

**Interfaces: Re-Asserting the Riverine Ecosystem as a Central  
Part of Burnaby**

by

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## **Abstract**

This thesis is situated on the green corridor of parks and lakes in Burnaby, BC. The system follows the Brunette River, one of three watersheds in Burnaby. This watershed comprises two parks: Deer Lake and Burnaby Lake Park, their feeder stream Still Creek, and their outflow, the Brunette River, which flows into the Fraser.

The city needs to start recognizing the importance of these riverine parks - not only for the residents of this area but for the plants and animals that live here, which find a riverine habitat that is important to their survival. This thesis proposes restoring the riverine infrastructure of Burnaby and strengthening citizens' appreciation for and use of the park, and designing three architectural elements in the park system. Each site has the objective to respond to the city's cultural, environmental, and social needs while establishing an interface between the urban and natural ecosystems of Burnaby.

# Acknowledgements

It takes one person to make something extraordinary, but many people help that person create and inspire her/him/them.

This thesis would not be possible if one person did not believe in continuing with the topic I started in M5. I want to thank Christine Macy for offering to be my thesis supervisor: giving support, encouraging me to be creative, and sharing her vast knowledge in the discourse of architecture and nature, public architecture and urban design.

I want to thank Fionn Byrne for accepting to be my thesis advisor. I appreciate the time that you invested in guiding and teaching me landscape design strategies that tackle the landscape architecture portion of this thesis

Thank you to my examiner, Maria Arquero, for her thoughtful critique during the defence. Also, I want to say thank you to my Jonathan Mandeville, Alice Bardos, and Kristina Bookhall.

Last but not least, I want to say thank you to my mother for her support and encouragement from the beginning; I would not be getting my Master's degree without her support.

## Chapter 1: Introduction

This thesis focuses its study on Burnaby, a municipality in metropolitan Vancouver, and more specifically on the green corridor in the heart of Burnaby, British Columbia. This is comprised of several parks that have been established along the city's Brunette River watershed: Burnaby Lake Park, Deer Lake Park and the unbuilt lands from Still Creek to the Brunette River, as it empties into the Fraser River.

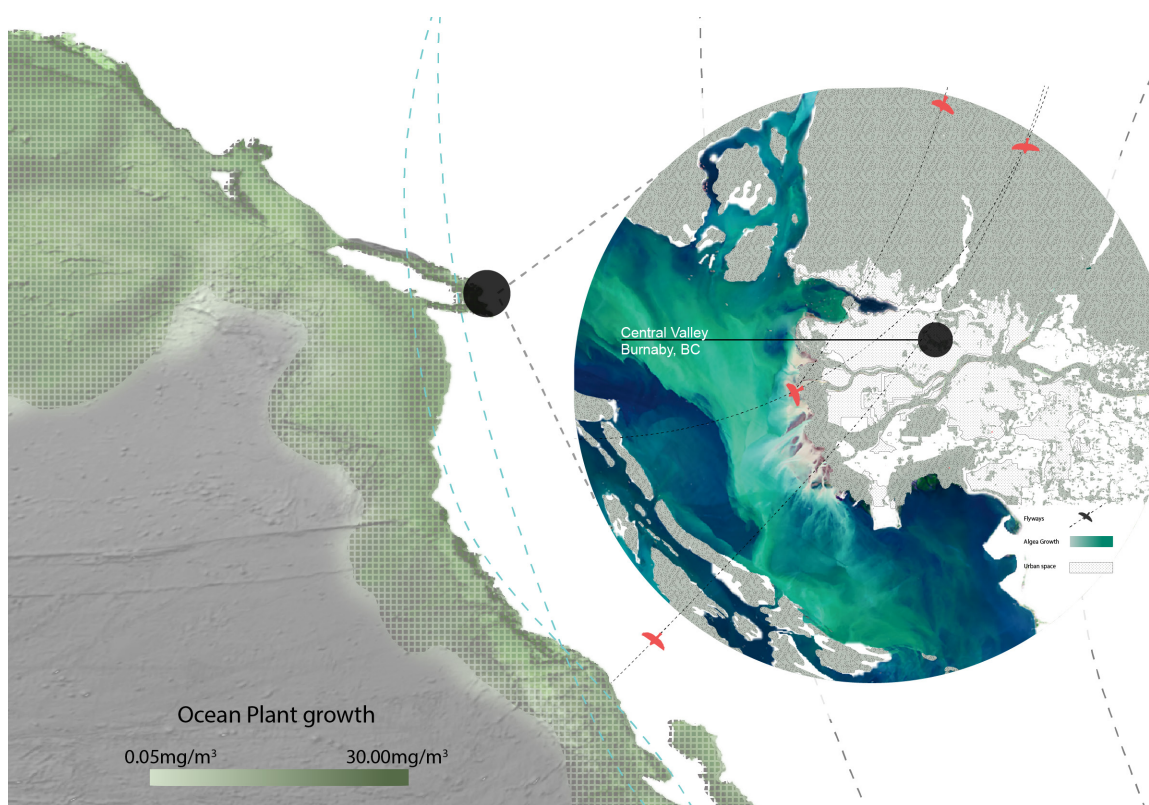
I propose strengthening this green corridor, which has been continually reduced by urban encroachment over the past century. It also aims to improve the ecological health of this river system and safeguard it as a valuable habitat for birds, fish and other animals. Lastly, it seeks to create a new interface between the park and its adjacent neighbourhoods to increase public use of and appreciation for the riverine ecosystem.

The thesis design then comprises landscape architecture and three architectural sites that are close to existing town centres but still in the park. The buildings in these three locations are designed to establish an interface between urban culture and the ecosystems of the green corridor while also responding to the city's social, cultural, and environmental needs. Between Still Creek and the Holdom neighbourhood, the westernmost site reaches out to Vancouver's disadvantaged downtown East Side population, providing emergency and short-term shelter in an affordable hostel. A central location is located between Burnaby's historic core and Deer Lake Park reinforces the park's cultural system by introducing a community market and gardens. Lastly, the easternmost site, located along the Brunette River near Burnaby Lake neighbourhood

and closer to Simon Fraser University, accommodates an ecological research centre that supports remediating and maintaining riverine health along this watershed.

## The Machine and Modified Nature

Any architecture, whether it is sustainable architecture or not, is anthropocentric. Almost always, people put human views first over the natural environment and wildlife. In Burnaby, this anthropocentrism has dramatically damaged the natural waterways and green infrastructure of Burnaby. They are reduced in size, filled with pollutants, and continually worsen. Despite periodic interventions on the symptoms, the root causes are not treated.



Agricultural and industrial wastes flow into the waters in the cities along the western edge of North America, which have impacted the blue environments of the Pacific Ocean. These wastes increases algae growth in turn diminishes the fauna growth in the blue environment. (Base data from Di Liberto 2015; base photograph from NASA 2016)

This thesis wants to address this challenge, and it poses the question, “How can architecture empower the natural ecosystems of the Central Valley Park system in Burnaby?” However, it could equally well ask, “How might architects and designers bring an eco-centric view to designing for and around Burnaby’s Central Valley Park system?”

This thesis proposes a framework to strengthen Burnaby Lake Regional Park in metropolitan Vancouver, re-assert necessary boundaries between urban neighbourhoods and the park, strengthen the river’s central role in the park, recognize and support its ecosystem, and prioritize an eco-centric approach to design over an anthropocentric one.

### **Conflicts and Interdependencies between Culture and Nature**

Everything and everyone on this planet is interconnected; what happens to one section of the world affects the whole. Humanity depends on nature, and nature relies on us. We need to look at the interaction between urban and nature to understand the symbiotic relationship between them. Catherine Ingraham conveys the idea that nature and culture compete for space and that “nature produces spaces,” whereas “culture stages spaces” (Ingraham 2006, 147). Society takes the spaces produced by nature and modifies them to our convenience, indirectly affecting nature in the process. Suppose the essence of culture is to stage spaces. How can designers stage spaces while managing and reversing the damage we as a society already have caused to the natural ecosystems of the city?

Living in cities is easy to disconnect from nature. However, the city’s people are still part of the living system of the city because “people and nature share one world and are tied

in a web of interdependencies” (Bonnemaison and Macy 2003, 293). Therefore, humanity’s potential to perceive and understand nature can contribute to its natural ecosystems management and enhance human appreciation of ecosystems. This needed symbiosis of culture and nature can be one possible solution to heal and stop the conflict between both.

According to the Gaia theory, humans, wildlife, the natural and the built environment form part of the planet’s living system. Each system member is equally essential for the earth’s survival (Donahue 2010, 51). Reconciliation between culture and nature can happen by stewarding and protecting green and blue infrastructure. Ian McHarg claims that man is “of the system, and entirely dependent upon it, but has the responsibility for management, derived from his appreciation” (McHarg 1971, 124). Harmony is the goal when creating any design for humanity or nature. The design with nature movement aims to encourage designers to work with natural processes. Hence, they improve natural and human landscapes while solidifying a biological partnership between nature, wildlife, and humanity (McHarg 1971, vi).

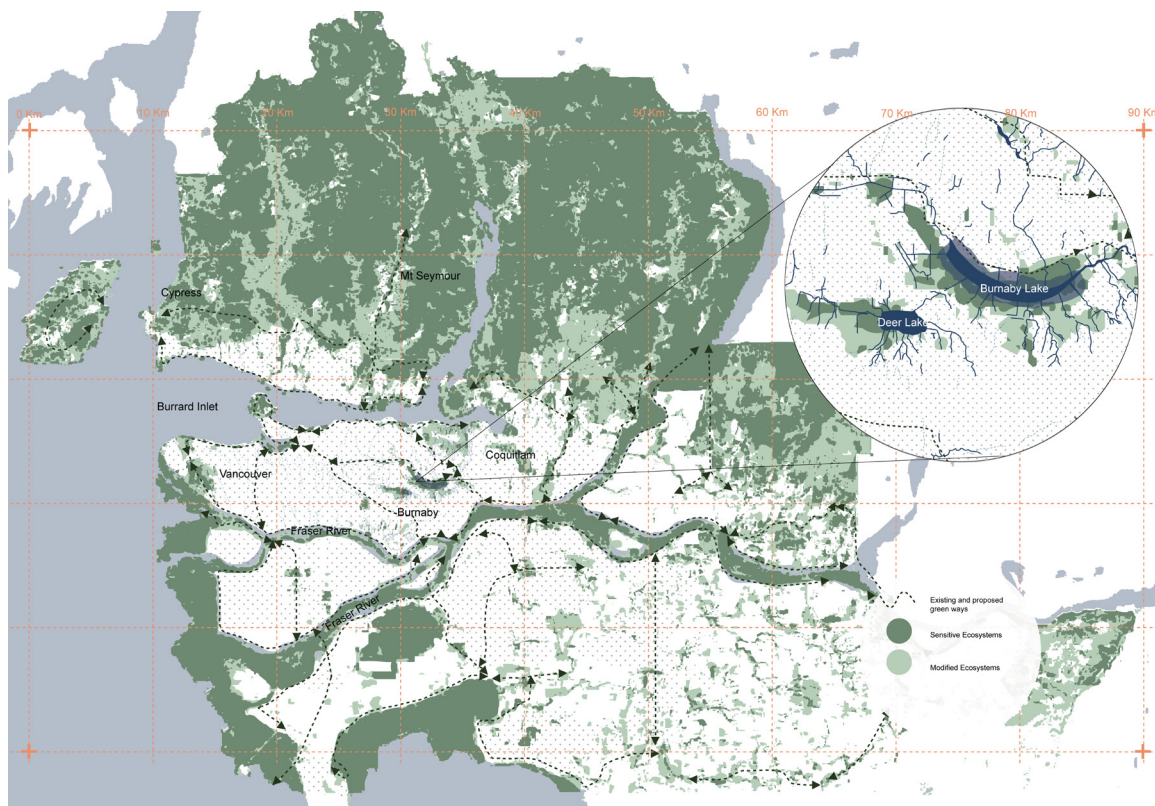
Such architecture and biophilic design facilitate reconciliation between human-made and natural environments. Humans shape nature so that nature works for humans. This thesis will focus on alleviating the rift between the urban life of Burnaby and the ecology of the city.

## **Ecosystem Fragmentation**

The degradation of the ecological infrastructure of Burnaby began with the city’s first settlement at the end of the 19th century. The settlers found the land around the lake a fertile ground to log centuries-old groves and ship through the



Still Creek and Brunette River. Throughout the years, the natural ecosystems were fragmented and transformed into urban spaces depleting the fauna and flora of the region. Land-use change is always a threat to the “natural systems” and is the leading cause of ecosystem degradation in the Vancouver region (Hilty, Lidicker, and Merenlender 2006, 10). One consequence of land-use change is ecosystem fragmentation, directly affecting the underlying natural infrastructure of a region, such as its watersheds, animal habitat and resiliency. As Aquino says, human-made landscapes are “the medium through which all ecological transactions must-pass” (Aquino et al. 2011, 20). Diana Agrest takes a different view in her book *Architecture of Nature*. Here, she argues that cities are urban machines that, when unregulated, cause harm to nature.



The Mapping of the modified and sensitive ecosystems and existig and future greenways around Metro Vancouver. (Base data from Adamoski et al. 2014, 42).



A city that regulates enjoyment through the presence of object buildings plays a key role in the unravelling of this complex articulation indicating the repetition of a system that goes back to the original urban scene sin: the violation of nature by machine. (Agrest et al. 2019, 257)

Although urban growth is gradual, its effects are cumulative, which can be seen in river systems throughout the Vancouver region. Urban lakes surrounded by urban development are suffering from eutrophication brought on by rainwater runoff from residential lawns and industrial sites. Here, excessive algal growth clogs the water with plants and slowly makes the lakes disappear.

## Chapter 2: Tracing the Aftermath on the Ecosystem

### Burnaby's Riverine Parks: A Biodiversity Hot-spot Threatened by Urbanization

Burnaby's Lakes are part of the Brunette watershed. Fed by Still Creek in the west, this system includes Deer Lake and Burnaby Lake, both empty into the Brunette River, a tributary of the Fraser River. As a result, the Brunette watershed is a significant source of contamination to the Fraser River, emptying into the ocean.

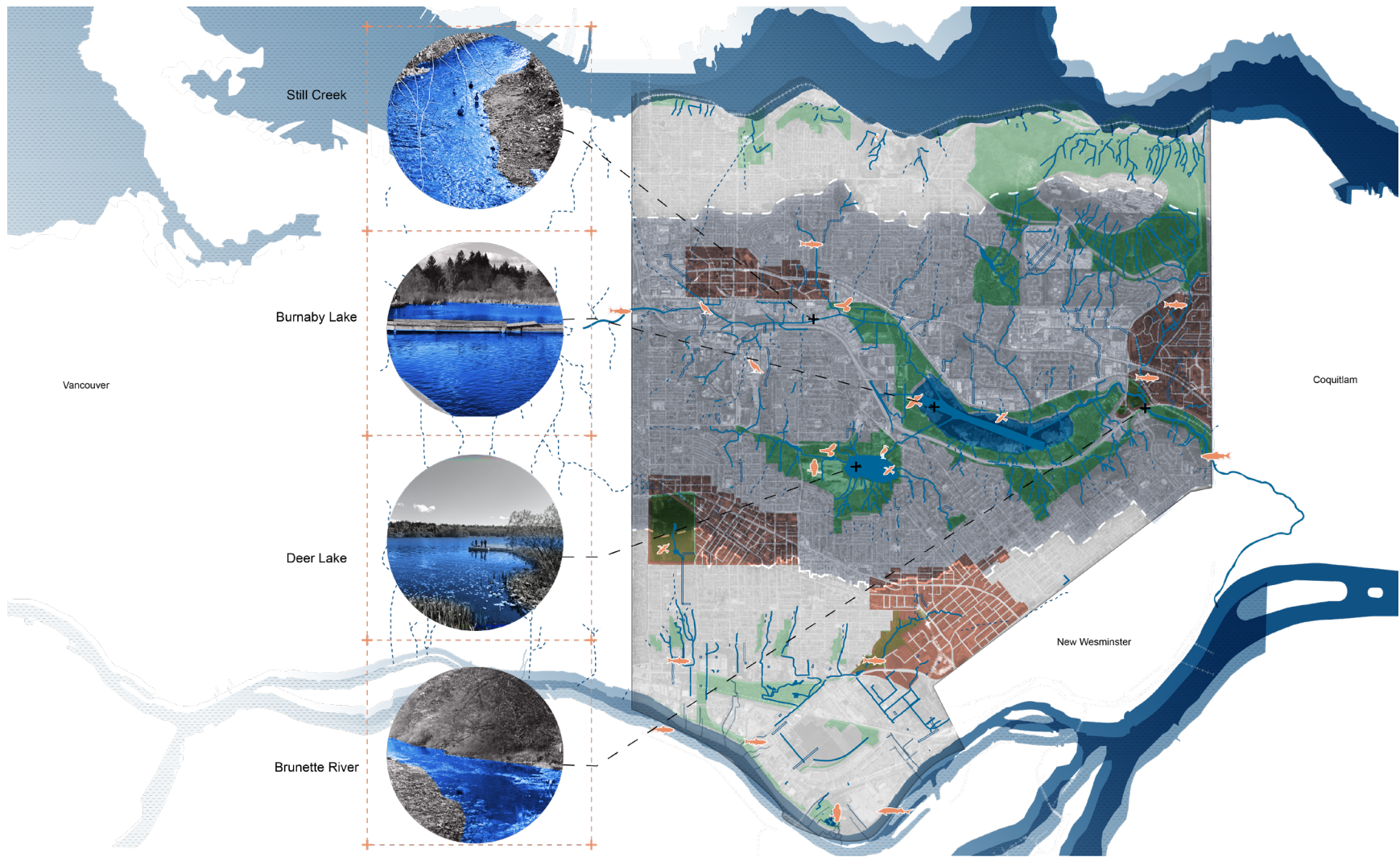


Photograph of Still Creek near Boundary Rd, Vancouver, 2021.

Still Creek, which comprises the headwaters and upper reaches of this system, is an urbanized stream, meaning that pavement and buildings interfere with the natural replenishment of its groundwater. Instead, stormwater is directed into the river system from sewers. It is one of only two remaining partially daylighted streams in the urbanized area of Vancouver (City of Vancouver 2002, v).

### Deer Lake

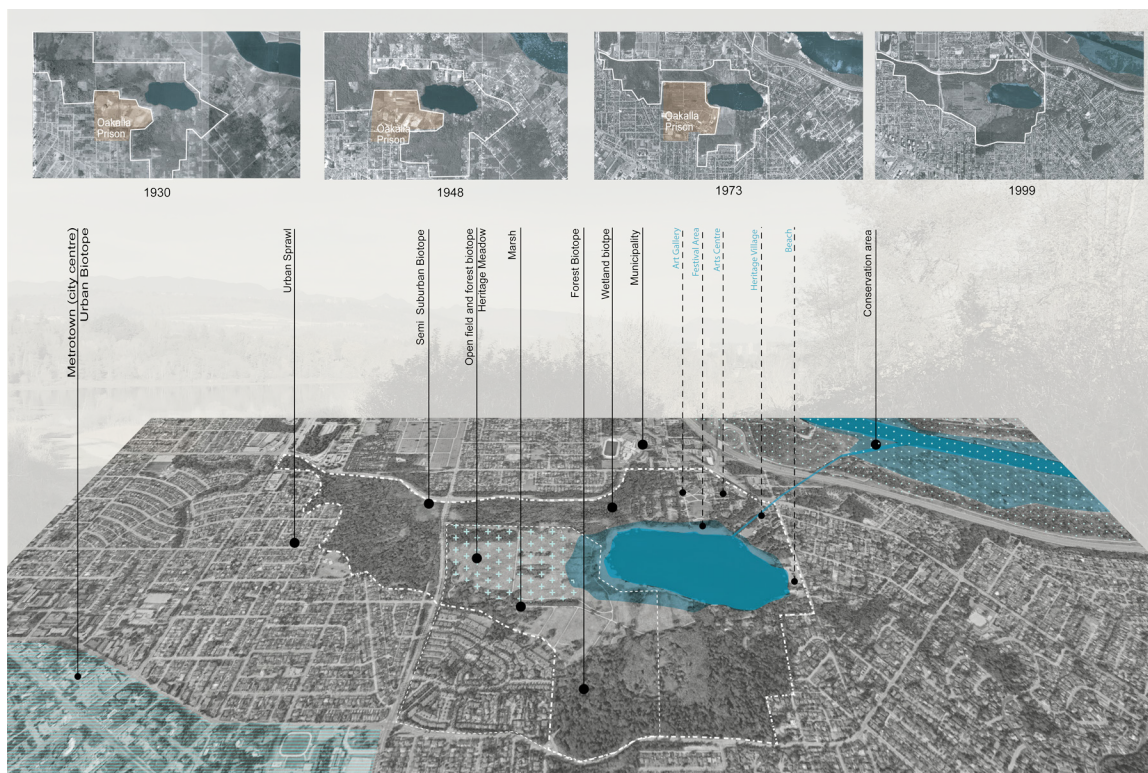
Deer Lake and its surrounding Park is a highly altered habitat. Once a hunting place for the Indigenous groups, *hən̓q̓əmi̓ñəm̓* and *Skwxw̓ ʔ7mesh* (Burnaby Village Museum 2019, 11). In the last quarter of the 19th century, when New Westminster was established as BC's provincial capital, Deer Lake was a stagecoach stop and favoured site for game hunting. At this time, it was a temperate rainforest of Western hemlock, Douglas Fir and Western Red Cedar. By the turn of the century, most of the forest had been logged, and "gentlemen farmers" cultivated fruits and berries to serve the New Westminster market gardens. With the construction of tramlines, the district began to attract home builders, large



Mapping of the waterways and green infrastructure around Burnaby. Dash lines represents lost waterways around the metropolitan areas.



estates, and many small cottages built between 1904 and 1935 in the picturesque English tradition. Many heritage homes have led the City of Burnaby to designate Deer Lake Park as a heritage precinct comprised of Edwardian and Arts & Crafts country homes in the city's largest park. In 1912, the south side of Deer Lake was transformed into farmland for Oakalla (Nature Vancouver 2016, 152). Post-WWII, Burnaby became a suburb of Vancouver, but the Deer Lake area retained its rural character due to its large estates. In the 1950s, a park was established on the lake's eastern shore; and the relocation of municipal government to Deer Lake transformed the district into Burnaby's administrative and cultural centre — including the Burnaby Art Gallery, Century Gardens and the Shadbolt Centre for the Performing Arts.



Mapping of Deer Lake boundary throughout the years and the current ecosystems around the park (Base photographs from City of Burnaby 2017)



Section through Deer Lake and mapping of raptors species habitats in the lake ecosystem (Base map from Google Maps 2020).

Today, Deer Lake Park serves as Burnaby's primary urban park and wildlife hotspot (Deer Lake Park n.d.).

