Re:Linking Lachine
a masterplan for the Lachine Canal

by

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author's declaration

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

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

abstract

Since the undertaking of urban planning as a prescriptive discipline, landscape projects have demonstrated their ability to integrate valuable cultural spaces with the construction of complex infrastructural systems, including systems that manage urban waste outflows. By the twenty-first century, urban planners have been tasked with the reclamation of derelict post-industrial sites and their abandoned infrastructural networks. The reclamation of these sites typically deploys complex operations in order to salvage and recycle valuable materials. These operations are also tasked with the disposal, stabilization or treatment of hazardous waste, contaminated soils and waterborne pollutants. Urban practitioners and theorists increasingly recognize the suitability of landscape as an interdisciplinary medium to expedite the reurbanization of these sites, assembling expertise from multiple engineering disciplines, horticultural and zoological science, and architectural design.

The thesis proposition is a masterplan for the post-industrial Lachine Canal in Montréal, Québec. The masterplan integrates government plans to rehabilitate aging highway infrastructure through the adjacent, now defunct Turcot Rail Yard. Using the analytical mappings defined by Alan Berger in *Drosscsape* and Pierre Belanger's "infrastructural landscapes" as a point of departure, the masterplan outlines a strategy to coordinate emergent waste diversion industries along the canal. Proposed interventions include a hybridized infrastructural landscape upon the abandoned rail yard to manage municipal organic waste, the effluents of brownfield reclamation, and construction debris. The application of phytoremediation landfarming and constructed wetlands comprise new landscapes that facilitate decontamination of existing brownfields along the Canal, promoting their reintegration with the surrounding urban environment. The thesis illustrates a speculative evolution of the site as an adaptively managed landscape, valued for its diverse biological wildlife habitat and for its recreational use by the citizens of Montréal.

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dedication

To my parents, grandparents and
in memory of Ugo.

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nomenclature

brown•field |ˈbroun ˌfēld|

As defined by Oxford American Dictionaries:

adjective [attrib.]
(of an urban site for potential building development) having had previous development on it.

noun
a former industrial or commercial site where future use is affected by real or perceived environmental contamination.

in•fra•struc•ture |ˈinfrəˌstrək CH ər|

As defined by Oxford American Dictionaries:

noun
the basic physical and organizational structures and facilities (e.g., buildings, roads, and power supplies) needed for the operation of a society or enterprise.

ORIGIN early 20th cent.: from French
infra- (1927, Lat. "below, underneath, beneath")
structure (1440, Lat. "action or process of building or construction")

Definition as elaborated by Prof. P. Belanger:
"the concept of infrastructure originated during military planning over the past five hundred years but gained importance in the US during the Great Mississippi Flood of 1927. The term now refers to a set of systems, works, and networks underpinning modern societies and economies."

nomenclature (continued from previous page)

land•scape |ˈlan(d)ˌskāp|

As defined by Oxford American Dictionaries:

noun

all the visible features of an area of countryside or land, often considered in terms of their aesthetic appeal: *the giant cacti that dominate this landscape | a bleak urban landscape*.

- a picture representing an area of countryside: [as adj.] *a landscape painter*.
- the genre of landscape painting.'

verb [trans.] (usu. be landscaped)

improve the aesthetic appearance of (a piece of land) by changing its contours, adding ornamental features, or planting trees and shrubs: *the site has been tastefully landscaped* | [as n.] (landscaping) *the company spent $15,000 on landscaping*.

ORIGIN late 16th cent. (denoting a picture of natural scenery): from Middle Dutch *lantscap*, from *land 'land'* + *scap* (equivalent of -ship)

re•me•di•a•tion |riˌmēdēˈā sh ən|

As defined by Oxford American Dictionaries:

noun

the action of remedying something, in particular of reversing or stopping environmental damage.

ORIGIN early 19th cent.: from Latin remediatio(n-), from remediare 'heal, cure.'

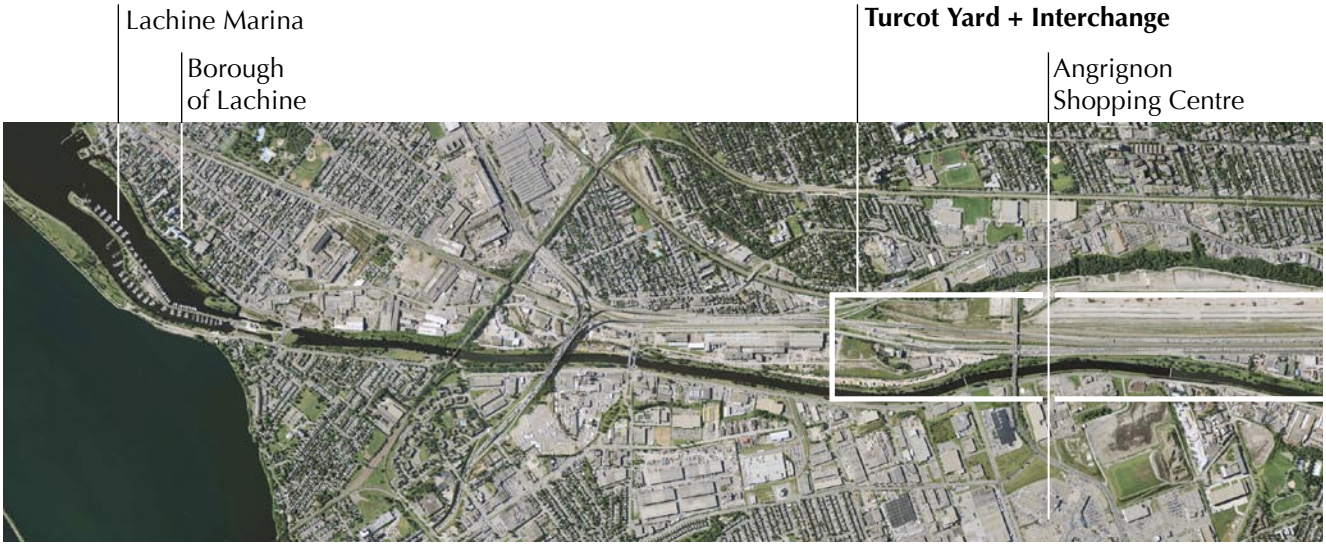
Introduction

Post-industrial society's reliance on infrastructural networks continues to shape urban landscapes and manifest horizontal constructs along regional and transcontinental scales. As humanity negotiates the cumulative effects of nearly two centuries of industrial activity and ongoing stresses that modern civilizations place upon ecological systems, leading design practitioners and theorists have taken up the challenge of reintegrating the hidden infrastructures and processes of the city into a more public landscape, revealing economic, ecological and cultural benefits. Whether these efforts are perceived as concerted or isolated, they highlight the ability of urban projects to transcend disciplinary boundaries and widen "its sphere of intervention to include the operative and logistical aspects of urbanization."[1]

Architecture has historically fulfilled the technological and cultural needs of a civilization, but the complexity of urbanization since the industrial revolution deployed several engineering disciplines and specialized practices in urban and landscape design. While the discrete execution of projects by professional disciplines—predominantly civil engineering—characterized city building through the twentieth century, greater interdisciplinary interaction is necessary to overcome the challenges of urbanization in the twenty-first century. Landscape design has emerged as the medium best suited to examine interdependencies between the built environment and natural ecosystems, informing greater efficiencies in urban metabolisms relating to the disassembly, reconstruction and operation of the city. Charles Waldheim coined the phrase "Landscape Urbanism" to describe this "disciplinary realignment currently underway, in which landscape is usurping architecture's role as the basic building block of city making."[2]

1. Bélanger, Pierre. "Landscape as Infrastructure." *Landscape Journal* 28: p.91

2. Waldheim, Charles. "Landscape Urbanism: A Genealogy," *Praxis* no.4, (2002): p.10.



The Lachine Canal in the City of Montréal, an infrastructural relic of the nineteenth century, can be read as a case study for Landscape Urbanism. Landscape has served as a means to urbanize the canal's infrastructure with minimal reliance upon bureaucratic planning principles and architectural intervention. Since the year 2000, the Canal has undergone a renaissance under Parks Canada's designation as a National Historic Site. Benefiting from the construction of linear parks and recreational paths along its banks, along with the inauguration of recreational boating, public perception of the Canal has transformed from an industrial wasteland to an urban asset. Since then, developers have readapted a selection of nineteenth century factories into profitable residential and commercial properties—despite their proximity to active industries, noisy highway infrastructure and forlorn toxic brownfields. In 2007, the public release of provincial plans to demolish and relocate large-scale freeway and railroad infrastructure through the defunct Turcot Rail Yard adjacent to the Canal has created an opportunity to merge infrastructural and industrial landscapes into the public realm. Although a plethora of toxic brownfields challenge the reurbanization of the district, the thesis demonstrates how existing industries and contemporary waste management operations may be orchestrated to expedite the reclamation of the district.

The thesis is organized in four parts. Chapter 01 contextualizes the thesis with contemporary urban theory. Chapter 02 examines waste management practices and plans in Montréal. Chapter 03 discusses the history of the site and describes its current morphology, then develops strategies to efficiently urbanize neighbourhoods surrounding Turcot Yard. Chapter 04 presents a masterplan of waste management operations for the district and related landscape interventions.

fig. 0.1 **Lachine Canal Corridor, Montréal**

Chapter 01

"Cities and urban regions become, in a sense, staging posts in the perpetual flux of infrastructurally mediated flow, movement, and exchange. They emerge as processes in the distant sourcing, movement and disposal of water reserves and the remote dumping of sewage and waste. They are the hotbeds of demand and exchange within international flows of power and energy resources. They are the dominant sites of global circulation and production within a burgeoning universe of electronic signals and digital signs. They remain the primary centres of transnational exchange and the distribution of products and commodities. And they are overwhelmingly important in articulating the corporeal movements of people and their bodies (workers, migrants, refugees, tourists) via complex and multiple systems of physical transportation.

The constant flux of this urban process is constituted through many superimposed, contested, and interconnecting infrastructural 'landscapes'. "

—Graham, Steven and Simon Marvin. *Splintering Urbanism*: pp.8–9.

fig.1.01: *Demolition site of Constellation Hotel, Etobicoke, ON. Photo by author, 2008.*

01

GLOBAL and LOCAL CONTEXT:

Theory and Practice Relating to Post-Industrial Sites and Infrastructural Networks

01.1

Brownfields as Infrastructural Landscapes

Global trends in city building have shifted focus from peripheral expansion to the reconfiguration and densification of established urban zones. A number of factors have led to this shift. From an urban morphological standpoint, the decline of nineteenth century industrial zones has resulted in their availability for redevelopment. Additionally, the twentieth century model of suburban growth is no longer sustainable with respect to its high energy demands, consumption of land resources, and escalating costs in the delivery of infrastructural services to urban peripheries. "The city now represents all territory, and all territory needs to be regarded and managed as one urban system. The contradiction embodied in the practice of architecture is that it has traditionally chosen

fig. 1.02: *Aerial view of Montréal's Modern Port Facilities. Courtesy Port of Montréal, 2006.*

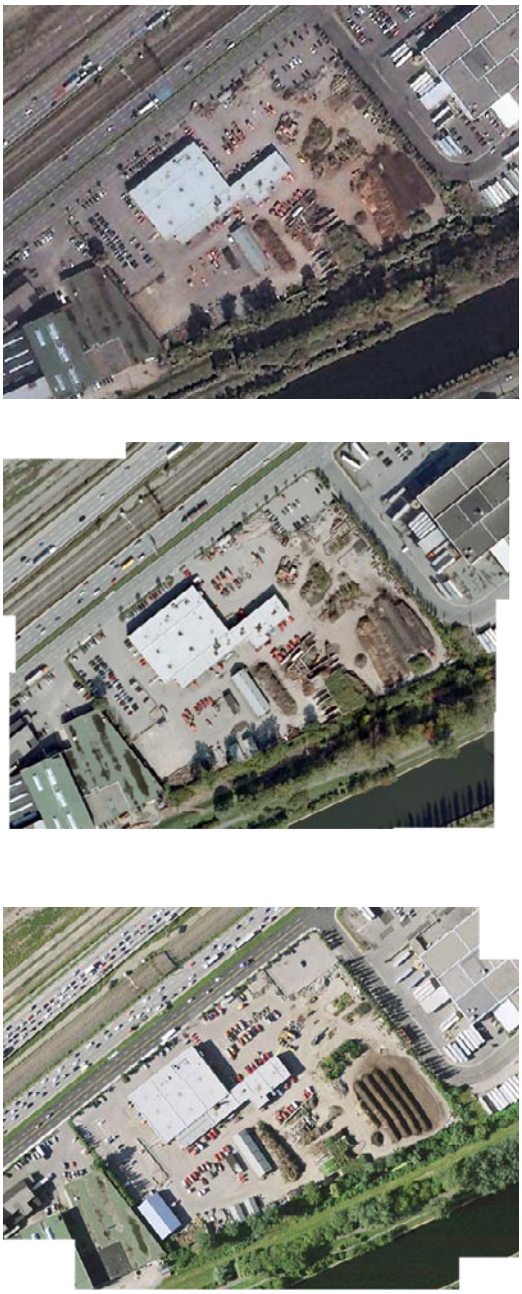
to focus on big buildings rather than to see the big picture as the most compelling design project."[3] The symptoms of unfettered growth through the previous century have become apparent in the complex administration of today's metropolis. Urban planning is now conducted at regional scales, as economic trade is carried out in greater magnitudes over longer distances. Built infrastructure and natural ecosystems, working synergistically or parasitically through design or circumstance, require constant vigilance and optimization to keep pace with growing demands.

As cities densify and transportation costs increase, planning and public works departments must rise to the challenge of locating manufacturing zones and waste disposal sites within proximity to human habitation. The role of the architect to orchestrate projects and the interdisciplinary capacity of architectural, urban and landscape design projects are well suited for re-envisioning post-industrial sites and abandoned infrastructure, as well as re-adaptation of active industries and urban developments toward more ecologically sound operations. The re-adaptation of post-industrial sites and abandoned infrastructural landscapes—commonly classified as brownfields—poses unique challenges according to their contaminant profiles, topographies, geology, hydrology, local adjacencies and prescribed end-use.

3. Leonard, Jennifer, ed. *Massive Change*. (London: Phaidon) p.45

fig. 1.03: *Aerial photo sequence of Montréal Public Works Site, Turcot-Lachine District.*

Courtesy Google Maps and Bing Maps; 2008, 2009.



As contemporary designers are tasked with reorienting industrial and urban developments toward more ecologically sound operations, they must take into account the flow of goods, materials and wastes. When these skills are applied to the design process for brownfield reclamation the designer becomes an infrastructural agent, seeking opportunities to introduce efficiencies and generate revenue from waste exchanges, including the strategic management of remediation logistics over time. Pierre Belanger elaborates:

> Once the sole purview of the profession of civil engineering, infrastructure—which includes the management of water, waste, food, transport and energy—is taking on extreme relevance for landscape planning and design practices in the context of the changing, decentralizing structures of urban-regional economies. Food production and energy networks can no longer be engineered without considering the cascade of waste streams and the cycling of raw material inputs. Landfills, land farms, laydown and storage areas, and sorting facilities can no longer be designed without their wastesheds. Highway networks, sewage systems and subdivisions can no longer be planned without their watersheds. Put simply, the urban-regional landscape should be conceived as infrastructure.[4]

As the thesis explores the relationship of brownfield redevelopment and related waste diversion operations as a hybridized infrastructural landscape with implications at the urban-regional scale, the urban-regional morphology of post-industrial sites expose the potential for new infrastructural networks.

4. Bélanger, Pierre. "Landscape as Infrastructure." *Landscape Journal* 28: p.91

01.2
Morphological Trends: The Case for Reclamation

Brownfields comprise some of a city's most desirable real estate. The reason for these sites' appeal is investigated by Alan Berger through his book *Drosscape: Wasting Land in Urban America*. His mappings of major cities across North America indicate morphological trends in which early industrial developments—now under utilized or abandoned—typically form a ring around a city's historic urban core.[5] This morphology attests to early industry's reliance upon the urban workforce and the limitations of nineteenth century passenger transit, but today's commercially viable urban cores are associated with a city's densest neighbourhoods and highest property values. Moreover, century-old industrial nodes are often sited along major bodies of water and navigable river valleys that facilitated shipping, railroad construction, freshwater intake, raw material staging, and waste outflows. These sites are subject to neglect following the widespread deindustrialization of North-American cities; but in the absence of industrial activity and in the presence of protective environmental regulations, the sites typically regain some of their natural beauty and pastoral character, potentially increasing property values and suitability for speculative development.

Meanwhile, the proliferation of the automobile throughout the twentieth century mobilized suburban expansion beyond a city's original industrial periphery. The conveniences arising from tractor-trailer and jetliner transport precipitated a revolutionary set of intermodal infrastructural connections. Newly constructed industrial zones capitalized on these expedient transportation networks whilst accommodating an automobile-centric suburban workforce. These advances spelled the demise of the city's nineteenth century industrial complex, burdened by inflexible rail and maritime infrastructure, too slow to remain competitive and too costly to renovate. Yet these sites' proximity to human habitation and commercial activity make them prime candidates for reintegration with the city.

5. See "Deindustrialization: Waste Landscape Through Attrition" in Berger, Alan *Drosscape,* pp.46–53. In the same work, also refer to "Dispersal Graphs" and "Entropic Indicators" for Boston: pp.86–89, and Chicago: pp.98–101.

01.3
Reclamation as a Means to Recall Cultural Values

The pastoral character regained by derelict industrial tracts also brings into question their cultural value, specifically with regard to their ability to serve as matrices for the design of public landscapes. Brownfields often contain infrastructural relics—such as grain silos and maritime cranes—that prove costly to adapt or demolish. Their permanence lend themselves as culturally-significant landmarks and quiet oases within bustling cities, and they are often associated with the identity of a neighbourhood and attest to the historic character of the city.[6] Brownfields are often scattered with defunct machinery that testify historic manufacturing

6. Aldo Rossi investigated unique features of a neighbourhood that contribute to collective identity. He described abandoned landmarks which contribute to the identity of a neighbourhood as "pathological permances," whereas landmarks that were adapted or transformed to continue contributing to the daily life of local residents as "propelling permances." His investigation informs insightful debate with respect to cultural value of post-industrial sites in North America. Refer to Rossi, Aldo. The Architecture of the City.

Asbestos removal operations at Turcot demolition site.

fig. 1.04, *top: Hazardous material membrane erected to protect surrounding environment from asbestos migration.*

fig. 1.05, *middle: Backlit condition reveals operations within.*

fig. 1.06, *bottom: All of the intermodal warehousing at the Turcot Site was demolished following MTQ's purchase of the grounds.*

All images courtesy Ken McLaughlin, ©2006.

methods, products, and local labour expertise. Juxtaposed against contemporary land use, derelict industrial sites remind citizens of how their culture progressed to other economic means and technologies. Daniel Bluestone, a historian collaborating with Julie Bargmann of D.I.R.T. Studio, presents a culturally cognizant position on brownfield reclamation:

> The urgent effort to clean and reclaim blasted landscapes—EPA Superfund sites and other polluted brownfields—often involves an unfortunate exercise of cultural and historical amnesia. The sites are cleaned of their toxic substances but they are also scrubbed of their history. This need not be the case. If former buildings and landscapes on Superfund sites were adapted to new uses and interpreted for the public, rather than destroyed during redevelopment, we would retain an important material framework for better understanding both the sites themselves and their surrounding communities. Moreover, with tangible traces of former uses left in place, we would have an important venue for learning about the human use, abuse, and stewardship of the built and natural landscape. On Superfund and brownfield sites where traces of industrial use and pollution are removed entirely, the landscape makes less sense to residents and visitors alike. People whose lives and livelihoods were bound up with these places lose important landmarks from their locality. We have pursued cleanup and redevelopment policies that fail to recognize the power and possibilities of the historical memories that hover over these sites.[7]

If derelict industrial landscapes are to be repurposed in a manner that exposes

7. Bluestone, Daniel. "Toxic Sites as Places of Culture and Memory: Adaptive Management for Citizenship" in Macey, Gregg P. and Jonathan Z. Cannon, eds. *Reclaiming the land: rethinking Superfund institutions, methods, and practices*: p.245.

their cultural value, a designer might conduct an investigation to determine which of their infrastructural relics could contribute to the remaking of a productive landscape. Such a strategy stands to be cost efficient and culturally significant if the aforementioned industrial remnants can be repurposed to function as a system that facilitates the environmental cleanup derelict sites, whilst demonstrating the cultural significance of their remaking to the public. The Turcot-Lachine district features a range of waste management industries that are able to participate in the environmental cleanup of toxic sites, many of which contain culturally significant infrastructural relics to be explored in further detail within Chapter 03. The thesis proposes that these industries could interface with the pending reconfiguration of highway infrastructure through the district as proposed by the Province of Québec. The thesis also provides a speculative masterplan as to how local waste management industries could be activated and networked to reclaim and supply recycled materials for nearby construction projects whilst contributing to the remediation of the district and the rehabilitation of public landscapes.

01.4
Urgent Opportunity to Reclaim Turcot

In 2003, the Ministry of Transport Québec (MTQ) acquired the defunct Turcot Rail Yard—a large tract of land adjacent to the Canal—from CN in exchange for $17.8 million.[8] By 2007, the MTQ released plans to reconstruct the Turcot Interchange over a twenty year schedule, and to fund the infrastructural renewal by allocating the former rail yard toward urban development that has yet to be determined. The province intends to completely demolish the existing interchange—as its concrete flyovers are in need of constant rehabilitation—and replace it with a design specifying shorter bridge spans at reduced elevations.[9] In addition, the expressway and rail mainline will be re-routed along the northern edge of the site. This would liberate lands adjacent to the Canal for development, but soil decontamination will be necessary if the province intends to maximize profit from the land.

The isolated qualities of the site pose another barrier for profitable development. The proposed expressway, railroad and the sylvan Saint Jacques Escarpment separates the site from the established residential neighbourhood of Notre-Dame-de-Grace to the north. To the south, active industries, former landfills, and snow dump sites conglomerate as a swath that slope down toward the Lachine Canal, buffering it from post-war suburban neighbourhoods within the Borough of LaSalle.

01.5
Reclamation Strategies

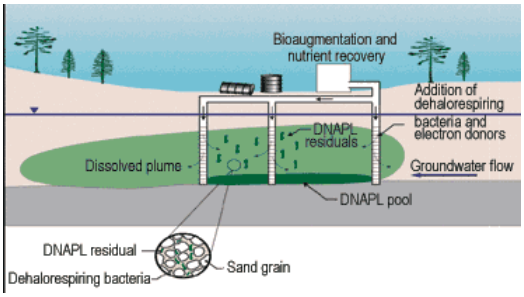
In the conventional brownfield redevelopment process, professional consultants are first retained to provide an environmental risk assessment. The assessment determines if contaminants exceed allowable levels for various occupancies, and considers ecological factors such as soil type, groundwater stability, air emissions, and erosion. If redevelopment is

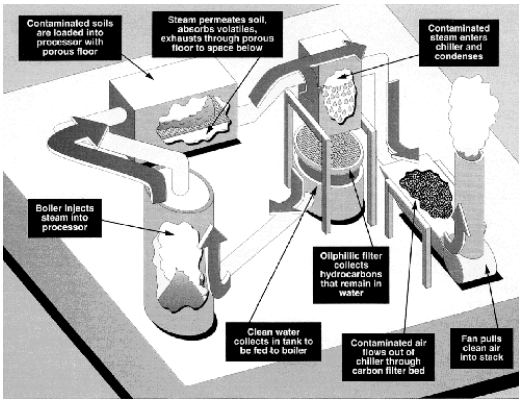
8. Lanken, Peter and Brenda Branswell. 2003. "Québec buys Turcot Yard, interchange fix planned $17.8-million deal. Most to be sold for redevelopment; options studied for road network." *Montréal Gazette*.

9. Québec Ministry of Transport. *Turcot Complex Reconstruction Project*: p.2.

fig. 1.07: *Schematic representations of soil decontamination.*

Top: *active in-situ (bioventing),*
Middle: *active ex-situ (thermal desorption)*
Bottom: *attenuated in-situ (phytoremediation)*





feasible or if decontamination is mandatory, the site undergoes one of three basic remediation strategies: ex-situ, active in-situ, or attenuated in-situ. Regardless of the chosen strategy, technical precautions may be necessary to stabilize or solidify contaminants in-situ through deep injection of chemical bonding agents—such as molasses, portland cement, lime, fly ash, clay and slag. In ex-situ remediation, hazardous materials are removed from the site through excavation or dredging, then processed for treatment by an authorized facility, or safely disposed at a regulated landfill. This approach is economically favourable if valuable materials can be harvested from the ground but require specialized processing off-site, such as the extraction of heavy metals from dross by smelting facilities, or the recycling of petroleum-contaminated soil as aggregate for asphalt production. Ex-situ decontamination is often the most labour-intensive strategy and carries the greatest risk that hazardous materials may be released into the environment during transport and handling. Therefore, from a risk-management perspective, in-situ techniques are often preferred. For active in-situ decontamination, contaminants are treated on-site using biological or technological strategies such as soil vapor extraction (pump and treat), aerobic bioventing, and phytoremediation landfarming. Methods are chosen based on the physical depth of contamination, time constraints, and economic criteria; but any of these methods will disturb contaminants and may release limited amounts of volatile compounds and fine particulate into the environment. This highlights the benefits of the final type of remediation, attenuated in-situ, in which contaminants remain in-place once they have been determined to be stable

and physically segregated from human activity. In this case, consultants may be employed to monitor long-term progress of the site's decontamination. The construction of physical barriers may be necessary, such as building a paved parking lot over contaminated land, or containing hazardous materials within a fenced area. Over time, contaminants typically decompose into less-hazardous chemicals through natural attenuation or biodegradation. Phytoremediation may be a factor, but not though human intervention. While this approach requires the least monetary capital and poses the least risk of migration of contaminants into the environment, it can pose severe limitations on land use for longer periods of time. Additionally, certain contaminants may prove to resist biodegradation, such that the site will require active decontamination at a later date. Overall, the site preparation process for brownfield redevelopment engages professional expertise for the assessment of contaminants and the deployment of operational landscapes to manage the diversion, processing or disposal of waste materials.

Any design proposition the Turcot site must address two challenging aspects of its soil conditions. Firstly, the site was a former wetland. Its soil is high in peat and drainage operations throughout the nineteenth century would have oxidized iron sulfides in the soil (predominantly pyrites), producing sulphuric acid.[10] In turn, the acid would have reacted with other naturally occurring compounds to release elemental forms of iron, aluminum and arsenic. Increased acidity in the soil and groundwater also degrades concrete and steel structures, as made evident by the rapidly deteriorating highway infrastructure at Turcot.[11] Secondly, decades of industrial use further contaminated the site. Scrap iron was used as ballast beneath the rail yard, and locomotives would have released toxins as fine particulate that migrated into the soil. Today, the site contains unacceptable levels of nickel, cadmium, mercury and lead, as well as polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs).[12] The proponents of the Turcot Yard project have not officially publicized the extent and nature of its contaminated soil. However, in 2008 a study conducted by the firm Dessau estimated 40,000 m^3 of petroleum contaminated soil projected to cost $3.6 million or $90/$m^3$; and 190,000 m^3 of soil contaminated by heavy metals and PAHs, expected to cost $19 million or $100/$m^3$.[13] Petroleum contaminants are volatile, such that partial decontamination is typically observed after excavating and aerating the soil. However, heavy metals and PAHs have greater chemical stability in the environment and are more difficult to eliminate.

To reverse the effects of dewatering operations from the nineteenth century and restore a more neutral pH to Turcot's peat soil, phytoremediation plays a predominant role using conventional landfarming practices and the introduction of

10. Government of Western Australia, Department of Environment, Environmental Management Division. *Proposed Framework For Managing Acid Sulfate Soils*: p.2

11. The corrosive nature of the soil at Turcot was investigated by driving twelve test piles and observing thirty-two structural piers over a three year period from 1966–1969. See Schwerdtfeger, W. J. and Melvin Romanoff. *Corrosion Rates On Underground Steel Test Piles At Turcot Yard, Montréal, Canada—Part 1.*

12. Canadian Environmental Assessment Agency. *Lachine Canal Decontamination Project*: p.12–13.

13. Dufour, Valéire. "EXCLUSIF - Près de 24 M$ pour décontaminer la cour Turcot." *Rue Frontenac*.

fig. 1.08, *top: Indoor biotreatment facility on Rue St-Patrick. This joint venture between Cintec and Decontam offers full services related to the excavation, transportation, and valorization of contaminated soil.*

fig. 1.09, *middle: Soil washing facility on Rue Newman, circa 1995. Co-developed by Cintec and ART, the system uses wet screens and hydrocyclones for physical separation of fine particulate and decontaminates them using flocculation polymers.*

fig. 1.10, *bottom: Attenuated maximum security soil cell under construction, circa 1990. Three defunct landfill cells built by LaSalle Coke and Gaz Metropolitan were dismantled by Cintec to construct one cell to the highest standards. SNC-Lavalin engineered membranes, leachate collection systems, and a water treatment facility. All images courtesy Groupe Cintec, 2008.*

neutralizing agents, such as lime.[14] If the estimations of the Dessau report are correct, and a nominal 600 mm phytoextraction root depth is applied, the volume of petroleum contaminated soil will require 6.7 hectares of plantings over 1–2 years of growth,[15] whereas the volume of heavy metal contaminated soil will occupy 31.6 hectares and typically biometabolize in 3–5 years under ideal conditions, but may require up to 18 years.[16] A secondary benefit to the restorative effects of phytoremediation is its ability to constitute the matrix for a biodiverse wildlife habitat, when combined with strategic design modifications of conventional terraforming methods for both irrigation and drainage. In effect, a phytoremediation strategy for the Turcot site will feature four types of habitat native to the local area:

1. **Woodlands** to control erosion and to remediate stable contaminants, but also serving to expand the woodland habitat of the St. Jacques Escarpment;
2. **farmed grasslands** for ongoing compost application and phytoremedation of volatile contaminants brought to the site;
3. **wetlands** for filtration and purification of stormwater from adjacent roadways, but also acting as a restorative feature for prevailing peat soils, and finally;
4. **bodies of open water** serving as

14. Daigle, Jean-Yves and Hélène Gautreau-Daigle. *Canadian Peat Harvesting And The Environment, Second Edition*: p.23.

15. United States Environmental Protection Agency. "Landfarming." http://www.epa.gov/oust/cat/landfarm.htm

16. Lasat, M.M. "Phytoextraction Of Metals From Contaminated Soil." *Journal of Hazardous Substance Research,* Volume 2, No.5: p.14.

irrigation reservoirs and as nurseries to enhance the existing aquatic habitat of the Lachine Canal.

The organization of these elements will be illustrated in Chapter 04. These elements could potential contextualize additional design interventions that will transform the emergent landscape into a recreational swath for local residents, although the thesis envisions that the Turcot site will retain waste management operations and offer soil decontamination services as its primary economic generator. To describe potential interactions between agricultural operations, waste management and culturally valuable recreational programme, the remainder of this chapter explores cases where these seemingly incompatible land uses have been designed and orchestrated to coexist as public landscapes.

01.6
Agency of Landscape for Turcot

Leading practitioners and theorists of landscape design have explored the strategic instrumentality of landscape as a means to organize urban elements while enhancing them. James Corner speaks of the agency of landscape projects "as a means to critically intervene in cultural habit and convention... what matters is how the form and geometry of a project make sense to the specific issues it is trying to address and the effects it is trying to precipitate."[17] Stan Allen describes the expediency and flexibility of landscape as ideal stimulators of urban development: "designers can activate space and produce urban effects without the weighty apparatus of traditional space making."[18] As a construction medium, landscape encompasses the growth of plant species and their interaction with other organisms over time, taking advantage of their ability to self-organize and adapt to seasonal changes and environmental disturbances. These properties of landscape, with particular regard to the selection of robust plant species that tolerate pollutants, make it an ideal medium to act as the progenitor of urban development at the Turcot site.

The need to remediate the site—providing topsoil coverage and irrigation to counteract the acidity of the land—positions landscape as a suitable medium to reclaim Turcot. Linda Pollak describes the discipline's shift in strategy toward wetlands, reinforcing its candidacy for the Turcot site:

> Wetlands have never been a part of a pastoral landscape tradition. As America's conceptual and physical landscape was being produced, wetlands were reviled as malarial swamps. They became used as dumps because they were perceived as equal to dumps... The valuing of wetlands—in and for their instability—reflects broad changes in paradigms of nature, according to which it no longer makes sense to talk about a natural system coming to rest. Rather, a new body of theory reframes nature in terms of its "continual disturbance," rejecting the previous scientific 'truth' of organic nature's tendency towards either equilibrium or homogeneity. The discovery that disruptions are fundamental to natural systems has provoked a shift away from the model of a single ecosystem to one of multiple systems overlapping in a landscape of patches... This new paradigm, in which "nature" is not

17. Corner, James. "Introduction" in *Recovering Landscape: Essays in Contemporary Landscape Architecture*: p.4.

18. Allen, Stan. "Mat Urbanism: The Thick 2-D" in *CASE: Le Corbusier's Venice Hospital,* ed. Hashim Sarkis (Munich, Prestel, 2001): p.124.

