming, with 20,119 visitors counted in the past fiscal year. Stadtbad Managing Director Kaufmann also stated that the sauna area achieved an excellent result in 2012/13, with approximately 11,000 visitors recorded. (Besucherrekord im Stadtbad Dornbirn, 2014)

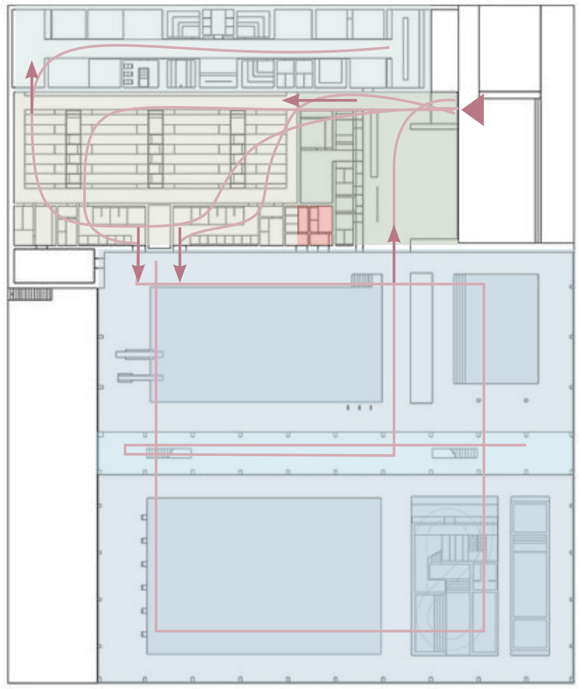


Figure 12. Functional Plan. (Base plan © archiweb)

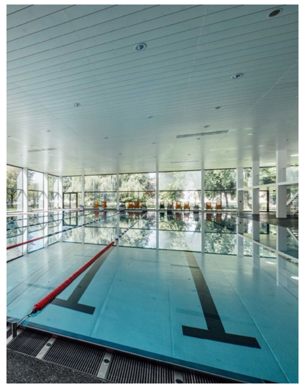


Figure 13. Sports pool. (Photo © Dornbirner Sport- und Freizeitbetriebe GmbH)

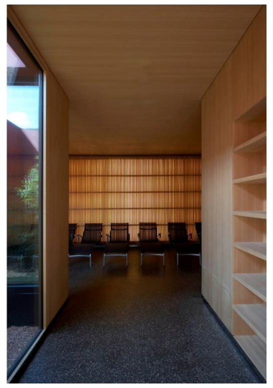


Figure 14. Relaxation zone in wellness area. (Photo © FotoHPSchiess)

- Inspiration:
What can be learned from this project is its treatment of different functional zones with color and materials, and how artificial lighting is used to clearly distinguish swimming lengths and functions. This approach has resulted in a highly accommodating swimming complex that is enjoyed by users of all ages.

FUNCTIONAL PROGRAM OF NON-POOL AREAS

Main Zone	Sub-Zone	Function	Users	Area (m^2)
Entrance area	Reception	Ticket purchase, information desk	All visitors	45
	Restaurant & Café	Dining, snacks	All visitors	235
Preparation area	Locker&Changing room	Storage for personal belongings and changing suits	All visitors	375
	Shower	Pre-swim and post-swim showers	All visitors	80
	Restrooms	Toilets and hygiene facilities	All visitors	70
Wellness area	Massage	Relaxation massages	Adults, wellness visitors	10 m^2/room
	Sauna rooms	Promotes blood circulation and relaxes muscles	Adults, wellness visitors	10 m^2/room
	Cold room	Cooling down after the sauna	Adults, wellness visitors	10
	Steam bath	Cleansing skin in high humidity environments	Adults, wellness visitors	10
	Relaxation zone	Lounging areas with seating	All visitors	30

FUNCTIONAL PROGRAM OF POOL AREA

Sub-Zone	Function	Users	Dimention (m)	Water depth (m)	Temperature (°C)
Sports pool	Competition or immersive swimming	Athletes, Trained swimmers	25 x 16.66 (8 tracks)	1.8	27
Multipurpose pool	3-meter diving platform; 1-meter; springboard; Starting pedestal; Massage jets; Waterfall	All visitors	24.70 x 12.20	1.20 - 3.50	28
Non-Swimmer Pool	Perfect their swimming skills Splash around here with parents	Families with children, Beginners	9 x 11.7	0.72 - 1	32
Parent-Child Pool	Children's slide Fountain field Children's toilet and changing room	Young families	3.55 x 6.75	0-0.35	32
Water Slide	Recreation with water, light and sound effects	All visitors	46 m long, 7 m high	0.56	28
Gallery	Spectator area for sporting events. Seating area for consuming food and drinks	All visitors	238 m^2	/	/

Table 8. List of area and function

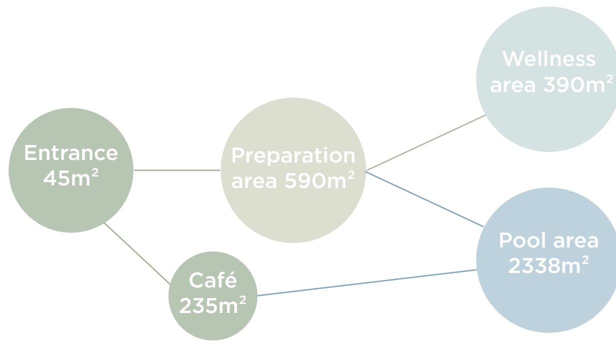


Figure 15. The area of each zone and their connections.

2. təməsewtxw Aquatic and Community Centre

Architects: hcma architecture + design
Area: 10684 m2
Year: 2024
Location: New Westminster, Canada
Type: Zero Carbon Building–Design

This is Canada's first completed aquatic center to achieve Zero Carbon Building–Design Standard. Designed by hcma architecture + design, təməsew'txw welcomes all ages and abilities, with a focus on community connections and wellness-based activities, alongside more traditional sporting and fitness pursuits. (Abdel, 2024)

This aquatic center of 10,684 m^2 consists of a water sports area, a fitness area (1103m^2), two gymnasiums (1080m^2), and a lobby. The main water sports area, serving as the core of the building, is located on the southeast side and includes:

- Leisure pool (450m2) featuring three 25m lanes, a lazy river, spray toys and a tot zone.
- Lap pool(1062m2) featuring eight 50m lanes, two bulkheads and a movable floor.
- Adult hot pool.
- Family hot pool.
- Diving boards (1m springboard, 3m springboard, and 5m platform)
- Steam room.
- Sauna.
- Accessible gendered and universal change rooms.

The pools will provide a range of access types including beach entry, ramp entry, transfer edge and lift, including ramps into the leisure pool and family hot pool.

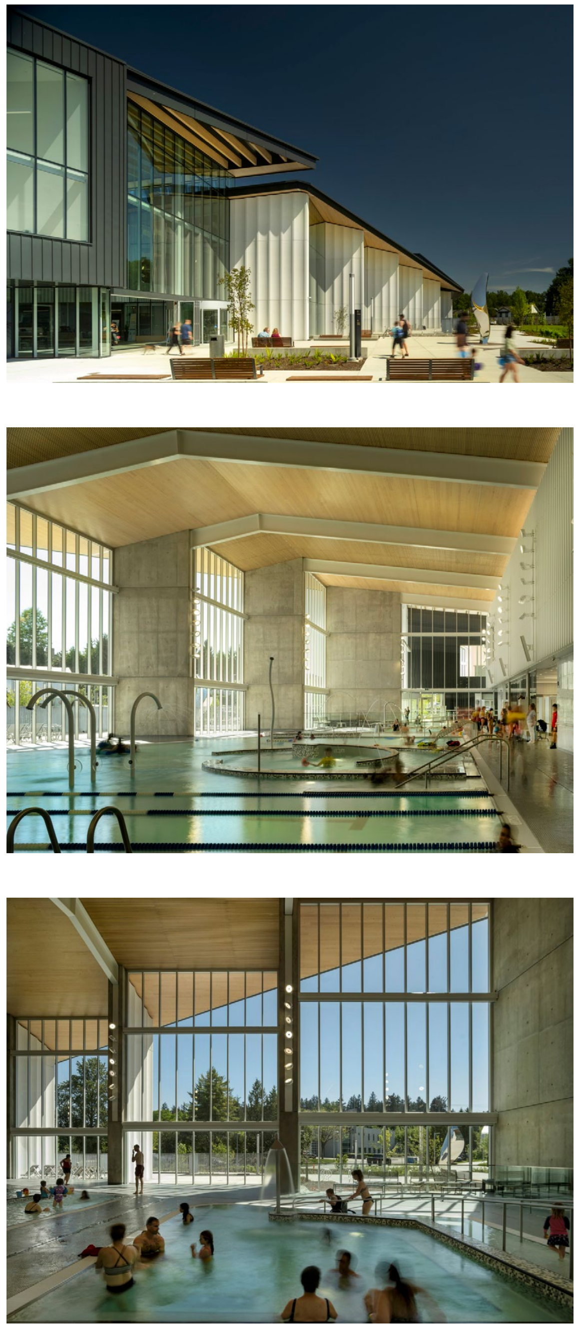


Figure 16. Exterior and interior photos. (Photo © Nic Lehoux)

What is the most noteworthy in this case is the adoption of sustainable measures that have achieved zero carbon emission building design standard certification—a tremendous accomplishment for a building type like a swimming pool, which typically has enormous energy consumption.

The building complies with an early version of the Zero Carbon guidelines, which focused almost wholly on operating carbon, deploying such strategies as optimal orientation, a high-performance envelope, and energy-conserving systems. It also includes a rooftop photovoltaic array. (Joann Gonchar, 2024)

This is also the first municipal swimming pool in North America to use the **InBlue filtration system**, which relies on gravity to reduce pump energy consumption by nearly 50%. The system also employs ultraviolet disinfection, reducing chlorine demand and minimizing the production of harmful chemical byproducts, thereby improving the quality of both air and water.

Based on the floor plan, it can be roughly estimated that the filter room for water purification is approximately 70 m^2, and it is located very close to the swimming pool. Meanwhile, the electric/mechanical plant that supplies the entire building has been placed in the rooftop space above the gym, although its exact dimensions are currently unknown.

- Inspiration:
From this case, it is evident that the prerequisite for achieving zero carbon emissions is to reduce the building's energy load by using passive strategies—such as natural daylighting and passive ventilation—as much as possible. In addition, renewable energy sources like solar and hydropower, which do not rely on fossil fuels, are employed to generate electricity for the remaining demand. Furthermore, the use of the InBlue filtration system greatly helps reduce the energy consumption associated with water treatment, making it one of the potential options for the water purification technology in my master thesis design project.

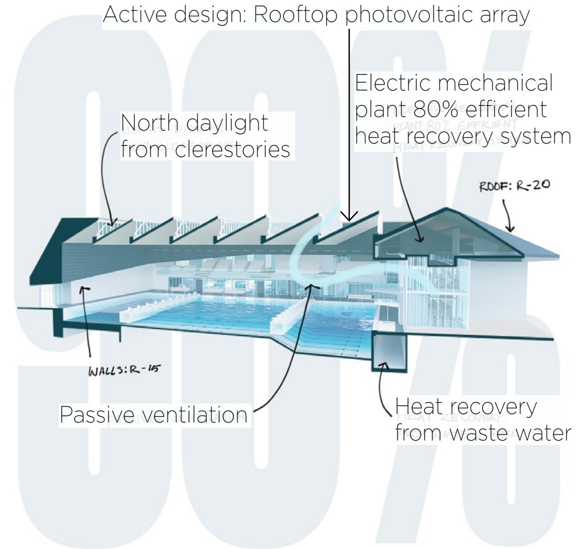


Figure 17. Sustainable strategies. (Image © youractivenw.ca, 2024)

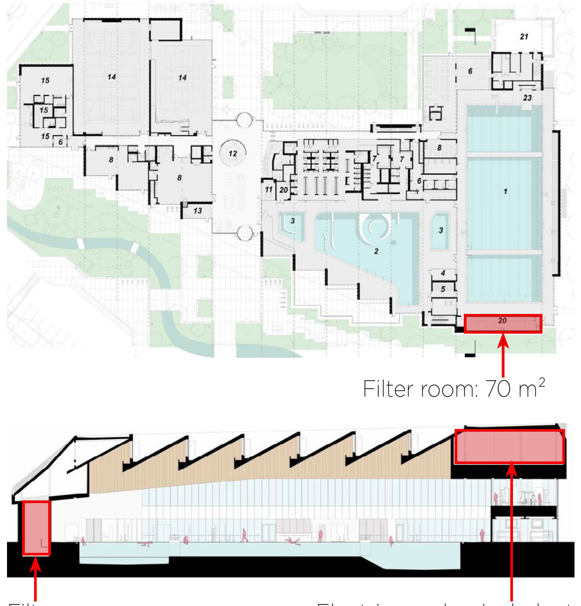


Figure 18. Ground floor plan and section. (Image © hcma, 2024)

3. Roskilde Waterscape

Architects: CREO ARKITEKTER, JAJA architects
Area: 7894.0 m2
Year: 1959(Built), 2015- 2021(Extended)
Location: Roskilde, Denmark
Type: Swimming Pool, Renovation

The building is extended based on the same ingredients. The existing is upgraded, and new courtyards organizing the internal program are introduced. Visual relationships connect the internal spaces but are differentiated through shifting roof designs. These roof differentiations provide each space with differing spatial qualities. (JAJA architects, 2021)

The garden was initially planned to mitigate the impact of the newly built 50-meter swimming pool on the foundation of the existing building. Beyond minimizing this impact, the outdoor garden also attracted more visitors, encouraging residents who typically prefer the beach in summer to choose the swimming pool instead. Project manager Poul Janum explained, "This way, every room has an outdoor area where visitors can enjoy fresh air in the summer or have a coffee in the sunlight."

- Inspiration:
What I learned from this case is how they maximize the surrounding landscape, bring the outdoor nature indoors, and design diverse pools with various roof shapes to create a distinct atmosphere for each.

We have a very similar natural environment, so in my design, I can also incorporate nature by bringing it indoors and using courtyards to separate different spaces.

