The Creek That is Not

A Composite Park-way at the Garrison Creek

by

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I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including my required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

A century after the burial of Garrison Creek, Toronto continues to experience urban floods and unpleasant sewer problems as a result of the unsettling creek. And as gentrification spreads westwards in the city, the neighborhoods where the former creek flowed through, are subject to commercial development dissecting the Victorian neighborhoods into fragments of polarized places resulting in the lack of continued public spaces for play. This thesis is conceived based on Michael Hough's theory of holistic design and draws design inspirations from landscape architects such as Kongjian Yu and Michel Desvigne to mediate the tension between city and nature by using localized strategies. Additionally, the writings of Aldo van Eyck and Jane Jacobs further anchor the thesis's strong belief in the intimate relationship between public life, ecology and the urban environment.

Combining the concerns of ecology, stromwater infrastructure and urban public space, this thesis proposes a series of design interventions centering on the Fred Hamilton Park at the College and Shaw neighborhood. The proposal is aimed at converting the area's current open spaces including parks, street corners and school yards into multi-functional public spaces that bear both environmental and social responsibilities. A water playground, programmed earth terraces, and stromwater retention basins form the central hub of the neighborhood—while a school wetland garden, a street corner square and an all-can-accessible park extend opportunities for play and environmental education into all corners of the neighborhood. Three scales of exploration—entire watershed, local neighborhood and detailed construction assembly—are executed in the design to create a composite network of public spaces that re-establishes the function and life of the former creek.

Acknowledgement

I would like to thank Philip Beesley, my supervisor, for his continued encouragement and enthusiasm through my early indecisions in finding a thesis topic, and for his broad knowledge that has guided this thesis to its final shape. Thank you also to my committee members. To Adrian Blackwell, for continuously inspiring me with references in urbanism and landscape architecture, and raising questions when needed. And to Melana Janzen, for her dedication in community efforts made towards transforming the Garrison Creek neighborhoods, and connecting me with the local community and experts to further develop this thesis.

I extend my gratitude to patrons in the Toronto communities that are working towards revitalizing Toronto's public spaces, especially those that are involved in the Friends of Roxton Road Parks and Lost Rivers. They have given me the opportunity to make small differences in bettering the city's public life, and helped build my confidence in this thesis endeavour.

Thank you to my friends, Fernie, Sheida, Tiffany, Joy, Farzin and Saeran for your emotional and academic support in the past two years, and thanks to my F_RMlab co-founders for providing me a platform to explore the many other interests that are small divergent from my thesis. And last but not least, thank you Ricardo, for constantly questioning my architecture jargons and reminding me that I am special.

To my four parents, for opening my eyes and mind to different worlds, and guiding me through rough times, despite our distance.

Contents

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Note i All images are by author unless otherwise noted.

Definitions

composite -	Made up of different parts that have distinct properties and functions.
in between -	The space separating and bridging the inside and outside, here and there. A term adopted from Aldo van Eyck's Writings.
interwoven -	Knitted tightly and intertwined.
park-way -	A connected public space and stromwater remediation corridor that is designed for pedestrians in the city. Not to be confused with 'parkway'—a landscaped highway for automobiles
rainwater -	Water runoff collected from roofs
sewershed -	Drainage plane of a sewage system; usually divided based on urban topography. The urban equivalent of watershed.
stromwater -	Water runoff collected from streets and paved surfaces.

Large Maps

Note: Refer to large format drawings in printed copies

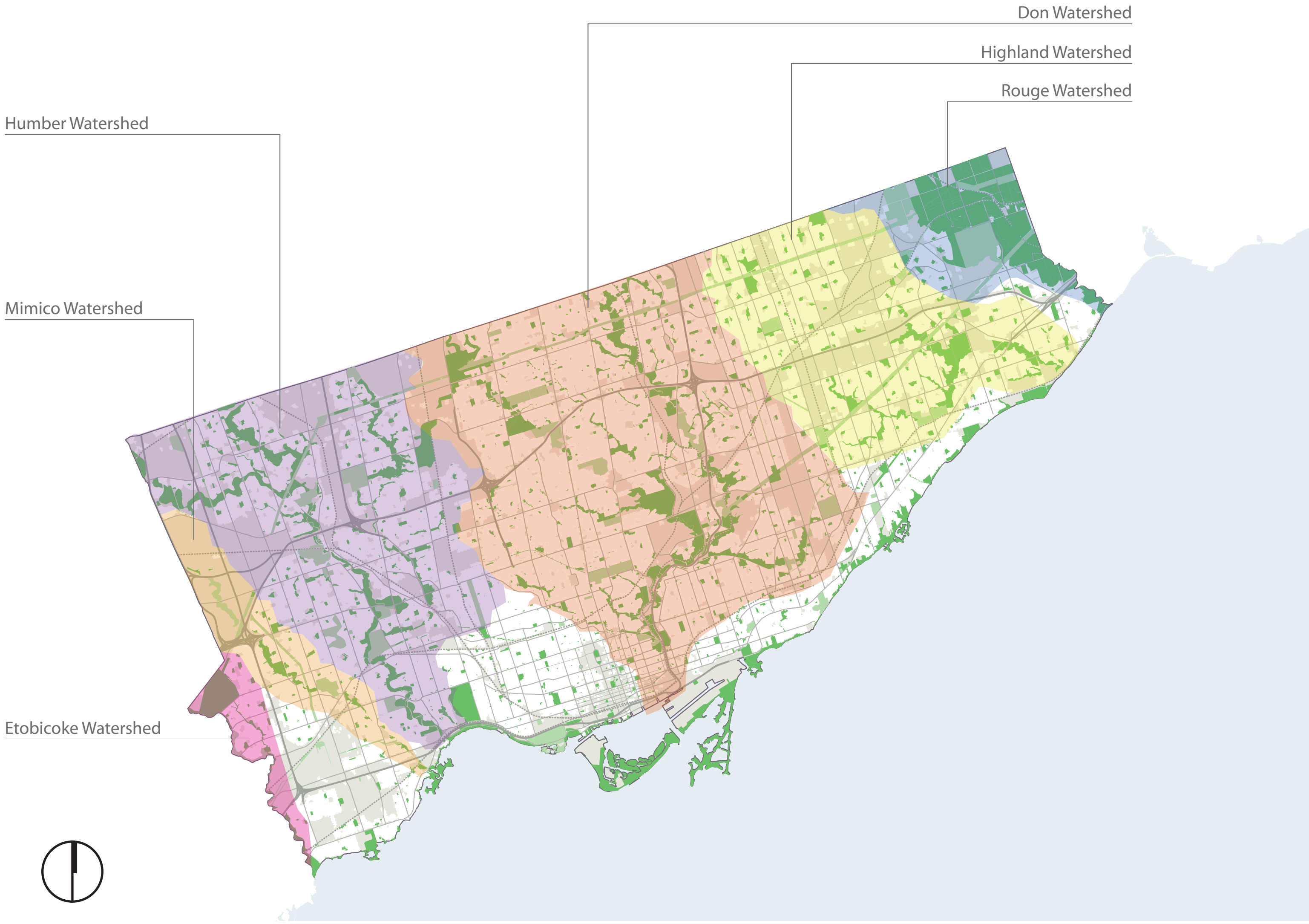

Figure 0.1 Map of Toronto's Watersheds.

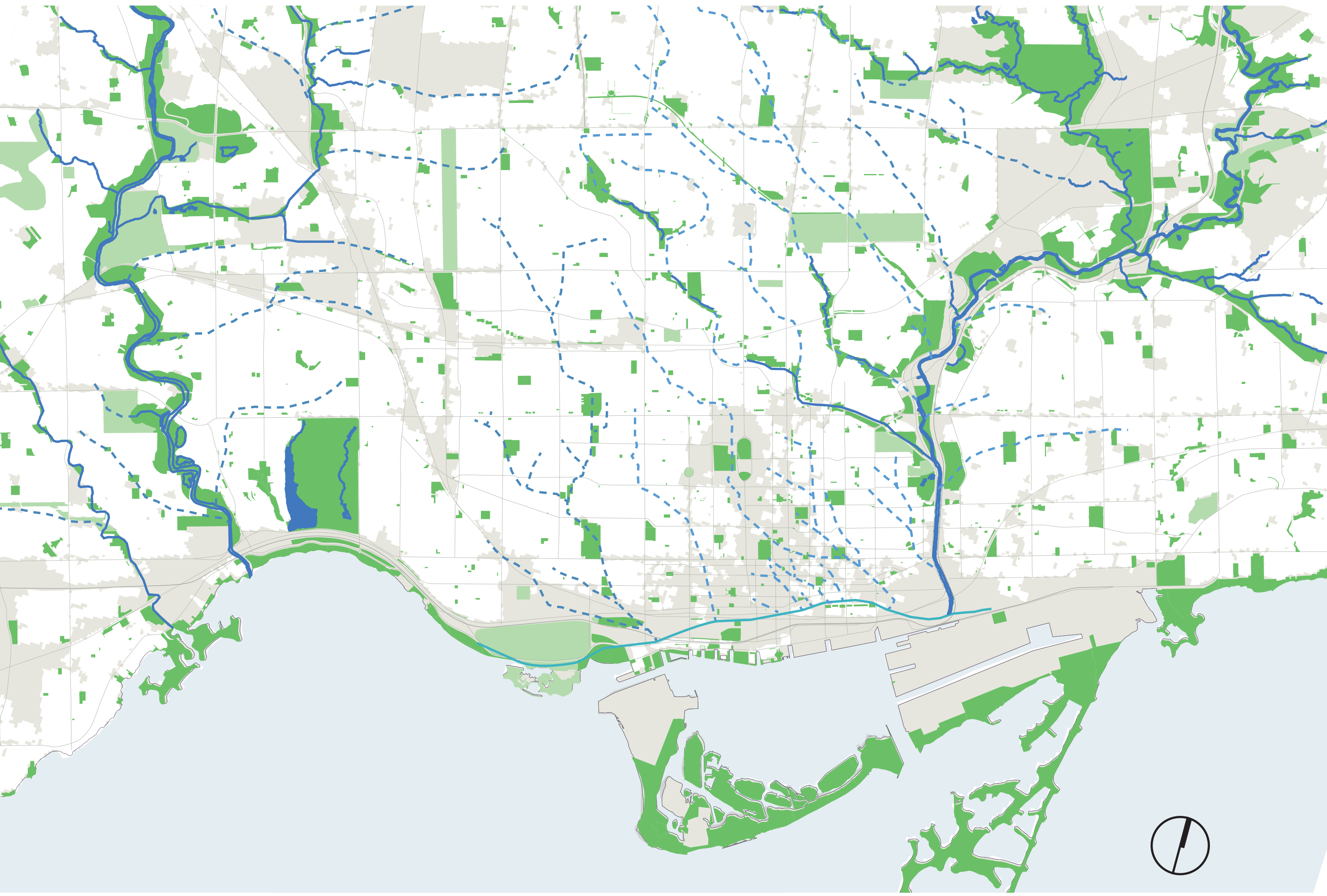

Figure 0.2 Map of Toronto's parks in proximity to the Humber, Don River and lost streams

Introduction

In the past 150 years, as engineering technology advanced and the city became more dense, Toronto gradually hardened its harbor front and buried many streams to make ways for better city living.[1] As part of this transformation, water, a mutable natural resource, slowly shifted its presence as a natural element that shaped our city's landscape to simply become an urban commodity that serves the citizen's day to day lives. Some of Toronto's smaller natural watersheds have now become sewersheds as cities encased streams in sewer pipes underground to keep our roads dry and city clean. Much of the city was built to conceal the processes that sustain our day to day lives. Michael Hough further confirmed:

> *"The curb and catch basin that make rainwater disappear without trace below ground, cut the visible links between the natural water cycle, the storm sewers and dispose of it into streams, and the lakes and rivers that ultimately receive it."*[2]

Between April and October 2011 there were 42 recorded cases of Combined Sewer Overflow (CSO) events in the Don River and central waterfront watershed, showing that Toronto's stromwater management system is inadequate to handle peak season torrential rainfall. [3] With that said, the citizens tend to be oblivious to such statistics until urban flooding becomes an inconvenience in their day to day lives. By burying the streams underground and turning a blind eye to the city's infrastructure, citizens have disconnected themselves from the support systems of the living environment, and hence, there is very little understanding of the urban hydrological cycle let alone any awareness of protecting the wellness of urban water and the landscape in which it lives in.

On the other hand, as condominiums fill up Toronto's waterfront and slowly find their places in the city's Victorian neighborhoods, streets are becoming gentrified and public spaces are claimed to become new

1 Hardwicke and Reeves "Shapeshifters: Toronto's changing Watersheds, streams and shorelines", 52-62.

2 Hough, *Cities and Natural Processes*, 23.

3 Eco-Justice 2013 Report, 56.

commercialized tourist attractions. Constant Nieuwenbuy's impression of mundane urban growth in the mid century still resonates within the city to this day: he depicted that the modern city lacked all kinds of play due to the neighborhoods' focus on automobile traffic and bourgeois ideals of comfort.[4] Play here not only refers to children's play but also pleasure and leisure activities among teens, adults and elders that can be experienced by the individual and or a larger collective. To incorporate play into the citizen's everyday lives, it requires the renewal of Toronto's current urban parks and public spaces to be inviting yet forgiving and non-judgmental. Ray Oldenburg calls this kind of spaces the Third Place:

> *"Third places exist on neutral ground and serve to level their guests to a condition of social equality. The character of a third place is determined most of all by its regular clientele and is marked by a playful mood, which contrasts with people's more serious involvement in other spheres."*[5]

While Third Places, such as pubs, cafes and street corners, are inclusive to all and are inherently places that provide people laughter and brilliant conversations, they are places that primarily serve a single purpose. This thesis, however, is made in an effort to create public spaces that are multi-functional, specifically to find a hybrid ground where function and pleasure can co-exist. Michael Hough's words in *Cities and Processes*, which described an alternative solution to reunite nature and city, summarize the central belief running throughout this thesis. He said:

> *"It involves the creation of new landscape – a mix of the natural and the human that may not have existed before, but which recognizes the interdependence of people and nature in the ecological economic and social realities of the city."*[6]

Hough believes that the best way to reintegrate nature into the city is by encouraging citizen involvement.[7] Therefore, places where nature and city meet become ideal places to implement social programs and opportunities for play. In other words, children's play and intergenerational public interactions are active agents that weave the city fabric and nature together, and are crucial in promoting citizen stewardship for maintaining resilient urban watersheds and

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4 Constant Nieuwenhuys "Another City for Another Life", 71.

5 Oldenburg, *the Great Good Place,* 42.

6 Hough, *Cities and Natural Process*, 23.

7 Ibid, 22.

ecologies. With this concept, this thesis takes on the analysis of Toronto's water and its roles in making public spaces with regards to both infrastructure and play. The interest, resting between the formal relationship between 'soft' infrastructure and places of pleasure, has continuously driven this thesis research forward. And the question of making a composite park-way, combining infrastructure, ecology and public spaces at the former Garrison Creek, has motivated the merging of theory and design studies to arrive at an architectural proposal that invoke a shift in the city's cultural relationship with nature.

Figure 0.3 Fragment of 1873 Toronto map, showing the spatial tension between city grid and riparian form at the Garrison Creek. Toronto Public Library.

Design Issues

This thesis uses the Garrison Creek sewershed as a pilot for developing a composite park-way that not only facilitates urban exploration, community activities, etc that generate individual and collective pleasure, but also encourages Torontonian's involvement in environmental education and to become part of the urban water cycle through intimate interaction with water. The College and Shaw neighborhood is selected to further design specific architectural ambience and stromwater remediation strategies at a local scale. Four main parts are discussed leading up to the design proposal: Part I is an overview of the urban context where the Garrison Creek's topography is examined along with Toronto's history with water; Part II and III speaks of water infrastructure and play respectively to set the tone for designing environmentally responsible and playful urban environments; and finally, Part IV presents the design proposal in three scales, watershed, neighborhood and detailed assembly, to

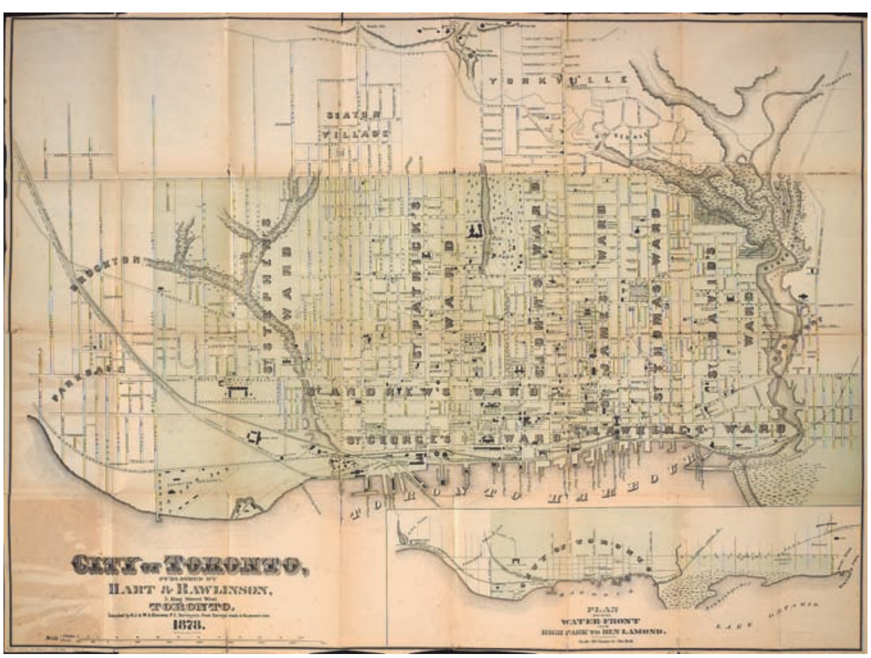


Figure 0.4 City of Toronto map, 1878. Map shows the Garrison Creek marks the city's west Boundary while the Don River flanks Toronto's east end. Toronto Public Library.

visualize and ensure viability of the thesis claims. Each of the first three chapters deals with a general concern, which the design proposal in Part IV attempted to address architecturally.

Part I, *Urban Context*, reveals Toronto's long lasting relationship with water, and the city's eventual burial of many creeks. The burial of Garrison Creek was a result of sanitary concerns in the late 19th century, but has consequently produced a polarizing landscape that divided the urban and the natural as well as the city's surface and its underground. Toronto's ambivalent relationship with water evolved from embracing the creek bank as a leisure space, to accepting it as the natural layer that the city needs to co-exist with, and finally to encasing it to become simply part of the city's infrastructure. Although covered for more than a century, the underground creek still presents many traces along its previous course providing opportunities for psychogeographers, architects and urban planners to explore and imagine its past, present and future. The former creek site has the potential to relink the city's urban habitat with that of nature due to its current varying topography and direct adjacency to parks and school yards. Previous efforts such as the Toronto Guild of Art's proposal in 1908 and James Brown and Kim Storey's Garrison Creek Demonstration Project both aimed at creating a continuous park corridor along the creek to improve the neighborhood's public spaces and civic life. These unrealized projects are the base references for the design proposal.

Part II, *Water and Infrastructure* regards to current problems of Toronto's urban water cycle that results in contaminated water sources and inappropriate drainage in the city's streets and public spaces. The outdated sewer pipes, especially the combined sewer overflow (CSO) causes regular bypassing of untreated sewage into Lake Ontario. The goal is, therefore, to find an alternative to the current centralized drainage method to handle excess water locally and reuse this resource to assist with landscaping irrigation and enhance public space quality and programs. Examples such as Kongjian Yu's Houtan Park and Rotterdam's Watersquares are recent projects that integrated 'soft' infrastructure into the making of public spaces. The design methods, which are inspired from the above mentioned precedents, align with Alex Wall's proclaim that the contemporary metropolis deals with a 'field' that is extensive and inclusive:

> *"A renewed concern with infrastructure, services, mobility and with the provision of flexible, multi-functional surfaces promises a revitalized role for the design profession. The grafting of new instruments and equipment onto strategically staged surfaces allows for transformation of the ground-plane into a living,*

> *connective tissue between increasingly disparate fragments and unforeseen programs"*[8]

Wall described an urban surface that is both functionally efficient and adaptable to the changing flux of urban conditions, while also providing an active link to other city programs. This leads up to Part III.

Part III, *Play and the City*, concerns the current polarizing condition between the city and its parks and public spaces. The city's current parks serve one single purpose: to provide citizens an alternate reality of the hard surfaced image of the city. They are often concealed by trees or fences, separating nature from the rest of the city. The parks themselves are also divided into zones for different age-groups–the prearranged children's playgrounds, benches for adults and open field for sports enthusiasts. A series of non-prescribed park features can encourage intermixing of demographics within the city's public spaces; and by blurring the boundaries between streets, parks and squares, the design of an interwoven neighborhood allows nature and playfulness to spread into the city's streets and people's front yards. Inspired by Aldo van Eycks playgrounds, the design proposal makes an effort to create the 'in-between' according to van Eyck's description of his playgrounds:

> *"With the aid of a little concrete, wood and aluminum there have come into existence social centers: places where children and parents meet, true extensions of the doorstep—for it is on the doorstep that the outside and inside worlds, the spheres of collective life and individual life, intersect."*[9]

But the 'in-between' would not exist only at the playground, one should find it at the street corner, sidewalks and laneways, as the parks, squares and playgrounds extend into these spaces. These road infrastructures are now no longer simply throughways to travel from point A to point B, but rather they become places that allow one to slow down, pause and observe without having to participate, or entryway into the social centers where involvement is encouraged.

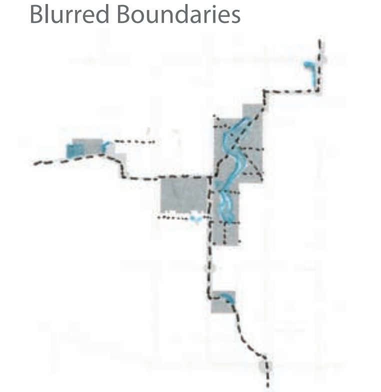
8 Wall, "Programing the Urban Surface", 235.

9 van Eyck, "The Child and The City", 37.

Hub and Satellites

Linking Parks and Streets

Blurred Boundaries



Water as the Hearth

Design Strategy

The design proposal, presented in Part IV, *Visible Waters*, is carried out to address the issues presented above. Its interests align with ideas of architects and landscape architects such as Cornelis Van Esterren, Kongjian Yu and Michel Desvign. And, in contrast, it diverges from Fredrick Olmstead's philosophy of creating "the greatest possible contrast with the restraining and confining conditions of the town" to urban parks.[10] Subsequently, the design aspires to weave and embed natural and constructed landscapes into Toronto's dense urban fabric, and revitalize public spaces in the Garrison Creek sewershed by addressing four principles: runoff harvesting, runoff treatment, connection to streets and play and education. The first two are demonstrated in the various hub and satellite sites' water diagrams (page82-90, even pages), and the later two are primarily illustrated in the sectional perspectives (page 82-90, odd pages)as well as detailed assembly sections (page94-103). The design interest lies in the cross pollination among all four principles in order to create an interconnected and hybrid ground where nature and urban inhabitation coexist. As such, three scales of design exploration are conducted: the watershed scale demonstrates a conceptual sketch of how the Garrison Creek sewershed can be made to become a green park-way; and the neighborhood scale design introduces spatial relations between the various architectural elements and acts as an example to help complete the watershed network; finally the detailed assembly scale zooms into specific opportunities to connect the designed sites with existing streets and sidewalks both architecturally and in terms of 'soft' infrastructure. There are four spatial strategies upon which the design is based, shown in Figure 0.5.

Hub and Satellites – Establishing a hierarchy of spaces, this helps with programming of the various open spaces in the neighbourhood. The hub site includes a variety of programs for all ages whereas the satellite sites can have more specialized programs targeting at specific demographics.

Linking parks and streets – A pedestrian focused path (made of a tiled stone material to provide visual differentiation and permeability) is introduced to not only link the parks and squares together, but also connects them to the existing street infrastructure providing safe and continuous crossings between the various public spaces.

Blurred boundaries – Blurring the boundaries between parks, streets and private properties can be done by extending park material, such as

10 Olmsted, "public Parks and the Enlargement of Towns", 183-191.

indigenous plants and permeable pavers into its adjoining places (such as sidewalks and parking lots) and placing park features, such as pools and sitting areas, immediately adjacent to the parks' perimeters.

Figure 0.5 [opposite] Spatial strategies for design proposal.

Water as the Hearth – Water detention basins and retention tanks are designed to act as the focal point to each site, and they help to organize park and public space programs according to their locations and geometries. In this case, water is both a spectacle and a necessity that naturally draws citizens' attention to stay and linger.

The design also takes advantage of existing conditions in the neighborhood to place play programs and implement bio-remediation processes. This is illustrated in Figure 0.6, where the catch basins and natural slopes are essential existing site ingredients that guided decisions in the spatial organization of the final design. The geometries of the play spaces are determined to not only provide programmed areas for extensive human occupation and wildlife inhabitation, but also facilitates delay of stromwater runoff and drainage into the sewer system. These spaces take on forms of stepped terraces, ramps and gentle hill slopes, and therefore, they become areas of hybridity that reduces stromwater drainage rate into the sewer pipes as well as human travelling speed, which in turn often results in people's engagement with the environment and or with each other—play.

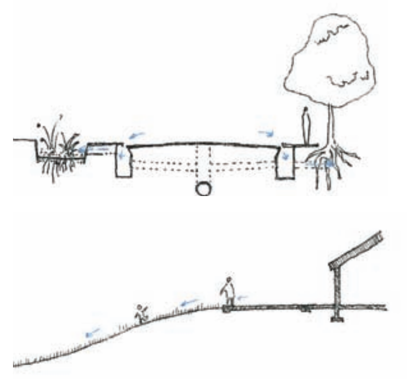
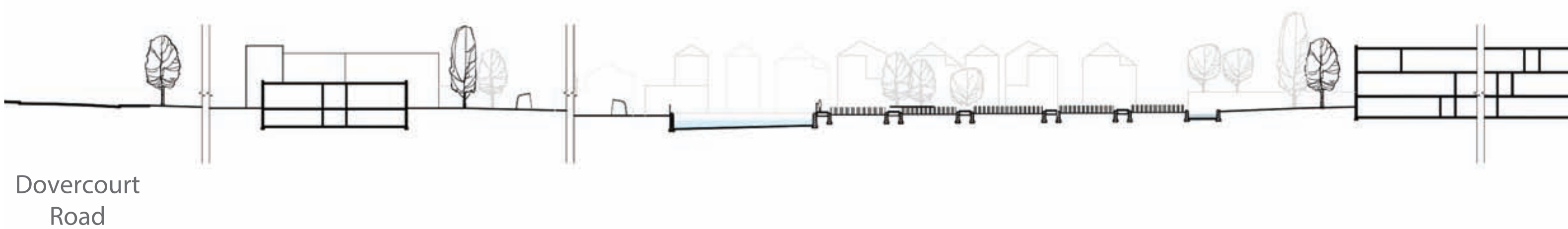


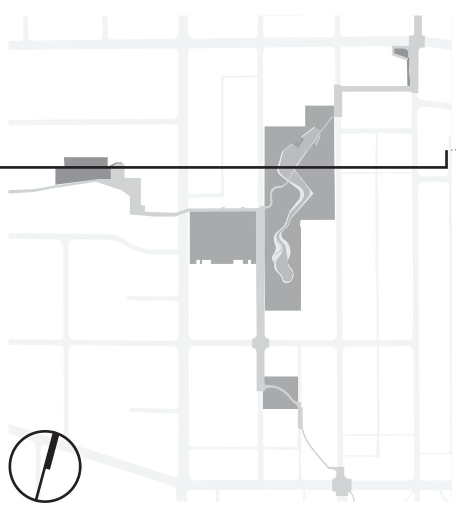
Figure 0.6 [left] Diagrams of existing site conditions. Top: Catch Basins beside streets. Bottom: Natrual slope created by the former creek ravine.

By delaying water's movement and bringing it onto the ground surface, the design makes water legible to the public. Although, one may not realize how the entire watershed system works through his or her experience in one park, certain design features such as cascading fountains, manual pumps and water discharging outlets present water's movement and its subsequent effects of travel through the designed system. As such, playful environments can be invoked by giving the public a set of clues in order to help them picture processes of water's drainage and treatment. Figure 0.7 conceptually illustrates the designed sequence of water's movement in the College and Shaw neighborhood from streets and roofs, through the various local treatment and detention processes, to eventually draining into the centralized sewer pipes for further treatment in the next neighborhood until ending its journey at Lake Ontario. This hypothesis is partially set up given that every neighborhood within the Garrison Creek watershed is to be designed to detain and treat a specific amount of stromwater runoff to ensure good water quality entering the lake. However, this thesis has a limited scope that focuses on the College and Shaw neighborhood and the watershed scale is included as a framework in which the neighborhood and detailed assembly design can be plugged in.

Figure 0.7 [below] Conceptual Water Harvesting Diagram


Converted from combined to
stormwater only sewer
Converted from combined to
sanitary only sewer


Dovercourt
Road



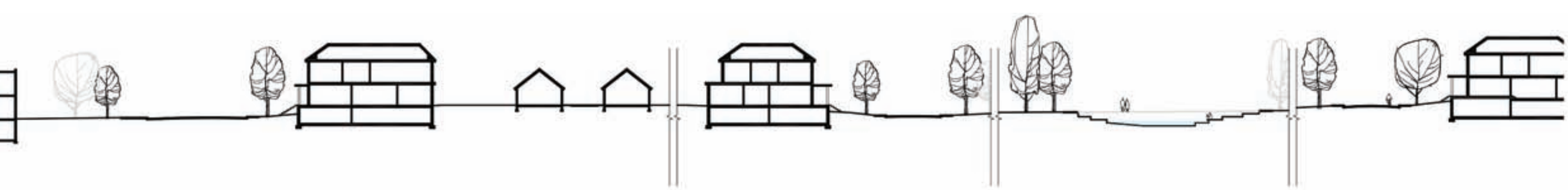


Figure 0.8 1:1000 Long site section sketch

Part I

"Toronto is an instructive case study in how localities relate to water. Drained by a half dozen major watersheds, cut by a network of deep ravines, fronting on a Great Lake and home to huge drinking-water, wastewater and flood-control infrastructures, Toronto is a city dominated by water. The trend of fettering Toronto's water and putting it underground, and of degrading what which still flows on the surface, has recently been countered by persistent citizen-led efforts to recall, rethink and restore our communal aqua.

--Wayne Reeves and Christina Palassio, Introduction: "Bridging the past, present and future of Toronto's Water", 14.

Urban Context

From the ancient lake Iroquois to the present Lake Ontario, Toronto has been a city largely shaped by its proximity to this large body of water to its south. Known as Ravine City, Toronto was originally divided by many streams that drained to the lake. Though many of these streams were built over and later buried, they still very much shape the city's topography and urban armatures.

In this chapter, the design site and its broader city context are examined along with the history of its rivers and streams.

Toronto, Shaped by Water

Founding of the city

When Mrs. Simcoe first arrived to the Toronto harbor with Governor Simcoe's appointment to establish Fort York in 1792, she remarked the serene scene at the mouth of Garrison Creek.[1] The geographical advantage of the Toronto harbor determined the establishment of Fort York, which became the founding place of Toronto. Because the triangular site is surrounded by Lake Ontario on the south and the Garrison Creek along the northeast side, it utilized water as a natural defense fortification.[2] Furthermore, as a military base, Fort York depended on Garrison creek as a secure source of hydraulic energy.[3] Many excursions of Mr. Simcoe and his surveyors included trips to the Don River and Humber River to determine the natural topography and resources existing for the city. These natural vines of the city, though have been exploited for many centuries after the founding of York, are still a vital part of the city's natural and infrastructure network that support the livelihood of Toronto.

Industry

Water, as a natural resource, has established many industries in Toronto. Early English settlers saw the opportunity of water powered mills, and hence the first mill appeared on the Humber River in 1793 and the milling industry bloomed throughout the 19th century.[4] Toronto's brick industry was also built on the city's abundance of the glacier lake deposits –shale.[5] This provided architects and builders a consistent supply of local material to build new residential neighborhoods and commercial streets. Brewing companies also moved into the creek lands to produce beer for locals to enjoy as well as boosting the exporting industry. These industries supported the fast

1 Simcoe, *Mrs. Simcoe's Diary*, 101.

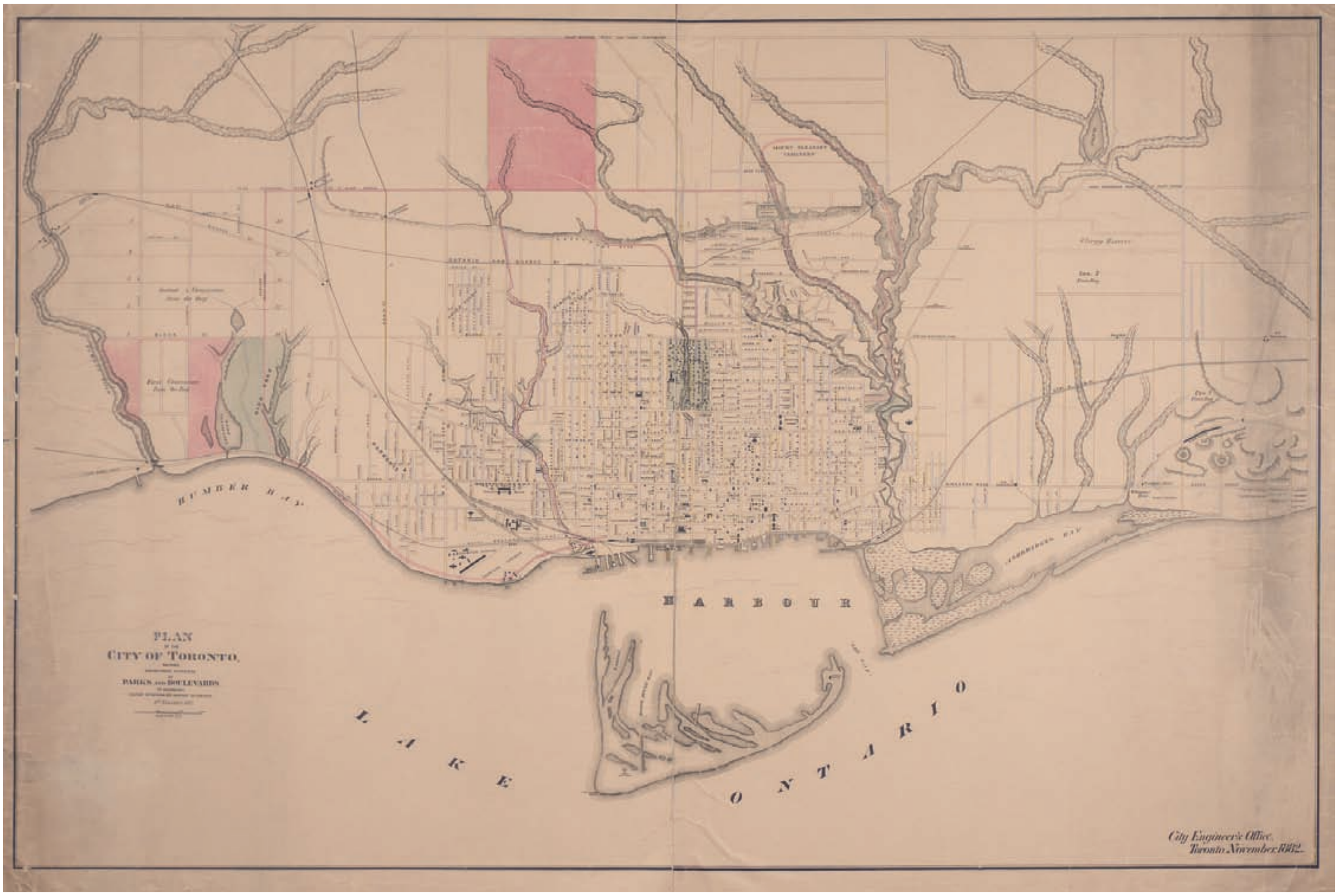
2 Benn, *Historic Fort York*, 22.