> harmonious, should shift representations away from pastoral tradition.[19]

The successful urban integration of the Turcot site requires the deployment of infrastructural landscapes to decontaminate the site itself, but their design carries the potential to reclaim strategic swaths of land that link the site to established residential neighbourhoods. The thesis contemplates the appropriation of the Turcot site by the province and the pending reconfiguration of transportation infrastructure through the site as opportunities to expand the recreational program of the Canal via landscaped swaths that will link the naturalized Saint Jacques Escarpment with the green corridor of the Lachine Canal Linear Park. Additionally, nearby industries and their surrounding urban fabric stand to benefit from permanent infrastructural networks supporting material recovery and waste diversion linked with stormwater management and soil decontamination. The strategic urbanization of the Lachine-Turcot district begins with operative aspects of brownfield decontamination that are able to integrate with existing recreational landscapes while they generate new public space. The expanded recreational program acts as an attractor for speculative urban development upon newly recovered post-industrial land. Finally, ongoing decontamination operations require urbanized interfaces at their fringes to mitigate the danger they pose to adjacent urban zones. To illustrate the potential for hybridized landscapes at Turcot, the following section describes contextual precedents that strive to integrate infrastructural artefacts or operations with public landscapes.

19. Pollak, Linda. "Sublime Matters: Fresh Kills" in *Praxis no.4,* (2002): p.60.

01.7
Contextual Precedents: Confronting the sublime

As practitioners of landscape design realize the full instrumentality of their projects, the discipline distances itself from the stereotypical representation of the pastoral garden. Indeed, recent work dealing with brownfields has allowed designers to test popular appreciation for the ecological benefits and programmatic opportunities that emerge with reclaiming post-industrial landscapes. In qualifying the candidacy of brownfields for adaptation as large parks, James Corner states, "the tough, machinic, strange quality of these sites—has produced an alternative image to the rural pastoral that has dominated public expectations of what parks should look like for the past two centuries."[20] The concept of the sublime further qualifies a broad attraction to these sites and offers and explanation as to why they retain popular interest. In this sense, the term describes the unintended picturesque, beauty borne seemingly without artifice, and an inspiring sense of grandeur. Linda Pollak elaborates:

> The sublime engages complexity, having to do with constructing an identity that is not singular. Its engagement of that which is uncontainable in time and space has a parallel in scales of ecological function that extend beyond the boundaries of the site, having to do, for example, with... processes that occur over time, eluding a stable or static identity. There is a parallel between the sublime as an aesthetic addressing something too large or too complex for the mind to grasp, and an ecological framework engaging forces and flows which are not contained or

20. Corner, James. "Foreword" in *Large Parks,* Czerniak, Julia and George Hargreaves eds.: p.12.

> containable within a specific site.[21]

Many of the derelict landscapes along the Lachine Canal—the Turcot Yards and Interchange, and the St. Jacques Escarpment—convey a sense of the sublime that would appropriately inform new projects. Furthermore, the uncontainable and plural qualities of the sublime appropriately engages the ecological and temporal aspects of landscape as a matrix for local industrial and remediation processes. To further illustrate strategic paradigms for the Turcot site, the following subsections describe exemplary landscape projects whose aims and outcomes align with the post-industrial urbanization of the Lachine Canal.

01.7a
Fresh Kills: cracks in the green veneer

James Corner's *Fresh Kills Lifescape* demonstrates methods of landscape reclamation suitable for Turcot Yard and other defunct landfills along the Lachine Canal. Field Operations was retained by New York City to produce a masterplan and execute a series of design interventions that will transform Fresh Kills Landfill into a park three times the size of Manhattan's famed Central Park. Surrounded by an estuary, the site's surface is being terraformed into forests, meadows, lawns, and marshes supporting wildlife habitat and multi-season recreational activities such as mountain-biking, kayaking, hiking, cross-country skiing, fishing, and bird-watching. Yet Corner's masterplan also incorporates productive landscapes. Beneath the 'green veneer,' methane is being harvested from the natural biodegradation of interned waste, and wind turbines will continue to produce electricity as the methane emissions subside. The park will require ongoing monitoring of its garbage mounds as the landfilled materials become inert.

> The materiality of the sublime makes it relevant to the remaking of the Fresh Kills landscape, both in terms of the displacements that have already occurred there, and the further displacement that the design entails. The operation involves locating the cracks within the mask of the pastoral landscape and opening them to a less domesticated sublime.[22]

These so called "cracks" also recall Bluestone's position that the cultural value of reclaimed sites are most potently conveyed if their former use is incorporated as part of a functioning landscape. Although garbage is no longer dumped at Fresh Kills, the cracks in the green veneer serve as part of a didactic legacy for public interpretation. Moreover, the park will feature an interpretive centre to reveal its historic waste management operations and the particulars of its transformative reclamation, thereby conveying the cultural importance of environmental stewardship.

The thesis proposes that a similar didactic program be offered on the Turcot site, potentially administered by Parks Canada which already organizes guided tours and special events along the Lachine Canal. Their presence has yet to be formalized by a dedicated interpretive centre. Therefore, informative displays, public services and related administrative functions would be appended to the compost facility proposed by the thesis, serving as a hub for guided tours of Turcot's phytoremediation grounds, the Lachine Canal, and the compost plant itself.

21. Pollak, Linda. "Matrix Landscape: Construction of Identity in the Large Park" in *Large Parks*: p.96.

22. Pollak, Linda. "Sublime Matters: Fresh Kills" in *Praxis no.4,* (2002): p.59.

Additionally, Fresh Kills demonstrates how biodiverse landscapes support a multitude of recreational programs, but its design matrix is open-ended enough to give ecosystems the ability to cope with programmatic and environmental changes. A hybridized landscape at Turcot will function along similar parameters, necessitating a matrix that can adapt to ongoing restorative interventions, just as the Fresh Kills site will require infrastructural interventions in response to changes in the chemical and physical composition of interred materials as they decompose. This alludes to cases in which wildlife habitat can emerge from active landfills and coexist with recreational landscape programs, as serendipitously recognized in the following example.

01.7b
Leslie Street Spit: the accidental landscape

Corner has also been retained as a design consultant for Toronto's Lake Ontario Park, incorporating the Leslie Street Spit. Like Fresh Kills, the Spit is a landfill, but its primary composition is rubble from demolition sites—mainly concrete, brick and vitreous materials. The initial purpose of its construction was to expand Toronto's port. The maritime infrastructural needs have since subsided, but landfill operations continue up to the present day. Over decades the landfill was passively seeded by grasses and fast growing trees—primarily cottonwood and poplar species—giving rise to habitats for migratory birds, cormorants, terns, fox and coyotes; species atypically encountered within proximity to urbanized areas. Like Fresh Kills, Corner's design improves the Spit's preexisting biological matrix to accommodate a variety of habitat for wildlife, and introduces a variety of outdoor activities for visitors, but these activities must be organized to coexist with ongoing landfill operations. Presently, the Spit's shorelines are composed of discarded concrete and brick, porous materials that are eventually

fig. 1.11: *Conceptual rendering of Fresh Kills Lifescape. Courtesy Field Operations, 2008.*

eroded into smooth beach pebbles and fine grains. The degradability of these materials mean that landfill operations must continue to combat erosion, and eventually the materials will self-organize into the angle of repose that best resists lake wave action, forming a beach of synthetic materials. Corner's vignettes indicate shorelines of riprap—quarried stone intended as a more permanent solution against erosion. Meanwhile, the design presentation text states that "new soil and grading will contain ground contamination and improve habitat."[23] The design approach and choice of material palette arrives at a refractory landscape that contends with active landfill operations. Whether or not landfilling will continue at the Spit, the strategy for Turcot necessitates a working landscape in which recreational use cohabits with waste management operations. Although such a cohabitation exists at the spit today, Corner's design is cognizant that some operational concessions are necessary in order to accommodate and expanded recreational programme at the site.

23. Corner, James. "Lake Ontario Park" *Concept Plan Presentation* (2007): p.25.

01.7c
High Line: accidental landscape urbanized

New York City's *High Line* shares the Spit's phenomenon of nature serendipitously rooting itself upon an artificial matrix, in this case an abandoned elevated railroad. The feral and pastoral qualities of the raised swath of grasses, sumac and trees juxtaposed against the rugged urbanity of Manhattan's Meatpacking District effectively inspired local residents to save the structure demolition. A design competition was held to investigate the structure's potential to serve as a linear park, culminating as a joint-venture between the firms of Field Operations and Diller Scofido+Renfro. The result retains much of its feral charm, as its pebbled pedestrian path occupies only a portion of

fig. 1.12: *Conceptual rendering of Lake Ontario Park, Leslie Street Spit section. Field Operations, 2008.*

fig. 1.13, *top: Conceptual Rendering of High Line Project. Courtesy Diller Scofidio+Renfro, 2006.*

fig. 1.14, *middle: Private development easement over the High Line. Courtesy Friends of the High Line Foundation, 2009.*

fig. 1.15, *bottom: Paving detail. Courtesy Friends of the High Line Foundation, 2009.*

the structure's breath, swelling to create rest points and connections with streets below, then narrowing to swerve through swathes of meadow grasses, litaris, and coneflowers; with clusters of sumac and smokebush. The designer's material palette emphasizes the landscape's infrastructural past as a medium of railroad gravel and mulch surrounds the plantings, partitioned by lengths of rail and wooden ties. Where bygone factories have been converted to residential lofts, their abandoned railroad spurs have been adapted as landscaped amenities that give residents direct access to the park. The project has precipitated a local renaissance as "over 30 projects are planned or under construction nearby."[24] Much like the Lachine Canal, the High Line is an abandoned infrastructural conduit adapted into a linear park. Its proximity to urban areas, in conjunction with public popularity toward the landscaped promenade through the city, attests to leisure landscape's role as a catalyst for urban revitalization. Moreover, the material and botanical palettes chosen by the designers recall the feral aesthetic that the site acquired in its neglected state, while demonstrating respect for the *High Line's* infrastructural heritage. This historically sensitive approach enhances the cultural richness of the promenade in a manner applicable to future design interventions for the Lachine-Turcot district.

01.7d
Landschaftpark Duisburg-Nord: subliminal reclamation

Duisburg is a 222 hectare, century-old former steelmaking site along the Emscher River in Germany. In 1991 Peter Latz's

24. Pogrebin, Robin. 2009. "First Phase of High Line Is Ready for Strolling." *New York Times*. June 8, Online Edition.

firm won an international competition commissioned to decontaminate the post-industrial site and transform it into a park. The strength in Latz's approach is that the transformative mechanisms require minimal intervention, thereby retaining much of the site's aging industrial character as though it remained a derelict landscape. The scheme is divided into three major zones: repurposed industrial machinery, a wilderness landscape, and finally a civic landscape that addresses adjacent residential neighbourhoods.[25] A recreational program has been applied to the industrial machinery, in which a defunct gasometer has been transformed into a diving pool and ore bunkers have been adapted for wall scaling. The wilderness area features secessionist plants that were introduced to the site over its industrial use via rail cars, but also acts as an attenuation landscape that covers and mitigates toxic areas. Abandoned rail lines have been appropriated as elevated conduits that circulate visitors through the park, whilst permitting visitors to recognize the industrial processes that once occurred throughout the site. The laissez-faire strategy for the park also recalls Bluestone's position that the cultural value of the site is interpreted through the adaptation of existing landmarks rather than obliterating them, and by attenuating toxic nodes rather than displacing them. The visitor can ascertain natural processes and transformative mechanisms that will—over decades or perhaps centuries—rid the park of its contaminants. These same processes will be implemented at the Turcot-Lachine District, albeit more intensively on certain sites, and the public will be able to witness

fig. 1.16, *top: Ore bunkers at Duisburg-Nord. Courtesy Ra'ike, 2009.*

fig. 1.17, *middle: Defunct gasometer repurposed as a diving platform. Courtesy Alice Chodura, 2010.*

fig. 1.18, *bottom: Nighttime illumination at Duisburg-Nord. Courtesy Tobias Arnst, 2007.*

25. Paraphrased from Hargreaves, George. "Large Parks: A Designer's Perspective" in *Large Parks*: p.162.

its transformation over time. Similar to the machinery adaptations at Duisburg-Nord, the former LaSalle Coke Crane and Canada Malting Silos abutting the Lachine Canal may serve as observation platforms overlooking local waste management, construction and decontamination operations at the Lachine-Turcot district.

01.8
Theoretical and Practical Summary

The preceding examples demonstrate how culturally valuable public landscapes can emerge from derelict post-industrial tracts and infrastructural artefacts. In the case of the High-Line, industrial railroad infrastructure was transformed to a mobility landscape and a valuable asset for growing urban areas. This effect reinforces the position of the thesis that the wide range of vehicular and pedestrian mobility afforded by the Lachine Canal shall continue to catalyze profitable development on its banks. Therefore, the masterplan for the Turcot-Lachine District to be illustrated in Chapter 04 designates canal lots for mixed-use and residential development. Fresh Kills and the Leslie Street Spit demonstrate how biodiverse recreational landscapes continue to interface with waste management operations and act as an infrastructural hybrid. The provincial proposal to reconfigure highway infrastructure through the Turcot-Lachine district is complex and will require temporary infrastructural landscapes and laydown areas in order to manage construction material receiving and staging, demolition waste recycling and outflows, as well as stormwater retention and drainage. It stands to reason that a biodiverse hybridized infrastructural landscape at Turcot shall serve as a suitable reprieve for local residents during Turcot's reconstruction, and shall secede as an ecologically diverse swath that will buffer undesirable aspects high-speed traffic from speculative developments along the Lachine Canal. Furthermore, working in tandem with existing industries at the Lachine Canal, such a landscape has the capacity to adopt waste management roles that will initially support the aforementioned temporary infrastructural requirements of the Turcot Interchange project, and then facilitate ongoing local brownfield remediation over the long term. In this manner, the introduction of a waste management landscape to the Turcot site is justifiable in that existing industries and expertise along the Lachine Canal stand to benefit from economic exchanges to be described in Chapter 02. The phytoremediation landscapes at Duisburg-Nord provide some sense of how a similar landscape at Turcot would take shape. Furthermore, Duisburg-

fig. 1.19: *Panoramic view of Landschaftpark Duisburg-Nord. Courtesy Raimond Spekking, 2006.*

Nord successfully retains the integrity of its historically significant artefacts by introducing programmatic functions that required little alteration of the existing industrial machinery, or simply by illuminating them at night. Such a strategy is appropriate for many relics along the Lachine Canal that have yet to be appropriated by the recreational agenda implemented by Parks Canada, particularly due to budget constraints.

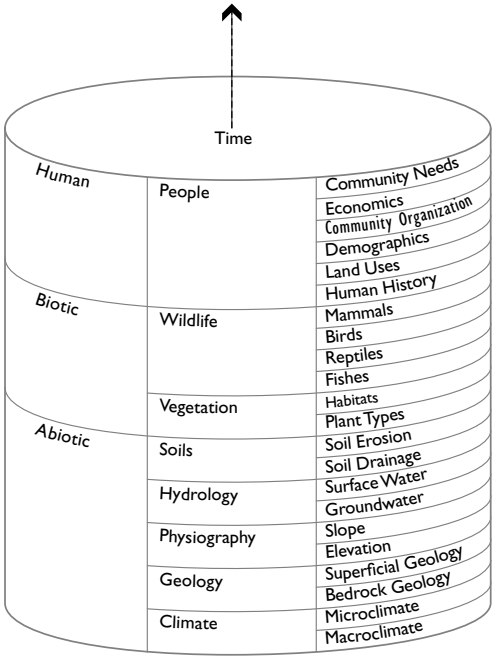
To inform a landscape management plan for Turcot, the precedents also reveal theoretical principles. It is apparent that biotic systems are employed as a means to reconcile human use and abuse of landscapes. Yet there remains underlying tension between deploying these systems as prescribed design elements, versus implementation of adaptive design schemes that permit resilient biotic systems to emerge over time. Prescribed ecological design—*ecological determinism*—is widely attributed to the late Ian McHarg, whose career at the University of Pennsylvania spanned landscape architecture and regional planning. McHarg's methodology, developed in the 1960s, championed the continued existence of natural processes within urban planning and design: "The basic proposition is that any place is the sum of its historic, physical and biological processes, that these are dynamic, and they constitute social values."[26] To perform illustrative analyses of these factors, McHarg's technique layered transparency maps depicting abiotic features, biotic systems and human constructs. Superposition of these transparencies would convey ecological criteria and social values for prescribing and situating interventions, culminating in what is commonly referred to as a *suitability analysis*. Corner, at one time a pupil of McHarg, uses this methodology as a means to represent existing parameters of the Fresh Kills site, demonstrating how these influenced his decisions to site new pathways, habitat and programme.[27] The model is equally valid to depict existing conditions at Turcot. However, contemporary landscape urbanists—including Corner—have recognized the shortcomings of McHarg's method as a planning technique. Theorists contend that its use of overlays as a decision making tool circumvents design opportunities,[28] and that the compartmentalization of landscape elements as discrete layers obscures the interdepend-

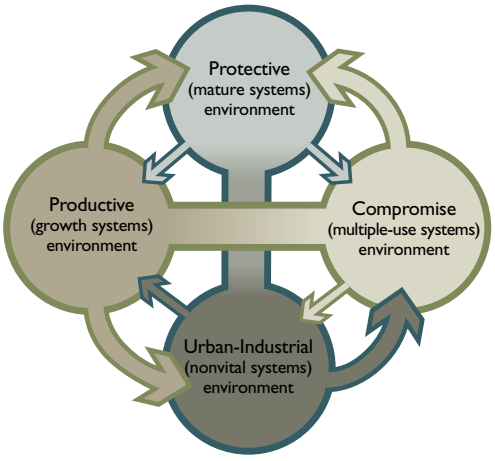
26. McHarg, Ian. *Design with Nature*: p.104.
27. Pollak, Linda. "Matrix Landscape: Construction of Identity in the Large Park" in *Large Parks*: p.113.
28. ibid.

fig. 1.20: *Panoramic view of Landschaftpark Duisburg-Nord. Courtesy Raimond Spekking, 2006.*

fig. 1.21, top: McHarg's Layer Cake Model superimposes landscape elements. Drawn by author; refer to footnote 29 for source.

fig. 1.22, bottom: Odum's ecosystem compartment model relates the major types of landscape to the ecological functions required to support them. Drawn by author; ibid source.





encies and interactions between them.[29]

To better identify how ecosystems change in response to human interaction, Eugene Odum developed a model that relates four major types of landscapes to the ecological functions required to support them: production (i.e., agriculture, forestry); protection (i.e., wetlands, mature forests); compromise or multiple-use (i.e., suburbs under a forest canopy) and biologically nonvital uses (i.e., cities, industry). Although Odum's diagram oversimplifies interactions between the four, the model is a progenitor for landscape urbanism and clarifies the basis of a working landscape at Turcot. The sylvan St. Jacques Escarpment falls under the protective category, but the thesis also identifies certain waste management industries for sheltered zoning regulations. The proposed phytoremediation grounds function as a multiple-use system, bearing a relationship to agricultural ecosystems, but also subject to recreational use and suitable for an expanded wildlife habitat. The phytoremediation grounds are also dependent on waste flows from the city and byproduct exchanges between the protected industries. The canal, historically an urban-industrial landscape, has shifted toward a protective designation under Parks Canada's jurisdiction, but hydrological requirements for Turcot would engage it as a productive resource. These flows and interdependencies allude to a less prescriptive model that adapts to unpredicted outcomes of constructed ecosystems, unforeseen interactions with migratory wildlife populations, as well as periods of resource scarcity or overabundance due to climatic

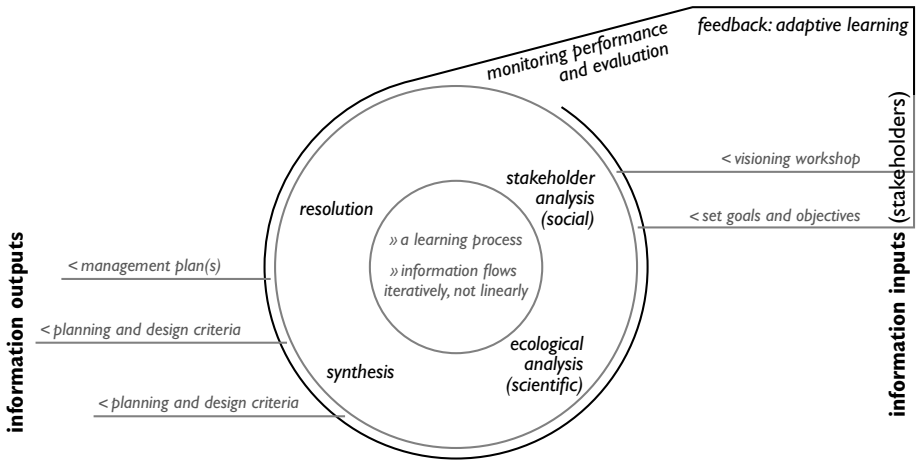
29. Ndubisi, Forster. "Landscape Ecological Planning" in *Ecological Design and Planning,* George F. Thompson and Frederick R. Steiner, eds.: p.26

abnormalities. Nina-Marie Lister elaborates:

> This recent view of ecosystems, and of nature more generally, as open, self-organizing, holistic, dynamic, complex and uncertain has significant implications for ecological design and other applications in planning and management. We can never determine with precision the consequences of our actions. The current and widely accepted concept of 'environmental management' is an oxymoron, because we can never truly 'manage' living systems. Instead, we can refocus our energies on those human activities that provide the context for the self-organizing processes in ecosystems. This implies a profound change in environmental decision making and has concomitant implications for design, planning and management of ecosystems in general and of large parks in particular.[30]

Lister's model of the adaptive landscape applies to the proposed working landscape at Turcot, which recruits the expertise of the Montréal Centre for Excellence in Brownfield Remediation to assay contaminated soils and monitor bioremediation progress. Wildlife experts and horticultural stewards from Parks Canada would surveil potential bioaccumulation of contaminants within flora and fauna. Meanwhile, nearby waste management industries shall act as a fail safe in the mitigation of contaminated soils. Other industries will contribute byproducts toward the chemical optimization of compost produced at Turcot, vital for phytoremediation landfarming operations. Finally, as the public engages the landscape as a recreational park, nature enthusiasts such as bird-watchers or sport fishers may be the first to encounter species as they migrate to newly reclaimed habitat. Under Lister's model, information gained from all sources is inputted in a feedback loop to determine if additional interventions are required to ensure public safety and health of local ecosystems. To surmise, the thesis uses a prescriptive model to propose interventions at Turcot, but employs adaptive models to speculate upon its evolution.

fig. 1.23, *below: Lister's Adaptive Design model describes the process for consultation, experimentation and stewardship of biodiverse landscapes. Drawn by author; refer to footnote 30 for source.*



30. Lister, Nina-Marie. "Sustainable Large Parks: Ecological Design or Designer Ecology" in *Large Parks.* p.45

Chapter 02

"If humans are truly going to prosper, we will have to learn to imitate nature's highly effective cradle-to-cradle system of nutrient flow and metabolism, in which the concept of waste does not exist... the valuable nutrients contained in the materials shape and determine the design: form follows evolution, not just function."

—McDonough, William and Michael Braungart, *Cradle to Cradle*: pp.103–104.

fig.2.01: *Turcot Yard, Montréal. Courtesy Ken McLaughlin, 2007.*

02

TRASH:
a description of current trash infrastructure and processes in Montréal

02.1
Modern Responses to the Waste Crisis

The widespread growth of North American cities over the past century has brought particular attention to their waste handling strategies. Often, landfills that were sited beyond city limits at the time of their inception are now completely engulfed by built areas, and will remain unsuitable for development for centuries to come. It has become increasingly challenging for cities to site new landfills within proximity to neighbourhoods from which garbage is collected. Furthermore, contemporary landfill operations require specific geological conditions and engineered sanitary measures; factors that ultimately contribute to increased transportation costs and tipping fees. Therefore, municipalities across the globe have embraced waste diversion—also known as recycling—as a means to abate costs borne by their ratepayers,

fig.2.02: *Demolition of Constellation Hotel, Etobicoke, ON; showing on-site material recovery operations, separation of reinforcing steel from aggregate. Photo by author, 2008.*

extend the life of active landfills, and potentially profit from waste. Waste diversion intersects with brownfield remediation through the recovery of recyclable materials from abandoned buildings and contaminated soil. Pierre Bélanger provides additional insight to the operative aspects of waste diversion and brownfield remediation. His analysis of waste management within the Northeastern Rustbelt—post-industrial sites largely tied to the decentralization of North American auto manufacturing and the obsolescing of their vertically-integrated industrial modes—has revealed emerging "waste economies and industrial ecologies" in what he classifies as "Landscapes of Disassembly."[31] In the context of modern environmental regulations and economic deterrents of mass-disposal, the tasks of operating landfills and rehabilitating post-industrial sites place greater requirements for professional consultation, geotechnical testing, biotechnological innovation, and mass-recycling. On a per ton basis, ecological waste diversion practices generate up to ten times more jobs than landfilling or incineration, "where the multiplier effect of the modern recycling industry eclipses conventional landfilling industry through employment spin-offs, technological innovation, land redevelopment, and brownfield remediation."[32] Waste economies are tied to human activity, especially now that modern waste management practices require a larger workforce and proximity to urban areas to maximize waste collection

31. Phrases coined by Bélanger, Pierre. "Landscapes of Disassembly." in *Topos* 60: pp.83,86,91.

32. ibid.: p.85.

efficiency and to minimize fuel and transport costs. Belanger continues:

> The complexity of recycling and remediation is magnified at the urban scale, especially when it involves an ecology of multiple industries and multiple waste streams. Two procedures are necessary to decode this complexity. Firstly, the mapping of the geography and flow of industrial processes (water coolants, material inputs, energy requirements, emissions, effluents, waste fluids) must occur in parallel with the mapping of urban processes (water courses, surface runoff, sewer outflows, domestic wastes). Secondly, linkages must be designed (using chemistry and biology in combination with geography and transportation) so that waste from one industry becomes fodder for another. With these two procedures, an ecology of waste transactions can be prototyped and a network of industrial exchanges constructed.[33]

Bélanger cites the city of Kalundborg, Denmark as a specific instance where two major industries altered their waste outflows in a manner that increased profits and benefited nearby residents. Their example precipitated a cascade of profitable industrial synergies that effectively reduced overall energy needs, decreased material costs and stimulated employment within the recycling and manufacturing sectors. Kalundborg undertook infrastructural upgrades and urban renewal as a result of the liberated capital.[34]

To facilitate similar industrial exchanges, the Lachine-Turcot District already exhibits an abundance of infrastructural landscapes in the form of intermodal conduits, laydown areas, containment berms and underused land that can be easily repurposed. The district also features a range of waste management and building product industries having inherent potential to expedite local urban renewal. The thesis envisions that these industries shall remain on the banks of the Lachine Canal so long as they can profitably facilitate the district's ongoing post-industrial renaissance, but also proposes protective zoning regulations as part of the masterplan. Furthermore, the thesis speculates that these industries shall become more viable with the introduction public works waste management to the Turcot Yard. The introduction of organic waste diversion—commonly referred to composting—will assist in the creation of nutrient-rich soil to expedite brownfield remediation and provide a matrix for wildlife sanctuaries and the expansion of recreational landscapes. The resultant infrastructural upgrades also carry potential to integrate public space that enhances and expands the existing recreational program along the Lachine Canal, generating connective landscapes that interface with viable industrial zones and link the canal's banks to nearby residential neighbourhoods. These potentialities will be discussed in greater detail following a description of Montréal's Waste Management Masterplan.

02.2
Montréal's Waste Diversion Practices

Like much of the world's metropoleis, Montréal is adopting strategies to mitigate a growing garbage crisis. In 1984, the city was forced to reassess its waste management practices when the residents of the St-Michel neighbourhood championed the closure of the island's last remaining

33. ibid.: p.86.

34. See Bélanger's description of the industrial economies of Kalundborg, Denmark. ibid.: p.87–88.

garbage dump, a former stone quarry. Today, the city relies on landfills as far as 112 kilometres from their central sorting facility.[35] Annually, over five million litres of diesel fuel are consumed in the transport of municipal waste beyond city limits.[36] Furthermore, 47% of Montréal's landfilled waste is organically biodegradable and could be recovered if the city constructs adequate composting facilities.[37] The city has logged a marked improvement in the recovery of recyclable inorganic materials, from a 34% diversion ratio in 2004 to a 53% ratio in 2008,[38] but still short of their 60% target and well short of the 80% ratio enjoyed by the nearest major city, Toronto.[39] In response, Montréal has drafted a waste management masterplan to expand programs that have already demonstrated economic and ecological sustainability. For example, a unique feature of Montréal's waste handling practices is its Eco-Centre facilities, which are essentially waste transfer stations executed at a smaller-scale than typical municipal facilities. Established in 1997, the Eco-Centres sort recyclable goods that are normally not handled by curbside pickup, such as electronic devices, major appliances and construction debris; and are located in proximity to residential areas. As of 2010, six facilities have been implanted across Montréal island, one of which is located in the shadow of the Turcot Interchange. The city plans to construct to eight more for total of fourteen by the year 2019.[40] Moreover, the city intends to substantially improve the diversion rate of organic waste, in which a paltry 8% of total organics is currently processed into compost.[41] The city's existing organic waste program is the result of a pilot project launched in 2004, serving a portion of Plateau Mont-Royal neighbourhood. The program was expanded in 2008 to include the districts of Côte-Saint-Luc, Point-Claire and Westmount; comprising 6% of the island's total population.[42] In 2009, the city approved a $1 million three-year contract to send organic waste to an existing privately owned facility in Ste-Genevieve-de-Bertheir, about 75 kilometres northeast of the city.[43] The contract would allow an additional 30,000 households to begin composting, but each year an additional 130,000 litres of diesel would be consumed to transport this waste beyond the city limits.[44]

To further improve the handling of organic waste, Montréal's Waste Management Masterplan allocates $203 million toward a citywide composting program, with an additional $13 million to be spent on an awareness campaign.[45] The city's plan will radically change the waste behaviour of the average Montréaler by cutting garbage pickup to once a week, distributing larger recycling bins to parts of the island that do not have them, and banning

35. City of Montréal. *Portrait 2008 des matières résiduelles de l'agglomération de Montréal*: p.12

36. Fuel consumption value extrapolated from tables by Larsen, Anna et al. "Diesel consumption in waste collection and transport and its environmental significance" in *Waste Management & Research* 27: p.657.

37. ibid., p.16.

38. Montréal's diversion rate ibid.: p.12

39. Toronto's diversion rate cited by Giambrone, Adam; speaking as Vice-Chair of the City of Toronto Public Works and Infrastructure Committee: "Ontario Society of Professional Engineers Waste Diversion Breakfast Forum," 8 December 2009.

40. Beaudin, Monique. "To Landfills No More" in *Montréal Gazette*: August 16, Online Edition

41. City of Montréal. ibid.: p.16.

42. Beaudin, Monique. ibid.

43. ibid.

44. Fuel consumption value extrapolated from tables by Larsen, Anna et al., ibid.

45. Beaudin, Monique. ibid.

residents from putting grass clippings, hazardous waste, and construction debris in the garbage. Ultimately, Montréal intends to construct four compost facilities on the island, and the Québec government has allocated $500 million for the construction of such facilities province-wide.[46] Intentions notwithstanding, as of 2010, no firm commitment of funding for Montréal's facilities has been announced by either government.

02.3
Organic Waste Diversion Exemplar

Meanwhile, other Canadian municipalities have already constructed advanced organic waste treatment facilities. Such facilities are engineered to expedite biodegradation of organic matter, promoting aerobic microbial digestion of the waste to reduce noxious odours. Filtration and conveying technology permits these facilities to be located in proximity to urban areas, occupying a relatively small footprint compared to traditional composting. On North America's first indoor compost facility, Pierre Belanger writes:

> On the cutting edge of this is a new, state-of-the-art composting facility in Hamilton, Canada's most polluted harbour. At full capacity, the 40-acre facility can process up to 90,000 tons of organic waste every year, enough for a city of almost one million. Operative costs of the facility are 30 per cent lower than conventional landfilling, and the process is 10 times faster and uses less than one tenth the land base of conventional outdoor composting. ...The composting operations have catalyzed an array of alternative industries based on the creation of different waste streams through separation. In other words, as Joel McCormick, manager of the facility explains: 'waste is simply acknowledged as part of the process of urbanization... Diversion strategies are literally bringing waste back into the economic loop, squeezing waste handling giants out.' ...Current plans in the Hamilton Harbour include the expansion of the Central Composting Facility to include recyclable materials sorting that, on a per-ton basis, could generate ten times more jobs than landfilling or incineration alone... This is where the multiplier effect of the modern recycling industry eclipses the conventional landfilling industry through employment spin-offs, technological innovation, land redevelopment, and brownfield remediation.[47]

Given Montréal's current waste management masterplan, four facilities of this type would appropriately handle the organic waste output of the island's entire population of the island, about 360,000 tonnes per year at an optimal 90% recovery rate.[48] For reasons elaborated below, thesis proposes that one such facility be constructed upon the former Turcot Yard and uses Hamilton's compost facility a template.