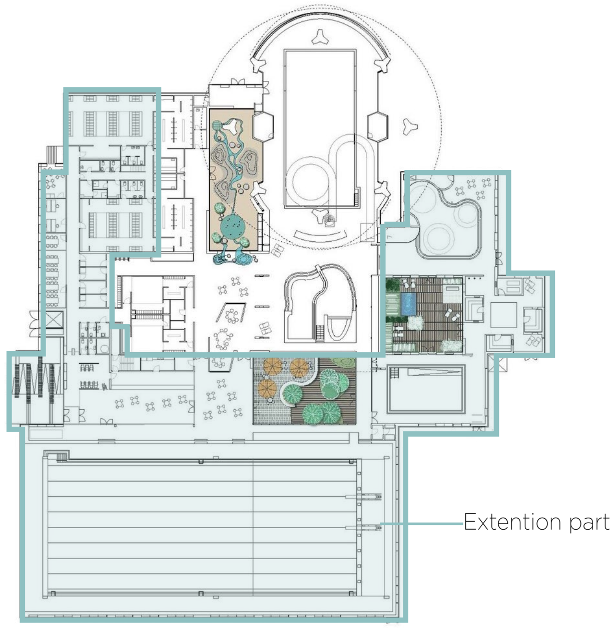


Figure 19. Plan-courtyard. (Image © CREO ARKITEKTER A/S & JAJA architects)


Figure 20. 50m sports pool. (Photo © LauraStamer)


Figure 21. Hot water pool (Left), Activity pool (Right). (Photo © LauraStamer)

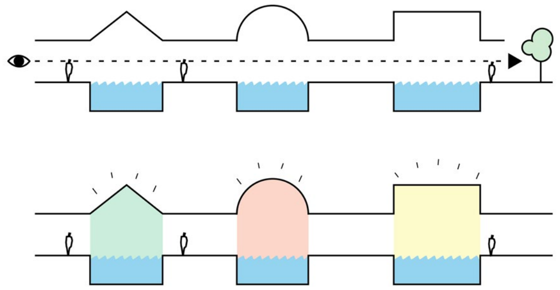


Figure 22.Conceptual section. (Image © CREO ARKITEKTER A/S & JAJA architects)

4. Thermal Spa Bad Aibling

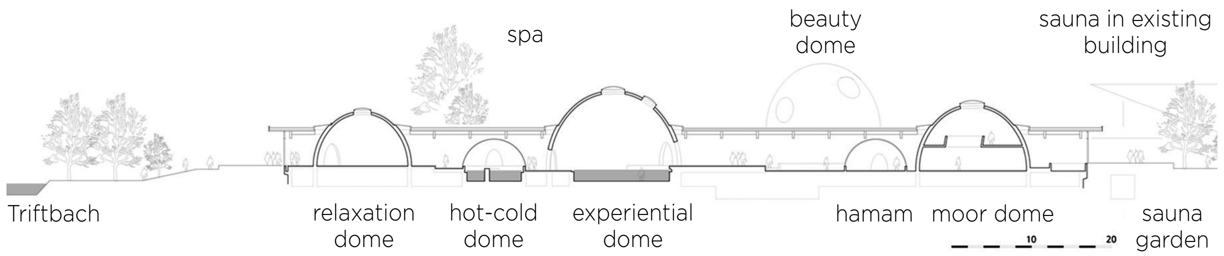
Architects: Behnisch Architekten
GFA: 10835 m2
Year: 2007
Location: Bad Aibling, Germany
Type: Swimming pool, Sauna, Hamam

Unlike Roskilde Waterscape's open plan, where all visual connections are uninterrupted, the indoor swimming pools and treatment areas (such as the swimming pool, sauna, and Hamam) at The Bad Aibling Spa are housed within individual domes. These domes are mostly opaque but are perforated with various circular openings, allowing natural light to filter through.

The dome defines the water area, creating a warm and humid interior, while the hall outside the dome remains cooler and drier. Additionally, each dome has a unique character, shaped by the distribution of natural light, artificial lighting, different materials and colors, water features, and acoustic qualities, resulting in a distinct atmosphere for each space. (Behnisch Architekten, 2007)

- Inspiration:
The project utilizes a contrast between the fully glazed facade and solid domes, maximizing natural lighting while effectively separating the hall and spa areas. This design allows each zone to maintain optimal temperature and humidity levels while reducing the energy consumption typically required for indoor climate control in traditional swimming facilities.


Figure 23. Exterior façade and indoor pool.(Photo © Adam Mørk / Torben Eskerod)



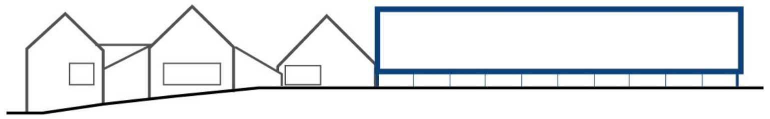


Figure 24. Britanny Swimming Pool & Spa / RAUM Architects (Photo © Charles Bouchaïb)

This case uses a contrast of materials—wood and glass—as well as differences in façade transparency (closed vs. open) and volumes (fragmented vs. unified) to express the relationship between old and new.

In my project, the swimming areas require more openness, while the wellness areas need to be more enclosed. Therefore, I can also express the dialogue between old and new through **contrasts in materiality and transparency.**

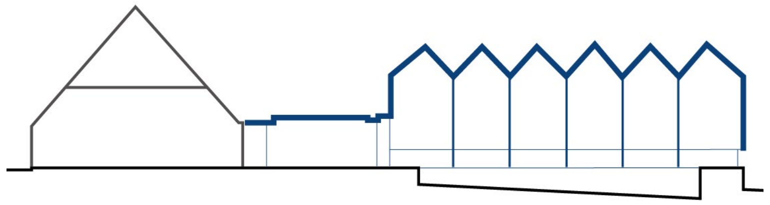


Figure 25. Alfriston Swimming Pool / Morris+Company (Photo © Morris+Company)

This case uses a contrast between fragmented and unified volumes, as well as material contrast, to express the relationship between old and new. The new extension, which houses the swimming area, features glass and wood to create a lighter and more contemporary identity.

In my project, I can also apply a similar strategy by using material contrast: the original building retains its concrete façade and steel panels, while the new additions introduce more sustainable, locally sourced timber to highlight the intervention.

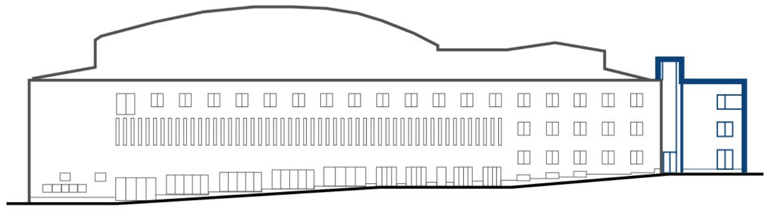


Figure 26. Gothenburg Concert Hall / White arkitekter (Photo © Max Plunger)

This case uses a façade material contrast between brick and gypsum board, making the difference in construction periods immediately apparent. The new building is connected to the old one by a glazed corridor, which allows both structures to remain structurally independent while serving as the main circulation route. On the façade, the same window rhythm is applied to both buildings, creating a shared architectural language.

In my project, I can also introduce a glazed corridor as the main circulation and transitional space between the new and old buildings.

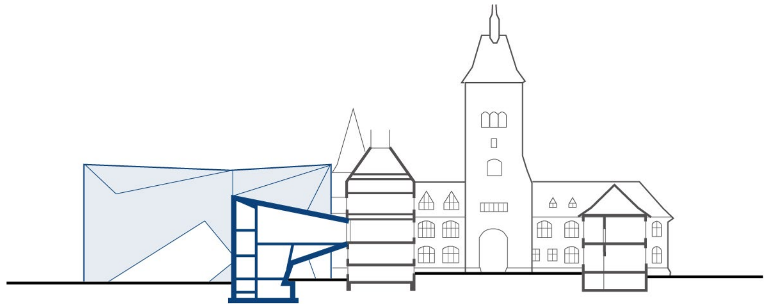
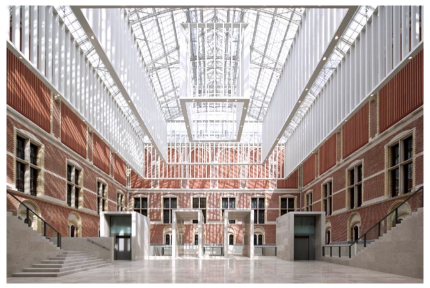


Figure 27. Swiss National Museum Extension / Christ & Gantenbein (Photo ©)

This project shows a strong contrast between old and new through differences in volume and materials. Still, some elements create continuity—for example, the new tuff concrete relates to the old tuff façade, and the polished concrete floor reinterprets the original terrazzo flooring in a modern way.

I learned that even with bold contrasts, connections can be made—like reusing or reinterpreting old materials. In my project, I plan to recycle materials from the original building, process them in a modern way, and reuse them in the new construction.



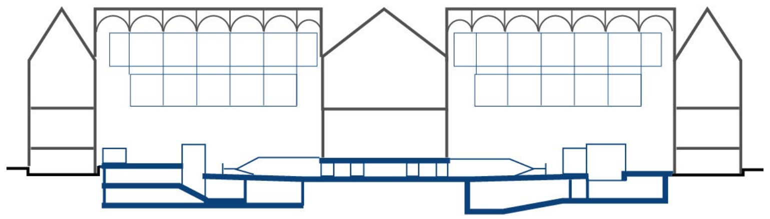


Figure 28. The Dutch National Museum / Cruz y Ortiz (Photo © Pedro Pegenaute)

Although **the Dutch National Museum** is not an extension, its handling of old and new within the existing structure offers useful insights. For example, it restored and preserved the red brick façade, only introducing new structures at the ground level and the roof.

In my project, I plan to preserve the original structure and parts of the façade, while redesigning the ground surface to suit the swimming functions. The contrast between the floor, walls, and existing structures will help clarify the distinction between old and new within the original building.

CHAPTER TWO

Site & Original Building

Site Selection
Site Analysis
Original Building

Site Selection

Based on the previous analysis, Gothenburg still lacks local-scale swimming pools. Since reusing old buildings generates significantly lower carbon emissions compared to constructing new ones, I aim to identify abandoned buildings in areas with a shortage of swimming facilities and explore their potential for transformation into swimming pools.

The site selection process follows these key guidelines:

1. Utilize Rivningskarta (demolition map) to identify buildings in Gothenburg that are either at risk of demolition or have already been demolished. Compare Rivningskarta with the map of current swimming facilities in Gothenburg to pinpoint suitable locations.

2. Ensure that the selected site is located in an area lacking swimming facilities, with the building situated in a relatively central position within the community and serving the surrounding areas.

3. Select a building that is suitable for conversion into swimming and bathing facilities, with features worth preserving and materials that can be reused.

Based on the above criteria and the observations from Figure 8, I have selected the Isdala Ice Hall located in Kortedala. Built in the 1970s, it has served as the home venue for the Gothenburg Ice Hockey Club since 1973. However, due to outdated facilities and poor technical condition, the old ice rink can no longer meet the association's needs for competitions and hosting small to medium-sized events. As a result, the government plans to replace the Isdala Ice Hall with a new ice sports arena in Kvibergs Park.

The well-known Isdala Ice Hall is thus set to be abandoned and demolished. Situated in the center of Kortedala, it has the potential to serve nearby areas such as Kortedala, Bergsjön, Utby, Kviberg, and Gamlestaden, all of which lack public swimming and bathing facilities. Additionally, the glue-laminated timber structure of the ice hall is in good condition, offering the possibility of preservation and reuse. The original large-span space also meets the spatial requirements of a swimming facility.

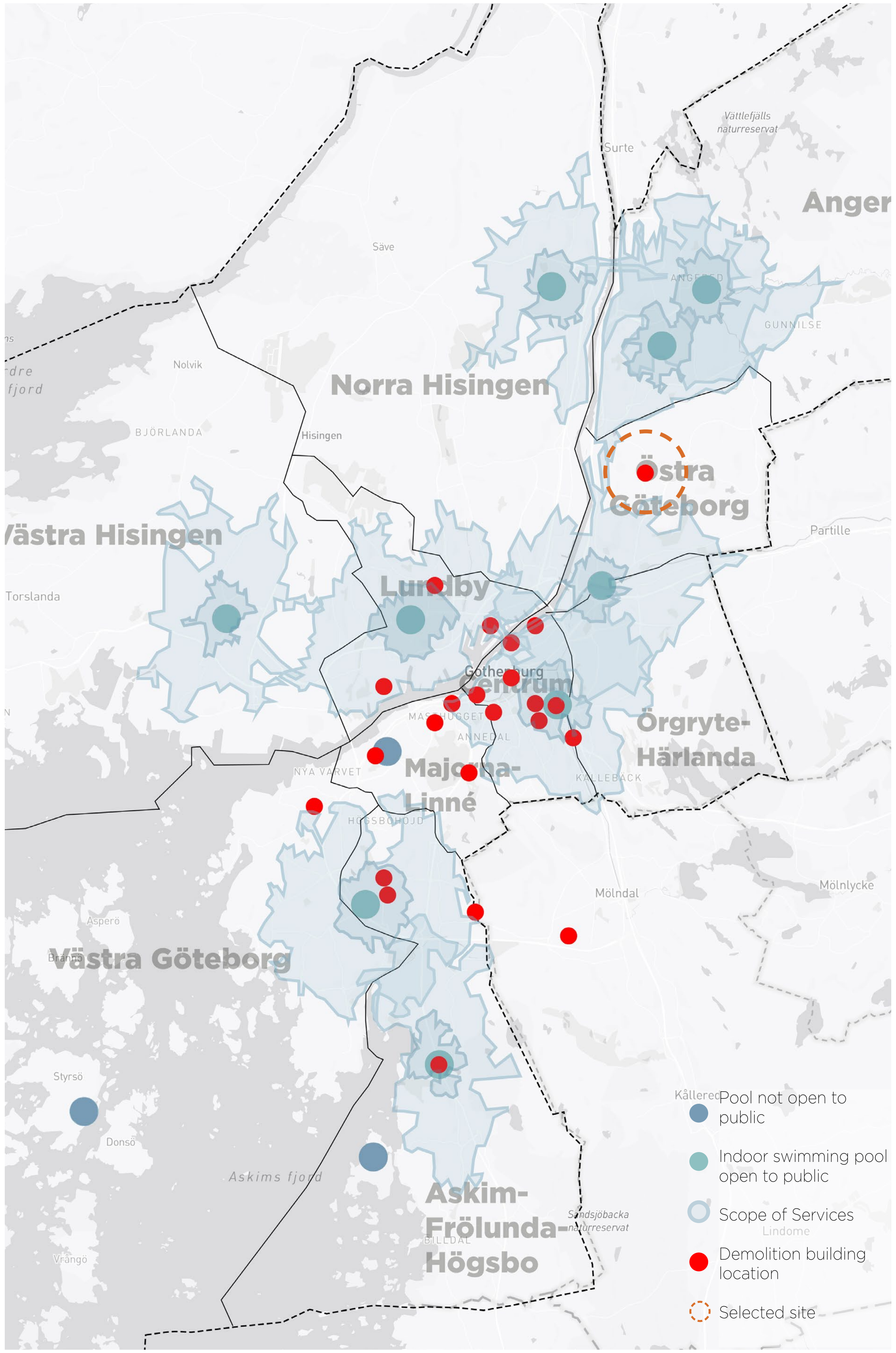


Figure 31.Demolition map and swimming pool location. (Drawing based on Rivningskartan.)