3 Brown and Storey, "Rainwater Ponds in the Urban Landscape", 5.

4 Miedema, "When the river really ran: Water-powered industry in Toronto", 68.

5 Freeman, "Formed and shaped by water: Toronto's early landscape", 29.

Figure 1.1 City of Toronto Map showing proposed parks and boulevards November 1882. Toronto Public Library

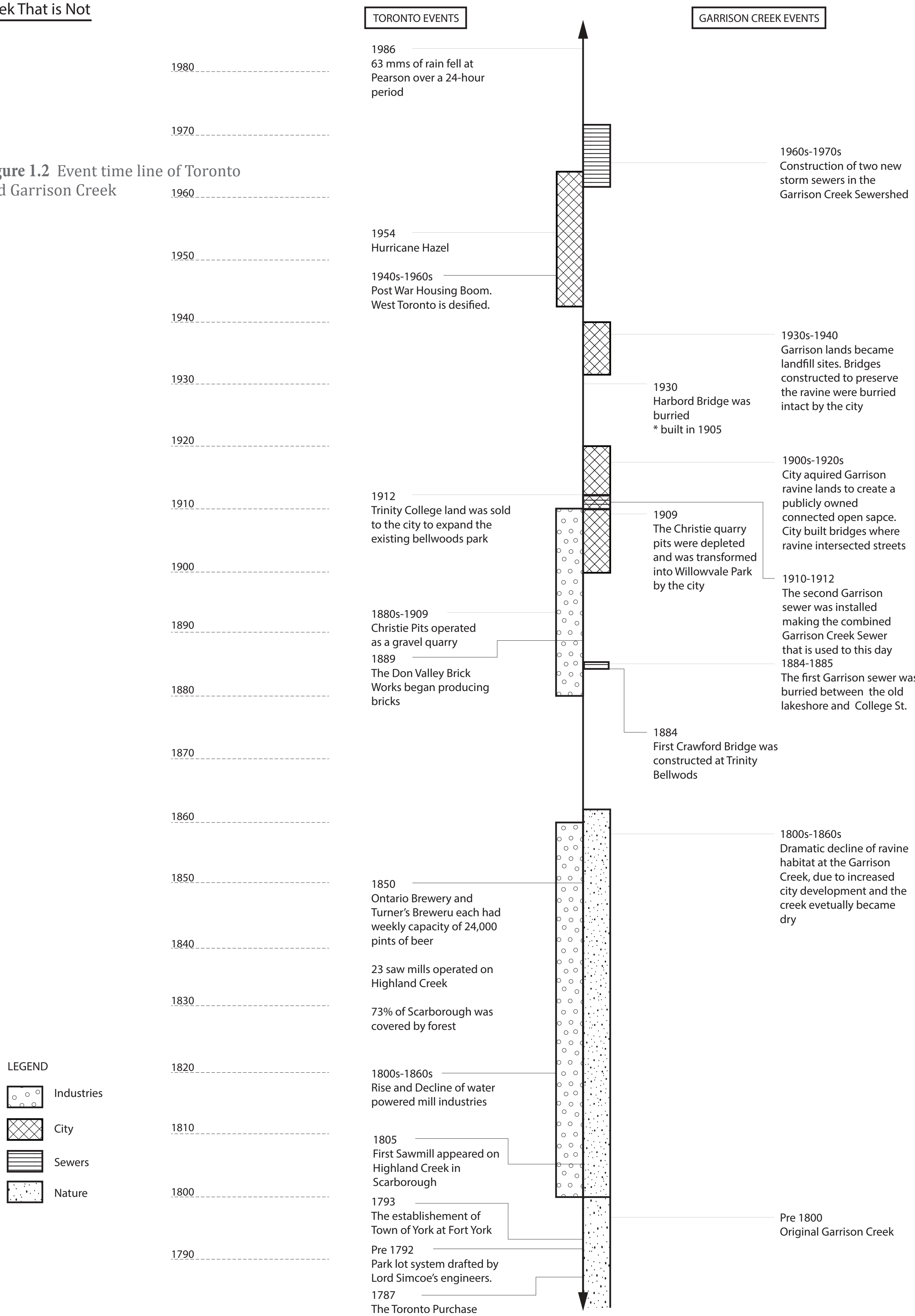


development and urban expansion of Toronto until the mid early 19th century when the water level dropped dramatically resulting in dried-out creeks and rivers with inefficient hydraulic energy to support the above mentioned industries.

Leisure

Torontonians have always adored the city's close proximity to bodies of water. A variety of sports could be found in the city's rivers and waterfront. Though, these bodies of water are no longer suitable for swimming, the Humber and Don River used to be enjoyed extensively by the citizens for swimming, fishing and even car washing. Kayaking or canoeing down the Don River also used to be a common leisure

Figure 1.2 Event time line of Toronto and Garrison Creek



activity while the water level was still high enough. Walking through the various ravines in the Rosedale valley or around the Humber River is an activity many citizens still enjoys to this day. Toronto's network of streams provides a complex trail of leisure activities to the citizens. Jacob, the protagonist in Ann Michael's novel, *Fugitive Pieces*, describes his exploration in Toronto's ravine landscape as "escapes into the ideal landscape."[6] In the west end of the city, a series of parks, established along the former course of Garrison Creek since the beginning of the 20th century, has been enjoyed by many citizens as leisure and recreational spaces. The city also developed a Discovery Walk guide with accompanied signage in the neighborhood to lead interested citizens on a self-guided tour of the old creek. Grassroot efforts such as Lost River Walks and Human River also provide opportunities to trace the Garrison Creek and discover it as part of the layers making up the city. Though these efforts encourage the discovery of the invisible layers of the city, the citizens' desire to reconnect with nature is unfulfilled.

6 Michaels, *Fugitive Pieces*, 102.

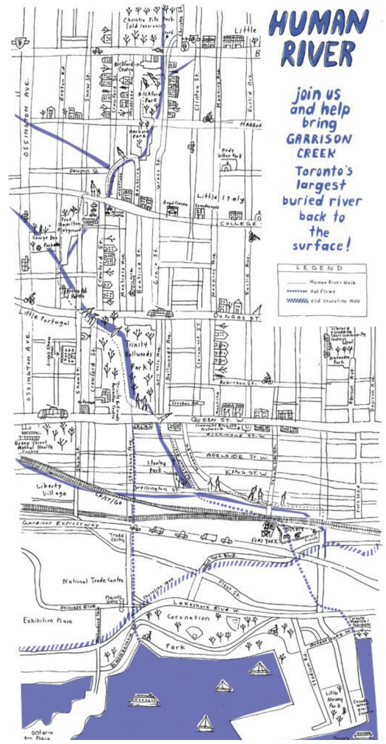


Figure 1.3 [above] Human River walk map. Illustrated by Marlena Zuber.

Figure 1.4 [below]Bathers and cars in Humber River, 1922. City of Toronto Archives.

Figure 1.5 A simulated color image of Greater Toronto Area. In contrast with Figure1.6, the rivers on the satellite image are hardly visible, especially in the downtown area. NASA, 2004.

Figure 1.6 Simplified map of Toronto and its rivers.

Retracing Water and Urban Forms

Looking at the satellite image of Toronto (Figure 1.5) , it is difficult to tell where the city's major rivers (Don, Humber and Mimicoe) drain to Lake Ontario because the city's shoreline has been added to and reinforced with concrete walls, and that most of these rivers are channelled to not follow their natural course. What can be seen is that Humber River and Don River flanks the modern day Toronto. Throughout the 18th century to early 19th century, Toronto developed and densified from its center (Yonge and Bay) outwards towards the Don River on the east end and the Garrison Creek on the west end. When the rivers could not contain the city's expansion, bridges (such as Bloor Viaduct, 1917, and Crawford Bridge 1884) were built to allow continued road infrastructure. A few years later, while the Don River was channelized to make way for industrial developments on the south end of the bank, the Garrison Creek was buried due to the need for land for real estate development. What is left at the Garrison Creek land afterwards is a homogenous flat landscape with tiny moments that recalls the existence of the past creek. Anne Michaels wrote in her novel Fugitive Pieces describing post-war Toronto:

> *"It's a city of ravines, remnants of wilderness have been left behind. Through these great sunken gardens you can traverse the city beneath the streets, look up to the floating neighbourhoods, houses built in the treetops."*[7]

While most of Toronto's streets are straight lines in a grid format, some streets were made to curve and turn following the remnant creek valleys. An example is the section of Crawford Street just north of College Street. The street deviated from its north-south axis and turned into a gentle curve following the original course of the Garrison Creek.[8] At the laneway's end between Shaw and Crawford Street, there is a visible drop of elevation in the houses' backyards (Figure 1.13). The portion of the laneway here was built up to provide vehicular access while the backyards are left in their original topography allowing the basements to open up to the ravine. Other moments that

7 Michaels, *Fugitive Pieces*, 89.

8 Lost Rivers. "Trinity Reach" Accessed June 16, 2014. http://lostrivers.ca/content/trinityreach

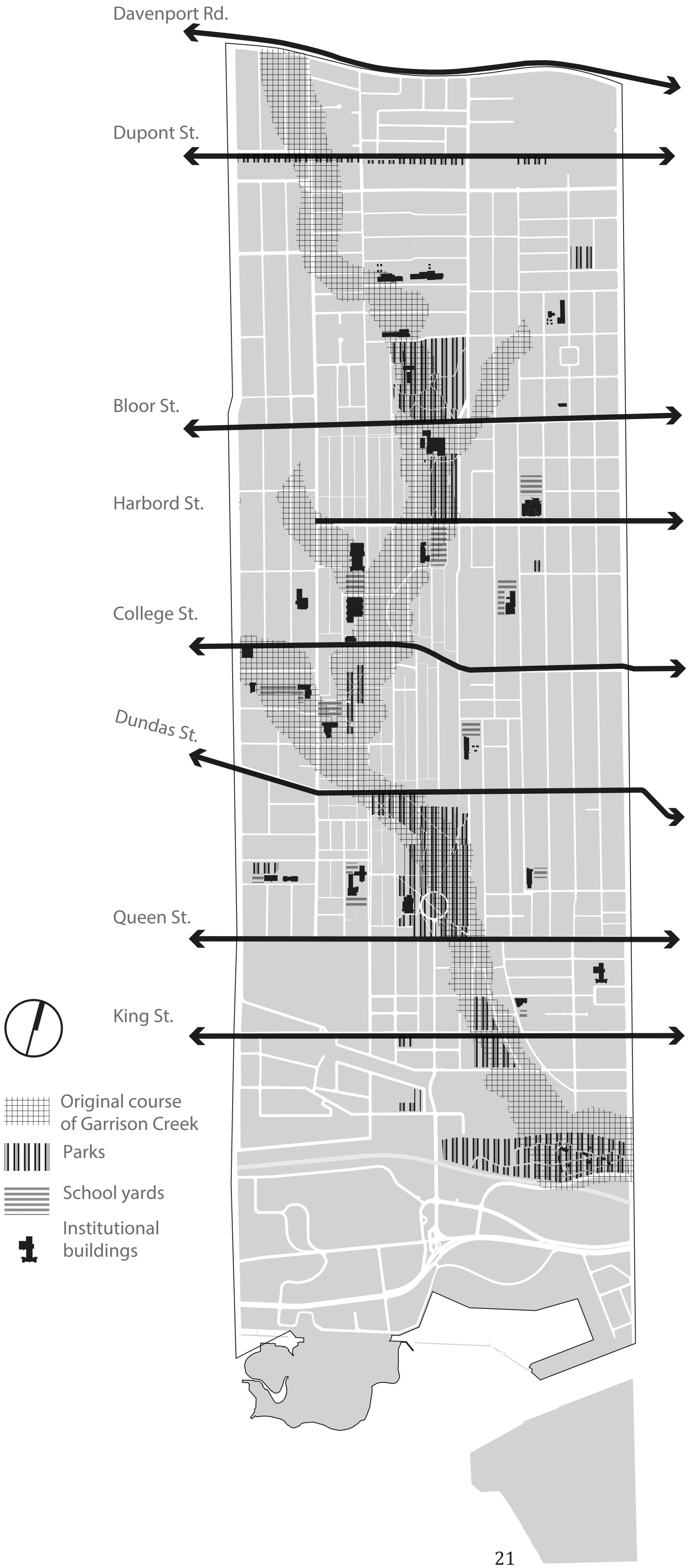


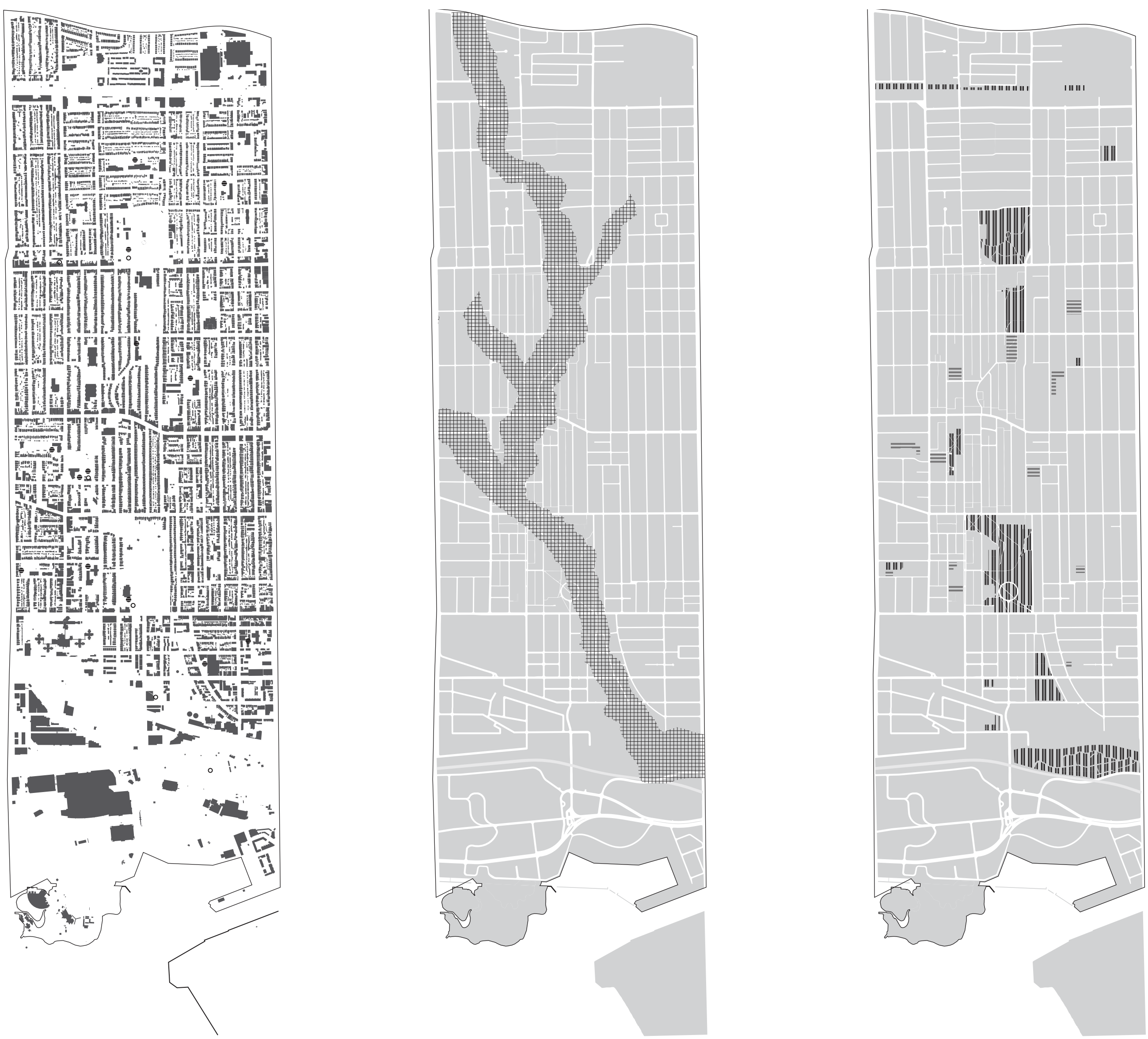
Figure 1.7 Harbord Bridge, looking south east. 1910.

Figure 1.8 Bickford Park, looking south, with Harbord bridge in the distance.

Figure 1.9 Google street view of Bickford Park, Looking from Grace Street, 2014.

Figure 1.10 [Left] Diagram showing parks, institutions and school yards along the original course of Garrison Creek intersected by the east-west major streets of Toronto.

Figure 1.11 Existing layers of urban construct at the Garrison Creek Lands

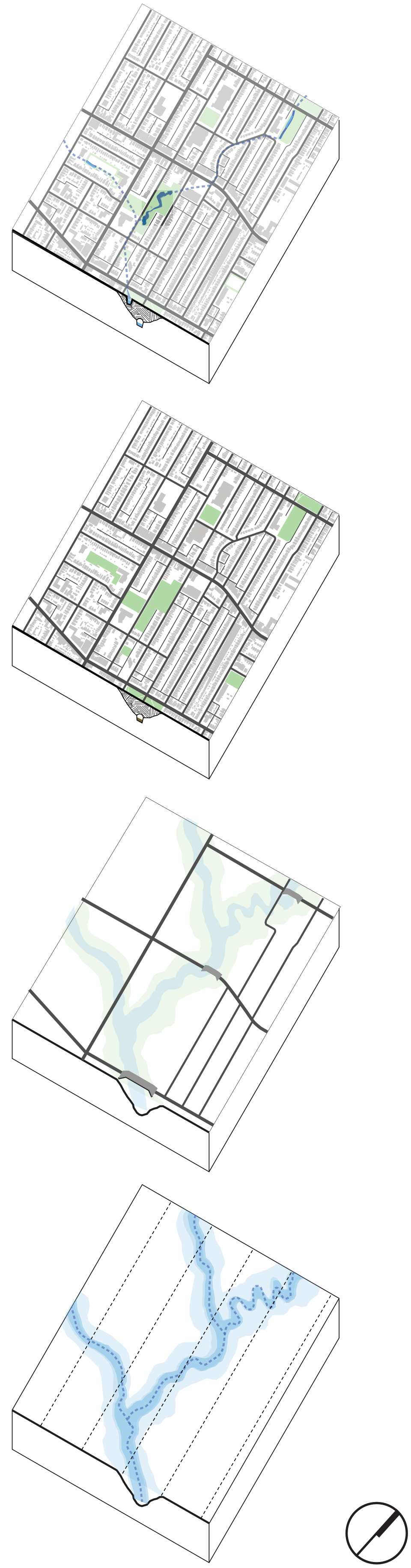


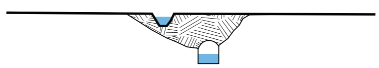
Built Forms | Original Terrain | Open Spaces

Commercial Strips

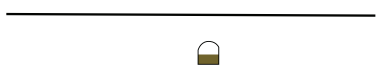
Institutional
Buildings

Playgrounds and
Community Gardens

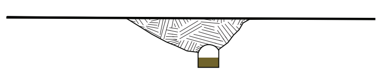




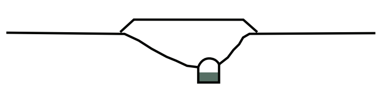
2014
Proposal to reconnect the fragmented public spaces by building a composite park-way.



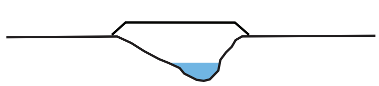
1940s-1960s
Post War Housing Boom. West Toronto is densified.



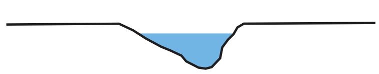
1930s - 1940s
Garrison lands became landfill sites. Bridges constructed to preserve the ravine were buried intact by the city



1910-1912
The Garrison sewer was installed making the combined Garrison Creek Sewer that remains in constant use today



1900s - 1920s
City of Toronto acquired Garrison ravine lands proposing to create a continuous public park space. Bridges were constructed wherever roads intersected with the creek.



Pre 1880s
Lord Simcoe's park lot division super imposed on Garrison Creek

mark the Garrsion Creek more visibly to the public are the sunken parks, namely Christie Pits, Brickford Park and Trinity Bellwoods Park's dog bowl, that are scattered along the creek's former course. Given their lower elevations, these parks are prone to flooding, making the park lands inaccessible at times. And with the creek buried under as a combined sewer, these public spaces often become undesirable because of raw sewage smells and soggy grounds after storms. These problems regarding stromwater and sewage are further expanded in Part II.

The disappearance of Garrison Creek was a result of Toronto's urban expansion towards the west at the turn of the 20th century. When Toronto was first developing as an industrial town, the city's harbor front was a natural place for supporting the booming import and export economy. Following the industrial development, the city grew towards the east and west end in the same period. Consequently, major roads, such as Queen Street, King Street and Dundas Street were extended in the east-west direction to support the growing city. These trunks of vehicular circulation, as a result, intersected the many north-south flowing creeks of the city. Take the modern day Garrison Creek as an example, from Davenport Road Escarpment down to where it entered Lake Ontario, the creek is intersected by nine major streets as seen in Figure 1.10. Though the city initially built bridges when the creek was still alive, the bridges and the creek was eventually buried giving ways to more housing developments and continued road network. Figure 1.12 presents the transformation of Garrison Creek at the College and Shaw neighborhood. From the open creek to it being buried underground, the transformation happened in over 200 years and marked the varied relationship modern city has had with water. The proposal at the very top of the figure provides a snapshot of the thesis design proposal, which details are presented in Part IV.

Figure 1.12 [Opposite] Historic Phasing Diagrams showing the changes of the water course in relation to urban development

August, 21, 2013

As I walked on the laneway to the back of these houses facing Shaw Street, there seemed to be a significant elevation drop from the laneway to some of the backyards,. Most of them don't have garages, so the cars sit right next to the lane and a fence beyond the driveway hides the sunken backyard. The garrison Creek used to be present here and its remaining topography created the backyard ravine.

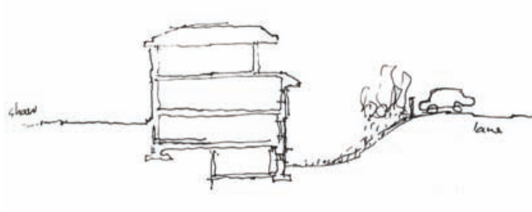


Figure 1.13 Site visit sketch of backyard ravine condition at Shaw Street

Case Studies - Unbuilt Park Networks

Guild of Civic Art City Beautification Plan

At the early turn of the 20th century, the city of Toronto made several efforts to improve the public spaces of Toronto. When Christie Quarry Pit (present day Christie Pits) and the Bickford brickyard (now Bickford Park) stopped functioning as mineral excavation sites in the late 1800s, the land was put on the market for sale as potential landfill sites for further housing development. However, instead, the city purchased the two sites through land tax sale in 1906 and 1907 respectively.[9]

The city had little to no interest in comprehensive park planning for Toronto, with the funding of the Guild of Civic Art in 1897, artists and architects from the guild began to promote ideas for improving and beautifying the city. Influenced by the monumental beaux arts and garden city movement, the guild largely influenced the urban transformations of Toronto in the early 20th century. By 1908, the guild released a plan (Figure 1.14) aimed at expanding city parks and introducing vehicular throughways to the city. After years of lobbying, the guild finally received considerations from the city council. The council appointed the Civic Improvement Committee to review the guild's recommendations. Although the report had a primary focus on road improvements, the committee also recommended adopting the idea of creating parkways for the city.[10]

Note ii Different from park-way. *"The concept of the parkway – a landscaped carriageway connecting parks in different parts of the city – had been used by Frederick Law Olmsted and Calvert Vaux in their parks plan for Buffalo, developed between 1968 and 1989. Adapted for the era of the motor car, it continued to find favour among City Beautiful planners."* Osbaldeston, Unbuilt Toronto, 24

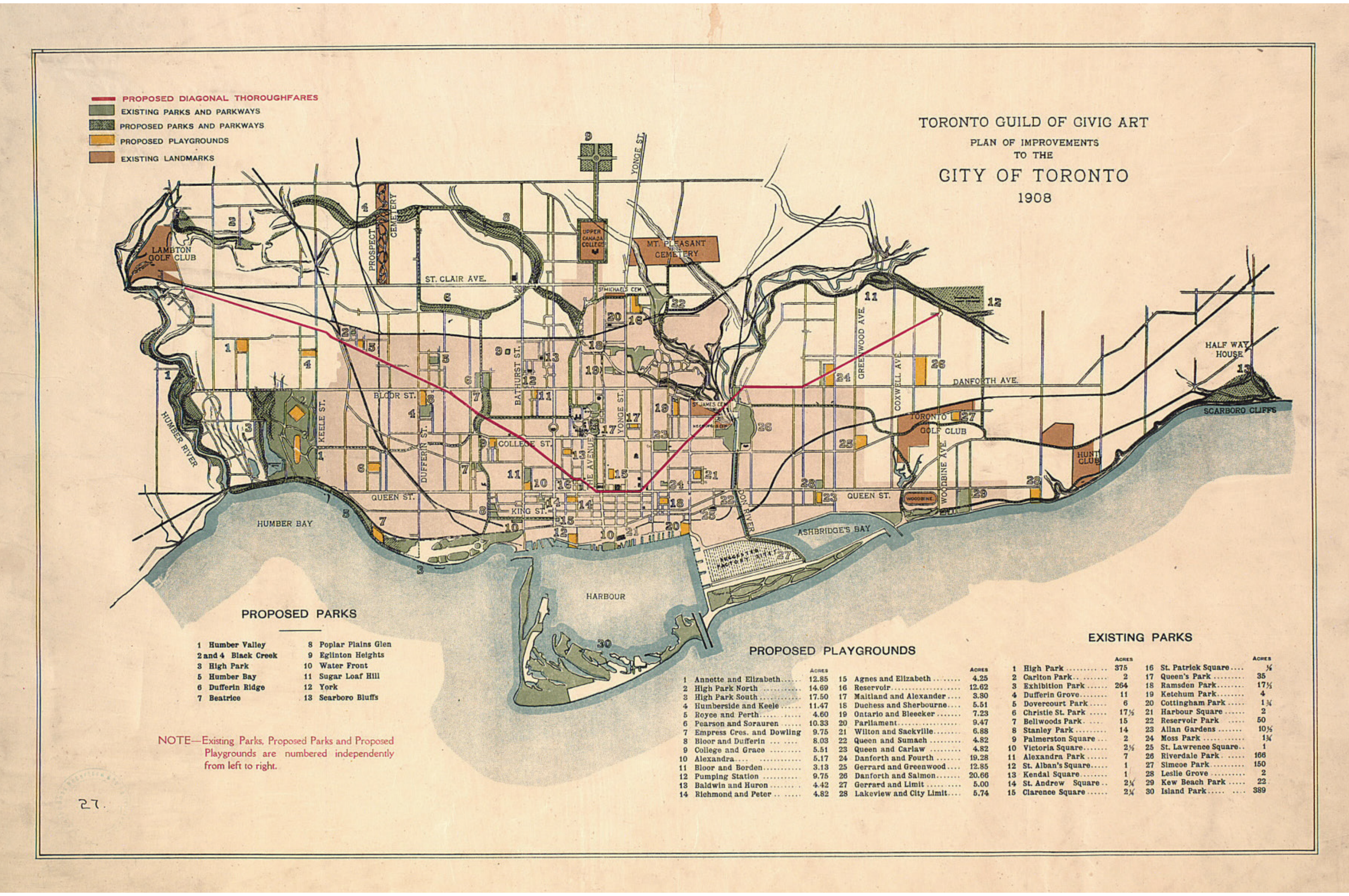
The parkways[ii] introduced in the guild's plan make up a network of parks that are closely linked with the city's rivers. Besides proposing to connect the island with the city's east and west harbor front, the guild planned to connect High Park with the Garrison Creek parks and Queen's park with a green corridor stretching east-west on College and Harbord Street.[11] This southern park network is then extended to the north intersecting with the Don River's tributary ravines. A series of playgrounds (shown in yellow) are also proposed for the city improvement scheme. Located in close proximity to the parkways, the

9 Brown and Storey. "Rainwater in the Urban Landscape",18.

10 Osbaldeston, *Unbuilt Toronto*, 22.

11 Ibid, 24.

Figure 1.14 Toronto Guild of Civic Art's City Beautification Plan Includes keys to proposed parks, proposed playgrounds and to existing parks, 1908.



planned playgrounds bring in another layer of public spaces to the city. Unfortunately, the Civic Improvement Committee only recommended building two of the proposed green parkways. One was to connect the Humber River with Fort York with an extended Harbourfront park[iii] and the second, which was never realized, would have linked High Park, the Garrison Creek and Queens Park with a long strip of parks in the east-west direction. If the Guild of Civic Art's whole parkway concept was adopted by the city, the Garrison Creek, and possibly other creeks, such as Taddle Creek and Castle Frank Brook, could have been preserved to serve as a continuous park network and resilient ecosystem for the city of Toronto.

Note iii The Harbourfront park was realized with the building of Martin Goodman Trail (first opened in 1984) which was recently revitalized and connected to the Central Waterfront designed by West 8 and DTAH

Brown and Storey Garrison Creek Demonstration Project

James Brown and Kim Storey, two architects in Toronto, pioneered a design project to integrate stromwater infrastructure as part of urban landscape and public spaces at the Garrison Creek in 1996. The project was commissioned by Toronto's Waterfront Regeneration Trust and its goal was to become a demonstration prototype to investigate the possibilities in integrating stromwater management into Toronto's open spaces, including public spaces, such as parks and parking lots as well as private properties. The design took advantage of the natural topography of the buried creek to create a series of pond systems that would restore the Garrison Creek's natural function and drain the neighborhood's stromwater through an ecologically based system. The pond systems, designed in detail for the connected trio parks: Christie Pits, Bickford Vale, and the Montrose Schoolyard, is proposed to not only to become an infrastructure for treating water but also a catalyst to encourage a holistic renewal of ravine system, its public spaces and the community.[12]

The demonstration project recognized the limitations of the combined sewers, which currently drains the neighborhood's stromwater, and proposed an alternative to the central and engineered sewer system. It proposed for the pond systems to be independent from the sewers and treat the collected rainwater through filtration systems and detention ponds. This treated water can then infiltrate into the ground to restore groundwater supply, be reused to irrigate the parks, and can be drained to the underground sewers as a smaller and cleaner volume than they previously collected.[13]

In the words of Michael Cook, a Toronto based urban sewer explorer

12 Brown and Storey, R*ainwater Ponds in the Urban Landscape*, 39.

13 Ibid, 40.

and photographer, "While this plan was not realized, it had a great and lasting influence on the ways that many in Toronto have thought about watersheds and have sought to change the way that we approach them as a city."[14] Although, successful in combining stromwater infrastructure with public spaces and amenities by presenting detailed accounts of the different layers at work in the parks, the Brown and Storey proposal remained at a conceptual level. Despite the scope and intention of the study project, three areas were overlooked: First, the amount of harvested water by the pond system was not quantifiable, and hence, could not be compared to existing conditions. Second, the relationship between the parks and their surroundings was not articulated to give a sense of its impact on the neighborhood. And finally, the proposal lacked visual vignettes that could further demonstrate citizen's involvement in the proposed public spaces. None of the above points are criticism to the design team, considering that the project had a very specific focus, and at the time this proposal, certain technologies were also limited.

This thesis uses the demonstration project as a starting point, to propose a design for a neighborhood surrounding Fred Hamilton Park, which is located south of the trio parks presented in the Demonstration Project. The proposal is built on top of similar strategies and philosophies outlined in the Brown and Storey scheme. Furthermore, this design proposal addresses the three points overlooked by the previous scheme. This is further expanded in Part IV *Visible Waters*.

14 Cook, "Resurfacing stormwater at the new Sherbourne Common". Accessed June 3o, 2014. http://www.vanishingpoint.ca/sherbourne-common

Figure 1.15 Brown and Storey. Abstracted Rain Water Pond System diagrams.

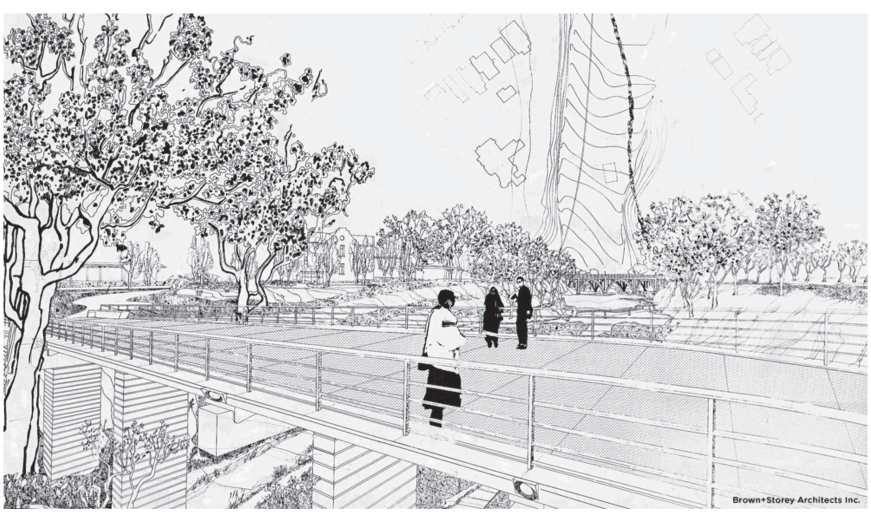


Figure 1.16 Brown and Storey's sketch of a conceptual view, looking northwest in Trinity-Bellwoods.

