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Retrofitting Obsolete Railroad Infrastructure

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RETROFITTING OBSOLETE RAILROAD INFRASTRUCTURE

by

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Bachelor of Architecture,

Ryerson University,

Toronto, Ontario, Canada, 2010

A design thesis|project

presented to Ryerson University

in partial fulfillment of the

requirements for the degree of

Master of Architecture

Toronto, Ontario, Canada, 2012

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Abstract

Thesis Statement

This thesis will explore the development and design opportunities related to the retrofitting of abandoned railroad corridors in post industrial cities. These lines of infrastructure will be viewed as the lifelines of the city whereby, the ramifications of main transportation arteries will impact the urban network through connectivity and the creation of public open space.

Abstract

This thesis will look at obsolete public railroad infrastructure, as an important fragment of the collective memory of a post-industrial city that can be reactivated to connect back into the transportation urban network. These structures will be identified as landmarks that must be preserved and incorporated into public space and amenity. The reestablishment of the railroad in this context will result in the connection of the contemporary to its past, creating more meaningful and resonant spaces.

These transportation corridors will be addressed as part of expanding ecological and man-made systems, thus becoming lifelines of the city, expanding their arteries to feed life into the urban fabric. The natural areas affected by these railroads will be treated as the lungs of the city and made more accessible to the public in order to raise ecological awareness. The railroad thus creates permeability, linking urban and natural areas and reviving its former function of connectivity by re-stitching the urban fabric.

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1. Introduction

The rapid development of urban centers is owed to industrialization and extended transportation systems, such as railroads. This type of infrastructure has allowed for large numbers of passengers or goods to be transported across vast territories in a safe and swift manner. Therefore, trains have contributed to the social and economic growth of cities. Rail transport is also one of the safest forms of land travel. Although trains travel at high speeds, their weight does not allow them to deviate from the tracks. As such, they require a great distance to stop. Also, as opposed to highways, which have also changed the nature of urban centers towards rapid intensification, railroads are more sustainable and revalue city spaces. Highways have been the incentive for the creation of suburbs at the periphery of cities, whereas railroads have encouraged development along their corridors, promoting increased housing values and mixed use development.

1.1 Problem Statement

Throughout large urban centers there are numerous remnants of past railroads that have helped develop the city and that are now forgotten and left to rust. Since railroads have been so instrumental to urban growth, why then have these corridors been abandoned? Instead of spending revenue on the destruction of greenfield lands to build new infrastructural systems, these corridors can be reactivated and given a new life, thus reusing the existing infrastructure. Besides the functional benefits of retrofitting, these obsolete railroads also create a connection between the city's past and its present. Consequently, they become landmarks and testaments to the heritage and rich history of the city they belong to. These railroad corridors must be embraced, revitalized and reconnected into existing infrastructural networks. This fact will create self-sustaining communities and it will also re-stitch the urban fabric that has been divided due to these corridors currently existing as physical separators. For these reasons, the reactivation of abandoned railroads will have great benefits in reconnecting them to the city's infrastructural network for better connectivity by becoming a catalyst for new urban development and creating public open spaces that will improve the quality of life for adjacent communities.

1.1.1 The Scar Project

Abandoned railroads should be acknowledged as urban landmarks; memories of an industrial past, in a post-industrial environment. Destroying or ignoring these lines of infrastructure will either become a waste of revenue or a missed potential for new development benefitting the growth of the city. These corridors should be proudly displayed and reinstated within the urban network, instead of being covered up or left hidden beneath wild natural landscapes.

This perspective on honoring the past and accepting these existing infrastructural lines as part of the city's story is a concept adopted by the Scar Project. The Project is characterized by a series of large scale portraits of young breast cancer survivors shot by photographer David Jay. Its purpose is to primarily raise breast cancer awareness, by putting a raw and unflinching face on this illness and paying a tribute to the courage and spirit of so many brave young women.¹ What is most amazing about this series of photographs is that each one paints a different facet of the physical and emotional impact of this illness on each woman. Scars and treatment interventions manifest in various ways, making each body unique to its long and tragic journey. Within this context, the scar is the perfect analogy for these obsolete railroads that endured time, as reminders of a turbulent past suffused with industrialization and expanding urban networks.



Figure 1.1 The Scar Project. Image courtesy of David Jay Photography for The Scar Project.