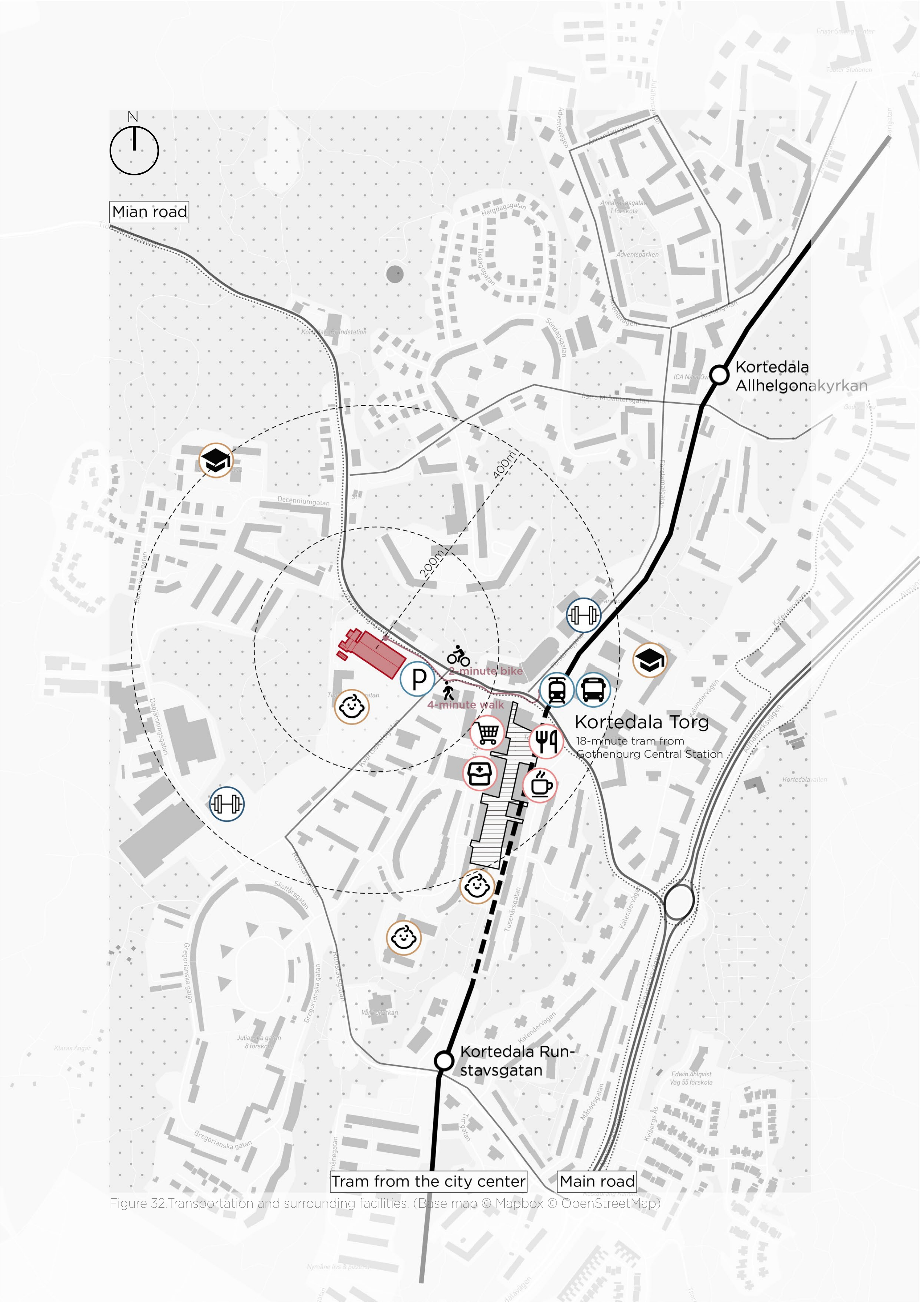


Figure 32.Transportation and surrounding facilities. (Base map © Mapbox © OpenStreetMap)

Site Analysis

Location & Transportation

The site is located in the Södra Kortedala, northeast of Gothenburg city center. Kortedala is Gothenburg's first suburb and has two main areas: Södra Kortedala and Norra Kortedala. This district is known for its row houses and apartment buildings, many of which were built in the 1950s and 1960s. The area is surrounded by nature, with dense forests and beautiful scenery.

The site is approximately 9 kilometers from Gothenburg Central Station and less than 400 meters from Kortedala Torg station. It is accessible via tram lines 6, 7, 11, and X, with a travel time of about 18 minutes from Gothenburg Central Station to Kortedala Torg station, followed by a 4-minute walk to the site.

The existing building on the site is adjacent to Tideräkningsgatan, a major traffic road to the north, which includes two-way lanes, a bicycle path, and a pedestrian walkway. To the east, there is a public parking lot with 63 parking spaces. As a result, the site is easily accessible to local residents by walking, cycling, or driving.

Surrounding Facilities

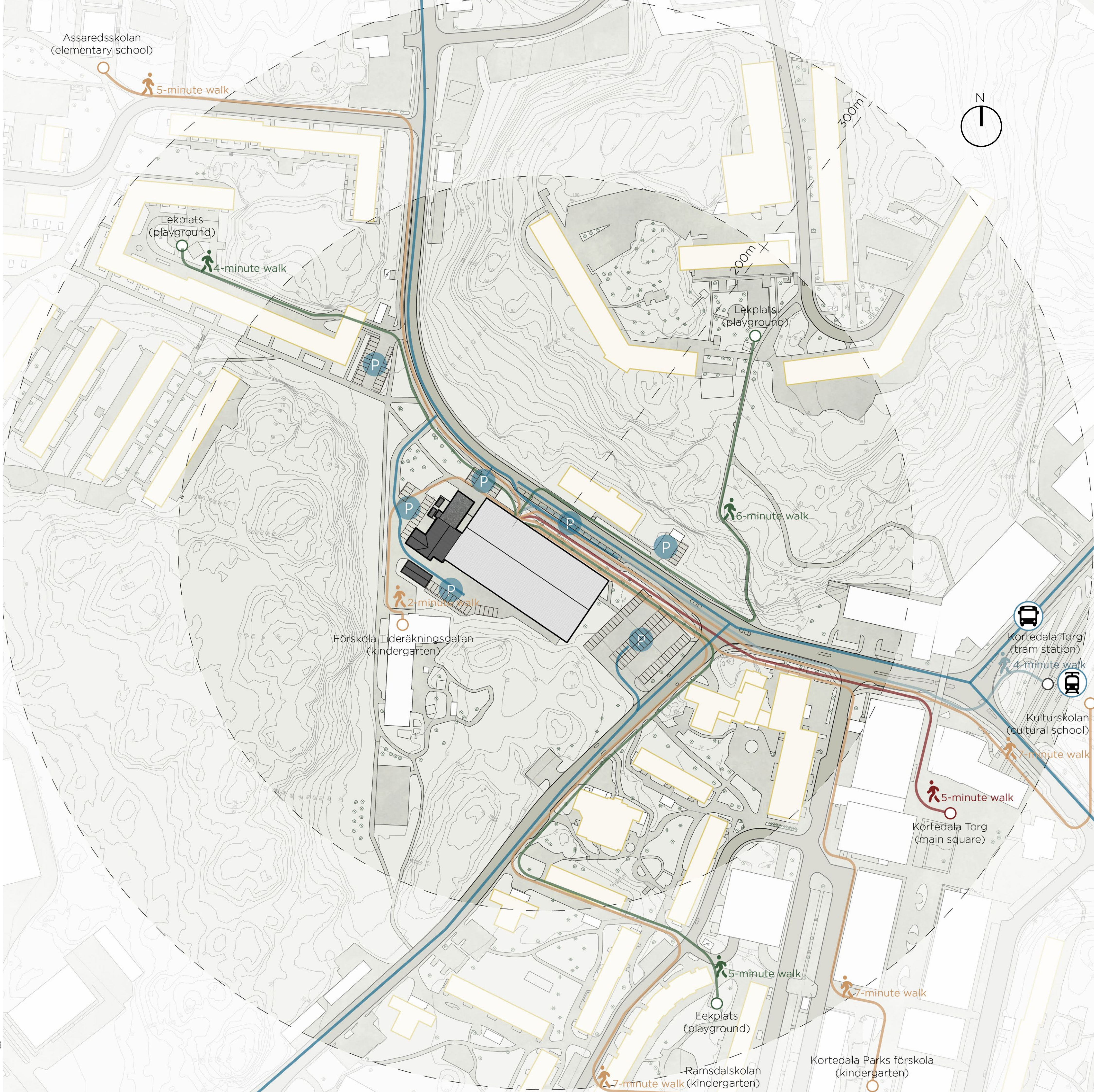
Not far from the site is Kortedala's main square, which features a Hemköp supermarket to meet residents' daily shopping needs and a City Gott Kortedala farmers' market offering fresh local produce. Additionally, the square is surrounded by various amenities, including cafés, restaurants, pharmacies, and clinics, catering comprehensively to the living needs of the surrounding community.

It is also worth noting that the area around the site hosts numerous educational institutions catering to a wide range of age groups, from preschools and kindergartens to primary schools. Additionally, there is a cultural school suitable for students aged 6 to 19, offering a variety of interest-based courses such as playing musical instruments, singing, dancing, filmmaking, and theater.

Given these conditions, the plan to transform the selected building into a swimming facility can not only serve nearby residents but also attract students and families of various age groups. For example, offering swimming lessons would meet the local educational and recreational needs while adding vitality to the community through thoughtful functional design.

Connections with...

Within a 300-meter radius of the site, there are various types of buildings serving different functions—including a station, residential areas, green spaces, educational facilities, and a central commercial square—all within a 2–7 minute walk. The main thoroughfare is Tideräkningsgatan Street. In addition, the parking lots around the site and the bike lanes on Tideräkningsgatan Street mean that residents from slightly farther away can easily bike or drive to the area.



Selection building

Residential building

Connection to tram station

Connection to local center

Connection to schools

Connection to parks

Figure 33. Site drawing 1:2000. (DWG © opengeodata.goteborg)

Figure 34.Exterior photo. (Photo © Eva Löfgren)

Original Building

History and current state

Originally, this sports facility was not an enclosed, roofed building but an open-air skating rink that was converted into tennis courts during the summer. The existing single-story structure was built in the 1980s, utilizing load-bearing concrete elements and glulam beams, with a gently sloping roof covered with metal sheets. Red aluminum clerestory windows are installed along the long eaves, and the area below these windows consists of enclosed concrete walls clad with light-colored exterior panels.

In addition to the skating rink, the other interior spaces and entrances have undergone numerous renovations and expansions. Around 2000, new restrooms were constructed, the entrance and changing rooms were expanded, and a parking lot was added on the west side. The most recent renovation and expansion plan dates back to around 2016, but it existed only as drawings and was never actually realized.

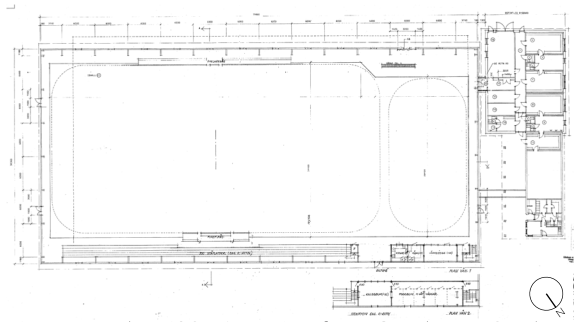


Figure 35. Plan, 1985 (Drawing from Göteborgs Stad Stadsbyggnadsförvaltningen)

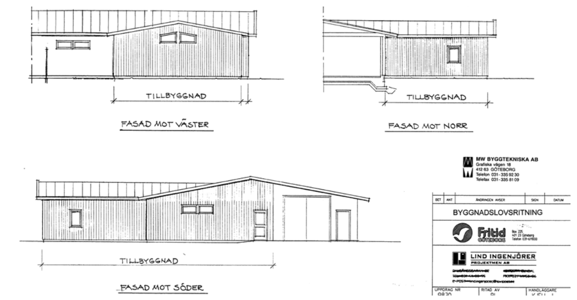


Figure 36. Elevation of extension part, 2000 (Drawing from Göteborgs Stad Stadsbyggnadsförvaltningen)

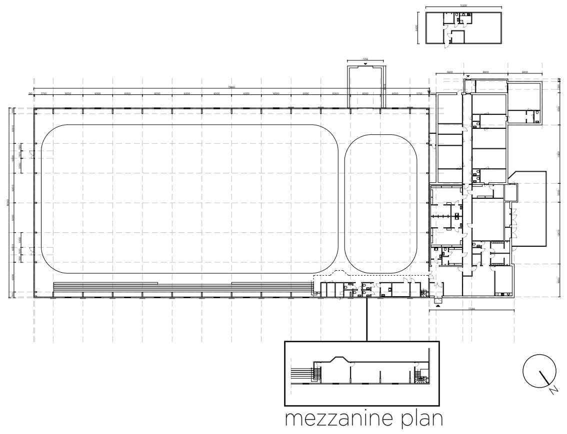


Figure 37. Plan, 2016 (Drawing based on Göteborgs Stad Stadsbyggnadsförvaltningen)

This skating rink, with a history of approximately 50 years, was demolished in 2023 due to outdated facilities, poor technical conditions, and its inability to meet the club's requirements for hosting small to medium-sized competitions. Many people mourned its loss. As a result, the design presented here is purely a fictional exploration that examines the possibility of converting the building into a swimming pool without demolishing it.