Part II

In an urban environment, our bodies are that part of nature that we directly inhabit -- aided and abetted by water-filtration plants, sewage-treatment plants and the pipes and the reservoirs in between.

--Michael McMahon, “We all Live Downstream.” 120.

Water and Infrastructure

As a creek turned to sewer, Garrison Creek represents one of the many cases where the city had turned its back to nature and treated Toronto's water problem with a 'out of sight, out of mind' approach. As a result, wild habitats were consumed by the city's growth, and the rivers drained by landfills; the fluctuating climate regularly tossed the city between drought and storm surges. The global cities have entered a new era where top-down infrastructure and 'object-in-the-field' architecture can no longer service and contribute to the constantly changing and non-static urban environment.[1] Instead, the understandings of sustainable urbanism and local ecology can positively renew the city's relationship with water. And on top of technical solutions, the connections between people, culture and city are most crucial in achieving long term goals for urban living.[2]

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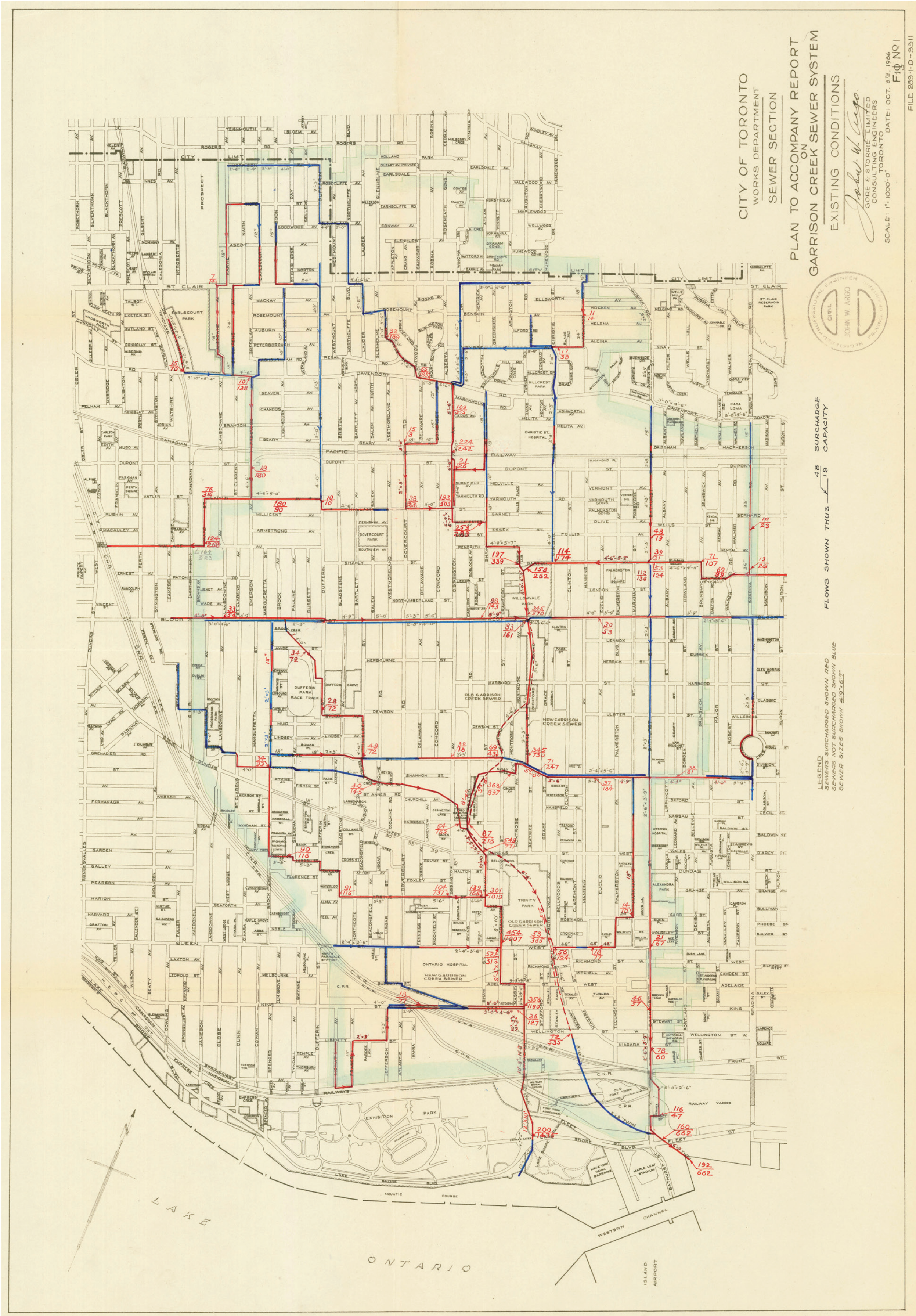
1 Orff, TedWomen, December 2010 http://www.ted.com/talks/kate_orff_oysters_as_architecture?language=en#t-120762

2 Dreiseitl, "Water – Spirit of Change" in Recent Waterscapes, 10.


CITY OF TORONTO
WORKS DEPARTMENT
SEWER SECTION
PLAN TO ACCOMPANY REPORT
ON
GARRISON CREEK SEWER SYSTEM
EXISTING CONDITIONS
GORE & STORRIE LIMITED
CONSULTING ENGINEERS
TORONTO
FLOWS SHOWN THUS 48/19 SURCHARGE CAPACITY
LEGEND
SEWERS SURCHARGED SHOWN RED
SEWERS NOT SURCHARGED SHOWN BLUE
LAKE
ONTARIO

Water Infrastructure - A Brief History

Figure 2.1 [opposite] Plan to Accompany Report on Garrison Creek Sewer System: Existing Conditions. John W. Argo, Gore & Storrie Limited Consulting Engineers, Toronto. October 5th, 1956.

Figure 2.2 [below] Building of the first Garrison Creek Sewer. 1890s.

City of Toronto Archives, Series 376, s0376_f0001_i0013

As the metropolitan with 2.8 million population, Toronto has experienced significant transformations in its public works in making supply and waste water infrastructure to support the growing city in the last 180 years.[3] In the beginning of the 19th century, households were still commonly using privies (holes in the ground to collect bodily waste) to dispose household human waste, and the supply of drinking water was primarily dependent on private wells. However, this caused the city to experience several infection disease outbreaks in the 1830s due to unsanitary disposal of organic waste. This became a major driving factor for the city to build sewers for the newly incorporated city of Toronto along with the city's concern of economic importance of keeping streets clean and drained.[4] The first six brick sewers were built in 1835 along King Street. The project was financed partly by the property owners, and the city continued to implement this self-financing strategy until 1877. The city, throughout this period of time, required property owners to petition for the building of sewers on their own street, and hence the cost of such infrastructure falls largely in the hands of the property owners.

By late 1800s, engineers and medical professionals at the local Board of Health were given the power to implement the 'sanitary idea' to further improve the health of the urban environment as a whole.[5] However, at this time, though sewers were laid in place to carry waste away from the urban households, these waste were eventually deposited into Lake Ontario. By 1860s, the accumulated sewage sludge largely compromised cargo ships' movement in the harbour.[6] Sewage discharged into the lake not only presented dreadful odor along the lakeshore but also put the city's drinking water source—Lake Ontario—at risk. It was believed that the lake, given its large size and ecosystem, could dilute the sewage and maintain its water quality over

3 Brace, "Public Works in the Canadian City; The Provision of Sewers in Toronto 1870-1913", 33-43.

4 Patel, "The long haul: Integrating water, sewage public health and city-building", 94.

5 Brace, "Public Works in the Canadian City; The Provision of Sewers in Toronto 1870-1913", 37.

6 Patel, "The long haul: Integrating water, sewage public health and city-building", 95.

time, but clearly this was not true. [7]

The question of building interceptor sewers to carry all the urban waste to a filtration plant was first raised in the 1850s but no concrete actions were carried out by the city until 30 years later. The interceptor sewers in Toronto function as final collection lines to transport waste water and surface runoff from all corners of the city to four centralized water treatment plants. As such, it seems that the interceptor sewers were an after-thought to the Toronto's water infrastructure planning as they were built with the capacity to only handle normal stromwater load, and today the city still relies on combined overflow sewers to drain excess amount of runoff directly into Lake Ontario during torrential rains. Due to combined sewers' direct contamination to the lake, Toronto waterfront's beaches and public spaces are forced to close during heavy rain periods. A non-profit organization, Eco-justice, conducted a report in 2013 and found Toronto's waterfront quality one of the worst among 12 studied Ontario municipalities mainly due to its antiquated sewage infrastructure, especially the combined sewers.[8]

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7 Brace, "Public Works in the Canadian City; The Provision of Sewers in Toronto 1870-1913", 39.

8 James Armstrong "Sewage pollution of Toronto's water among worst in Ontario: study ", accessed June 30, 2014, http://globalnews.ca/news/780788/sewage-pollution-of-torontos-water-among-worst-in-ontario-study/

Figure 2.3 1889 Plan of the City of Toronto with proposed Intercepting Sewers and Outfall. Hering, Rudolph G. & Gray, Samuel M., Consulting Engineers, February 1889.

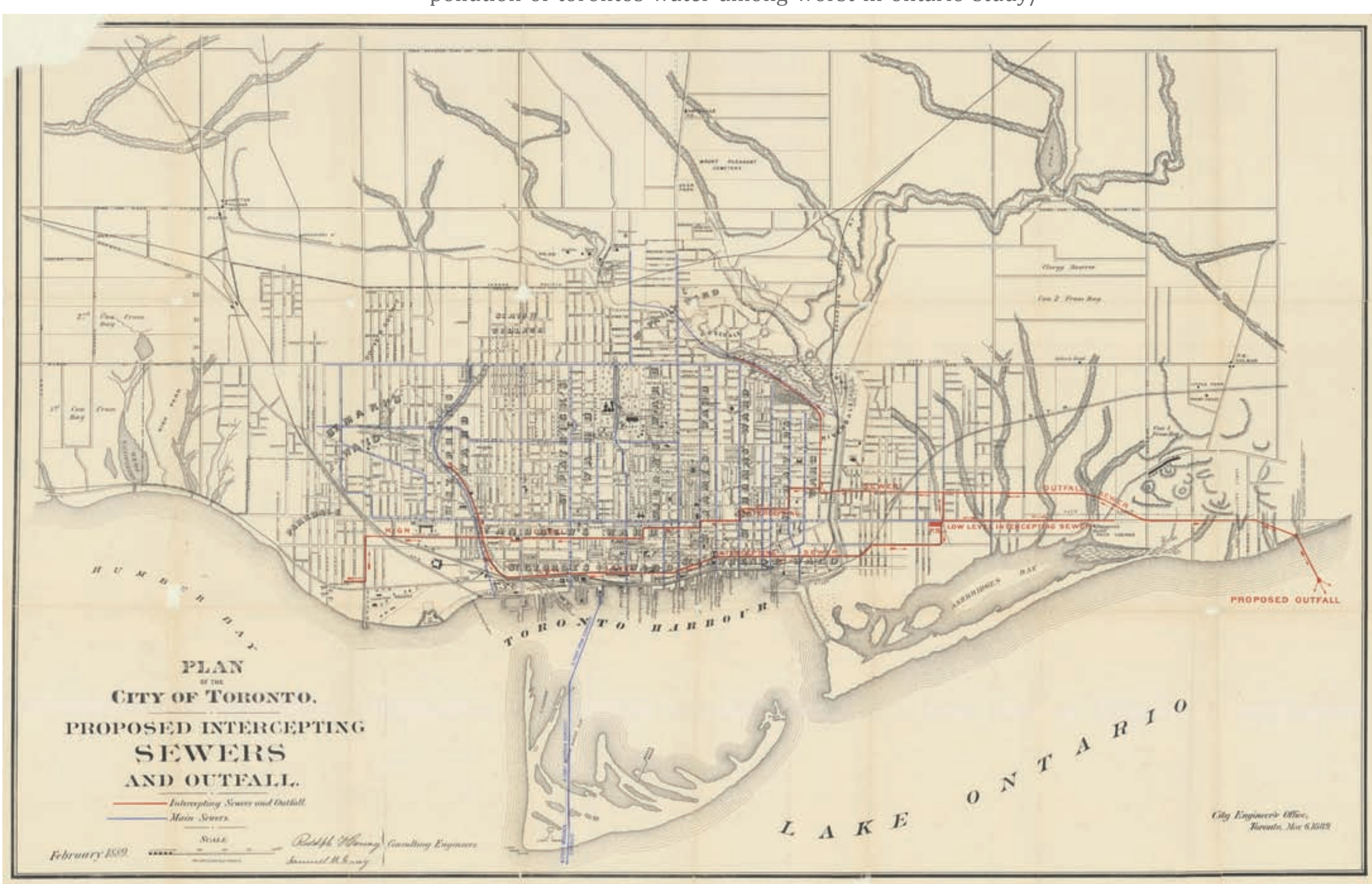
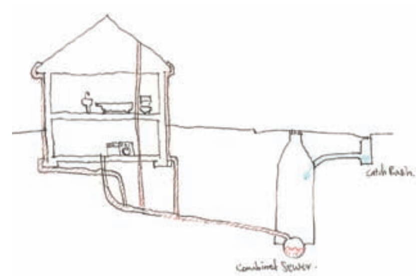


Figure 2.4 [above] Toronto Watersheds

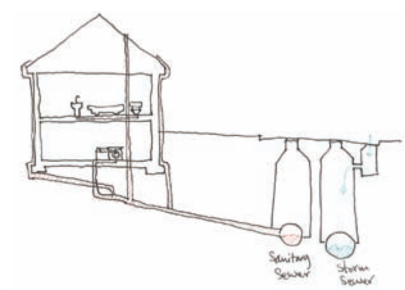
The Urban Water Cycle

Urban areas have a dramatically different hydrological cycle than that of un-urbanized places. While asphalt pavements replaced soil, buildings rose above trees, and sewer pipes encased streams, urbanization increased surface water run-off quantity up to 85% of precipitation.[9] The 'waterfront zone'(shown as WZ in Figure 2.4), which now has little to none open-course waterways, makes up 18% of Toronto's landmass and drains directly to Lake Ontario, constantly threatening the lake's ecosystems with water pollutants.[10] In these densest urban areas, Sewer pipes are necessary to not only dispose cities' waste water, but also divert excess stromwater from the streets to keep the citizen's feet dry. Toronto's combined sewers (see sewer types in Figure 2.5) are some of the city's oldest infrastructure that transports both wastewater and stromwater. The huge quantities of partially treated or untreated sewage are dumped directly into Lake Ontario and its rivers through Combined Sewer Overflow (CSO) during torrential rain weathers.[11] Consequently, after more than a century of careless dumping and brutal alterations done to the city's rivers and streams, new solutions are required to reunite citizens with natural elements and resources to achieve sustainable, and long term goals for better city living. Antoine Picon portrayed the fluctuating tension cities have had with water in his essay "Constructing Landscape by Engineering Water". He argues that the dichotomy, between water as a spectacle versus it being an increasingly invisible resource traveling in an underground infrastructure, requires serious reconciliation in the contemporary era. He continued:

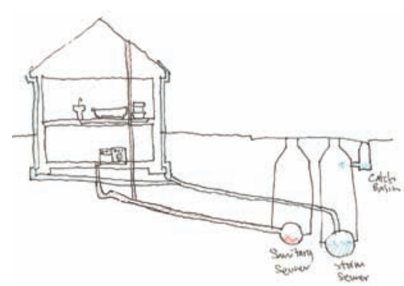
> *"Whereas traditional cities were simply crossed by rivers, the new urban territories often incorporate entire hydraulic systems. This new state of affairs means that the former distinction between territorial and urban engineering no longer applies. ... Above all, problems of urban waters can no longer be understood in traditional terms of beautification on the one hand and limited technological problems of supply and disposal on the other. What is now*



Combined Sewer



Partially Separated Sewers



Fully Separated Sewers

Figure 2.5 [above] Toronto's three sewer types.

9 Hough, *Cities and Natural Processes*, 30-31.

10 Hardwicke and Reeves, "Shapeshifters: Toronto's changing watersheds, streams and shorelines", 55.

11 Eco-Justice 2013 report, 7.

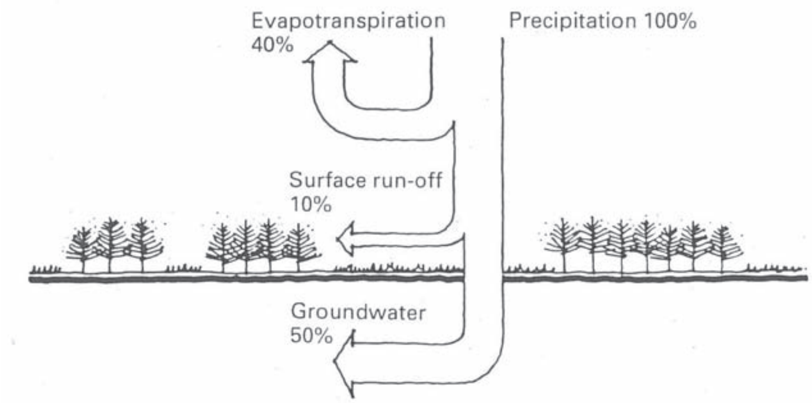


Figure 2.6 Natural water cycle. Ontario Ministry of the Environment diagram, appeared in *Cities and Natural Processes*.

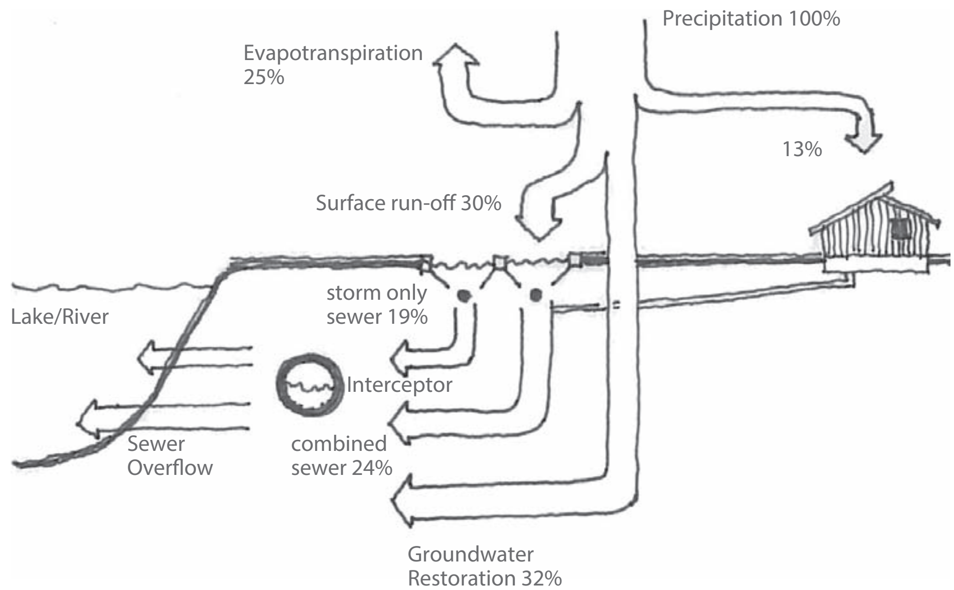


Figure 2.7 Toronto's Urban water cycle. Modified from Ontario Ministry of the Environment diagram, appeared in *Cities and Natural Processes.*

September 2, 2013
Fred Hamilton Park

I walked around the park trying to make note and differentiate the various ground conditions. Sure some areas are wetter than others but they come in patches. The ground of the east side of the park was generally moister than the west side. This was probably only due to the natural slope of the site. The areas under the trees didn't dry as fast as those that situated in a clearing. These all made perfect sense to me. The only thing that puzzled me was that I found a few puddles of water in muddy dirt on and next to the X shaped paths crossing the park. This may be because of the soil in these areas don't drain as well and water tends to build up. Another speculation of mine is that the path cutting from the southwest to the northeast corner of the park may be following the previous course of the Garrison Creek.

> *at stake are environmental issues that require a much more global approach."*[12]

This global approach means the collaboration between city government, architects and engineers, and also citizens to comprehensively revitalize the decaying infrastructure by creating local change that together impacts the whole urban ecological system and complements the existing sewer infrastructure.

Wet Weather Flow Management Master Plan

The Wet Weather Flow Management Master Plan Project (WWFMMP) was Toronto's first attempt at addressing its flooding and water

12 Picon, "Constructing Landscape by Engineering Water", 105.

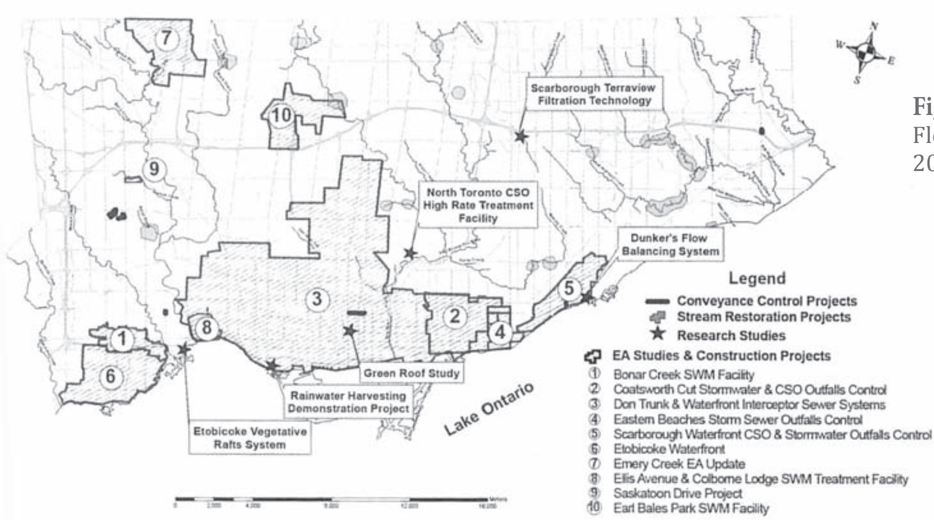


Figure 2.8 Toronto's Wet Weather Flow Management Master Plan, 2007.

pollutant issues. Although the master plan remained largely invisible to citizens after its approval by city councils in 2003, its involvement of engineers, hydrologists and activist groups, such as Bring Back the Don, brought numerous ideas into manageable efforts carried out by different stakeholders in various neighborhoods across the city. The plan has a set of clear objectives to both mediate the dramatic loss of stream ecology as well as improving water quality. The objectives include " meeting water and sediment quality guidelines; virtually eliminating toxins through pollution prevention; improving aesthetics and promoting beach swimming; reducing erosion; re-establishing natural hydrological cycles and minimizing flood risks; protecting habitats and reducing fish contamination; and eliminating the discharge of untreated sanitary sewage and reducing basement flooding" as well as public education.[13] Although a handful of localized and bio-remediation projects were executed, such as residential down-spout disconnection (2007) and constructing stromwater retention ponds(2008), the majority of the projects conducted as part of the master plan were centralized engineered solutions, such as the massive holding tanks put in the eastern and western beaches to retain excess runoff (Completed in 1990s) and the interceptor sewer planned for beneath the Don Valley (proposed in 2008)[14]. Nevertheless, WWFMMP inevitably kick-started Toronto's enthusiasm on embracing alternative stromwater management and treatment solutions and lead to successful recent architecture and landscape architecture projects, such as Sherbourne Commons Park (2010) at Toronto's eastern waterfront and Corktown Common Park (2012) as part of the Lower Don Redevelopment Plan.

There once was coexistence between the engineered and natural, when the bridges crossed over the creeks and when the Garrison creek was half stream and half sewer (1889-1910), but this state was short lived. The city chose engineered infrastructure over the soft

13 Lorinc, "The Big Gulp: How Toronto's Wet Weather Flow Management Master Plans will save the lake", 226.

14 Ibid, 228, 231.

Case Studies - Water as a Guide for Design

landscape without any negotiation.[15] The creeks were buried alive and the connection between the citizens and nature has since been lost. Michel Desvigne states that "building in the city, one runs up against the absence of synchronization: the rhythms of the landscape are not those that make up the built neighborhoods".[16] But it is precisely these rhythms of landscape that should be reintroduced into the urban environment to not only functionally mediate between people and the built environment, but also to provide people a glimpse of familiarity—that of nature. A few case study projects are presented here to visualize how water guided design decisions for architects and landscape architects.

The Amsterdam Bos

Cornelis Van Eesteren
Jacopa Mulder

15 Brown and Storey, "Rainwater in Urban Landscape". 16-25.

16 Desvigne, Intermediate Natures. 91.

Figure 2.9 Dunn's River Falls in Negril, Jamaica. March, 2014. In a recent trip to Jamaica, I visited the Dunn's River Falls. Even though the natural landscape has been modified to accommodate tourists, it is a place that demonstrated how water can create an inclusive public space where nobody is judged and collaborative adventures are encouraged.

The Bos Park is a 875 hectare forest-park built between 1929 and 1950s in Amsterdam. It is a one of the first park projects that departed from Olmsted's conception of the necessary clear boundary between parks and the city. The park used landscape design and process as an organizational tool to arrange park programs, therefore the park is visibly productive and connects to processes of the industrial city.[17] Furthermore, the park boundary is free of dikes and landscaped barriers making the movement into the park (or into the city) continuous. A variety of spaces are offered in the park providing both areas for collective activities and individual contemplation.

17 Berrizbeita, "The Amsterdam Bos", 188.

Figure 2.10 [above] Amsterdam Bos Park Master Plan.

Figure 2.11 [left] Cherry Blossom watching at Bos Park.

Figure 2.12 [below] Bos Park river bank.

Houtan Park

Kongjian Yu Turenscape

Houtan Park was built on a former industrial site on the bank of Shanghai's Huangpu River. A series of constructed wetland and water ponds make up the majority of the park to not only treat polluted river water locally but also ecologically mediate river flooding. The restorative design strategy also incorporated reclaimed industrial material to contrast the extensive use of plant materials and create involving public spaces to facilitate leisure and recreational activities, as well as urban agriculture.

Figure 2.13 [right top] Houtan Park plan showing water treatment sequence.

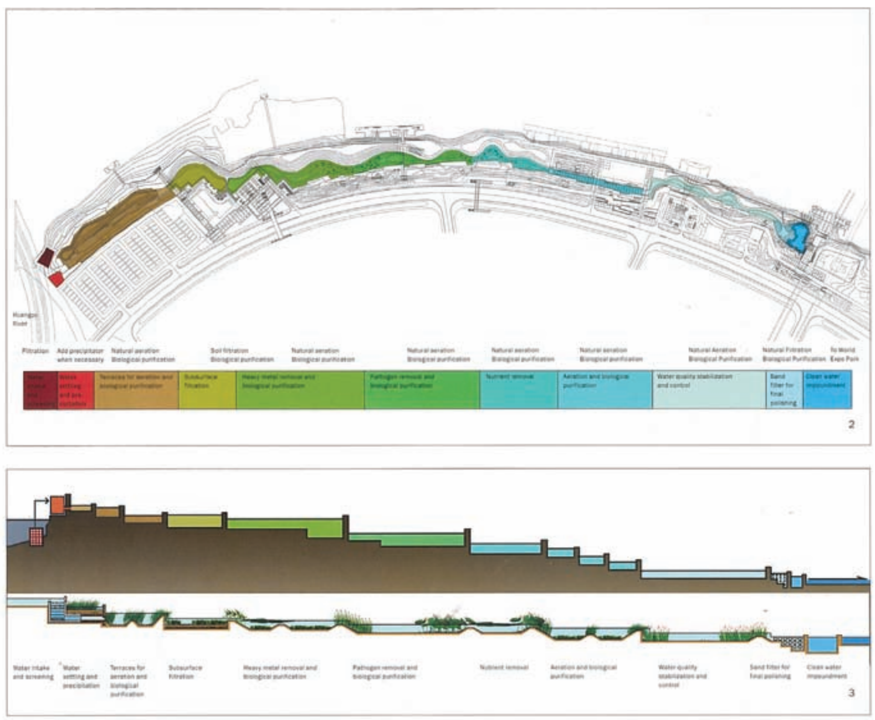


Figure 2.14 [below] Various activities takes place at Houtan Park due to its spatial and ecological diversity.

Figure 2.15 [right bottom] Houtan Park master plan.

Summer Park Governor's Island

Michel Desvigne

Michel Desvigne's competition entry for Governor's Island in New York conceives a peaceful balance between man and nature in an urban context. The master plan is laid out in a grid to accommodate a wide variety of diverse plant material to strive in each plot. These plots and grids are then interrupted by a contrasting language of streams, which supports plant growth and urban agriculture. By becoming productive, the park facilitates the continuous interaction among man, infrastructure and nature.

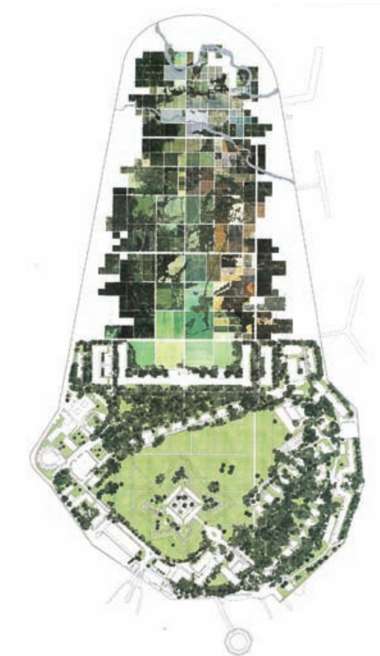
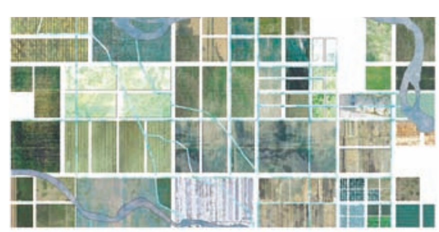


Figure 2.16 [above] Summer Park master plan

Figure 2.17 [above] Summer Park's open field formed in accordance to a grid system. The fields are meant to be flexible and accommodate a variety of leisure activities

Figure 2.18 [left] Community gardens at Summer Park. Community agricultural practices are encouraged in the park to yield social coherence and playful architecture

Figure 2.19 [below] Streams and street grids divide Summer Park's fields.



Don Valley Evergreen Brick Works

DTAH and Diamond and Schmitt Architects

Built on the former site of a brick yard, the Evergreen Brickworks is one of Toronto's first brownfield revitalization projects that focuses on environmentally responsible and healthy community living. Farmers markets, a plant nursery and a creative playground are features of the community park. The former quarry site has been transformed to become a scenic park where wetlands, water detention ponds and gentle hills together created a resilient ecological habitat, while providing spaces and trails for public leisure activities. A variety of flexible indoor and outdoor spaces also host seasonal programs such as bike workshops, flea markets, and summer camps, for people of all ages to be involved.

Figure 2.20 Aerial view of Evergreen Brickworks

Parc Diagonal Mar

Enric Miralles & Benedetta Tagliabue
EDAW

Parc Diagonal Mar is a manifestation of the new Barcelona, where sustainability and technology has driven the city's growth in recent years. The park is divided into seven large areas featuring a children's play area, raised walkways over water and a lake with tangled tubular sculptures that splashes water. All seven areas are linked by a common theme—water. The various structure and sculptures are not only designed to be aesthetically pleasing to the citizens but are also functional for moving water across the site and drawing groundwater to irrigate the park's gardens.

Figure 2.21 [above] Aerial view of Parc Diagonal Mar

Portland Sidewalk Stormwater System

Portland Bureau of Environmental Services

This sidewalk intervention project in Portland, Oregon, provides a precedent for surface water runoff treatment at a local level. Instead of flowing directly into catch basins, the runoff water flows from the street into small wetlands located on a generous sidewalk. Water is then treated by passing through the wetland gardens. Additionally, by landscaping the sidewalk, two different pedestrian zones are created, one for through traffic, and the other for those who have parked their cars by the street curb.

Figure 2.22 [below] Street view and detailed view of Portland's sidewalk stormwater system

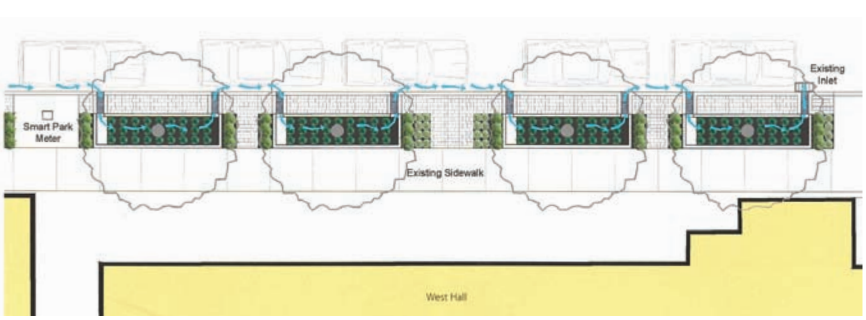


Figure 2.23 [left] Plan of Portland's sidewalk stormwater system.

Part III

Play as a special form of activity, as a "significant form", as a social function--that is our subject. We shall not look for the natural impulses and habits conditioning play in general, but shall consider play in its manifold concrete form as itself a social construction.

-- Johan Huizinga, *Homo Ludens*, 4.