Compost is an inexpensive material useful in landscape renewal operations. As a permanent measure, it can be used as the top layer of capping material for toxic sites, as compost blankets for slope stabilization or erosion control, as fertile material supporting growth of riparian buffers that cleanse stormwater. As a temporary measure, compost is used in filter berms and socks that purify wastewater; especially at construction sites.[49]

46. ibid.

47. Bélanger, Pierre. "Landscapes of Disassembly." in *Topos* 60: pp.84–85.

48. Value calculated by author based on information published by the City of Montréal. *Portrait 2008 des matières résiduelles de l'agglomération de Montréal*: p.16.

49. The United States Environmental Protection

In consideration of provincial plans to reconstruct the Turcot Interchange and parcel Turcot Yard for profitable development, the availability of compost will be essential in the mitigation of existing contaminants and construction-related pollutant discharges. As part of a masterplan for the Lachine Canal Corridor, the thesis speculates as to how an expanded waste diversion network within the district will influence public landscapes.

02.4
Potential Waste Economy at Turcot

The Lachine Canal of the industrial revolution was a landscape of enormous production, made efficient by grouping industrial sectors and feeding raw materials and by-products between them. The historic exchanges between these industries will be explored in greater detail in Chapter 03, but this chapter explores a parallel exchange between extant urban resources in the canal's contemporary state. Ironically, the urban fabric of today's Lachine Canal is capable of consuming itself, with active operations and expertise in material recovery. No fewer than three privately held facilities dedicated to sorting paper and cardboard for recycling are located within walking distance of former Turcot Yard: Kruger, Cascades Group and the Montréal Paper Recycling Company. The district is also scattered with scrap metal recovery operations, and recyclers of concrete and aggregates, namely: St. Lawrence Cement

Agency has produced a number of *Best Management Practices Fact Sheets* (BMPs) pertaining to the usefulness of compost. These are easily retrieved by entering "compost" as a keyword search under National Pollutant Discharge Elimination System (NPDES) website: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/ Fact sheets cited include: "Compost Blankets," "Compost Filter Berms," "Compost Filter Socks," "Riparian/Forested Buffer."

fig.2.03, top: *Compost stockpiles contaminated by inorganic debris at Montréal Public Works Site. Photo by author 2009.*

fig.2.04, bottom: *Holcim Concrete Plant, Lachine-Turcot District. Photo by author, 2009.*

(a subsidiary of Holcim), Pavages Chenail and Construction DJL.

The machinery used to mechanically separate materials for recovery and refinement is also manufactured in the Lachine-Turcot district. In 2008, Metso acquired a former General Electric hydro turbine factory, and retooled it to manufacture of mining equipment, with plans to employ over 170 skilled labourers.[50] Metso is an international conglomerate with technological expertise for the pulp and paper sector, including the recycling of paper fibres. Their expertise is undoubtedly capable of supporting and streamlining the aforementioned waste management sector along the Lachine Canal by fabricating customized solutions for their unique technological needs. Furthermore, customized mining equipment might also be applied to the classification and separation of contaminated soils within the Lachine Canal district, especially in the recovery of recyclable materials from Turcot Yard and neighbouring decommissioned landfills. To rationalize their acquisition of the property, Metso cited the district's "excellent land and sea connections," specifically, "rail lines that extend directly to the interior of the plant, as well as being close to the Lachine canal, the Port of Montréal, and the Trans-Canada Highway," allowing them to "efficiently service Metso's customers worldwide."[51] The nineteenth century factory was originally owned by Dominion Engineering, who designed the structure to flexibly fabricate customized heavy machinery for a diverse portfolio of contractees, as explained further in Chapter 03. Since the breakup of Dominion Engineering, GE Hydro subdivided the plant with CAD Railway Industries Limited (Canadian Allied Diesel), itself a descendent of the canal's nineteenth century industrial giants relating to the

50. Gibbens, Robert. "GE Hydro plant gets new life making mining equipment." *Montréal Gazette*: Online Edition, July 26, 2008.

51. "Mining equipment manufacturing in Lachine, Canada." Metso—Mining and Construction, Technology & Services, Worldwide Manufacturing. http://www.metso.com/miningandconstruction/mm_gen.nsf/WebWID/WTB-090622-2256F-D4626?OpenDocument&mid=7B39FEF4D2E8A622C22575DD002AA9C8 (Accessed June 2010).

fig.2.05: *Deitchter & Frère scrapyard, Lachine-Turcot District. Photo by author, 2009.*

fig.2.06: *Aggregate stockpile at Construction DJL, Lachine-Turcot District. Photo by author, 2009.*

manufacture of railroad equipment. Today, CAD is independently contracted to rebuild and maintain diesel-electric locomotives and rolling stock. Their ESDC Division specializes in upgrading engines to comply with increasingly stringent emissions standards and improved fuel economy. The company also cites the advantageous infrastructural connections at its location, "serviced daily by both the CN (Canadian National) and CP (Canadian Pacific) Railroads at no switching charges."[52] These are examples of heavy industries that continue to thrive at Turcot due in part to the district's comprehensive infrastructural network, but also because they have adapted to ecologically conscious business practices and waste economies.

Ecological expertise is also paralleled in the waste management sector elsewhere in the district. Just east of Turcot on the south bank of the canal, the Montréal Center of Excellence in Brownfield Remediation (MCEBR) partners with private geotechnical firms to develop strategies for environmental risk assessment analysis, techniques in phytoremediation and technologies like flotation columns for soil decontamination. Moreover, the MCEBR uses its own headquarters situated atop a former rail yard as an experimental phytoremediation rehabilitation site. The expertise gained from their operations is directly applicable to the decontamination of Turcot Yard. Meanwhile, Groupe Cintec, an environmental cleanup firm, operates an ex-situ soil biotreatment facility adjacent to the Montréal Paper Recycling Company. Cintec also operated and continues to monitor a high-security contaminated soil cell upon a portion of the former LaSalle Coke site, featuring a composite liner to protect groundwater, air quality control and discrete leachate treatment systems. The cell is adjacent to active municipal snow dump sites and former municipal landfills, easily identifiable by their encapsulated garbage mounds. Additionally, the municipality of Montréal Arrondissement Sud-Ouest retains an infrastructural

52. CAD Railway Industries—Our Facilities. http://www.cadrail.ca/eng/equipement.htm (Accessed June 2010).

fig. 2.07: *Montréal Public Works Site, Lachine-Turcot District. Photo by author, 2009.*

fig. 2.08: *Kruger Inc. Division Turcal, Lachine-Turcot District. Photo by author, 2009.*

public works facility located between the Canal and the Turcot Site. The facility's operations include the stockpiling and deployment of seasonal street furniture and portable structures for nearby parks, along with decorative annual plants, perennials, and tree saplings for streetscape and landscape beautification programs. The facility also makes use of the compost derived from the city's pilot organic waste program—the shortcomings of which are evidentiary in the quality of the compost, tainted by plastic debris and decay-resistant lignin.[53]

Aside from the need for higher quality compost for existing public works operations, introducing an organic waste facility to the Lachine Canal district would strengthen existing waste diversion operations and generate new symbiotic waste flows between local industries. For example, organic waste sourced from McAuslan Brewery would lend itself as ideal growth medium for mushrooms,[54] whose spores can then be cultivated to expedite biodegradation of petroleum contaminated soil throughout the Lachine-Turcot district.[55] Oily paper and cardboard waste deemed unfit for recycling by nearby facilities would also be diverted to organic waste flows, where the carbon content of the paper balances phosphorous and potassium derived from food waste, thereby reducing anaerobic digestion and associated unpleasant odours in the compost process.[56] Alkaline byproducts from adjacent industrial processes—such as ash and lime from nearby aggregate recyclers—may also be introduced to achieve ideal topsoil acidity and carbon content within the finished compost product.[57] In turn, the compost produced by the facility would support nearby post-industrial remediation operations, specifically by mixing with uncontaminated aggregates to produce fertile topsoil to cap contaminated sites, or as a growing medium for phytoremediation landfarming. Like Kalundborg, the resultant waste flows will reduce material imports, and allow companies to profit from their waste rather than landfill it.

By re-networking defunct infrastructure along Montréal's Lachine Canal, and overlaying a program of material exchange and ecologically productive waste diversion, the city will benefit from an economically efficient recycling business sector. Because the Lachine Canal is also popular recreational corridor, members of the public will be able to observe these exchanges and engage the remaking of landscapes upon abandoned industrial brownfields. Daniel Bluestone speculates on the potentially advantageous outcomes of public relations with waste economies:

> People involved in the cleanup could make their efforts more comprehensible and decidedly less scary to the public if they could reveal how the flows of materials and pollutants on toxic sites had actually taken place. To see toxic sites as part of a broader industrial process with material inputs, products, and by-products that

53. Observed by author, refer to fig. 2.03.

54. Brewer's waste may be used as a substrate for mushroom cultivation. Beyer, David M. *Basic Procedures for Agaricus Mushroom Growing*, p.3.

55. Khade, Sharda W. and Alok Adholey. "Feasible Bioremediation through Arbuscular Mycorrhizal Fungi Imparting Heavy Metal Tolerance: A Retrospective." *Bioremediation Journal* Vol.11, No.1: pp.33-43.

56. Wood products role in achieving ideal carbon to nitrogen ratio in compost discussed by Richard, Tom L. "Biological Processing" *Municipal Solid Waste Composting*. Fact Sheet 2 of 7.

57. Mangan, Frank, Allen Barker, Steven Bodine, and Peter Borten. "Compost Use And Soil Fertility."

> all worked their way through the buildings and the site would promote a kind of critical understanding of basic site processes that could in turn lay the groundwork for understanding something of the processes of site pollution, site remediation, and site reuse.[58]

At Turcot, public relations would potentially be augmented through partnerships with private recycling industries to create mercantile frontages within or in proximity to the premises of the recycling operations. For example, the addition of bagging and packaging equipment at compost stockpiles would easily give rise to a marketplace for local gardeners. Moreover, environmentally conscious landscapers and contractors would obtain recycled granular materials and sustainable concrete sourced from urbanized diversion operations. In terms of the urban character of the Lachine Canal corridor, these potential market exchanges would complement the well-established Atwater Farmer's Market and the high-concentration of antique stores, household goods restorers, and furniture reupholsters located in the Little Burgundy neighbourhood along the northeastern edge of the Canal. In essence, the design and execution of public markets within expanded industrial networks would allow the Turcot-Lachine district to become the regional 'hot-spot' for sustainable, recycled goods and materials. These interactions will undoubtedly support future speculative private developments along the Lachine Canal Corridor.

58. Bluestone, Daniel. "Toxic Sites as Places of Culture and Memory: Adaptive Management for Citizenship" in Macey, Gregg P. and Jonathan Z. Cannon, eds. *Reclaiming the land: rethinking Superfund institutions, methods, and practices*: p.246.

fig. 2.09, below: *Bird's eye view of:*
a) *asphalt paving production plant,*
b) *aggregate recycling operations, and*
c) *snow dump site*
atop a former coal gasification site at the Lachine-Turcot District.
Image courtesy Bing Maps, 2009.

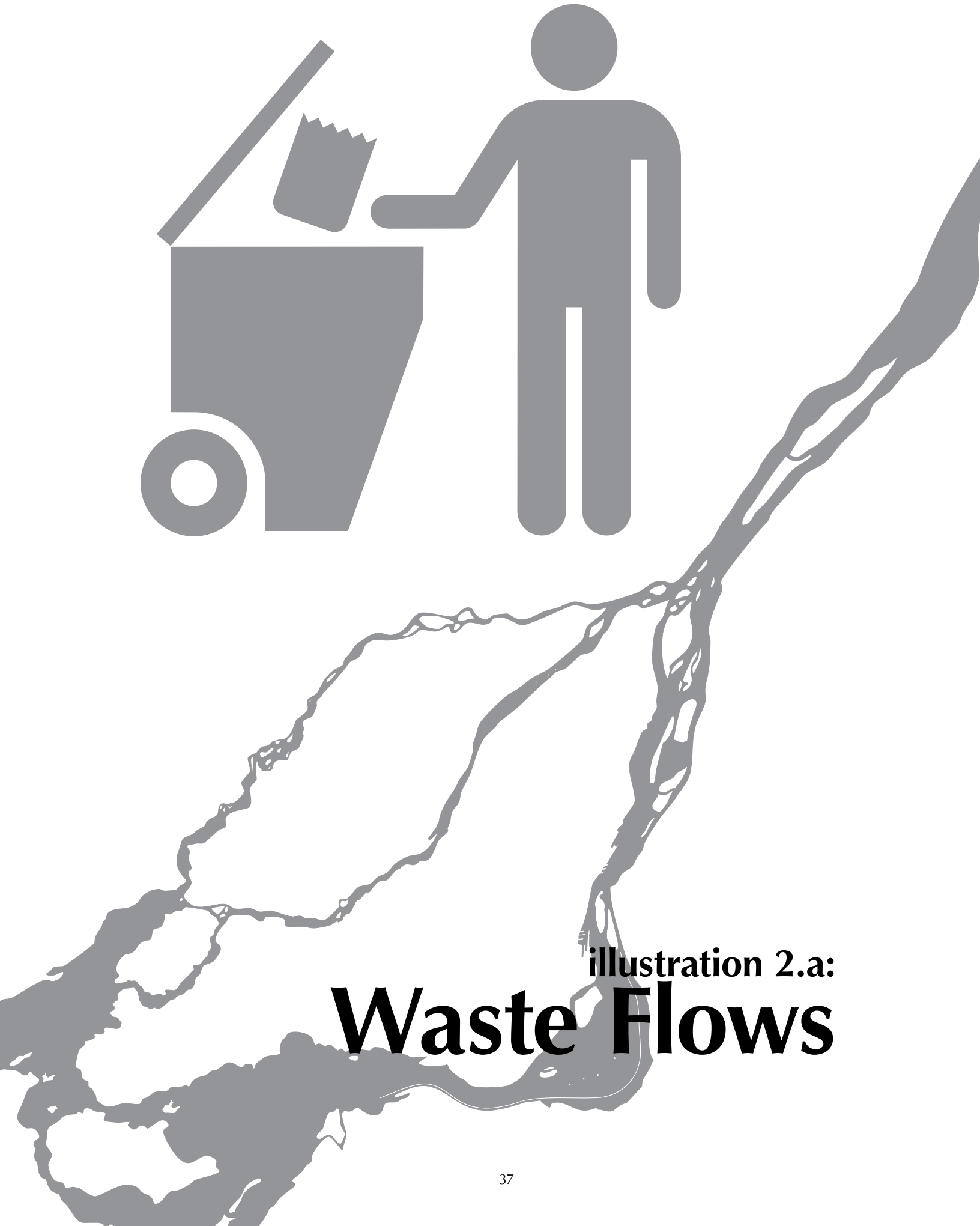


illustration 2.a:

Waste Flows

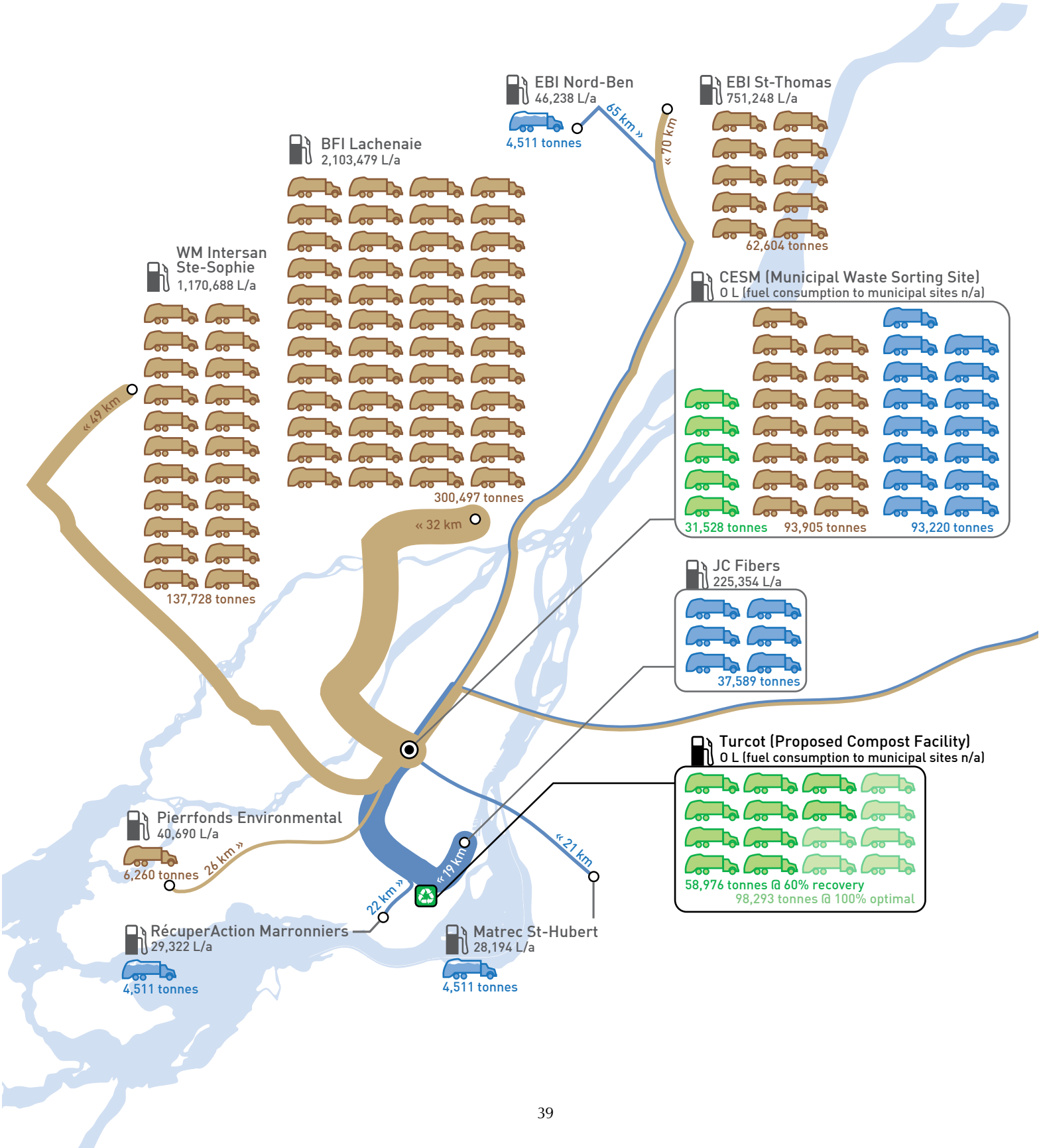
Overleaf:

illustration 2.a: *Overview of municipal household waste diversion and disposal by the City of Montréal and private partners under public contract. The CESM, or St. Michel Environmental Centre, is the defunct quarry-landfill readapted as the city's nerve centre for recycled material recovery, sorting and processing. Pending the implementation of compost facilities to handle the waste output of the island's two million residents, potential waste diversion tonnages are indicated at the city's feasible 60% diversion ratio and at an optimal 100% diversion ratio.*

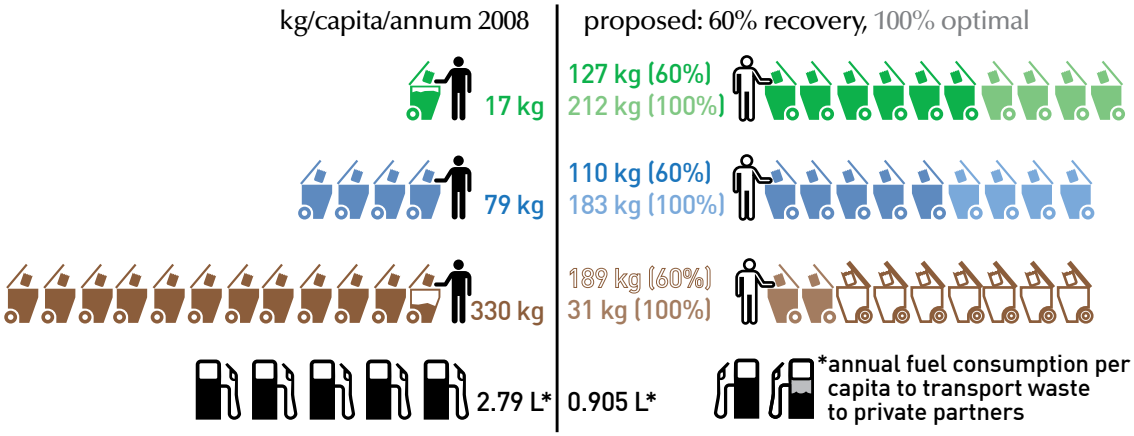
Compiled with information sourced from: ***Portrait 2008 des Matières [R]ésiduelles de l'agglomération de Montréal.***

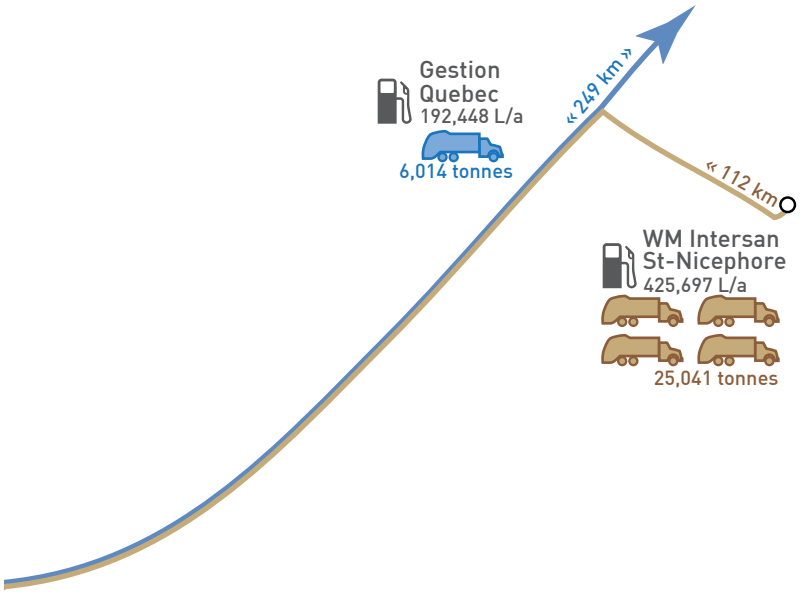
Montréal's Waste Profile

illustration 2.a

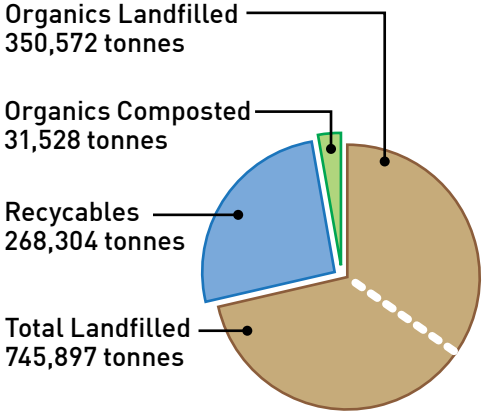


Montréaler's Average Waste Production





Annual Waste Tonnage (2008)



Legend

Waste Flows
- organics + composting
- paper, plastic, metals
- non-recoverables

Representation
- ±6250 tonnes or ±100 long-haul trips
- ±20 kg or avg. capita bi-weekly collection

Waste Management Facilities
- municipal
- private
- Proposed Turcot Compost Facility

0 2 4 10 km
1:400,000 scale

Chapter 03

"A third phenomenon surrounding landscape's recovery is the massive process of deindustrialization that has accompanied the shift toward global communication and service economies. These changes have stressed both urban centres and rural areas, perhaps even collapsing their differences. As a consequence, new demands have been placed on land use planning and the accommodation of multiple, often irreconcilable conflicts. Huge and complex post industrial sectors of cities have presented new challenges for landscape architects and urban designers in the past few years."

—Corner, James.
Recovering Landscape: p.14

fig.3.01: *Lachine Canal inlet facing northeast, Lachine, QC. Courtesy Parks Canada, c.1920.*

03

REVISITING RELICS:
a historic account of the Lachine Canal and Turcot Yard

03.1
Historic Lachine Canal

Plans for Lachine Canal were first envisioned by the Sulpician Order in 1686, and constructed in the 1830s to allow steamships to bypass the Lachine Rapids of the Saint Lawrence River.[59] At a local scale, the canal facilitated the flow of goods and passengers between Port of Montréal and the fur-trading Port of Lachine. However, in terms of continental geography, it served as an important link within a system of canals throughout the Great Lakes Basin. The maritime infrastructure permitted agricultural, forestry and mineral exports from Canada's burgeoning hinterlands through industrializing nodes along the Great Lakes and on to European and Atlantic Ports. The canal would eventually become an industrial

59. Parks Canada. "The Course of History." Lachine Canal National Historic Site of Canada. http://www.pc.gc.ca/eng/lhn-nhs/qc/canallachine/natcul/natcul1.aspx

fig.3.02: *The Dominion Engineering Works dominate the landscape at the western inlet of the Lachine Canal, c.1920. The Saint Lawrence River and CP Rail bridge are prominently visible in the background. Courtesy BANQ.*

incubator of great significance to the Montréal's economy and that of the nation.

The canal's route follows a 13 kilometre portage trail established by Aboriginal peoples and used by early European fur traders, which once featured rivulets (Saint Pierre) and a wetland marsh (Otter Lake) that expedited transport by canoe. Historically, the Port of Montréal was the most central point within North America that could be reached by Ocean-going vessels, as the Lachine Rapids were a barrier even for Jacques Cartier, the first European to sail up the Saint Lawrence River. Because of its advantageous geographic location, the Port of Montréal supported a rapidly growing proto-industrial city at a time when the Industrial Revolution was well underway in Europe, and the Lachine Canal provided a source of hydraulic power well before electricity was commodified and widely distributed. These factors, combined with flow of goods through the canal, and its proximity to workforce bolstered by immigrant arrivals, established the canal's status as Canada's first industrial cradle.

Nodes of industrial production chiefly manifested themselves as clusters of multi-storey buildings adjacent to the canal's locks. The change in the water's

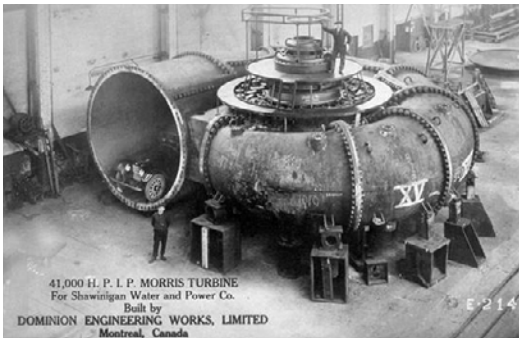
Aside from bridge building, the Dominion Engineering Works were contracted to design and construct industrial machinery for neighbouring businesses along the Lachine Canal, and contributed to infrastructural developments nationwide.

fig.3.03, top: *Watermain valves for the Montréal Water Board, c.1920.*

fig.3.04, middle: *Newsprint production machines for the Laurentide Company, c.1920.*

fig.3.05, bottom: *Hydroelectric Turbine for Shawinigan Water & Power, c.1920.*

All figs. courtesy BANQ.



elevation lent the greatest hydraulic potential to power industrial machinery. Early adopters included sawmills, textile mills, iron works, tool and die makers, sugar refineries, and granaries; all served by Canada's colonial railways year round.

Eventually, hydroelectric generation occurred at the canal, deploying transmission lines that served industries along the canal's route. Thermal electric generation from four coal gasification plants soon followed, allowing some of the biggest names in Canada's industrial mosaic to take root along the entire length of the Canal: Montréal Rolling Mills and Dominion Wire (Stelco), Dominion Bridge (involved in the construction of numerous world-record spans and machinery for other industries along the canal), Dominion Tar & Paper (Domtar), Dominion Textile, Northern Electric (Nortel), Canada Sugar Refining Co. (Redpath), and Canada Car & Foundry (Bombardier Transportation). These industries benefitted from their proximity to each other and the bundled rail and maritime infrastructure along the canal corridor, propelling the canal's historic significance toward mythological proportions. For example, since the Grand Trunk Railway required materials to construct its transcontinental network and rolling stock to operate it, a series of vertically-integrated iron foundries supplied the demands of the railroad. The railroad's presence attracted value-added manufacturers such as Canada Switch and Spring, Caledonia Iron Works, and the aforementioned Canada Car and Foundry, "which would become Canada's second largest producer of rolling stock."[60]

60. Yvon Desloges, "Behind the Scene of the Lachine Canal Landscape," IA, The Journal of the Society for Industrial Archeology NA, Vol. 29, No.1 (2003): p.13.

Meanwhile, Dominion Bridge supplied trusses for the railroad's continual expansion across the nation's valleys and ravines. Dominion also constructed all of the bascule, lift and swing bridges spanning the canal. Their engineering division was contracted to supply machinery for numerous neighbouring industries, including LsSalle Coke, Canada Malting, Northern Electric, Consumers' Gas, and Redpath. Meanwhile, Dominion Bridge was also purchasing rivets and minor components from other small foundries in the vicinity of the canal, such as William Clendinneng and Son. To profit from the rustproofing and maintenance of these ferrous fabrications, Sherwin-Williams built "its first Canadian paint factory alongside the canal, more interested initially in industrial clients than in domestic, having bought beforehand the Canada Paint Co. at St. Gabriel."[61]

Aside from industries established to serve the railroad's hunger for industrial structures and machinery, the railroads and naval navigation companies also required vast amounts of food products to nourish its passengers. Over five flour mills were situated along the canal, operated chiefly by Ogilvie under the consumer brand Five Roses, and by Robin Hood. The existence of food processing plants spawned their own unique byproduct exchanges.

> Railways and navigation companies could buy their sugar from Redpath's and their meats from Laing or Wilsil, later to be known as Canada Packers... In the 1930s animal carcasses produced in this sector would be recycled and sent upstream, pollution and odours obliging, where they would be turned into fertilizers of all kinds by Nutrite,

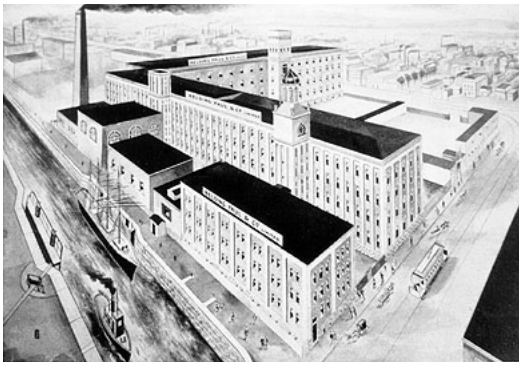
61. ibid.: p.14.

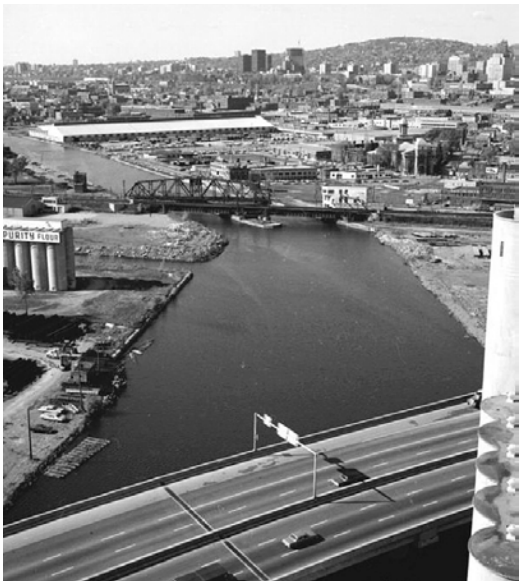
fig.3.06, top: *The silk mills of Belding, Paul & Co., c.1884, now a residential building.*

fig.3.07, middle: *Canada Paint Co. at St. Gabriel Locks, c.1920.*

fig.3.08, bottom: *Flour mills line the defunct Peel Basin, c.1967.*

All figs. courtesy Parks Canada.





a subsidiary of Canada Packers.[62]

The nexus between the food and chemical industry would also be enhanced by presence of four coal gasification plants within the Lachine Canal Corridor, as Nutrite specifically depended on LaSalle Coke in the production of ammonium sulphate fertilizer. LaSalle Coke also supplied petroleum byproducts to Simmons Mattress located two kilometres east at Côte St-Paul. Meanwhile, coal tar byproducts were also used in the production of synthetic textile dyes and whitening agents at Dominion Textile across the canal from Simmons. Waste fibres from Dominion Textile were sold to Dominion Wadding, which supplied local furniture manufacturers and upholsterers through the nineteenth century. By the twentieth century, Dominion Wadding also supplied fibres to Northern Electric as electrical insulation in the fabrication of wires and cables. Not to be undermined by LaSalle Coke to find buyers for its coal gasification byproducts, Dominion Tar & Paper established its own building product plants nearby. Not only did the adjacency of these industries permit efficient and profitable exchanges of waste byproducts and engineering expertise, it also permitted "just-in-time" (JIT) production modes long before they became the norm in North-American manufacturing.