The fate of the other materials from the original building remains unclear, but it is known that the original glulam beam structure was carefully dismantled and transported to a factory for further processing, with the possibility of being reused in new residential construction. Although this approach adheres to certain sustainable principles, it also resulted in the loss of the skating rink's most distinctive memories and incurred additional carbon emissions during transportation. Furthermore, other parts of the building may also have potential for preservation and adaptive reuse.

On the other hand, in line with the Gothenburg Municipality's goal to reduce the carbon emissions of municipal construction projects by 90% by 2030, reusing existing buildings to minimize construction activities is considered the most valuable option. Compared to new construction, this method can reduce emissions by 50% to 75%.

Taking all factors into account, I am inclined to propose an adaptive reuse strategy for this small building rather than its demolition. This approach would not only alleviate the local residents' sense of loss over the skating rink's disappearance, but also contribute to the municipality's sustainability objectives.

Figure 38. The demolition site (Photo © Niclas Malmeling)

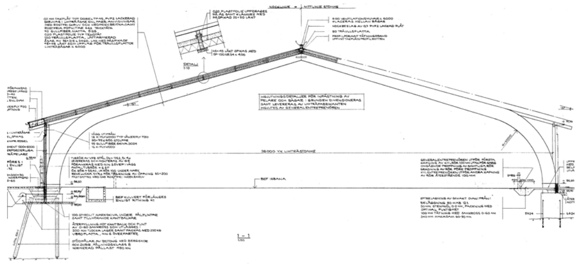


Figure 39.Roof section (1984) (Drawing from Göteborgs Stad Stadsbyggnadsförvaltningen)

Figure 40. 3D Reconstruction - Ice hall interior view

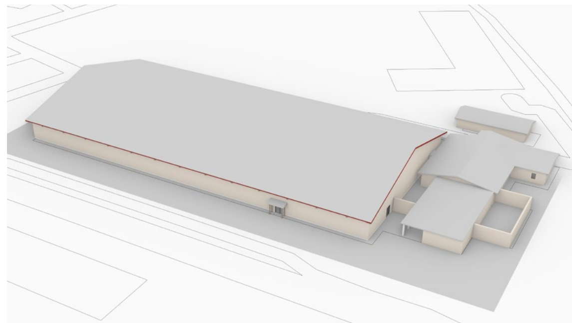


Figure 41. 3D Reconstruction - Bird view

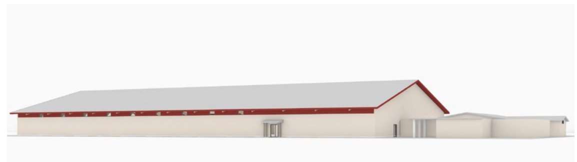


Figure 42. 3D Reconstruction - Street view from Tideräkningsgatan direction

Material Analysis

The 2016 architectural drawings provide information about the facade materials of both the original ice rink and the northern extension part. Since the building has already been demolished, it is no longer possible to conduct an on-site assessment of the materials' condition. Therefore, I can only estimate their state and potential for reuse based on photographs.

Ice rink interior:

Glulam beam structure — 100% reusable.

Ice rink exterior:

Roof — Light gray trapezoidal sheet metal: around 95% reusable (3270 m²).

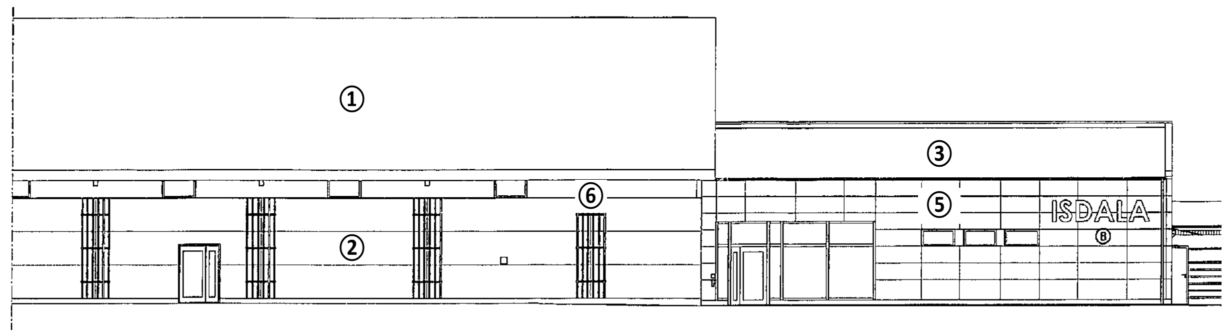
Facade — Prefabricated concrete panels: around 50% reusable (550 m²).

Red aluminum elements: 100% reusable (215 m²) (can be repainted).

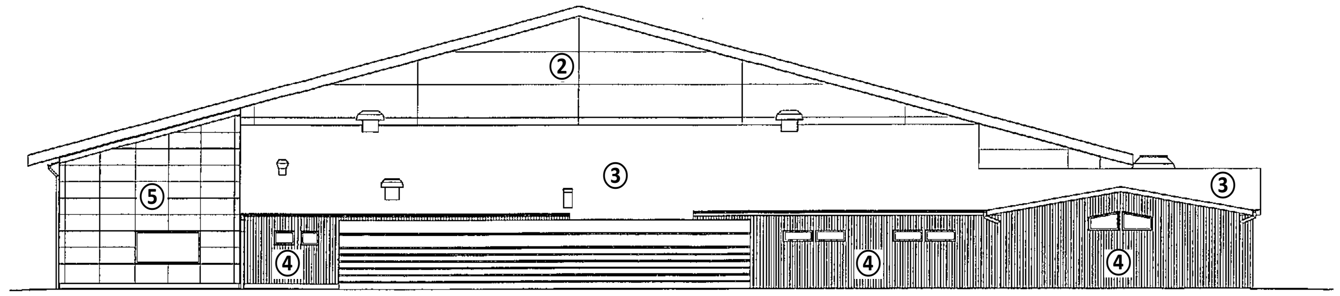
Northern extension exterior:

Wooden board cladding — around 80% reusable (270 m²) (can also be repainted in other colors).

As a result, a significant amount of the original building materials can be preserved. For the ice rink, high-quality sections of the concrete facade panels can be retained while enlarging the window openings. The wooden board cladding from the northern extension can be reused in the construction of new buildings.



Northeast facade



Northwest facade

Figure 43.Elevation and material (2016) (Drawing from Göteborgs Stad Stadsbyggnadsförvaltningen)

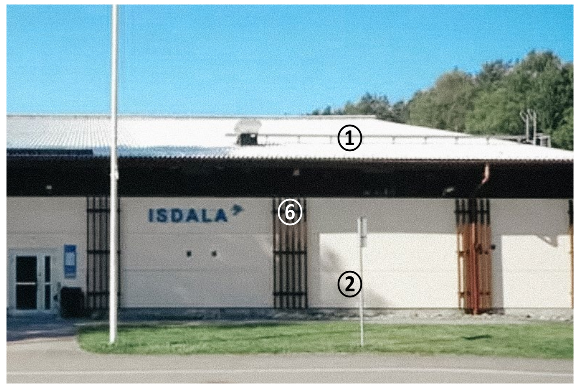


Figure 44.Facade photo. (Photo © Göteborg Stad, 2018)

Figure 45.Facade photo. (Photo © Google earth, 2022)

1. "TP-PLÅT LJUSGRÅ":
Light gray trapezoidal sheet metal

2. "BETONGELEMENT NCS S 0510-Y50R":
Prefabricated concrete panel in a warm beige tone.

6. Red aluminum

3. "TAKPAPP SVART":
Black roofing felt

4. "STÅENDE LOCKPANEL NCS S 0505-Y60R":
Vertical wooden board-and-batten façade cladding in a warm cream/beige tone.

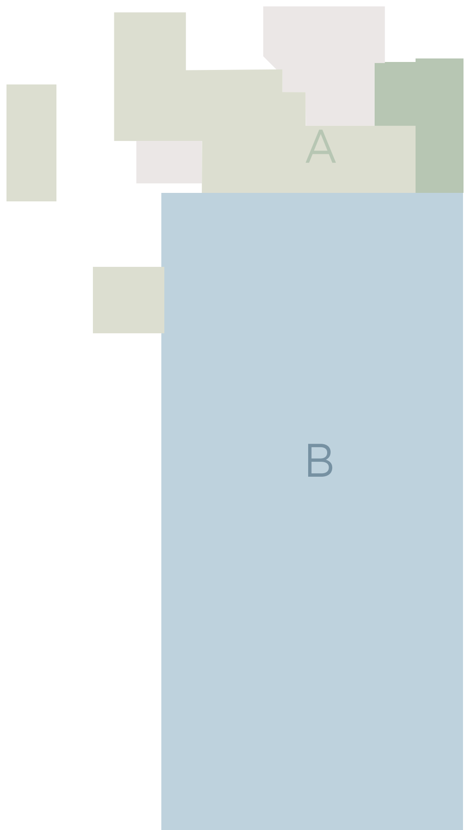
Zoning and area

This building has undergone multiple renovations and expansions. On the right is the floor plan from the 2016 building permit, which proposed adding a garage, an entrance, and more changing rooms and bathing facilities. However, based on Google Earth imagery from 2022, I still do not see these additions constructed. Since the building was demolished in 2023, I assume that the planned extensions from the 2016 layout were never realized. Nevertheless, this floor plan clearly indicates the functions of each room, making it a valuable reference for analyzing the functional layout of the old building. Therefore, I will use this plan to examine the distribution of functions and floor areas of the original structure.

Gross Floor Area: 4187m^2

ZONE A:
Entrance+Staff rest and changing room: 140m^2
Technical room: 221m^2
Changing room/shower/toilet: 596m^2

ZONE B:
Skating area : 3230m^2



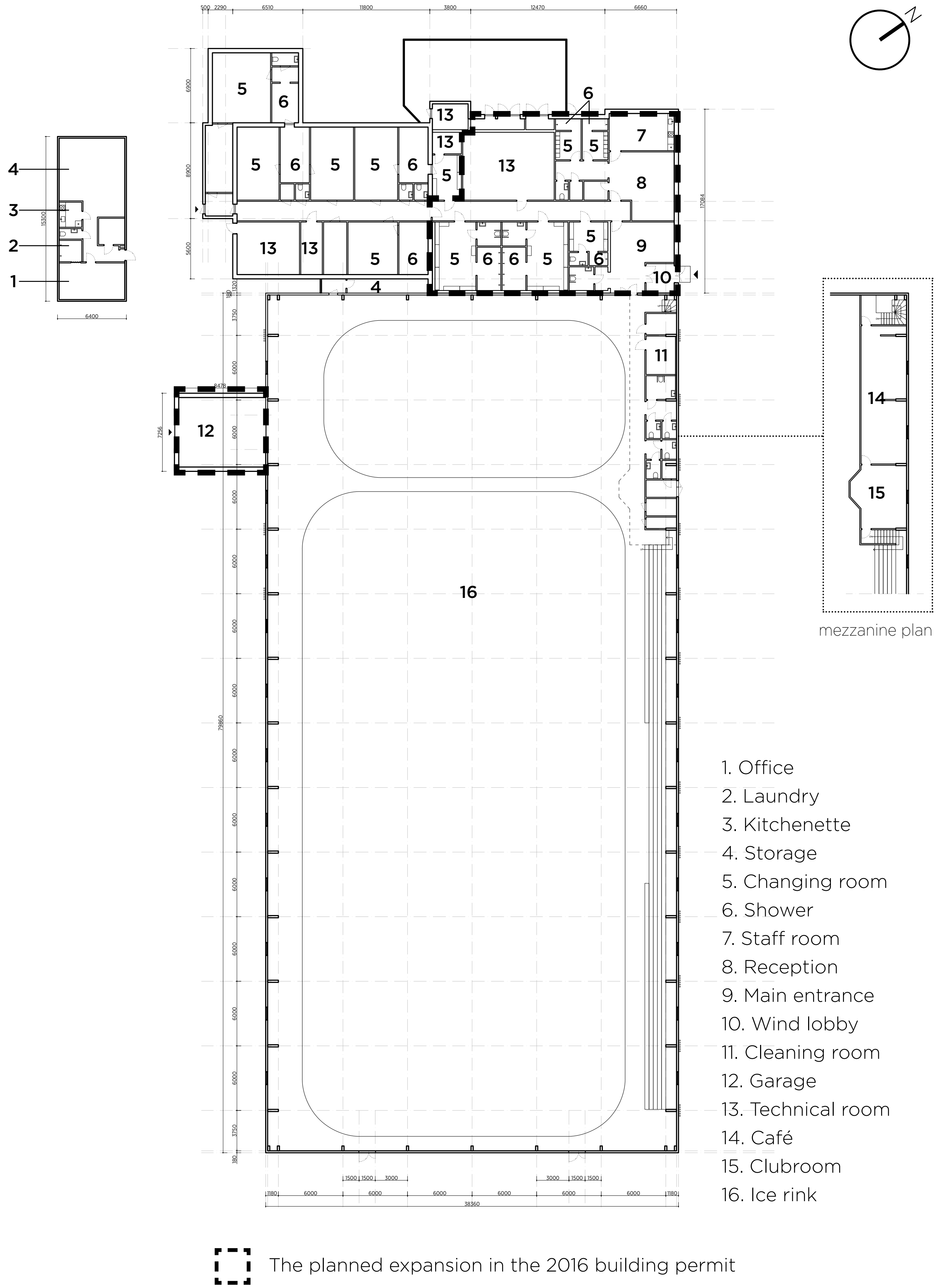


Figure 46. Original Plan(2016) 1:500

CHAPTER THREE

Program

Program Decision

What can a swim and bath center contain?

Based on the background analysis, this project is defined as a Local Pool, which must include at least a 25-meter pool and a teaching/warm pool with an adjustable floor.

In addition, a typical Swim and Bath Center usually consists of the following components:

Usual Pools – Standard swimming and recreational pools, including:
- 25-meter pool
- Teaching pool
- Family or leisure pools with shallow areas
- Kids' splash zones

Wellness Area – Spaces for relaxation, recovery, and health benefits, including:
- Saunas (dry and steam)
- Hot tubs and thermal pools
- Cold plunge pools
- Massage
- Relaxation lounges

Support Functions – Essential facilities for operation and visitor convenience:
- Changing rooms and showers
- Reception and ticketing
- Staff areas and offices
- Technical and maintenance rooms

Additional Features– Enhancing the user experience with:
- Water slides and adventure pools
- Fitness and gym areas
- Cafeterias and social spaces
- Outdoor pools or terraces

Population of Östra Göteborg

The project site is located in Kortedala, and its service area covers Östra Göteborg. Therefore, I have gathered population data for Östra Göteborg to analyze the needs of different age groups and estimate the required swimming pool area accordingly.