Play and the City

The preservation and restoration of urban rivers inevitably depends on citizen's care and involvement in urban ecologies. Since the early settlement in the 18th century, Toronto's rivers and ravines not only was a source of drinking and washing water but also sites for leisurely stroll and recreational activities. In her diary of years spent at York, Elizabeth Simcoe described extensively of her adventures on exploring the various rivers and ravines in the Town of York by walking its ravine terrains and observing the subtle scenes in the landscape. She remarked on September 4th 1793:

> *4th of September "I rode to St. John's Creek [Humber River]. There is a ridge of land extending near a mile, beyond St. John's House [St. Jean Rousseau], 300 feet high & not more than three feet wide, the bank towards the river is of smooth turf. There is a great deal of Hemlock Spruce on this river, the banks are dry & pleasant. I gathered a beautiful species of Polygala."*[1]

Although today's scenery at the Humber River and Garrison Creek are very different than that described by Mrs. Simcoe, these riverbanks and former creeks are still active part of the city's public spaces and are enjoyed by many citizens. Continued grassroot movements such as the Human River and Lost Rivers walks provide additional opportunities for the citizens to connect with the urban landscape by remembering its past. These organizations collaborate with historians and ecologists and lead walks through the former course of the creeks to discover subtle clues of the ecological and historical habitat that used to exist and how the current urban landscape became the way it is today. All the efforts of activists, ecologists and historians are

1 Simcoe, *Mrs. Simcoe's Diary*, 106.

aimed at returning the urban environment to a healthy balance with nature and to improve the citizens' health and lives in the urban areas where negotiation among housing development, public works and nature are always prevalent. With the goal of improving urban living, the question of play needs to be brought forward. Johan Huizinga describes play as an "interlude" that allows people to escape from their day-to-day routines; yet, it is embedded into the individual's lives due to its reoccurrence and extends its affect into the collective community where spiritual and social associations are formed.[2] Consequently, play is beyond human's basic needs and instinct of survival and is necessary to enhance the well-being of the larger social community. In turn, the playing community shares ideas and curiosity with the individuals to yield collective growth. Therefore, public spaces in cities are social centers where individual and collective play should be encouraged, though they should not be isolated, and instead they would be embraced by the sidewalks, streets and parking lots to extend the playfulness from the parks and squares into the city and form a network for urban exploration and play.

2 Huizinga, *Homo Ludens*, 9.

Figure 3.1 Playground by Aldo van Eyck. Amsterdam, 1956.

Streets and Playgrounds

The city should provide a canvas, for the citizens to play and create based on their curious instincts. To design for play means to design for pedestrians and the children, because it is through wandering and exploring the city fabric, establishing its visual image in one's heads and discovering new geometries to reinforce this image, that the citizens can develop new imaginations for the city. The children often are the firsts to imagine new ways to play in a static environment because they not only explore the space but also let their mind wander to discover new possibilities. Aldo van Eyck believed that public playgrounds should be for everyone and accommodates a variety of activities including children's play, teen's lunch gatherings and adult meetings:

> *"The special thing about these playgrounds is that they do not belong exclusively to children. The city simply continues in these places, with all the dangers and disadvantages that go with it, and they are not closed off. They are meeting places, for children too, but when the child has gone to bed it's just an ordinary street again. ... The public playground has to be attractive as a meeting place for everyone, including adults, if its existence is to be justified. It also has to be acceptable to the city even without the movement of the child. The city has to be able to absorb the forms."*[3]

Van Eyck emphasized extending public playgrounds into the rest of the city so that they become all inclusive and multifunctional spaces. The playgrounds become part of the city, and the city, the playgrounds. The current city arrangement of street-sidewalk-park confines the playgrounds inside the parks and keeps the children out of the streets. This typology excludes children (and adults too) from the city.

Jane Jacobs asserts that the city sidewalks can offer positive aspects to children as they require a variety of places to play and learn; sidewalks can become an unspecialized outdoor home base not only for play, but also for helping children to form their notion of the world.[4] The magic of the sidewalk is in its in-between nature. Situated

3 Van Eyck, "On the Design of Play Equipments and the Arrangements of Playgrounds", 113.

4 Jacobs, *The death and Life of Great American Cities*, 80-81.

between busy vehicular traffic and relatively static public (parks and plazas) or private (front yards) places, the sidewalks provide a buffer zone, where one can observe without participating, encounter like minded-people to chat or be buried in his/her own mind. As such, the pedestrians are always in the public, providing eyes to the streets and also a continuous social network that manifests social ties and a form of social play.[5] Once this pedestrian network is established and utilized, citizens can be enticed to discover pockets of attractions in the city –a skating rink, a farmer's market in the public square or a playground – because others are on the street too.

August 5, 2013
Fred Hamilton Park

It was a good afternoon. I decided to linger for the rest of the day. A friend visited along with her dog. As we were playing fetch, I noticed the two elderly man chatting at the picnic table were gone , and replaced them were four twenty-somethings with their bikes and a dog having what seemed like a picnic. There was also a couple playing bocci and another one hanging out with their infant baby. It was a simple long weekend. Chatters and laughters filled the park.

The current Little Italy neighborhood (College and Shaw, where the design site situates in), especially along College street, already exists a kind of public sidewalk life in the summer. The cafes in the area generally provide a few chairs for the lingering customers or passersbys; and commuters make up another group that float between stores, cafes and streetcar stops. Comparatively, Toronto's Kensington Market excels in having a vibrant street life. The grocer stalls and buskers occupy the neighborhood's sidewalks all year round attracting both children and adults. The design in this thesis, therefore, is aimed at enhancing the existing College and Shaw neighborhood to bring incidental play into the sidewalks and streets . Generous sidewalks larger than 7 meters can accommodate adequate spaces for pedestrian circulation, public life and loitering, as well as landscaping to provide shade for the activities.[6] At the detailed assembly scale, the thesis design proposal takes advantage of the wide sidewalk on College Street to extend the park programs onto the streets encouraging public sidewalk life while mediating stromwater runoff with generous sidewalk landscaping.

5 Jacobs, The death and Life of Great American Cities, 55-73.

6 Ibid, 87.

Figure 3.2 Playing giant Scrabble at Kensington Market's Pedestrian Sunday. June, 2011.

Psychogeography

The situationists believed that cities are giant playgrounds for people to explore and play in. Psychogeography is adult's play in this playground. Once function is established, play should follow to create social engagement that results in varied sensations for the citizens and ambiance in the complex urban environment.[7] Constant Nieuwenhuys wrote:

> *"we demand adventure. Not finding it on earth, some want to seek it on the moon. We, however, are committed to changing life here on earth. We intend to create situations, new situations, breaking the laws that prevent the development of meaningful ventures in life and culture. We are at the dawn of a new era, and we are already attempting to sketch out the image of a happier life, of a unitary urbanism—an urbanism designed for pleasure."*[8]

The Internationale Situationniste #1 defines psychogeography as "the study of the specific effects of the geographical environment (whether consciously organized or not) on the emotions and behaviors of individuals."[9] This definition can be extended to include the collective emotions and behaviors as psychogeography experiments are usually conducted with more than one individual. Therefore, the subjective analysis of location based experience is constantly nested within a larger social context. As Simon Sadler said, "situiationism took over the negotiation between reason and imagination, and between the individual and the social."[10]

This thesis took inspiration from Constant Nieuwenhys, who said that functionalism should be immediately followed by unitary urbanism.[11] As a result, the design intervention is developed in an effort to bring play and pleasure to the selected sites once the green infrastructure systems are set up to ensure their function. Psychogeographical explorations needs to be guided by choreographed spaces that can

7 Nieuwenhuys "Another City for Another Life", 72.

8 Ibid, 71.

9 Knabb, ed. trans, *Situiationist International Anthology*, 52.

10 Sadler, *The Situiationist City*. 8.

11 Nieuwenhuys "Another City for Another Life", 71.

Figure 3.3 Lawrence Halprin's Love Joy Fountain in Portland, Oregon.

engender a variety of ambience and opportunities based on the individual. At an architectural scale, Lawrence Halprin's Love Joy Fountain is an example of this.

> *"Though the environment itself is visually exciting it was conceived as a place for involvement; for physical interaction in which the constructed elements were there to encourage physical and emotional participation by the people of Portland... I hoped that they would use the water, climb the cascade, wade in the pool, listen to the sounds, and use the entire composition as a giant play sculpture which would heighten and enrich the normal everyday life-activity in the neighborhood. (P) becomes (S). It happened."*[12]

The designed sites would not be polarized; meaning people should be encouraged to linger around the peripheries without having to participate in the activities occurring inside of the spaces. The spaces and furniture in the space would not be prescribed to have single functions, but instead they encourage a variety of uses and occupation. The design spaces are to become places of distractions, which one is drawn to explore and play in extensively on a psychogeography tour of Toronto's west end.

12 Halprin, *The RSVP Cycle*, 58

Case Studies - Inclusive play

In an urban environment, where nature is almost entirely absent and children are kept safe from streets and mud, playfulness can be a difficult virtue to find in city's public spaces. Susan G. Solomon criticized the standardized American playgrounds for its exclusive activities that contribute to the dissolution of a neighborhood community.[13] For a space to be inclusive, it ought to be designed (consciously or subconsciously) for multiple demographics and age groups to first form a healthy community. Streets, sidewalks and laneways should also be embraced by the space to formulate a mutual exchange between people in the space and people on the streets. This section presents a few case studies that, in one way or another, are designed to practice inclusive playfulness.

13 Solomon, *American Playgrounds*, 1.

Figure 3.4 Pieter_Bruegel_the Elder, Children's Games, 1560.

Note iv *Derive* is a term coined by Guy Debord.

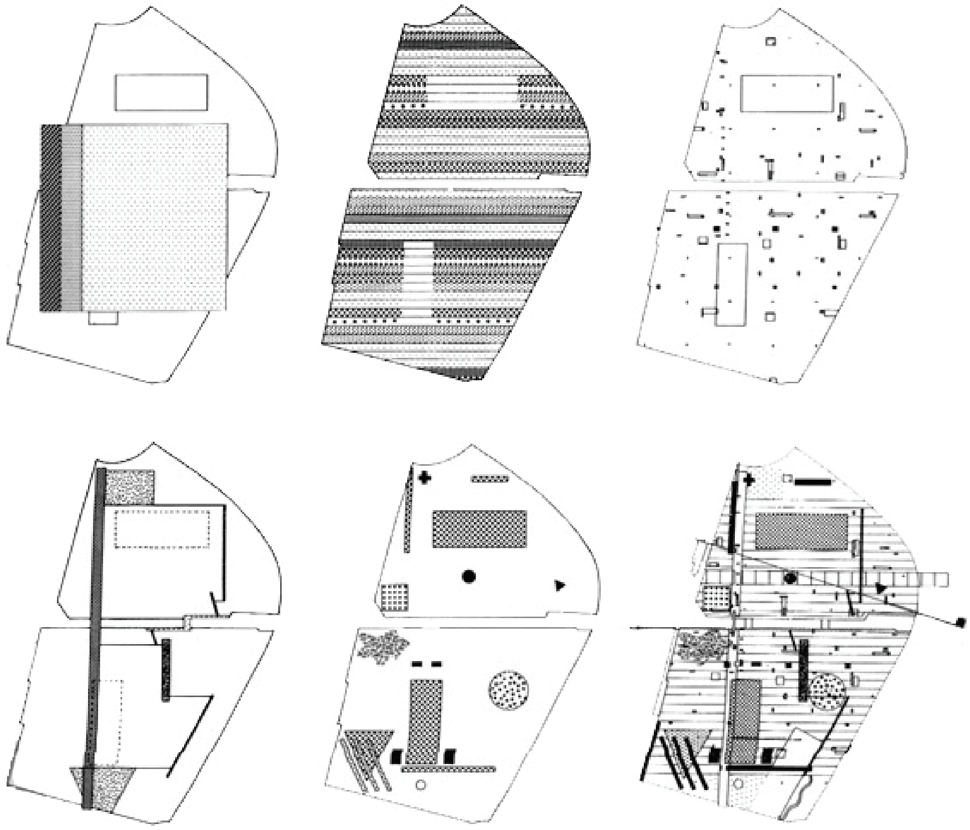
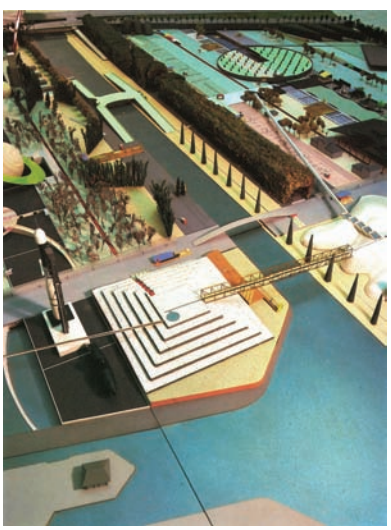


Figure 3.5 [right] Diagram of Park de la Villette layers.

Figure 3.6 [below] Photographs of OMA's Park de la Villette conceptual model.



Park de la Villette

Rem Koolhass OMA

Rem Koolhaas's proposal for Paris's Park de la Villette competition consists of many layers that together make up a sequential set of expediences that cannot be repeated every time as an individual or group traverses through out the park. The layers are made up of stripes, point grids, access and circulation, and landscape corridors. These layers forms an interwoven network that facilitates *derives*[iv] and a variety of play activities for all age groups in the park.

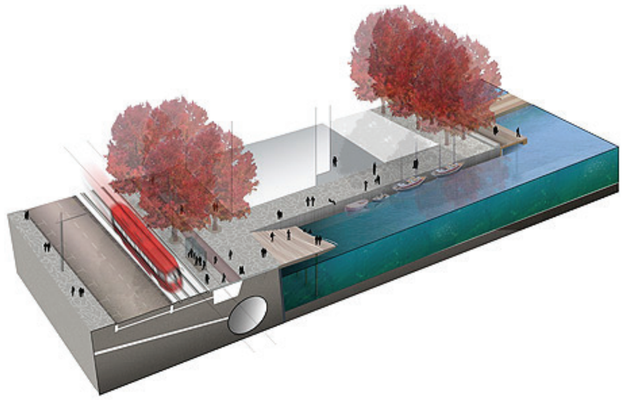


Figure 3.7 [left] Conceptual drawing showing the waterfront public spaces' relationship with Queens Quay and Lake Ontario.

Figure 3.8 [below] Conceptual rendering of Toronto's west Waterfront where Martin Goodman Trial converges with Queens Quay.

Toronto Waterfront Revitalization

West 8 DTAH

Since 2008, Waterfront Toronto has been working with West 8 and DTAH to develope phased designs for revitalizing Toronto's central waterfront into an active public realm. The project is aimed at creating an expansive water's edge where citizens can enjoy recreational activities and participate in outdoor events and arts programs. The integration of pedestrian path, bike path and streetcar rail enables the public spaces to extend into the streets.

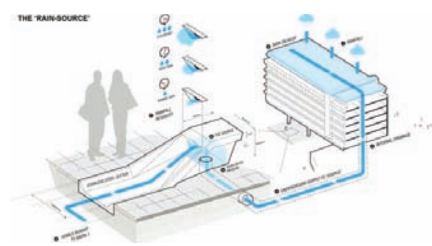
Figure 3.9 [above] Reeves WaveDeck at Toronto's Waterfront.

Watersquare Benthemplein

De Urbanisten

Watersquare Benthemplein is one of the pilot projects commissioned by the city of Rotterdam in 2013 to utilize urban public spaces to mediate the city's increased rain storms. The design not only implemented water storage facilities to generate environmental sustainability but also visibly integrated these facilities into the public realm, creating a playful and enjoyable public square.

Figure 3.10 [below] Water is collected from building's roofs and directed to central basins through various channels that provide opportunities for the public to interact with water.



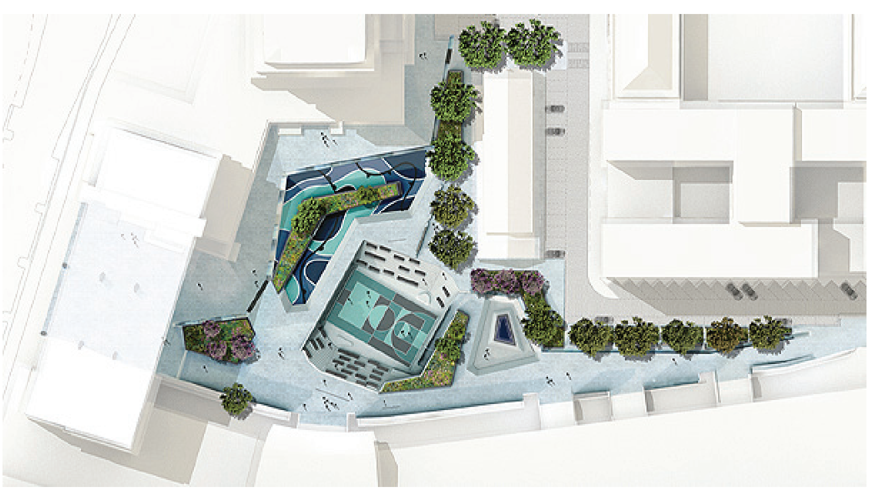


Figure 3.12 [left] Watersquare Benthemplein Plan.

Figure 3.11 [below] When the basins are dry, a series of recreational and play activities happens in them.

Play Streets in Copenhagen, Denmark

Municipal Planning Department of Copenhagen (Max Siegufieldt)

In the 70s, the City of Copenhagen commissioned to develope a series of playgrounds to occupy the city's laneways between residential complexes. By situating playgrounds in streets that are not often used by automobiles, the city planners and designers enabled children's freedom in the city. They can roam freely in the neighborhood while knowing neighbors and parents can keep an eye on their safety from their apartment windows and the streets.

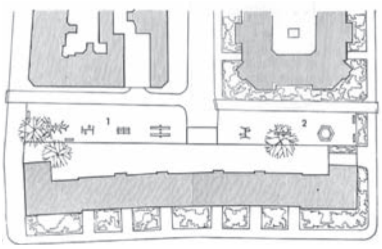


Figure 3.13 [above] Plan of one of Copenhagen' Play Streets.

Figure 3.14 [right] Play street in a laneway between residential complexes.

Figure 3.15 [right] Play street planned for Copenhagen are shaded in the neighborhood plan.

'Water Traces' in Hannoversch Munden
Heiner-Metzger Plaza, Neu-Ulm

Herbret Dreisitl

As a sculpture artist and an architect, Dreisitl designs public gathering places that represents water's natural characteristics and provide the public opportunities to become intimately involved with the resource that is often taken for granted. In these two projects, special attentions are paid to textures and forms that articulate the fluidity of water. As such, water is made visible to the public.

Figure 3.16 [above] Aerial view of 'Water Traces'.

Figure 3.17 [below] Texture detail of 'Water Traces' reflecting pool.

Figure 3.18 [left] Heiner-Metzger Plaza in Neu-Ulm, Germany.

Part IV

"A city, if it is really a city, has a very compound rhythm based on many kinds of movement, human, mechanical and natural. The first is paradoxically suppressed, the second tyrannically emphasized, the third inadequately expressed."

-- Aldo van Eyck, "Wheels or no wheels, man is essentially a pedestrian", 111.

Visible Waters

This chapter presents a proposal to bring the natural rhythm of water back to the city and to integrate it as part of citizens' everyday play and exploration of the complex urban environment. In this proposal, water is reintroduced to the city's public spaces such as parks, street corners and school yards. These spaces are then threaded by the city's sidewalk and laneway infrastructure to create a network that not only guides the flow and treatment of stromwater and rainwater runoff in localized sites but also provides a new connected layer of spaces for public events and exploration.

Design Objectives

This design proposes an alternative to traditional stromwater engineering practice, which utilizes a centralized approach to direct runoff away from where it fell. This proposal is designed to accommodate localized water runoff collection, storage and reuse. As Doglas Farr puts it, this alternative sustainable approach helps restore and stabilize the historically groundwater-dominated hydrology pattern on a site-by-site basis and, as a result, decreases the chances of downstream flooding prevalent in traditional stromwater engineering practices.[1] Runoff is collected mainly from two sources. The first collection source is stromwater which is runoff from major arterial streets, laneways and paved plazas – the urban vehicular and pedestrian traffic network; and the secondary source is rainwater runoff which comes from roofs of commercial units, schools and institutions in the neighborhoods. Because the sources involve both public and private owners, the process of implementing the proposed design would depend on a variety of stakeholders and private-public partnership will require further negotiation. However, this thesis focuses mainly on the design strategies of stromwater collection and its use in the public space therefore the implementation process involving the private and public owners will not be discussed but may be explored at a later endeavour. Consequently, the proposed design expresses its focus of stromwater collection and reuse through the design of various architectural interventions that are designed to be the counter form of the centralized engineering methods of stromwater management by exploring strategies of local collection, treatment and natural bio-processes. In turn, the spaces transformed by this design proposal will become education and learning spaces for the public to be actively involved in the city's water cycle. Four design strategies guide the design's spatial organizations as diagramed in the thesis Introduction (page 6-7)—establishing hub and satellite sites; linking parks and streets; blurring boundaries between streets and parks; and using water as the hearth in public spaces.

The proposed design is launched by using Storey and Brown's 1900s connected pond proposal (page 28-29) as a base. Against the predecessor design, this proposal first demonstrates, at a watershed scale, how to further the original proposal by incorporating existing infrastructure and street networks into making new urban public spaces that mediates between the natural landscape and urban habitat.

Following the introduction to its larger context, the design is then presented at the neighborhood scale and detailed assembly scale

1 Farr, *Sustainable urbanism*, 175.

where it addresses the following four principles in an effort to reconcile the urban with its natural landscape at the neighborhood centred on Fred Hamilton Park at College Street and Shaw Street.

Water Runoff Harvesting – including both stromwater collection from the streets as well as roof rainwater harvesting.

Water Runoff Treatment – the metabolism of filtration systems, such as wetlands, UV and sediment filters.

Connection to Streets – direct and indirect connection to existing streets, sidewalks and laneways.

Play and Education – spaces to function as multipurpose areas providing fun and educative features for the various demographics.

Concentrated on these four principles, a series of local remediation plans, designed to capture, detain and or treat stromwater, are implemented at Fred Hamilton Park and its satellite sites to achieve in local change that together can impact the whole watershed. And lastly, the detailed design investigates in the transitions between these public spaces and the street network, and closely looks at Fred Hamilton Park's central public space to imagine a comprehensive play area that intimately connects to the city's urban water cycle.

Watershed

The design is first established in the entire watershed scale at the site of the buried Garrison Creek. The boundary of the watershed is defined in Figure 4.1. The watershed's natural topography and sewer pipe locations determine its drainage zones and patterns, which are currently invisible to the citizens. By implementing a series of public spaces that also function as stromwater treatment and retention sites, the design allows water to be visible at the ground surface level and also provides the opportunity to purify and reuse water before it is drained into the sewer system. In order to restore the watershed's original functions of drainage and water treatment, it must be independent from the combined sewer system that currently works as a primary trunk sewer in the Garrison sewershed. Therefore infrastructure alteration is necessary to support the systems at work on the surface level, namely the series of public spaces that also functioning as stromwater remediation and retention sites. This results in separating the sewershed's two combined sewers and the combined sewer overflow (CSO) connected to them (Figure 4.2 before); and converting them to become one stromwater only sewer and the other the sanitary sewer for the sewershed (Figure 4.3 after). This allows the stromwater sewers to only handle surface stromwater runoff; and the stromwater carried to the central plant for treatment can undergo a simpler purification process because of its first level of treatment done locally though bio-remediation processes. As such, a network of water retention ponds nested in parks and public spaces can be established for the whole watershed, as illustrated in Figure 4.5.

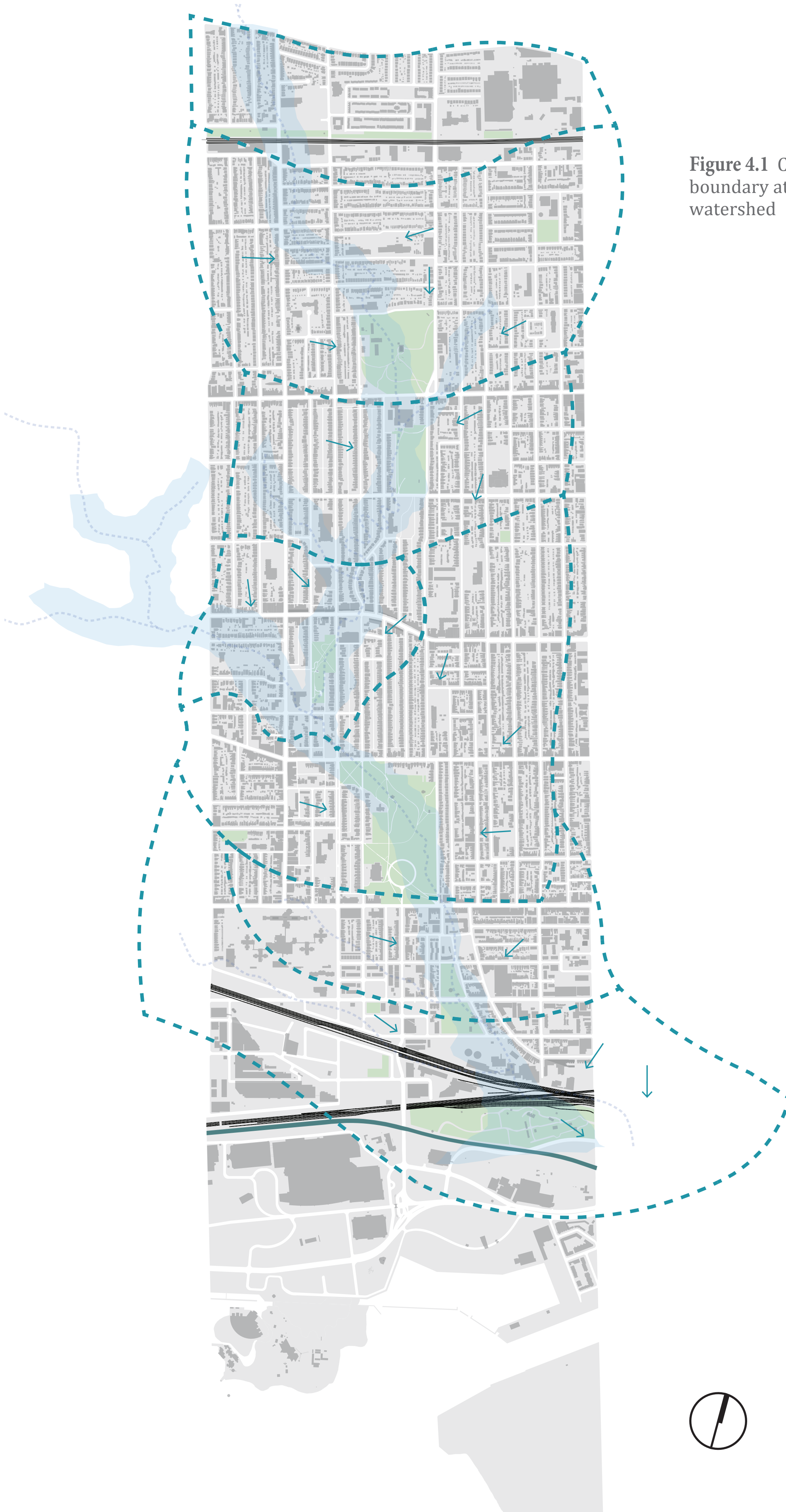


Figure 4.1 Conceptual drainage boundary at the Garrison Creek watershed

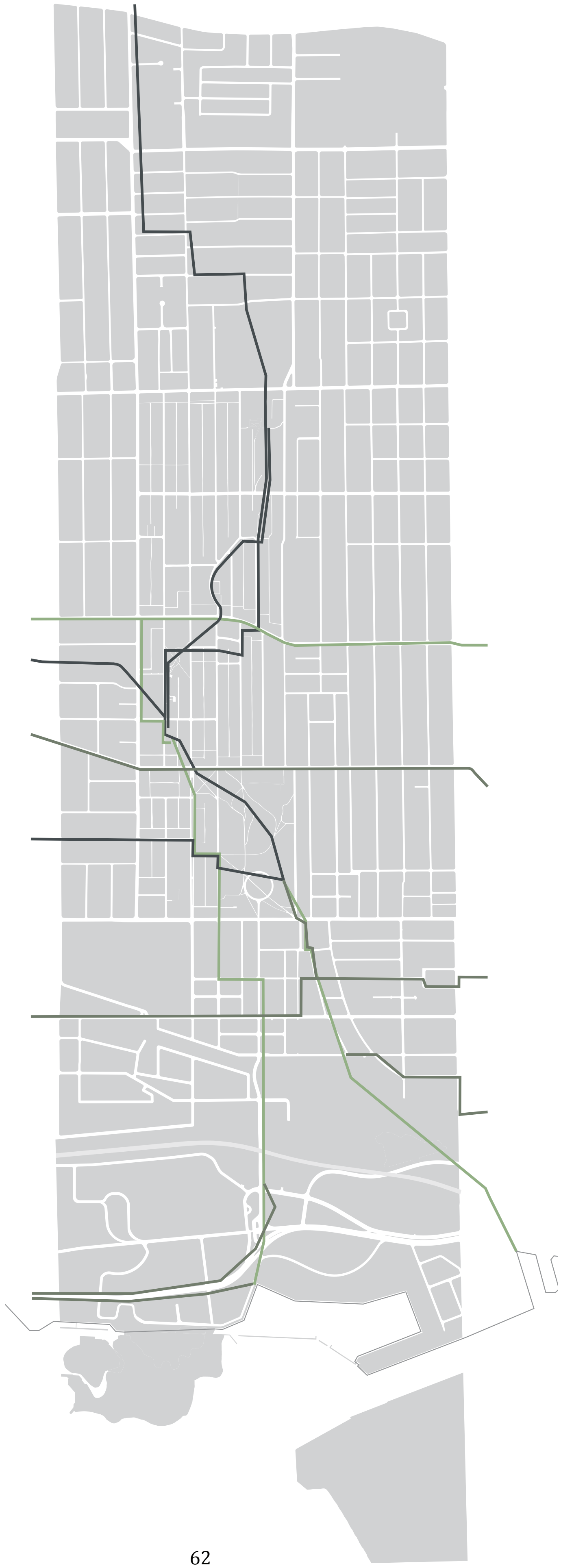


Figure 4.2 [Opposite] Existing sewers at the Garrison Creek sewershed

Figure 4.3 Converted sewers. Infrastructure setup for creating a connected water and park network.

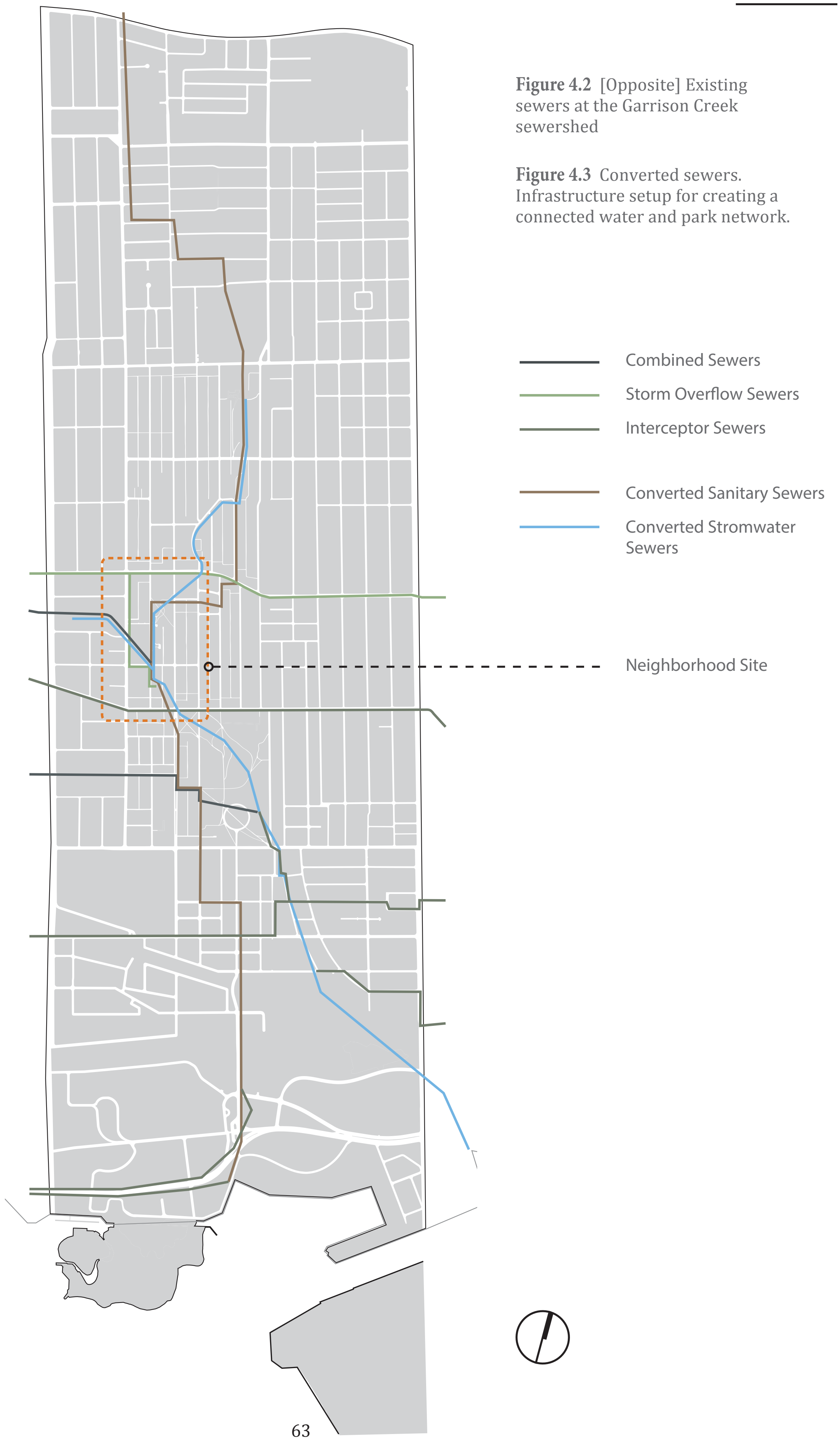


Figure 4.4 Conceptual water movement from streets to parks.

Figure 4.5 Map of proposed continuous Park Corridor: A network of Garrison Creek Parks connected by the new integrated storm waterway

Figure 4.6 [top] Open spaces indicated in green at the College and Shaw neighborhood. [bottom] topography depression indicated in dark grey.

August 10, 2013
Behind Metro Supermarket

I entered between the houses just east of Fred Hamilton Park. Ahead of me is a laneway intersection. The path in north-south direction seems to be newly paved. The asphalt is a light grey color with near perfect surface texture. I turned left and was confronted by a red brick wall (Metro's back wall). The laneway next to the brick wall is a wide one, at least eight meters wide. The paving here is not as nice--you can see the cracks and the occasional weeds growing out of them.

I turned my way back onto the newly paved laneway. This is a standard laneway setup--six meters in width with garages lining both sides of the lane. There are occasional push-backs from the lane that reveal people's backyards. In these cases, garages have been removed and cars park under a porch or simply on the driveway.

One thing I was very happy and surprised to see was how many houses have produce grown in their backyards. Many families have trellises set up for growing grapes. I suppose they also act as really great backyard shading in the summer. Tomatoes is a common plant growing in this neighborhood. Some gardens are filled with plants and I can hardly distinguish what was what.