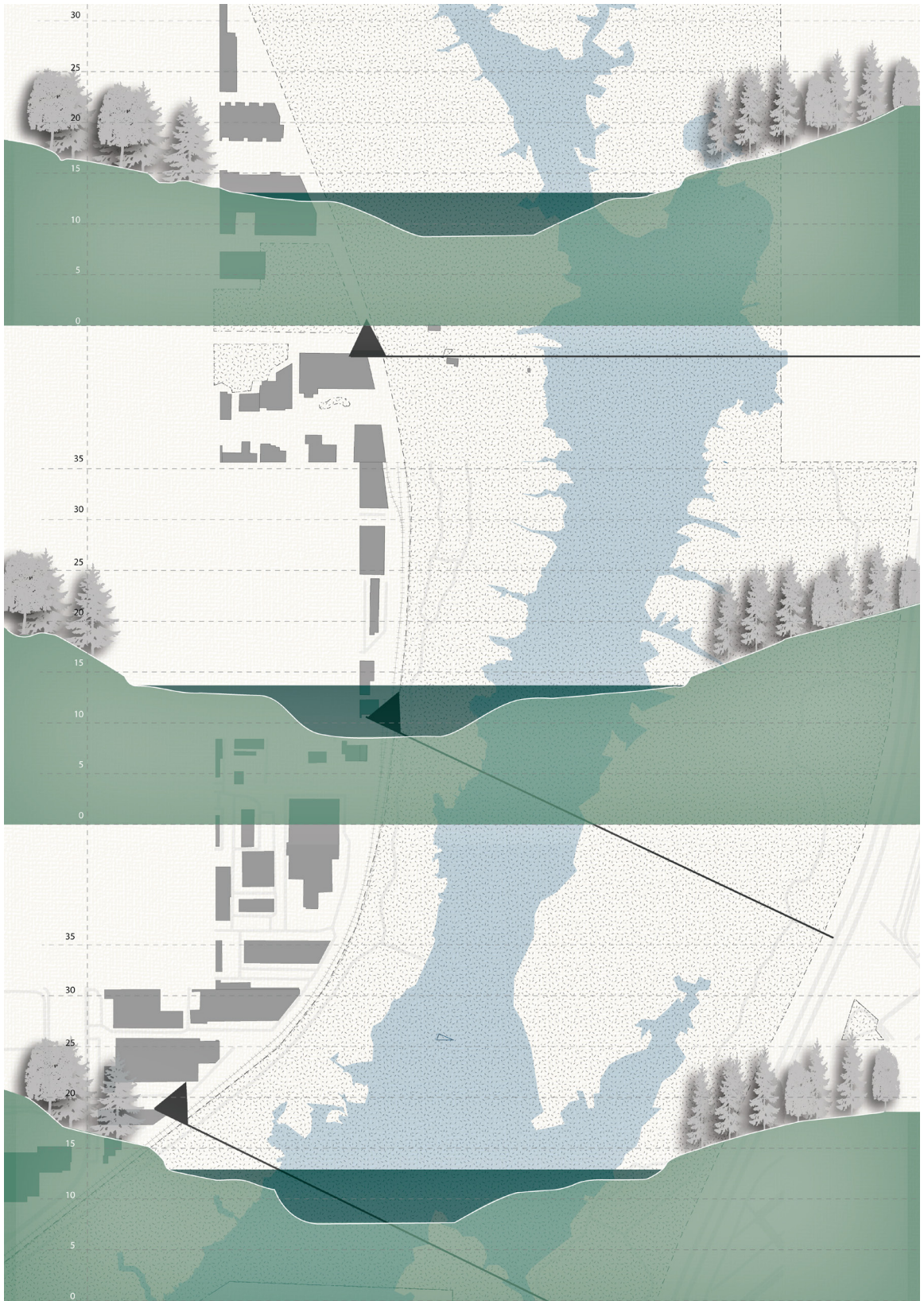
### Burnaby Lake

Burnaby Lake is a glacial lake that formed at the end of the last ice age. With the establishment of New Westminster as the provincial capital in the late 19th century, the watershed was logged, and the region was used for agriculture. Today, the lake serves as a settling pond for incoming pollutants from Still Creek, producing large amounts of sediments and reducing the average lake depth, making it unsuitable for swimming and paddling sports. Urban activities have disrupted the lake's ecological balance and it is in danger of being reduced to mudflats and wetlands. Multiple dredges have occurred over the years, the most recent in 2006, when the city removed a large amount of sediment as part



View of Burnaby Lake, 2021.



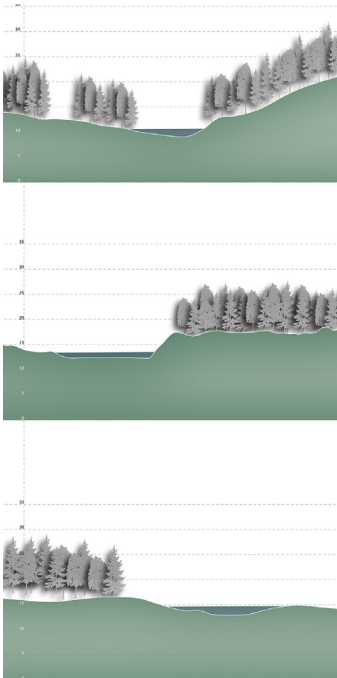


Sections through Burnaby Lake

of its “Burnaby Lake Rejuvenation Project” (City of Burnaby 2011). Today, the lake’s wetlands cover 770 acres, providing habitat for a large variety of wildlife. Many birds frequent the area, including great blue herons, bald eagles, osprey, and the green heron.



View of Brunette River in 1907. (Davy 1907)



Section through Brunette River in Burnaby.

## Brunette River

The Brunette watershed was transformed when the city prioritized the drainage system over the ecological system. The watershed is fed by over 200 kilometres of streams from Vancouver, Burnaby, Coquitlam, and New Westminster. The Brunette River area comprises unstable silt, clay and peat soils that contribute to flooding, erosion and sedimentation in vulnerable areas. The poor water quality and low flow of the Brunette River has increased its temperature and decreased water levels, reducing aquatic life. Over the years, many studies of water quality in the Brunette River have shown contaminants in its water, such as metals (lead, copper and zinc), organic pollutants (hydrocarbons), nutrients (nitrogen and phosphorus), fecal coliforms, spills, and suspended solids. One of the effects of being close to urban centres, the Brunette River and surrounding forest are heavily impacted by industrial and residential uses, which only leaves about 20 percent of the Brunette River space be protected of any anthropogenic uses (Greater Vancouver 2001, 15). Over the decades, so-called “drainage improvements” have significantly altered the modified ecosystems of the Brunette watershed. Once teeming with salmon, today, few inhabit the Brunette watershed, and only a few patches of old-growth forest have survived along the edges of the waterways.

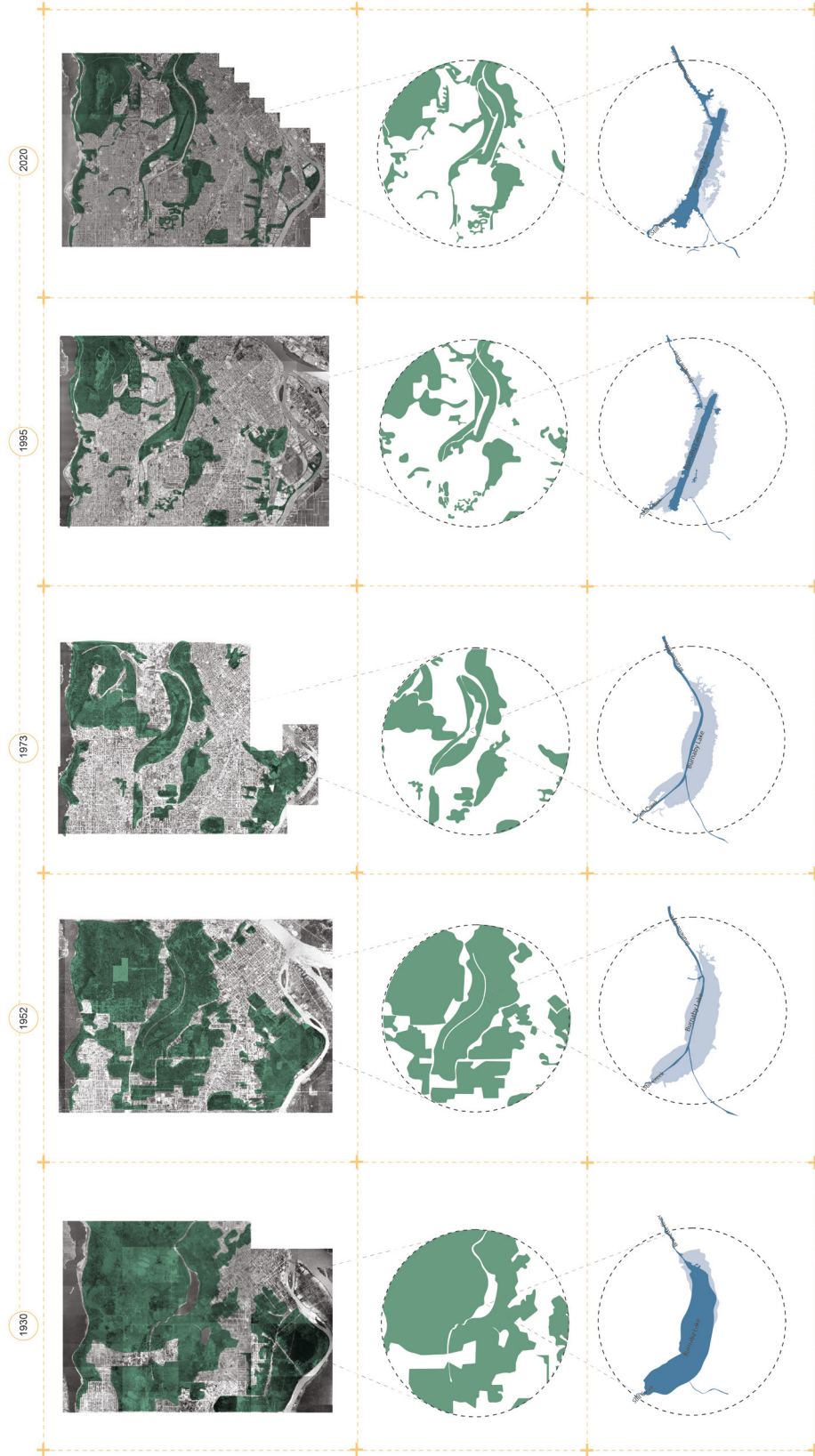
## Chapter 3: Reclaiming Green and Blue from Urban Encroachment

### Urban Encroachment on Parklands

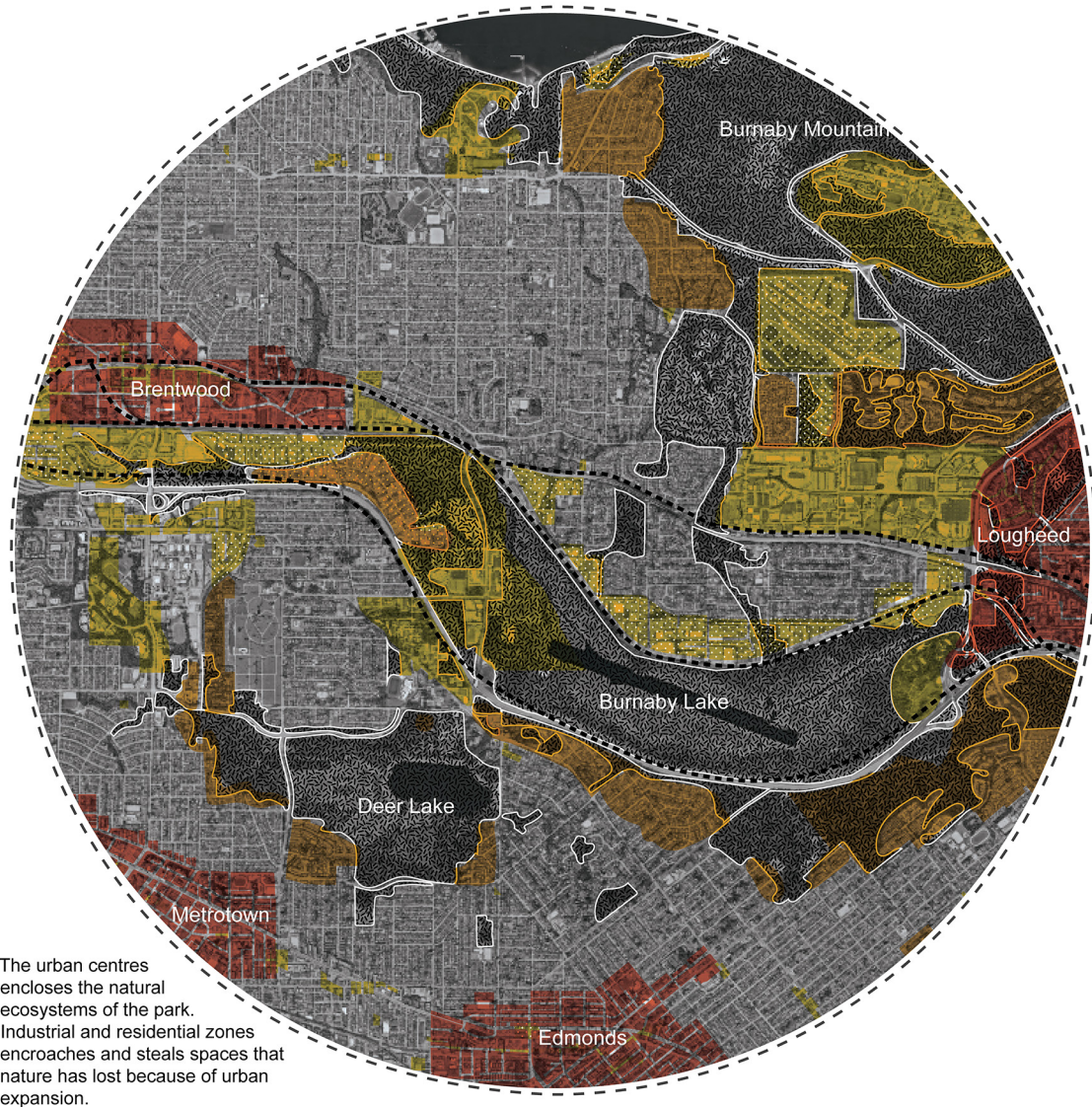
Since the 1930s, urban expansion has continually impacted Burnaby's natural ecology. Forests have been logged, green spaces built on, wetlands reduced, and watercourses canalized, all for the purpose of urban expansion; what little green infrastructure that remains is increasingly commodified and threatened with further reduction. However, Burnaby still has more public green spaces than many other districts of Vancouver — mainly because its two large water bodies, Deer Lake and Burnaby Lake, are wetlands subject to flooding. For this reason, the green spaces of Burnaby are essential habitats for migrating birds and other fauna.

Urban sprawl directly affects the riverine lands of Burnaby and the modified ecosystems of the city. Catherine Ingraham noted that our human habitats create boundaries and barriers against the natural world. Wildlife and biological processes surround the built environment while maintaining “an insistent human enclave inside its borders” (Ingraham 2006, 7). While the encroachment of private spaces on green spaces blurs the boundaries of urban and natural and provides a sense of “living in nature” for residents, it also decreases biodiversity in the city, reduces flora, and damages riverine ecology. This encroachment on the riverine lands in Burnaby takes the form of all major building types — residential, industrial, and mixed-use. The encroachment to the riverine parks causes high levels of nitrogen and phosphorus. The result has been severe degradation of Burnaby and Deer Lake from algae blooms.





Fragmentation and deterioration of the natural ecosystems are seen from 1930 to 2020 (Base photograph from City of Burnaby 2017).



Mapping of the encroachment along the green spaces in the city of Burnaby - yellow indicates mixed-use land, yellow with hatching indicates the industrial land, and orange indicates multi-family residential spaces (Base map from Google Maps 2020).

## Reclamation of the Garden

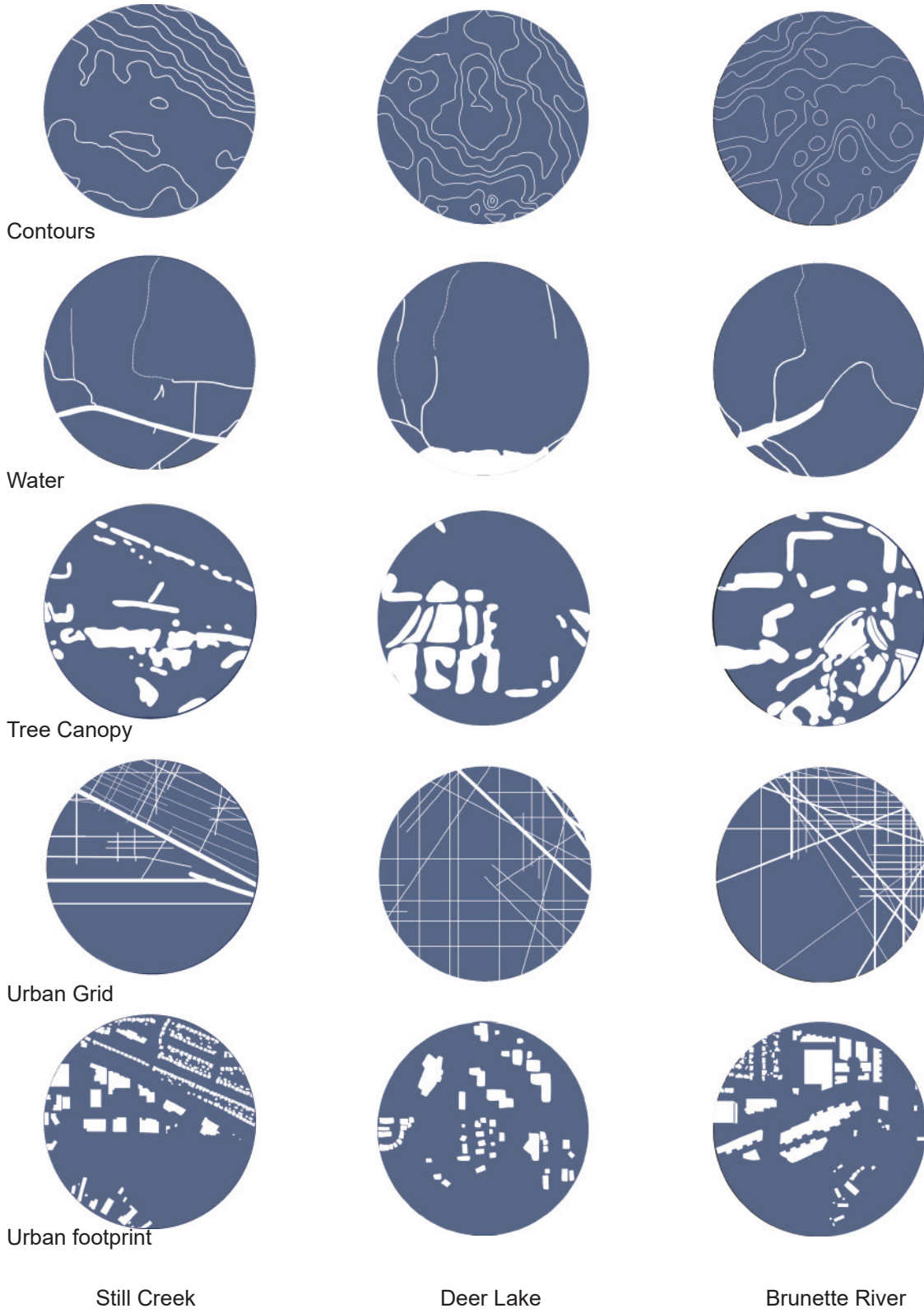
The current conditions of Burnaby Lake and Deer Lake Parks' is intertwined with the city's development of the surrounding neighbourhoods. John Dixon Hunt's "garden theory" is useful for understanding how people conceive of a natural ecosystem in an urban setting — in other words,

what an urban park is in the city of Burnaby. In his book *Greater Perfections: the Practice of Garden Theory*, Hunt proposes three ways of thinking about nature: the natural world (which he calls “first nature”), the cultural landscape (“second nature”), and the garden (or “third nature”).

In this thesis, I focus on the third nature, which, according to Thomas Juel Clemmensen, “represents those human interventions that go beyond what is required by the necessities or practice of agriculture and urban settlement and [is] associated with the garden” (Clemmensen 2015, 144). Burnaby’s central riverine park can be seen as a courtyard garden for the city, in which the courtyard garden where the courtyard is part of the building, and the building is part of the garden. Clemmensen continues, “the machine is no longer accommodated in the garden, but the garden itself becomes part of an environmental machine that can be optimized” (Clemmensen 2015, 143). Since Burnaby’s parks are already an extension of the city, in this thesis, I expand on the topic of the third nature to introduce dynamic systems that can assist the garden’s already human-managed blue and green systems. The riverine parks have played an important role in the city’s development from wilderness attraction to a cultural centre. The landscape architect and theorist James Corner explains that the designer needs “to see the landscape as an active instrument for the enrichment of culture rather than as a passive product of culture” (Clemmensen 2015, 143).

According to (Swiss architect George) Descombes, a garden is an important place of reflection, interrogation, and doubt regarding the relationship between the world given and the world transformed, a place that represents, simulates, and reveals what we are doing to the world given. (Clemmensen 2015, 145)





Contours

Water

Tree Canopy

Urban Grid

Urban footprint

Still Creek

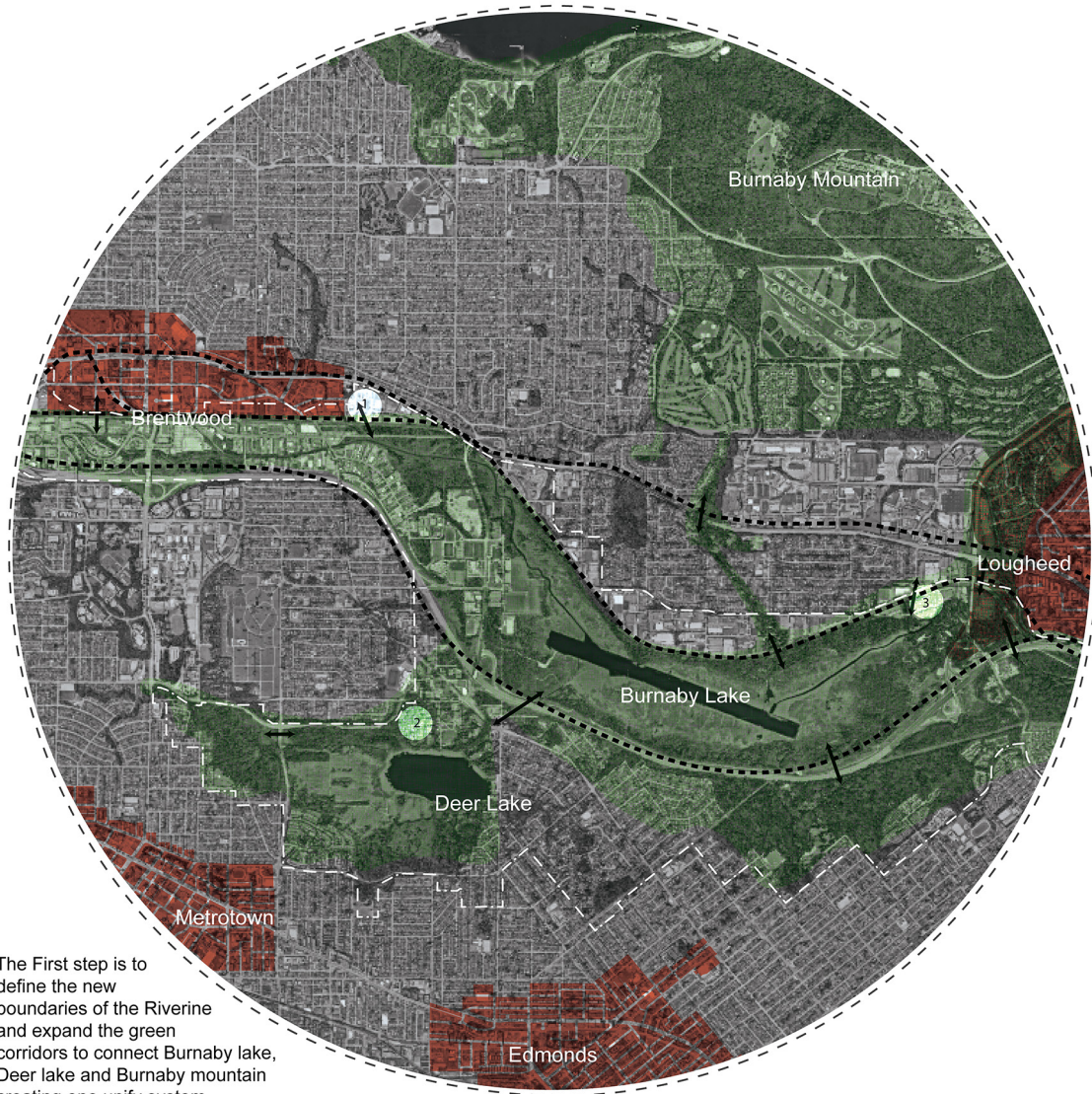
Deer Lake

Brunette River

A study of the urban and natural layers on the landscape of tree key locations around the riverine, Still Creek, Deer Lake and Brunette River.