POPULATION OF ÖSTRA GÖTEBORG 2023

Age	Bergsjön	Gamlestaden -Utby	Kortedala	All	%
0-5	1648	1382	1282	4312	8.0
6-12	1856	1338	1348	4542	8.4
13-18	1495	1047	1011	3553	6.6
19-29	3313	3740	2870	9923	18.4
30-64	8280	9002	8294	25576	47.3
65+	1726	1986	2401	6113	11.3
All	**18318**	**18495**	**17206**	**54019**	**100**

Table 9.Population (Göteborgsbladet, 2024).

From the table, the population distribution across different demographic groups is as follows:
- Young children(0-5):8%
- School Student(6-18):15%
- Adult(19-64): 65,7%
- Senior(65+): 11.3%

This indicates that the majority of users will be adults, followed by school-aged children and seniors, while young children make up a smaller portion. Additionally, families with children will also be an important user group.

Pool Capacity

The ASA use a figure of 11m² of water per population of 1000 as a guide to Local Authorities for urban locations (assuming a 'pay and play pool' open to the public and excluding open-air pools and teaching pools). (Sport England, 2013)

The Swedish bath industry suggests that the required water surface area per user in a swimming pool should be 4.5m² to ensure physical safety. (Svenska Badbranschen, 2023)

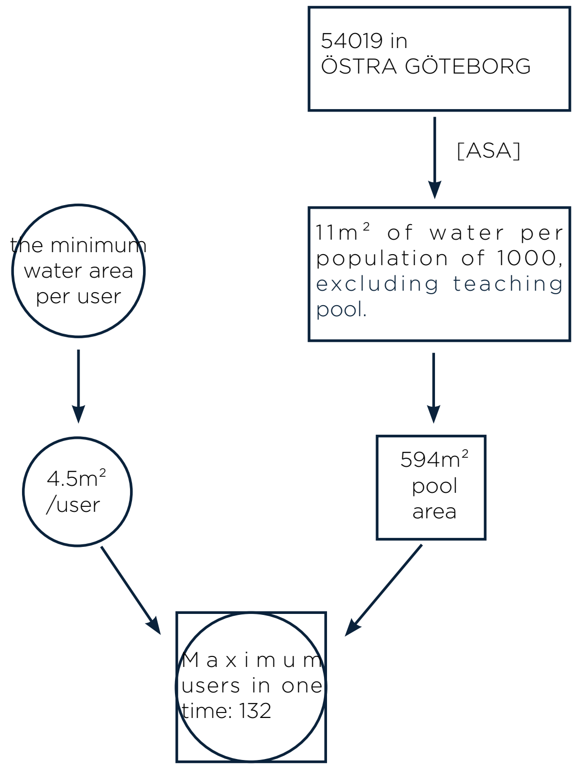
There are around 54019 people in ÖSTRA GÖTEBORG, so we need around 54019÷1000X11=594m² for indoor pool area excluding teaching pools. Maximum users are 594÷4.5=132. Based on the proportions of the age structure, it is possible to speculate on the age structure of these 132 users and the surface area they would need if they were all in the water at the same time:

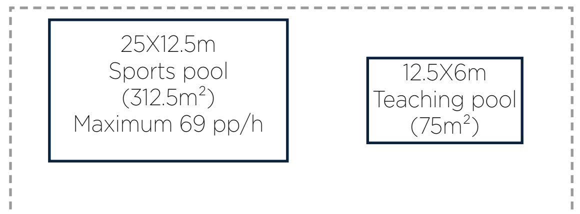
Yound children(0-5):
    8%X132=10(pp)
    10X4.5=45m²

School-age children(under 18):
    15%X132=20(pp)
    20X4.5=90m²

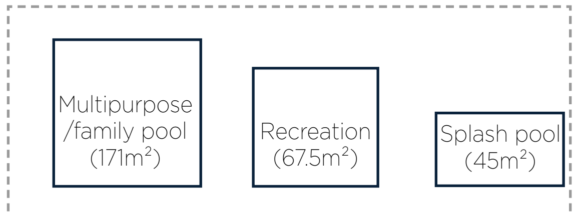
Adult(19-64):
    65,7%X132=87(pp)
    87X4.5=391.5m²

Senior(65+):
    11.3%X132=15(pp)
    87X4.5=67.5m²





Basic requirement for a local swimming pool



Calculate based on the number of people and the minimum water area per person

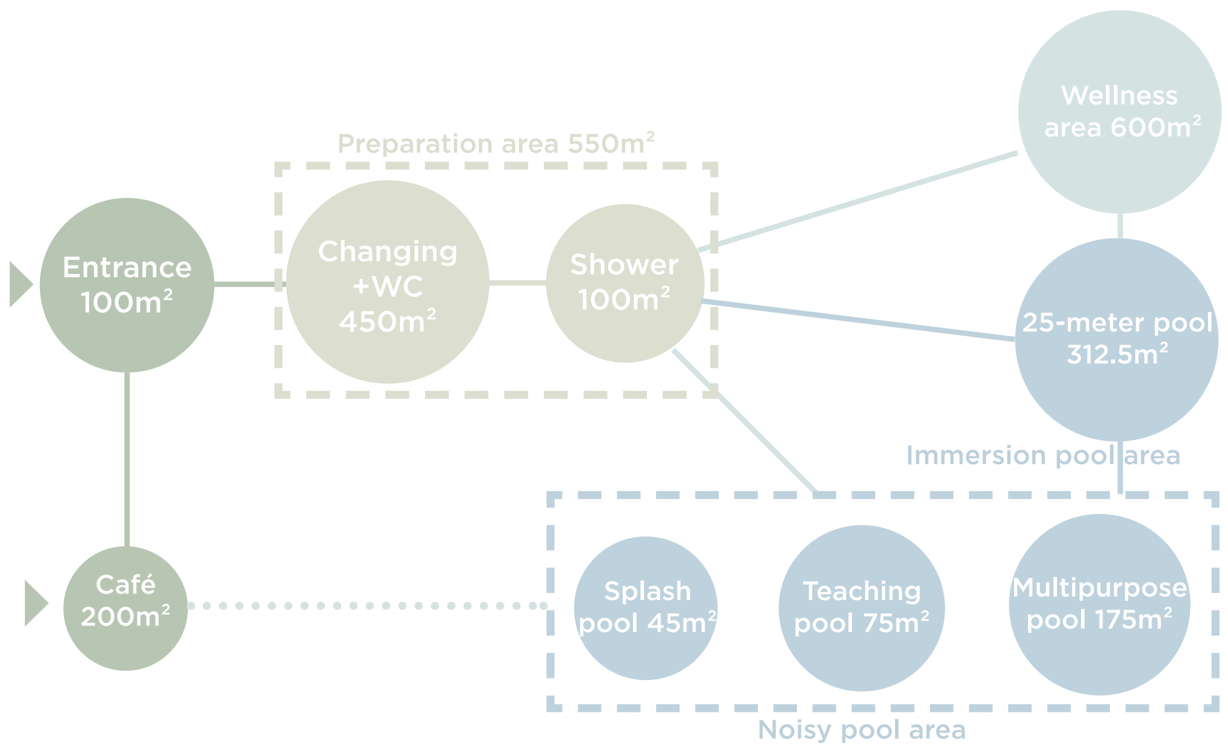


Figure 47. Bubble diagram and functional space relationship

Functional Program

This functional program serves only as a preliminary design guideline and may be slightly adjusted later based on specific project needs.

FUNCTIONAL PROGRAM OF POOL AREA

Sub-Zone	Function	Users	Area (m^2)	Water depth (m)	Temperature (°C)
Sports pool	A peaceful, uninterrupted swimming area	Swimmers who seek a fully immersive experience	25X12.5 /16.66	1.8	27
Multipurpose pool	A fun area for low-altitude diving(1.5m springboard, 3m platform)	Teens and adults, families	20X10=200	1.2-3.5	27
Teaching pool	Swimming instruction for students from neighboring schools	Beginners	12.5X6=75	0.8-1.2	32
Splash pool	A place for kids to play with water	Young children	6X7.5=45	0.1-0.3	32
Lounge and corridor area	Rest area with seats, passage	All visitors	2263.5	/	/
TOTAL	/	/	3000	/	/

FUNCTIONAL PROGRAM OF NON-POOL AREAS

Main Zone	Sub-Zone	Users	Area (m^2)	Water depth (m)	Temperature (°C)
Entrance area	Reception	All visitors	100	/	/
	Café	All visitors	200	/	/
Preparation area	Locker&Changing room	All visitors	400	/	/
	Shower	All visitors	100	/	/
	Restrooms	All visitors	50	/	/
Wellness area	Sauna rooms	Adults/seniors/ wellness visitors	15*2	/	60 / 80
	Cold room with cold pool	Adults/seniors/ wellness visitors	30	1.2	10
	Steam room	Adults/seniors/ wellness visitors	30	/	/
	Massage rooms	Adults/seniors/ wellness visitors	10*6	/	/
	Turkish bath	Adults/seniors/ wellness visitors	30	/	/
	Relaxation Lounge	All visitors	70	/	/
	Hot spa pool	Adults /seniors/ Child under adult supervision	30	0.9 - 1.2	36 - 40
	Relaxation pool	Adults/seniors/ wellness visitors	68	1.2	29 - 32
Technical room	/	Staff	730	/	/

Table 10. Functional Requirements

CHAPTER FOUR

Design Proposal

Design Concept

Based on the previous site and building analysis, as well as considerations of circulation for the swimming and bathing center, the following design concepts serve as key principles guiding the proposal.

Keep the original building clean

The existing building consists of a main hall (originally the ice rink) and several attached auxiliary structures, which include the entrance, changing rooms, showers, and staff facilities. As these auxiliary buildings are relatively disorganized and the original entrance location is not ideal, the proposal suggests demolishing them. Some of the façade materials will be reused in the new construction.

The main hall, however, features a well-preserved and elegant glulam beam structure, with a spacious interior that is also well suited for swimming. Parts of the original façade—such as the steel panels and concrete panels—are still in good condition. Therefore, the main hall will be retained, while the attached buildings will be removed to preserve the clarity and integrity of the original structure.

Clear flow

The local center and tram station are located to the southeast of the site, while the original entrance to the building was positioned on the northwest side. For improved accessibility and convenience, the new entrance—along with changing and shower facilities—should be relocated to the southeast side, even though this will occupy part of the existing parking area.

To accommodate users of all ages, the circulation from the changing rooms should clearly branch out to the wellness area, the sports pool, and other pools designed for children and young people to learn and play. These routes should be clear and designed to minimize disturbance between different user groups.

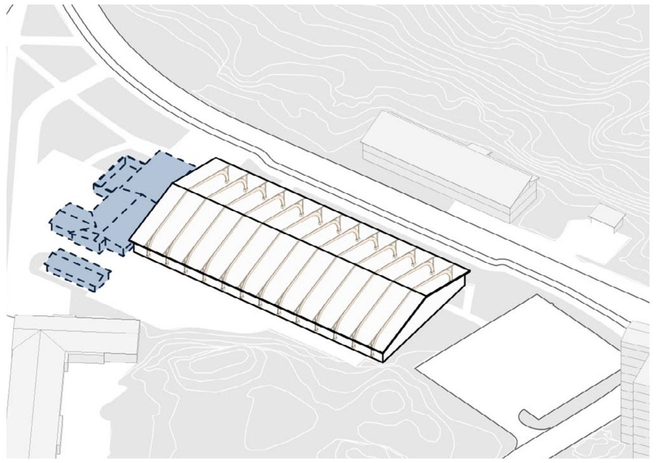
Dialogue betweed old and new

The original building offers a large and open interior, making it suitable for accommodating the entire pool area. New structures are therefore needed to house the entrance, changing rooms, bathing and wellness functions.

The dialogue between the old and new buildings—in terms of structure, volume, and materials—should be carefully considered. A glazed corridor is proposed to link them, serving both as a public circulation route to different functions and as a clear transition between the two volumes.

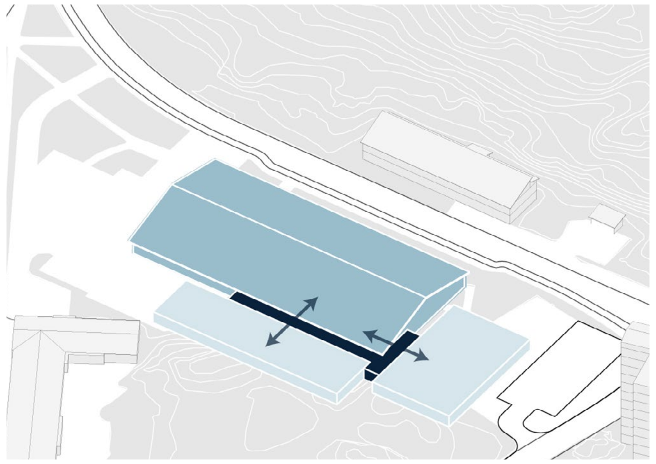
A close connection with the surrounding nature

The site is bordered by woodland on the south and west sides, offering an opportunity for the new building to integrate more closely with nature and allow the landscape to flow into the site. The southern and western façades can be designed to be more open and transparent, creating the atmosphere of swimming within a forest.

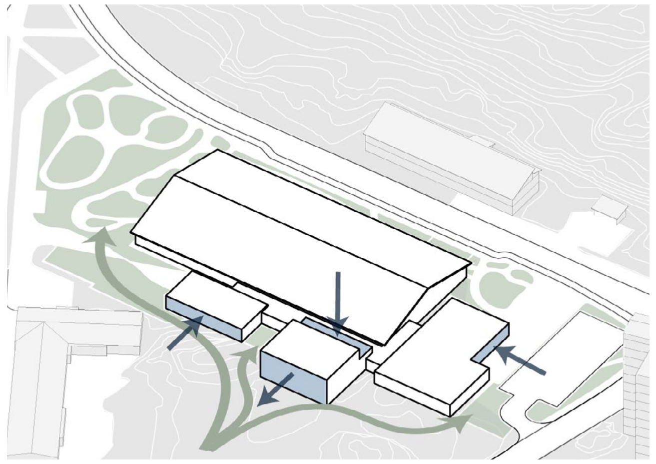


1. Demolish the annexes to keep the original building clean and uncluttered, while recycling some of the materials.

2. Define the locations of the entrance, plaza, parking areas, and overall functional layout based on the surrounding traffic conditions and main pedestrian flow.