> This crisscrossing from one company to another shows the great diversity of production on the canal's shores. Interdependence among the various industries was evident as they produced for one another. But this aspect had a corollary: Lachine industries did not need huge warehouses in which to keep the components needed for their production, especially after truck transportation became widespread.[63]

Given that the operational aspects of these industries left their imprint in the urban

62. ibid.: p.14.

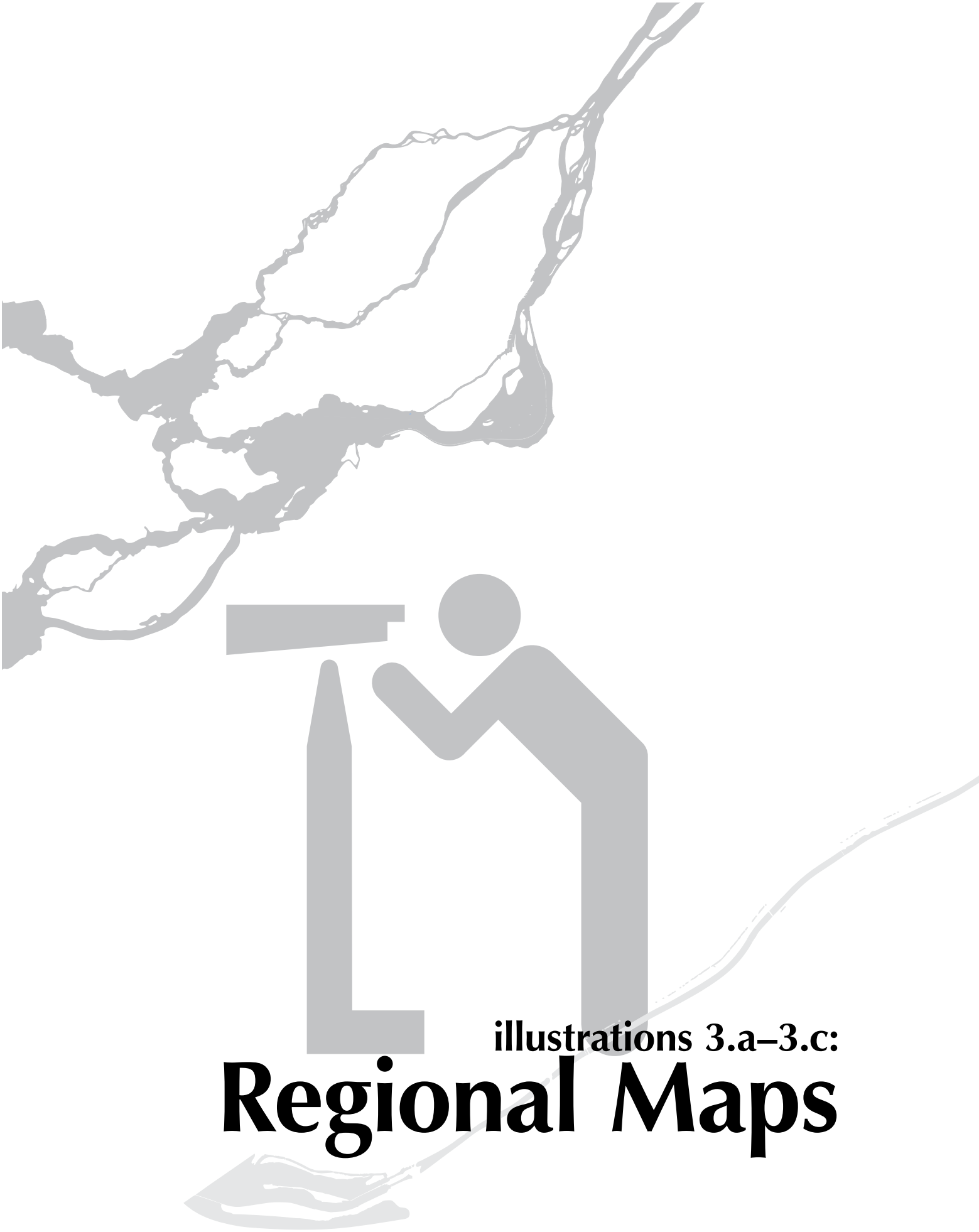
63. ibid.: p.14.

fig.3.09: *Panoramic view of the canal from the Street Railway Power House Chimney, showing Peel Basin and Victoria Bridge over the St. Lawrence river at left, and St. Gabriel industrial cluster at right, circa 1896.»*

fabric and infrastructural landscapes of the Lachine Canal, the thesis reiterates that extant waste management, food processing, and building product industries stand to improve their prospects by operating as a network similar to their historic counterparts. If these industries choose to develop profitable exchanges of waste byproducts, they would take advantage of their proximity and abundant infrastructural connections latent in the urban fabric of the district. Perhaps these opportunities are not immediately apparent to the private stakeholders of canal tracts, given the demise of the district's industrial complex since the canal closed to commercial shipping.

In the 1950s, the importance of the Great Lakes/Saint Lawrence Valley corridor was reinforced when the Canadian and United States Governments bilaterally selected it for upgrades over the competing Chicago/Mississippi River route and the Erie Canal/Hudson River system. The two nations collaboratively constructed the Saint Lawrence Seaway, which opened all five Great Lakes to higher-capacity oceanic vessels. The new route bypassed the Lachine Canal, leading to its abandonment in the 1960s. In the following decades, the Canal's waters stagnated along with the area's industrial economy. As the canal infrastructure fell into disrepair, industries relocated further west within proximity to Dorval Airport or upriver toward the new Seaway-oriented "New" Port. As portions of the canal were filled, its banks became sites for illegal dumping, auto wreckers, and urban blight. Scrap yards and metal recyclers found their operations analogous to this wasted landscape, and have since set the tone for the corridor's predilection for the waste management sector.

»Due to efficient navigation infrastructure, note the presence of laydown areas near the canal basins, but the general absence of warehousing. Photo credit William Notman & Son, courtesy McCord Museum.



illustrations 3.a–3.c:

Regional Maps

Overleaf:

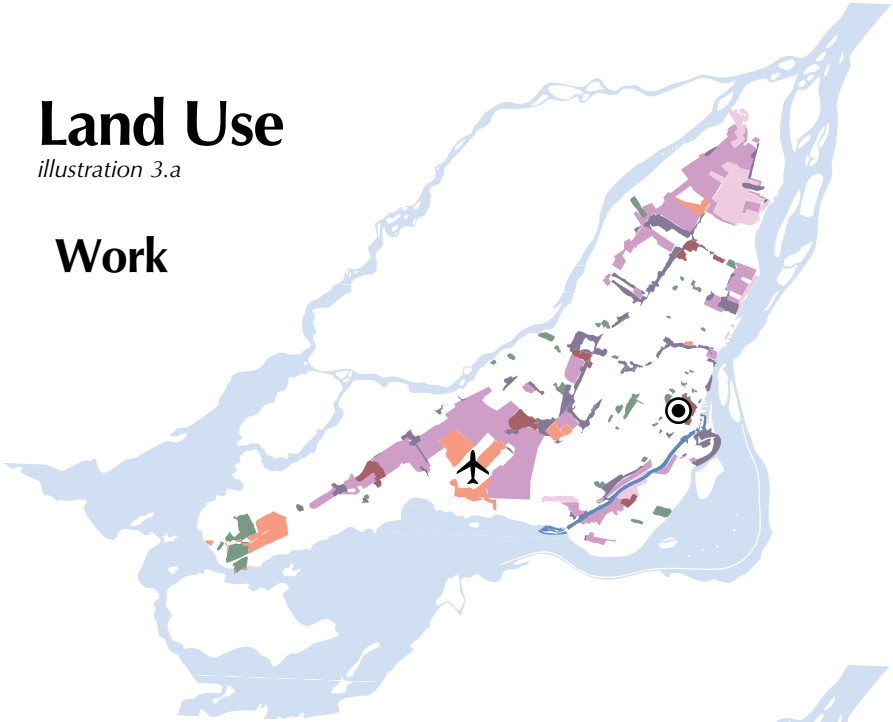
illustration 3.a+b: *Overview of Montréal Island, showing active industrial areas near the Airport, the Seaway bypass of the Lachine Rapids to the south, and new Port facilities upriver from the Old Port, rendering the Canal and related industrial areas redundant or obsolete. Compiled from information contained within the Montréal Masterplan.*

illustration 3.c: *Analyses of the Canal's urban fabric, showing:*
a) the general organization of historic manufacturing sectors
b) today's residual industrial nodes

Land Use

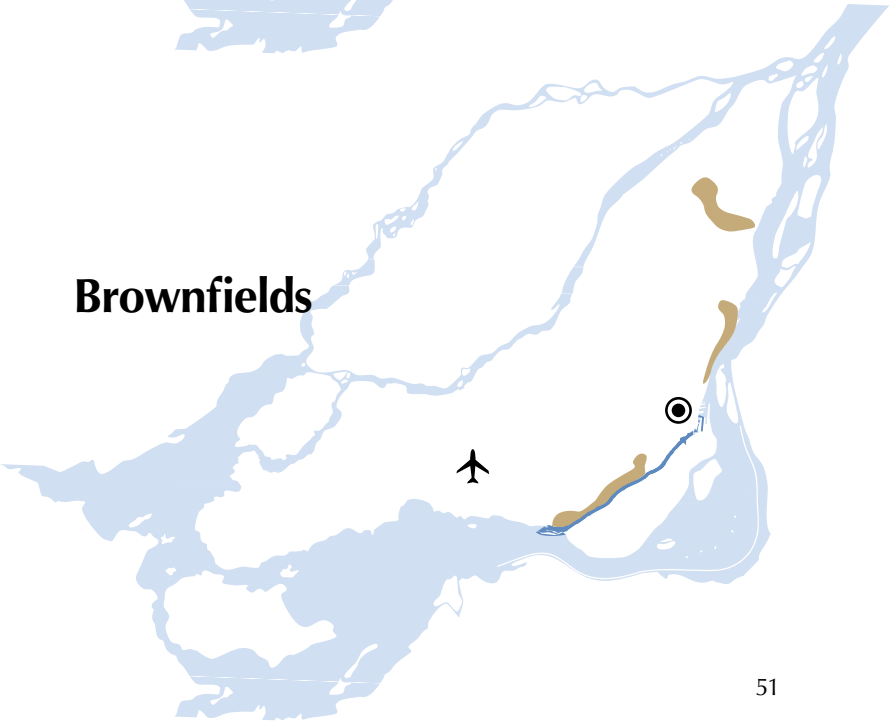
illustration 3.a

Work



Play

Brownfields



Legend

Land Use Designation
- dense industrial
- light industrial
- diversified
- retail & business
- corporate
- institutional
- recreational

Aquatic Classification
- River
- Lachine Canal

Nodes
- downtown
- airport

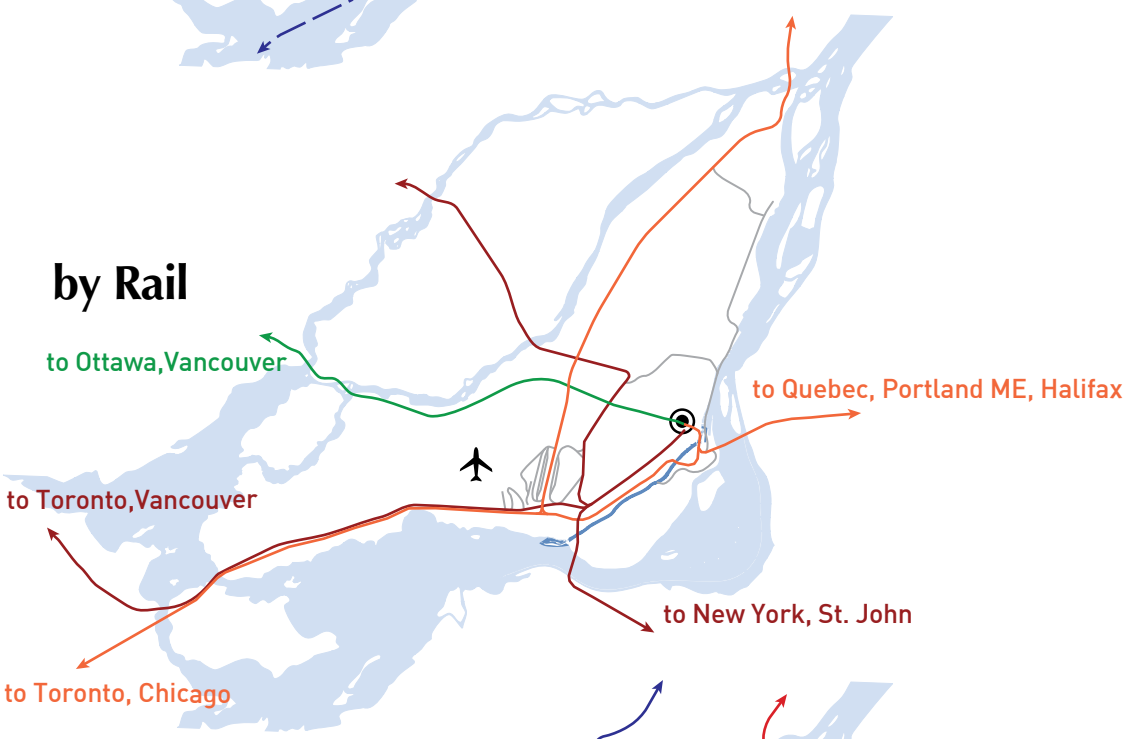
0 2 4 10 km
1:500,000 scale

Transport

illustration 3.b

by River

by Rail



by Road

Legend

Nodes

seaport
marina
downtown
airport

Corridors

St. Lawrence Seaway
River
Rapids
Old-Port
Active
Lachine Canal
CP Railway
CN (ex-Cdn Northern)
CN (ex-Grand Trunk)
Branch Line
Trans-Canada Highway
Provincial Autoroute
(proposed autoroute)

0 2 4 10 km
1:500,000 scale

Lachine Canal Industrial Analysis

illustration 3.c

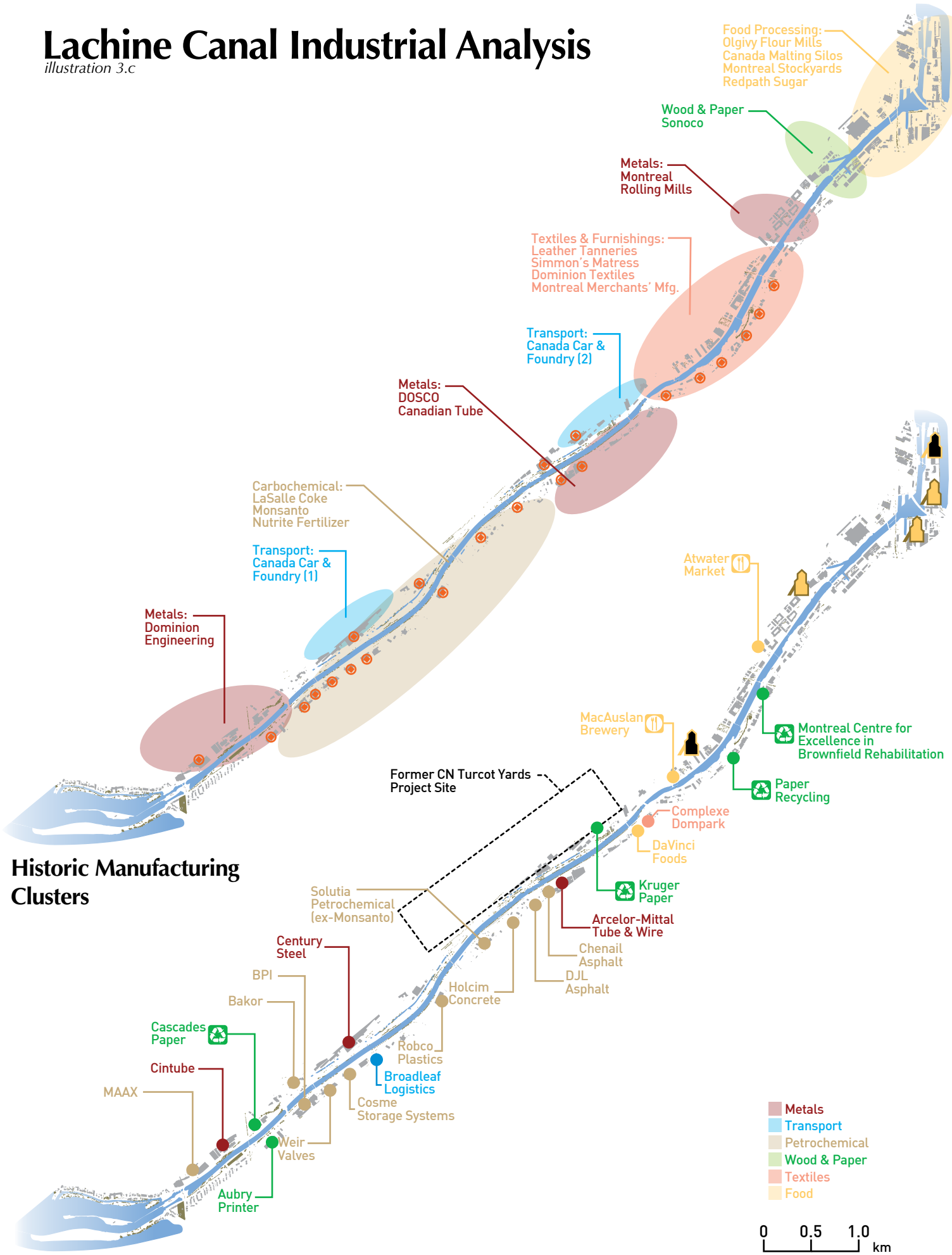


fig.3.10, top: *Paved multiuse recreational path and gravel walking path alongside Kruger recycling facility. Landscape maintained by Parks Canada.*

fig.3.11, middle: *Parkette near Atwater Market maintained by the City of Montréal. Active railroad spur in background, connecting CN mainline with Robin Hood flour mill.*

fig.3.12, bottom: *Former Montréal Merchant's Manufacturing complex now live/work lofts. Located at juncture of Robin Hood spur and CN mainline, overlooking the canal.*

Photos by author, 2009.

03.2
Canal's Renaissance

Since the Canal was transferred to Parks Canada's jurisdiction and designated as a National Historic Site, it has undergone a gradual socio-economic transition from an industrial/infrastructural corridor to an urban/recreational swath. Starting with small interventions in the late 1970s and snowballing into $100 million project through the 1990s, the federal government, working in cooperation with the City of Montréal, orchestrated a large-scale interdisciplinary public works program to revitalize the canal. In 1978, paved cycling paths replaced abandoned rail spurs, and the path quickly "became the most popular in Canada with 750,000 users."[64] Archeologists and historians catalogued historic industrial buildings and ruins, exhuming the remnants of piers and quays. Environmental engineers performed water quality analyses, capped highly contaminated sediments at three locations within the canal bed and abated wastewater outflows to prevent recontamination of its waters. Landscape designers and architects collaborated to promote public enjoyment of the canal banks through the expansion of paved cycling paths, granular walking paths, pavilions, wetlands, sylvan riparian buffers and forested clusters. Structural and mechanical engineers rehabilitated the nineteenth century locks and iron bridges, accounting for $40 million of the total cost.[65] The project culminated in the canal's reopening to non-commercial watercraft by the year 2002.[66]

64. London, Mark. "Heritage Preservation and the Lachine Canal Project." *Plan Canada,* Vol. 43, No.2 (2003): p.34.

65. ibid.

66. Parks Canada. "The Revitalization Project—The Major Works and Their Artisans." Lachine Canal National Historic Site of Canada. http://

Parks Canada has successfully introduced an aquatic and terrestrial recreational component to the Lachine Canal through a decade long process of remediation, risk management, archeological documentation and landscape regeneration. During pleasant seasonal weekends, the linear park would seem to be a victim of its own success, with pedestrians, skaters and cyclists queuing along the paved paths, while sun seekers, dog owners and sports players vie for space along its grassy banks. Eventually, the water quality improved to greater than that of the St. Lawrence River,[67] owing to the slow moving waters in the canal and the relative stability of the contaminated sediments in the canal bed. Although the water is safe enough to swim in, such use of the canal is not permitted due to the risk of churning up the industrial toxins that remain in its inundated sediments. While the canal's transition is widely regarded as a success, it retains particular interest for urban research because of its industrial past, manifested by the marine and infrastructural relics that remain abandoned in fenced-off properties, and the juxtaposition of greenspace and industry as nature slowly reclaims nineteenth century ruins. Now that public awareness of the canal has heightened, the focus for further intervention has shifted to the fate of these unused infrastructural relics which speak to the canal's industrial past.

Views of rehabilitated Lachine Canal, from top to bottom:

fig.3.13, top: *Renovated office-industrial complex facing canal at St. Gabriel with defunct grain elevator in background.*

fig.3.14, middle: *Redpath Condominiums at St. Gabriel locks, adapted reuse of former sugar refinery.*

fig.3.15, bottom: *Westerly view from Angrignon overpass, showing Senkus footbridge.*

All photos by author, 2007.

www.pc.gc.ca/eng/lhn-nhs/qc/canallachine/plan/plan1/c.aspx.aspx

67. From a geographical standpoint, the Lachine Canal is fed by the St. Lawrence River. However, from a hydrological standpoint, the canal's water actually originates from the confluence of the Ottawa River, some 20 km upstream. The respective watersheds do not mix as they pass the inlet of the canal. See Canadian Environmental Assessment Agency. *Lachine Canal Decontamination Project*: p.51

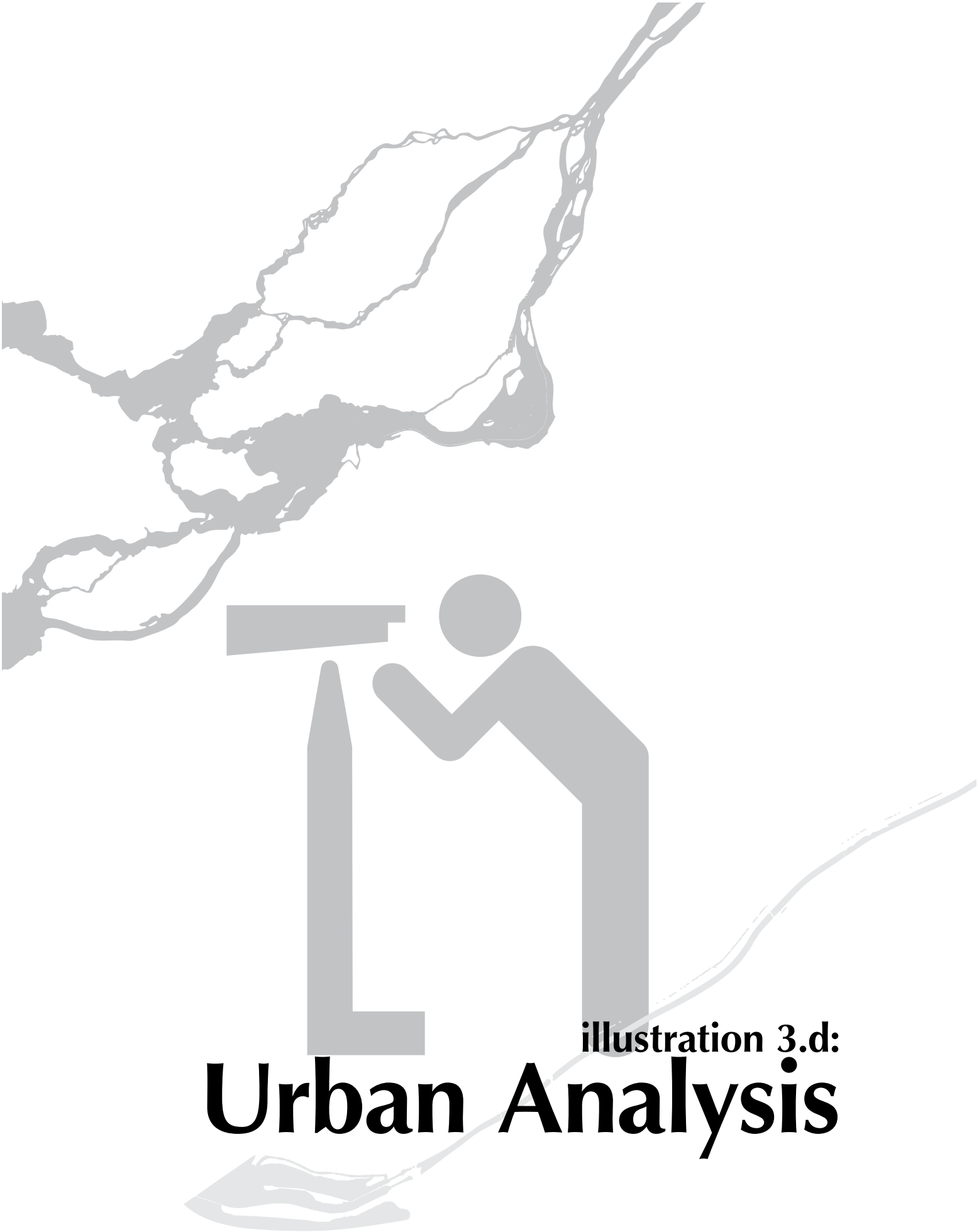


illustration 3.d:

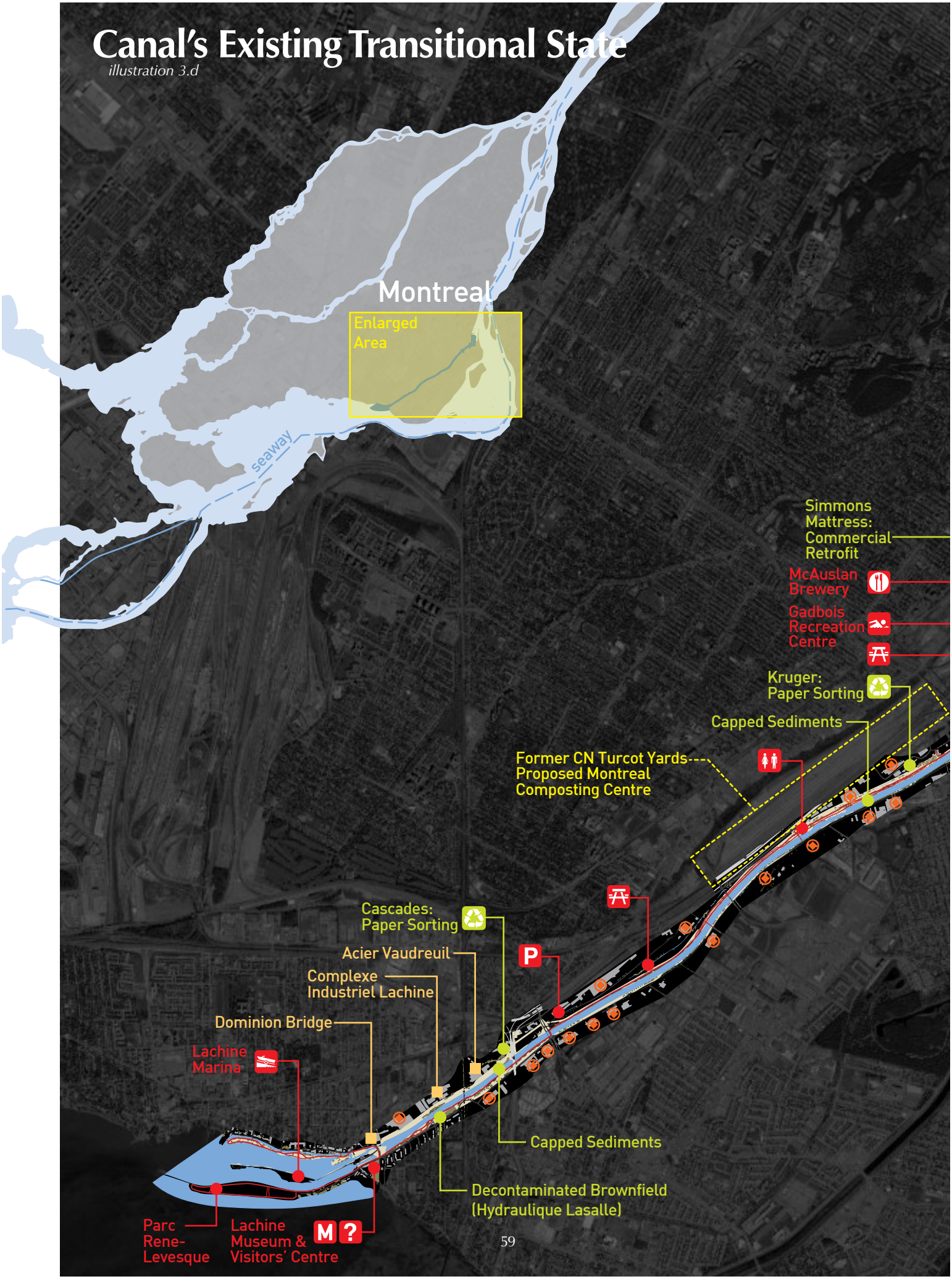
Urban Analysis

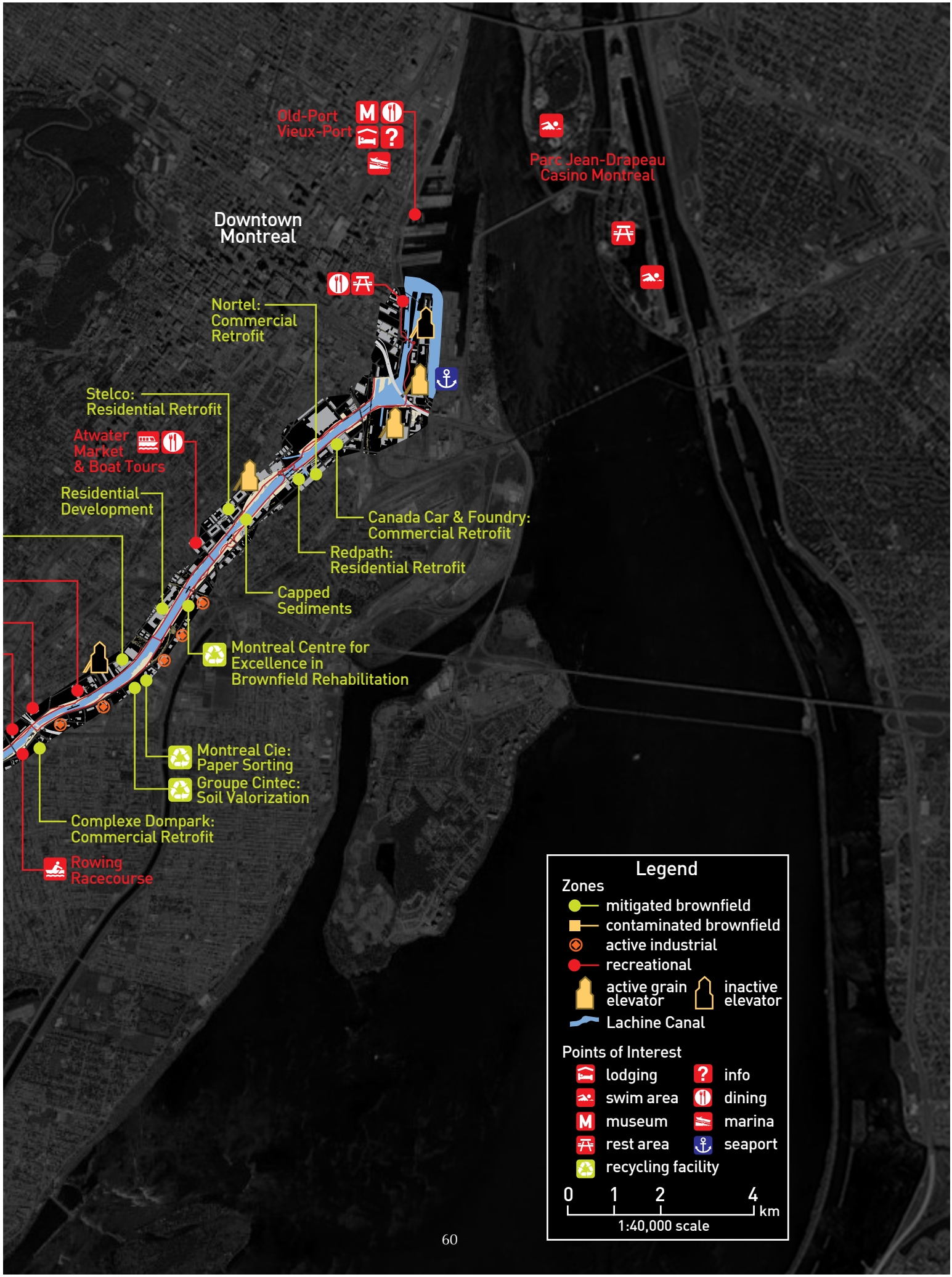
Overleaf:

illustration 3.d: *Canal at a local scale, showing active industrial areas, contaminated properties, remediated brownfields, commercial and/or residential retrofits within industrial buildings, parkland and multi-use paths along the canal. Compiled from information contained within Parks Canada documentation.*

Canal's Existing Transitional State

illustration 3.d




Old-Port
Vieux-Port
Parc Jean-Drapeau
Casino Montreal
Downtown
Montreal
Nortel:
Commercial
Retrofit
Stelco:
Residential Retrofit
Atwater
Market
& Boat Tours
Residential
Development
Canada Car & Foundry:
Commercial Retrofit
Redpath:
Residential Retrofit
Capped
Sediments
Montreal Centre for
Excellence in
Brownfield Rehabilitation
Montreal Cie:
Paper Sorting
Groupe Cintec:
Soil Valorization
Complexe Dompark:
Commercial Retrofit
Rowing
Racecourse
Legend
Zones
mitigated brownfield
contaminated brownfield
active industrial
recreational
active grain elevator
inactive elevator
Lachine Canal
Points of Interest
lodging
info
swim area
dining
museum
marina
rest area
seaport
recycling facility
0
1
2
4
km
1:40,000 scale

03.3
Turcot Interchange and Former Rail Yard

Turcot Yard was constructed atop a drained peat bog, the remnants of the St. Lawrence River's ancient progenitor. The Lachine Canal was routed through the bog, along the southern edge of Otter Lake, to take advantage of the wetland's pancake flat elevation. By the mid-nineteenth century, the Grand Trunk Railway dewatered Otter Lake using scrap railroad equipment as landfill, and constructed a massive rail marshalling yard and maintenance facilities, having the distinct advantage of proximity to the Lachine Canal and related industries. Towards the eastern end of the site, rail shops included Canada's largest roundhouse for steam locomotives and sheds for maintenance of rolling stock, all accessible to Canada Car & Foundry's analogous enterprise.[68] Eventually, the British-owned Grand Trunk was assumed by the Canadian Government which incorporated it into Canadian National Railways (CN). As the Lachine Canal fell into disuse, a greater percentage of freight came in the form of containerized goods routed toward the vicinities of the airport and the modern seaport. In response, CN built even larger marshalling facilities in Taschereau, and Turcot Yard was eventually declared surplus.