Neighborhood

The design at the neighborhood scale proposes a series of stromwater management strategies that can be implemented to the College and Shaw neighborhood[v] to not only mediate water quality for reuse but also provide a framework to construct and revitalize the neighborhood's open spaces. These design strategies are established at the corner of College and Crawford, Ossington Public School, St. Luke Catholic School and Roxton Road Parkette along with Fred Hamilton Park being the hub site of the design intervention. These design sites are then linked by the sidewalks and laneway network existing in the neighborhood, creating a network of public spaces in the neighborhood. Once these strategies are adopted ubiquitously in all of the Garrison Creek lands, the city's west end not only would benefit from a comprehensive organic stromwater management system but also gain an active public space network energized by wetlands, open waterways and wildlife habitat.

Each design site features a water retention device, either basins or storage tanks, to not only collect water for irrigation and play but also help prevent overloaded sewers during peak rain seasons that results in contamination of natural water sources (such as Lake Ontario), basement flooding, and inaccessible streets. The capacity of four proposed stromwater detention sites - Fred Hamilton Park, Metro Square, Ossington Orchard School Wetlands and Roxton Road Parkette – are compared with the their respective collection area's runoff volume[vi] to portray how these sites handle average and peak daily rainfall (Figure 4.7). The water harvesting strategies for these sites are further illustrated in the following sections which explain the design of Fred Hamilton Park, its playground and satellite sites.

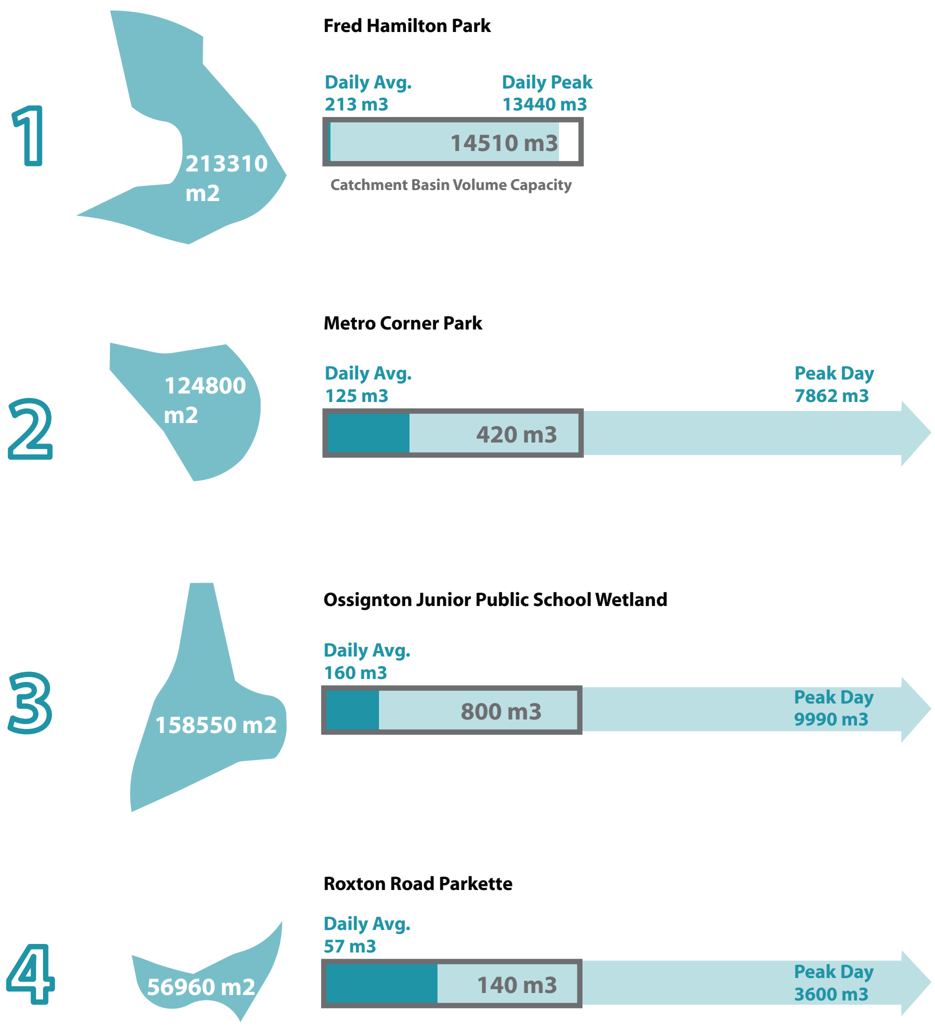
Note v The neighborhood is defined with College street on the north, Dundas Street on the south, Ossington street to the west and Montrose Avenue to the east.

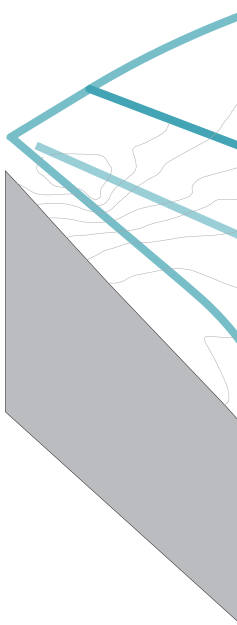
Note vi Total runoff volume = Average/Peak Daily Rainfall x Rain Fall Collection Area x Runoff Factor. Refer to Appendix Figure 5.5 for Stromwater Collection Volume and Basin Capacity table.

August 14, 2013
Ossington Orchard Public School

I followed a path wedged between the playground and the end of a block of row houses on Ossington Avenue, and found myself in the back of the school next to a lush stepped garden. Vegetables are planted in the garden and neatly labeled as kale, cauliflower, tomatoes, etc. Turning a corner, I found the space opened up and there were more stepped gardens to my left and the backyards of a few houses sitting on a hill to my right. The stepped gardens have tiny paths that lead to the top of the hill. Kids love it here. The natural topography left behind by the Garrison Creek provides a natural playground for them. It offers places to hide, slopes to run and accelerate, as well as stepped retaining walls for resting.

Figure 4.7 College and Shaw neighborhood local drainage diagram and site comparison. Refer to Appendix Figure 5.5 for Stromwater Collection Volume and Basin Capacity table.





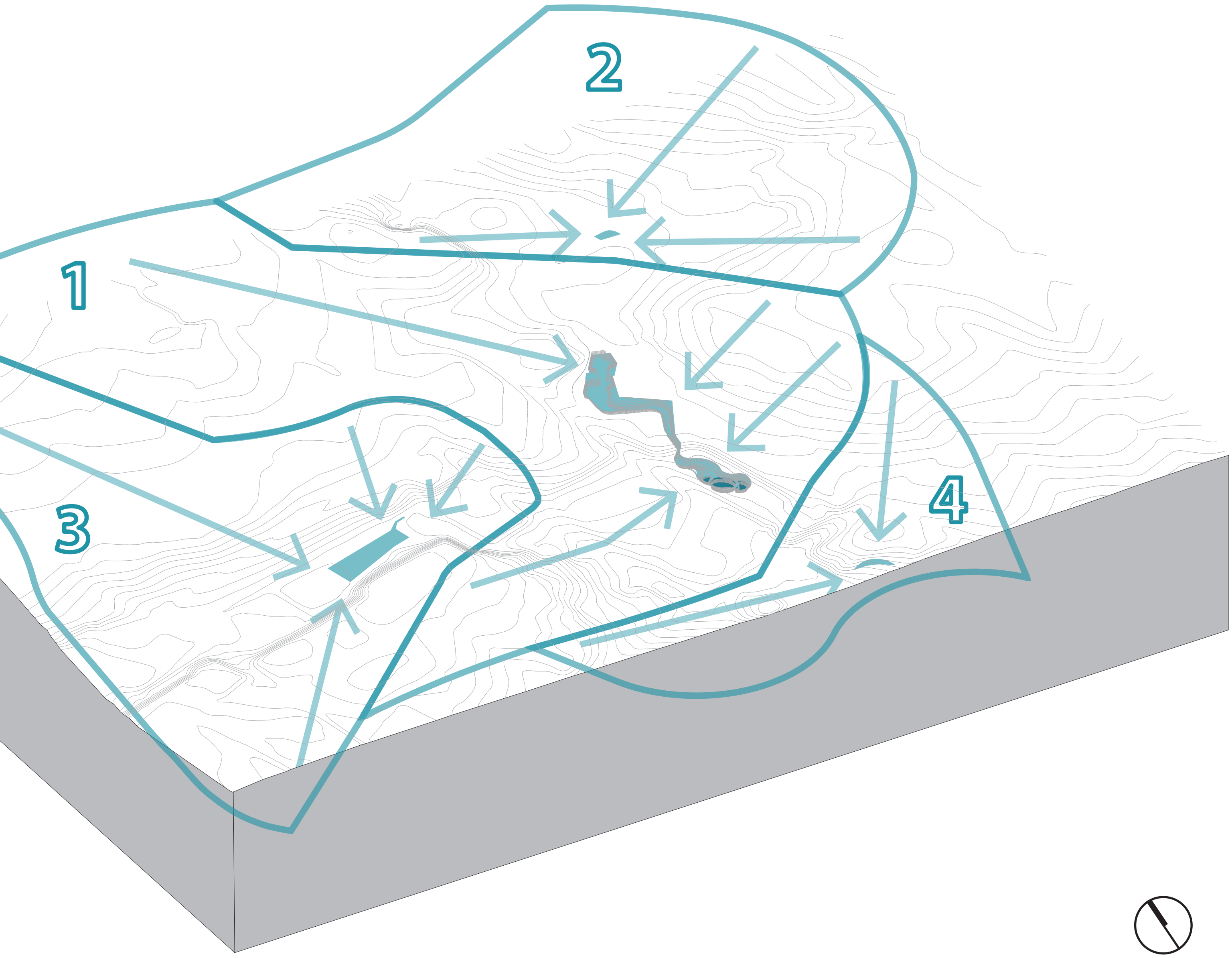

1
2
3
4

Figure 4.8 [opposite] College and Shaw neighborhood master plan with neighborhood scale section references. Refer to Map A for 1:1000 Plan.

August 5, 2013
Fred Hamilton Park

I Settled at the picnic table under the tree, took out a Annie Dillar book to read for the rest of the afternoon. It's interesting to read her book in the outdoors. The rustling leaves and quite breeze set a good mood for the read.

I get distracted easily and my eyes tend to wonder when other things are happening around me. At this instance, a sparrow landed on the picnic table only about six inches away from me. I thought sparrows are easily startled, but not this one. It jumped two steps towards me, looked down as if it was checking on my reading progress, and then it quickly flew off, but landed on the other edge of the table. It tilted its head again to see what's under and beyond the table, and then it was on its way to somewhere else. I'm not sure if it was the same sparrow, but a bird came back a few more times, staying for about half a minute each time.


College Street
Roxton Road
Shaw Street
Crawford Street
Ossington Avenue
Harrison Street
Dundas Street
75
81
79
76
85
87
89
91

Fred Hamilton Park

As the largest public park in the College and Shaw neighborhood, Fred Hamilton Park currently functions as a hub for the public's recreational and leisure activities as well as community events and gatherings. The proposed scheme introduces another function to the park: A stream running through the park with three retention basins located on the south portion to help detain stromwater runoff collected from the streets, laneways and paved parking lots in the area. Fred Hamilton has the largest capacity for stromwater detention compared to the other satellite sites. Its stream and basins can retain more than 50% of the neighborhood's stromwater runoff during 100mm rain surges. The wetlands located at the head of the stream helps treat intake water coming from the underground stromwater pipe which is a trunk sewer that collect catch basin runoff on College and Crawford Streets. Other than the wetlands, the streams and basins also support a wide range of wildlife habitat. On the south portion of the park, the stream bank is retained by a series of *Geoterraces* that features reedbeds at the lower levels to handle seasonal water level fluctuation, and transitions into shrublands and woodlands as the elevation increases. A series of ramps cut through the *Geoterraces* to provide intimate contact with flora and fauna for the public. As one descends into the area, she or he can experience the transition of one habitat to another as the ground elevation changes.

Figure 4.9 Fred Hamilton Park plan, refer to Map B for 1:500 plan.

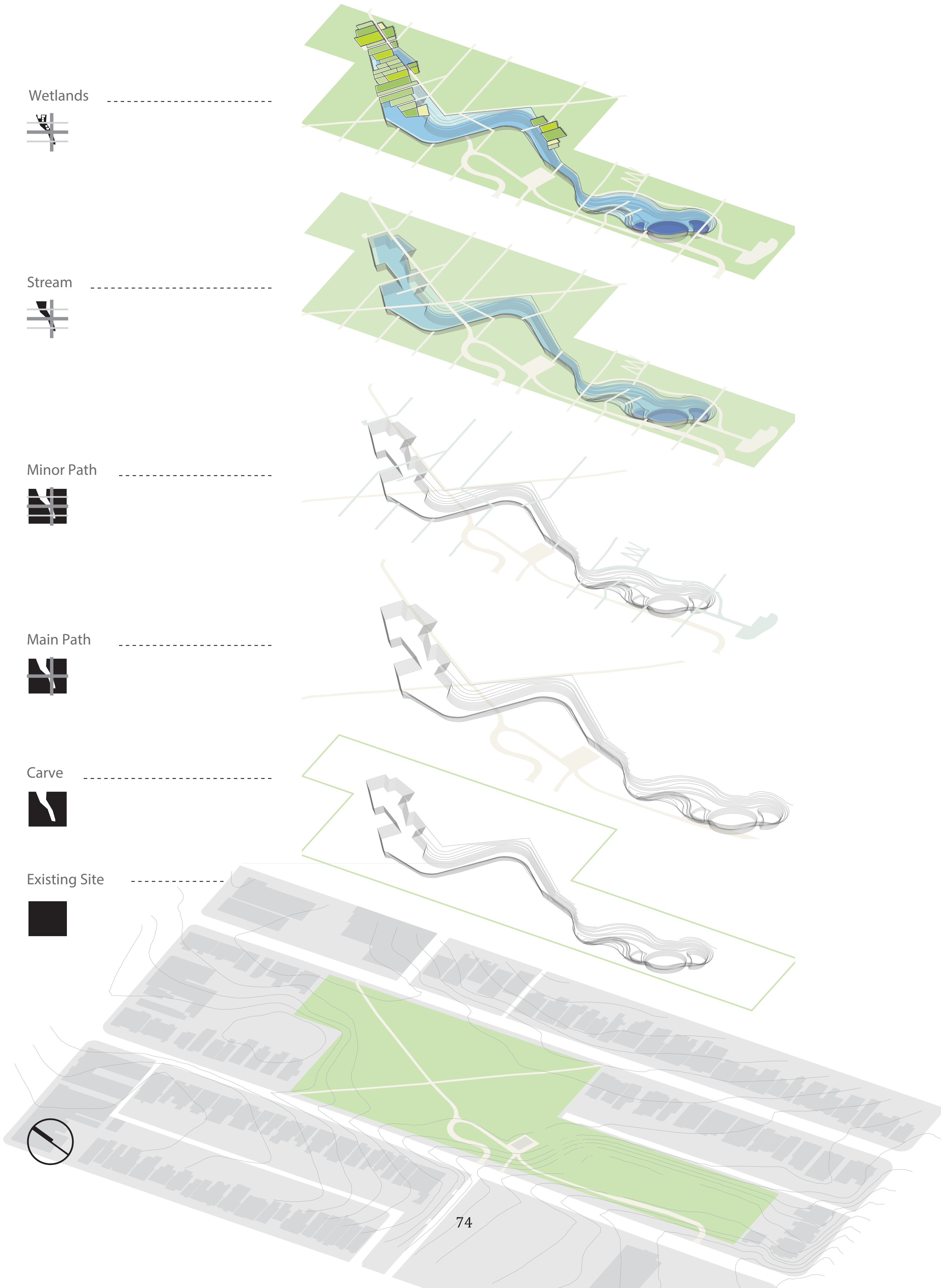

Wetlands
Stream
Minor Path
Main Path
Carve
Existing Site

Figure 4.11 [Opposite] Diagram showing the various layers making up the new Fred Hamilton Park.

Figure 4.10 Fred Hamilton Park Sectional Perspective

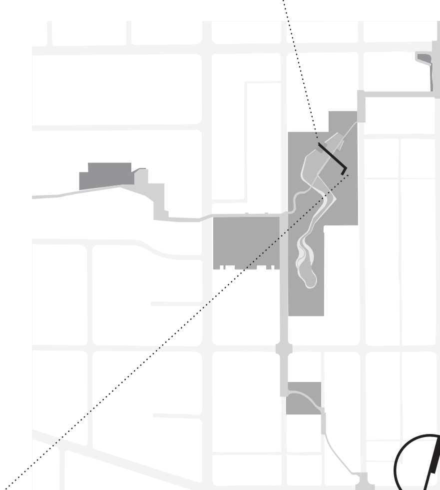


Figure 4.12 Sectional perspective through foot bath and detention basin on the south end of Fred Hamilton Park.

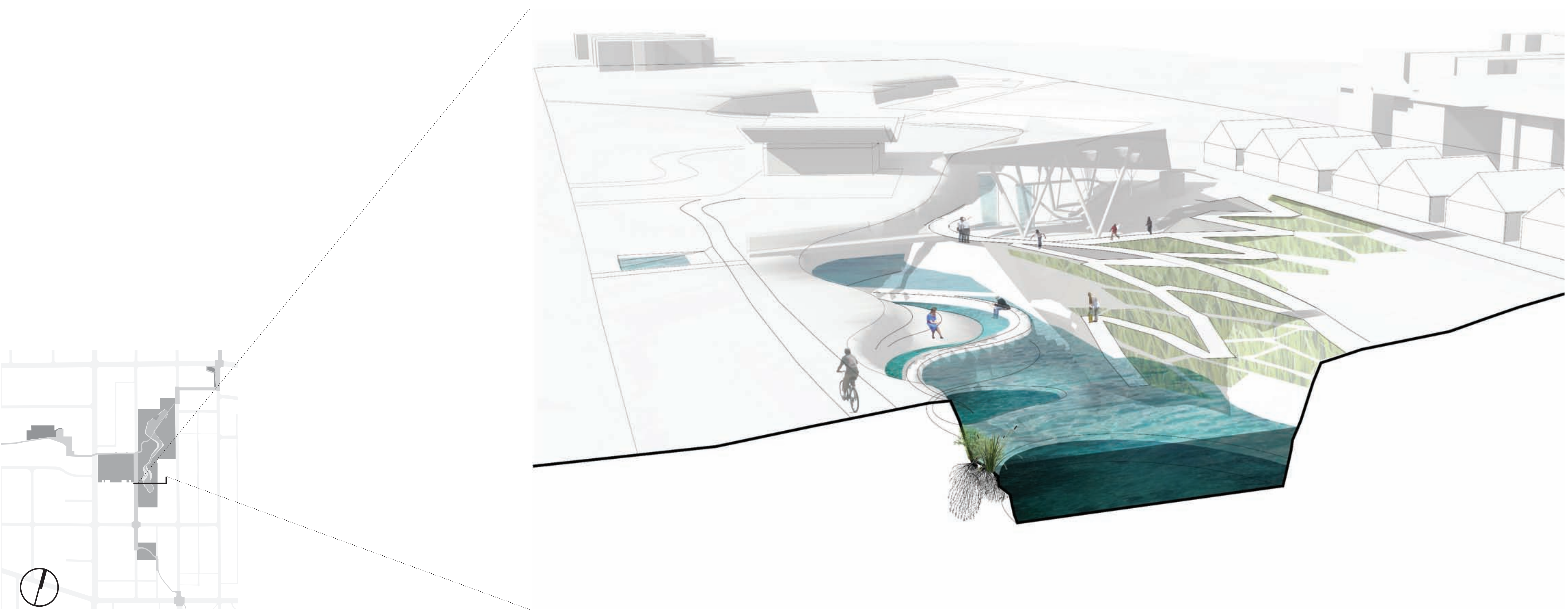


Figure 4.13 Sectional perspective through foot bath and detention basin with different space occupation in [top] dry season and [bottom] heavy rainfall season.

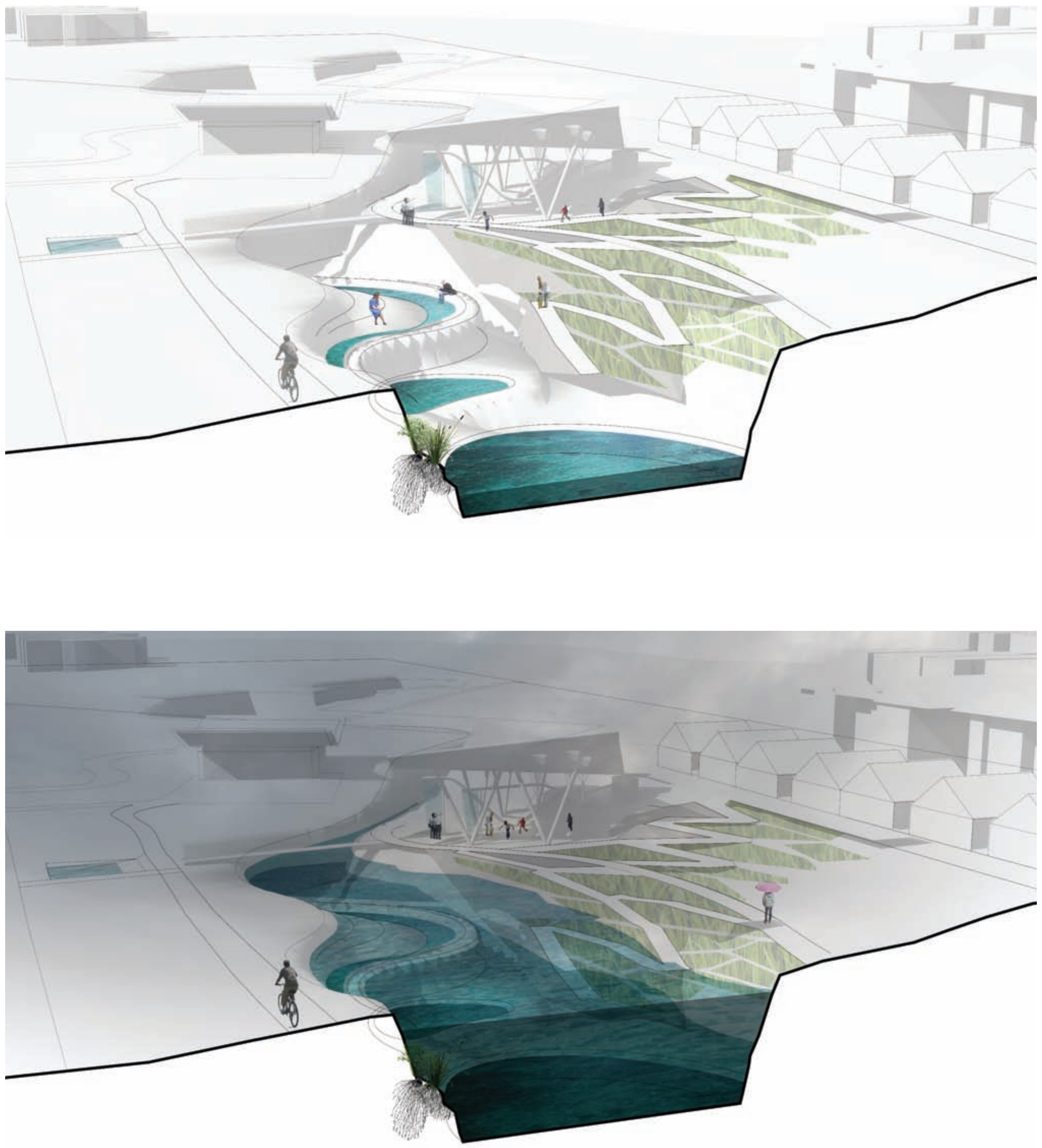
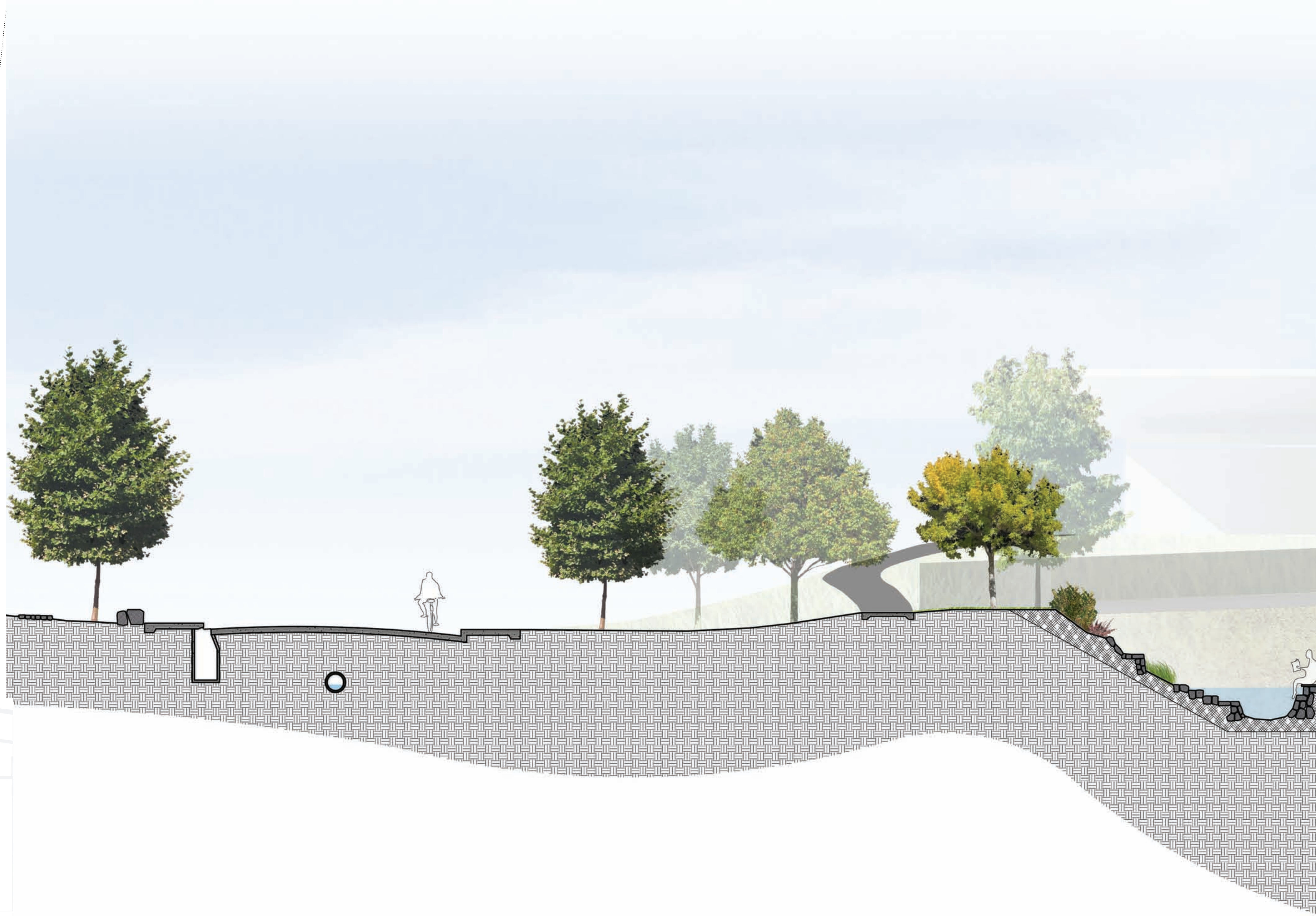
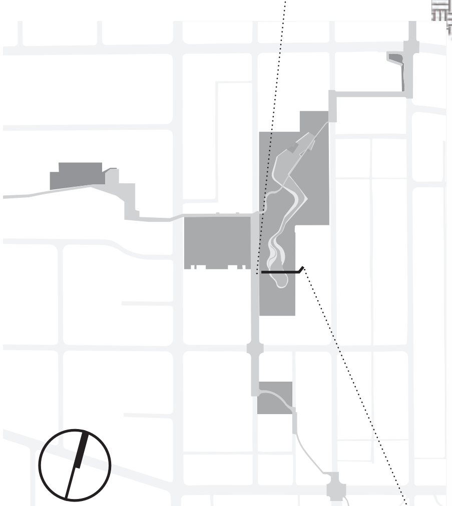
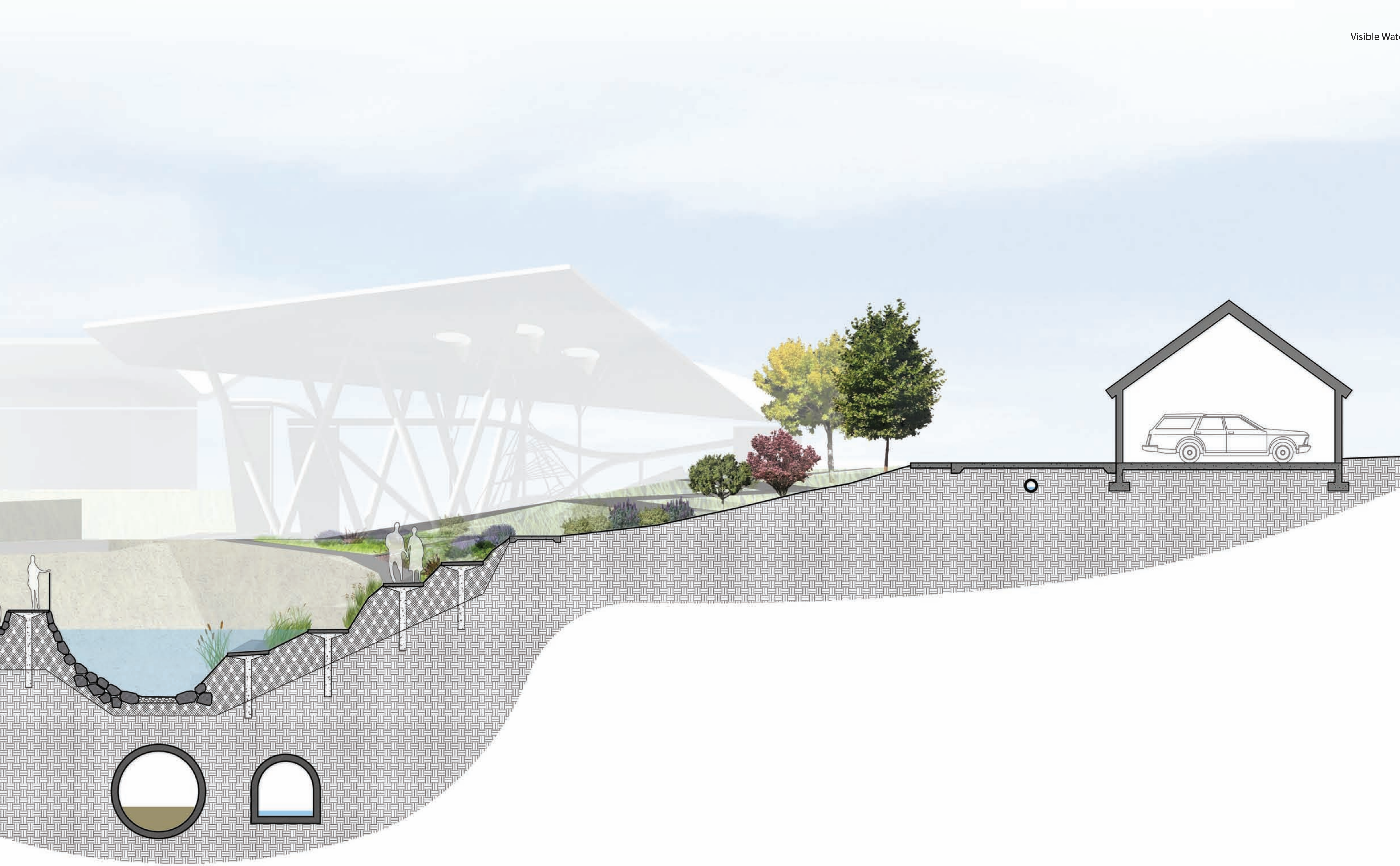


Figure 4.14 1:100 East-west section cut through Fred Hamilton Park







Fred Hamilton Playground

Immediately to the north of the *Geoterraces* is the proposed playground. The intention for redesigning the park's playground is to; first, integrate water to become a central part of the public spaces and everyday play; and second, to reconnect the public space with the city's pedestrian and infrastructure network. The design of the Fred Hamilton Playground features a roof structure that has the same rainwater catchment area as the park's newly renovated washroom pavilion. In contrast with the pavilion's roof, the playground's roof is folded on a diagonal to direct rainwater into its cistern tank located on top of the east berm. The tank is sized at 20 cubic meter capacity, which is roughly how much rainwater the playground roof can catch in a day during the city's record-high rain surge at 126mm[vii]. Water harvested into the cistern tank goes through large and small sediment filtering before it gets UV disinfected to meet sanitary requirement for recreational use. Because the playground water is collected directly from the playground roof, minimum treatment is required for recreational use.[2]

Note vii Daily rainfall of 126mm was measured on July 8,2013 at Toronto's Pearson Airport by Environment Canada.