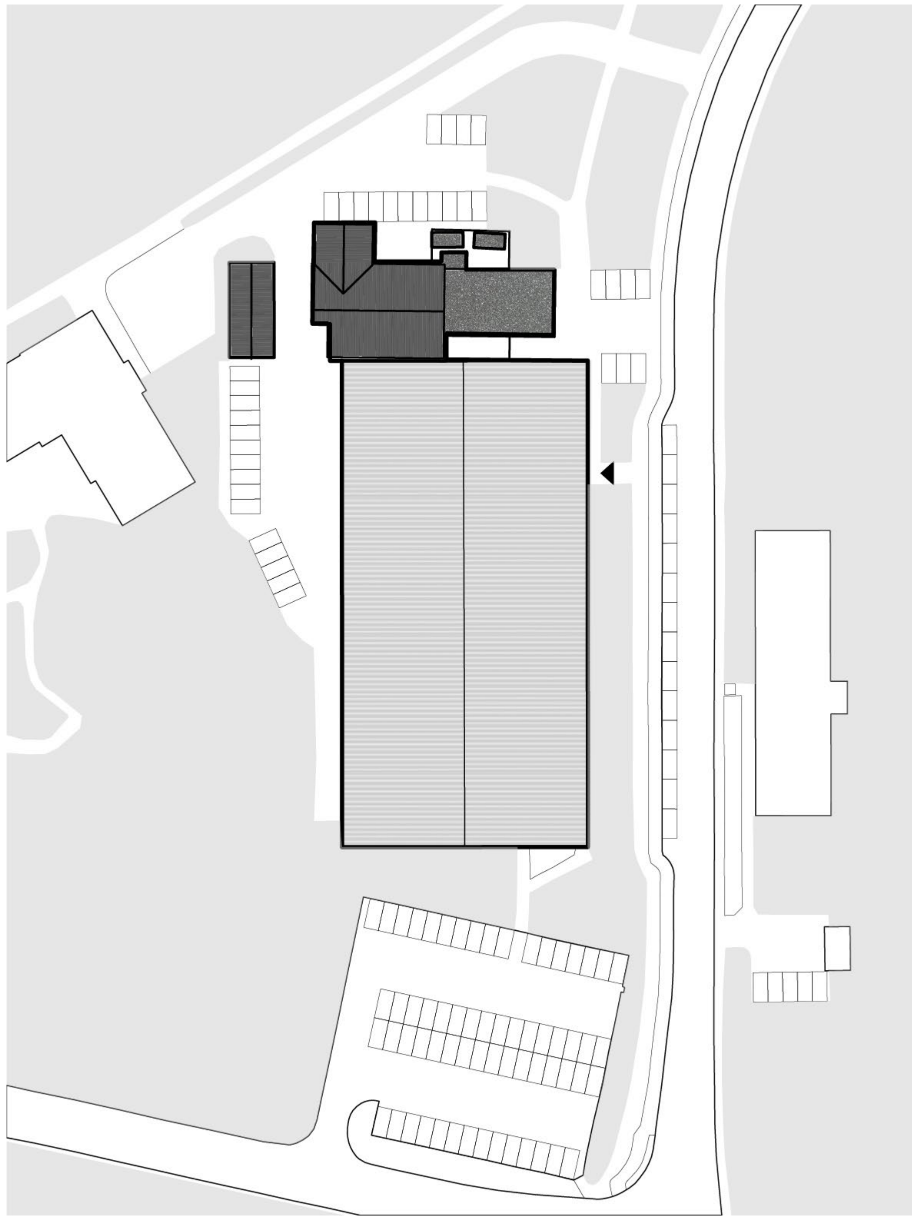
3. A glazed corridor is introduced to connect the existing and new buildings.



4. The new volume contrasts with the existing building while engaging more directly with the surrounding nature.

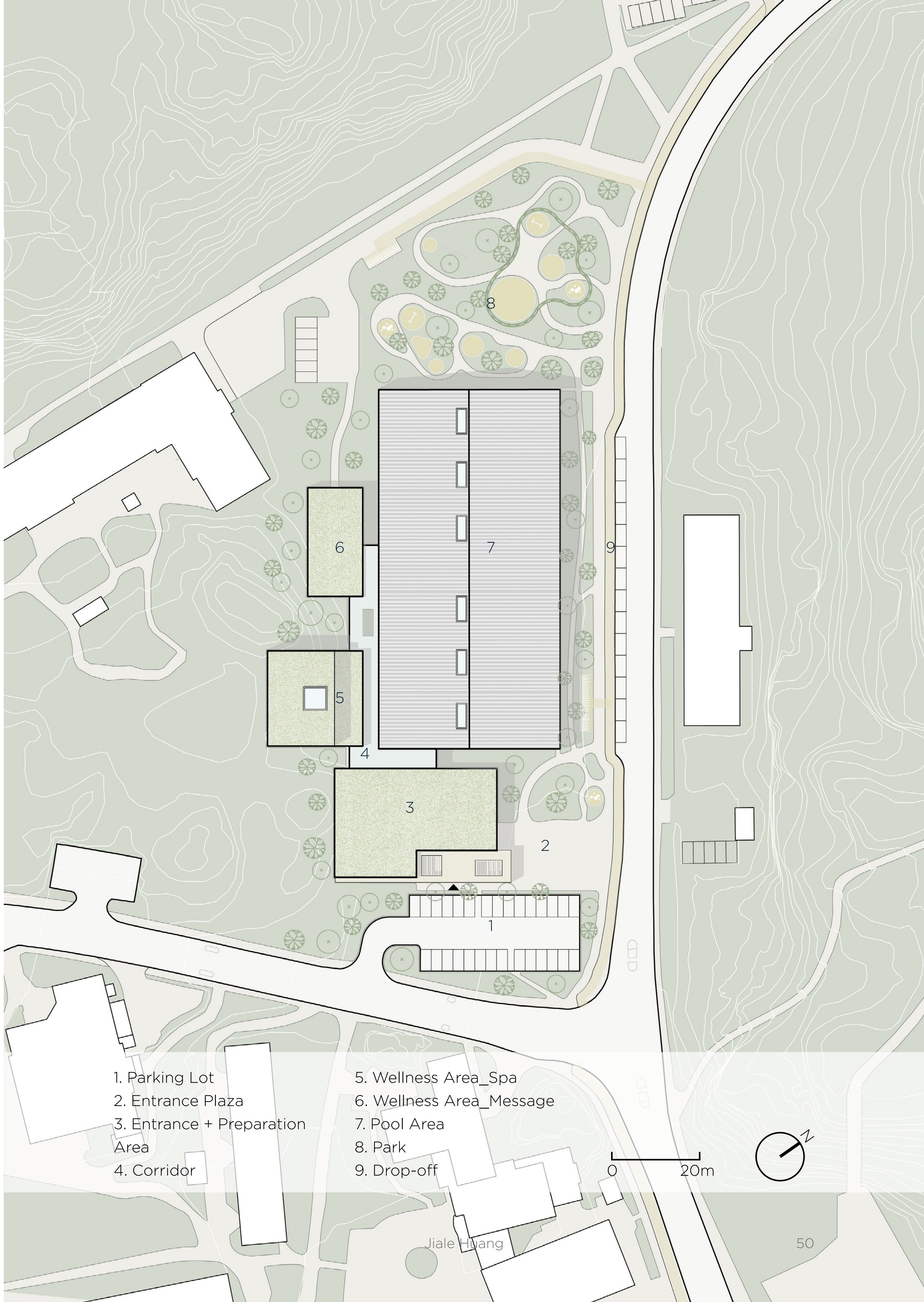
Design Generation

Site Plan



Before

In the site plan, the relationship between the entrance square and the parking lot more clearly. The wellness area has been split into two buildings, one focused on the spa function and the other on massage. The open space on the north side has been turned into a park with some outdoor fitness areas. This makes the whole building feel more immersed in the landscape and nature.

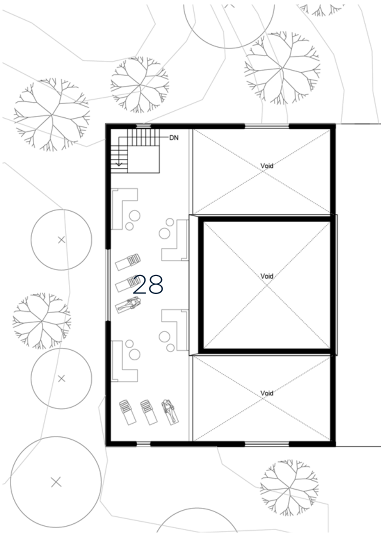


Plan 1:500

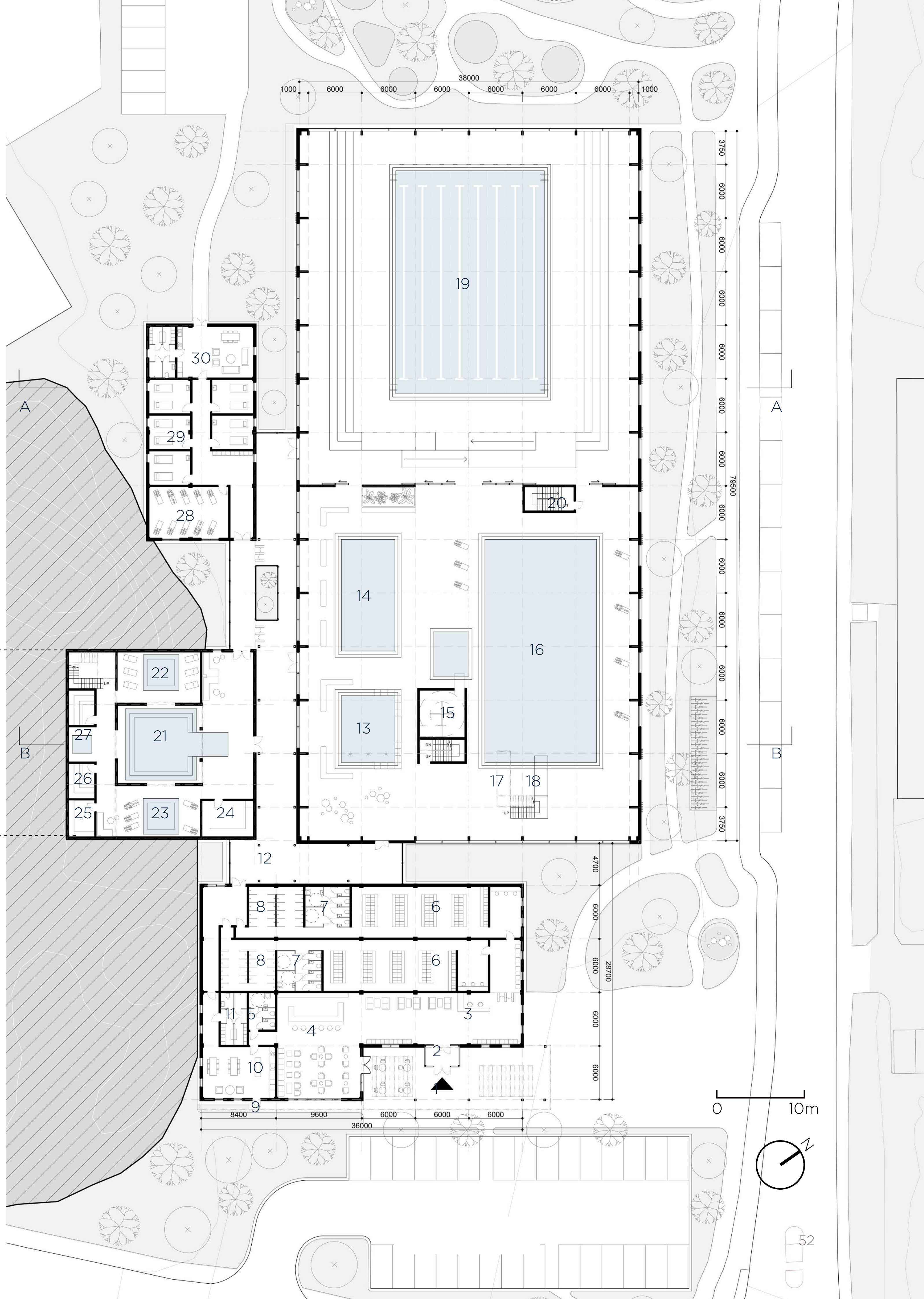
Entrance + Preparation
1. Main entrance
2. Wind lobby
3. Reception
4. Café
5. Toilet for café
6. Changing room
7. Toilet
8. Shower
9. Staff entrance
10. Staff room
11. Staff changing room+toilet+shower
12. Corridor

Pool Area
13. Splash pool
14. Teaching pool
15. Water slide
16. Multipurpose pool
17. 3-meter diving board
18. 1.5-meter diving board
19. Sports pool
20. Technical room

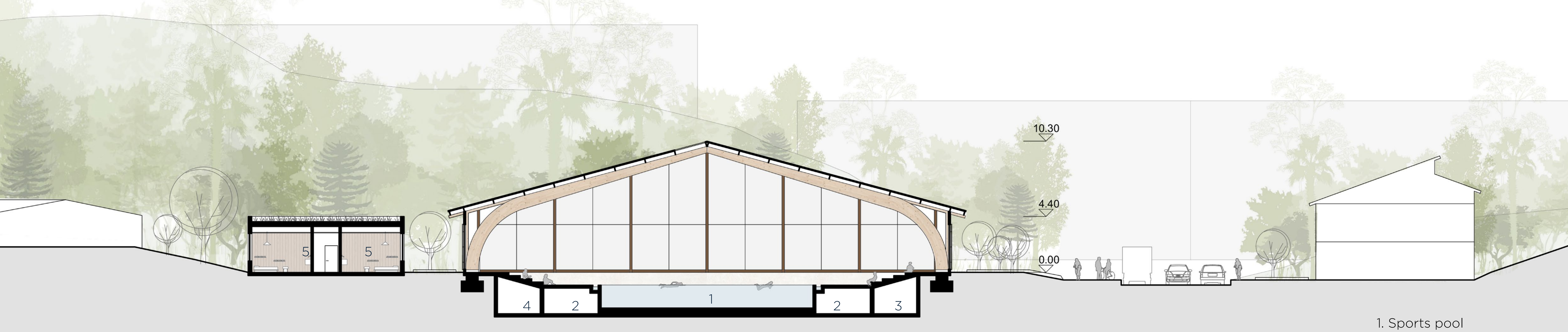
Wellness area
21. Warm pool
22. Message pool
23. Hot pool
24. Turkish bath
25. Steam room
26. Sauna room
27. Cold pool
28. Rest lounge
29. Message room
30. Staff room