In his 1999 essay “The Reclaiming of Sites” in the book *Recovering Landscapes*, Sebastien Marot sets out several principles for reclaiming sites:

- **Anamnesis:** To read the land as “an expression of ancient culture, or as a palimpsest.” This entails taking into account events that have shaped the landscape. Multiple events shaped the land where now we know as Burnaby Lake, from multiple lake dredgings, construction of the Cariboo Dam at the intersection of the Brunette River and Burnaby Lake, the anthropogenic eutrophication of the lake that has been accelerated, the recreational activities (trails, boating, and sports centres), and industrial activities along the lake and its tributaries. These changes illustrate the phrase, “Whatever is sown in the earth typically comes to fruition long after the original gardener has died” (Marot 1999, 50), as all the previously mentioned activities and events have shaped what is now known as the Brunette watershed.
- **Preparation:** To understand that landscape is not a product but rather a transient process of time and nature since it is “a living and dynamic organism” (Marot 1999, 51). The blue and green infrastructure in Burnaby are living systems, and any living system changes over time. The landscape of the Brunette watershed will continue to be transformed by direct or indirect interventions.
- **Three-dimensional sequencing:** Three-dimensional sequencing refers to the network of layers that operate in any landscape. These are the sky, the ground, and underground. Together, these networks create “a habitat” which “engages and creates multiple relationships defined by the nature of each of them” (Marot 1999, 51). Each layer (sky, ground, underground) category is essential in recovering a site, but



New boundary and green cover in the riverine lands.

the “ground” and “underground” are the most pertinent to a design process, since both impact the design. We therefore need to reflect on the following concerns: How the building meets the ground, how the water drains from the site, and of what type of soil is the site made.

- Relational structuring: Relational structuring refers to the action of attending to the boundaries and surrounding areas of a site. The end goal of landscape and public space design is to focus on the relationships, sequencing, and

visual connections among buildings and spaces (Marot 1999, 52). In this last step, we focus on creating interfaces between Riverine parks systems, the three site of focus and the suburban city spaces; Thereby building on what is already there and introducing new relationships with the boundaries and surrounding public and private spaces around the parks.

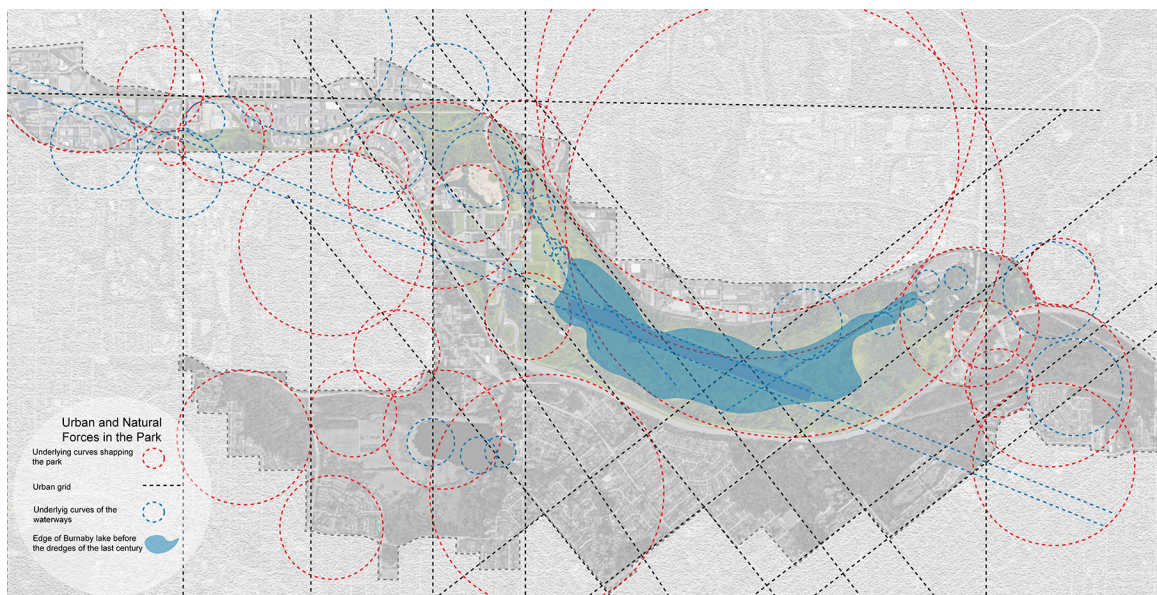


## Chapter 4: Landscape and Urban Design

### Interfacing the Urban and the Natural around the Riverine Parklands

This project proposes expanding and restoring the riparian infrastructure of Burnaby and strengthening citizens' appreciation for and use of their riverine park. The first step suggests that park encroachment be arrested and eventually reversed through municipal planning policies and practices. This would include removing industrial and mixed-use spaces and reintroducing forest cover and vegetation. The most critical objective is preserving and expanding bird and aquatic habitats in these sensitive wetland areas.

The second step, which could occur before the first step, is to strengthen the continuity of Burnaby's parks and protect the riverine system that feeds into the Fraser River. However, again, the city's infrastructures act as forces that



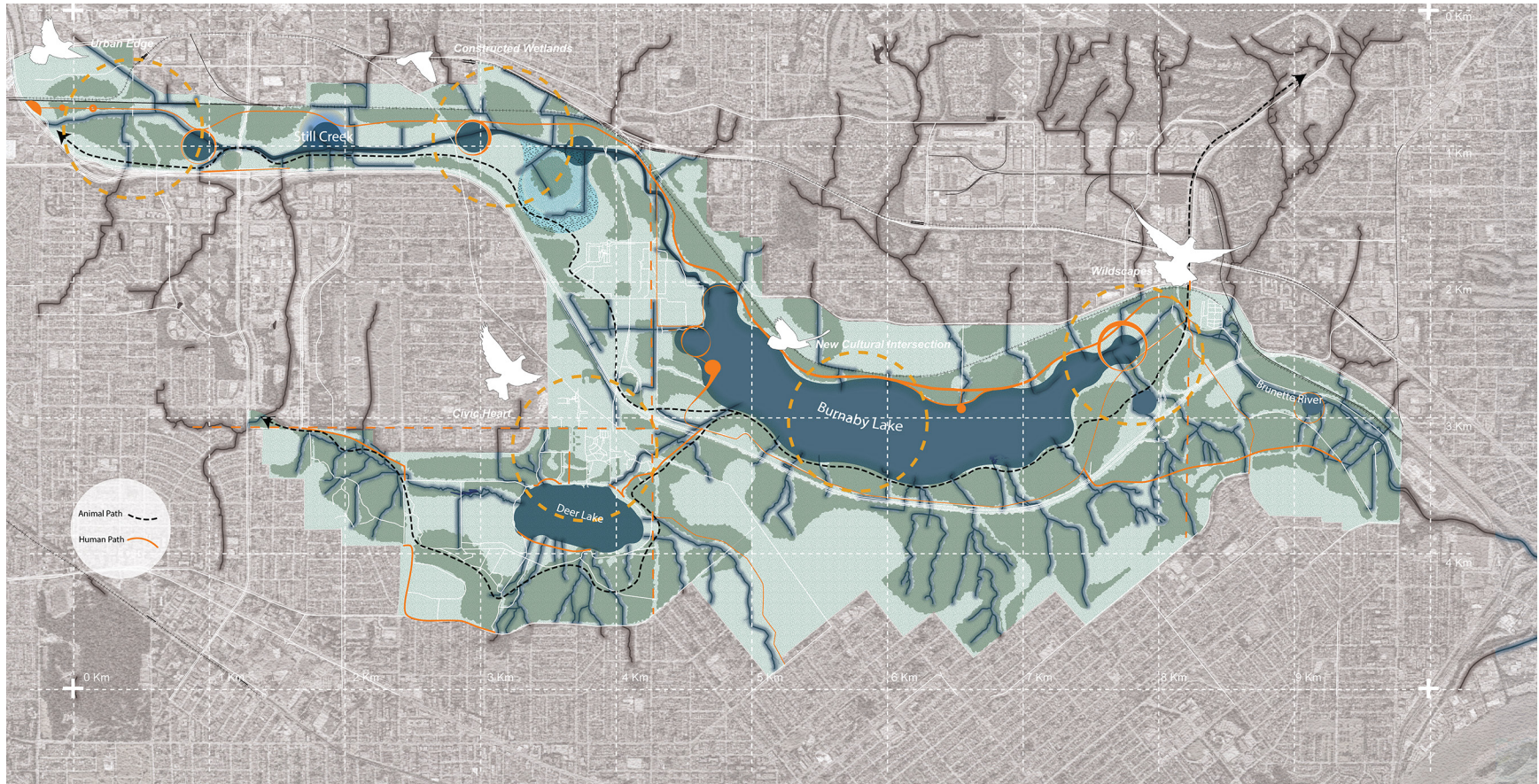
Process of finding the new boundaries and shaping the riverine parks (base photograph from Google Maps 2020).





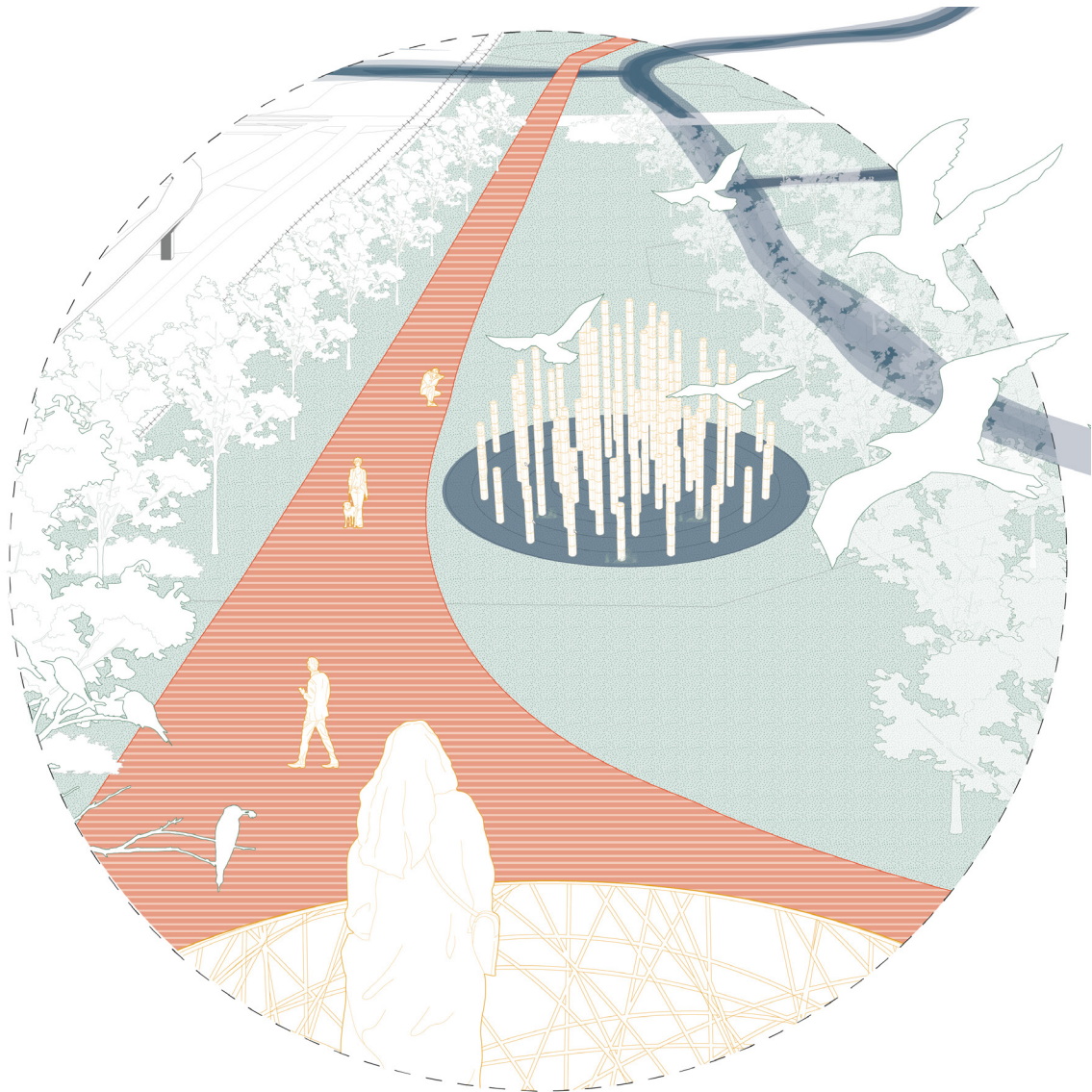
Ground figure mapping of the dry and wet spaces around the new boundary of Burnaby Lake Park. This study allow to find the new locations of the dam and ponds network along Still Creek and the new shape edge of the Burnaby Lake.



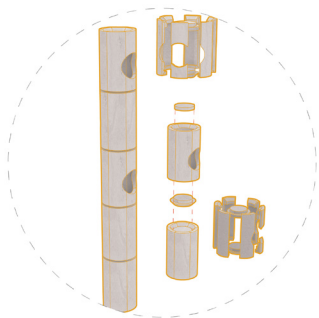


Diagrammatic view of the master plan to extend the boundaries of the riverine park (base photograph from Google Maps 2020).



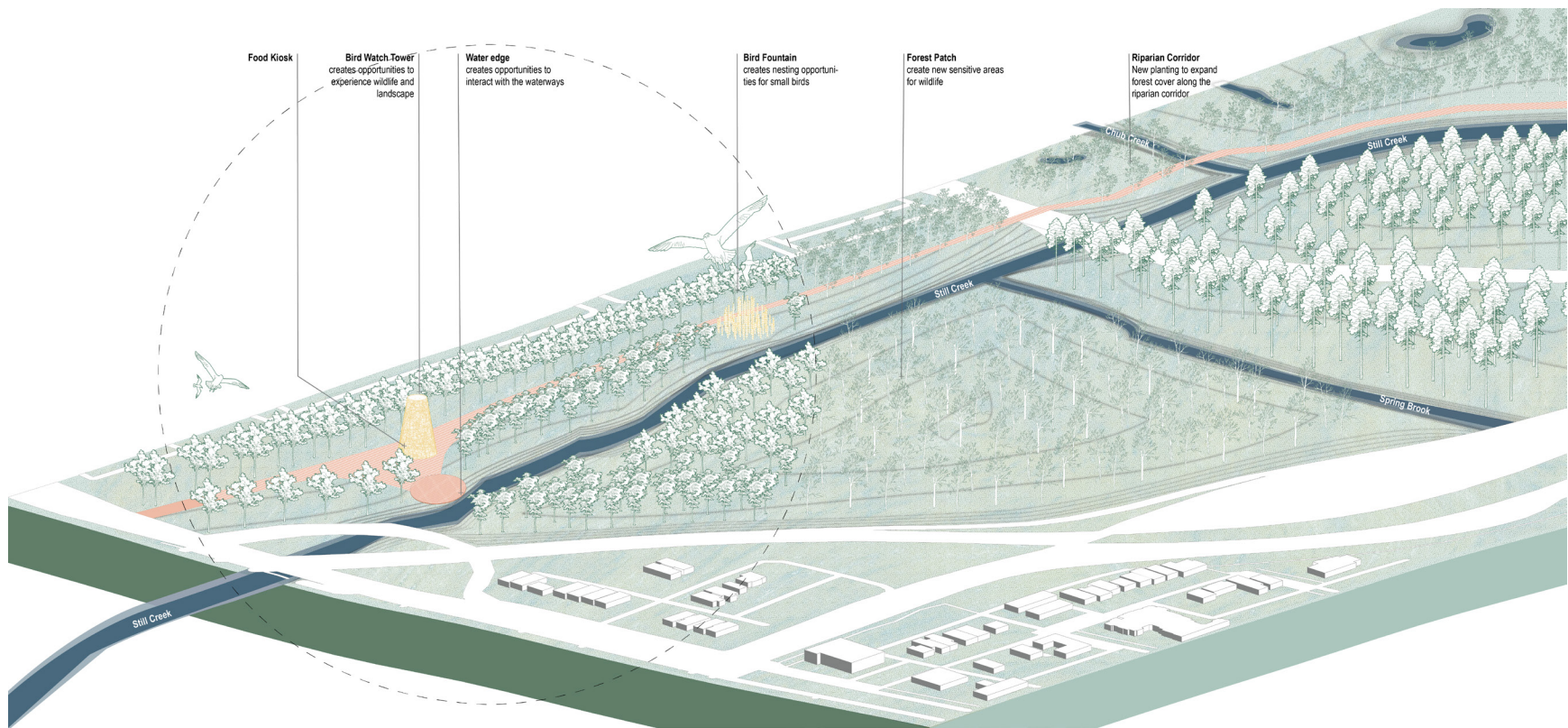


Human view of the nesting poles for cavity nesting birds.



Human view of the nesting pole elements that forms each nest.

continue to shape the new boundaries of the park. These new boundaries are defined by a railway that cuts along the park's north side and the Trans-Canada Highway, which runs along the south side. These two infrastructures form a barrier between the park and the city, creating a sense of urban enclosure around the riverine park. At key points of access close to municipal centres, urban portals need to be introduced to At key points of access close to municipal centres, urban portals need to be introduced where



Bird view of the threshold between urban and natural ecosystems.

pedestrians enter the park. Eco-underpasses and bridges for wildlife can be distributed throughout the park where needed.

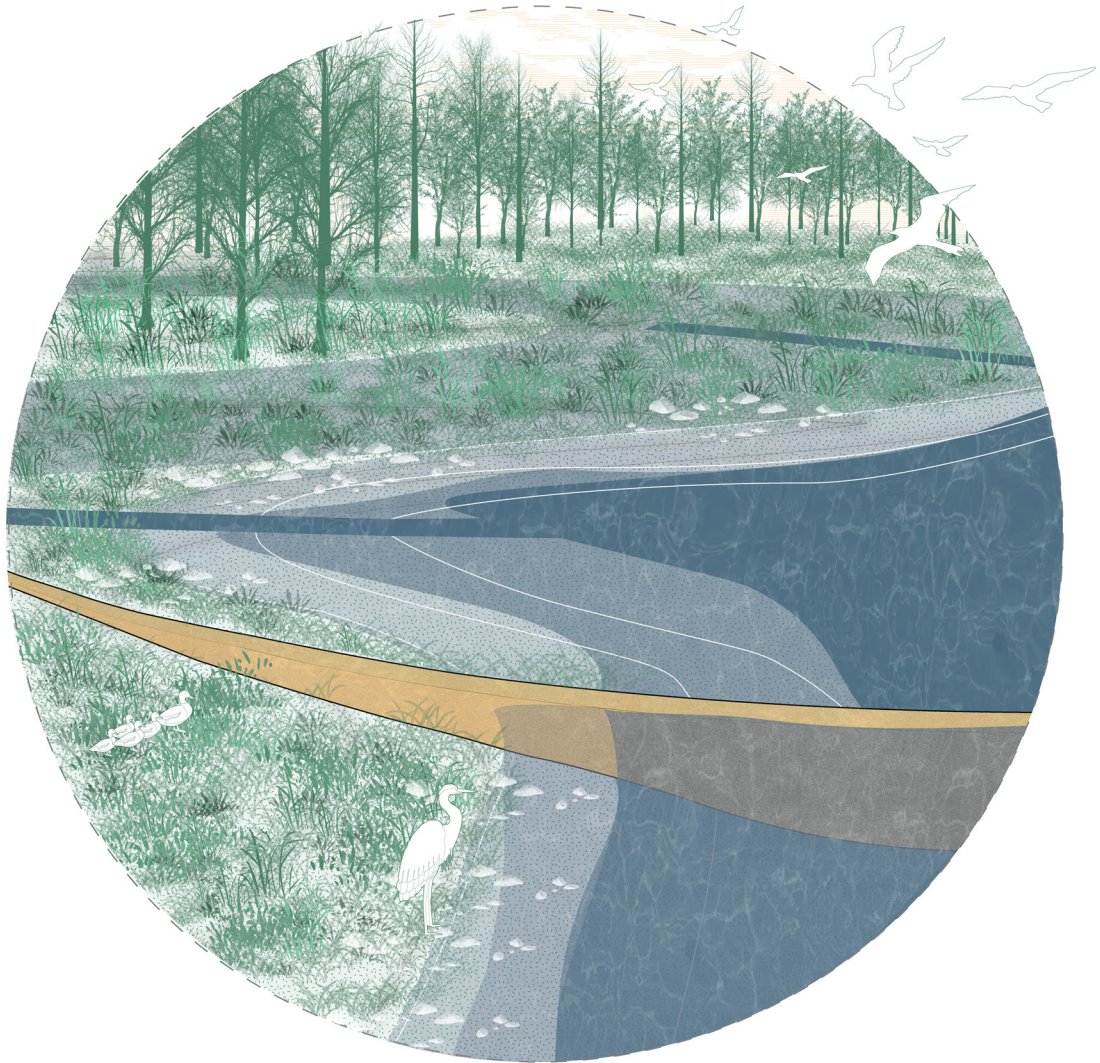
The third step is to design three buildings of social infrastructure in and near the park system to support community use of and appreciation for the park. These are also close to urban centres. The riparian zones, which are the transitional areas between the streams and the urban land, need to be enlarged and contoured to ensure a gradual flow of water to filter pollutants, moderate the water temperature, provide food for aquatic and terrestrial wildlife, and create a biodiverse area (City of Vancouver 2002, 19). As a suburban city, Burnaby can expand its green urban infrastructure using Burnaby Lake and Deer Lake Parks as a starting point and connect these to metropolitan Vancouver's more extensive green network.