After the collected water is treated, the two pipes connected to the cistern tank will help discharge the treated water through the two water screen features, across the bridge and into the triangular pool plaza next to Roxton Road. The Cistern tank will discharge to the pond every month throughout April to October unless the area is hit by rainfall heavier than the monthly average (Figure 4.18), in which case the discharge would happen the day after the rain surges with 60mm or more precipitation. When the water screens and features are not on automatically during monthly discharge periods, the water in the cistern tank can be controlled by a manual foot pump. This would allow the people in the community to not only use the water as desired, but also to monitor the playground water usage, and therefore become aware of quantity used in relationship to the amount collected. The cistern features a glass window with water volume markers to inform the community how much water is available for play. An immediate water show can be seen at the playground, water screens and pools as soon as one starts cranking on the foot pump. Consequently, a relationship between visual cues of the water flowing and one's feet stepping repeatedly on the pump is created. This kind of active participation encourages collaborative play where one may lend a hand to help creating a bigger water spectacle as the water flow speeds up if more energy is given to the pump. Furthermore, this setup, involving water collection, distribution and reuse processes

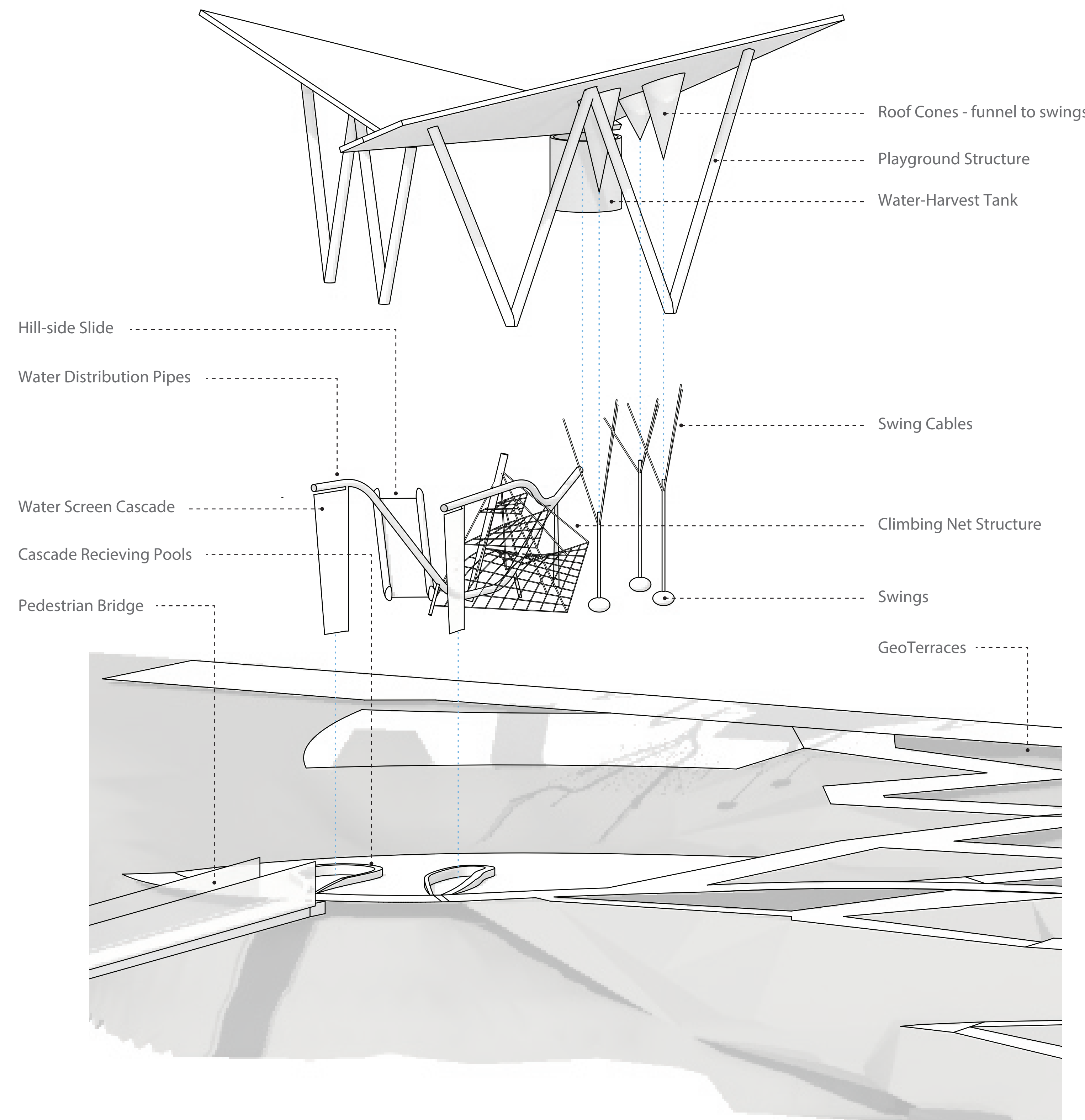
2 Landcom, " Water Sensitive Urban Design: Book 2, Planning and Management",2004.

visible to the public, demonstrates the sustainable urban water cycle to all age groups through participatory play.

The playground also features a slide and a net climbing structure for younger children to explore. The roof structure not only functions as device for water harvesting but also provides shade for the play area. On the north side of the playground, three swings are also hung from the roof. At where the swings are hung, the roof has punctures with a cone shaped funnel attached to direct water into the reservoir at the bottom of the spherical swings. As one mounts onto one of the swings, the weight of the body and the oscillating motion causes the water to trickle out from the swing and draws out varying patterns on the playground floor.

The south portion of Fred Hamilton Park is designed to be a diverse public space where all age-group demographics from the neighborhood can enjoy socializing with one another and or participate in one of the park events, such as community gardening, informal book club meetings and foot bathing. The meandering path and ramps down to the creek basin allow aimless wondering throughout the park and create new opportunities for the neighborhood's long tradition of organized or self-directed urban discovery walks. The playground, with its ponds and water features naturally becomes a hub to the park, where the paths converge and children and adults meet and interact. While the playground on the east side of the basin has a focus for children's play, it is not separated from the rest of the site and teens and adults are encouraged to participate along in using the equipment and water features. Connected to the playground with a bridge carrying the playground water stream, the west pool plaza is a slower paced area where one can walk through the pool bare feet to experience the subtle texture patterns under his or her feet. Children may scoop water from the pool and splash each other on a hot day, while the parents sit on the sloped lawn, one buried in her book and the other waving and smiling at their children. The pool plaza also functions as a buffer to the pedestrian traffic on the sidewalk attached to it. A nurse rushing to her Sunday shift can pause here for a few seconds and soak in the sunshine and its sparkles on the water before she moves back onto her daily routine.

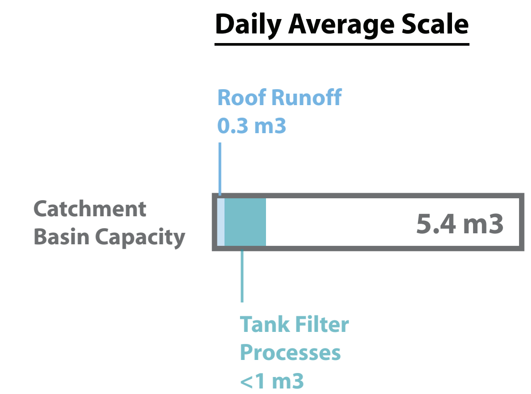
Figure 4.15 1:50 Fred Hamilton Playground Exploded Isometric Drawing.

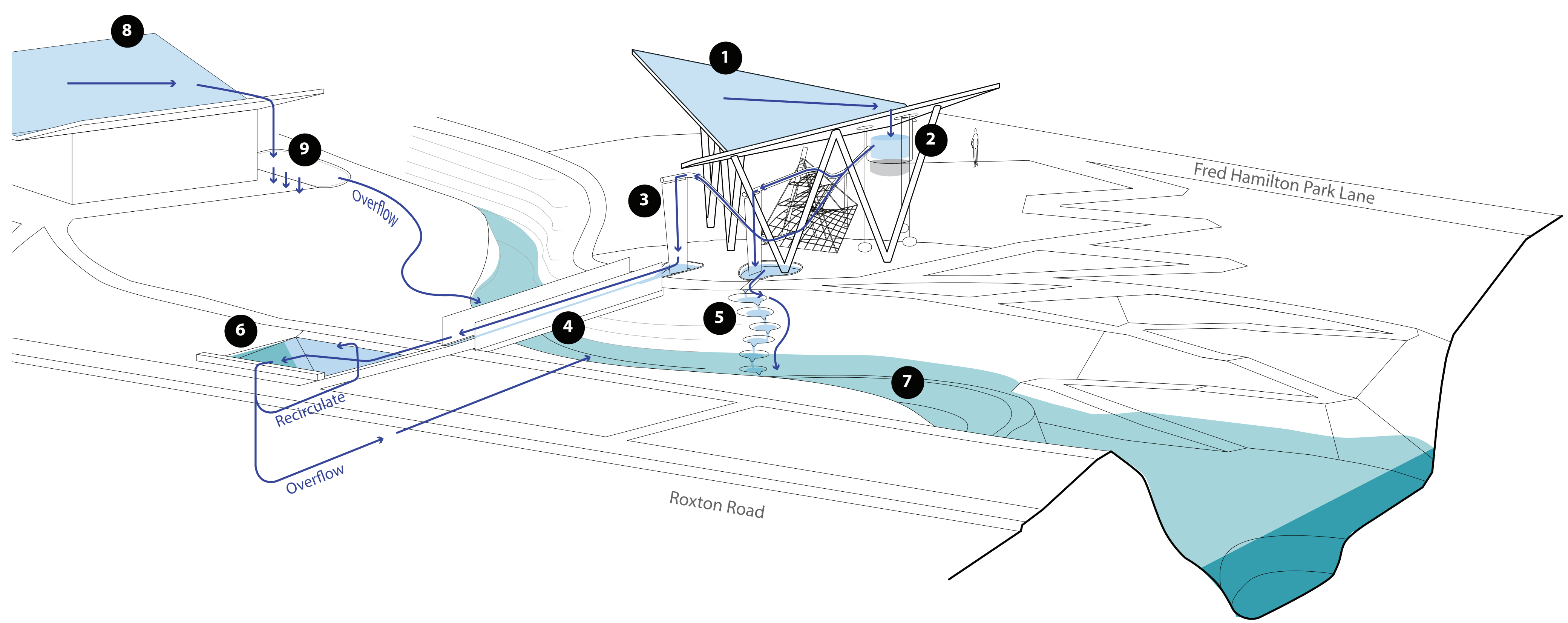


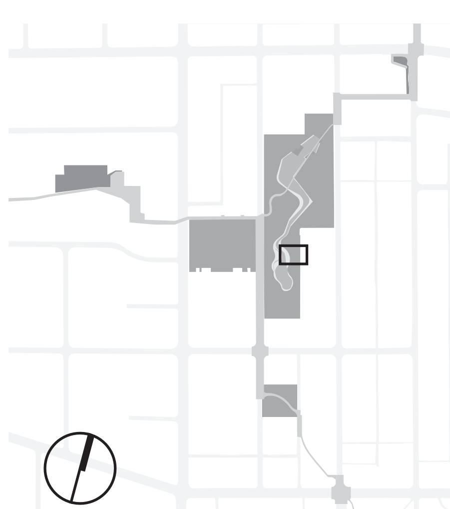
Fred Hamilton Park Playground

Figure 4.16 1:250 Fred Hamilton Playground water harvest and distribution isometric diagram.

1. Playground
2. Playground Water-Harvest Tank
3. Water Screen Cascade
4. Pedestrian Bridge
5. Cascading Water
6. Play Pool
7. Main Stream
8. Existing Park Pavilion Roof
9. Existing Prototype Rain Garden







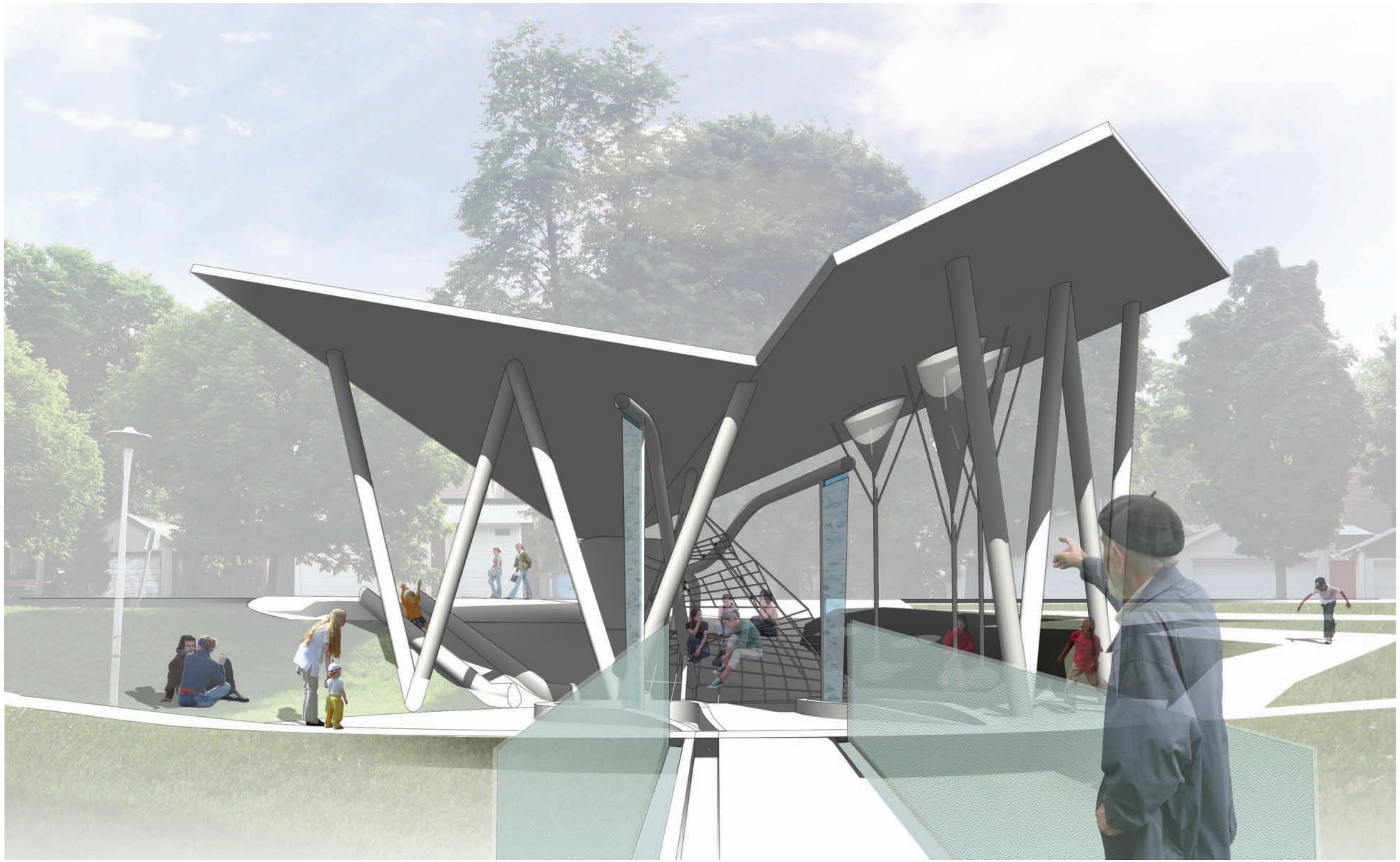


Figure 4.17] Fred Hamilton Playground vignette

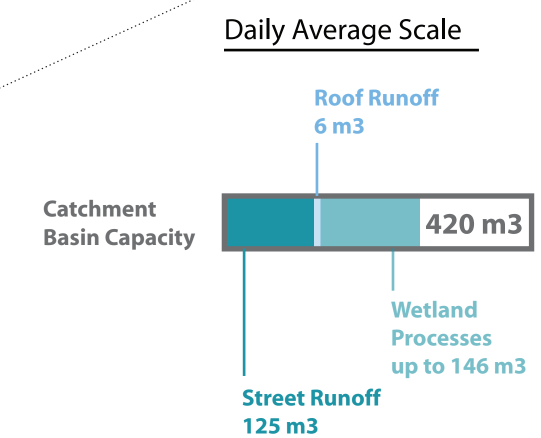
Metro Square

Figure 4.18 1:750 Metro Square water harvest and distribution isometric diagram.

1. Metro Supermarket Roof
2. Temporary Holding Pool
3. Wetland Pool
4. Retention Basin In Metro Square
5. Street Landscaping Pods

Satellite Sites

As seen in Figure 4.7, drainage quantity diagram, it is evident that all the proposed sites are not designed to handle peak rain surges except for Fred Hamilton Park. The satellite sites, George Ben Park, Metro Square, Ossignton Public School Wetlands and Roxton Road Parkette must rely on other stromwater management strategies, such as raingardens and permeable paving to offset rainwater loads during peak times. However, these sites, featuring constructed wetlands, detention pools and reservoir tanks are more than capable to help relief sewer overload by detaining excess water locally during 10 or 20 year floods, and hence preventing contaminated water flowing into Lake Ontario. Moreover, these satellite sites also function as smaller public spaces that put the public in touch with water and wildlife habitat. As a result, the citizens learn to understand the renewed urban water cycle while playing in these spaces.



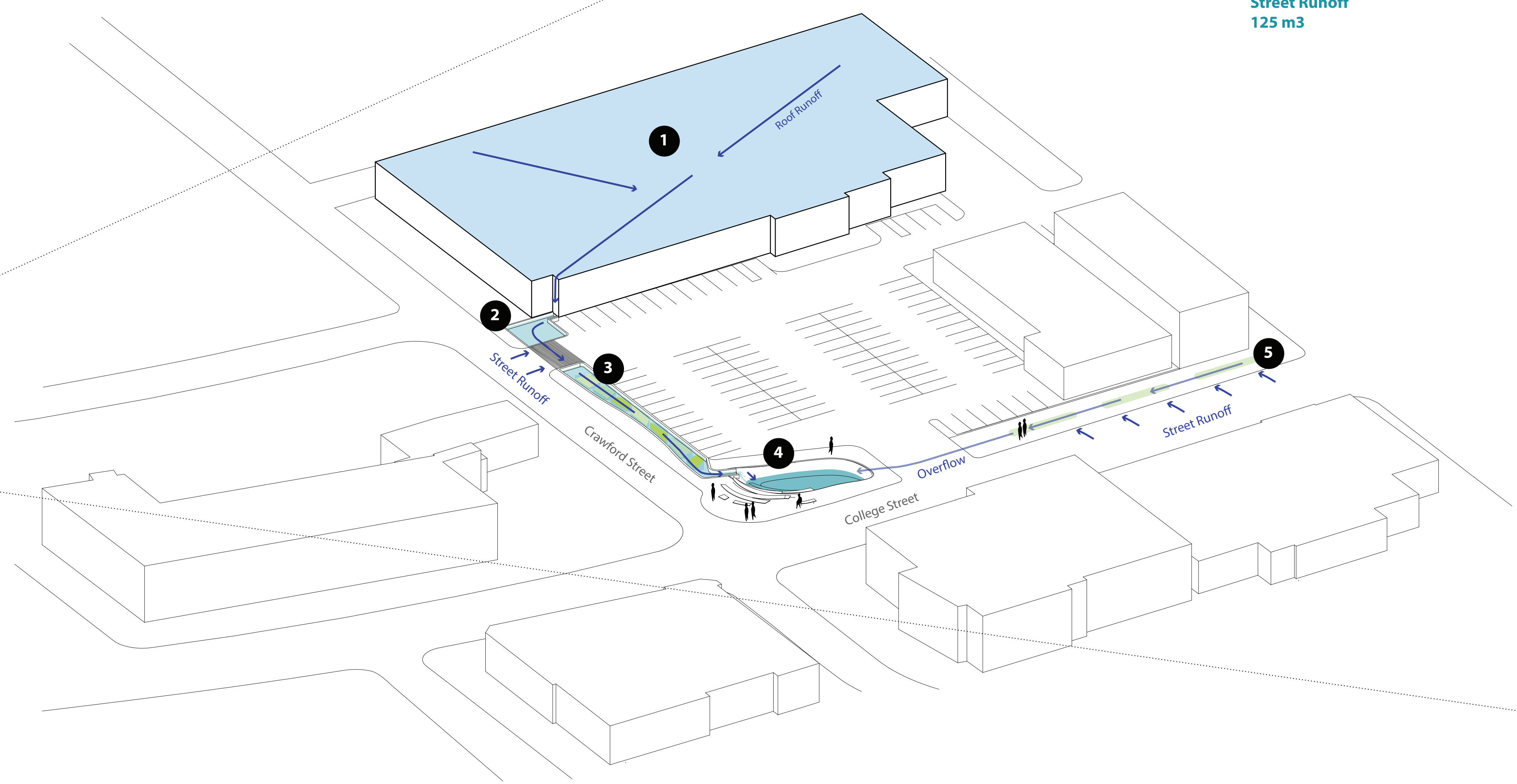
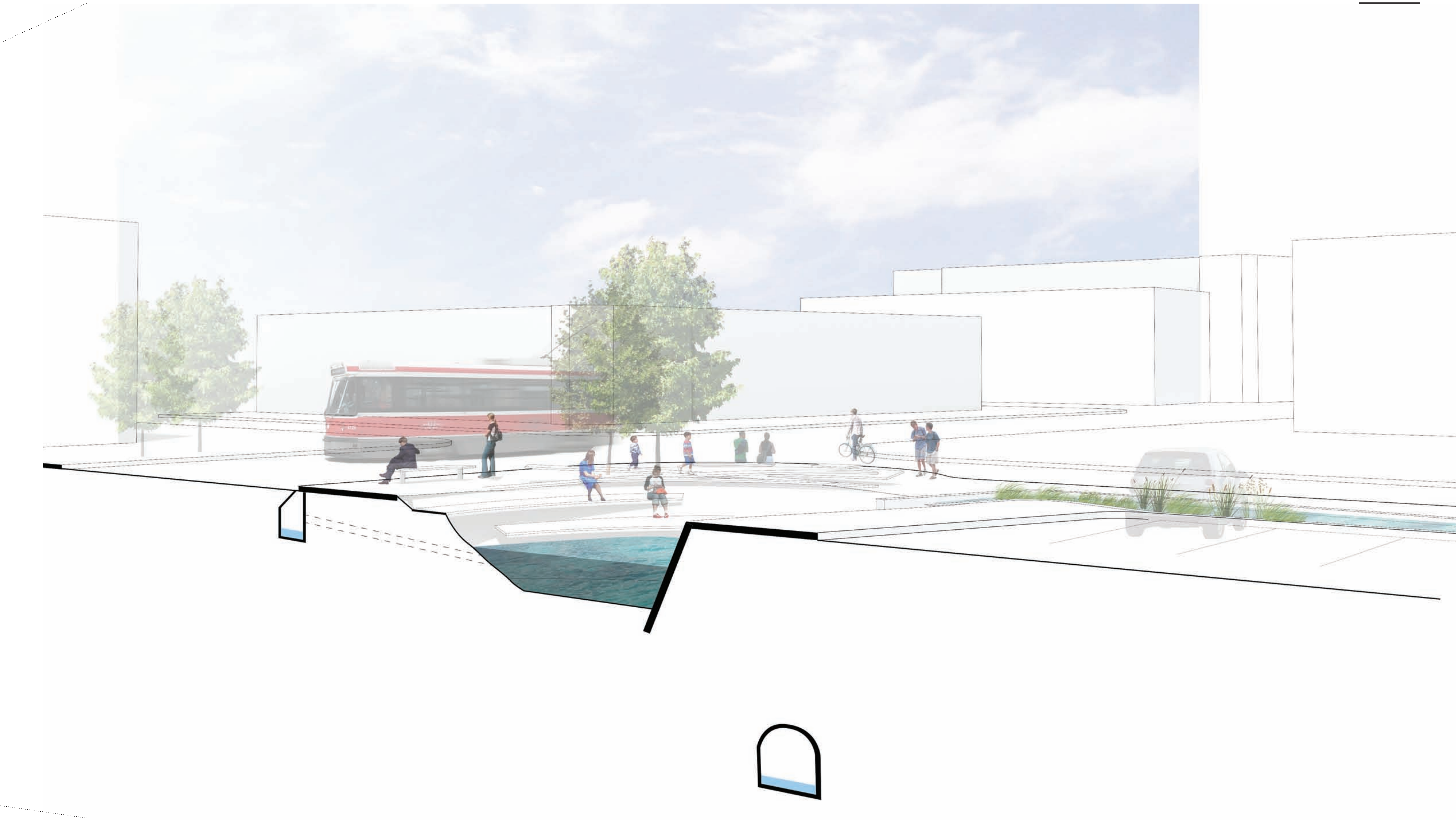


Figure 4.19 [opposite] Metro Square Sectional Perspective



George Ben Park

Figure 4.20 1:750 George Ben Park water harvest and distribution isometric diagram.

1. St. Luke's Catholic School Roof
2. 3 x Water Towers
3. George Ben Park and St. Luke's Sports Field
4. School Garden
5. Fred Hamilton Park Basin

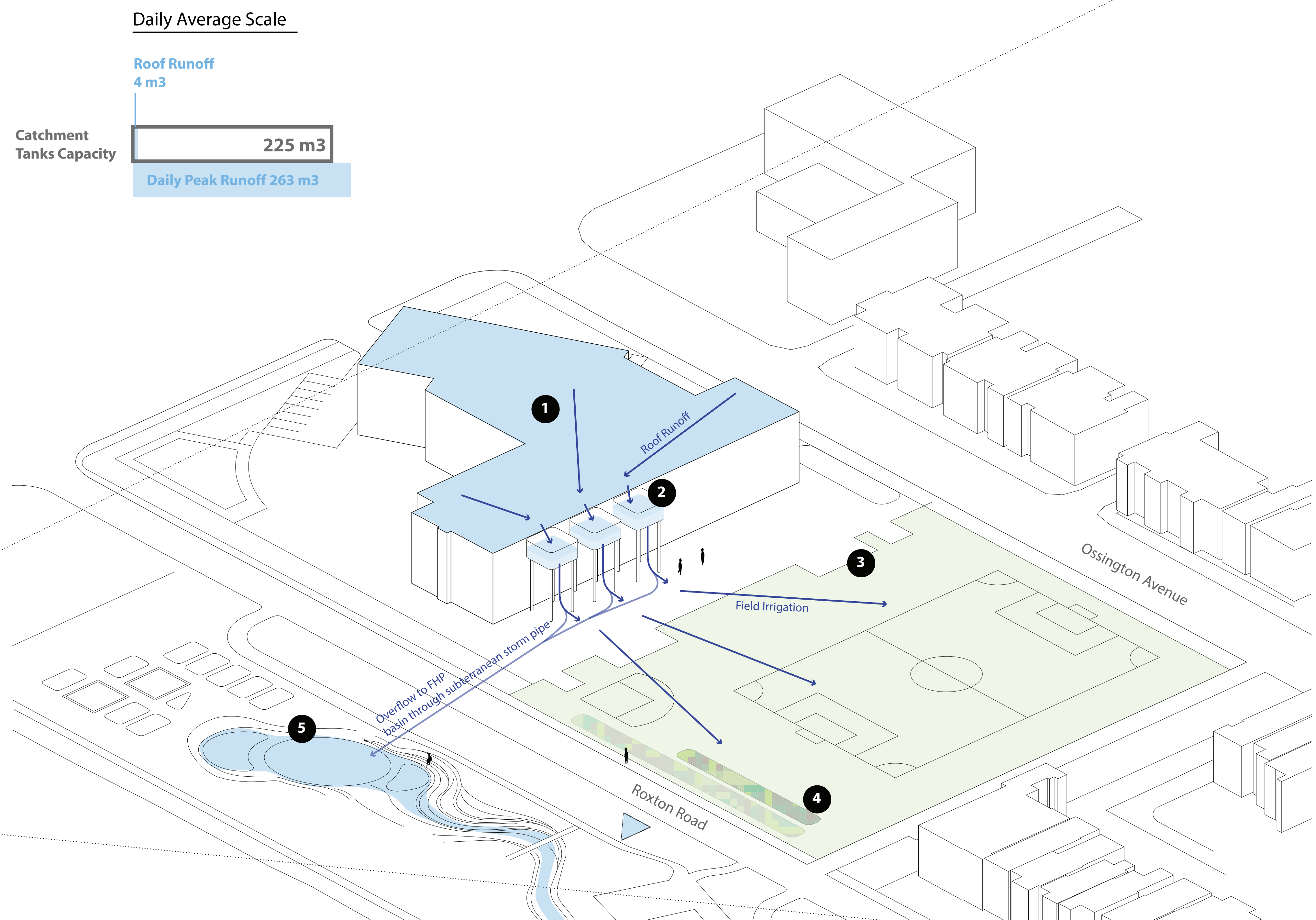
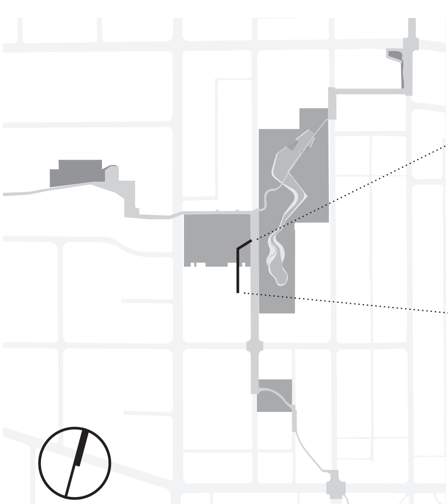


Figure 4.21 [opposite] George Ben Park Sectional Perspective at St. Lukes Catholic School.

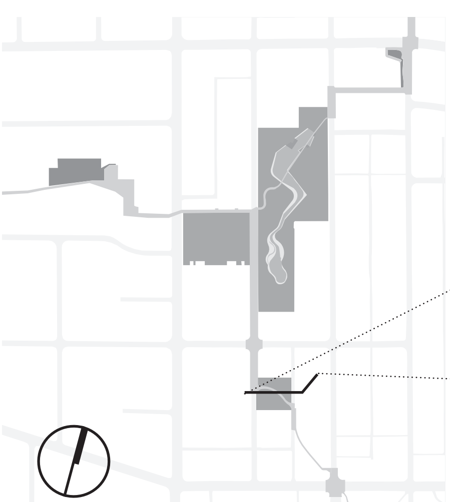


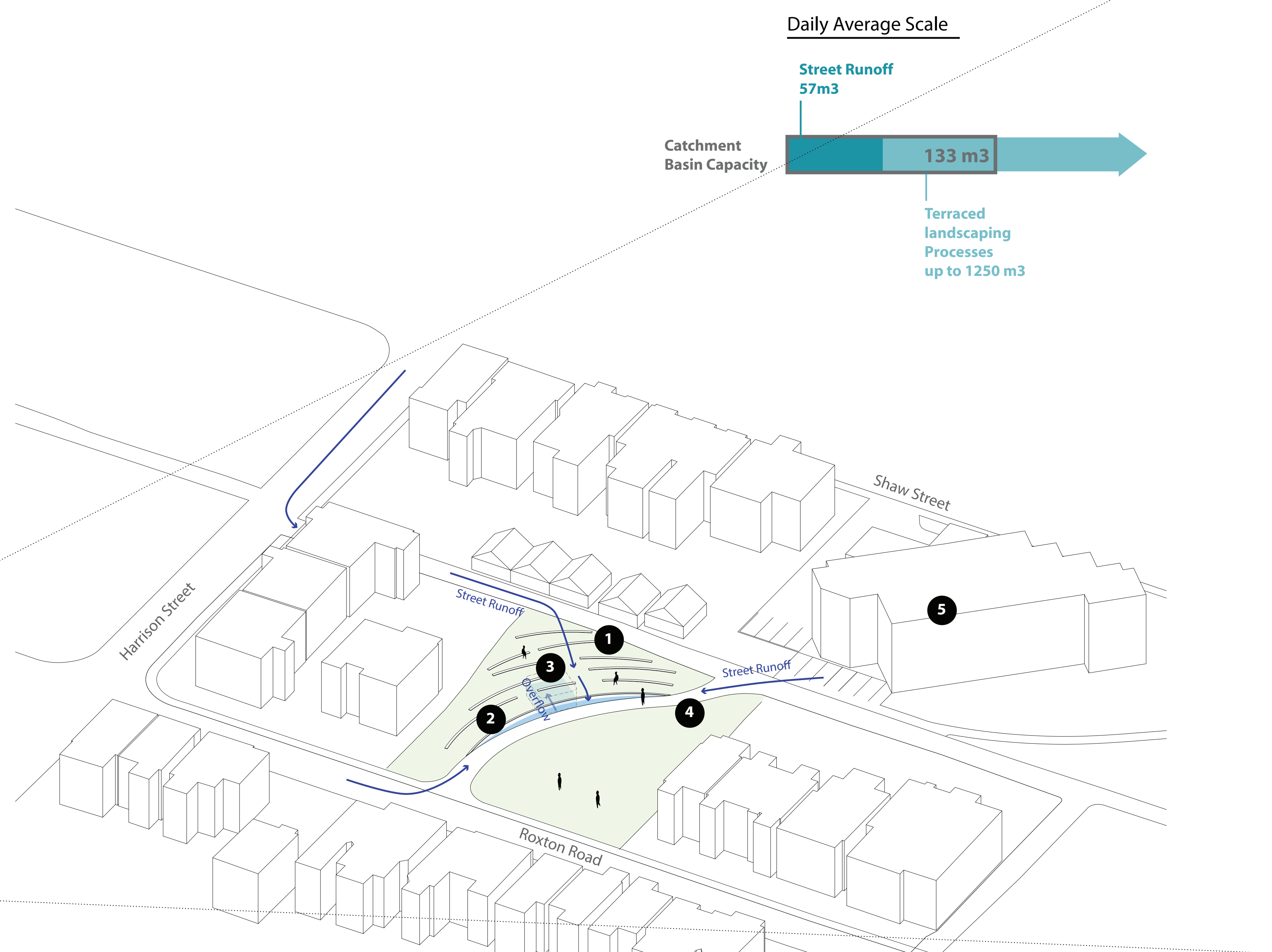
Roxton Road Parkette

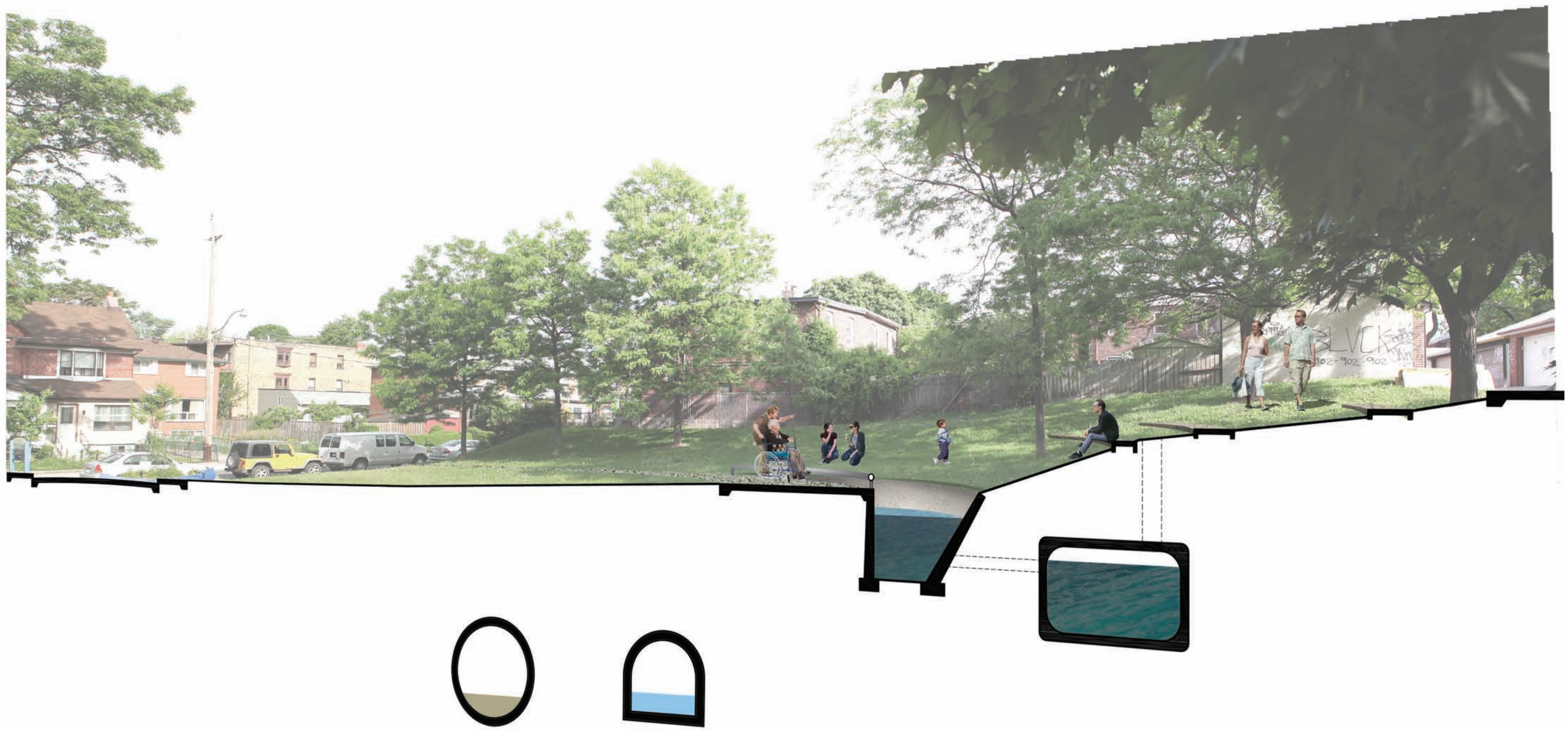
Figure 4.22 1:750 Roxton Road Parkette water harvest and distribution isometric diagram.