Mezzanine Plan



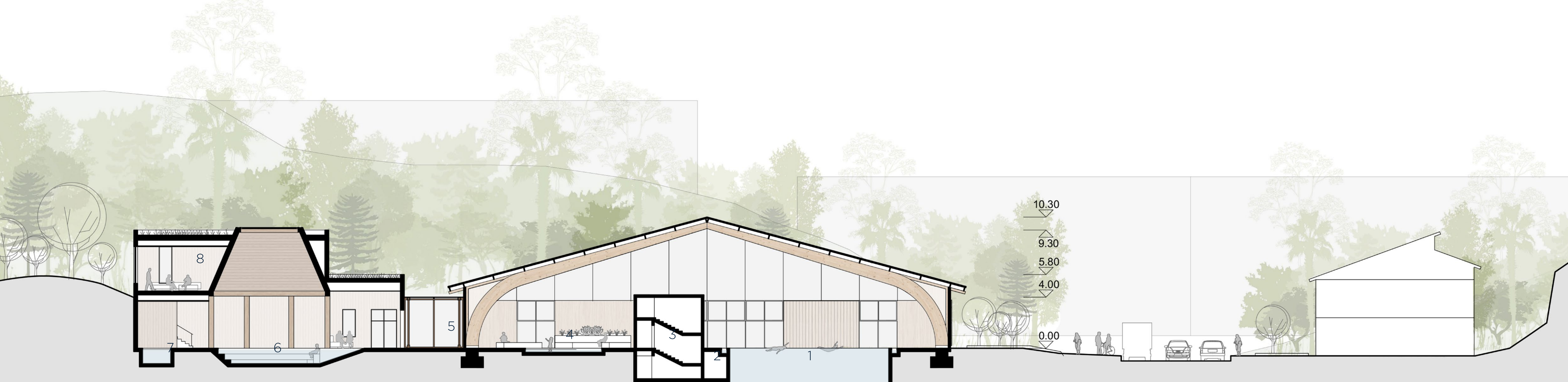
Section



Section A

0 6m

1. Sports pool
2. Pipe
3. Drum filter
4. Ventilation
5. Message room

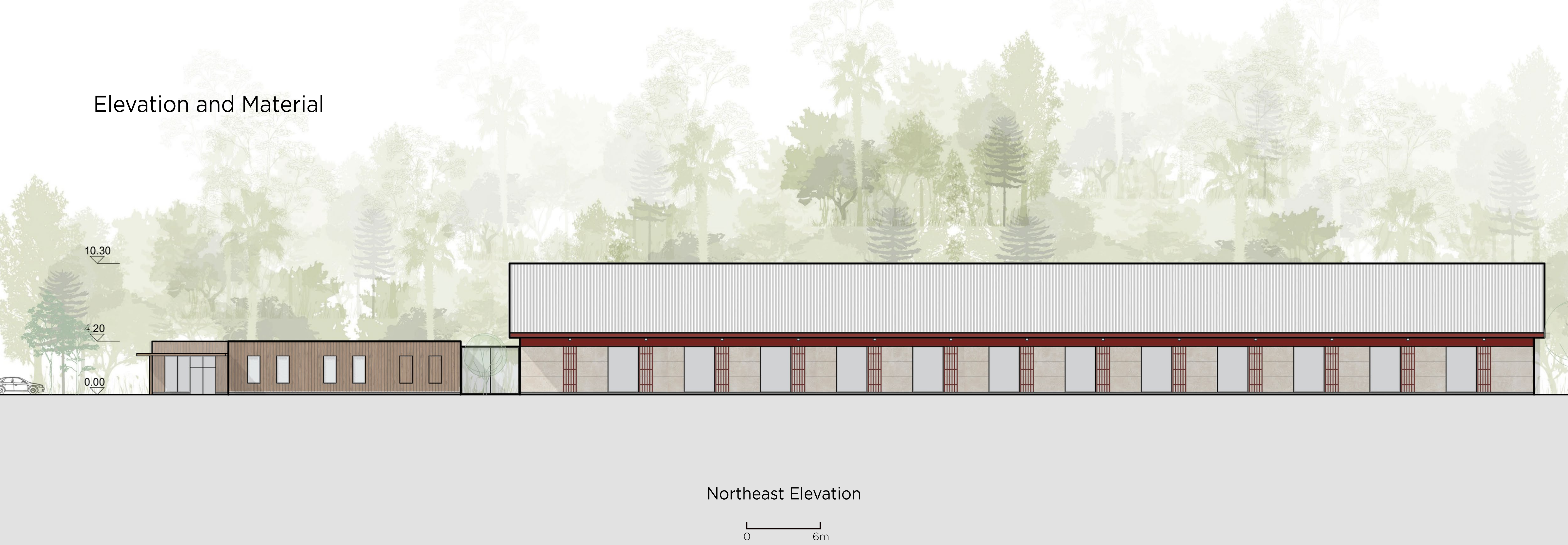


Section B

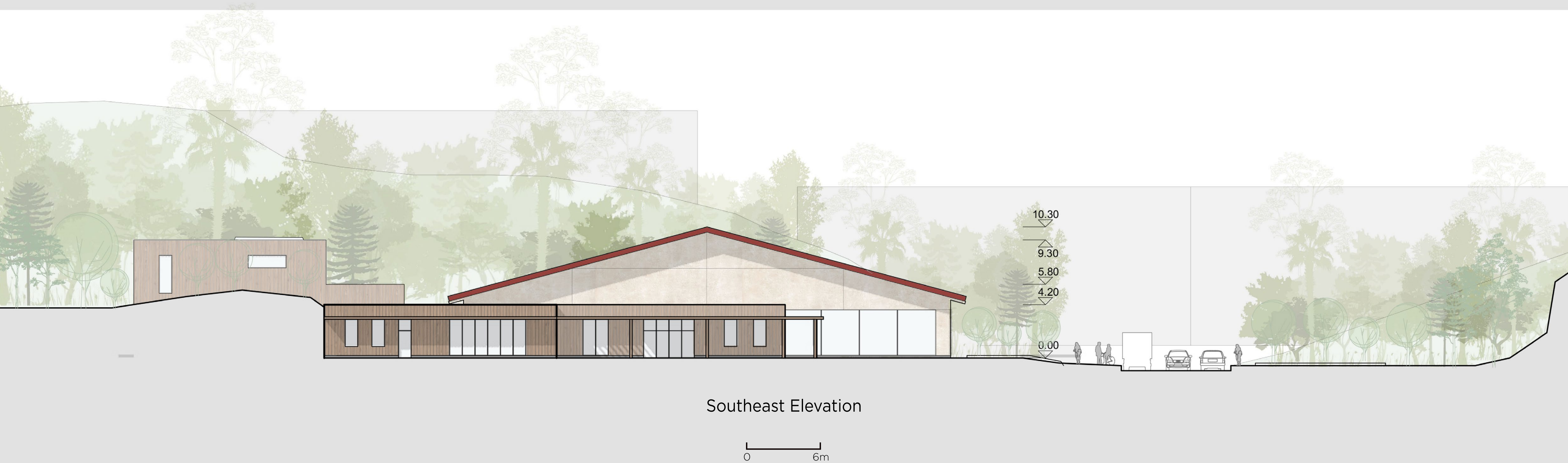
0 6m

1. Multipurpose pool
2. Pipe
3. Stairs to water slide and technical room
4. Splash pool
5. Corridor
6. Warm pool
7. Cold pool
8. Rest lounge

Elevation and Material



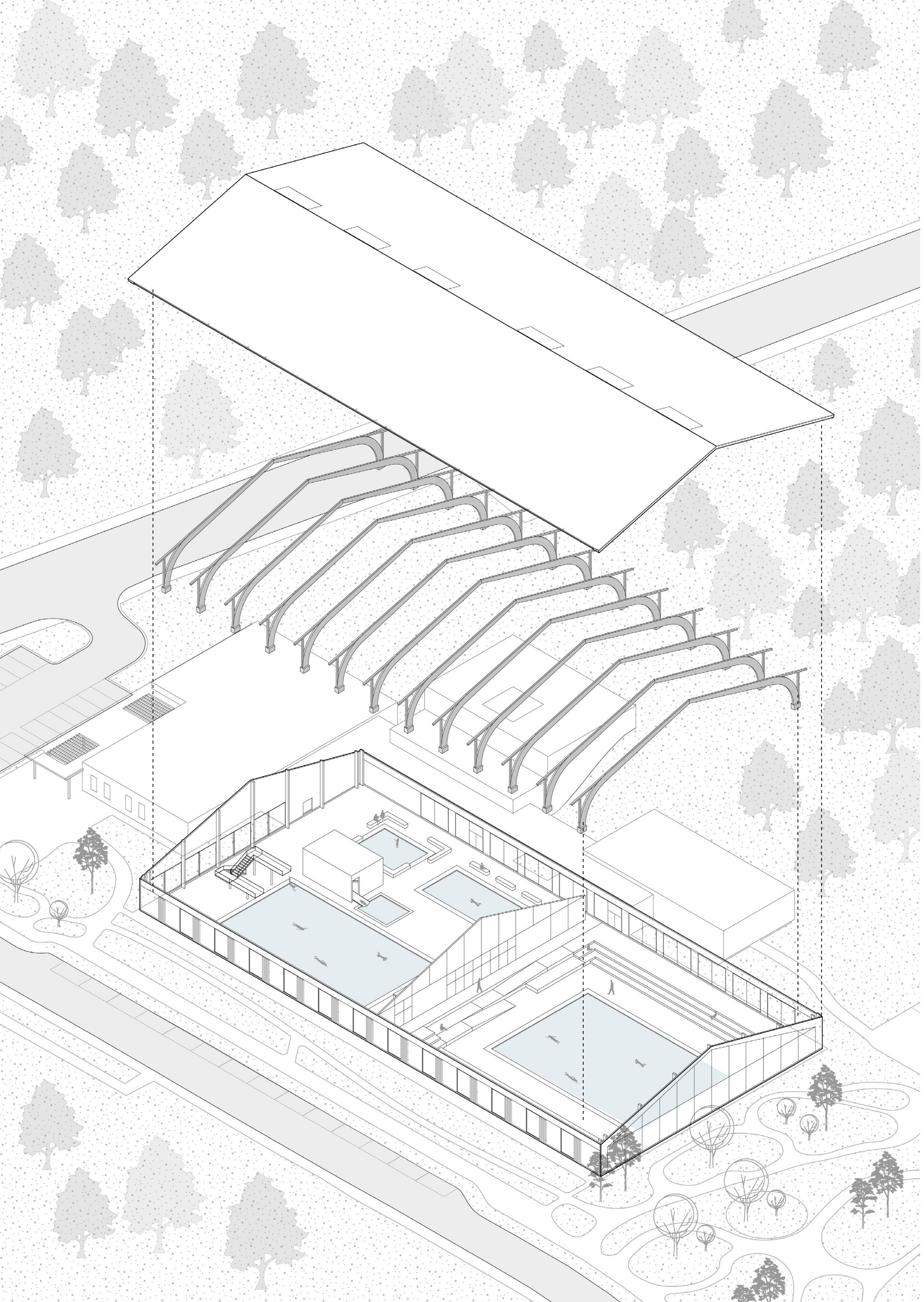
Northeast Elevation



Southeast Elevation

Exterior View

Corridor View



Pool Area

Multi-purpose pool

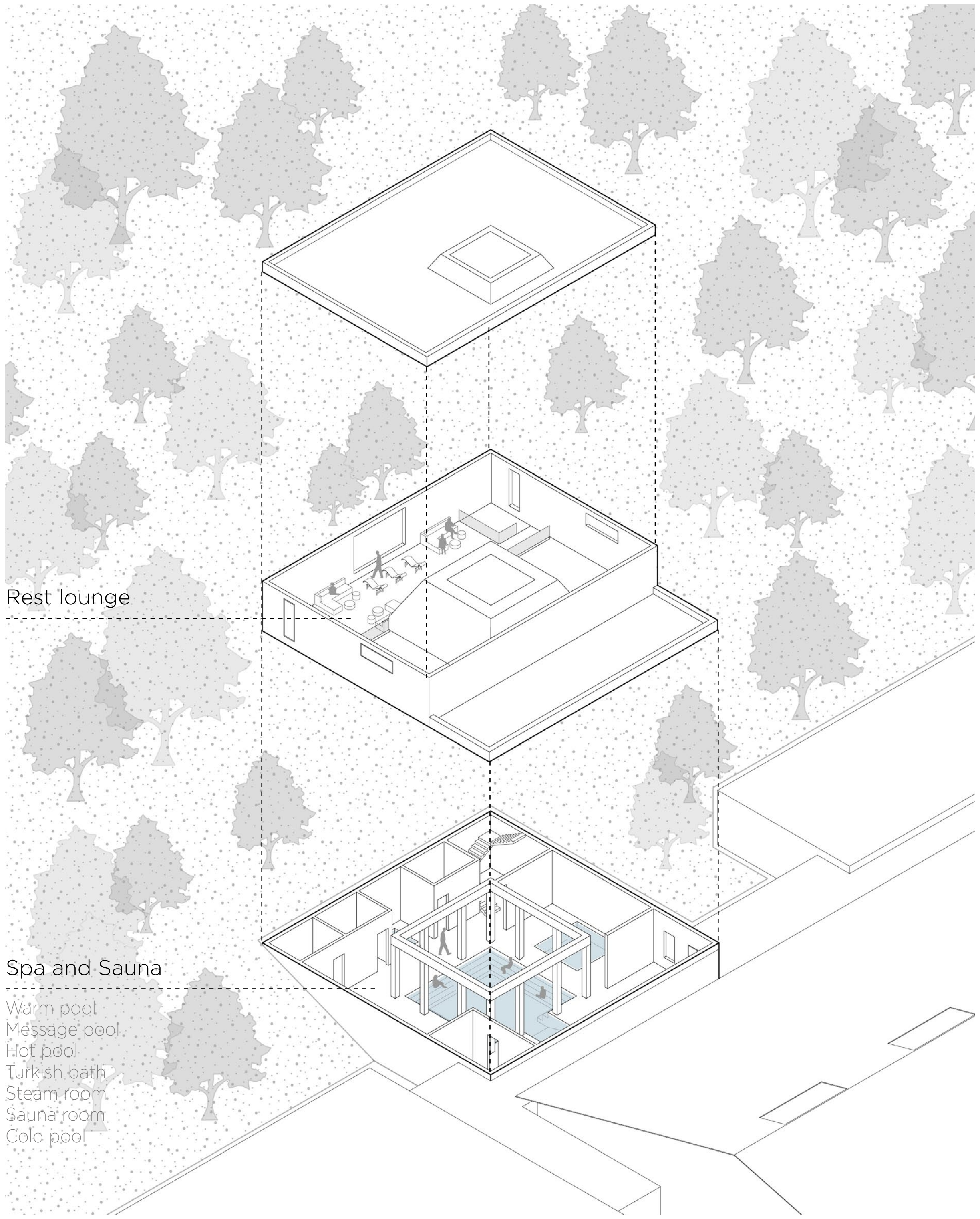
This part includes a multi-purpose pool with diving board, a water slide, a splash pool for kids, and one teaching pool, creating an engaging and fun environment especially suited for families and younger swimmers.