### **Urban Edges and Reclaiming the Forest and Expanding the Boundaries**

The western entrance to the park is one such threshold between city and park, a buffering interface. This invites people to exercise their "inclination to affiliate with natural systems and processes instrumental in their health and productivity" (Kellert, Heerwagen, and Mador 2008, 17). As we have seen, buffering the urban edges that interact with the waterways will decrease fertilizer runoff into the water. Expanding the riparian corridors with new forest patches will improve the continuity of wildlife habitat while protecting waterways from urban pollution.

However, from a people-centred perspective, a re-designed entrance to the park generates opportunities for people to experience wildlife from birdwatching towers and bird posts

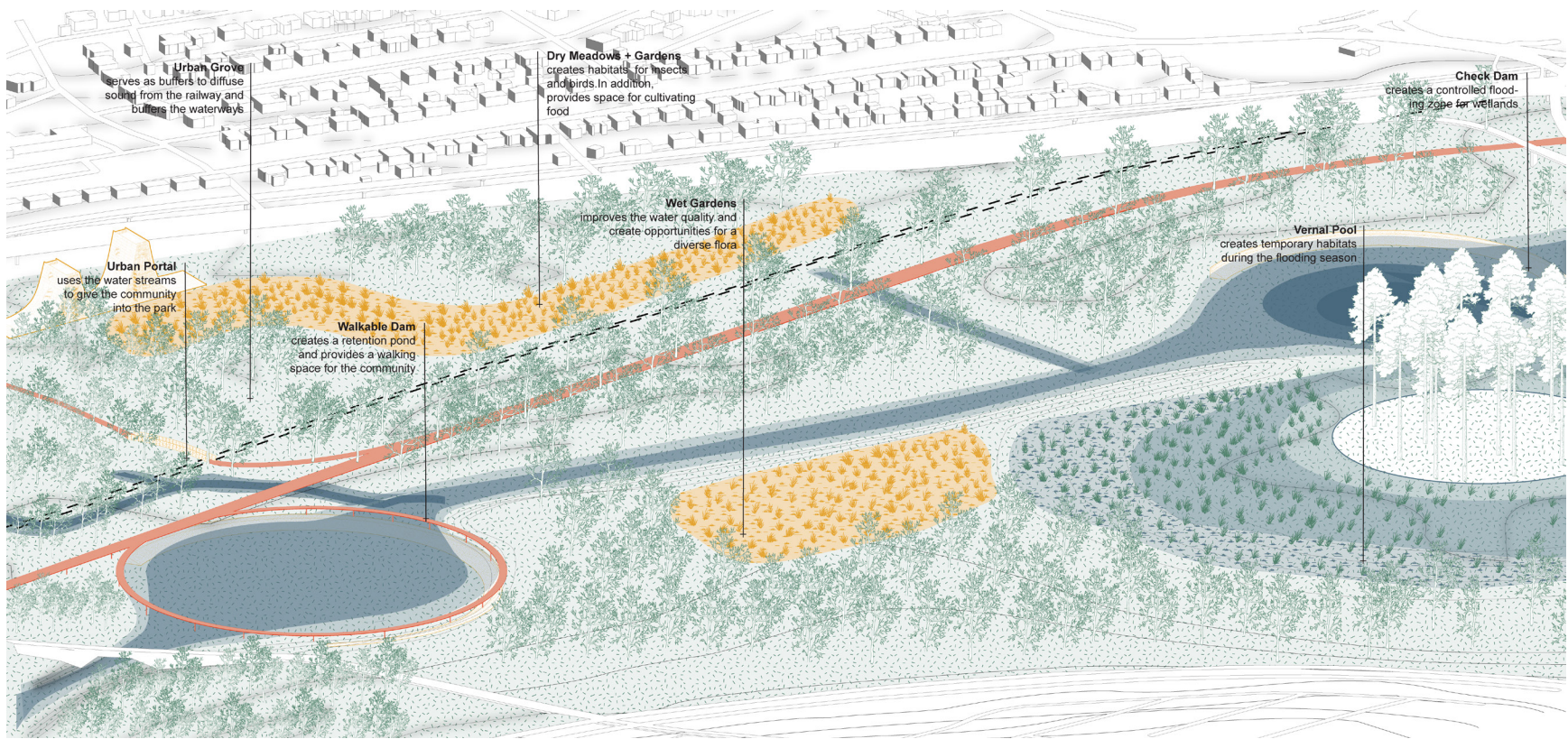




Human view of the nesting poles for cavity nesting birds.

that also provide nesting opportunities for small bird species in the park. These birdhouses evoke the ancient pigeon cotes carved by Egyptians into the walls of their homes, as well as common birdhouses built in present-day backyards. Portions of the park's greenery enclose sections of the path. Here, "the gardens can be perceived as a moment of standstill from which to contemplate the world outside, and from where a route begins or fans out" (De Wit 2018, 145).





Bird view of the rehabilitation of Still Creek in Burnaby.

## Rehabilitating the Urban Waterways and the Lake

### Constructed Wetlands to Filter Urban Stormwater

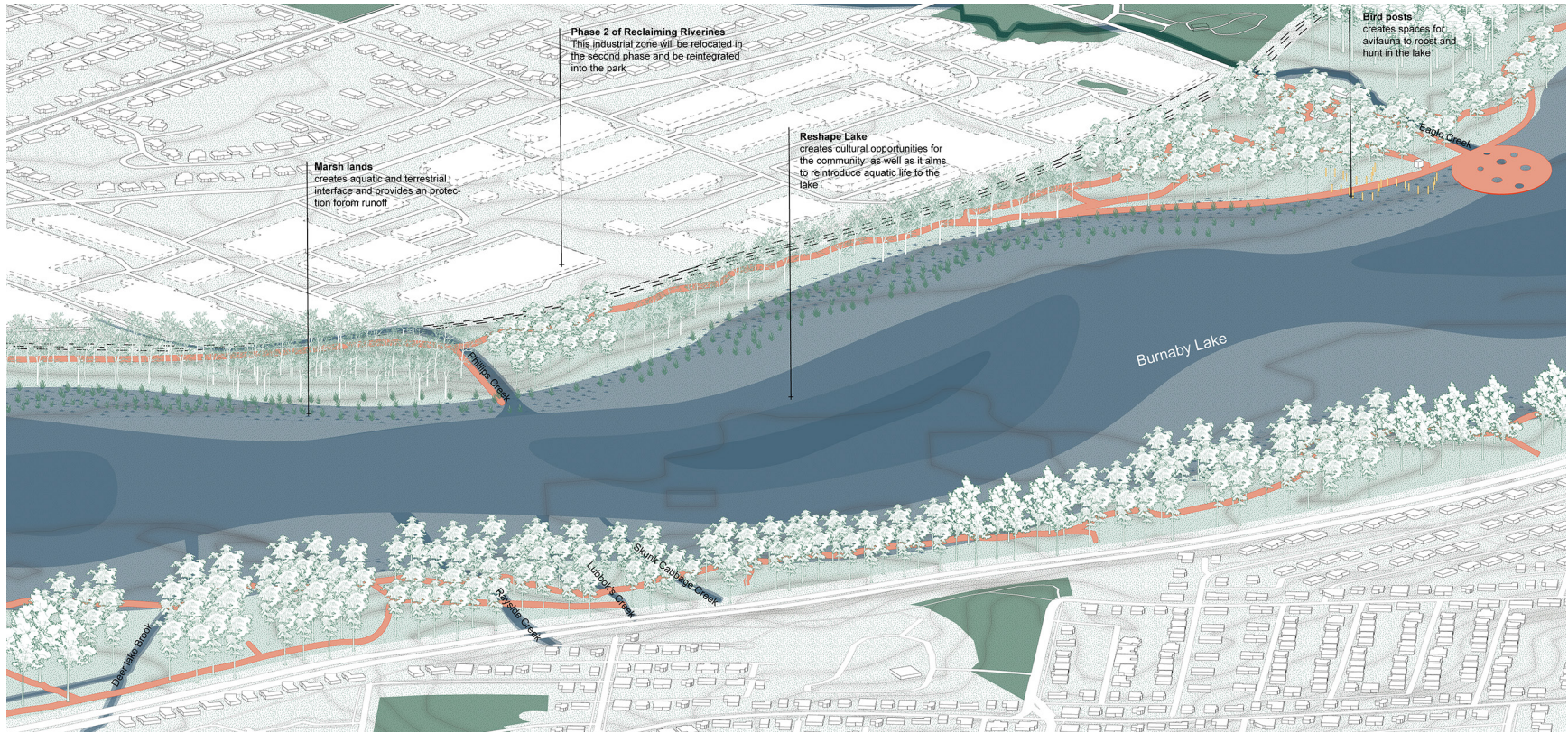
The treatment of runoff water is essential to protect and reintroduce aquatic biota into the park's waterways. This can be done with "constructed wetlands" that slow down sediment- and contaminant-laden water streaming into Still Creek. These wetlands are terrestrial and aquatic ecosystems that produce oxygen, store carbon, and process nitrogen (Keddy 2010, 2).

Most precipitation reaching the landscape is disposed of in four ways. Some is taken up on the surface of vegetation in a process known as interception. Some is absorbed directly by the soil in a process known as infiltration. Some, called depression storage, collects on the ground in small hollows and pockets. The remainder, called overland flow, runs off the surface, eventually joining streams and rivers or collecting in low spots. This is stormwater (Marsh 2010, 168).



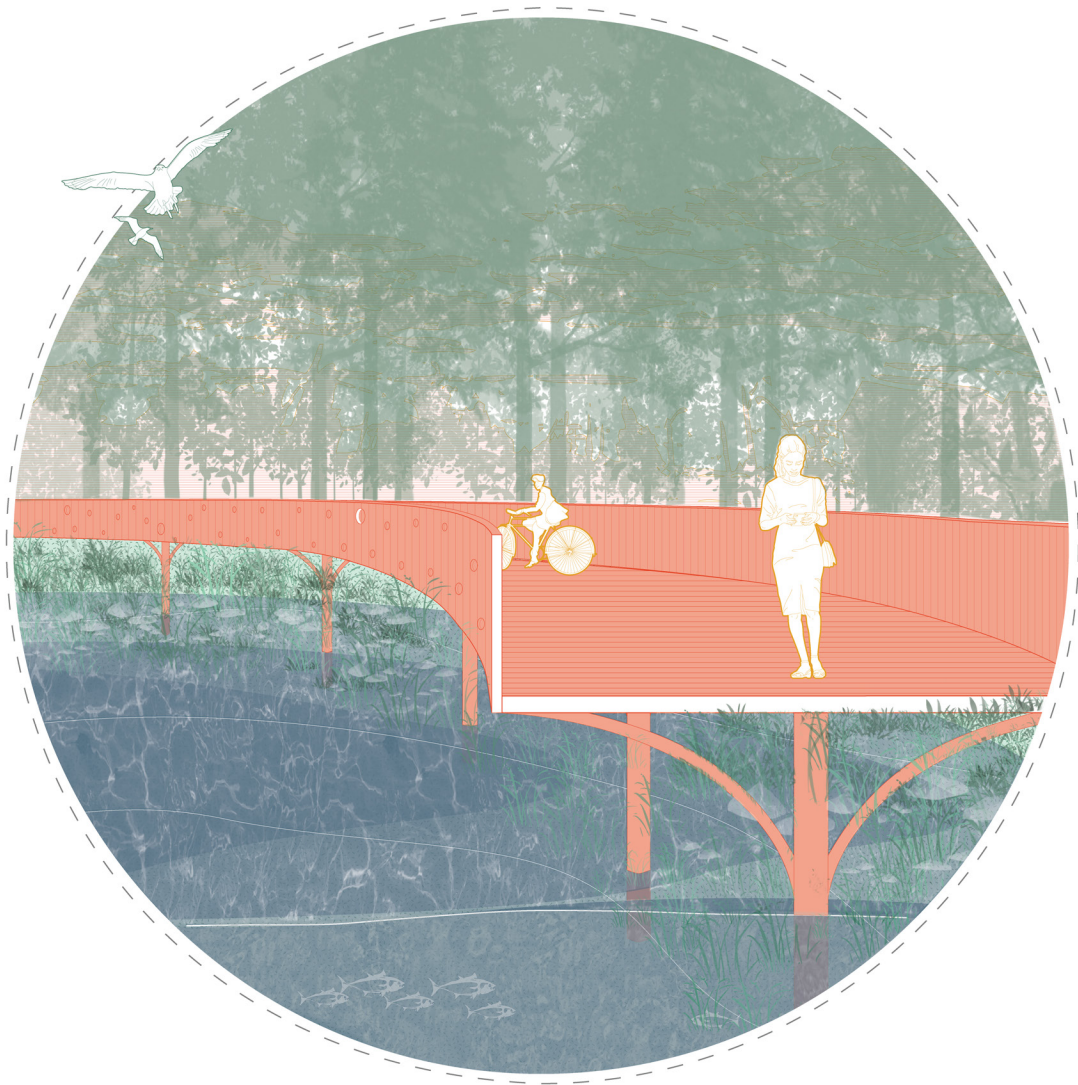
Dave Polster explains that reclamation of the landscape happens when there is a variety of types of habitats from from meadows or bare ground to mature forest (Polster 1989)





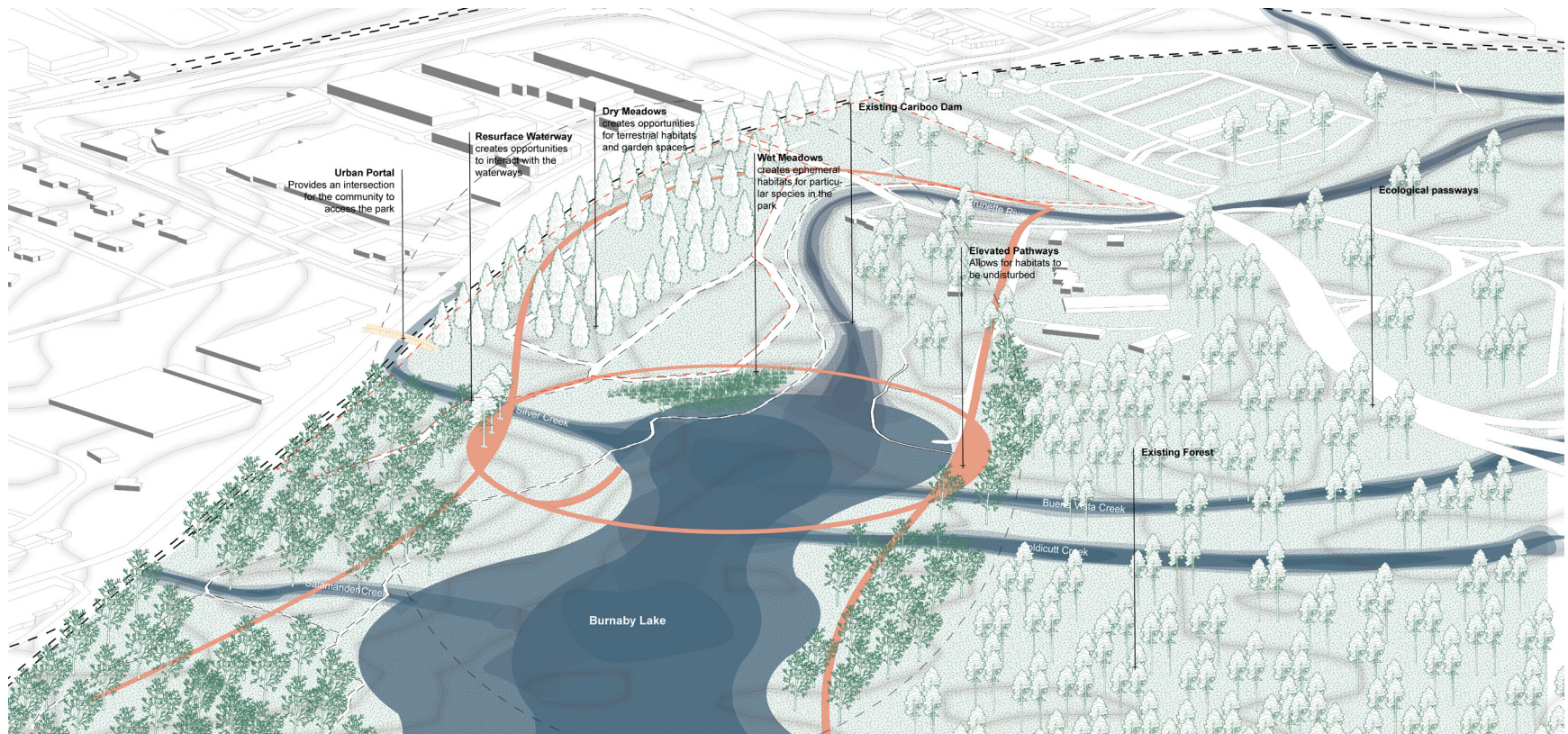
Bird view of the new shape of Burnaby Lake.





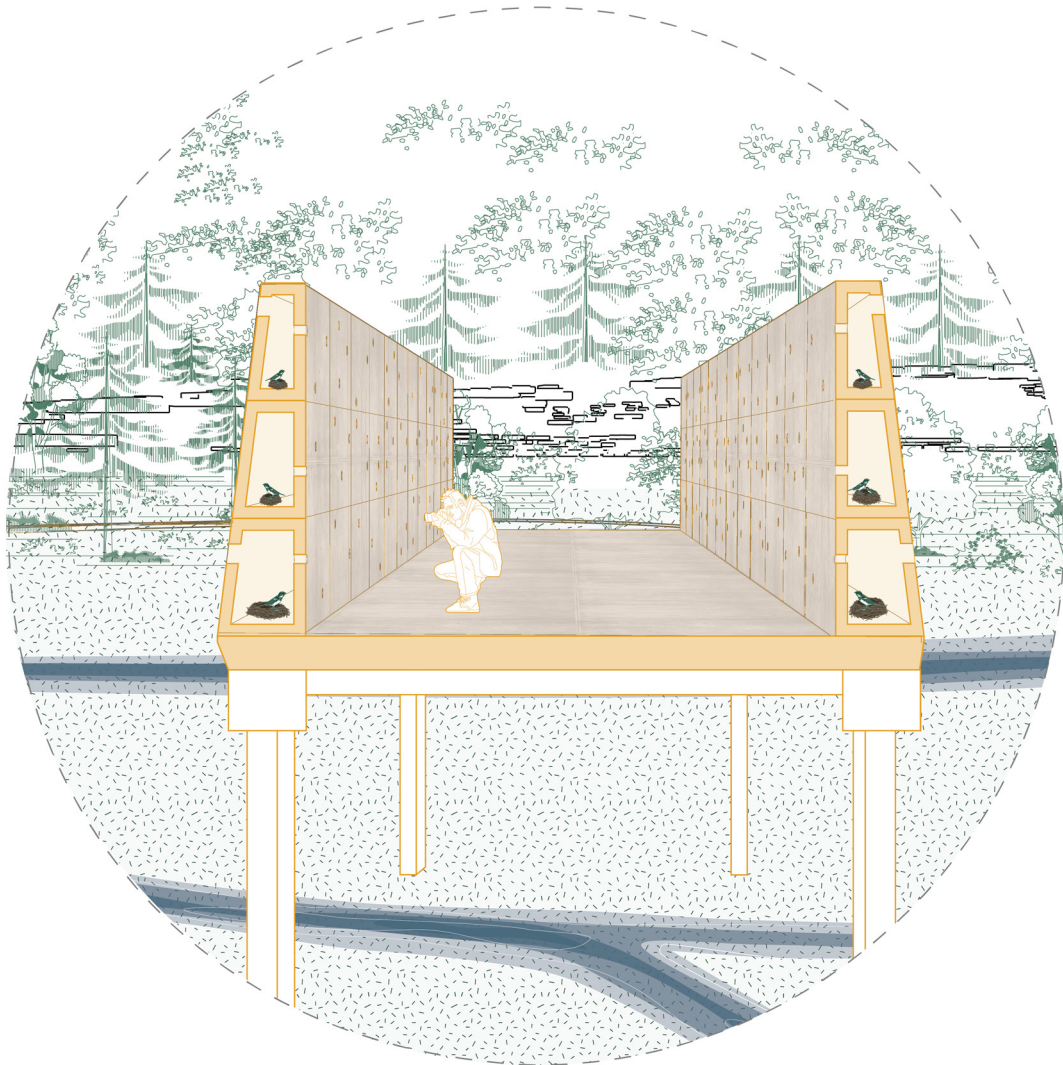
Human view of the elevated paths on the Burnaby Lake. The walls of the paths have two purposes - to give a resting space for the community and to provide nesting cavities to birds and insects along the water.

New retention ponds and wetlands are formed by introducing check dams at the north side of the park along Still Creek, which is one of the primary depositors of nutrients and sediments into the shallow lake. These will contain and slow down urban stormwater before it reaches Burnaby Lake. The water levels in these ponds will vary with the season. They expand as “vernal pools,” which comes from vere, the



Bird view of interventions along Burnaby Lake and Brunette River.





Human view of the eco-portals that connects the residents of the city of Burnaby with the riverine parks.

Latin word for spring. In drier seasons, they shrink in size but can be landscaped to accommodate changing water levels.

Overall, these constructed wetlands are designed to serve as ecological pockets which can treat, through natural ecological processes, stormwater flowing into the river system. In addition, such dynamic waterscapes engage with this urban park's environmental and cultural dimension,

creating symbiotic opportunities to steward its fauna and flora.

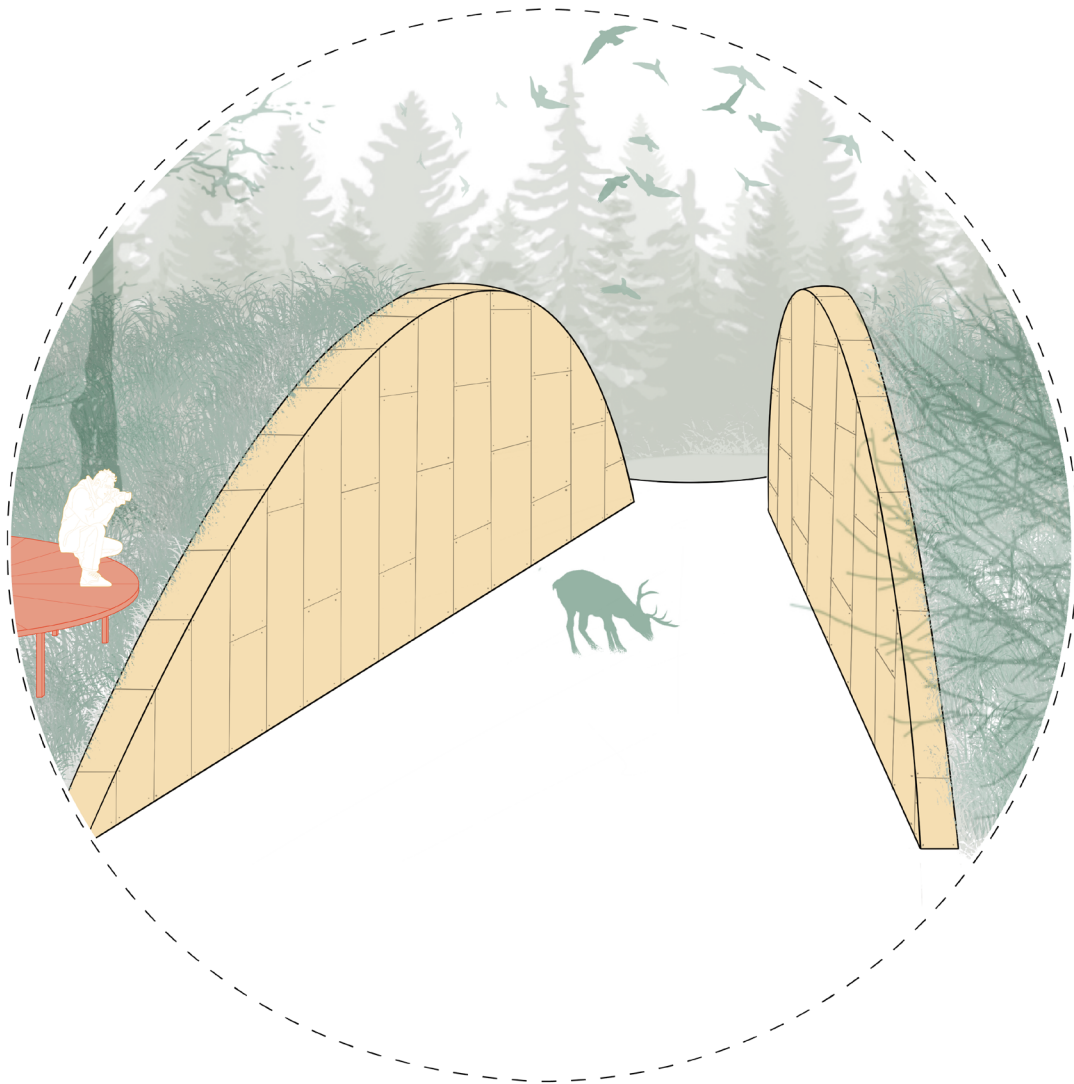
### **A New Shape for Burnaby Lake**

Burnaby Lake is presently significantly reduced in size due to eutrophication from nutrient and pollutant overload. Periodically, the city dredges a strip in the middle of the lake to enable sporting events such as paddling, but the lake is dying. This thesis proposes to reverse this process by increasing the park's periphery so that natural water treatment can be accommodated through constructed wetlands and by enlarging, better defining, and stabilizing the lake's borders using the park's natural topography.