Currently under public ownership, Turcot's decaying warehousing and control tower were demolished sometime in 2007. The oblong tract of land, some 130 hectares, is situated approximately midway along the length of the Lachine Canal. Due to continual rehabilitation work required on the massive concrete flyovers of the Turcot Interchange—built in the 1960s to accommodate rail movements and tall canal vessels below—Transport Québec plans to completely relocate the freeway and railroad along a more northerly route at the base of the escarpment, and construct a new highway interchange with a reduction of costly elevated structures. To the northeast of the interchange,

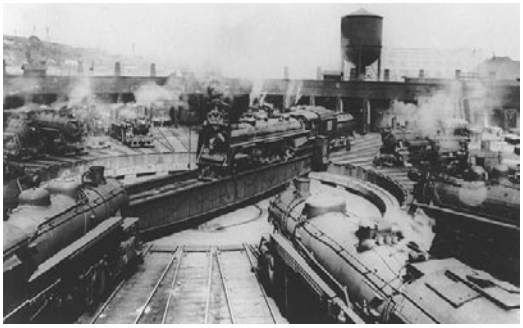
68. Yvon Desloges, "Behind the Scene of the Lachine Canal Landscape," IA, The Journal of the Society for Industrial Archeology NA, Vol. 29, No.1 (2003): p.14.

fig.3.16: *Panoramic view of Turcot Yard from St. Jacques Escarpment, circa 1890. The escarpment was an active landfill. The rail yard and related industries such as Canada Car Foundry (centre) and LaSalle Coke »*

Canadian Pacific Railway's former Glen Yard has undergone decontamination in preparation for McGill University's "super-hospital," alluding to future developments of a biotechnological campus upon nearby brownfields.

The Turcot Yard is the largest piece of real estate to exchange hands in the Canal District since its rehabilitation. No other site in proximity to the downtown core offers greater development opportunities generated by the infrastructural reconfiguration on these lands. As a result, debate over the site's future has been fielded and documented by local mainstream media, citizen's websites, and seminars organized by neighbouring residents.

fig. 3.17: Turcot Roundhouse c.1949, demolished 1962 to make way for Turcot Interchange construction. Courtesy CN Collections.
fig. 3.18: Workers assemble near Turcot Workshops, c. 1949. Courtesy CN Collections.



»(right) dominate the landscape. The industries on the left include Canada Malting, Simmon's Mattress and Dominion Textiles clustered around St-Paul locks. Photo courtesy McCord Museum.

figs. 3.22–3.24: *Views of Turcot Interchange nearing completion, c.1967. Credit: Gabor Szilazi, courtesy BANQ.*

03.4
Report on Turcot's Current Status

Although pockets of rejuvenation have occurred along the Canal's banks—most notably in the adaptive reuse of daylight factories near Montréal's vibrant Atwater Market—many sites along the canal fall into the classification of contaminated brownfields. The largest of this class of sites is the Turcot Rail Yard, a site that could only fit the description of dross since the mid nineteenth century. The site's morphology has proven to be an inhibitor of development. In other areas of the Lachine Canal, the urban fabric takes the form of walkable residential communities built up with medium-density vernacular architecture, and it is relatively easy for residents to travel the short distance on numerous vehicular and pedestrian bridges. This is not the case for the residential neighbourhoods across the lateral section of the Turcot Yards/Lachine Canal corridor. Firstly, the St. Jacques Escarpment acts as a natural barrier between the neighbourhoods of Notre-Dame-de-Grace (NDG) and Arrondisement Sud-Ouest. Atop the escarpment, a suburban arterial road severs the pedestrian-friendly communities of NDG to the north from the natural beauty of the escarpment. For over a century the Turcot Yards augmented this barrier below the escarpment, as the Lachine Canal featured only one swing bridge that connected Turcot's industrial sector to the Arrondisement Sud-Ouest. Given that no urban fabric encroached into this swath of land, it was easy for Transport Québec to construct Autoroute Ville-Marie in the post-war years.

On the longitudinal section of the former rail yards, the aforementioned Ville St-Pierre to the west is completely

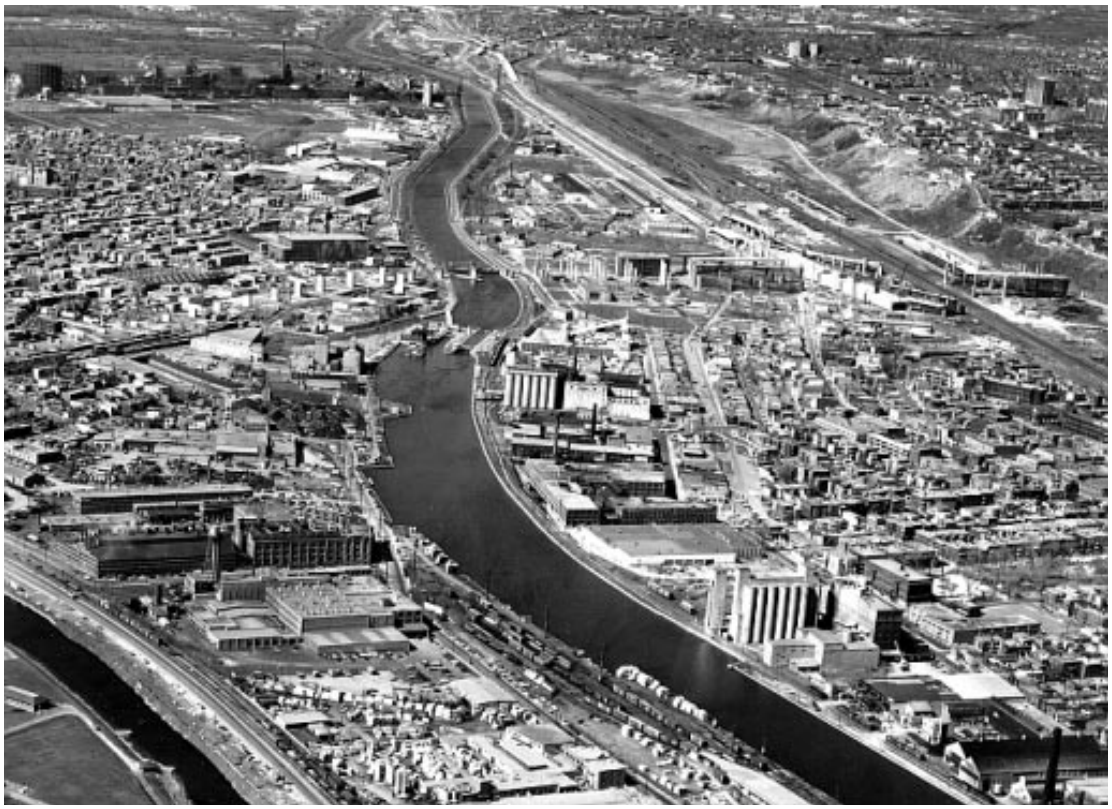


fig.3.25: *Aerial view of Turcot-Lachine District showing granaries in foregound, autoroute construction midground, and LaSalle Coke operations in background. c.1965. Credit: Gabor Szilasi, BANQ.*

disconnected from the neighbourhood of Place St-Henri at the east end of the site. A former working class neighbourhood devoted to the industries along the Lachine Canal, Place St-Henri benefits from multiple transit connections to more affluent neighbourhoods such as Westmount, Notre-Dame-de-Grace and the City Centre, and is also better integrated with adjacent via multiple transit connections. However, Ville St. Pierre remains isolated, originally attributed to the sheer length of the rail yard, but also due to existing industrial areas that buffer the Lachine Canal from Turcot Yard. The separation of the urban fabric was eventually augmented by two freeway interchanges acting as bookends to the rail yard.

In the summer the land lies fallow, slowly being reclaimed by pasture grasses that seem to recall the lost wetland. Through the unusually snowy winter of 2008, Transport Québec allowed municipal snow collection trucks to dump on the site, creating spectacular snowbanks that dwarf the escarpment.[69] Local residents have raised concern that the accumulative meltwater from these activities could lead to further contamination of the site, but Transport Québec contends that the site's existing drainage ties in with the Montréal's Wastewater Treatment and the snow dump operations have since ceased.

69. Bundale, Brett. 2008. "Dirty Snowbank Stretches Far into Summer." Montréal Gazette.

fig.3.26, top: *Turcot Yard and Interchange, courtesy Ken McLaughlin, 2007.*

fig.3.27, middle: *Easterly view of Autoroute 20 and CN mainline from Angrignon overpass, Montréal skyline looming over the horizon. Photo by author, 2007.*

fig.3.28, bottom: *Active rail spur underneath the Turcot Interchange, servicing the Kruger recycled paper sorting facility. Photo by author, 2007.*

03.5
Outlook for the Lachine-Turcot District

The Canal received a designation as a Historically Significant site, but this designation only protects the Canal's banks, waters and certain environmentally sensitive areas. The site lacks legislative mechanisms that would allow Parks Canada's historians to consult proponents of adjacent private developments. Since the corridor is now perceived as an urban asset, a strand of urban gentrification and speculative development has manifested along its route. Daylight factories—such the former Redpath Sugar Refinery at St. Gabriel Locks and the Dominion Textile Mill just west of the Turcot Interchange—have been converted to lofts and offices. To the west of Atwater Market, shed warehouses were demolished to make way for mid-rise condominium developments overlooking the canal. However, east of the market, Stelco's former steel mills—clad in decorative masonry—have undergone a much more historically sensitive residential retrofit. Meanwhile, in Côte St-Paul just east of the Turcot Interchange, contaminated brownfields are now undergoing remediation for townhouse developments. Although active industries remain on this segment of the Canal—namely, the McAuslan Brewery and Standard Chemical—the influx of residents will benefit from their proximity to services such as the Gadbois Recreation Centre and James Lynn High School. Despite Côte St-Paul's notoriety as one of Montréal's most impoverished neighbourhoods, evidence of private investment testifies to the canal's public revitalization as a model example for landscape urbanism.

fig.3.29: *Lachine Canal through Turcot, facing southeast. Showing paved multi-use path in foreground, poplars planted by Parks Canada and rail spur on opposite bank, aggregate stockpiles in background, defunct LaSalle Coke Crane at left. Photo by author, 2007.*

Although the aforementioned urban developments and rejuvenation are generally well-received and would be perceived as positive indicators of socioeconomic health for any city, the rigorous urbanism applied to the Lachine Canal thus far threatens to obliterate the district's industrial and natural heritage. The Canal is at risk of becoming a sort of Post-Industrial Disneyland, a landscape whose history can only be interpreted in photos and historic plaques that dot key points along a cycling path. To reiterate Bluestone's position:

> The public should not have to read scholarly journals or back issues of local newspapers to engage the history of a site that is so ripe for interpretation... A key ideal of many Superfund and brownfield reclamation projects is not only to mitigate environmental problems but to recycle or reuse abandoned sites that are often already tied into existing transportation and utility infrastructures. I would argue that these sites are also tied into an infrastructure of community history and memory; exploring such a perspective offers tremendous potential to engage the work of citizens, communities, and agencies working for site reclamation and renewal.[70]

Interestingly enough, many of the

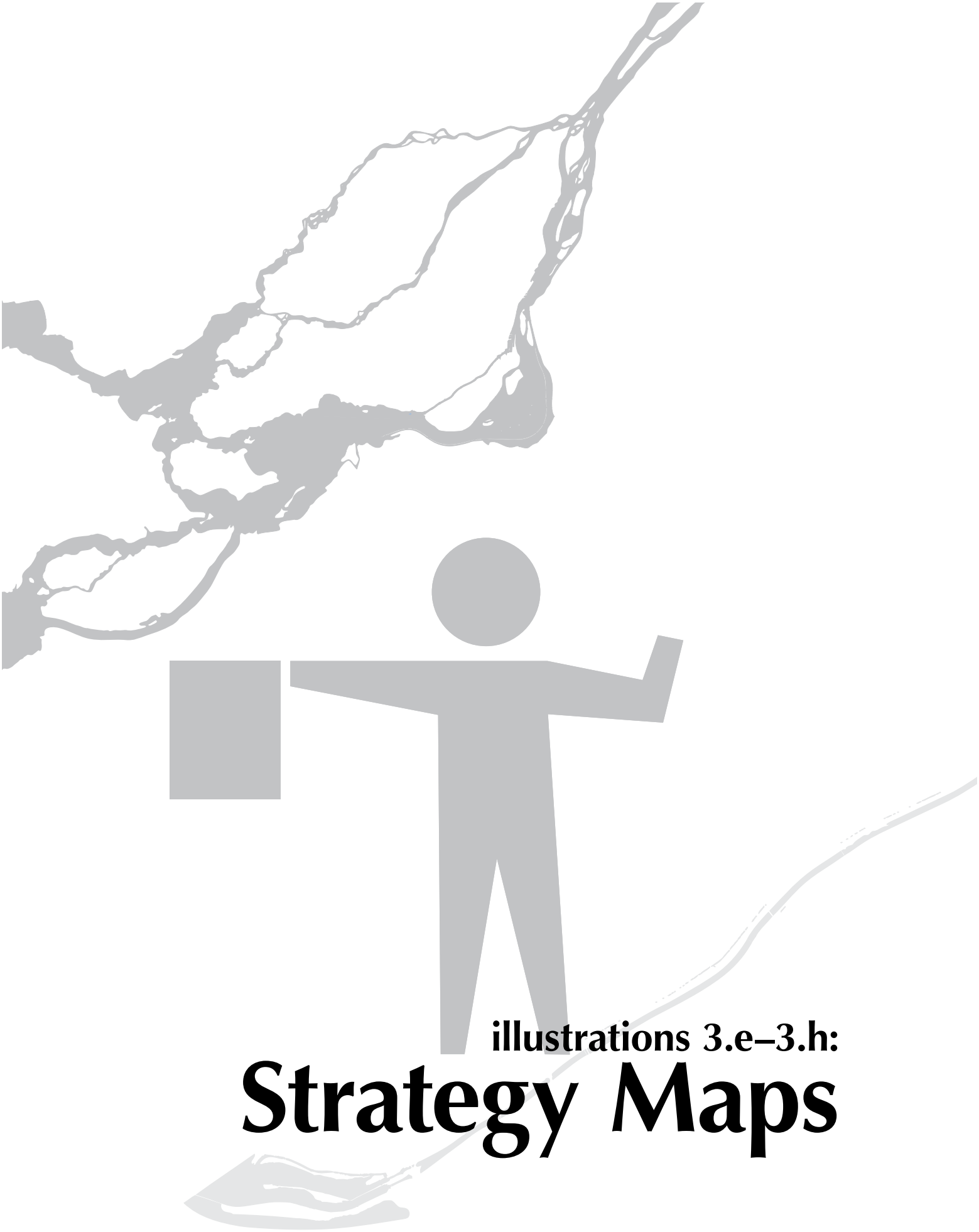
70. Bluestone, Daniel. "Toxic Sites as Places of Culture and Memory: Adaptive Management for Citizenship" in Macey, Gregg P. and Jonathan Z. Cannon, eds. *Reclaiming the land: rethinking Superfund institutions, methods, and practices*: p.253.

industrial uses that remain on the canal sit squarely in the waste management, environmental and building construction sectors, as previously described. Although coal gasification has ceased at the canal, production of petroleum-based construction materials continues today at Building Products of Canada (EMCO-BP), which produces roof shingles, rigid insulation, housewrap and acoustical tiles; and at Bakor, manufacturer of advanced polymer building membranes. Other building product manufacturers that exist today include MAAX, which produces acrylic bathroom fixtures in Lachine, just west of Bakor and EMCO-BP.

These industries continue to maintain infrastructural linkages in the form of rail spurs, truck yards, laydown areas and containment berms. As part of a masterplan for the Lachine Canal, it is possible to envision highly-efficient material flows and exchanges between brownfields and the aforementioned aggregate industries. The pending reconstruction of the Turcot Interchange will activate exchanges of demolition waste and recycled materials. Furthermore, the introduction of a compost facility as proposed by the thesis will result in organic waste diversion exchanges between local paper recycling agencies, building product manufacturers, and food processing plants. The compost product from this facility will support phytoremediation landfarming at the Turcot Site, and shall be made available to local brownfield remediation operations. Recalling Bélanger's Kalundborg example, as local industries profit from these operations, the potential investments in infrastructural upgrades could be tied with the enhancement of public landscapes. The resultant waste diversion network not only expedites the ongoing revitalization of the district; they shall also contribute the cultural potency of the Lachine Canal as an industrial complex, albeit one adapted to the needs of the twenty-first century. The

thesis intervention proposes a working landscape at Turcot Yard that networks with these existing infrastructures during the construction of MTQ's highway rehabilitation. Such a landscape would develop temporary infrastructural elements that can become permanent features in a hybridized recreational landscape. For example, a conventional temporary stormwater retention pond would be constructed during the construction phase to protect existing waterways and divert construction debris from entering the city's vital sewer system. Moreover, the highway's drainage swales could be sloped to incorporate the retention pond as a permanent stormwater overflow system, which would allow roadside chemicals to be filtered by saline tolerant flora. By diverting stormwater away from the existing sewer system, there is reduced risk that overflow outlets will release contaminated water directly into the Lachine Canal or the Sain Lawrence River, and also less chance of flooding nearby properties in the event of a severe storm. The pond can also serve as an irrigation basin for adjacent phytoremediation operations at Turcot. Furthermore, a special exemption could be granted by Parks Canada to connect the pond to the Lachine Canal via a gated weir, regulating the depth of the pond in all weather conditions. As the pond becomes a habitat for wildlife and recreational paths line its banks, park users appreciate it as a water feature, obscuring its original infrastructural purpose; and the strategic waste management objectives of the landscape.

fig.3.30: *Panoramic view of the Arcelor-Mittal Dosco site on the south bank of the canal, opposite Kruger and Turcot. Photo by author, 2007.*



illustrations 3.e–3.h:

Strategy Maps

Overleaf:

illustration 3.e: *Zoning strategy for the Lachine Canal Corridor, showing industrial zones to remain, and industrial zones anticipated to undergo speculative commercial and residential development, thus requiring decontamination operations. The logistical background for the zoning strategies will be elaborated in Section 03.6 and Chapter 04.*

illustration 3.f: *Vehicular masterplan for the Lachine Canal Corridor, provincial plans to relocate the CN Rail mainline and Autoroute 20 at Turcot, as well as the rehabilitated interchange. The drawing also indicates municipal proposals for a tram along Rue Notre-Dame connecting the Metro Station Lionel-Groulx with the Dorval Airport.*

illustration 3.g: *Waste management masterplan, showing locations of existing facilities and proposed compost plant. Proposed and speculative waste flows and by-product exchanges are also indicated.*

illustration 3.h: *Recreational masterplan for the Lachine Canal Corridor, showing speculative trails within the St. Jacques Escarpment conntecting through Turcot to existing paths along the Lachine Canal. The purpose of this diagram is to contextualize new connections with existing parks and residential neighbourhoods.*

Zoning Overlay Strategy

illustration 3.e

Transitional / Mixed-Use Overlays:
Permits continued operation of profitable industries, but also the conversion of post-industrial properties for commercial and residential occupancies. The unique morphology of the Lachine Canal lends itself to the coexistence of these land uses. Industrial tracts tend to be of size and orientation suitable for medium density multi-unit dwellings—exemplified in the post-industrial retrofits at St-Gabriel. The thesis anticipates analogous urbanization at:

E. LaSalle Highlands
Expected to urbanize gradually; retains industrial character due to the presence of highway infrastructure and decommissioned landfills, reducing its desirability for speculative development.

G. Cote St-Paul District
Expected to urbanize rapidly; contains brownfields and industries, but adjacent to residential neighbourhoods with access to public transit.

Public Works / Greenspace Overlay:
The thesis proposes a hybridized landscape in which organic waste diversion and recreational uses coincide at:

F. Turcot Yard + Interchange
- to provide a greenspace link between the canal and the escarpment,
- to expand existing waste diversion and brownfield remediation, and
- to catalyze urbanization of the aforementioned LaSalle Highlands.

3) Intervention

Selected Viable Industries:
Existing industries within the waste management, building material, and heavy machinery sectors whose products and waste exchanges shall contribute to the revitalization of the Lachine Turcot district.

b) Building Products
b_3 MAAX: plumbing fixtures; b_5Bakor: architectural membranes;
b_6 BP-EMCO: interior finishes, architectural membranes.

c) Building Materials/Aggregate Recycling
c_7 Holcim: ready-mix concrete; c_{12}DJL and Chenail: hot mix asphalt.

d) Waste Diversion
d_4 Cascades, d_8 Kruger, d_9 Montreal Paper Recycling Co.: paper sorting;
d_{10} Decontam/Groupe Cintec: soil valorization.
d_{11} Deitcher & Frère: scrap metal.

e) Heavy Machinery
e_1CAD: maintains locomotives; e_2 Metso: fabricates mining equipment.

2) Urban Resources

Existing Zoning:
The revitalized urban fabric along the Lachine Canal at St. Gabriel (a3) between the Turcot Interchange and the Old Port is reflected by "Mixed-Use" and "Residential Zones." This pattern repeats at Lachine's historic core (a1).

Industry continues to dominate the landscape through the Borough of LaSalle, between the CP Rail line and the Turcot Interchange (a2).

The Lachine Canal cuts a swath of designated greenspace through the industrial district, serving as a catalyst for speculative post-industrial urbanization. However, brownfields remain; they will require decontamination if a more rigourous urbanization is to occur.

The challenge therefore, is to retain industrial zoning for existing companies which can provide any of the following products and services:

b) building products for construction of commercial and residential buildings,
c) aggregate recycling to process demolition waste and supply materials,
d) waste diversion to facilitate exchanges for local dwellings and the above,
e) heavy machinery to expedite decontamination of nearby brownfields.

1) Existing Zoning


Reclaimed Greenspace
Speculative Mixed Use
Reserved Public Utility
Transitional
Retained Ind.
G.
F.
E.
d9, d10
d8
c7, d11, c12
a3
b5
d4
e1, e2
b3
b6
a2
a1
Viable Industrial
Industrial
Residential
Transport
Institutional/Religious
Major Greenspace
Mixed (Res/Ind/Commercial)
Public Utilities
0 0.5 1.0 km
1:50,000 scale

Transport Rehabilitation Strategy

illustration 3.f

Thesis Interventions:

The thesis modifies the province's plan as follows:

F. Stormwater Retention Pond / Wetland Overpass
Serves as a gateway structure for intercity rail passengers and highway commuters, the bridge also permits passage of recreational users and wildlife between the Lachine Canal and an exsiting gulley within the St. Jacques Escarpment.

G. Turcot Interchange / Passage Park
The planned interchange requires only slight modifications to permit passage of pedestrians between the future McGill Superhospital, the existing St-Henri neighbourhood, and the Lachine Canal. Appending recreational program, ground treatment will include provisions for trials by skateboarders and freestyle cyclists.

H. Speculative Local Roads:

Prospective reclamation of industries that are expected to cease operations, and potential mining of decomissionsed landfills:

H_1 Arcelor-Mittal Site
• extending existing urban grid to Rue St. Patrick.

H_2 Decomissioned Landfills
• connecting Angrignion to Rue St. Patrick.

H_3 Former Canada Car Foundry
• prospective development analogous to St-Gabriel revitalization.

3) Interventions

Provincial Projects:

Expected start date: 2011. Expected completion: 2015.

c) Autoroute 20 and the CN mainline to be relocated along the foot of St. Jacques Escarpment.
d) Turcot Interchange, Angrignion Interchange, and Autoroute 15 elevated structures to be reduced both in height and span.

Municipal Projects:

Expected start date: 2015. Expected completion: 2020.

e) Notre-Dame LRT: Designated in the city's masterplan, the tram shall interchange with Metro lines at Lionel-Groulx Station near Atwater Market, threading through Place St-Henri, and Lachine, with the potential of extending the route westerly to the airport. The project creates an opportunity to rebuild Rue Notre-Dame as an urban thoroughfare analogous to the street profile through St-Henri. Rue Angrignon shall divert industrial traffic to the Autoroute.

2) Projected

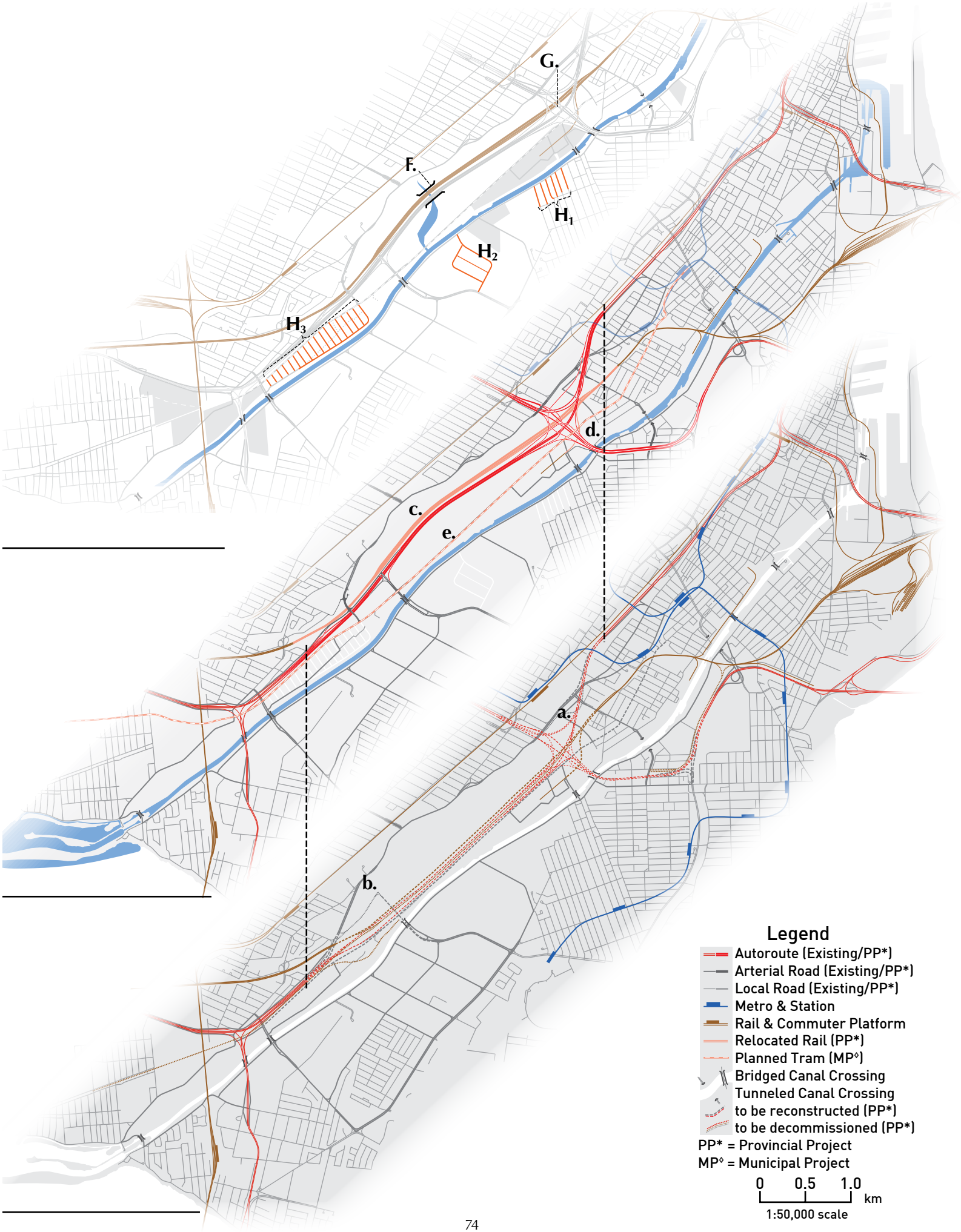
Existing Conditions and Predetermined Demolition:

The demolition of infrastructure shall engage local waste diversion industries in the classification of concrete, aggregate, crushed stone and bitumen for recycling. Rubble processing also includes the separation of reinforcing steel and iron rail, which will then be diverted to local metal recyclers.

a) Dashed splines indicate portions of Autoroutes 20, 15 and 720 to be demolished, as well as the CN mainline to be relocated.
b) Provincial proposals also call for the decommissioning of abandoned railroad spurs and the relocation of minor roads.

Of general concern are industrial contaminants in the soil at the former Turcot Yard, and the disposal of railroad ties preserved in carcinogenic creosote. The thesis prescribes that toxic demolition waste shall be rendered inert using bioremediation technologies.

1) Existing


G.
F.
H1
H2
H3
d.
c.
e.
a.
b.
Legend
Autoroute (Existing/PP*)
Arterial Road (Existing/PP*)
Local Road (Existing/PP*)
Metro & Station
Rail & Commuter Platform
Relocated Rail (PP*)
Planned Tram (MP◊)
Bridged Canal Crossing
Tunneled Canal Crossing
to be reconstructed (PP*)
to be decommissioned (PP*)
PP* = Provincial Project
MP◊ = Municipal Project
0 0.5 1.0 km
1:50,000 scale

Waste Diversion Strategy

illustration 3.g

Speculative Urbanization:
Existing and proposed infrastructure facilitates environmental cleanup of toxic sites rezoned as mixed-use for speculative development.

Anticipated Material Extraction Sources:

- Contaminated Soil: all sites
- Rubble (concrete, asphalt): all sites
- Recyclable Metals: all sites
- Recyclable Paper: decomissioned landfills Lf_1, Lf_2
- Biodegradables: Lf_1, Lf_2

Locally-Sourced Building Products:

- Roofing & Membranes: b_5, b_6
- Recycled Concrete, Asphalt: c_7, c_{12}
- Plumbing Fixtures: b_3

Locally-Sourced Equipment:

- Extraction Equipment: e_2 Metso

4) Speculative

Waste Ecologies:
Mapping potential waste exchanges catalyzed by the introduction of a municipal compost facility.