Sports pool

The sports pool is positioned one meter lower than the other pools, keeping the Bleacher seating from blocking the original timber structure. A glazed partition separates it from the other pools, with a sliding door providing access—clearly defining the two spaces while also improving acoustic control. The façade facing the park is fully glazed, creating an immersive experience of swimming among the forest.

Wellness Area - Spa and Sauna

In contrast with the pool area, the wellness area is designed to be more immersive, with only some skylights to bring in limited natural light. The material choices will also contrast, further emphasizing the different atmospheres of each space. To enrich the spatial experience, a mezzanine lounge is introduced—offering a quiet place to relax while enjoying views of the surrounding landscape.



Water Treatment and Ventilation

To reduce the health risks caused by chlorine by-products, the InBlue system is used in this project. This integrated solution combines hydraulics, filtration, and ventilation to improve water and air quality while saving energy and water.

The system uses gravity to direct water from deep gutters into a drum filter and balance tank, reducing pump energy use. Around 75% of the water is then UV disinfected and returned to the pool, while the remaining 25% goes through a sand or D.E. filter for fine particle removal before also receiving UV treatment.

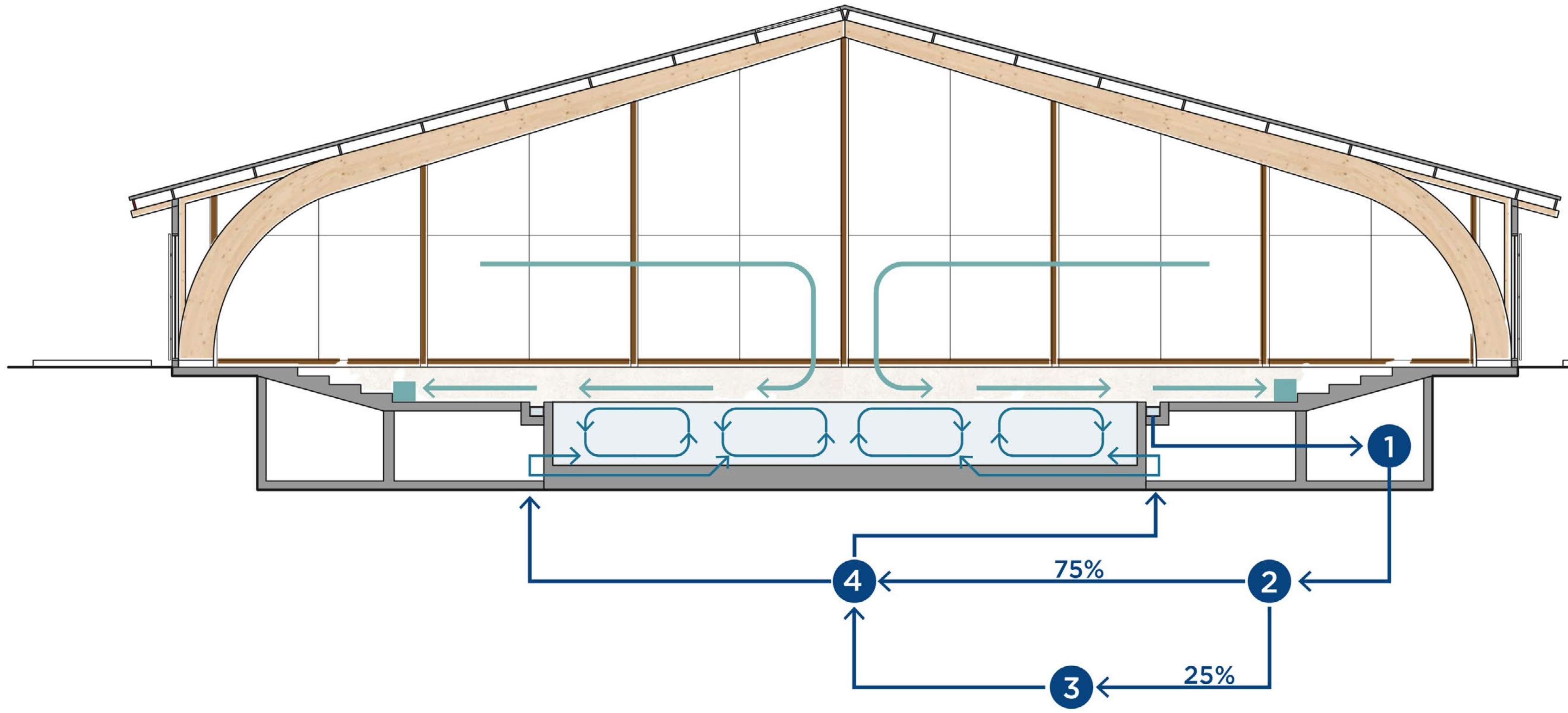
To address airborne chlorine by-products, the system generates airflow at the water surface level to reduce the concentration of these compounds.

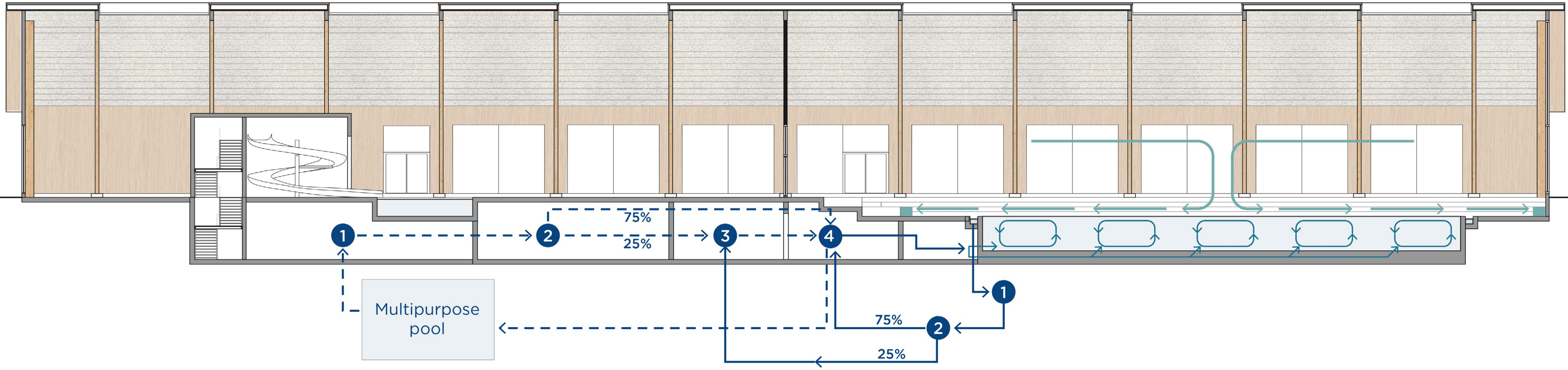
Hydraulics
Special inlet brings water in from the bottom, pushing particles toward the side gutters and reducing dead zones where particles might accumulate.

Filtration
1. Drum Filter
2. Balance Tank
3. Sand or D.E Filter
4. UV Disinfection System

Ventilation
The system mainly targets the removal of chlorine by-products from the water surface.

(Diagram based on InBlue Systems)





Discussion

This thesis was inspired by the shortage of swimming facilities in Gothenburg. It takes the demolished Kortedala Ice Rink as a case for adaptive reuse, exploring how a swimming and bathing center can meet the needs of all user groups in the community, how to manage the relationship between old and new structures, how the site influences the architectural design, and how to reduce the energy consumption and environmental impact of such facilities.

> ***How can the swim and bath centers promote health and well-being, serve people of all ages, and become a gathering place for the local community?***

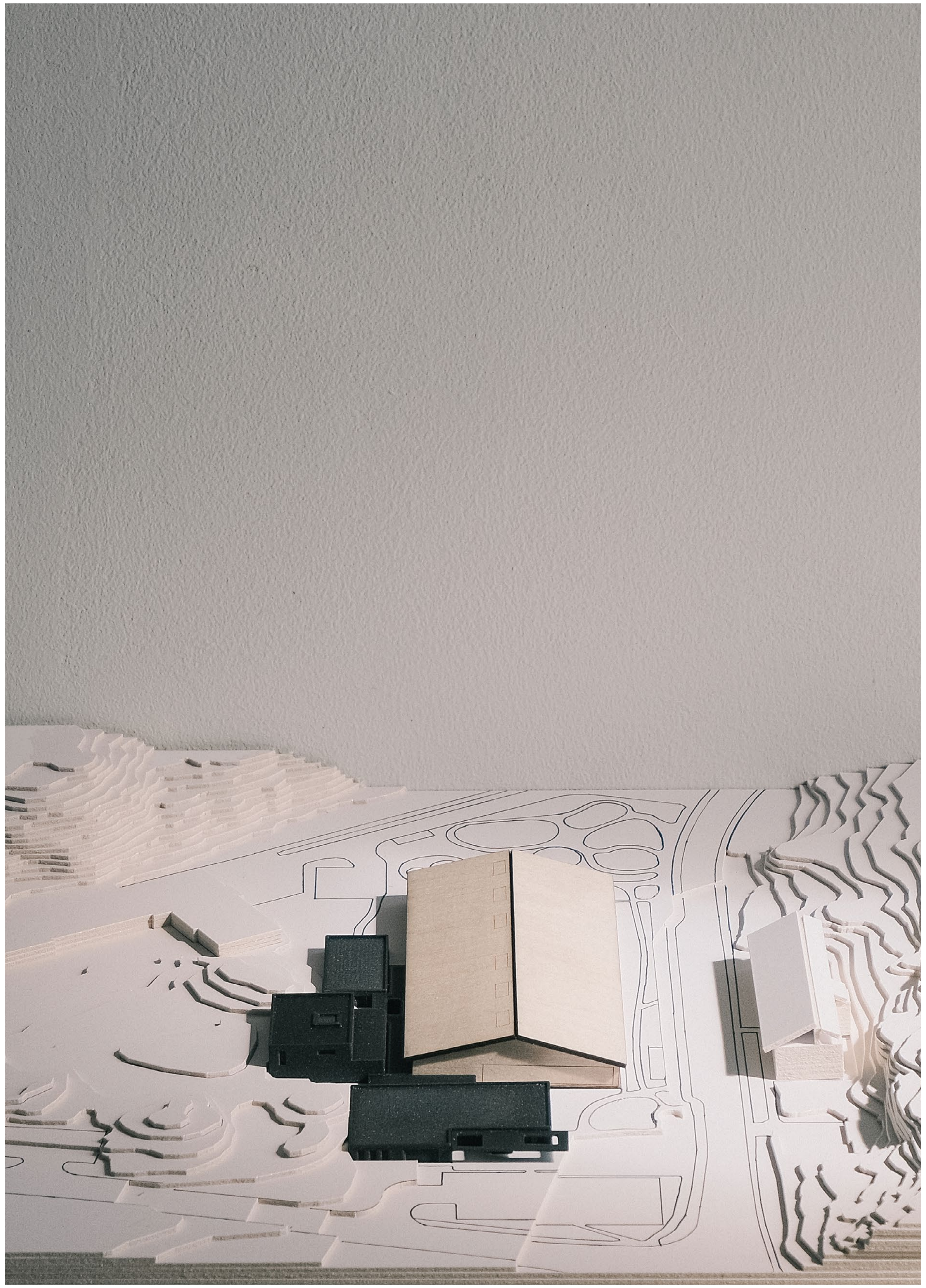
This question guided my thinking on the programmatic layout, spatial circulation, and acoustic strategies within the building. The quietest spaces—such as the spa and massage areas—are placed in a separate building to ensure tranquility, while the immersive sports pool and the family and children's pools are located within the main structure but separated by height and glass partitions. Each area has its own entrance, creating a clear flow and minimizing disturbances. The design caters to the diverse needs of people of all ages, turning the facility into a space where the entire community can gather and feel welcome.

> ***How can the design connect the old building with new additions in a clear and harmonious way?***

There are many ways to approach the relationship between old and new buildings, often depending on the site's conditions and architectural characteristics. The large-span structure of the Kortedala Ice Rink is ideal for housing swimming pools. In this project, the wellness area and the pool area are equally important and both need direct access to changing rooms. I drew inspiration from several projects and introduced a glazed corridor, which functions as both a circulation space and a transitional zone between the existing structure and the new addition.

Returning to the main research question, if an existing building is located in an area with a shortage of swimming facilities and is spatially suitable for bathing programs, it can be transformed and expanded to address this local need. From a sustainability perspective, reusing structural materials and incorporating more efficient water treatment systems can significantly reduce the energy consumption and carbon footprint of swimming facilities. However, this thesis focuses primarily on architectural space, circulation, and the relationship between old and new; sustainability is only discussed qualitatively, without quantitative calculations.

Overall, this period of research has deepened my understanding of bathing architecture. During these years in Europe, I have visited numerous bathhouses—from enjoying them as a user at first to analyzing their design and operations as part of my thesis. I hope this project contributes to a broader awareness and appreciation of this unique building type.



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CHALMERS
UNIVERSITY OF TECHNOLOGY

MELT ICE INTO WATER

Transforming a Disused Ice Rink into a Swim and Bath Center

Author
Jiale Huang