1. Terraced Landscaping
2. Roxton Road Parket Pool
3. Underground Cistern Tank
4. Wheelchair Accessible Path
5. Bellwoods Community Housing

Figure 4.23 [opposite] Roxton Road Parkette Sectional Perspective.







Ossington Orchard Public School Wetlands

Figure 4.24 1:750 Ossington Orchard Public School Wetlands water harvest and distribution isometric diagram.

1. School Roof
2. School Parking Lots
3. Runoff Water Collection Basin
4. Constructed Wetlands
5. Treated Water Basin
6. Temporary Holding Basins
7. Shool Gardens

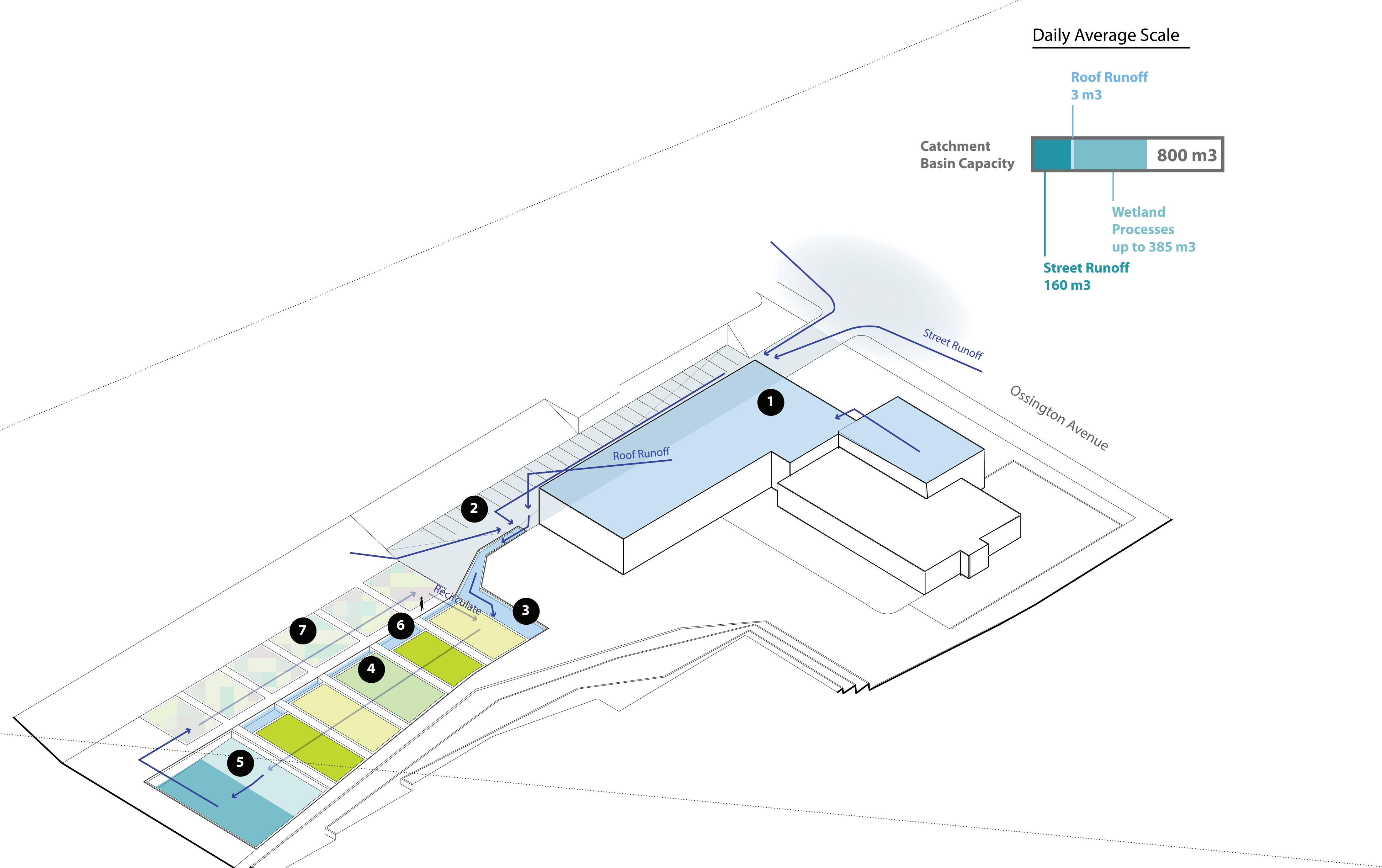
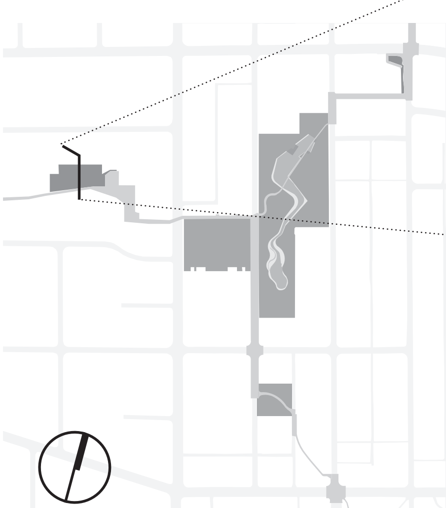
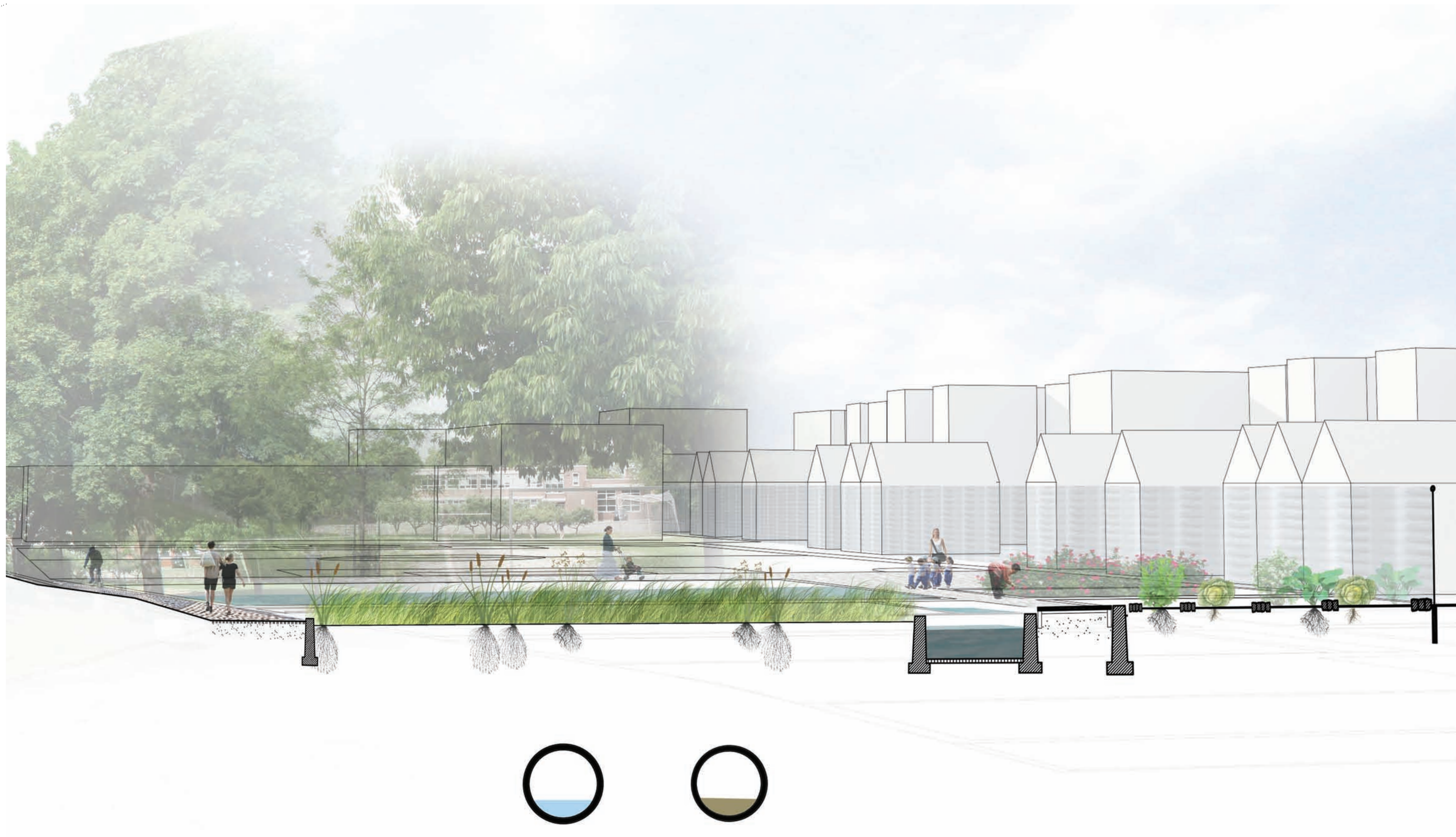
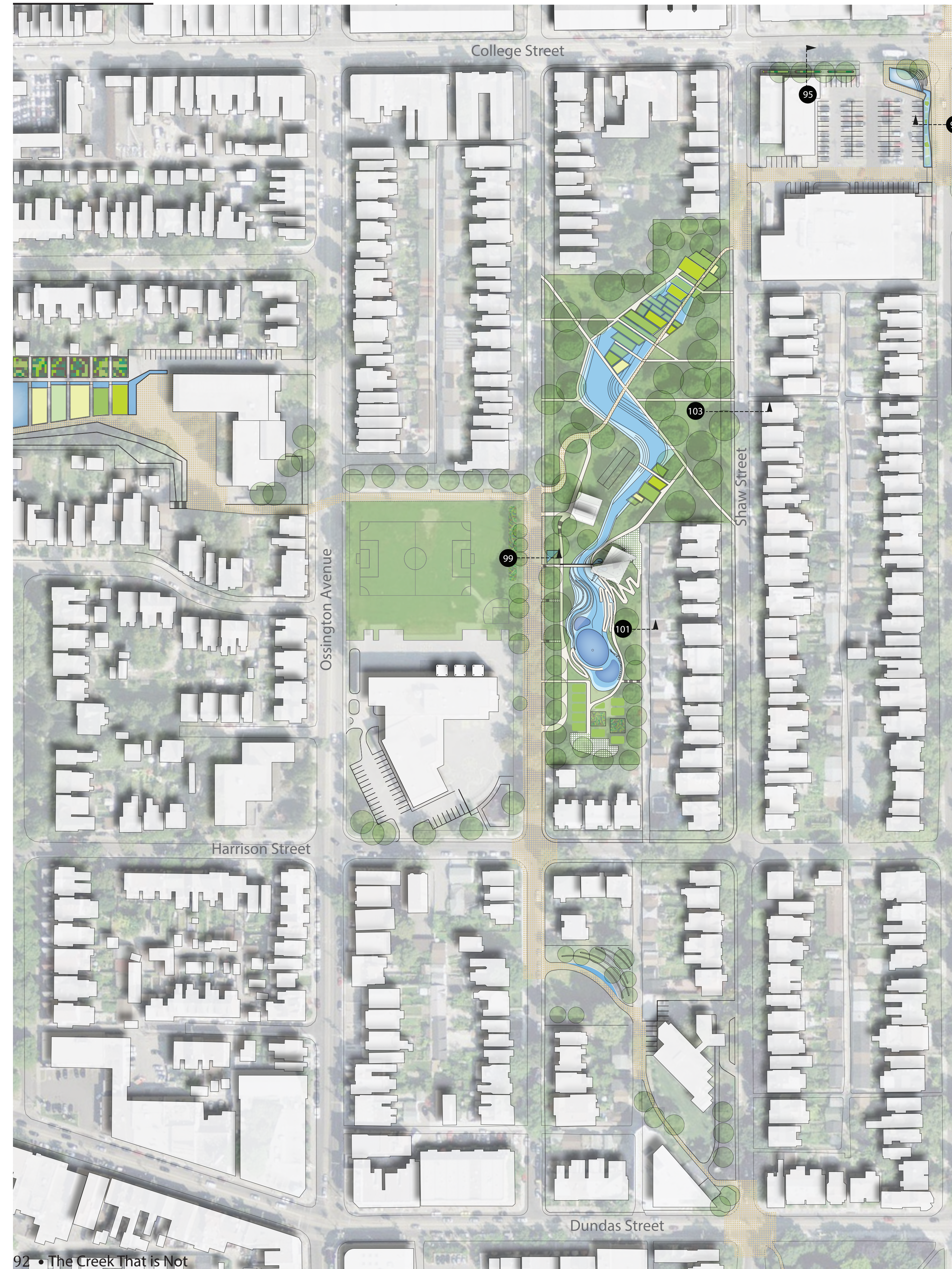


Figure 4.25 [Opposite] Sectional perspective cutting through Ossington Orchard Public School Wetlands






College Street
Ossington Avenue
Shaw Street
Harrison Street
Dundas Street
95
97
103
99
101

Detailed Assembly

Figure 4.26 [opposite] College and Shaw neighborhood master plan with detailed assembly scale section references. Refer to Map A for 1:1000 Plan.

The following drawings in this section illustrate the thresholds between the proposed design sites and arterial streets, including laneways and sidewalks. As Aldo van Eyck says, parks and playgrounds should not be isolated from the streets but instead should become part of the street, this thesis design proposal makes a conscious effort to link public spaces with the city's streets.[3] This extends the citizen's mobility into the city's border transportation infrastructure and allows the design sites to be linked with other leisure and institutional spaces. Furthermore, the detailed sections also demonstrate how stromwater runoff is moved from the streets to localized detention and treatment areas in order to yield less sewage overflow burden than previously during rain surge conditions. These street-side and localized stromwater management strategies, including landscaped sidewalks, bioswales and wading pools etc, further assist the main basins and pools, introduced at Fred Hamilton Park and its satellite sites, with stromwater treatment and detention while providing natural wild habitat and play spaces to the city and its citizens.

3 Van Eyck, "On the Design of Play Equipment and the Arrangements of Playgrounds", 113.

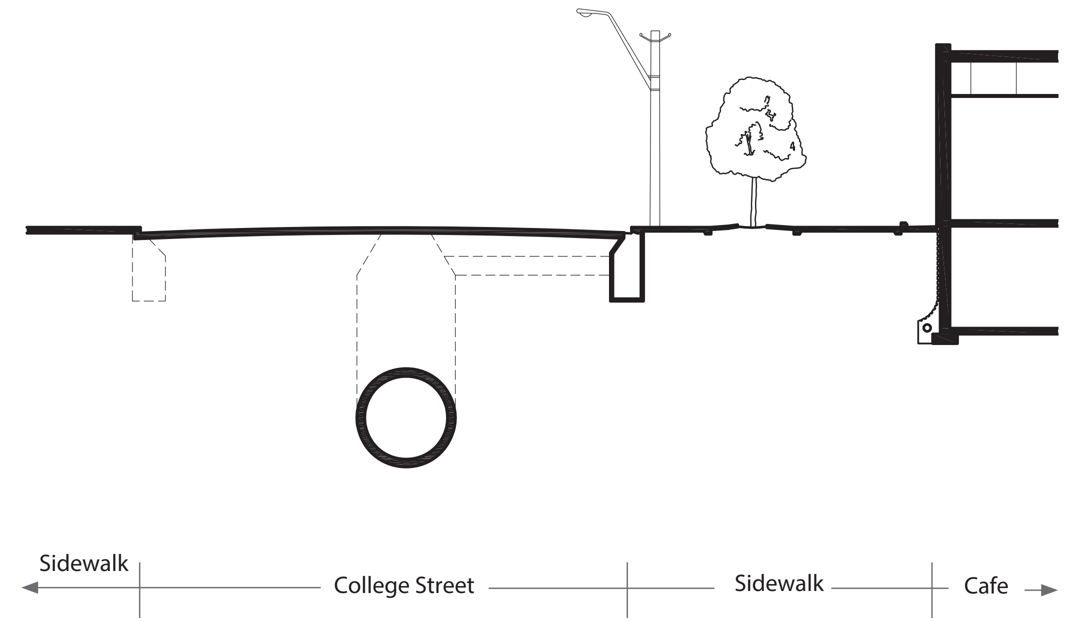
College Street

Figure 4.27 [opposite] 1:50 proposed College Street section

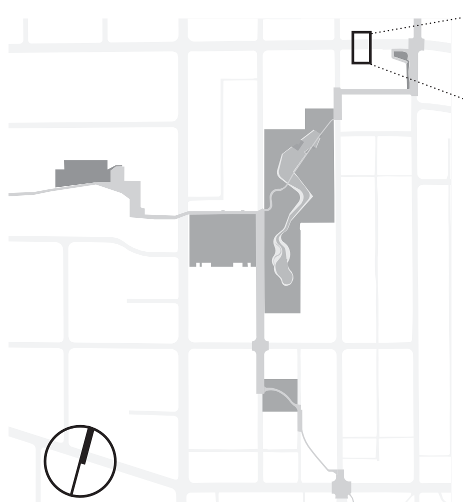
Figure 4.28 [right] 1:200 College Street existing section

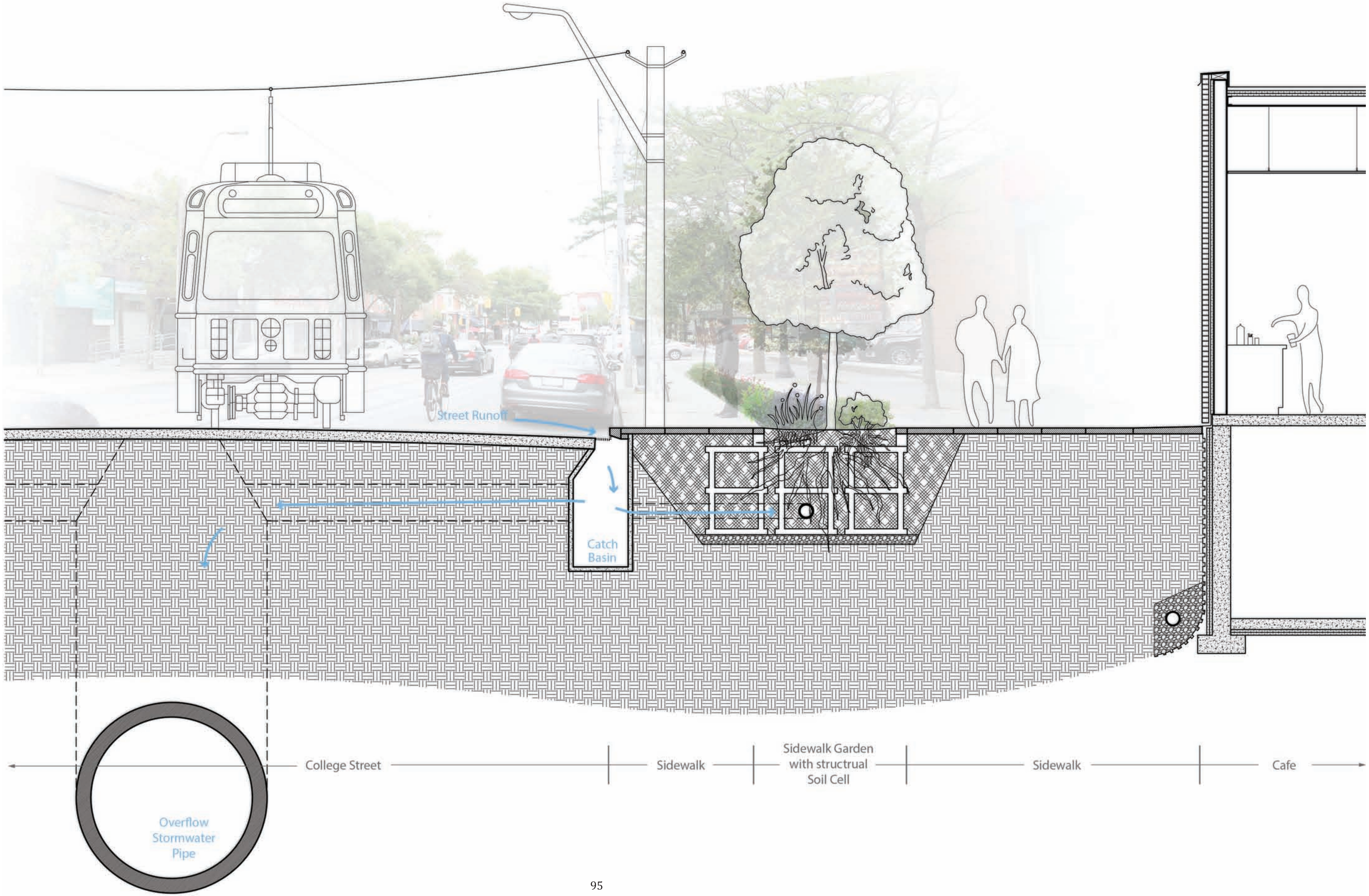
Figure 4.29 [below] Key plan and 1:200 College Street plan.

Existing Section



Proposed Plan




Street Runoff
Catch Basin
Overflow Stormwater Pipe
College Street
Sidewalk
Sidewalk Garden with structrual Soil Cell
Sidewalk
Cafe

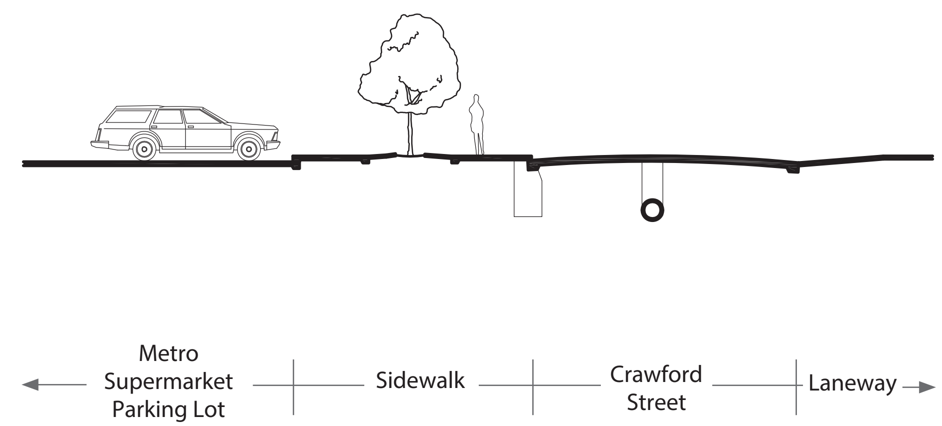
Crawford Street

Figure 4.30 [opposite] 1:50 proposed Crawford Street section

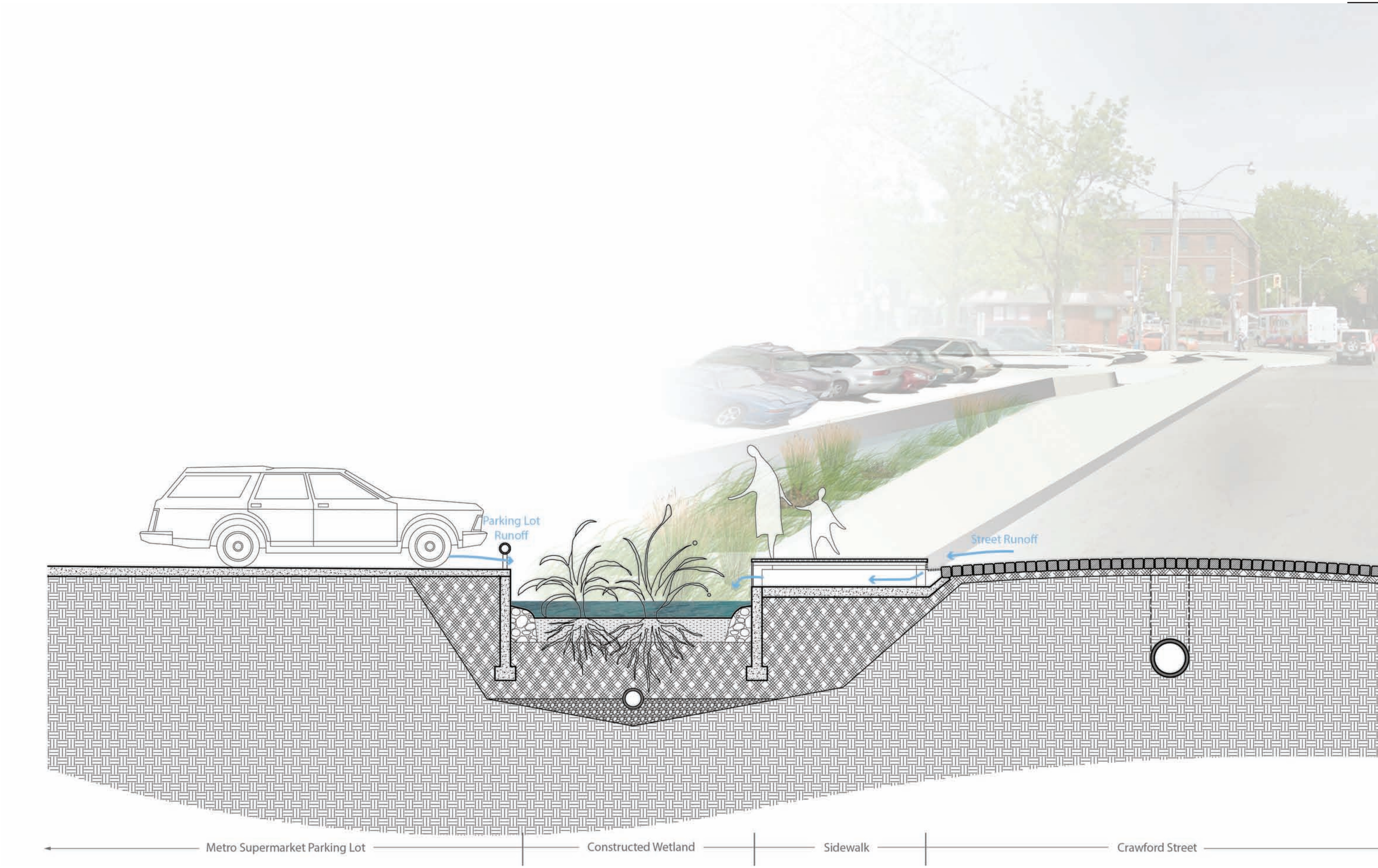
Figure 4.31 [right] 1:200 Crawford Street existing section

Figure 4.32 [below] Key plan and 1:200 proposed Crawford Street plan.

Existing Section



Proposed Plan



Parking Lot
Runoff
Street Runoff
Metro Supermarket Parking Lot
Constructed Wetland
Sidewalk
Crawford Street

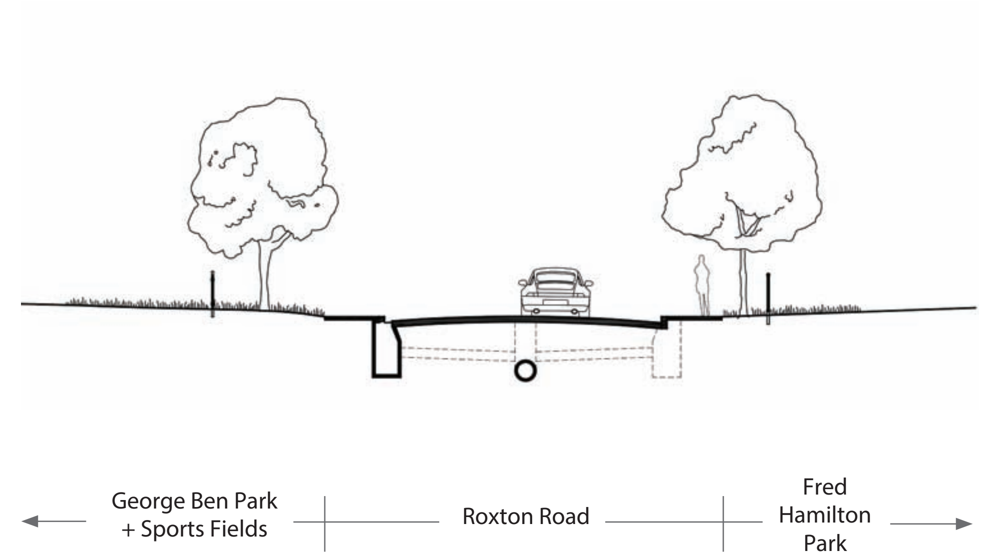
Roxton Road

Figure 4.33 [opposite] 1:50 proposed Roxton Road section

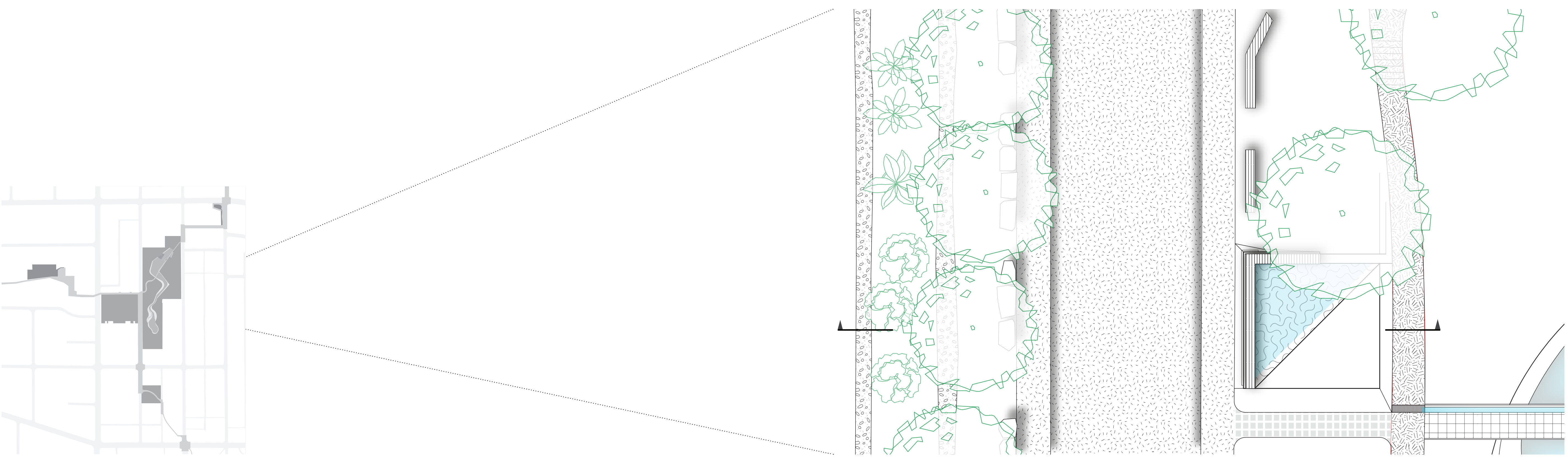
Figure 4.34 [right] 1:200 Roxton Road existing section

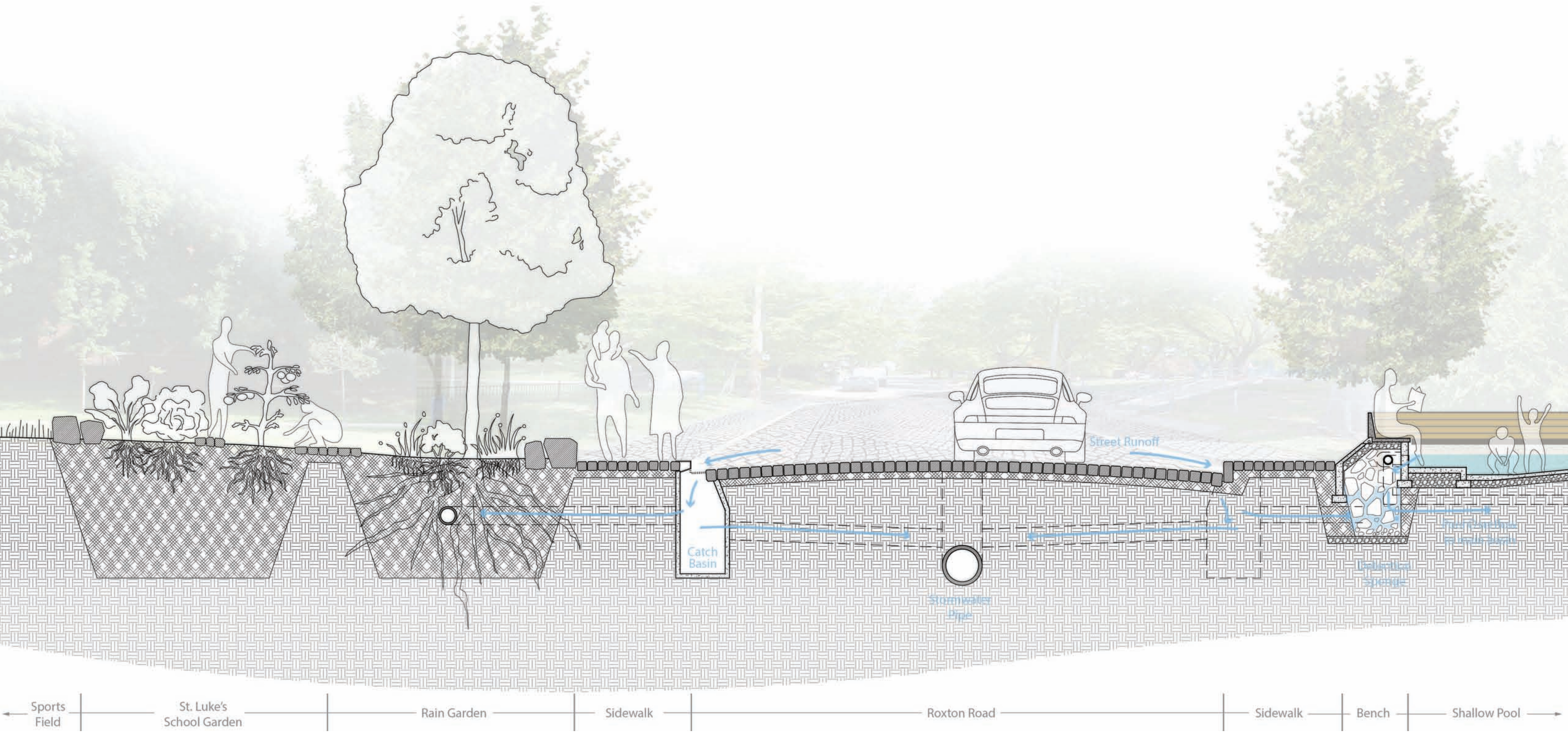
Figure 4.35 [below] Key plan and 1:200 proposed Roxton Road plan.