Proposed Organic Waste Diversion Facility:

- **Organics:** fp_1 Municipal Compost Facility
  - •oversees phytoremediation of contaminated soil
  - •oversees mycoremediation of mulched sleepers

Existing Industrial By-Product Sources:

- **Brewery Waste:** fe_1 McAuslan Brewery
- **Deinking Sludge:** d_4, d_8, d_9
- **Soiled Biodegradable Paper:** d_4, d_8, d_9

Anticipated By-Product Consumption:

- **Deinking Sludge:** b_5 Bakor, b_6 BP-EMCO
- **Recycled Asphalt:** b_5, b_6, c_{12}
- **Brewery Waste, Biodegradable Paper:** fp_1

3) Interventions

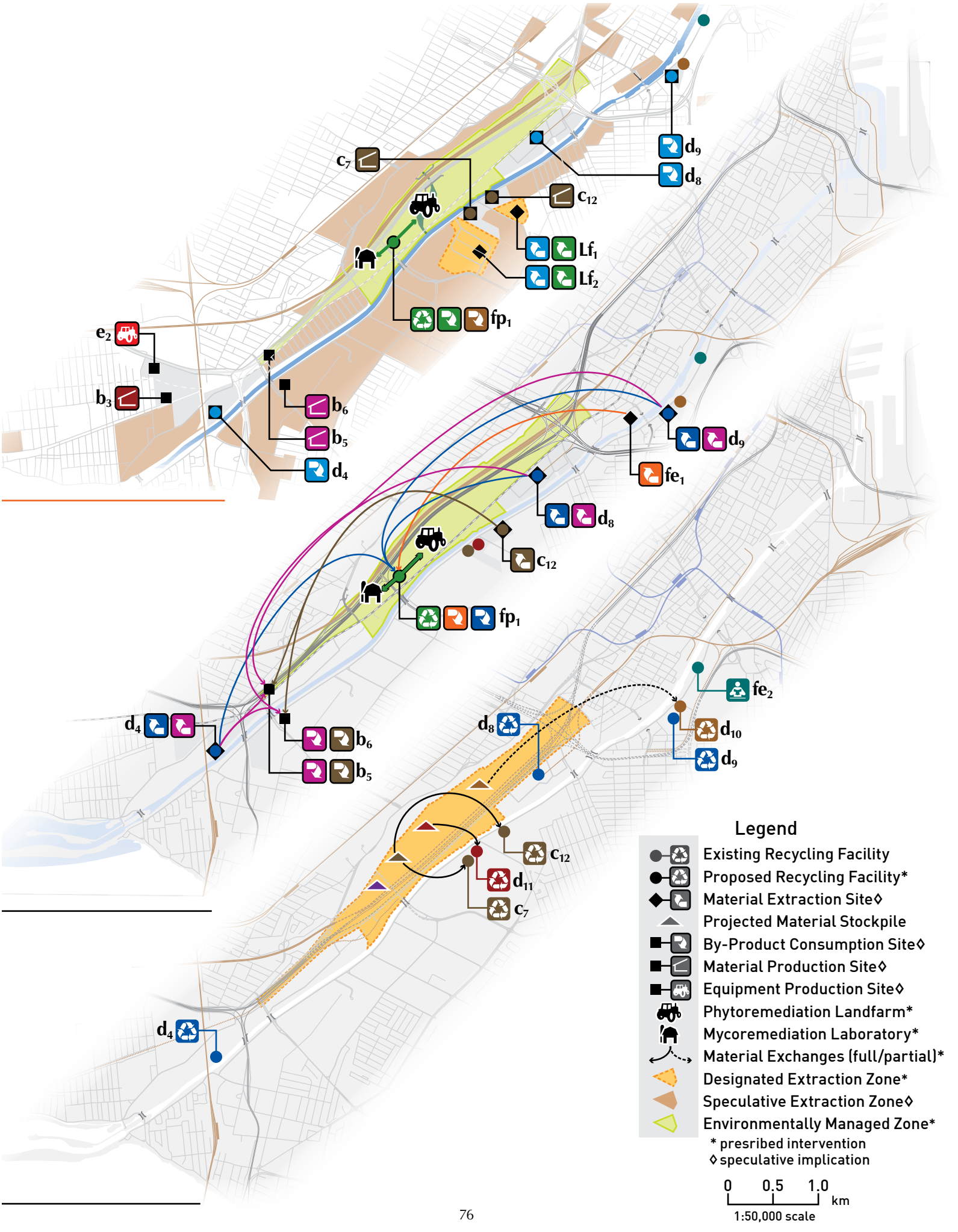
Existing Waste Diversion Facilities:

- **Paper:** d_4 Cascades, d_8 Kruger, d_9 Montreal Paper Recycling Co.
- **Contaminated Soil:** d_{10} Decontam/Groupe Cintec.
- **Metals:** d_{11} Deitchter & Frere.
- **Rubble:** c_7 Holcim (concrete); c_{12} DJL, Chenail (asphalt).
- **Local Expertise:** fe_2 MCEBR

Pending Demolition Stockpiles:

- **Cresoted Wooden Sleepers:** 12,500 m^3
- **Contaminated Soil:** 40,000 m^3 (PAH); 190,000 m^3 (HM)
- **Metals:** 19,000 t (rebar); 10,600 t (rail)
- **Rubble:** 170,000 m^3 (concrete); 62,500 m^3 (asphalt).

2) Projected


c7
d9
d8
c12
Lf1
Lf2
fp1
e2
b3
b6
b5
d4
d9
fe1
d8
c12
fp1
d4
b6
b5
d8
fe2
d10
d9
c12
d11
c7
d4
Legend
Existing Recycling Facility
Proposed Recycling Facility*
Material Extraction Site◊
Projected Material Stockpile
By-Product Consumption Site◊
Material Production Site◊
Equipment Production Site◊
Phytoremediation Landfarm*
Mycoremediation Laboratory*
Material Exchanges (full/partial)*
Designated Extraction Zone*
Speculative Extraction Zone◊
Environmentally Managed Zone*
* presribed intervention
◊ speculative implication
0 0.5 1.0 km
1:50,000 scale

Recreation Expansion Strategy

illustration 3.h

H. New Pathways and Gateways provide ingress to Turcot:

H_1 West Escarpment Entrance:
- connects with planned dedicated bike route (g)
- provides access for unpaved trail users

H_2 Compost Facility/Biotech Campus:
- visitor parking, interpretive centre, administration information

H_3 North Escarpment Entrance:
- via exsting ravine, connects to NDG at Rue St-Jacques
- provides access for pedestrians and non-motorized vehicles

H_4 East Escarpment Entrance:
- ducks underneath the interchange and over the rail line
- links to Superhospital, Metro Vendôme, and commuter rail

H_5 LaSalle Rail Trail:
- existing ROW to become paved multiuse path
- links LaSalle Coke Crane to Angrignon Park and Metro

J. Programmatic Nodes:

J_6 Canal Playground / Picnic Area
- reclaim brownfield to expand greenspace along the canal
- adjacent to proposed mixed-use zone overlay

J_7 LaSalle Coke Crane
- rehabilitate heritage relic as a public oberservation deck

J_8 Canal Edge Outdoor Pool
- expropriated intermodal site diversifies aquatic activites

J_9 Irrigation / Laking Gardens / Fish Hatchery
- focal point of Turcot Park

J_{10} Highway Embankments / Programmed Berms
- MTQ's design supports activities such as tobagging

3) Interventions

Municipal Masterplan:
The Municipal Masterplan identifies the St. Jacques Escarpment as one of the city's greenspaces requiring stewardship, and the potential to decontaminate Turcot Yards and surrounding brownfields, but it fails to identify programmatic uses for either.

g) Projected on-street and dedicated bike routes to connect the existing Maisonneuve Bike Route (g_1)—a major trunk route between Notre-Dame-de-Grace and downtown—with existing bike paths leading to the westernmost point of the island via the Borough of Lachine (g_2), and to an existing footbridge across the Canal to the Borough of LaSalle (g_3).

The path will use an existing rail bridge to cross Autoroute 20, and a second crossing via a road overpass proposed by the MTQ.

2) Projected

Existing Recreational Program:

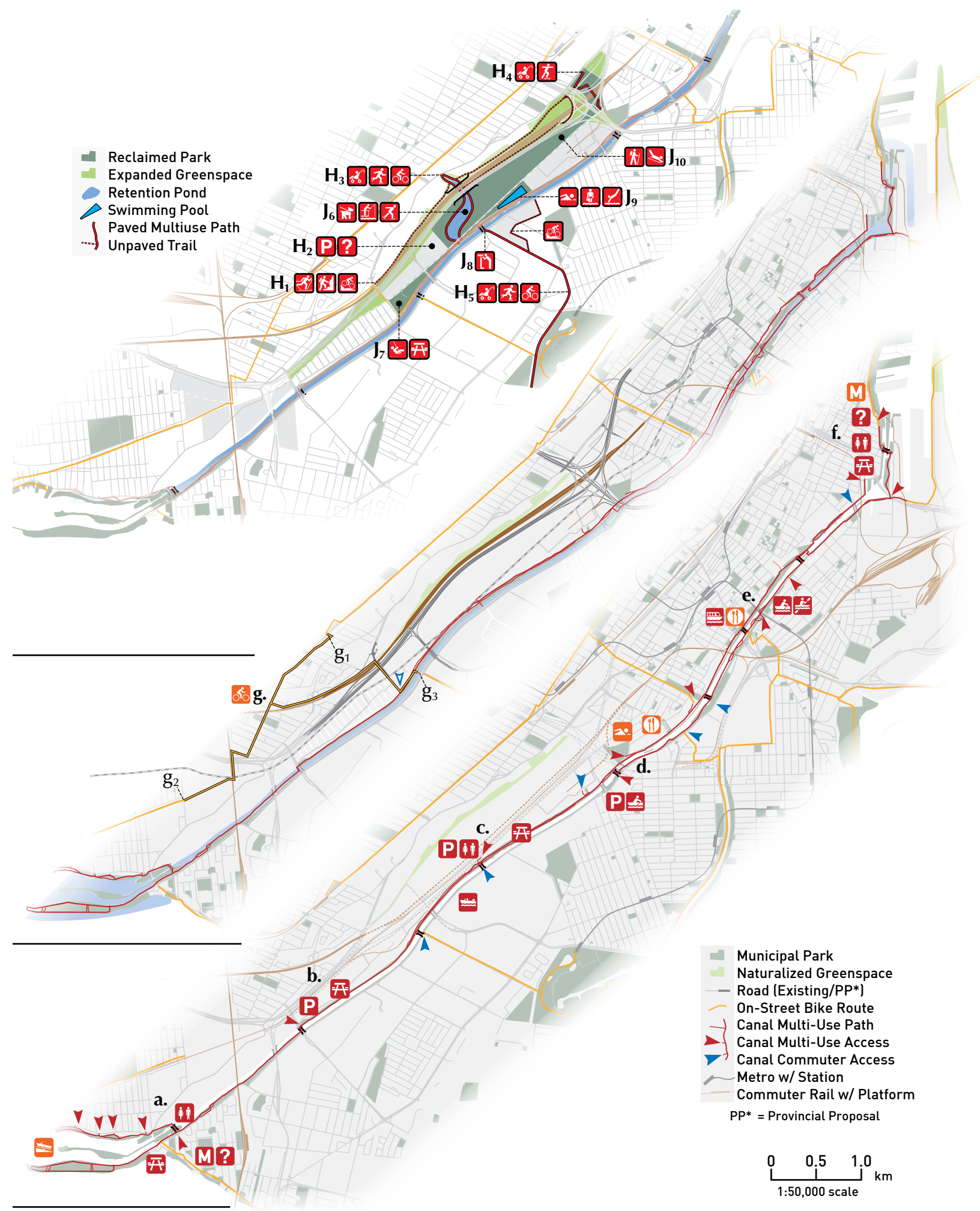
Parks Canada is responsible for the maintenance of the Lachine Canal multi-use paths and related amenities.

The City of Montreal has tied on-street bike routes to the Canal, and offers and/or licenses public amenities.

Major recreational nodes as follows:

a) Borough of Lachine: Information, Marina, Museum & WC
b) Ville St-Pierre: Parking & Picnic Grounds
c) LaSalle Coke Crane: Parking, Picnic Grounds & WC
d) Cote St-Paul Locks: Gadbois Recreational Centre, Dining
e) Atwater Market: Food, Dining, Boat Tours & WC
f) Old Port of Montreal: Info, Dining, Museums & WC

1) Existing


Reclaimed Park
Expanded Greenspace
Retention Pond
Swimming Pool
Paved Multiuse Path
Unpaved Trail
H4
H3
J10
J6
J9
H2
J8
H1
H5
J7
a.
b.
c.
d.
e.
f.
g.
g1
g2
g3
Municipal Park
Naturalized Greenspace
Road (Existing/PP*)
On-Street Bike Route
Canal Multi-Use Path
Canal Multi-Use Access
Canal Commuter Access
Metro w/ Station
Commuter Rail w/ Platform
PP* = Provincial Proposal
0 0.5 1.0 km
1:50,000 scale

Chapter 04

"The spatial task is no longer to embed the road in the landscape, but to design a mobility landscape, in which infrastructure, urban development and landscape are combined."

—Meurs, Paul. "Parkways and Polderways" in *Mobility: Room With A View*: p.430.

fig.4.01: *Lachine Canal footbridge leading to Atwater Market. Photo by Author, 2009.*

04
INTERVENTIONS

04.1
Prerequisites for a Working Landscape

The previous chapter discussed potential waste exchanges that may contribute to a working landscape at Turcot Yard, and this section explores project management methods that preclude the strategies and interventions illustrated herein. Architects are involved in the tendering of projects to contractors, but in this case, it would be necessary to forge private public partnerships and develop policies to foster these exchanges. For example, the municipal government may wish to increase revenue by opening tracts of land along the Lachine Canal for speculative development. To create incentive for private developers, municipal governments adjust zoning regulations for increased densities and building heights, thereby maximizing a developer's return on investment. The zoning strategy represents this by changing large tracts of land from industrial to mixed-use, generally taxed at a higher rate, and market forces will deindustrialize the district. At the same time, the masterplan protects industries whose products and services

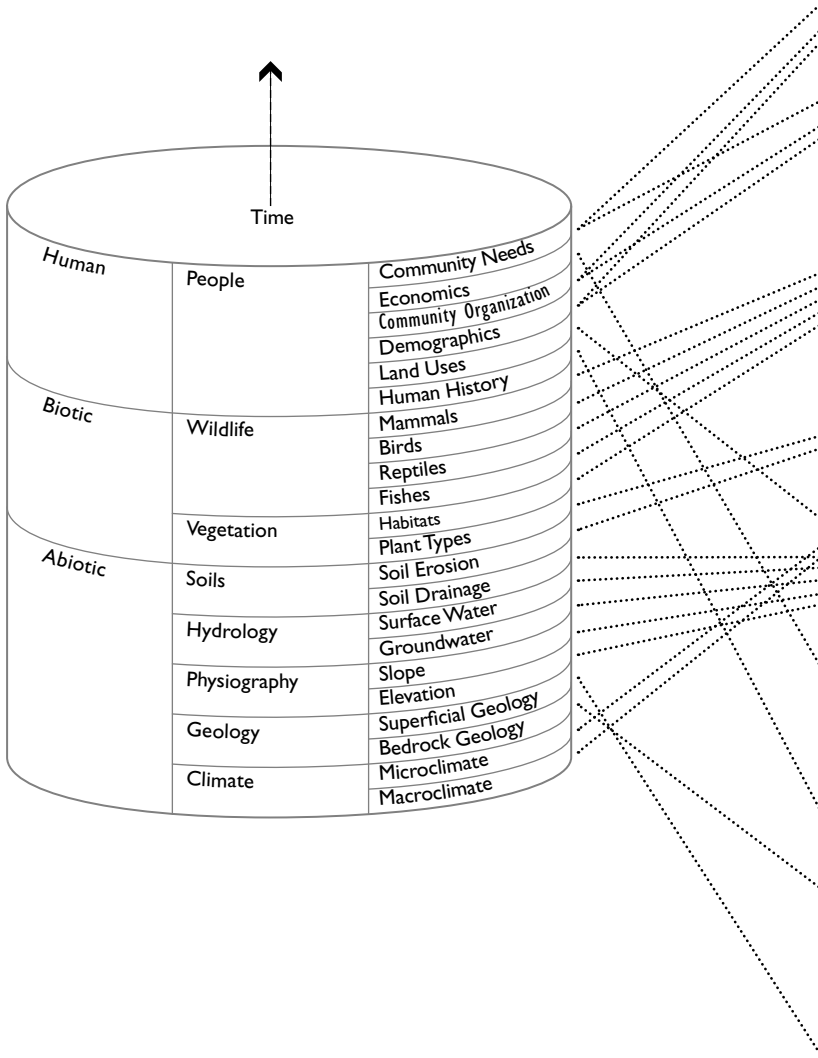
fig.4.02: *Bird's Eye view of Turcot Yard and Interchange, c.2007. Courtesy Google.*

contribute to the urbanization of the district. The city may protect these industries under a favourable taxation rate, but in exchange, bylaws could be adjusted to enforce setbacks and landscape components upon protected industrial properties.

Meanwhile, the province may decide to forgo a standard tendering process for the Turcot Interchange Replacement, and identify local industries as sole suppliers in exchange for favourable disposal fees of demolition rubble. These profitable exchanges for local industries would liberate funds to upgrade the landscape components of their own property in adherence to the new municipal regulations. Alternatively, if it is impractical for these industries upgrade landscape components on their property, they may choose sponsor reclamation of Turcot by donating materials, equipment or expertise. These potentially profitable exchanges recall Belanger's example at Kalundborg where ecologically efficient industries invested in urban beautification programs that transformed the urban fabric of their industrial area. The masterplan organizes a schematic design for Turcot based on a few simple parameters. Firstly, the masterplan accepts the railway diversion, freeway replacement, and interchange configuration as proposed by the MTQ. The route as planned maximizes the distance between the freeway and the canal, mitigating noise and pollution for future urbanization along the canal's banks. The MTQ's proposal also creates two tract of lands on either side of Boulevard Angrignon which feature good infrastructural connections to the freeway and local arterial roads, namely Rue St-Patrick and Rue Notre-Dame. The thesis dedicates these tracts to the compost facility and to a speculative biotechnology campus that will profit from consultation of local waste management operations and research and innovation in remediation technologies. The offers speculation as to how these infrastructures contribute to the formation of Turcot Park.

04.2
Schematic Design

The schematic design is represented as axonometric layers that are loosely based on McHarg's model for suitability analysis. The layers are also arranged in chronological order of past, present, and future site operations for the site. Each illustration is preceeded by an explanatory caption.



Turcot Park: schematic design

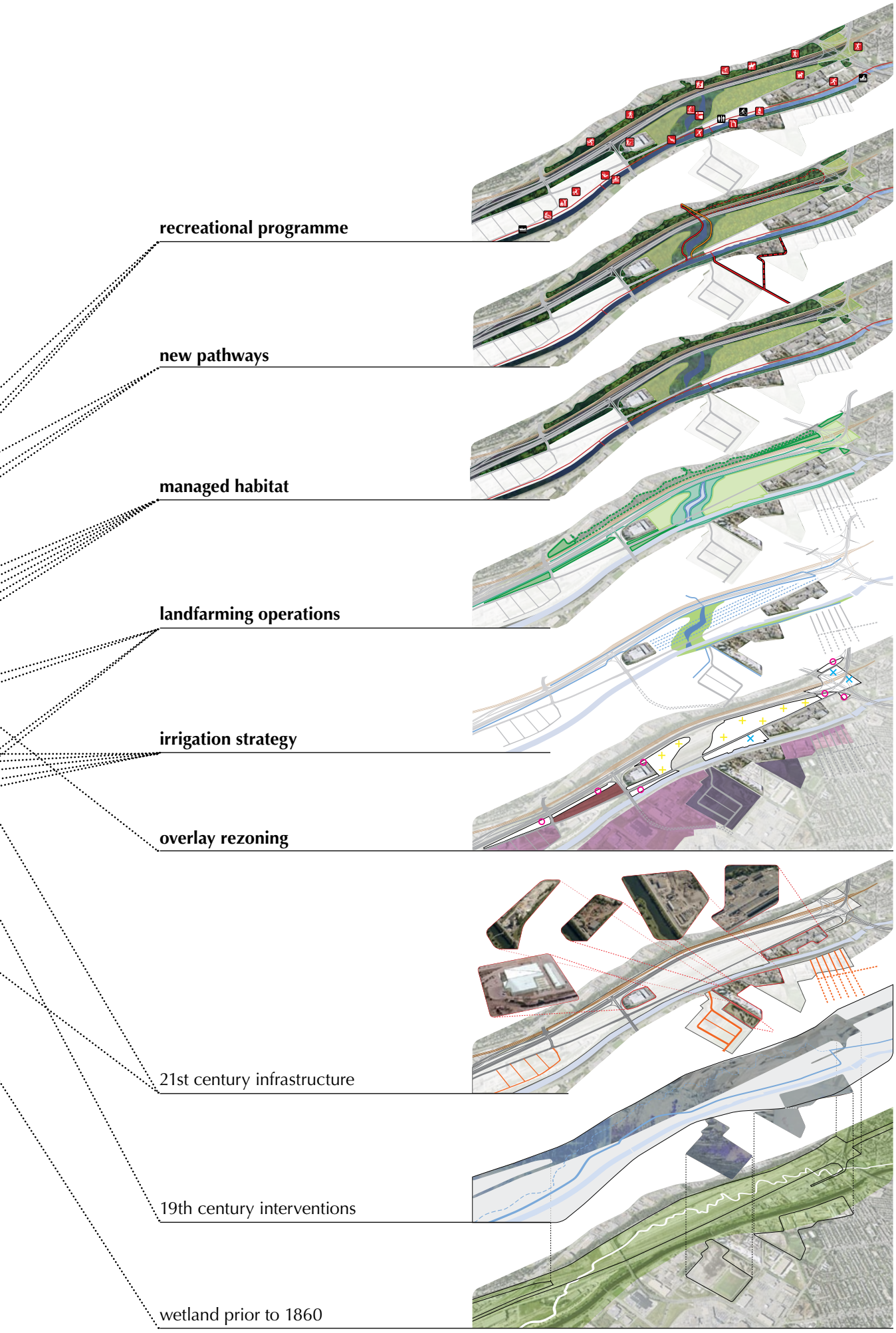

recreational programme
new pathways
managed habitat
landfarming operations
irrigation strategy
overlay rezoning
21st century infrastructure
19th century interventions
wetland prior to 1860

illustration 4.a:

infrastructural foundations

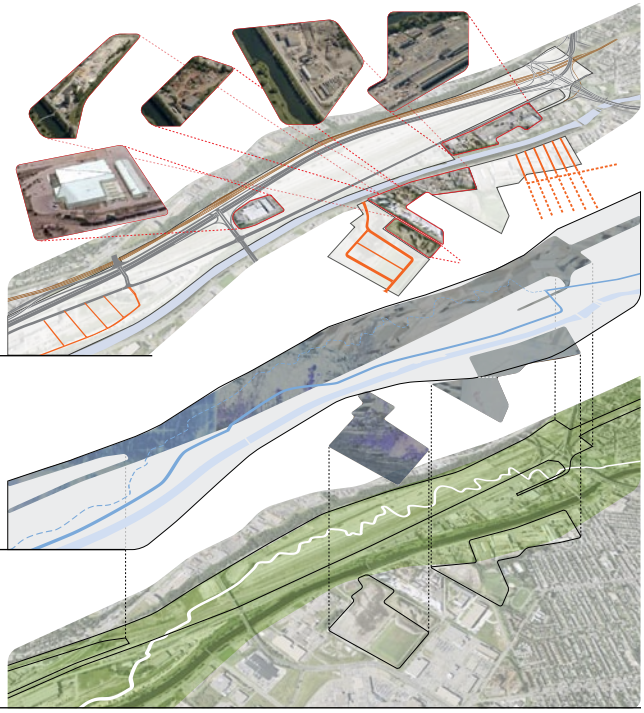
Overleaf:

illustration 4.a: *Three layers are grouped to show the how the past two hundred years of human infrastructural intervention have impacted the abiotic and biotic features of the site, effectively decreasing its suitability for urbanization.*

The first layer (bottom) conveys a retrospective view of the site in its natural state.

The second layer (middle) demonstrates how 19th Century interventions dewatered and landfilled the site, increasing the amount of toxins and highly reactive compounds in the soil.

The third layer (top) indicates infrastructural upgrades slated by respective levels of government. The layer also identifies existing and proposed waste management industries having the capacity to supply materials for the proposed infrastructure reconstruction and decontamination of the defunct Rail Yard. The compost plant is the first of a series of interventions to the site. To show the relationship between speculative infrastructure to the roadways as proposed by the government, the layer also speculates the construction of future roadways that will coincide with brownfield development post-reclamation.



Turcot Park: Infrastructural Foundations

illustration 4.a

fp_1 Proposed Central Compost Facility
- introduces municipal organic waste treatment
- finished compost supports phytoremediation landfarming
- operations interface with mycoremediation cultivation

c_7 Existing Concrete Plant
- able to source recycled aggregate from local demolition
- efficencies gained through proximity to future construction
- recycled materials applied to expanded recreational program

d_{11} Existing Metal Recycler
- able to process salvaged metals from extraction sites
- able to source recyclable metal from local demolition
- interchange with rejected materials nearby facilities

c_{12} Existing Asphalt Plants
- able to process petroleum contaminated soil
- able to source recycled aggregate from local demolition
- efficencies gained through proximity to future construction

d_8 Existing Kruger Paper
- proposed soiled paper interchange with Compost Facility
- potential growth medium for mycoremedation cultivation
- potential interchange of deinking sludge with landfarming

Lf_3 Existing Cintec Maximum Security Soil Cell
- currently monitored by Cintec, no existing street frontage
- features leachate collection and discrete water treatment

projected roads (MTQ)
proposed roads
extraction zones
projected railroads (MTQ)
treatment facilities

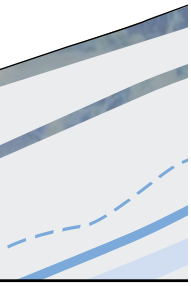
21st c. infrastructure

Human Use and Abuse:
Peat is an acid-sulphate soil. Wetland drainage oxidized pyrites in the soil, creating sulphuric acid. In turn, the acid leaches heavy metals from the soil, contaminating groundwater. The acid also decays subterranean structures.

A: Turcot Yard
- ferrous materials (scrap railroad equipment) used as landfill
- soil contaminated by heavy metals, petroleum and PAHs.

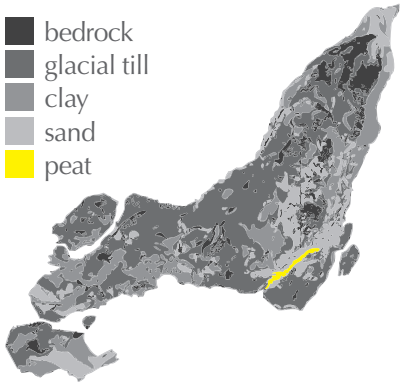
B: Arcelor-Mittal
- industry expected to become non-viable and vacate site

Lf_1 , Lf_2: Defunct Landfill / Active Snow Dump
- potential surface mining of interred recyclable materials



contaminated fill
Lachine Canal
rivulet exposed c.1915
drainage swale c.1832

historic interventions



Surface Geology:
The Lachine Canal follows a prehistoric outflow of the St. Lawrence River. 9500 years ago, glacial till diverted the river course and exposed the site, becoming a wetland peat bog named Otter Lake. The wetland featured the meandering St. Pierre Rivulet, which drained the lands north of the St. Jacques Escarpment and joined the St. Lawrence near the site of Montreal's earliest european settlement.