Finding a new shape for the lake started by tracing the "dry" and "wet" spaces in the park. First, the park's existing recreational and amenity buildings and forest patches were mapped as dry land. The wetland layer includes the waterways, edges around the water, and low lands where industrial buildings used to exist along the water's edge. Next, the new water edges were defined by combining the result of this mapping process and through the use of geometrical shapes — circles that are used as an underlying structure aligned with the significant transportation corridors that enclose the park.

### **Connecting Pedestrian Circulation in the Riverine Parklands**

A pedestrian trail meanders along the re-formed land paralleling Still Creek, Burnaby Lake, and the Brunette River. This path allows people to engage with the water's edge, while bridges with nesting niches provide avian habitat.



Human view of the wildlife paths which are not disturbed by humans.

### **Habitat and Continuity of Habitat in Wildlife Green Corridors**

Humanity is a natural force that affects and transforms natural spaces, and we can start influencing the ecosystems around us for the better.

Public architecture, especially public architecture in parklands, should be designed with animal habitats in mind. According to John Marzluff et al., “the interaction [between humans and animals] is profound, and humans affect



habitats so persistently and [...] a truly large number of opportunities for symbioses is created” (Marzluff, Bowman, and Donnelly 2001, 50).

This thesis proposes that buildings, pedestrian bridges, and constructed landscape elements should be designed so that birds are invited to nest and roost. Some wildlife, especially birds, nest on tree cavities left by woodpeckers or other species. These wildlife animals benefit enormously from human-made structures or structures that mimic their niches because “nature does not just come back into the cities without an invitation: artificial habitat mimics lost habitat niches and fosters the return of wildlife to areas inalterably changed by urbanization” (Orff 2016, 121).

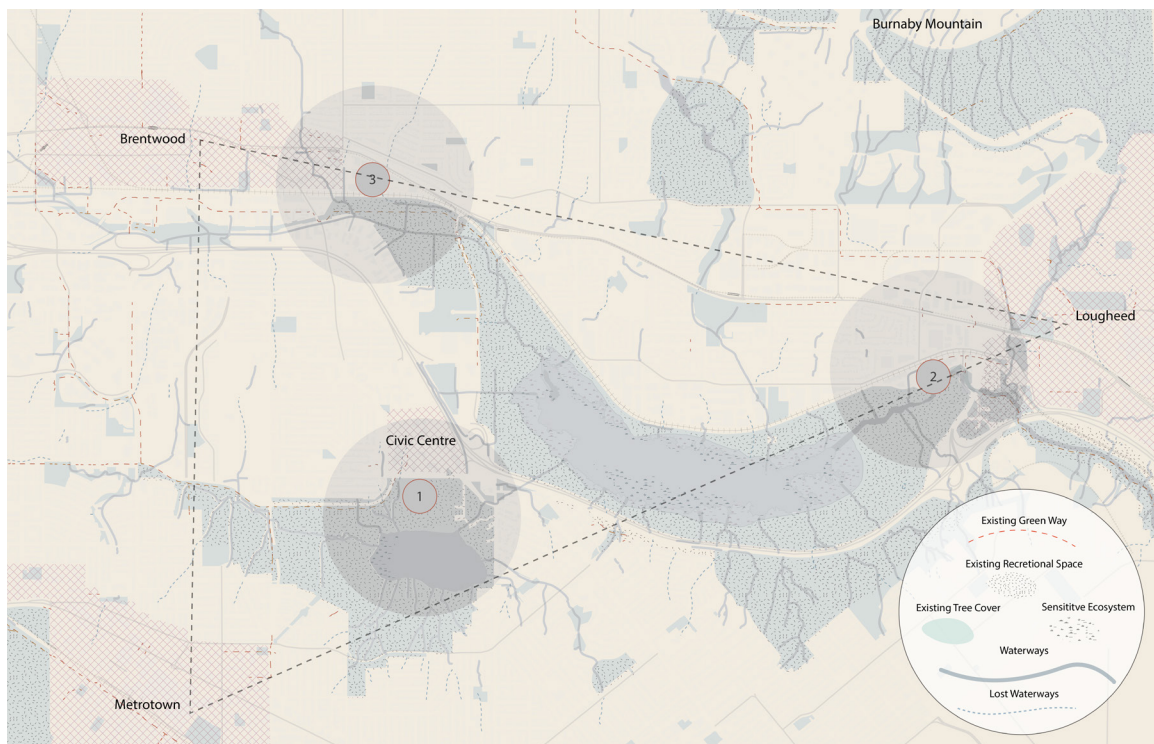
## Chapter 5: Architectural Design

### Three New Buildings that Bridge the Park and the City

By nature, people design buildings for other people. It takes more effort to conceive buildings as ecosystems that could support and maintain non-human lives.

Only man has the faculty to connect and separate what is found in nature and to do so in a distinctive manner that one is always the presupposition of the other. By plucking two things out of their undisturbed natural state to call them “separate,” we have already connected them in our consciousness. We have differentiated these two together from what lies between them. The things must first be separated from each other in order to be then united. (Boettger 2014, 10)

The urban artifacts constructed around Burnaby’s central valley corridor have created a rift between the city and its riverine park. So we need to ask ourselves, how might architecture contribute to healing such natural landscapes?



Site interventions locations along the riverine lands.

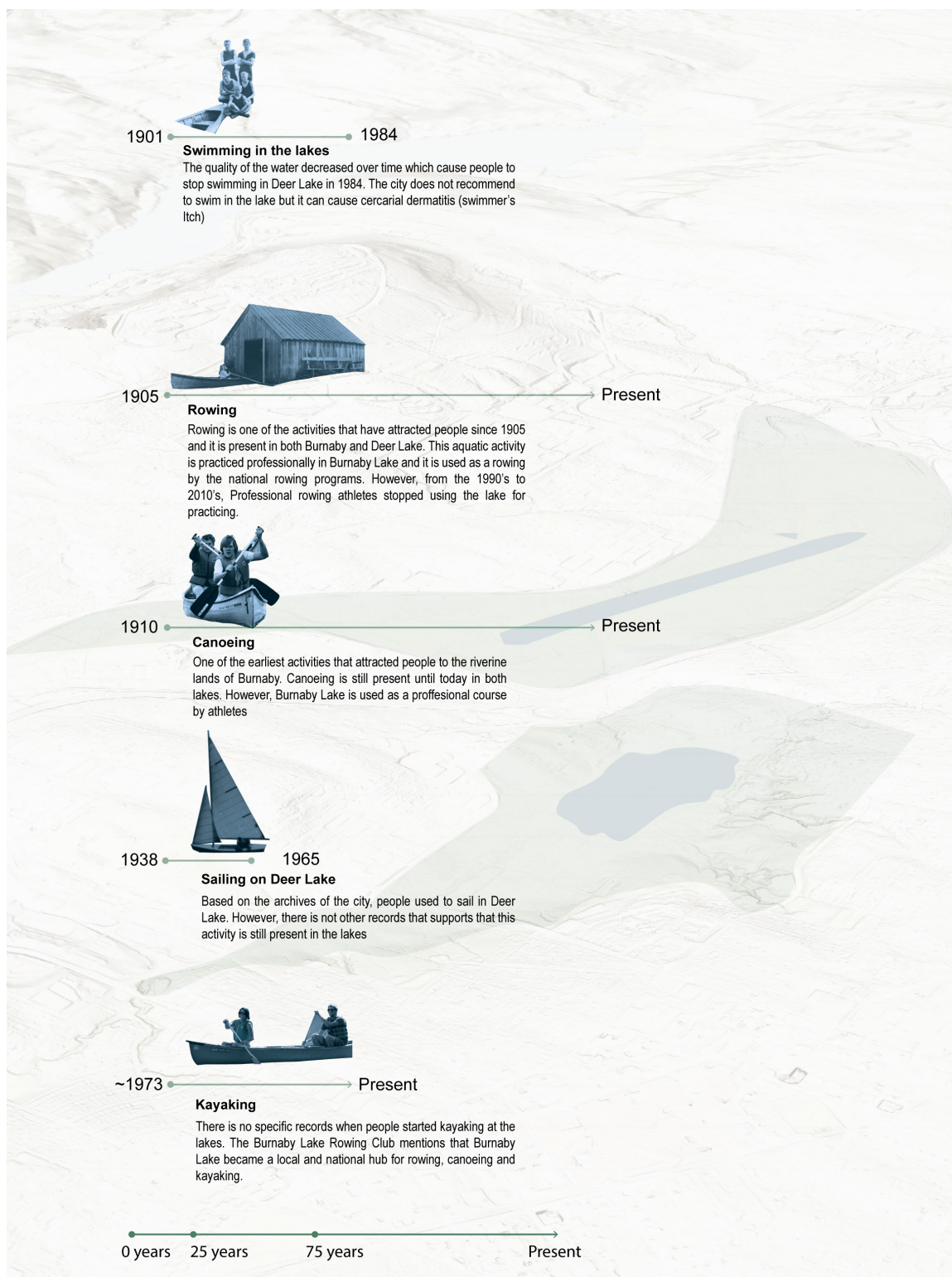


Diagram of the aquatic activities around the riverine parks.



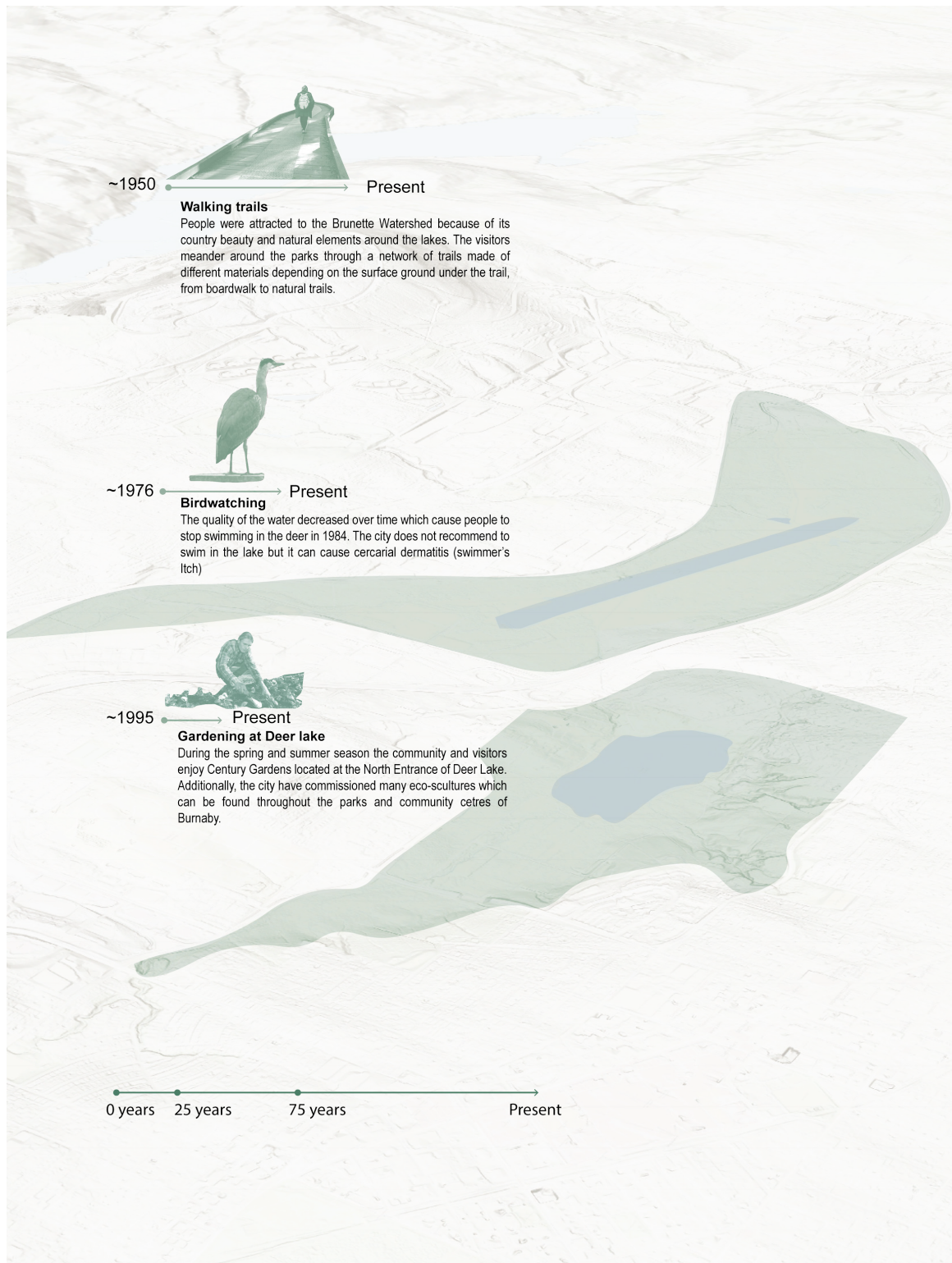


Diagram of landscape and forest related activities around Burnaby and Deer Lake parks.

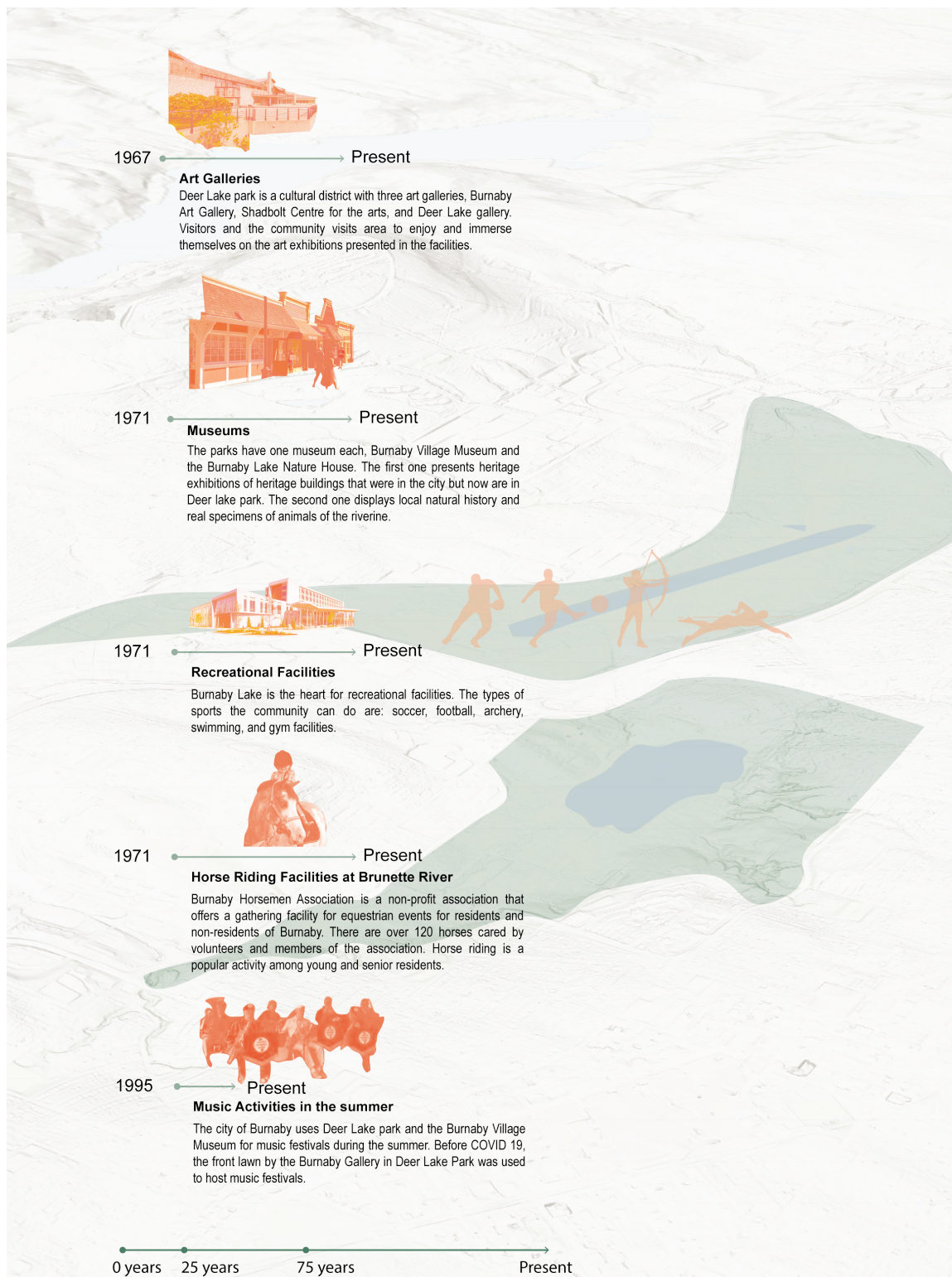
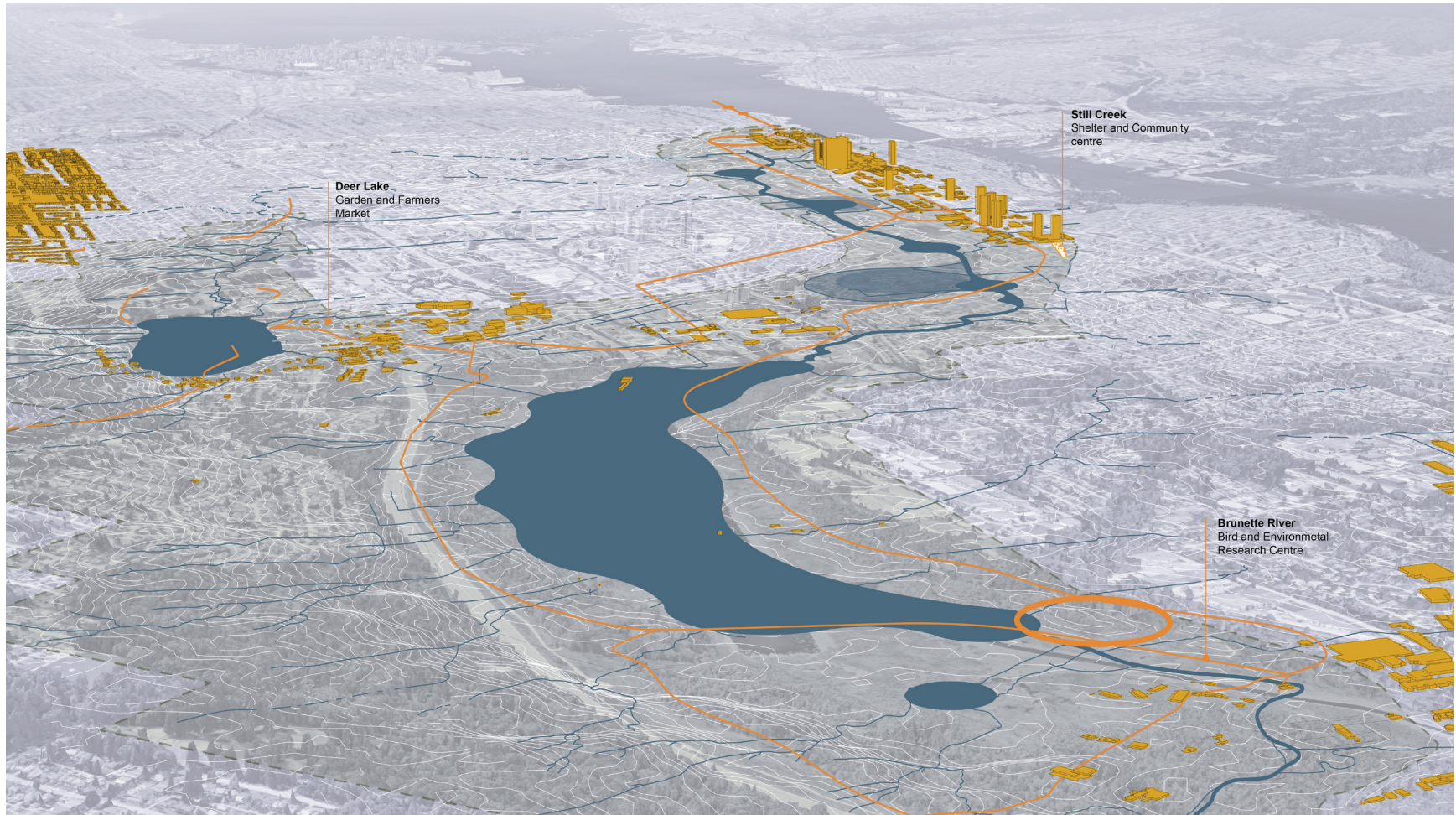


Diagram of the cultural activities around the lakes.