Existing Section



Proposed Plan




Street Runoff
Catch Basin
Stormwater Pipe
Sports Field
St. Luke's School Garden
Rain Garden
Sidewalk
Roxton Road
Sidewalk
Bench
Shallow Pool

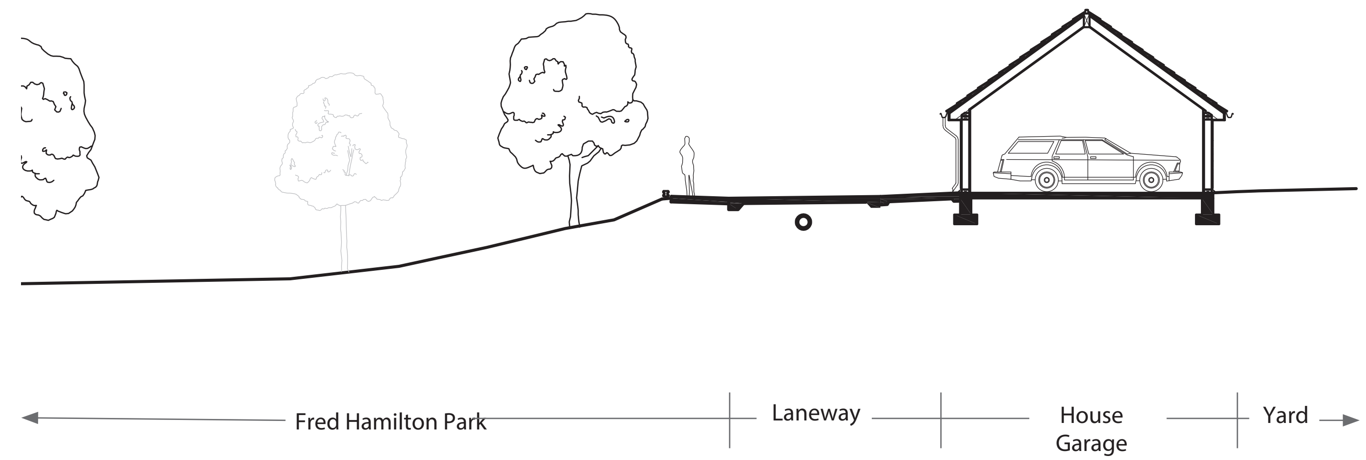
Fred Hamilton Park Laneway

Figure 4.36 [opposite] 1:50 proposed Fred Hamilton Laneway section

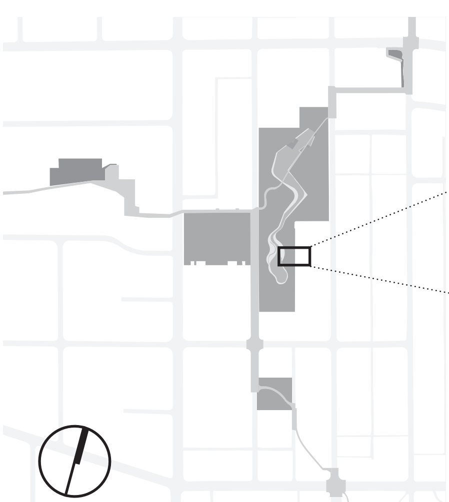
Figure 4.37 [right] 1:200 Fred Hamilton Laneway existing section

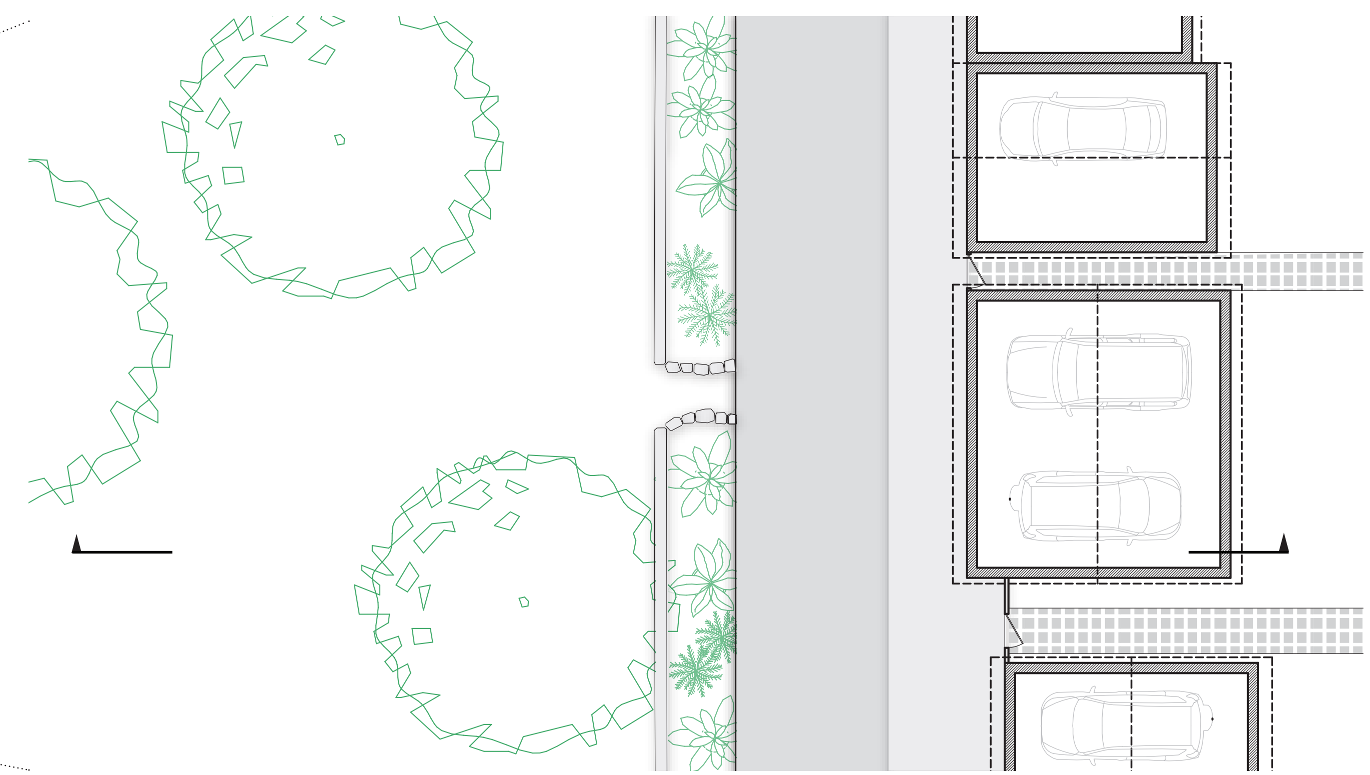
Figure 4.38 [below] 1:200 proposed Fred Hamilton Laneway plan

Existing Section



Proposed Plan






Roof Runoff
Street Runoff
Fred Hamilton Park
Bioswale
Laneway
House Garage

Shaw Street

Figure 4.39 [opposite] 1:50 proposed Shaw Street and Fred Hamilton Park section

Existing Section

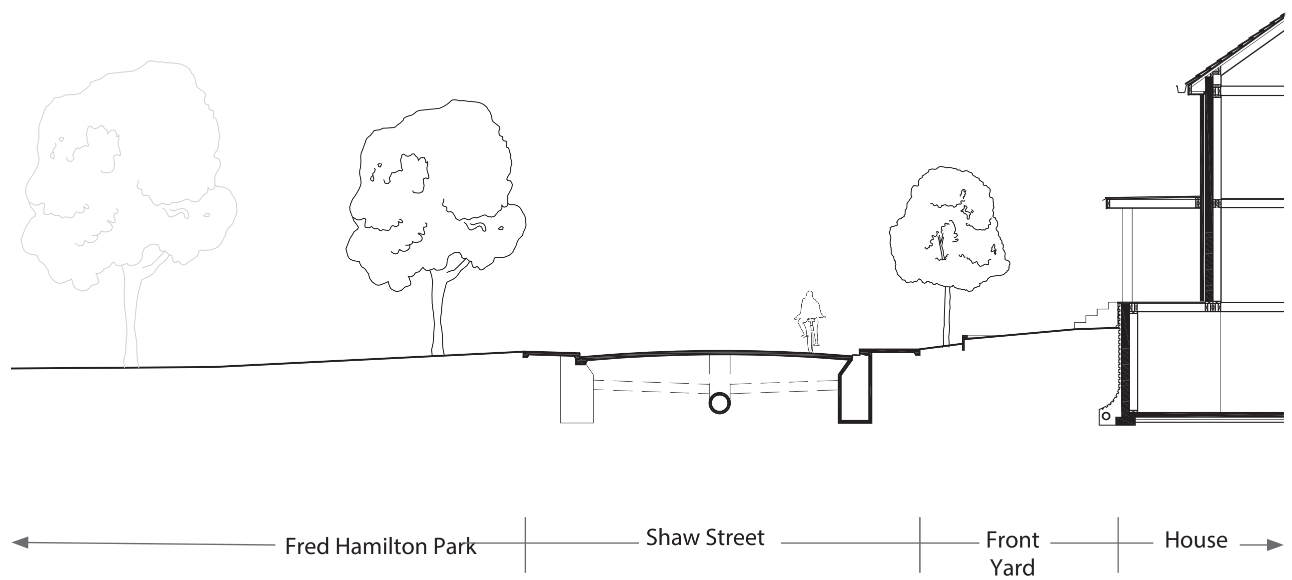
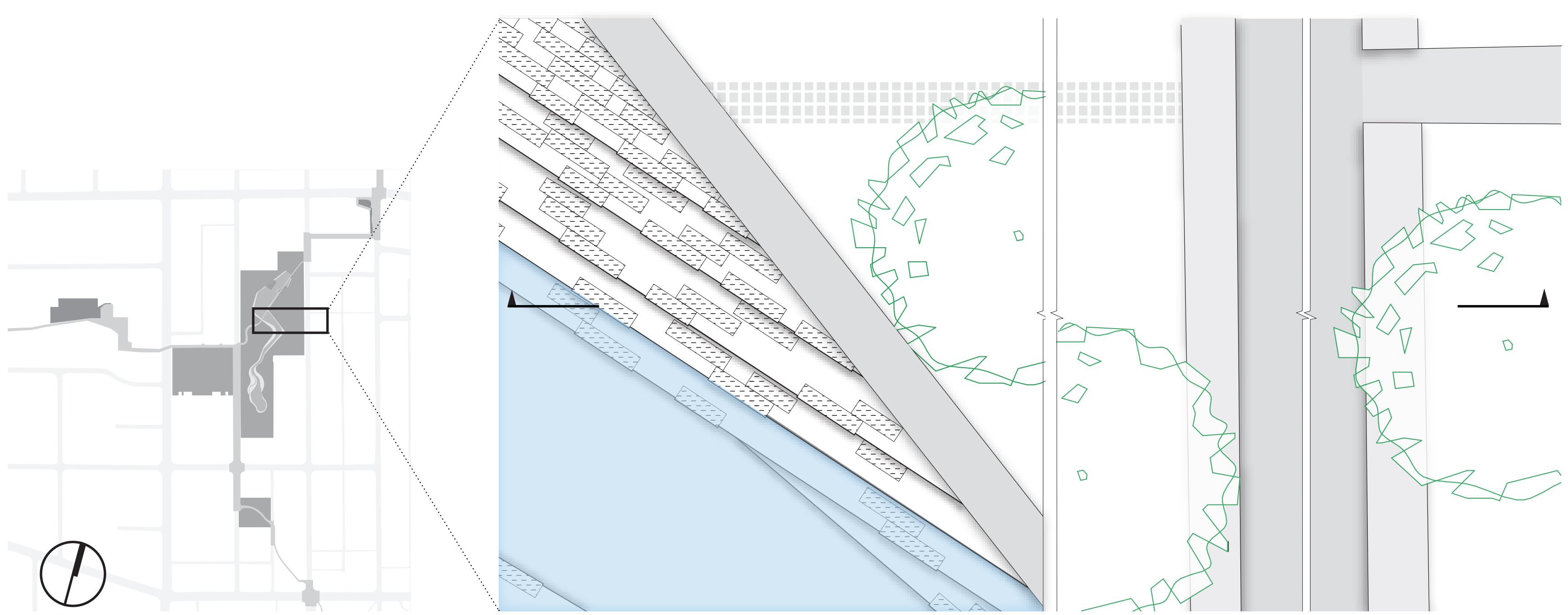
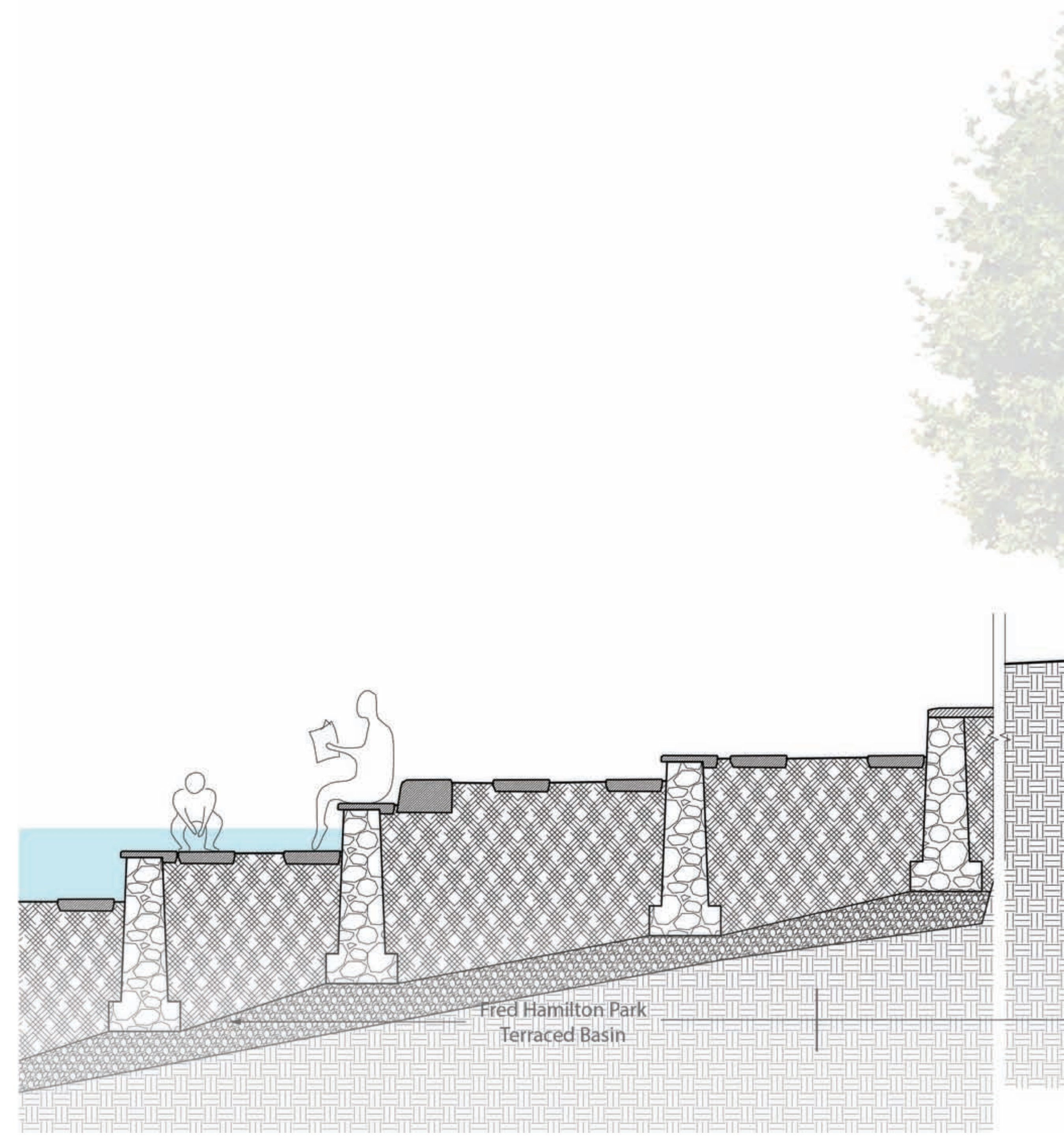


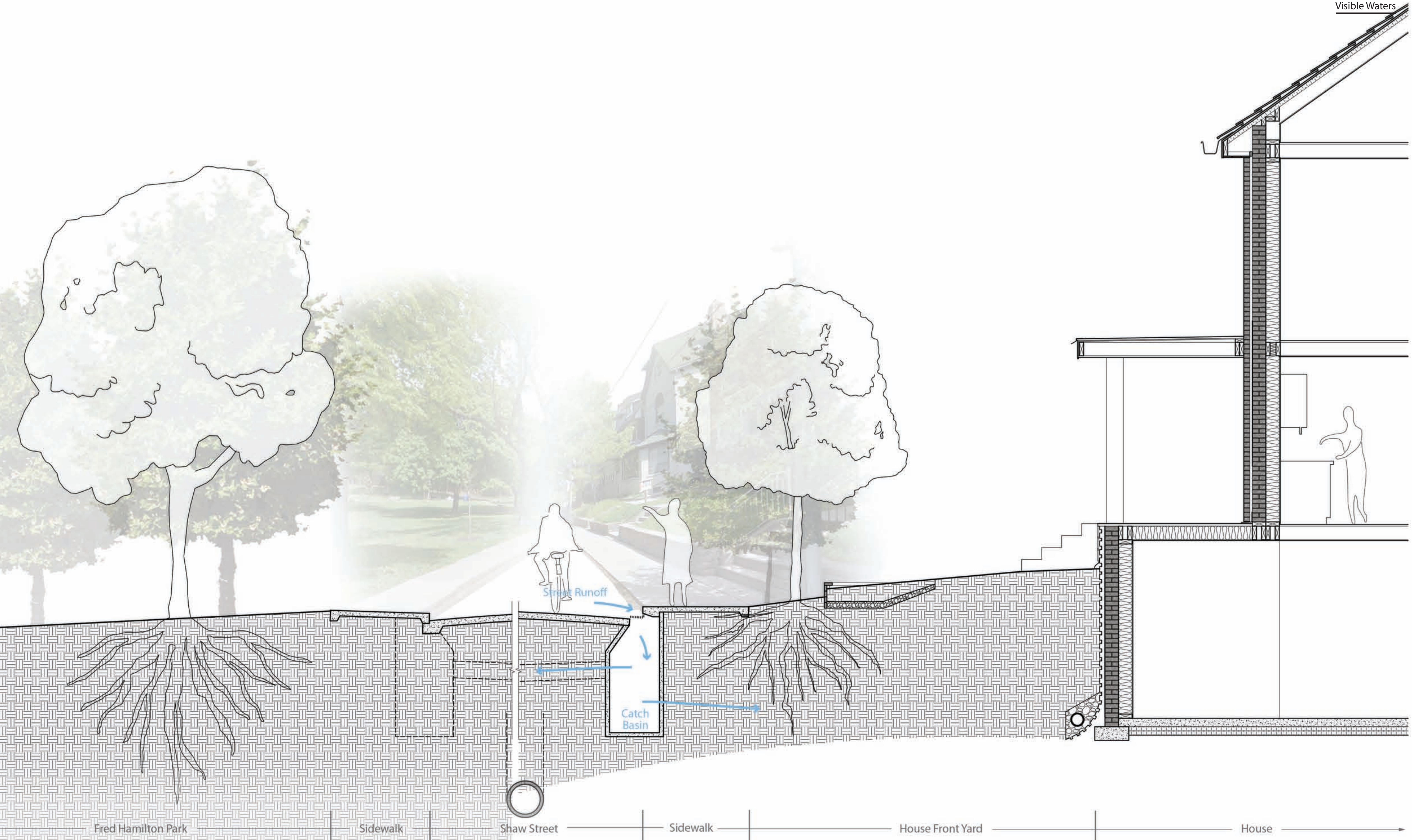
Figure 4.40 [right] 1:200 Shaw Street and Fred Hamilton Park existing section

Figure 4.41 [below] 1:200 proposed Shaw Street and Fred Hamilton Park plan

Proposed Plan







Street Runoff
Catch Basin
Fred Hamilton Park
Sidewalk
Shaw Street
Sidewalk
House Front Yard
House

Conclusion

The composite park-way at Garrison Creek is a manifestation of an interwoven and balanced bond of nature and the city, and a celebration of an urban public life that is pedestrian focused. A holistic approach is utilized in this thesis to find an alternative solution to the current centralized system for stromwater management and the clear division between leisure spaces and street traffic. As Michael Hough mentions that the urban citizens' understanding and education of natural systems must involve "a continuous process of experiencing and exposure to one's local surroundings", therefore, it is important that the city can facilitate individual and collective exploration and play.[1] Furthermore, playing in the urban environment, where nature and human artifacts are intimately woven together, strengthens public life; as Fredrick Frobel—a German educator who invented kindergarten—believed that the study of geometries and nature provides "a common ground for all people, and advances each individual and society in general, into a realm of fundamental unity."[2]

While the playful nuances of the design proposal can only be imagined through images presented in part four, the result of implementing soft and localized strategies for mediating excess stromwater in the College and Shaw neighborhood can be quantified by using the Rational Method for calculating surface runoff flow. Figure 5.2 compares the neighborhood's current stromwater runoff rate with the runoff rate of the proposed design. In this case, the peak storm intensity (i) and Drainage Area (A) stays constant in the equation, while the runoff coefficient (see table in Appendix, page110) determines the runoff rate difference for the existing and proposed scenarios.

Although the College and Shaw neighborhood is primarily residential, it is situated in Toronto's downtown and includes a few major streets and commercial areas that are largely paved by asphalt. By increasing the soft and permeable surfaces in the neighborhood, the design proposal is able to approximately lower the runoff coefficient from 0.7 to 0.5, which is similar to a residential only neighborhood. As a result, the reduction of surface runoff in the proposed design is

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1 Hough, *Cities and Natural Process*, 257.

2 Brosterman, *Inventing Kindergarten*, 12-13.

roughly a quarter of the existing quantity. Additionally, the Rational Method equation does not take into account of the design's stromwater detention basins, tanks and wetlands, therefore, the design proposal's reduction in stromwater runoff should be greater than what is presented in Figure 5.1. This reduction in surface runoff rate means that localized stromwater remediation strategies can significantly relieve Toronto's sewerage burdens during torrential rain, and also locally manage and treat surface runoff on a day to day basis.

Figure 5.1 Table for calculating and comparing Stromwater runoff rate for the existing and proposed neighborhood. See Appendix, Figure5.x for runoff coefficient reference.

The Rational Method - Storm Water Surface Runoff Rate				
				q=CiA
	Runoff Coefficient (C)	Peak Storm of intensity (i) (mm/hr)	Drainage Area (A) (Hectares)	Storm Water Runoff Rate (q) (L/s)
Existing	0.7	5.25	55.3	**203**
Proposed	0.5	5.25	55.3	**145**

If this soft and decentralized approach can be adopted by Toronto's city planners at the current Garrison Creek sewershed, the city's west end will be transformed into a pedestrian friendly park network, where the path from the city's western waterfront to Christie Pits and extending to Garrison Creek Park north of Dupont Street will be filled with momentary pauses at the splash pads, pools and wetlands. A kind of incidental play will fill the neighborhoods' public places. During rain storms, instead of fearing of basement flooding and inaccessible roads, citizens will have the opportunity to observe water, to see it either getting absorbed by the ground, consumed by the wetlands, or channeled into detention basins. In such events, water becomes a spectacle as well as an educational process that makes the urban water cycle visible to the citizens. The scope of the composite park-way can also be extended into the rest of Toronto, since the city has many lost creeks that span across residential, industrial and commercial dense neighborhoods. Partially buried creeks (such as Castle Frank Book) and suburban creeks (such as Taylor Massey Creek) can also adopt similar methodologies as the Garrison Creek park-way. This will contribute towards restoring the creeks' ecological habitats, and also protecting the currently vulnerable river banks and the water quality of the lake. Such implementation occurring city-wide will result in an interwoven city where ecological habitat, ravines and creeks are tightly knitted into the man-made city fabric, as illustrated in Figure 5.2.

This new spatial relationship between city and nature also implies a cultural paradigm shift where citizens begin to realize the importance of nature and wholesome environments for the benefit of people's body and mind. The current society as a whole is moving towards an increased consciousness in the health of the public environment in relationship to humans in order to create fertile soil in cities. Additionally, with the increased frequency of storms due to climate change, cities are faced with the challenge to live and deal with stromwater, because the traditional method of building hard-surfaced infrastructure to fortify the city against it is no longer sufficient. Therefore, a holistic approach of urban design that includes 'green' and 'soft' local remediation strategies coupling with existing sewer infrastructure is necessary for maintaining the city's proper functioning during extreme weathers as well as its everyday well being.

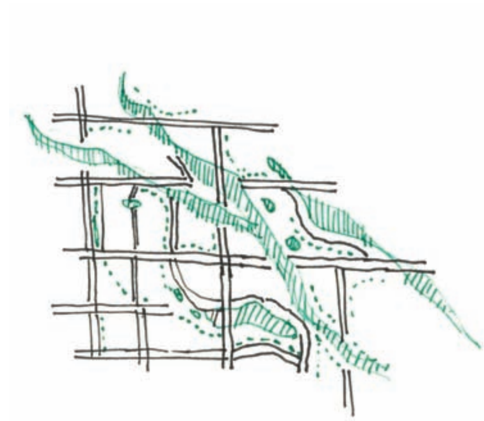

Figure 5.2 Diagram of an interwoven city, where city and nature are tightly knitted together both spatially and experientially.

Inevitably, such integrated approach requires close collaborations among specialized professionals and may raise complex issues that are not yet explored in this thesis. One issue that is crucial for the further execution and planning of the composite park-way is the many stakeholders that would be required to participate in such a multifaceted project. Collaborations and decisions made among city councillors, planners, engineers and private property owners are essential in determining the scope, success and feasibility of the project. One of the foreseeable concerns city officials may have are potential health and safety issues the design may raise. Although the proposed playground and play spaces may not pass the same safety standards as the generic 'catalogue' playgrounds that are ubiquitous in North America, it is designed to be flexible, encourage risk-taking and provide opportunities for people to reconnect with nature. It is important to design places where children (and adults) "can play safely without over-restrictive control", because play means challenging one's fear and taking on an adventure.[3] The balance between safety and stimulation means navigating the edge-realm by providing children a 'home base' as well as stretching places for curious exploration; and in turn, this polarizing interface invokes a rich variety of playful activities.[4] Along with proper mentorship and self-initiating activities, citizen stewardship will be developed to help maintain the designed public spaces.

Non-prescribed play spaces may also provide opportunities for integrating varied seasonal programs and activities. One can imagine that pools and stromwater basins can be transformed to become ice

3 Day, *Environment and Children*, 26.

4 Ibid, 27.

Figure 5.3 [opposite] Map of reintroduced Toronto ravines. A new city-wide network of parks are connected by following the former course of the city's lost streams.

rinks to facilitate winter sports. Similarly, street-side landscaping and school yard wetlands can become places for snow berms, which becomes a natural blanket for the plants' winter hibernation. There is great potential to make these public spaces multipurpose to accommodate a diverse range of activities all year round. All the efforts made towards this goal are ultimately aimed at creating extensive community involvement in urban places. This kind of involvement, be it individual or collective, fosters social responsibility that balances the neighborhoods' livelihood with the urban ecosystem's well-being.

The problems of executing this thesis design proposal may be countless and cannot always be predicted, as there are many variables involved. However, this thesis offers an initial sketch of a holistic urban park-way, where ecology, citizens and infrastructure are intertwined and all play equal parts. The tension between city and nature will continue to exist, but by working together, architects, city planners, engineers and citizens can invent suitable strategies that not only mediate between the two, but also create urban environments that improve public life—which is closely dependent on the well being of urban ecosystems.

Appendix

Figure 5.4 Runoff Coefficient reference table for the Rational method of calculating stromwater surface runoff rate. See Figure5.1. Mccuen, Hydrologic Analysis and Design. 1998.

Figure 5.5 [opposite top] Table used to calculate stromwater daily and peak volume, as well as water detention basins' capacity. The resulting numbers are reflected in the various hub and satellite sites' water diagrams (page80-89, even pages).

Figure 5.6 [opposite bottom] Table used to calculate wetlands' and terrace gardens' subsurface flow rate, which conceptually reflects how much water there soft surfaces can treat through bioremediation processes. The resulting numbers are also illustrated in the water diagrams where applicable(page80-89, even pages).

TABLE 7–10 Runoff Coefficients for the Rational Method

Description of Area	Range of Runoff Coefficients	Recommended Value*
Business		
Downtown	0.70–0.95	0.85
Neighborhood	0.50–0.70	0.60
Residential		
Single-family	0.30–0.50	0.40
Multiunits, detached	0.40–0.60	0.50
Multiunits, attached	0.60–0.75	0.70
Residential (suburban)	0.25–0.40	0.35
Apartment	0.50–0.70	0.60
Industrial		
Light	0.50–0.80	0.65
Heavy	0.60–0.90	0.75
Parks, cemeteries	0.10–0.25	0.20
Playgrounds	0.20–0.35	0.30
Railroad yard	0.20–0.35	0.30
Unimproved	0.10–0.30	0.20

It is often desirable to develop a composite runoff coefficient based on the percentage of different types of surface in the drainage area. This procedure often is applied to typical "sample" block as a guide to selection of reasonable values of the coefficient for an entire area. Coefficients with respect to surface type currently in use are listed below.

Character of Surface	Range of Runoff Coefficients	Recommended Value*
Pavement		
Asphaltic and Concrete	0.70–0.95	0.85
Brick	0.75–0.85	0.80
Roofs	0.75–0.95	0.85
Lawns, sandy soil		
Flat, 2%	0.05–0.10	0.08
Average, 2 to 7%	0.10–0.15	0.13
Steep, 7%	0.15–0.20	0.18
Lawns, heavy soil		
Flat, 2%	0.13–0.17	0.15
Average, 2 to 7%	0.18–0.22	0.20
Steep, 7%	0.25–0.35	0.30

The coefficients in these two tabulations are applicable for storms of 5- to 10-year frequencies. Less frequent, higher intensity storms will require the use of higher coefficients because infiltration and other losses have a proportionally smaller effect on runoff. The coefficients are based on the assumption that the design storm does not occur when the ground surface is frozen.

*Recommended value not included in original source.

Source: Design and Construction of Sanitary and Storm Sewers. American Society of Civil Engineers, New York, p. 332, 1969.

Daily Rainfall Volume and Catchment Basin Capacity

Average Daily Rainfall	2	
Record Peak Daily Rainfall	126	
Dry Season Watering	25	per week S(1)
Annual Precipitation Average	792.7	S(3)

	Drinage Area (m^2)	Collection Source: Streets and Paved Area Runoff Factors	Collection Source: Roofs	Total Average Collection/Day (m^3)	Daily Peak	Site Catchment Volumn Capacity m^3
Fred Hamilton Park				Daily Average		
Streets	213310	0.5		213.3	13439	14508
Washroom Roof	175		0.9		19.8	
Playground Roof	190		0.9	0.3	21.5	
Triangular Pool						5.4
Metro Plaza						
Streets	124800	0.5		124.8	7862.4	
Roof	3186		0.9	5.7	361.3	420
Ossignton Public School						
Streets	158550	0.5		158.6	9988.7	804
Roof	1315		0.9	0.0	0.0	
George Ban Catholic School						
Roof	2321		0.9	4.2	263.2	225
Roxton Road Parkette				Daily Average		
Streets	56960	0.5		57.0	3588.5	133
Roof					0.0	

*Pools are sized to accomodate for peakload, --126mm daily record high (estimated 50yr rainfall).
**Cisterns and wetlands should be sized for play and irrigation needs. Numbers on this chat only provides a reference for the faily minimum.

Wetland and Garden Processes Volume: Daily Subsurface Flow Rate

	Total Cross Section Area (A)(m^2)	Hydraulic Conductivity (Ks) (m3/m2/d)	Hydraulic Gradient (S) (S=Rise/Length)	Rise (m)	Length(m)	Darcy's Law Q=KsAS **Flow per Unit Time (Q) (M^3/day, KL/day)**
Fred Hamilton Park Wetland	17	5000	0.02	1.5	74	**1723**
Metro Plaza Wetland	3.6	5000	0.01	0.3	37	**146**
Ossignton Public School Wetland	15.0	5000	0.005	0.4	78	**385**
George Ban Catholic School N/A						
Roxton Road Parkette Slopped Garden	10	1000	0.13	2	16	**1250**

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