The soil has poor weight bearing capacity and is therefore ill-suited for high-density construction. Its high absorbency permits deep permeation of industrial contaminants.

ancient river bed
St. Pierre Rivulet

wetland prior to 1860

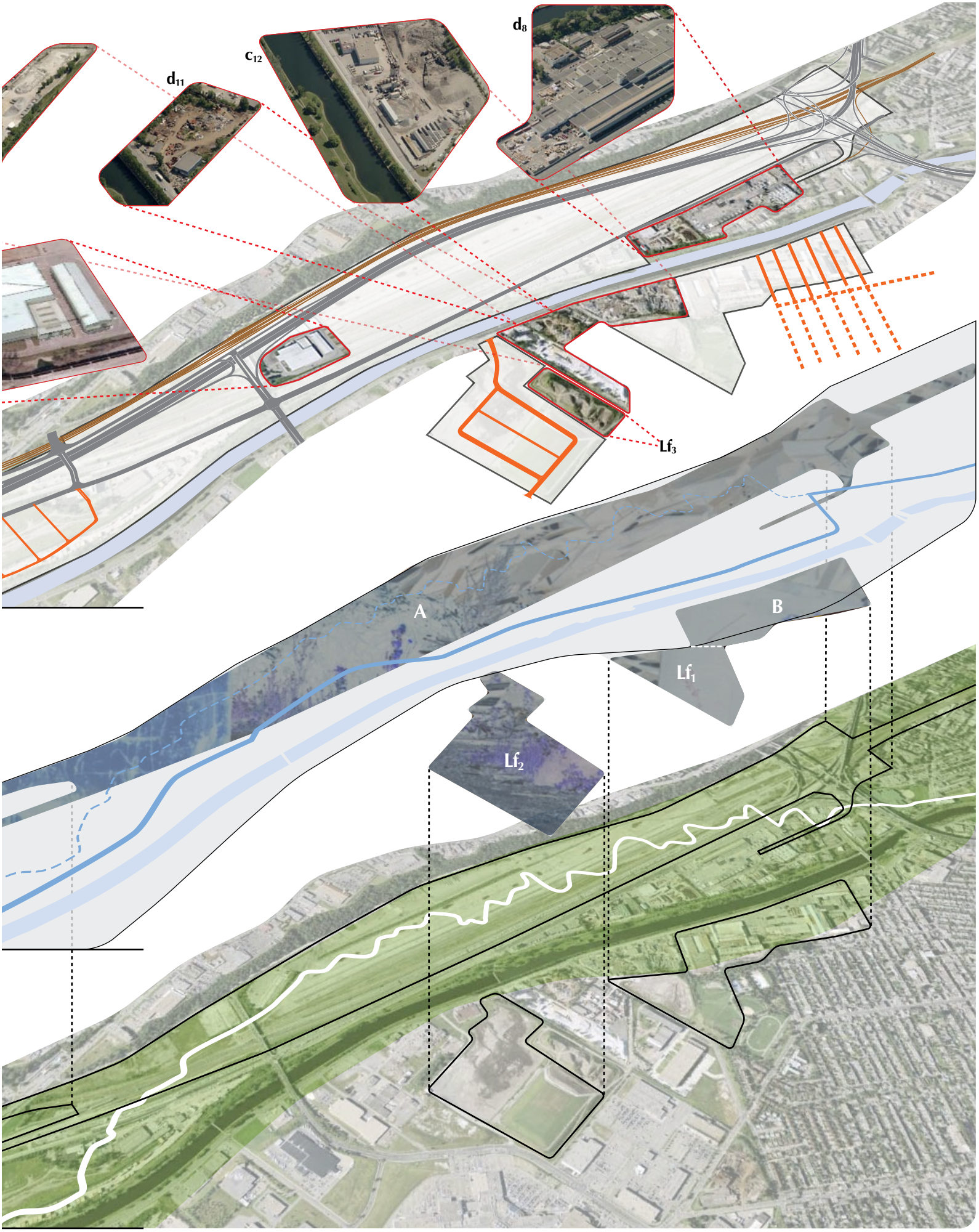

d11
c12
d8
Lf3
A
B
Lf1
Lf2

illustration 4.b:

operative interventions

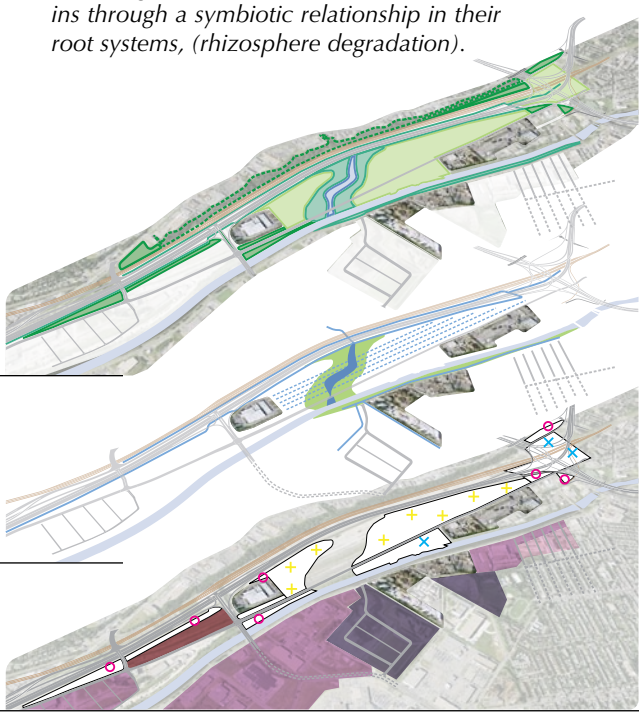
Overleaf:

illustration 4.b: *The grouping of these three layers schematically represent operations proposed by the thesis to initiate an adaptive landscape at Turcot Park.*

The first layer (bottom) *conveys a re-zoning of the site, specifying the distribution of contaminated soils in preparation for phytoremediation landfarming. The layout also prescribes land use for properties surrounding Turcot Park. The extraction of contaminated soil from these properties shall engage the phytoremediation facilities at Turcot Park, as economic benefits for their decontamination outweigh costs. Contaminated soils are graded across the site to a depth of 0.6 m and capped with 0.1 m of compost (Section 4.3 describes a speculative phasing of these operations).*

The second layer (middle) *indicates the irrigation strategy for the site. Drainage swales are prescribed to capture stormwater runoff from the newly constructed freeway. These swales flow to an irrigation reservoir centrally located within the planned phytoremediation grounds. The reservoir is aligned to capture runoff from an existing ravine in the St-Jacques Escarpment. The reservoir is also fed by the Lachine Canal via a control weir. The weir shall not disturb contaminated sediments within the canal, thereby ensuring a reliable flow of clean water to the reservoir. The layer indicates the canal's documented aquatic plant species that will seed and germinate within the reservoir (whether through natural migration or human intervention). The layer also identifies a set of resilient plant species proven to thrive in the unique conditions of roadside drainage swales, able to endure deluge, drought and road salt.*

The third layer (top) *prescribes a selection of hyperaccumulating plant species and indicates their deployment upon contaminated soil. First to be planted are saplings of red maple and white pine, potentially germinated and nursed at the existing public works facility adjacent to Kruger. Tall fescue, goldenrod and pussy willow shall be spray seeded. Alfalfa and sunflower shall be cultivated using conventional agricultural practices. Landscape contractors shall deploy bullrush and duckweed to generate a marsh condition along sloped banks of the reservoir. The marsh shall contain floods in the event of a deluge, but will also aid in the filtration of leached chemicals. The selected species shall metabolize toxins from contaminated soil into more inert compounds, either by sequestering them into their cellular structure (phytodegradation), by releasing them into the atmosphere as gaseous compounds (evapotranspiration), or by recruiting microbes to metabolize the toxins through a symbiotic relationship in their root systems, (rhizosphere degradation).*



landfarming operations

irrigation strategy

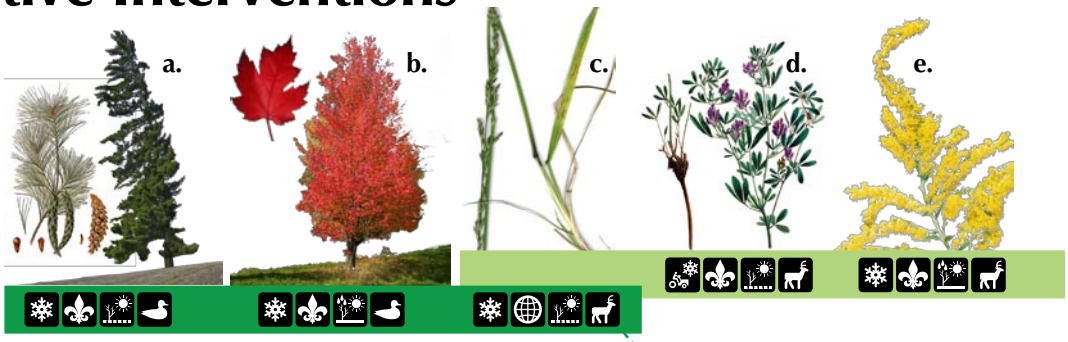
overlay rezoning

Turcot Park: Operative Interventions

illustration 4.b

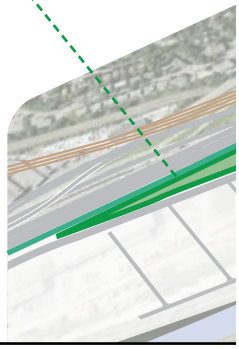
Phytoremediation Species:

a. Eastern white pine *(Pinus strobus)*
   Organics†
b. Red maple *(Acer rubrum)*
   Cs_{137}, Pu_{238}, Sr
c. Tall Fescue *(Festuca arundinacea)*
   Organics‡ Cs_{137}
d. Alfalfa *(Medicago sativa)*
   Cr
e. Hairy goldenrod *(Solidago canadensis L.)*
   Al
f. Sunflower *(Helianthus annus)*
   Cd,Cr,Cs,Mn,Ni,Sr,U,Zn
g. Pussy willow *(Salix discolor)*
   Organics† Ag,Hg,Se
h. Bullrush *(Typha latifolia)*
   rhizofiltration
j. Duckweed *(Spirodela polyrhiza)*
   Cd,Cr,Ni,Pb,Zn



annual, cultivated
perennial, rotated
perennial, self-organizing
drought tolerant
moderate moisture
waterlogged soil
woodland plantings
grassland plantings

hyperaccumulator of...
grazing habitat
nesting habitat
aquatic food chain
introduced, non-invasive
indigenous
wetland plantings
aquatic plantings



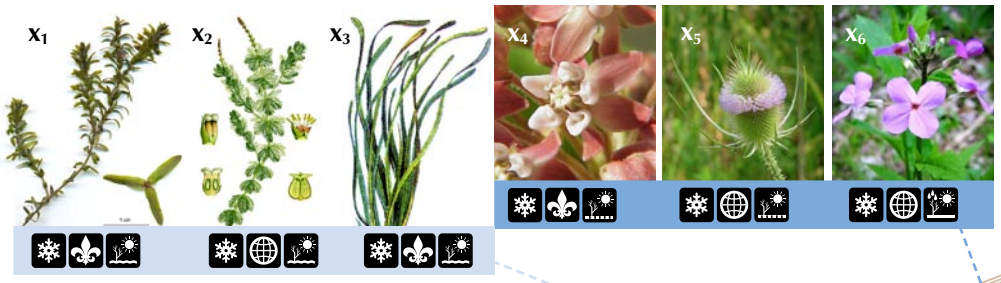
landfarming operations

Existing Aquatic Species:

x_1 Pondweed *(Elodea canadensis)*
x_2 Water-milfoil *(Myriophyllum spicatum)*
x_3 Wild Celery *(Vallisneria americanus)*

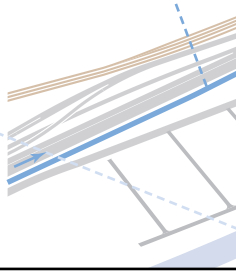
Saline Tolerant Roadside Species:

x_4 Common Milkweed *(Asclepias syriaca)*
x_5 Common Teasel *(Dipsacus fullonum)*
x_6 Damask Violet *(Hesperis matronalis)*



Lachine Canal
irrigation channels
irrigation reservoir

control weir
drainage swale
rhizofiltration wetland



irrigation strategy

table of contaminants:

Ag: Silver	Al: Aluminum	Cd: Cadmium
Co: Cobalt	Cu: Copper	Cr: Chromnium
Cs: Cesium	Hg: Mercury	Mn: Manganese
Mo: Molybdenum	Ni: Nickel	Pb: Lead
U: Uranium	Se: Selenium	Zn: Zinc

† Organics-A: Solvents, MTBE(methyl teritary butyl ether), TCE(trichloroethylene), petroleum hydrocarbons

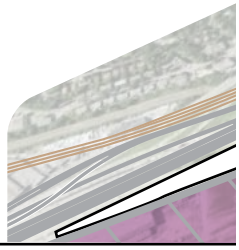
‡ Organics-B: PAHs (polycyclic aromatic hydrocarbons), napthalene

soil remediation zones:

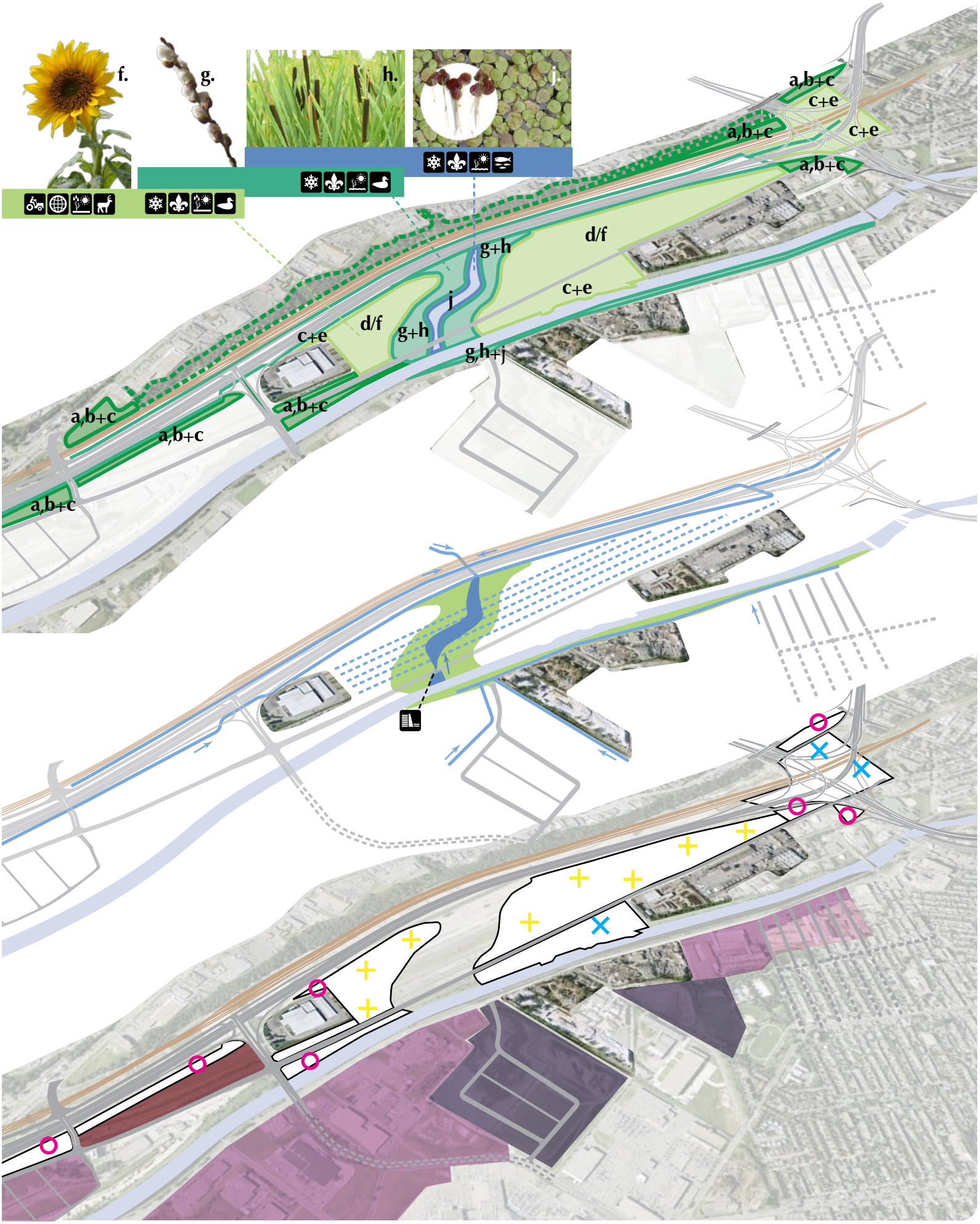
Cd, Cr, Mn, Ni, Zn.
Al, Cd, Co, Cu, Mo, Ni, Pb, Zn.
organics

speculative zoning overlays:

medium density mixed use
biotechnology campus
2-3 storey residential
environmental industry



overlay rezoning


f.
g.
h.
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a,b+c
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g+h
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d/f
g+h
c+e
g,h+j
a,b+c
a,b+c
a,b+c
a,b+c

illustrations 4.c-4.e:

adaptive management

Overleaf:

The final three illustrations in the schematic design indicate the speculative evolution of the site as a park.

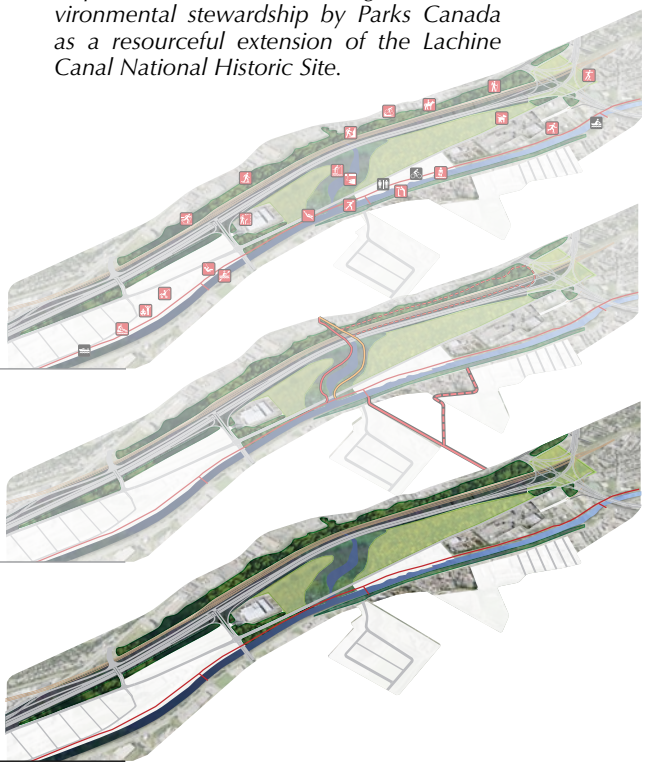
***illustration 4.c** (bottom) indicates species within the area likely to reside in or benefit from the succession of the proposed phytoremediation ecologies.*

The escarpment has already gained notoriety for its animal and plant biodiversity, particularly as a natural bird sanctuary. It is a nesting habitat several notable species including indigo bunting, chimney swift, and ruby-throated hummingbird; and is also a migratory stopover for several birds of prey, such as Cooper's hawk, red-shouldered hawk and American kestrel. Additionally, sightings of predatory animals such as fox and coyote at the former Glen Yard at the northeastern tip of the escarpment would also suggest an abundance of mammalian prey within the escarpment, such as rabbits, groundhogs, and other rodents.

Furthermore, the Lachine Canal is currently home to several species of aquatic flora such as pondweed, milfoil and wild celery. These species support populations of pumpkinseed fish, yellow perch, and sunfish; which also stand to benefit from the existence of the irrigation pond as a natural spawn or as an environmentally managed hatchery. Potentially, a fish ladder would be constructed at the control weir to facilitate ecologically restorative opportunities.

The introduction of rhizofiltration wetlands and phytoremediation grasslands will provide a biodiverse range of habitat that spans the existing aquatic ecology of the canal and the sylvan habitat of the escarpment. For example, milkweed is a known saline tolerant species, and is also the primary food source for the monarch butterfly. Amphibious birds such as duck, swan, cranes and heron would benefit from the existing aquatic plant species within the irrigation pond and canal, but will also be able to nest within the tall grass and bullrush of the wetland that separates the grasslands from the irrigation pond.

Meanwhile, the grasslands will attract insects and small rodents that are prey to the wide range of avian species that already migrate and nest in the escarpment. As the landscape self-organizes, it stands to reason that an increasingly diverse array of animal species will reside on the site in ways that are not entirely predictable. Not only will this attract recreational uses to the site as an ecological park, it would also potentially acquire administrative oversight and environmental stewardship by Parks Canada as a resourceful extension of the Lachine Canal National Historic Site.



Turcot Park: Adaptive Habitat

illustration 4.c

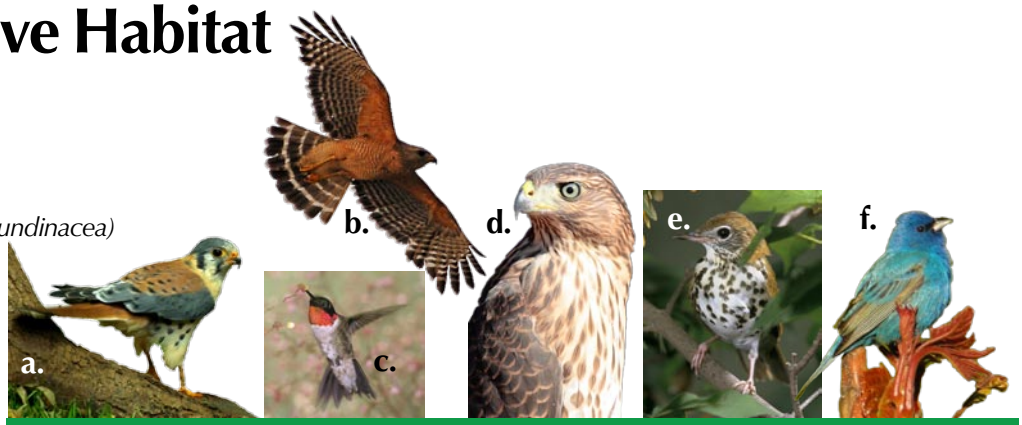
Observed Fauna:

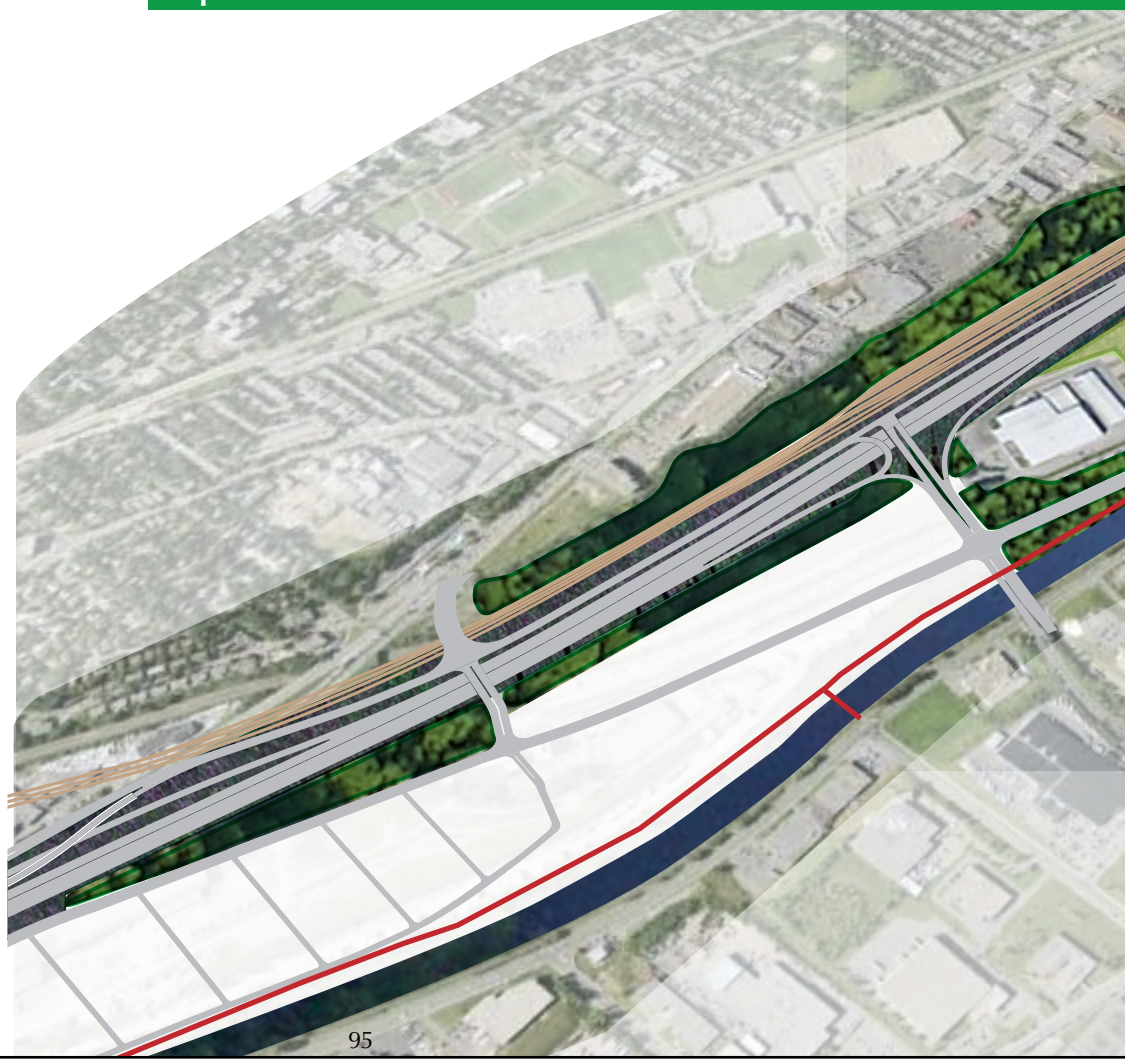
a. American Kestrel *(Falco sparverius)*
b. Red shouldered hawk *(Buteo lineatus)*
c. Ruby-throated Hummingbird *(Festuca arundinacea)*
d. Cooper's Hawk *(Accipiter cooperii)*
e. Wood Thrush *(Hylocichla mustelina)*
f. Indigo Bunting *(Passerina cyanea)*
g. Scarlet Tanager *(Piranga olivacea)*
h. Brown Snake *(Storeria dekayi)*
j. Eastern Cottontail *(Sylvilagus floridanus)*
j. Red Fox *(Vulpes vulpes)**
k. Coyote *(Canis latrans)**
m. Groundhog *(Marmota monax)*
p. Pumpkinseed *(Lepomis gibbosus)*
q. Yellow Perch *(Perca flavescens)**

* grey text denotes sighted species awaiting verification.

Anticipated Early Adopters:

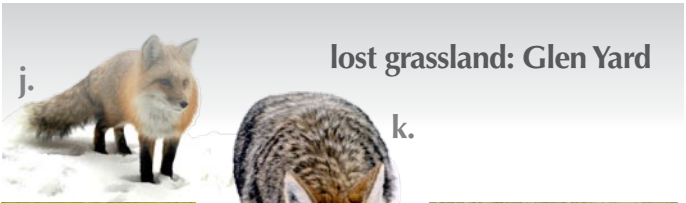
r. Red Back Salamander *(Plethodon cinereus)*
s. Deer Mouse *(Peromyscus maniculatus)*
t. Monarch Butterfly *(Danaus plexippus)*
u. Eastern American Toad *(Bufo americanus)*
v. Great Blue Heron *(Ardea herodias)*
w. Muskrat *(Peromyscus maniculatus)*





woodland
grassland
wetland
open water

new habitat



Existing Grasslands: Lachine Canal Banks

Existing Aquatic: Lachine Canal

a fish ladder shall be constructed with the proposed weir to permit use of reservoir as spawning habitat by canal species

Glen Yard

Proposed Reservoir

illustrations 4.c-4.e:

adaptive management

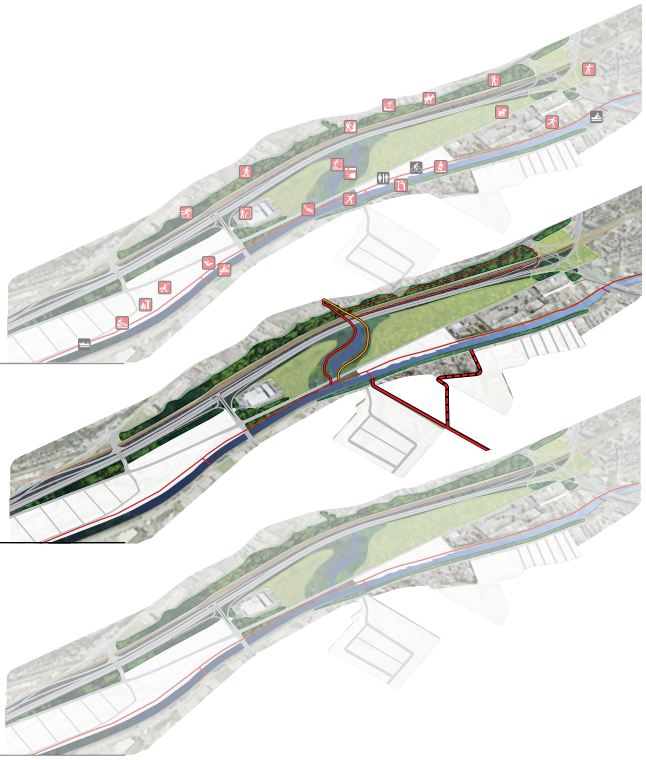
Overleaf:

illustration 4.d *(middle) indicates an initial system of pathways that addresses the dire need of pedestrian connectivity between established residential neighbourhoods on the north-south axis.*

Within Turcot Park, the paths are integrated with riparian buffers that control erosion and capture surface runoff between the farmed phytoremediation tracts and open water. The paved path (indicated in red) is initially used as an access road for farming equipment, but in the absence of farming operations, are opened to non-motorized public use. The boardwalk (indicated in amber) is constructed from salvaged railroad sleepers and interfaced with oyster mushroom to mitigate surface runoff of creosote Both paths use the natural gulley within St. Jacques Escarpment to reach the residential borough of Notre-Dame-de-Grace at the northern edge of the site.

To the south, the thesis speculates that a paved multi-use path will connect to Angrignon Metro Station via CP's abandoned LaSalle Spur. The spur enters the Lachine Canal site between the Holcim concrete plant and Cintec's maximum security landfill, arriving at the foot of the historic LaSalle Coke Crane. An existing footbridge in vicinity of the Coke Crane spans the canal, completing the connection.

The proposition also speculates that unpaved trails will extend through the St. Jacques escarpment and through an easement provided by the local recycling facilities as part of their amended zoning obligations to the city. These trails shall serve hikers, off-road cyclists, and nature enthusiasts. As an intervention, the thesis proposes that the MTQ include a provision for the trail alongside the south to west ramp of the new Turcot Interchange. The trail would be separated from freeway traffic using conventional concrete barriers, but they will share the same overpass structure. Typically, unpaved trails are maintained by local cycling clubs and community organizations on an annual basis. Given that the city prohibits off-road biking at Parc Mont-Royal, a network of trails within the Escarpment stands to be a popular addition to the city's recreational programme.



recreational programme

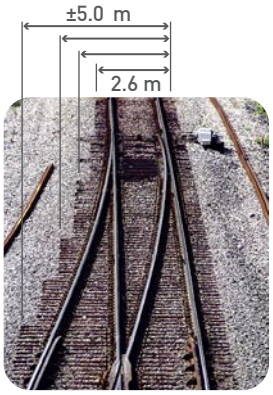
new pathways

adaptive habitat

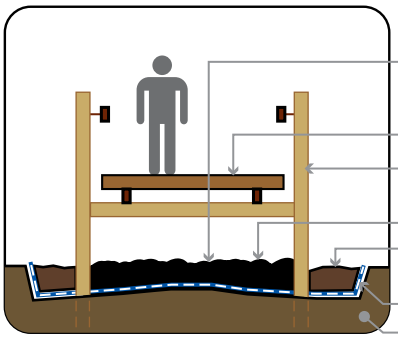
Turcot Park: New Pathways

illustration 4.d

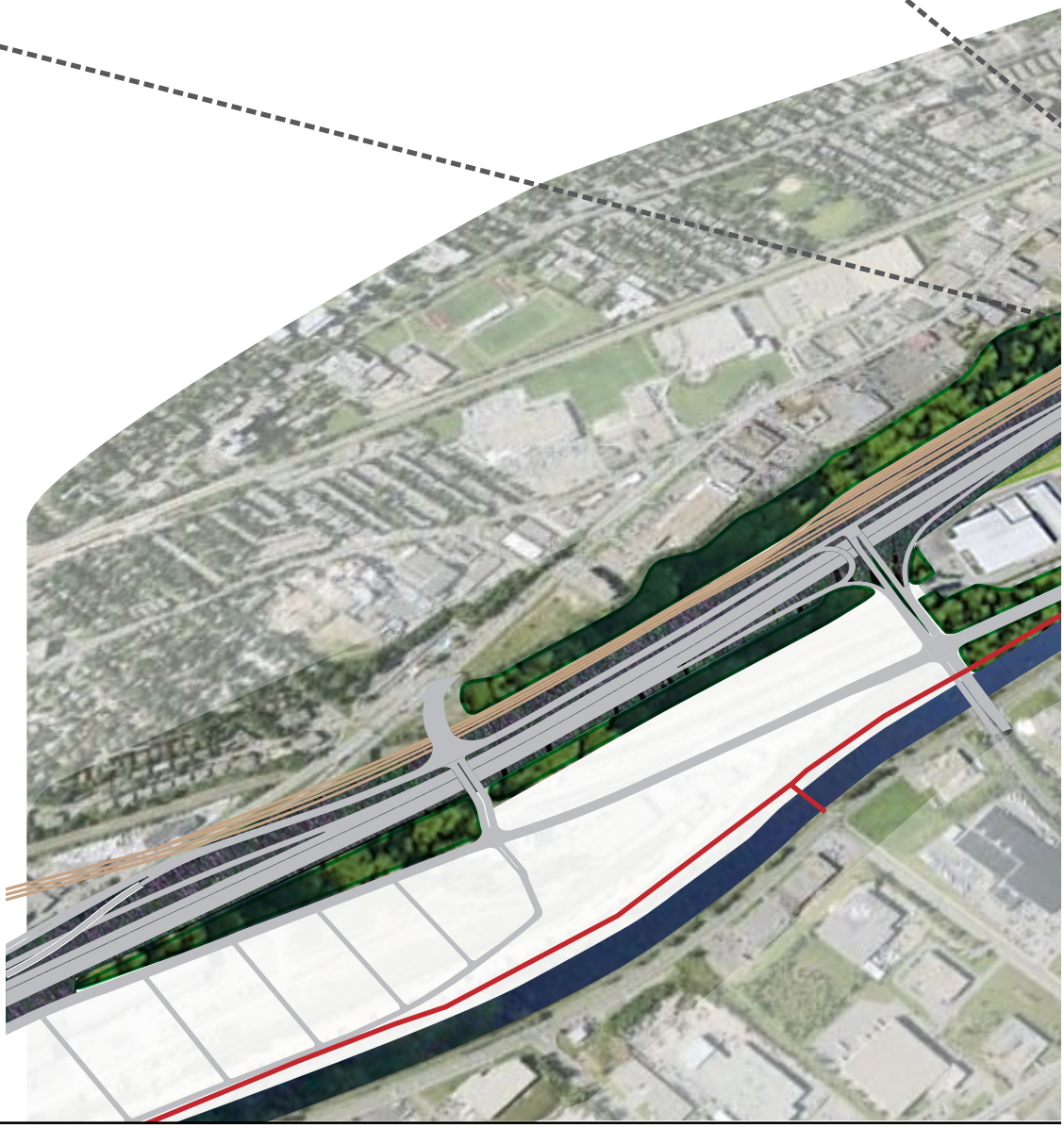
Wooden sleepers extracted from Turcot Yard contain creosote and are therefore classified as hazardous waste. Waste diversion and soil remediation interface with recreational uses by reusing wooden sleepers:



a_1 during site preparation, sleepers are extracted, sorted and stockpiled according to their width.



a_2 sleepers are reused to construct boardwalks, but migration of contaminants is mitigated by the cultivation of *Pleurotus ostreatus* within impermeable trenches.



mycoremediation boardwalk

rough trail

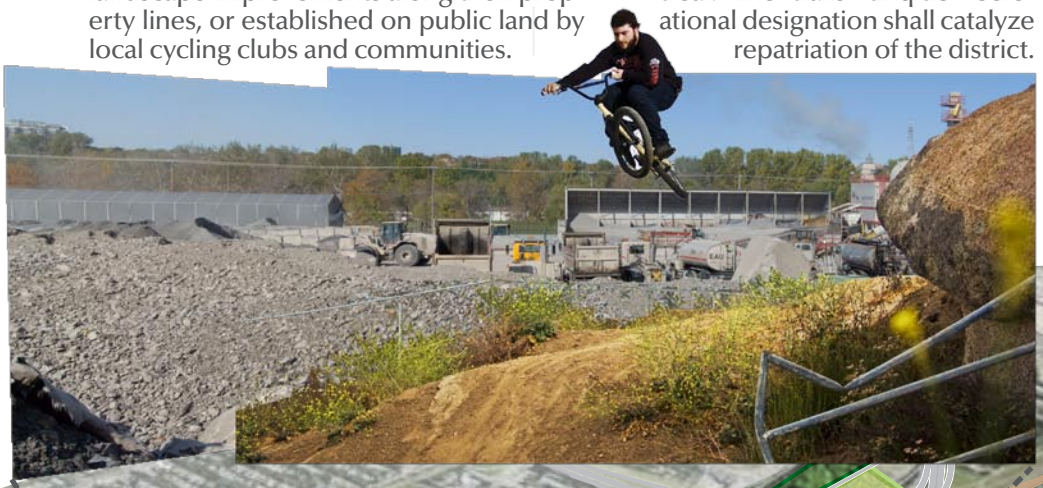
paved path

existing path

new pathways

Rough trails are constructed by local industries in agreement with the city to make landscape improvements along their property lines, or established on public land by local cycling clubs and communities.