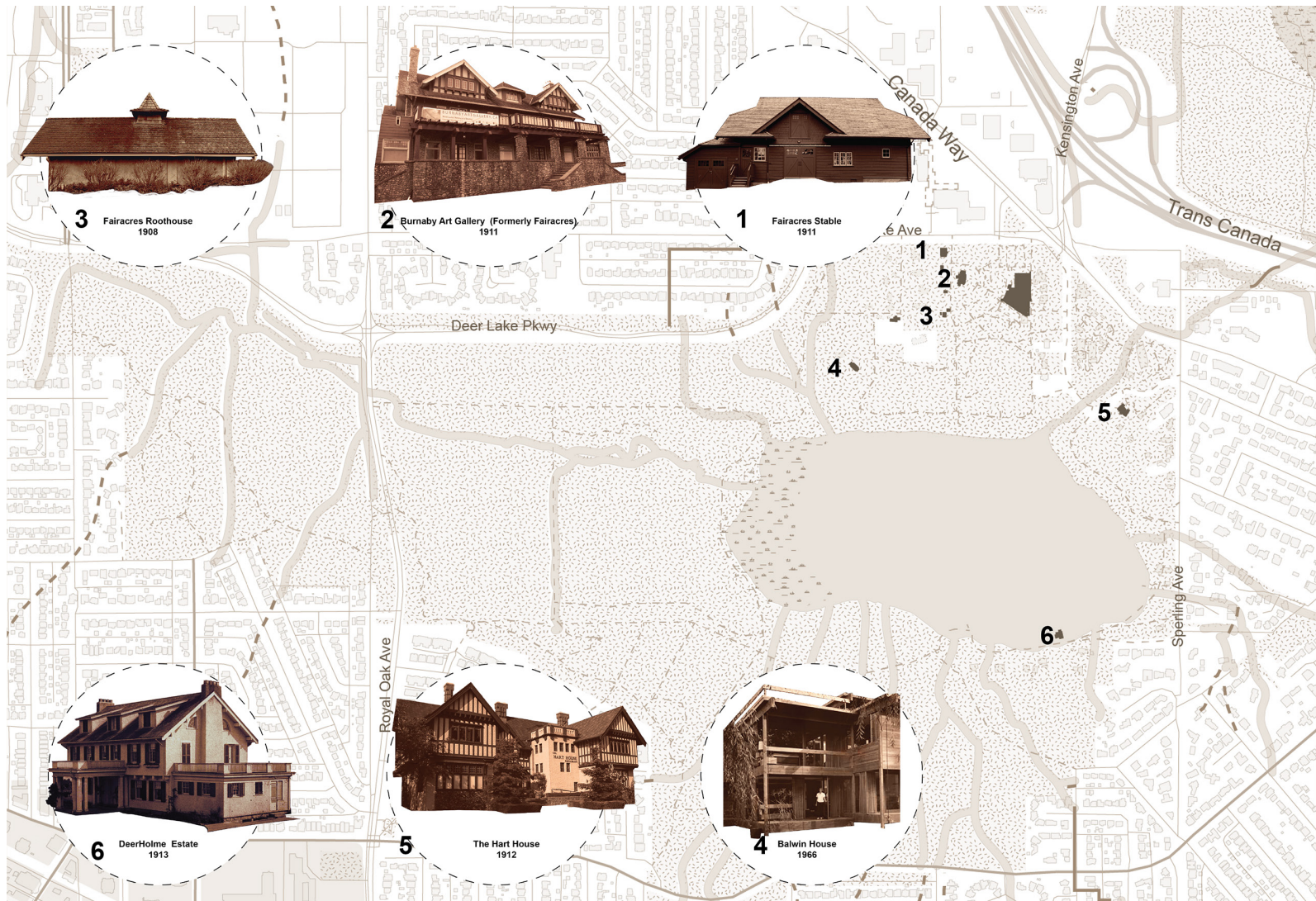
The three architectural intervention location in context with the new landscape design and city elements (base photo from Google Maps 2020).



As we have now seen, the first step is to start the process of consolidating, expanding and healing the riverine park ecosystem. This next portion of the thesis will focus on the park architecture. Three sites were chosen based on their proximity to town centres and the park. Each site is programmed to support a cultural, environmental, or social need currently not provided for in Burnaby.

Nature and the city are opposites — like darkness and light, or opacity and transparency. For instance, plants and landscapes have lightness and translucency, while urban buildings are solid and opaque. Such an opposition between the natural and the urban suggests that cities need to come to terms with a richer and more complex concept of the interface between two such different worlds. These architectural interfaces need to belong to both city and park, but also to keep these realms separate, because blurring the lines between nature and city has not worked in Burnaby; it has contaminated the blue environments of the riverine parks. The three locations chosen as sites for architectural projects provide an interface between the suburban city and the natural park ecosystem.

All three sites explore the thematic concept of porosity and transparency, particularly the concept of the “void,” to literally “make space” for the natural world in the built environment. The intention is that each architectural project derives its shape and form in relation to the landscape and its interaction with the cultural and social context. They are also designed based on lived experience, with the aim to engage all of our senses in an effort to establish a relationship with nature.



Locations of heritage structures that lay down the premise of the new garden market in Deer Lake.



Log boathouse at Burnaby Lake in 1905 (City of Burnaby Archives 1905).

## Site 1: Creating a Cultural Interface

Deer Lake Park, located near Burnaby's historic civic centre, provides an opportunity to reinforce the symbiotic relationship between nature and culture and create an urban threshold between the city and the park. Deer Lake Park is a modified landscape. The park may look like a wildland, but it has been changed over a century of settlement— now, it includes a wide variety of cultural and recreational activities in a park-like setting. People come to Deer Lake Park for the park's heritage buildings, the art galleries, the nature trails, and the boardwalks around the lake.

Over the years, the City of Burnaby has been acquiring heritage buildings from the late 19th and early 20th centuries, and most of these houses are near or on Deer Lake Park. Four buildings in particular, have significant cultural and architectural value: these are Deerholme Mansion and its Cottage, Fairacres Mansion, and the Baldwin House.

Deerholme mansion and cottage, located on the northwest side of Deer Lake Park, were built by Vancouver's Mayor Colonel Thomas Owen Townley and his wife, Frances. The mansion and the cottage were designed by their son, architect Fred Laughton Townley, in 1913. Fairacres Mansion, now the Burnaby Art Gallery, was commissioned by Grace Dixon Ceperley and her husband, Henry Tracy Ceperley. A sprawling Arts & Crafts mansion was designed by the English-trained architect R.P.S. Twizell in 1911. Finally, the Baldwin House, adjacent to the southern lakeshore, was designed by Arthur Erickson in 1962. These heritage houses represent a variety of design approaches in a park-like setting, ranging from an English Arts & Crafts



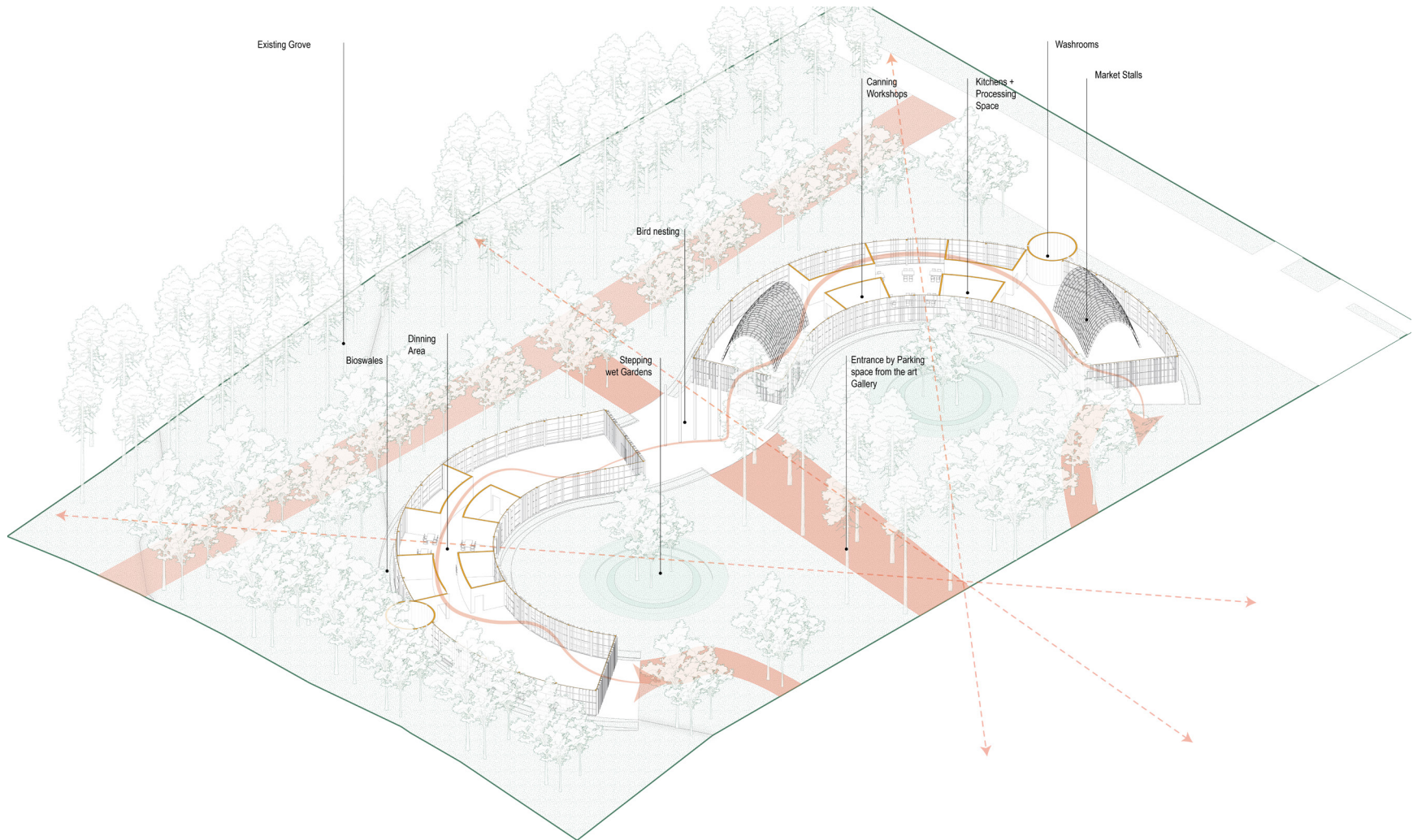
style to a West Coast post-and-beam construction typical of mid-century modernism in the lower mainland.

Deer Lake Park is located between two crucial town centres of metropolitan Vancouver: Burnaby's civic centre (which is a cultural and artistic hotspot of the city) and the commercial hub of Metrotown. The civic centre was established in 1950 when the city's municipality was relocated to the north of Deer Lake Park.

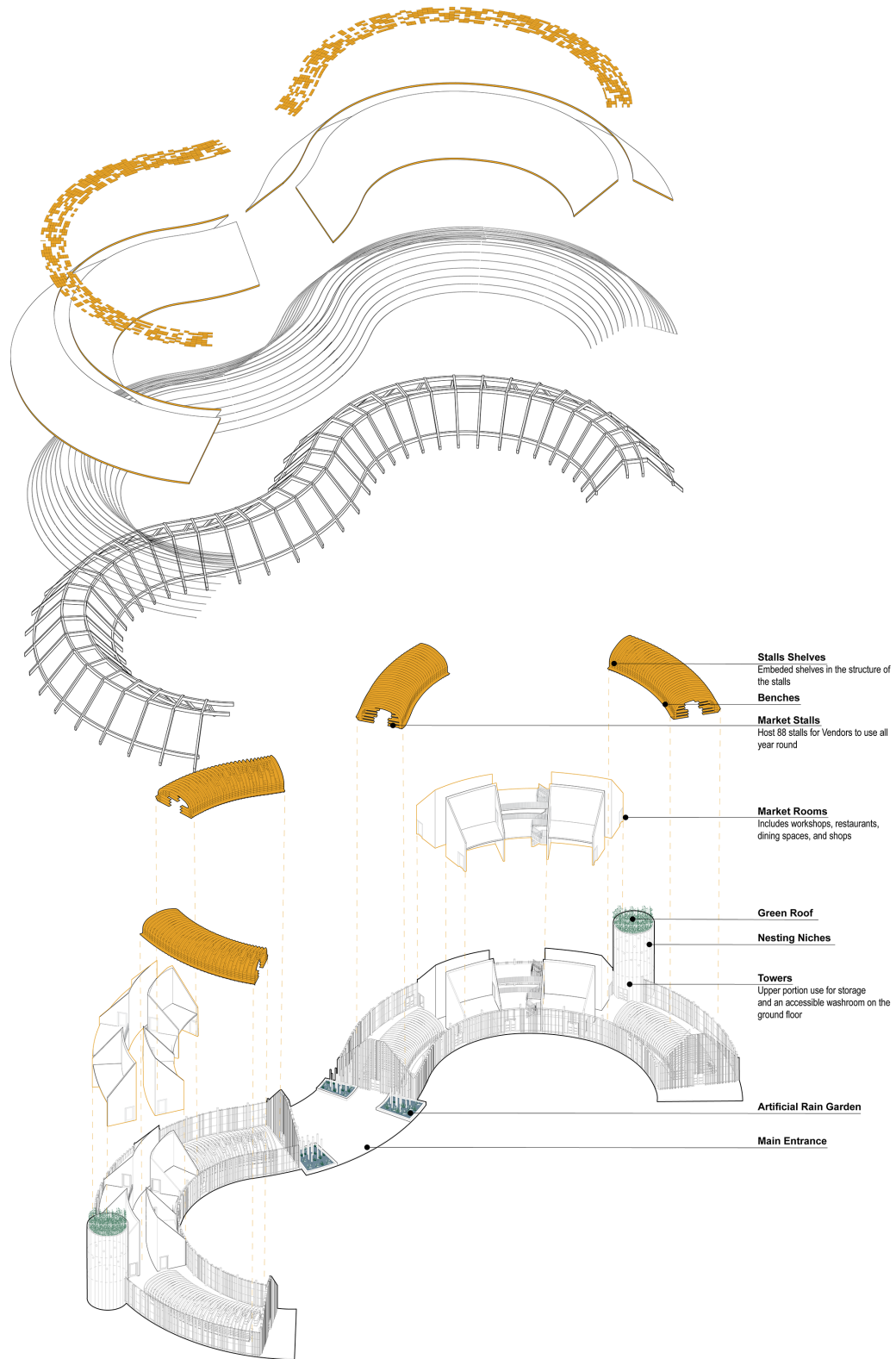
This location opens the opportunity to introduce a community garden and market. Already, a farmer's market occurs seasonally in the parking lot of the municipality, but is unroofed; it does not serve as a year-round cultural space for the community. The vernacular architecture of the Deer Lake site encouraged me to propose a garden market that embraces and enhances the artistic and cultural nature of Deer Lake and also considers its historical garden markets of the early 20th century.



Bird view of the new garden market in context with the heritage structures near and long Deer Lake Avenue.

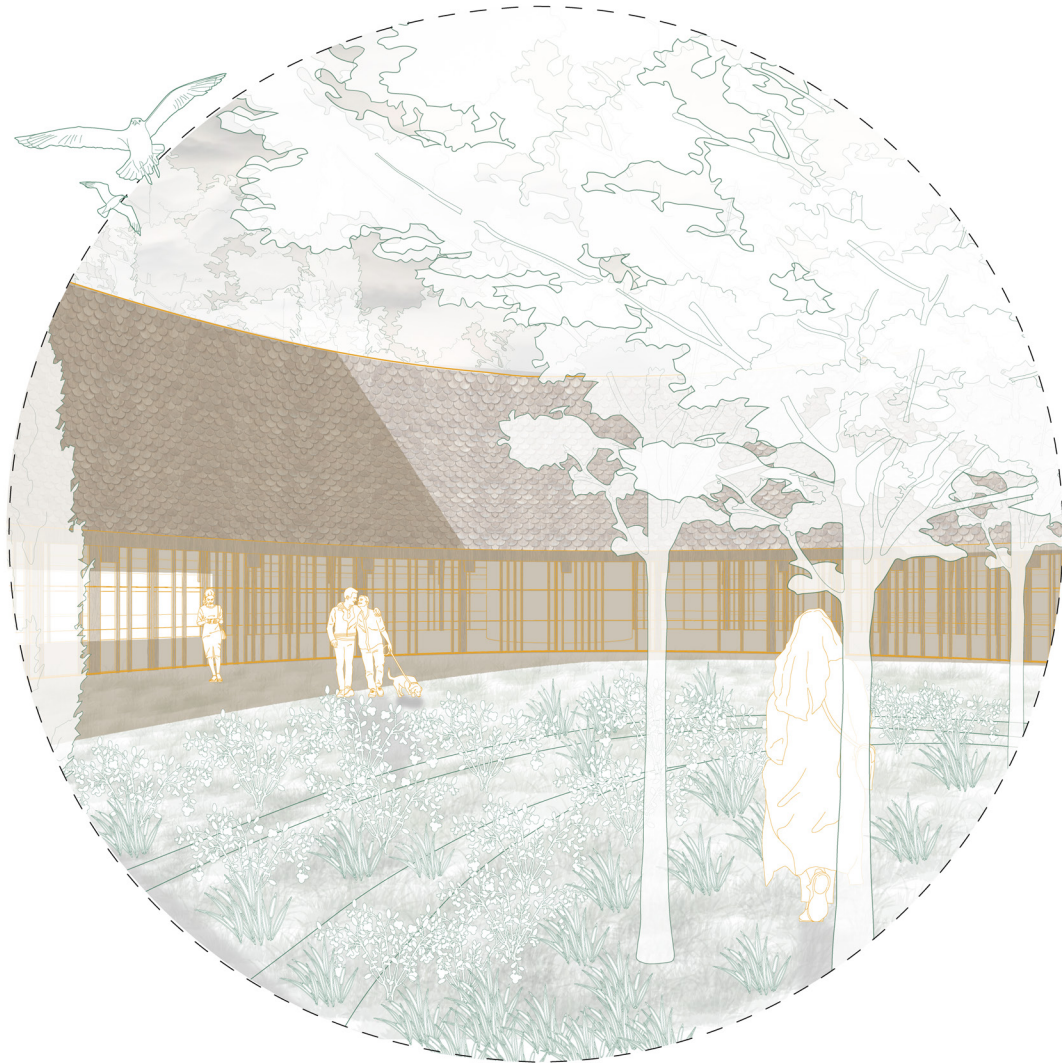


Bird view of program and sequential movement in the new garden market.



Exploded axonometric displays the layers of the market: the roof components, the market stalls and the overall interior organization of the market.

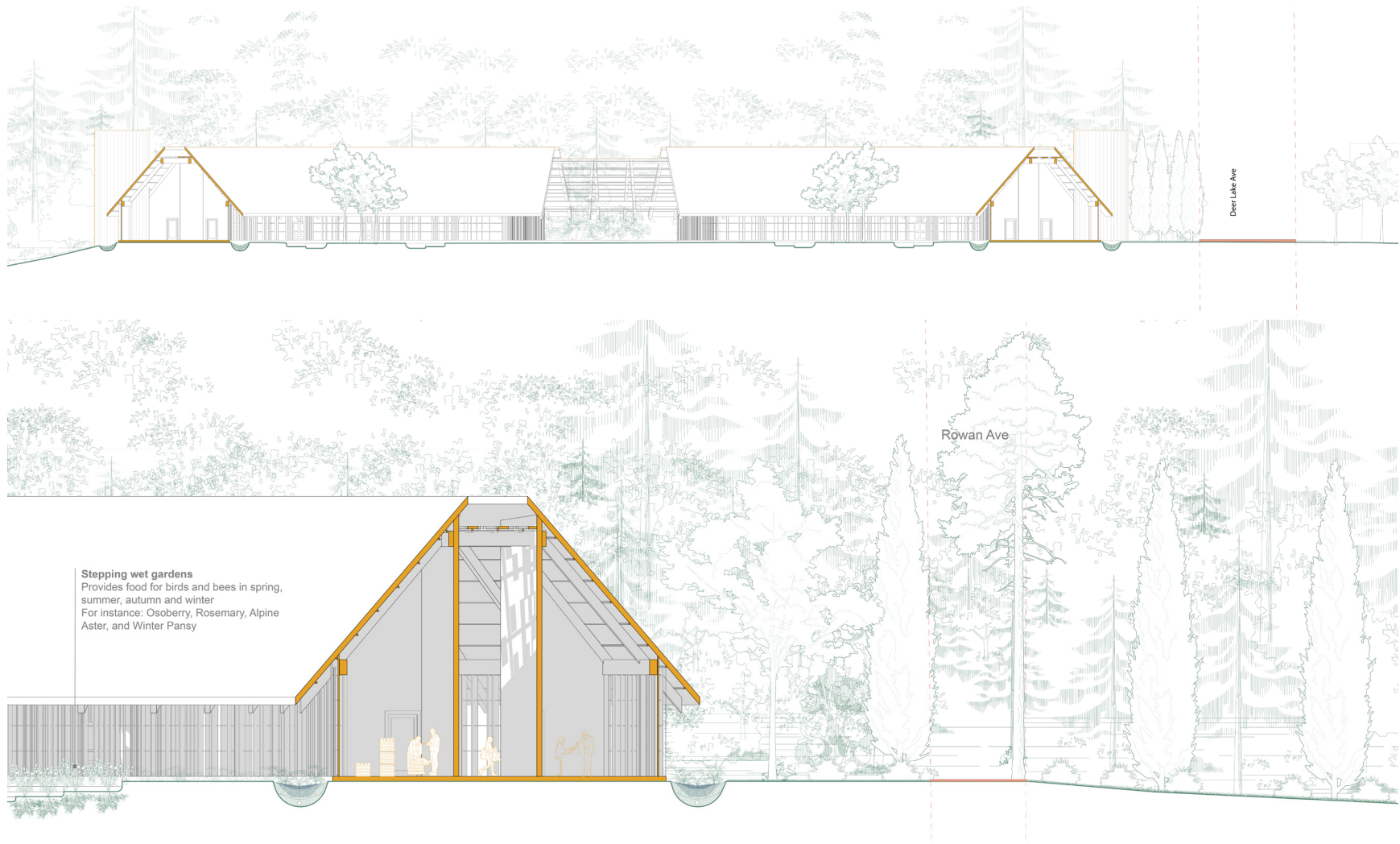




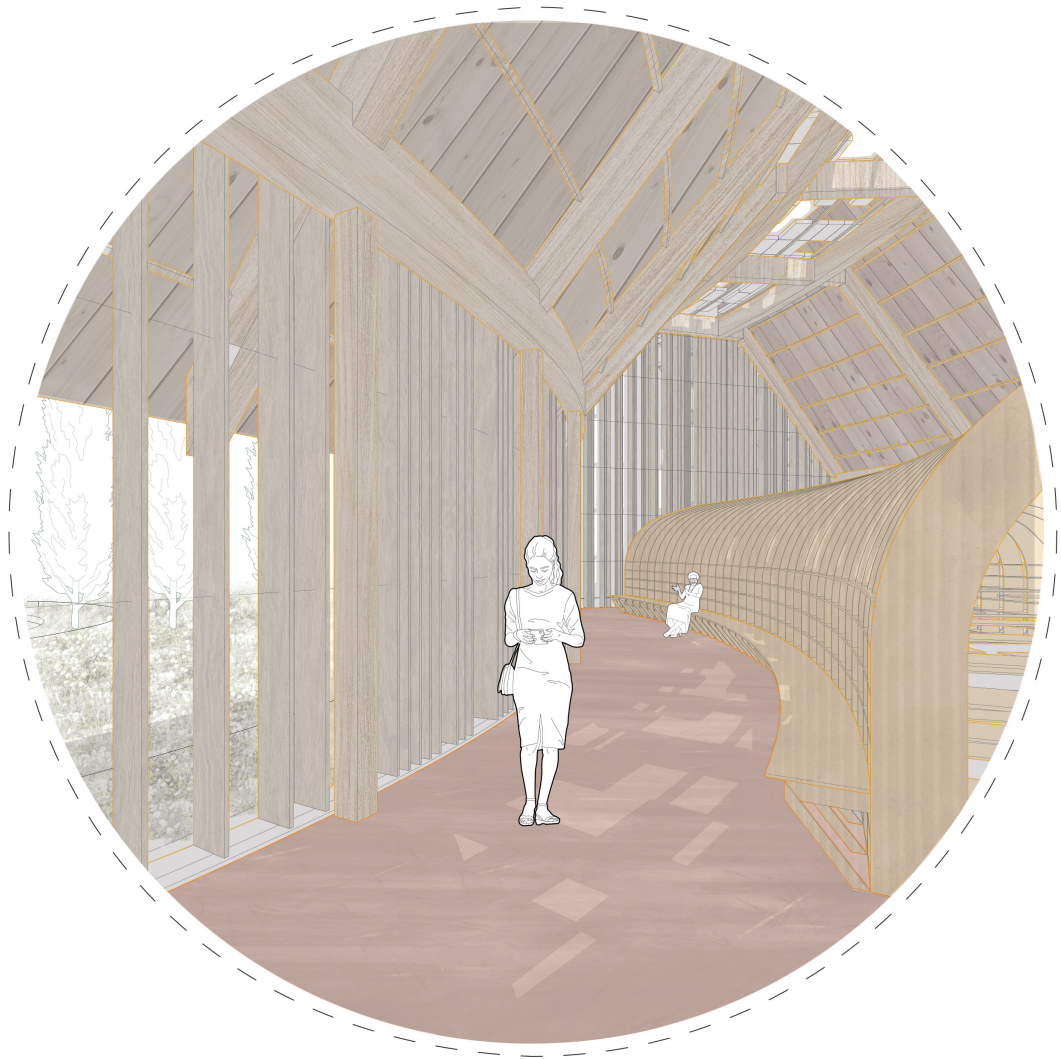
Human view of the envelope interacting with the gardens.