Currently, there is no provision for off-road cycling within Montréal. The trails' unqiue recreational designation shall catalyze repatriation of the district.



illustrations 4.c-4.e:

adaptive management

Overleaf:

illustration 4.e *(top) indicates the potential for a greater variety of recreational activities afforded by improved accessibility to Turcot Park and the Saint Jacques Escarpment. Currently, the narrow banks of the Lachine Canal focus recreational activities on non-motorized transportation and strolling. The expanded fields of Turcot Park will support a multitude of activities that are currently impossible to accommodate at the Canal, such as team sports, kite flying, or off-leash dog areas.*

Environmental toxicologists may be retained to assay the landscapes to determine if the risk of exposure meets existing safety standards. The following provisions may contribute to a successful commissioning of the park:

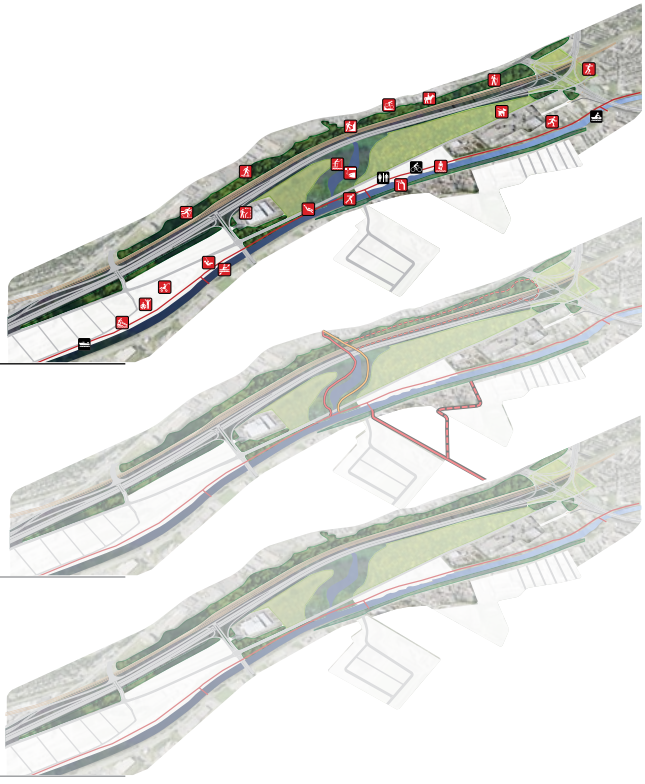
a) That the initial contamination was of a chemically stable nature, emitting no vapours, as is the case with most heavy metal contaminations.

b) The top layer of compost (0.1 m depth) is acting as line of defence against exposure to toxic soil.

c) That the root systems in the plants have matured to stabilize the contaminants. In the case of the selected ground-cover species (alfalfa, tall fescue, sunflower, hairy goldenrod, pussy willow and bullrush), root systems effectively stabilize soil in as little as three months.

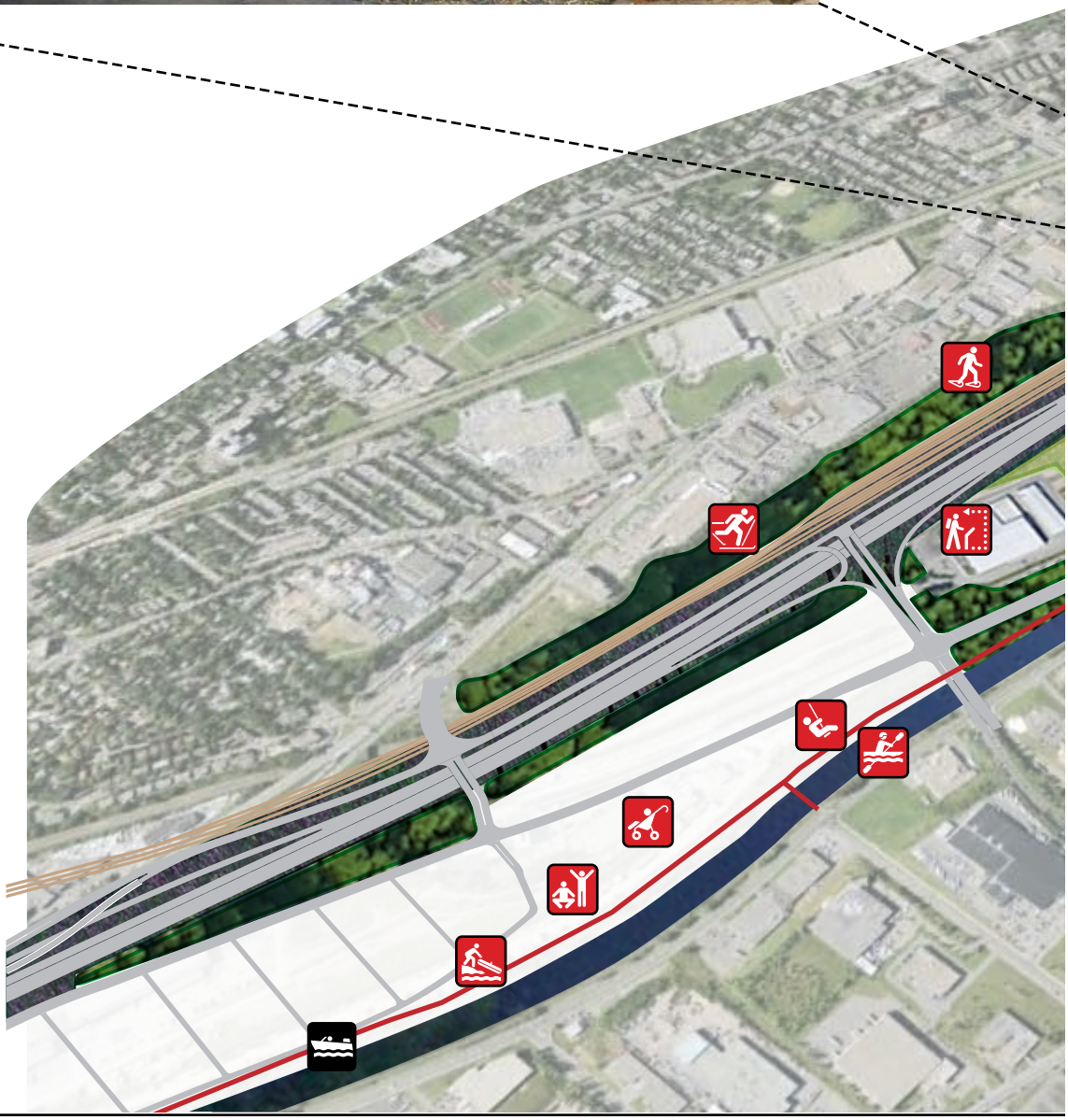
In the case of phytoremediation tracts seeded with tall fescue, they may be mowed to provide playing fields. As with conventional field maintenance operations, mechanical aeration of the soil would expedite decontamination of the soil underneath.

The illustration also speculates how a thorough decontamination of the canal's sediments would lift prohibition of aquatic sports in the canal. This speculation is described in further detail in Section 4.3, Project Phasing. Although catch-and-release fishing currently occurs in the canal, the irrigation pond would also lend itself to such activities. Moreover, improved remediation techniques developed at the park would be applied to the canal. As the canal's sediments are stripped of their toxins (or capped by rehabilitated aquatic habitat), the levels of toxins in the fish shall diminish with each passing generation; potentially becoming safe for human consumption.



Turcot Park: Recreational Programme

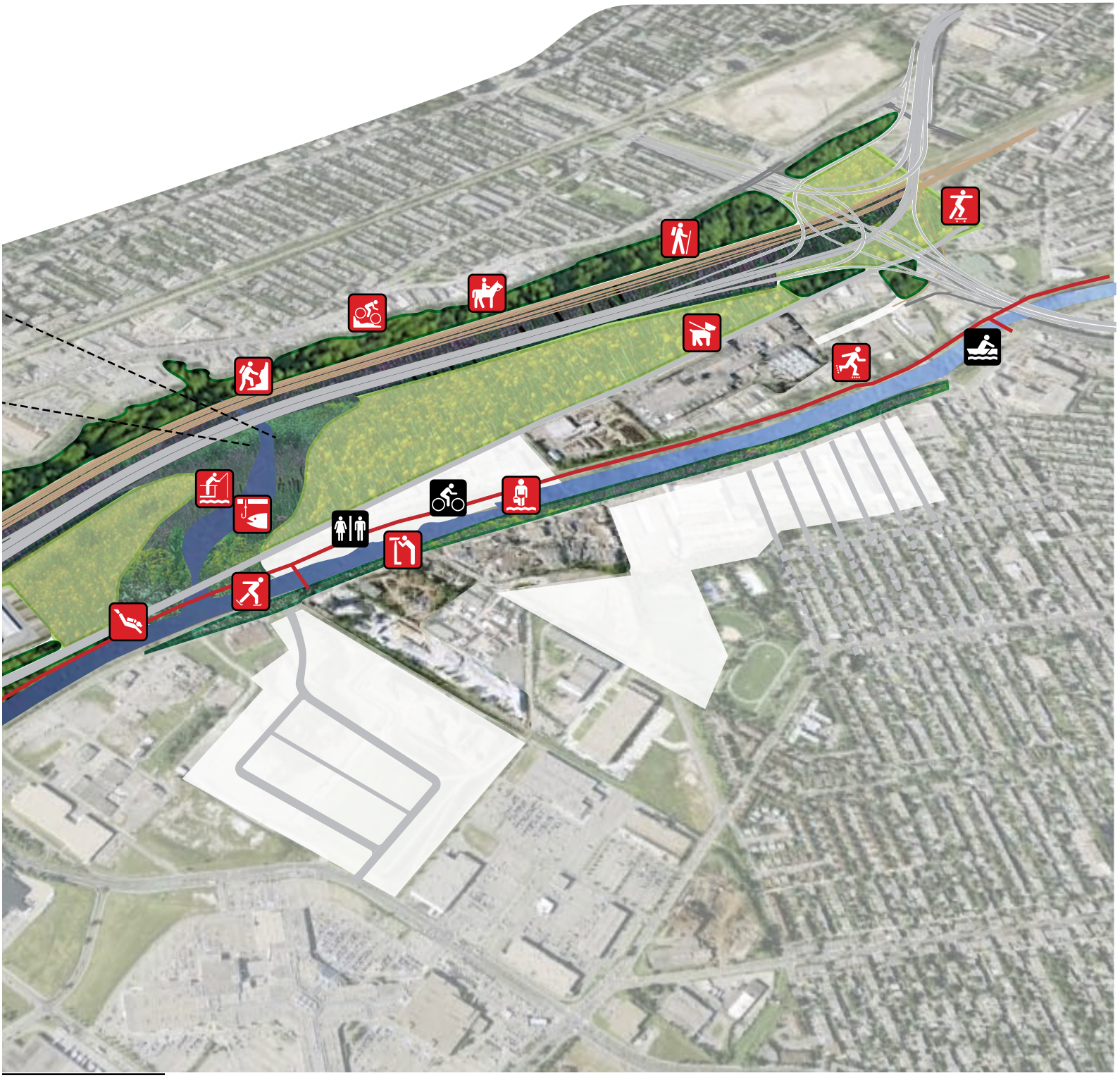
illustration 4.e



introduced

existing

recreation activities



section 4.3:

project phasing

fig.4.03: *Envisioning rubble classification operations at Turcot. Photomontage by author, 2008.*

Phase One (2012-2013):
Turcot Park is a surface mine

Projected Operation:

In preparation for the new rail line and autoroute, demolition crews under contract to the MTQ peel the surface of the abandoned rail yard from the base of the escarpment to the northern edge of the existing autoroute. Concrete and asphalt are separated and crushed into rubble, then transferred to local facilities for recycling. Iron is pulled from the railroad and sold for scrap. The limestone ballast is washed and stockpiled as clean fill for grading the pending autoroute construction. A provision for wastewater is constructed from clean fill at the base of an existing gulley. A compost filter sock treats the wastewater before it enters the existing storm sewer underneath the Autoroute.

Prescriptive Interventions:

To save disposal costs, contaminated earth is classified according to its toxicity. Sandy bitumen is sold to the local asphalt plant for recycling, but soils containing PCBs and heavy metals are stockpiled at the western end of the site. Creosoted wooden sleepers are recovered and stockpiled as a future landscaping material. Sleepers left intact after the strip mining sorted according to their length and neatly bundled four wide by five high, then stacked five bundles high at the western edge of the site. Broken and rotten ties are mulched and protected from rainwater under a temporary structure. Scientists from the MCEBR take samples of the wood to assay a contaminant profile and determine suitable spores for mycoremediation.

Speculative Consequences:

Local asphalt suppliers, concrete recyclers and metal salvagers profit from waste generated in the dismantling of Turcot Yard. They're poised to reinvest locally, upgrading their equipment to expedite processing of the waste material. The city and the MTQ realize potential economic benefits to the local area and designate these industries as sole suppliers of building materials for the pending interchange reconstruction.

Phase Two (2013-2015):
Turcot Park is a construction site

Projected Operation:

As the mining operations crawl south, construction crews under contract to the MTQ and CN push clean fill to the northern edge of the site for road and rail grading. They only construct sections that do not interfere with existing traffic patterns. Meanwhile, the regrading Rue Notre-Dame at proposed by the MTQ shall sever road access to industrial lots between the canal at Rue Angrignon. The lots are too constricted to provide a temporary road access between the proposed berm and their frontages, but their adjacency to the Lachine Canal makes them candidates for expropriation.

Prescriptive Interventions:

To eliminate construction costs of underground stormwater sewers for the new highway, and to mitigate the potential to overburden the city's infrastructure during heavy rainfall, drainage swales are proposed alongside the shoulders of the highway. The swales allow water to infiltrate the earth and hydrate flood-tolerant plants such as *Typha latifolia* and *Salix discolor*. In turn, *Typha's* rhizomes and *Salix's* roots provide a natural matrix against erosion and a home for mutually symbiotic microbes that aid in the filtration of typical roadside contaminants, namely: copper, lead and zinc. As the swales are connected to the existing stormwater tailing pond, this biotic matrix in the swales greatly reduces the concentration of contaminants in the pond, which is still connected to the existing sewer system at the south end. As the wastewater tailing constructed in Phase One is still in use and connected to a natural gulley, the roadway and rail line must not interfere with the flow of stormwater. A bridge would have to be constructed. The city seizes this as an opportunity to construct a landmark gateway not only for travellers entering the city from the airport and points west, but also for local residents who wish to traverse the escarpment and access the Lachine Canal's recreational path system. A cable-stayed design is chosen and is the first permanent feature of Turcot Park.

Speculative Consequences:

The MTQ determines that it is more cost efficient to source recycled asphalt and concrete from local facilities, engaging in a mutually profitable exchange. Likewise, CN sources crushed rock reclaimed in Phase One as ballast for new trackage, and decides that precast concrete rail sleepers have less ecological impacts than conventional pressure-treated wooden sleepers. The local concrete plant fulfills this need profitably. With respect to the severed lots between the canal and Rue Notre-Dame, the MTQ seeks consultation from the landowners, along with representatives

fig.4.04: *Envisioning temporary concrete production at Turcot. Photomontage by author, 2008.*

from the city and Parks Canada. Since truck access is crucial to these businesses, a narrow service road would be inadequate for their needs. The city and federal government see the value in these lands for speculative residential development, as an annex to Turcot Park and as a connection to the Lachine Canal. All three levels of government split the costs of expropriation, and the demolition crews continue their crawl south of Rue Notre-Dame, salvaging materials from the expropriated properties. MCEBR scientists assay contaminated soil and provide a survey for remediation operations. Soil deemed tenable through phytoremediation or mycoremediation stockpiled with the remnants of Turcot Yard, the rest is brought to existing private-sector soil washing facilities on the Lachine Canal.

Phase Three (2015-2018):
Turcot Park is a demolition site

Projected Operation:
As work crews connect new ramps to existing roadways, the old structures are pulled down. The rubble is once again classified as concrete, asphalt, aggregate and reinforcing steel; then dispatched to local facilities for recycling. By the end of Phase Three, all the new roadways proposed by the MTQ are commissioned to public traffic.

Prescriptive Interventions:
Stormwater outflows from the drainage swales are periodically sampled and assayed to determine the effectiveness of roadside rhizofiltration. As the tailings pond will eventually be used to irrigate

the phytoremediation operations at Turcot Park, scientists from the MCBER must select plant species that can cope with the quantity of soil contamination and waterborne contaminants as proposed in the park's masterplan. A consultation process ensues to determine which species shall be seeded and/or grown in a nursery before they are planted.

Speculative Consequences:

The effectiveness of local asphalt and concrete recyclers incites the city to recognize potential waste exchanges that evolve stem from their proposed compost plant. The local industries can provide lime, fly ash, sand and paper in varying quantities that would allow the city to perfect their compost product and command higher prices. Although the city would prefer to stimulate mixed-use development along the banks of the Lachine Canal, and intends to redesignate zoning by-laws from industrial to mixed-use to that effect, the city drafts a grandfather clause for these industries. The city also secures their business with material sourcing contracts that will expedite production of compost. As part of the agreement, the industries shall receive compost to conduct landscape improvements along the edges of their properties in anticipation of new residential development on adjacent properties.

Phase Four (2019-2022):

Turcot Park is a landfill

Projected Operation:

The MTQ projects that it will remediate Turcot Yard for development. From an economic standpoint, parcelling and sale of the land would offset construction costs of the new autoroute and interchange. The thesis proposes that different forms of bioremediation is used to efficiently remediate contaminated soils *in situ*. However, the thesis speculates how this landscape participates in a much more lucrative waste exchange in the local area, with unexpected consequences.

Prescriptive Interventions:

Now that demolition is completed and rubble has been successfully dispatched for recycling, construction of the Municipal Compost facility is in full swing. Contaminated stockpiles are dismantled and tilled to a depth of 0.6 m on either side of the drainage basin in preparation for phytoremediation landfarming. After analyzing the biotic constituency and contaminant profile for each batch of soil are spatially organized based on the length of time required to bioremediate. The most volatile contaminants are the quickest remediating batches, and are centrally located near the irrigation pond, where the soil may be turned over quickly using conventional agricultural practices. Longer-term bioremedation zones are organized to along the edges of Turcot Park, where they will act as buffers between the Autoroute and the park. The landfarming sites entail 6.7 hectares of soil to be treated for polycyclic aromatic hydrocarbon, and 31.7 hectares of heavy metal contaminated soil. To ensure that the drainage basin is a reliable irrigation resource, it is expanded to the southwest and an inlet is constructed at the Lachine Canal. Since ongoing studies attest to the cleanliness of the canal water (provided its sediments remain undisturbed), the canal is a suitable source of water for irrigation. The inlet includes a weir to control the level of water in the basin at a nominal elevation of 21 m above sea level. Its banks are sloped and planted such that stormwater flooding shall create a high marsh condition along its banks. The high marsh has adequate capacity to contain a 100 year flood from the surface runoff of the escarpment gulley and the Autoroute. Riparian buffers are proposed as boundaries between the contaminated soil and high marsh. These riparian buffers shall be integrated into the recreational path system proposed for Turcot Park. By the end of the phase, the Compost Facility is commissioned and accepting waste from over a half million local residents.

fig.4.05: *Panoramic view of Constellation Hotel demolition operations. Photo by author, 2008.*

Speculative Consequences:

At first, organic household waste is being diverted from landfill at a rate of 60,000 tonnes per year, the city is saving $3 million annually in tipping fees.[71] As local landfills approach capacity, they increase their fees to match standard North American rates, $250 per tonne.[72] By then, the city is operating four compost plants across the island as per their masterplan, and diverting 240,000 tonnes per year from landfill, putting $60 million toward public coffers. Moreover, the city is selling surplus compost in bulk or bagged at an average rate of $50/m^3, generating an additional $15 million in revenue annually. As each plant costs $30 million to construct, their capital costs are recuperated in two years. Meanwhile, the local brewery and three local paper recyclers are modestly profiting from selling their waste to the compost facility. Other local industries pursue profitable waste exchanges. Manufacturers of building products, chiefly asphalt shingle roofing, acoustic ceiling tile and weather membranes begin purchasing deinking sludge from local paper recyclers as a cost-efficient component of their gypsum and bitumen products.

71. Curran, P. 2005. "Gorilla on top of the heap." Montréal Gazette.

72. ibid.

Phase Five (2023-2030):
Turcot Park is an experimental farm

Projected Operation:
The MTQ calls in experts from the MC-BER to apply various bioremediation techniques to the prepared soil.

Prescriptive Interventions:
Four to weeks after accepting its first batch of household organic waste, the plant produces finished compost at a weekly rate of 1,200 tonnes. The compost is spread over the contaminated soil at a depth of 0.1 m. After twenty-three weeks, all of the landfarming tracts have been fertilized by compost and prepared for seeding. Long-term bioremediation zones receive woodland saplings, such as Eastern White Pine *(Pinus strobus)* and Red Maple *(Acer rubrum)*. Both species are resilient and can grow in a wide range different soil

fig.4.06: *Envisioning landscape improvements conducted by local industries. Photomontage by author, 2009.*

types and moisture levels, but Red Maple has greater hydration requirements and is flood tolerant, and is therefore planted closer to the drainage swales. Eastern White Pine prefers well-drained soil and is grown near the peaks of berms. Together, the species' root systems will accumulate hydrocarbons, cesium and strontium; and act as riparian buffers to prevent soil erosion between the highway and land for future development. Volatile contaminants that biodegrade rapidly are the basis for centrally located grassland plantings. Conventional agricultural practices, aided by GPS, plant fields of Alfalfa *(Medicago sativa)* and Sunflower *(Helianthus annus)*; along with riparian buffers plantings of Tall Fescue *(Festuca arundinacea),* Pussy Willow *(Salix discolor)* and Hairy Goldenrod *(Solidago canadensis L)*. Meanwhile, reclaimed granular materials and recycled asphalt is sourced to construct a multi-use path along the edge of the marsh and underneath the cable-stayed bridges, connecting the Saint Jacques Escarpment to the Lachine Canal. Stockpiled creosoted railroad sleepers are deployed in the construction of elevated boardwalks along the marsh area. In the event of a downpour, potentially contaminated drips are contained in mulched sleepers below the boardwalk. The mulch is pretreated with Oyster Mushroom *(Pleurotus ostreatus)* spores that will biometabolize polycyclic aromatic hydrocarbons, including creosote.[73]

Speculative consequences:

The MCEBR calls assembles expertise from private partners in geotechnical engineering, hydrology, biochemistry, horticulture, microbiology and zoology, to monitor progress of bioremediation, identify interactions on local fauna, and to provide feedback to the adaptive site management plan. The assembly of these experts, along with the visceral bioremediation at Turcot Park, attracts speculative developers to the brownfields of the Lachine Canal district. The proponents are eager to have their properties assayed by the MCEBR. Depending on expert analyses, contaminated soil may be extracted and dispatched to Turcot Park and local soil washing facilities for *ex situ* decontamination, or compost will be transferred to remote sites to cap and stabilize contaminants *in situ*, or a combination thereof. Meanwhile, a diverse range of habitat is serendipitously taking shape, attracting insects, migratory birds, mammals, fish and reptiles that were previously undocumented on the site. Nature enthusiasts make regular trips to the park to partake in leisure activities and to sight species migration into the park.

73. Byss, Marius.

Phase Six (2030-2050):
Turcot Park catalyzes urbanization

Averted Operation:
Given the profitable waste exchanges that are taking place, and the environmental sensitivity that is developing at Turcot Park, the MTQ abandons its plans to develop the former rail yard. Residents applaud the decision and engage the city to commission the site as a park.

Perpetuating Interventions:
The MCEBR continue their stewardship of the phytoremediation tracts. Over the past twenty years, they have acquired sufficient practical research to accelerate bioremediation. The landfarming fields of alfalfa and sunflower, now remediated, are extracted to be sold as clean fill for local private construction projects. The harvested plants have bioaccumulated heavy metals, and are used to research phytoextraction techniques to recover valuable metals. Meanwhile, landfarming the fields are prepared to accept over 150,000 tonnes of contaminated soil, generating $37.5 million. The park commissioners wish use landfilling operations to gradually increase the elevation of the fields, thereby raising the top of bank of the irrigation pond, deepening the aquatic habitat. Their goal is to develop fish nurseries and aquaculture to test deployment of horticultural habitat throughout the Lachine Canal. Eventually, biological interventions shall strip toxins from the sediments of the Lachine Canal. will be stripped of their toxins. The commissioners begin planning and construction of a biotechnology campus on the western side of Rue Angrignon, opposite the Compost Facility. The building will provide rentable space for like minded private partners in geotechnical engineering, landscape design, biochemistry, and waste management technology.

Speculative consequences:
Given the strength of local expertise in brownfield remediation, waste diversion and material extraction, land speculation is made feasible atop decommissioned waste dumps. The city orchestrates mining operations at the abandoned landfills to the south of Turcot Park, extracting recyclable metals, paper, and organic waste for compost. Local industries fabricate specialize mining and material sorting equipment to perform the job expediently. By the end of the phase, an influx of new residents along the south bank of the canal provide the critical mass necessary to make Turcot Park a popular leisure landscape.

Phase Seven (2050-):
Turcot Park maturation

Perpetuating Interventions:
Decontamination of the Lachine Canal expands the aquatic activities permitted by Parks Canada. In the summer months, the canal features designated swimming lanes, wading beaches, fishing piers, and scuba diving zones. In winter, the 7.5 km section between Lachine Lock and St-Paul Lock is transformed into the world's second longest skating rink (after the Rideau Canal in Ottawa). Turcot Park becomes the nerve centre for the stewardship and administration of these recreational infrastructures. The irrigation pond lends itself as a developed aquatic habitat for both natural fish spawning and for aquaculture nurseries. Within the park's wetlands, local expertise experiment in creating improved habitat for waterfowl, amphibians and semi-aquatic mammals. Extending from the Saint Jacques Escarpment, the park's woodlands become popular stopovers for migratory birds and nesting habitat for birds of prey. The mature trees flanking the freeway, and the pylons of the cable stayed bridge, assist in the separation of traffic from avian flight, and also provide overlooks for predatory birds to stalk their next meal in the grassland habitat.

Speculative Consequences:
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fig.4.07: *Envisioning Turcot Park's managed ecosystems and infrastructure at the irrigation pond. Photomontage by author, 2010.*

conclusion

"Flying into Montreal nineteen years later, in the summer of 1967, our very golden Expo summer, coming from dowdy London, via decaying New York, I was instantly struck by the city's affluence... I rode into the city on multi-decked highways, which swooped here, soared there, unwinding into a pot of prosperity, a downtown of high rise apartments and hotels, the latter seemingly so new they could have been uncrated the night before. Place Ville Marie. The metro. Expo. Ile Notre Dame. Habitat. Place des Arts. This cornucopia certainly wasn't the city I had grown up in and quit."

—Richler, Mordecai. *The Street*: p.5

fig.5.01: *Deteriorating infrastructure at Turcot Interchange. Photo by Author, 2007.*

Conclusion

History has shown that landfilling is a byproduct of urban renewal, but the relationship is reciprocal. Worldwide, many cases exist where landfilling was deliberately orchestrated to reclaim land from bogs and bodies of water. As a result, many of today's great cities are built on their own trash, and the practice continues. Since industrialization, deployment of sanitary disposal infrastructure has fostered a *throw away society*, where trash is evidently collected at the curb and never to be seen from again. Incineration notwithstanding, typical sanitation infrastructure relies upon designated landfills remotely situated from the city. Yet in a strange twist of fate, cities are now sprawling towards their own active and decommissioned landfills, bringing into question how these derelict sites may be repatriated into the city. Proactive waste management practices now entail long-term planning for land use after a disposal site is decommissioned. Fresh Kills demonstrates how landscape design is well suited for the reclamation of these potentially hazardous sites. By contrast, the Leslie Street Spit's unforeseen and serendipitous ecological transformation into a lakeshore oasis informed an adaptive use of the landscape, where leisure activities and wildlife stewardship coincide with the tipping and grading of rubble. In both cases, local citizens have embraced the cultural significance of these landscapes, where human abuse has been recompensed by the emergence of diverse biological habitat. They are valued for their juxtaposition against the hustle and bustle of urban life.

As cities confront growing demand for brownfield remediation services, it is foreseeable that specialized landfills will be deployed to accept contaminated soil, but the material itself may be rehabilitated for commodification, or situated to provide the matrix for a rehabilitated landscape. In the later case, design professionals stand to benefit in this emerging economy, where waste correlates with urban renewal. Strict environmental policies have spun-off a plethora biological discoveries pertaining to the clean-up of toxic sites, requiring specialized expertise to evaluate soil remediation progress, mitigate plant and animal species that may impede progress, and to identify ecosystems that are particularly sensitive to exposure to toxins versus tolerant and resistant species. The information gained from this stewardship—whether by trial and error, or learned from the natural self-organization of the site—will prove to be invaluable to the remediation of other toxic sites with similar climate characteristics. In so doing, the orchestration of landfills as hybridized recreational landscapes form the basis for a growing interdisciplinary territory.

Turcot Yard presents an unparalleled opportunity to orchestrate landscape urbanist principles through interdisciplinary infrastructural interventions. By implementing infrastructure for cost-efficient rehabilitation of post-industrial sites, and recruiting necessary expertise to carry out soil remediation, the infrastructural interventions engage local industries in profitable waste exchanges. To initiate these waste ecologies, the masterplan illustrates how local industries shall play an economically efficient and ecologically responsive role in the MTQ's planned

highway rehabilitation. The masterplan also recognizes the valuable infrastructural role played by existing waste diversion industries in the area, and proposes organic waste management operations and protectionist policies to advance their continued presence along the Lachine Canal. These policies, such as grandfathered zoning designations and favourable taxation rates, shall be applied in exchange for landscape improvements with the aim to harmonize continued waste diversion operations alongside future speculative residential and commercial developments. Speculative post-industrial developments will inevitably occur due to the Lachine Canal's favourable public perception of and its proximity to Montreal's core, but the thesis recognizes the human health hazard posed by the situation of dwellings and workplaces adjacent to freeways, and designates Turcot Yard as a park for hybridized infrastructural and recreational use. The reciprocal economic benefits of Turcot Park's dedicated soil remediation operations shall become apparent as land speculators shall have an expedient and cost-efficient means to rid their sites of toxic materials, whereas the city shall profit from the biotreatment of contaminated soil and the biodiverse ecosystems that emerge in the process.

Herein lies the cultural benefits of the infrastructural interventions proposed by the thesis, which permit nature's dividends to emerge through the medium of landscape. The masterplan outlines how a designer's prerogative may interpret this relationship and incorporate them into culturally valuable public spaces. The thesis illustrates that the connection of Turcot Park to Angrignon Park, the Lachine Canal and the Saint Jacques Escarpment will expand recreational activities to include those which are currently scarce within the district, such as off-road cycling, skateboarding, Nordic skiing and off-leash dog areas. Moreover, the thesis speculates that the bioremediation expertise developed for Turcot Park will lend itself to a more through decontamination of sediments at the base of Lachine Canal, enhancing aquatic habitat to the point where fish may be suitable for human consumption, whilst permitting the inauguration of new recreational activities such as long-distance swimming, scuba diving and ice skating. The expanded recreational program stands to improve quality of life for local residents, and also engage local natural enthusiasts through interpretative visits and stewardship of the park.

All waste disposal sites explicate the potent relationship between civilization and the universality of wasting, or the crisis generated by human consumption vis-a-vis the finiteness of natural resources; but reclaimed and well-managed waste disposal sites demonstrate a participatory and productive waste exchange between human society and natural processes. Turcot Park shall provide a potent legacy for the future influx of residents upon the Canal's remediated brownfields, not only as a infrastructural component to the city's waste disposal strategy, or as a didactic that responds to the industrial abuses of the canal's past, but as a participatory landscape made possible by continued waste diversion operations and ongoing recreational use that expands as the land and waters are rehabilitated.

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