### **A Garden Market at Deer Lake**

The Garden Market serves as a threshold between the forest and culture. It acts as an interface that separates and connects both urban and natural systems, allowing them to function independently from each other. The market is designed to “nestle” on the ground, wrapping around the forest and two central gardens dedicated to birds and insects. The market’s shape was heavily influenced by acknowledging the existing location of the trees and using



A human view of the cross-section of the building, gardens, and the details of the bioswales around the garden market.

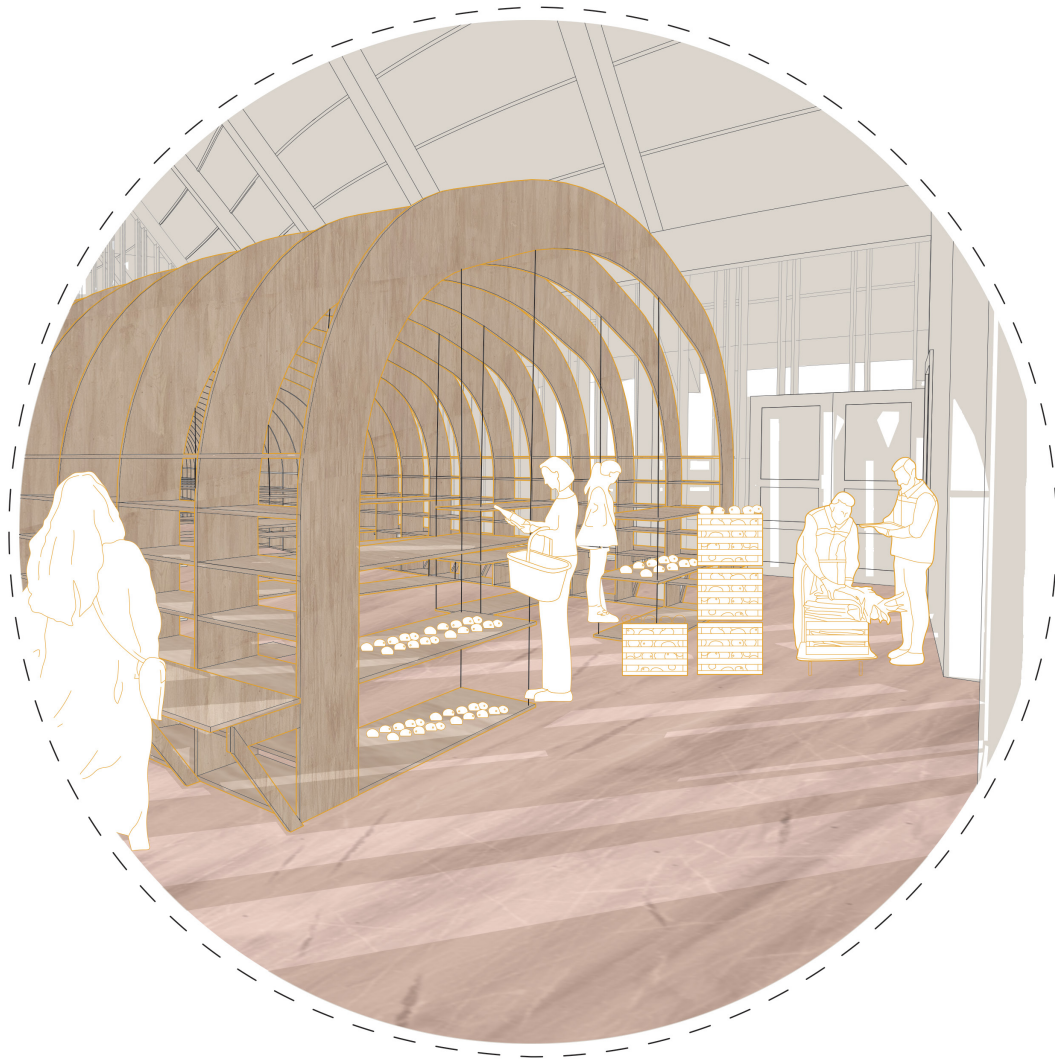


Threshold between inside and outside from the bench attached to the market stalls

the voids between the forest to design a two-winged market that embraces the forest. The central gardens would exhibit plantings that blossom seasonally, such as Thimbleberry, Rosemary, Osoberry, Alpine Aster, and Winter Pansy, which have proven to be food sources for bees and small birds.

The visitor's journey starts at the main entrance — the central element of the market, which is accessible from the parking lot of the Burnaby Art Gallery. The central hall is an open space with artificial niches and rain gardens to remind





Inside view of market stalls. The vendors' tables are suspended from the arches, and the arches are connected to each other through a series of horizontal wooden slats that also functions as shelves for displaying merchandise.

visitors that we are entering a borrowed space that belongs to nature. The artificial niches are meant to be inhabited by small birds. The rain gardens at the entrance are watered by the roof's water during the wet season. The main entrance to the market also acts as a two-sided view frame of the park: on one side, the wilderness aspect of the park, and on the other, a blended builtscape consisting of the art galleries, museum, and their modified landscape. Inside the market,



Inside view of the dining space of the market.

the roof is shaped with an undulating interior to encourage people to meander through the market. Additionally, visitors can access the market through Deer Lake Avenue and Rowe Avenue.

Inside the Garden Market and looking out to Deer Lake Park, patterns are perceived in every moment, from tree canopies forming different types of shadows, depending on the time of day and the season, to the visual pattern created by

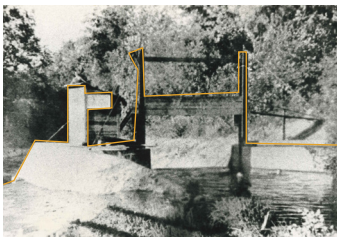
tree trunks. The undulating walls are clad with wooden fins that echo the surrounding forest and blend the interior and exterior with a play of shadows and views of the urban grove and the gardens. Light filters down from scattered skylights along the ridge. The shadow patterning created by the roof and the envelope's wooden fins reproduce the experience of walking in a forest, enhancing the visitors' understanding of the market as belonging to the park.

There are four instances of nesting spaces in the market—the market stalls follow the analogy of wood patches providing spaces for active and passive activities. In addition, the market stalls' overall idea represents how birds build their nests on and in existing structures. These spaces are found along with the entrances to both wings of the market. The market stalls offer spaces for the farmers to sell their goods to visitors. Along the sides of the patches, the visitors can sit and observe glimpses of nature created by the wooden fins. Additionally, each building has a merging tower element, and the top of the towers serves as a nesting and roosting element for the park's wildlife.

We find the canning workshops, kitchens, food processing spaces, restaurants, and dining spaces at the centre of each market wing. Dining spaces are placed so that when people are eating or conversing, they can look over at the gardens and the forest of the lake. Through sets of stairs in the dining area, visitors can also access the second level of the market. Through sets of stairs in the dining area, visitors can also access a second level, which is daylit through the skylights on the roof. These spaces are more private and secluded from the market activity.



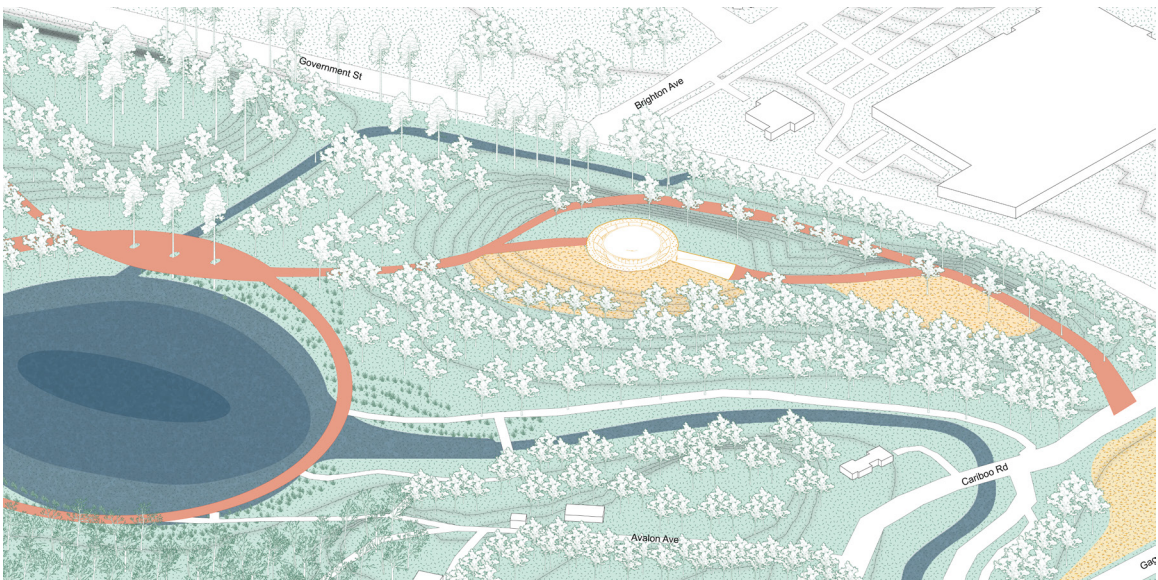
The design of this building responds to the site's ecological systems—its use of sunlight, its relation to the forest, its formation of animal habitat, and also in its rainwater filtration, which can be seen in a bioswale that directs water from the roof back into the landscape and eventually the Brunette watershed. In short, the market aims to reinforce the already cultural activities around the park and produce a year-long space that assists the communities of farmers while trying to create an appreciation for the natural ecosystems of the city.



Old Brunette River Dam in 1925. (City of Burnaby Archives 1925)

## Site 2: Establishing an Environmental Interface

The second site is close to another metropolitan hub, Lougheed Centre, and near where Burnaby Lake flows into the Brunette River. Additionally, this site has environmental and educational qualities as it is close to Burnaby Mountain and Simon Fraser University (SFU). Around this area, the visitors can enjoy the nature trails along the lake and even enjoy a horse riding lesson from the Burnaby Horsemen Association.



Bird view of the wildscape site shows the relationship of the building with the new landscape and the Brunette rivers mouth that starts at the Cariboo Dam.

Burnaby Lake has supported many aquatic activities from swimming, rowing, kayaking, and canoeing for many years. However, the eutrophication of the lake stopped supporting aquatic sports for some time until 2010, when Burnaby Lake underwent a major dredge to clear a strip in the lake. The local and national rowing teams use Burnaby Lake for training after the last lake's dredged in 2010.

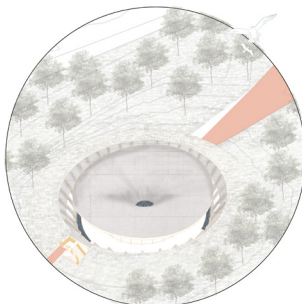


Model for Contoured Playground by Isamu Noguchi (Nobel 1941)

The site chosen for the new ecological centre is presently the Cariboo business park. This section of the riverine park presents an opportunity to reclaim formerly industrial lands as a wildscape. A wildscape is a land that was or is an artificial space reimaged and transformed into a natural landscape. This site is ideal for depositing some of the dredged soil from Burnaby Lake and building an elevated landscape for the Cariboo Park.

### **An Ecology Research Centre at Burnaby Lake and the Brunette River**

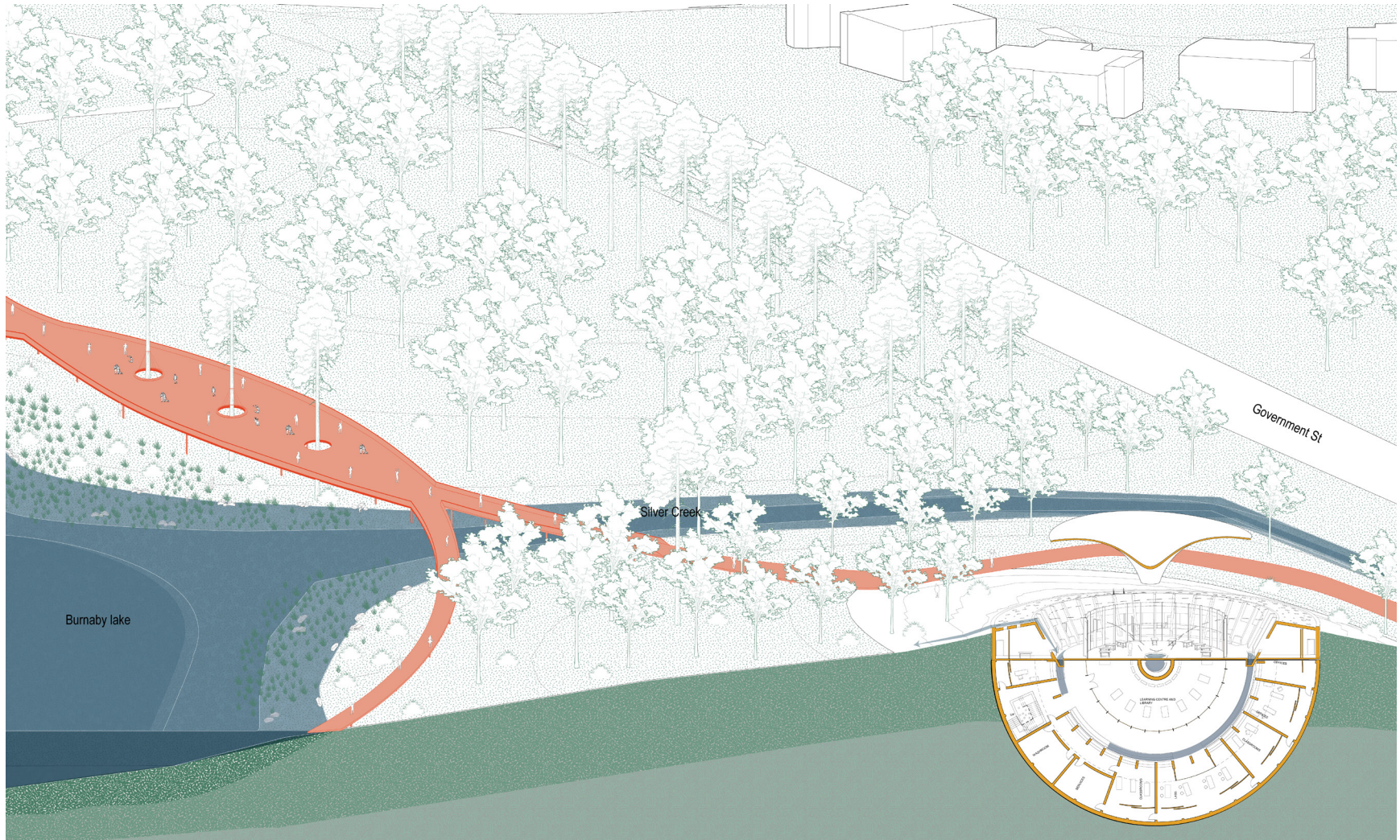
The centre's design limits its palette to the earth-shaping techniques employed in other park areas, the swales, dams, and wetland formations. The method is cutting into the earth to make a void that people can inhabit, following the theme of separating to form and transform a space. In addition, the centre appears to shape the ground of the wildscapes to carve spaces from the site, dwelling on themes Isamu Noguchi utilized on United Nations Playground.



Closed up view of the bird view of the building.

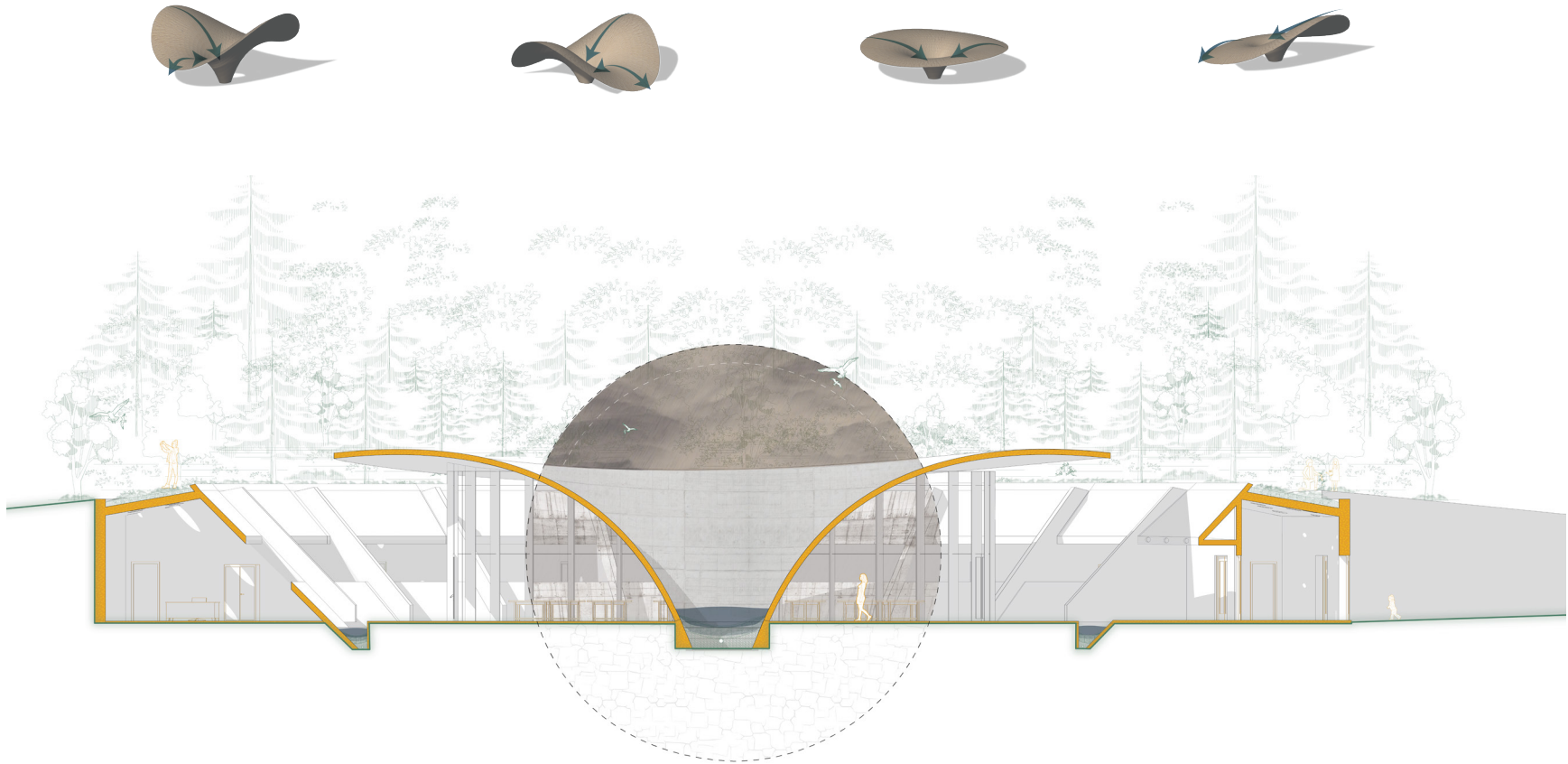
The only indication that the ecological centre is there is from the main entrance seen when the visitors approach from Cariboo Road. After that, visitors follow the nature trail to the carved entrance of the centre. The ecological centre is designed as two buildings; the first element is the earth-



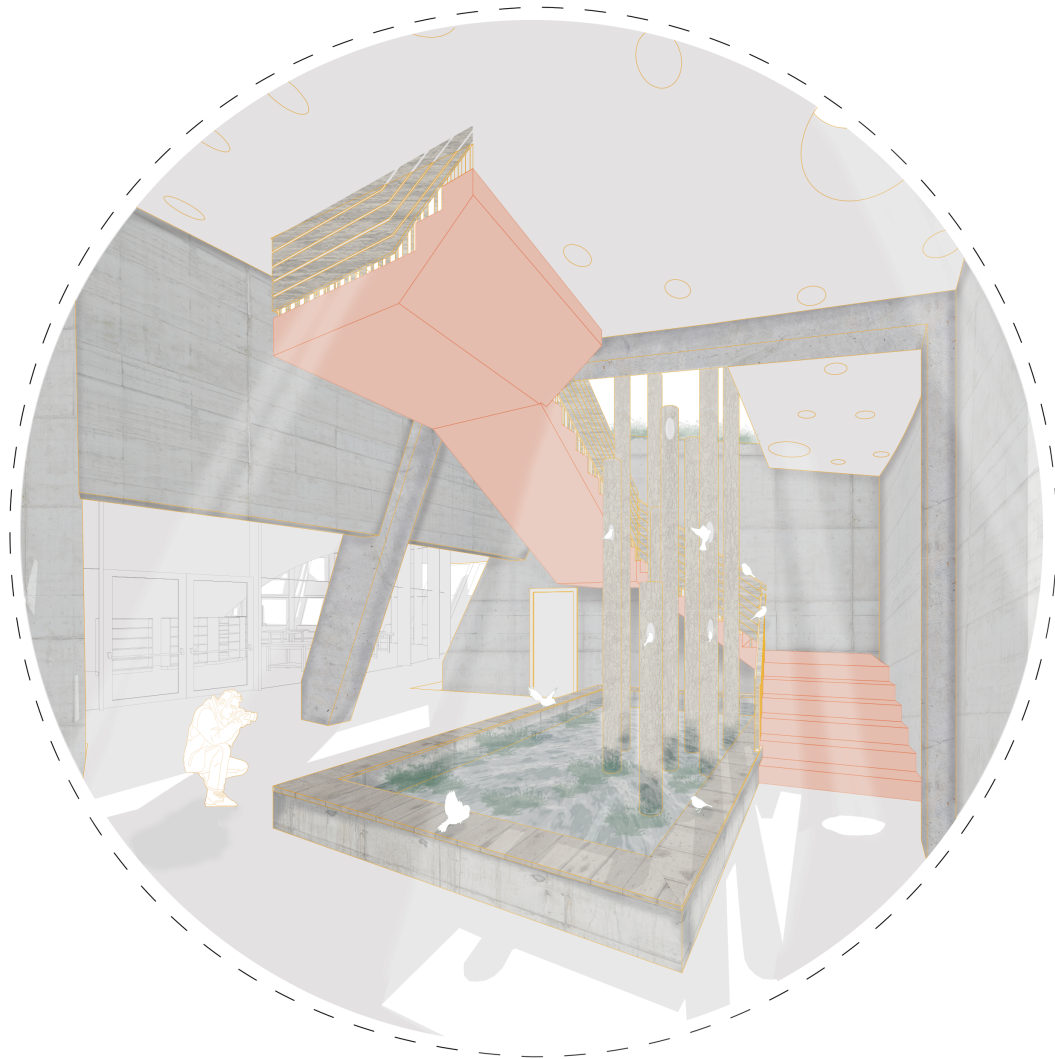


Cross-section of the building in relation of the landscape and water environment.





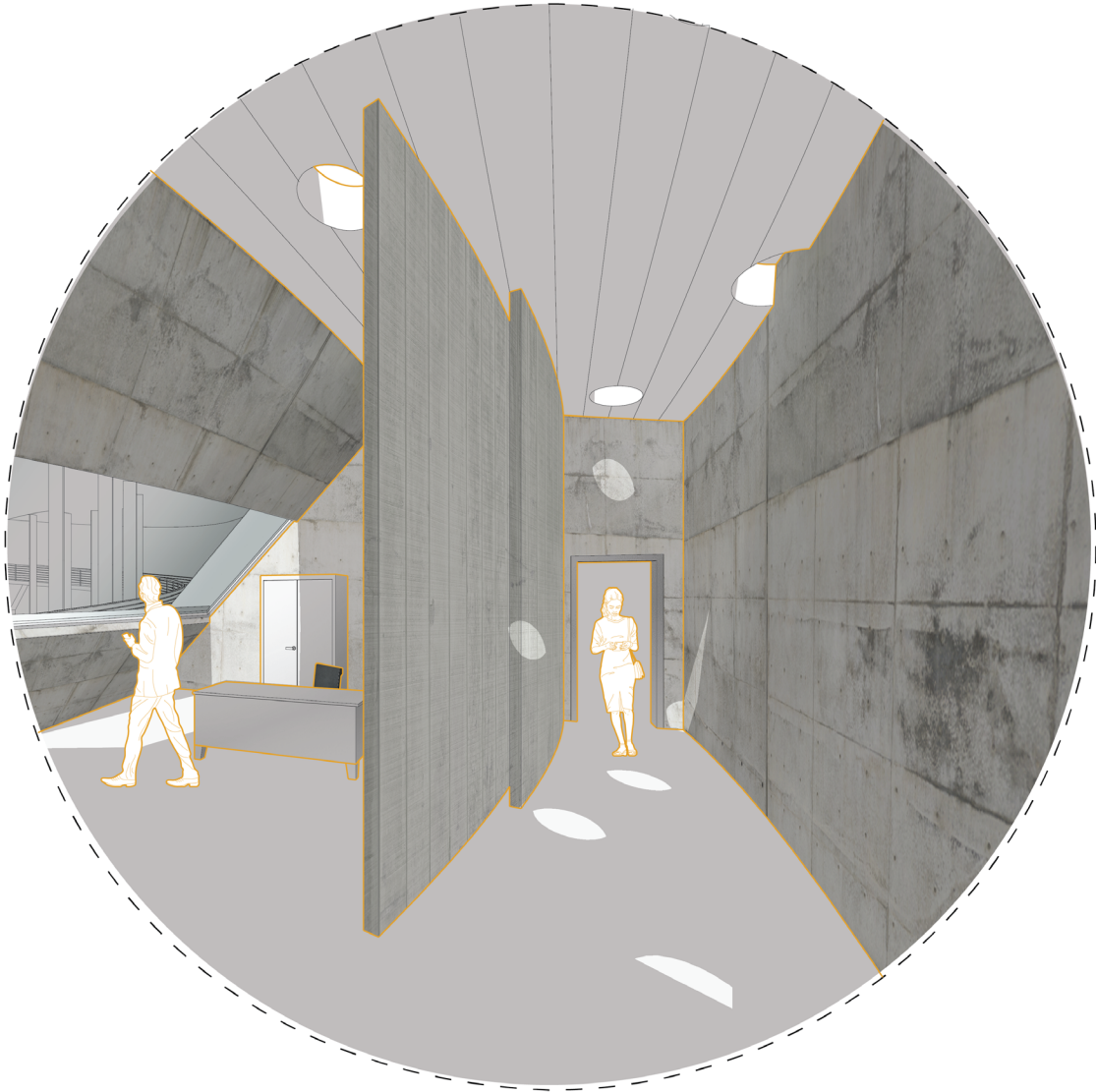
The top image shows the form finding for the interior roof structure. The bottom image is a cross-section cutting through the learning centre and the perimeter building spaces.



Human view of the secondary entrance to the ecological centre.

carving technique on the site, and the second is a rain collector.

First, the perimeter building's roof presents a continuity with the seemingly untouched landscape, which is preserved to be inhabited by birds, bees, and other insects. The perimeter building sculpts the land and directs water to a perimeter swale that encloses the central roof—the perimeter structure host the entrances, the offices, the labs, and classrooms.



Interior view of the offices in the perimeter building

The main entrance is carved into the landscape leading the visitors to the interior towards a courtyard wrapped around the perimeter building. In this courtyard, the exterior corridor runs all around the exterior edge of the building, and the swales catch water running along the walls. The secondary entrance is less evident to the visitors – it is a set of stairs on the top of the perimeter building. Finally, the perimeter roof has cavities that make it look like light is piercing through the heavy roof, creating a patterning on the floor and walls





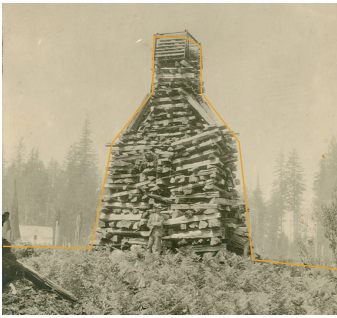
Human view of the secondary entrance to the ecological centre.

throughout the day. Again, the materiality reinforces the idea that this building is a space inside the ground.

The second building acts as fennel to collect water directing to the centre of the building. The space where water is collected from the roof is not accessible to the visitors or the users of the space. The hope is that the space can become a wildlife habitat one day, enabling the non-human life to thrive in the riverine parks. In this building, visitors can learn to be stewards of the riverine parks, that they can help

protect and preserve waterways, green infrastructure, and wildlife. The building is enclosed by a glass and wood slats envelope that allows daylight to pierce through the space. The roof structure is reminiscent of Felix Candela's "Los Manantiales" in Xochimilco, Mexico.

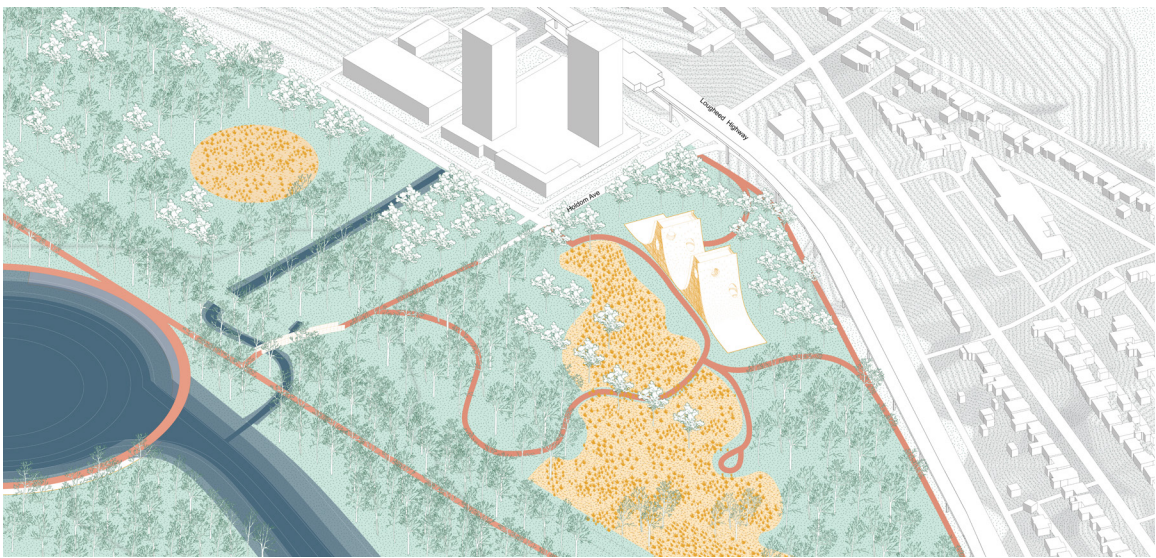
We could imagine that this building adapts to its site much as the birds must adapt to their environmental space. The building program is a Centre for Ecological Research and Education for the community to become a steward of the urban ecology.



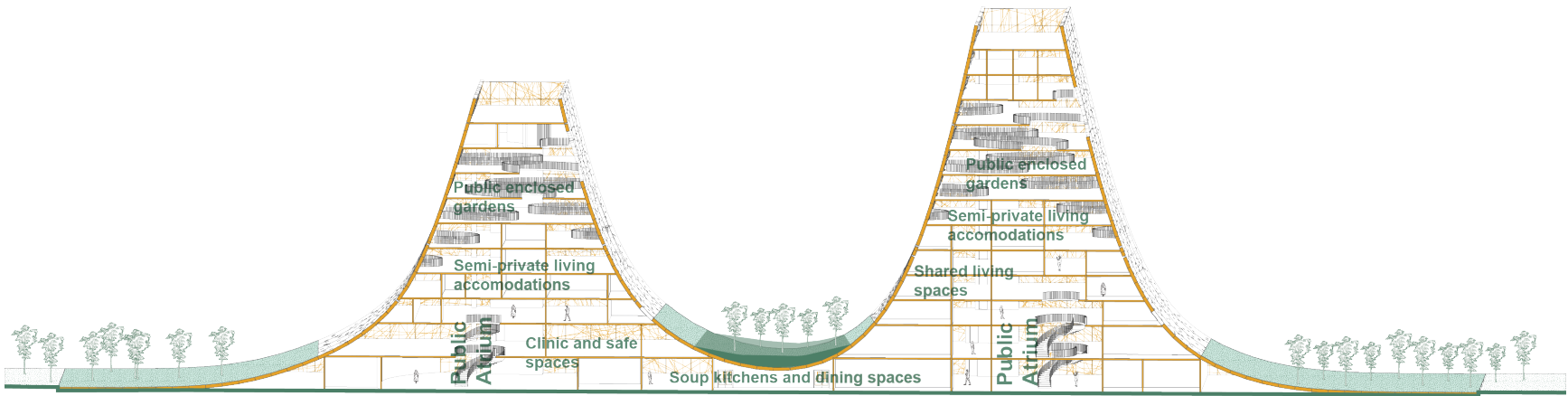
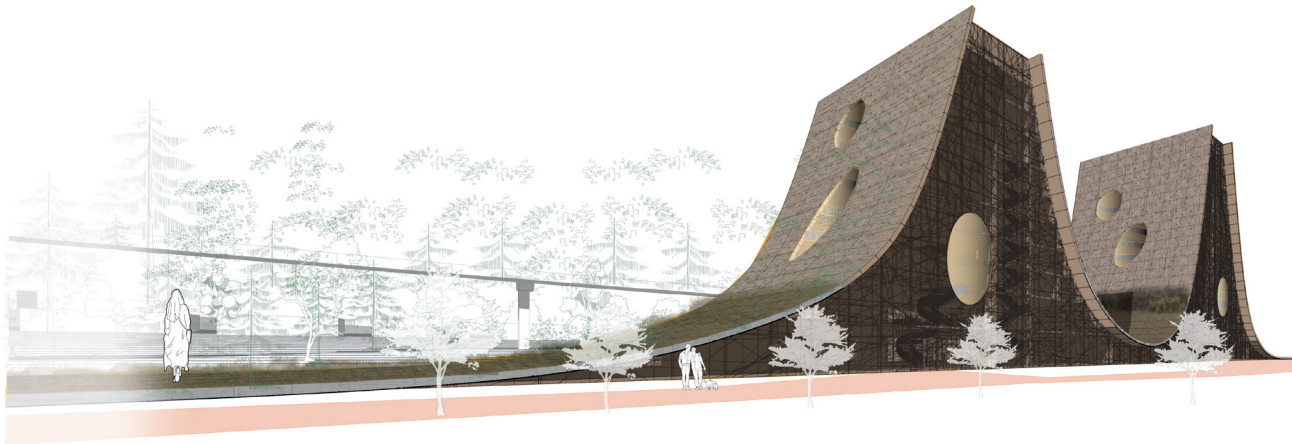
Log pile prepared for bonfire on a hill near Centennial Pavilion in Burnaby in 1897. (Burnaby Village Museum 1897)

### Site 3: Building a Social Interface

Still Creek near the Holdom SkyTrain Station has been an industrial site since the 1980s, evidence of the fragmented green infrastructure of Burnaby. Most of its buildings are warehouses and commercial spaces. In recent years, the Brentwood Town Centre has expanded, adding many new mixed-use high rises where there used to be open space. These industrial and residential uses create an opportunity for a new interface that engages the city's social ecosystems



Bird view of the towers in their context in the suburban Burnaby.



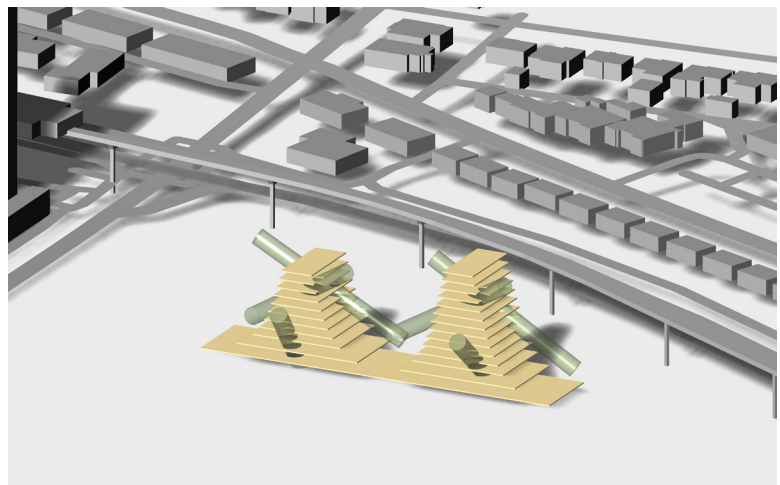
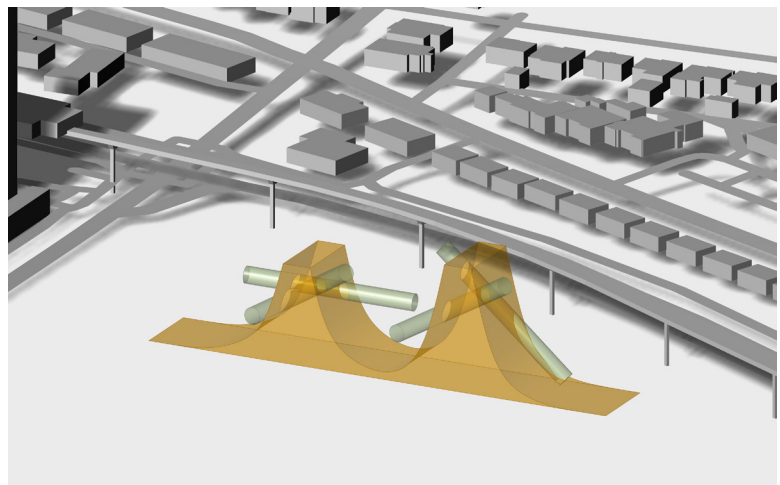
Schematic section view of the distribution of programs in the emerging social towers.



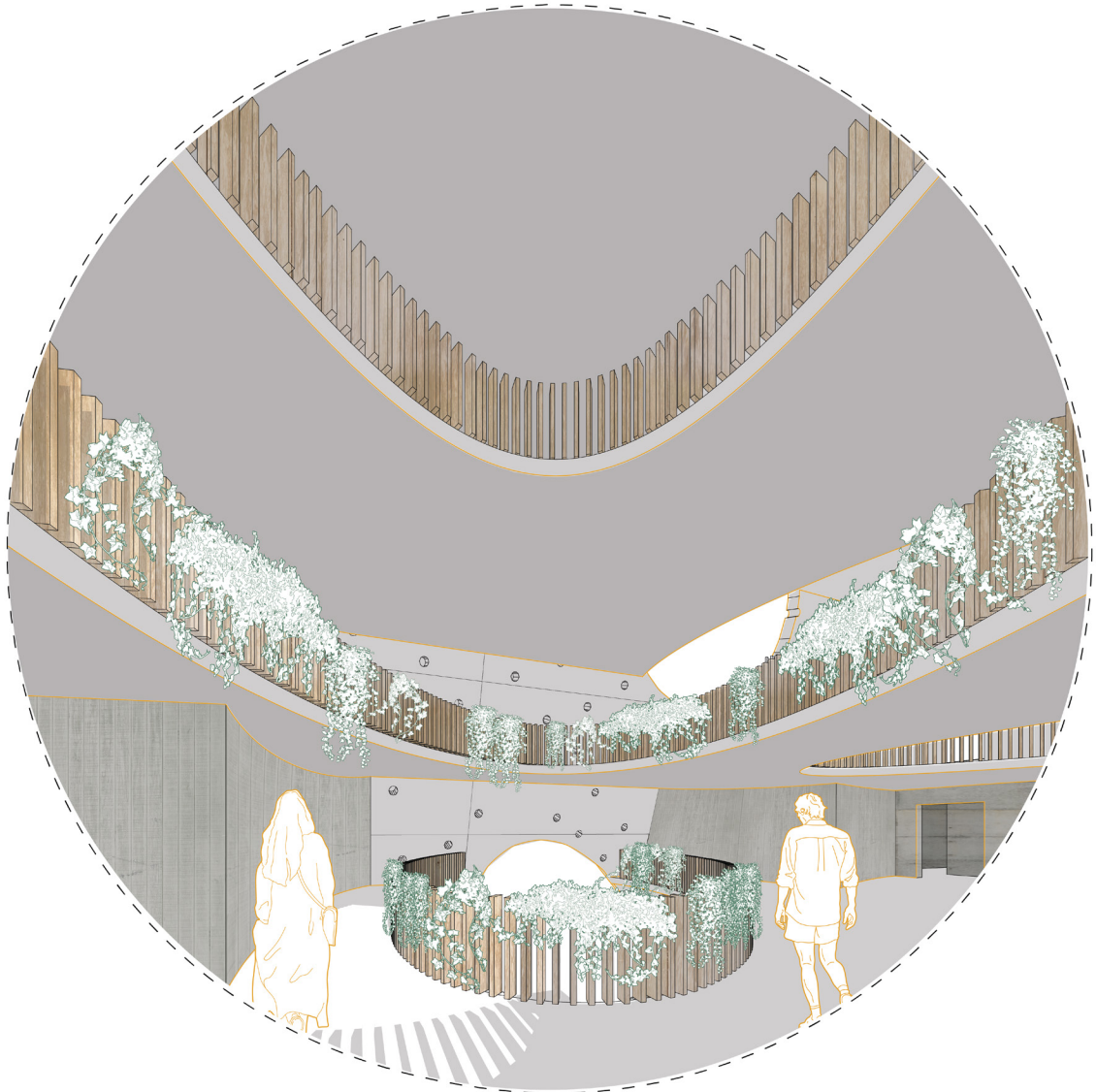
with the park's natural ecosystems. In addition, the city has seen an influx of emergency shelters for people who cannot afford Vancouver's rising rents. This site, close to Hastings Street, a major thoroughfare in Vancouver's troubled Downtown East Side, presents an opportunity to provide emergency housing while expanding the riverine lands' green spaces.

### Emergency Housing near Still Creek

The concept for this site is to create residential towers near the rail lines that are roughly the same scale as adjacent ones in the urbanized area. Towers reduce the building's



Process of finding the ideal angle for the voids.



Human view of the public enclosed gardens on the upper floors of the towers

footprint while increasing the amount of shelter provided for people in need. However, these towers appear to rise out of the ground organically, employing a curved form reminiscent of Alvar Aalto's use of curved geometry in his Finnish Pavilion in NYC (1939) and his work with Aino Aalto, creating wooden screens that evoke the undulating enclosure of a forest when it surrounds a woodland lake.

These stacked towers are inspired by 19th-century photographs from Burnaby, showing freshly-cut lumber

stacked in “chimney” formations — such forms attract nesting birds. Although the proposed towers are also based on the idea of “nesting” in the city, their shapes evoke chimneys that look like one could “nest” in them.

The second concept in these towers is the “void,” to make space for the natural world. It is the opposite of building - it is unbuilding. The aim is to bring air and sunlight into the emergency housing, through giant voids cut into the envelope and through floor slabs, which allow light to pierce the building all day long. According to McHarg, “form is integrated with all processes” (McHarg 1971, 173).



## Chapter 6: Conclusion

This thesis focused its study on Burnaby's green corridor on the Brunette River watershed and its importance to the blue environments of the city. The goal is to highlight the importance of the riparian corridor was to strengthen the green corridor by reducing and removing urban encroachment and industrial and residential spaces from the new boundaries of the riverine parks. Reducing urban encroachment in the riparian corridor and reasserting urban forests and wetlands in Burnaby improves the ecological health of the Brunette River system and protects the habitats of birds, fish and other wildlife in the riverine parks.

This thesis explored blending the architectural interventions with urban and landscape design to tackle the issues of the urban encroachment and anthropogenic eutrophication of Burnaby Lake. The interventions are divided into the renewal of Burnaby Lake Park and three architectural interventions for the residents and the wildlife of the city of Burnaby. The urban and landscape interventions in this thesis emphasized the strengthening of the green corridor to improve the ecological health of the riparian system of Brunette River Watershed. The architectural interventions exhibit ways to work with the landscape and establish an interface between the cultural and natural ecosystems of the city while also responding to the city's social, cultural, and environmental needs. Each of the sites follows the strategies of the third nature by John Dixon and the reclaiming of sites by Sebastien Marot. Three architectural sites close to town centres but still in the park. A central location between Burnaby's historic core and Deer Lake Park reinforces the park's cultural system by introducing a community garden

market. The easternmost site, situated along the Brunette River near Burnaby Lake neighbourhood and closer to Simon Fraser University, accommodates an ecological research centre and supports remediating and maintaining riverine health along this watershed. Lastly, between Still Creek and the Holdom neighbourhood, the westernmost site reaches out to Vancouver's disadvantaged downtown East Side population, providing emergency and short-term shelter in affordable housing for the displaced individuals of the city.

In short, each architectural intervention explored an idea of interface or threshold with the city, the forest and the ground. In addition, porosity, light and water were instruments to connect the inside and outside. The expansion of the riverine's natural system needs to establish to reverse the damage to the ecosystems. The theme of separating to form a whole system is symbolic to represent what nature and the city must be to stay connected and unaffected by each other.

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