In its essence, the scar is the memory of a dramatic event whose impact has left a mark that will forever be remembered due to its presence. By the same token, abandoned railroads that were once the life lines of urban centers and the catalysts for growth, are now but nostalgic memories of the impact of infrastructure on the development of cities. Static and imposing, they stand alone; separated from the ever changing landscape of the cities they helped shape.

¹David Jay Photography. *The Scar Project 2011*. November 11 2011. <http://www.thescarproject.org/>

Scars however, can be dealt with in various ways, depending on whether their host is accepting, embarrassed or terrified of them. Scars can be camouflaged, covered up or displayed as a sign of hope and approval by self and others. Each decision on how to cope with this reminder of the past is a reflection of one's ability to once more gain confidence and further grow. Similarly, abandoned railway corridors that physically divide the urban fabric are also reminiscent of scars that must be addressed in order for the surrounding city to continue to develop symbiotic to its past. The abandoned railroad is an urban fabric scar, as "it marks a new reference plane, a dent in the landscape where something has happened"². Thereby, it must be embraced and reintegrated within the larger transportation network of the city.

This thesis project will address these obsolete railroads as landmarks, as proud displays of a city's historical past, emphasizing them as origins of an industrial era. This approach will replace the act of demolishing these infrastructural lines or of pretending they do not exist. Instead, these corridors should be retrofitted, re-establishing their large scale connecting potential as catalysts of urban development. True to their function throughout history, such structures allow for the creation of new open public spaces and amenities in relation to them.

Accordingly, this thesis will also be a critique of "landscape's complicit role in covering over and hiding abused landscapes, such as formerly industrial sites."³ This thesis will adopt the approach of the scar project with regards to the concept of displaying cancer scars as proud reminders of the past whilst looking towards a new future. The retrofitting potential and relevance of these abandoned railroad corridors as part of the urban fabric of the contemporary city will be explored. These railroads will be considered a vital part of the heritage of a city, containing place memory potential. This fact will be reflected in the design interventions that will be part of the process of reactivation and introduction of new program.

1.1.2 Network Approach

"City centers are served by overlapping networks of transportation, electronic communication, production and consumption. Operationally, if not experientially, the infrastructures and flows of material have become more significant than static political and spatial boundaries. The influx of people, vehicles, goods and information constitute the 'daily urban system', painting a picture of urbanism that is dynamic and temporal.

²Peter Reed, *Groundswell: constructing the contemporary landscape* (New York: MOMA, 2008), p.21.

³Ibid, p.22

The emphasis shifts here from forms of urban space to processes of urbanization, processes that network across vast regional surfaces”⁴.

The reactivation of obsolete railroads will benefit the larger transportation infrastructural system, through increased connectivity within the city. The railroad will become the spine from which numerous layers of the urban infrastructural network can expand. This thesis project will learn from the way transportation networks are layered and from their way of interacting with each other and the surrounding communities. Understanding the connecting potential of these railroads within the larger network will inform development opportunities along single corridors as well. Therefore, any proposal along the railway will be explored through linear dynamics. The focus will not be a single object, but a field of elements that have the common goal of increasing connectivity, efficiency and improving quality of life. This approach will lead to a blurring of the division between landscape, infrastructure and architecture, while animating the ground plane.

These railroad corridors traverse a variety of landscapes, whether natural, man-made or cultural, requiring any interventions along its span to adapt to change. The interventions are site specific, catering to the surrounding character of the urban fabric. By respecting the varying environments it crosses, the railroad can be seamlessly restored and reintegrated in the existing infrastructural networks.

Consequently, the railroad must be viewed as a lifeline with ramifications expanding throughout the entire city. The layering aspect of the transportation network on a larger scale and the symbiotic relationship between these layers will be used as a concept for the design opportunities in this thesis project. The network approach and the layering technique will be utilized at different scales when addressing site specific conditions.

1.2 Background Information

This thesis will employ concepts from the context of landscape urbanism, exploring the relationship between the landscape, built forms and the potential for the creation of new typologies. It will also look at how retrofitting obsolete infrastructure can benefit cities and their future developments. Obsolete railroad corridors will be acknowledged as heritage that must be conserved and reintegrated into the city fabric.

⁴Wall, Alex. “Programming the Urban Surface” in Corner, James (ed). *Recovering landscape*. New York : Princetown Architectural Press, 1999, p.234

Looking at abandoned railroad corridors for redevelopment implies the involvement of various urban, infrastructural, ecological and landscape architectural factors. Theories such as field systems and infrastructure landscape will be critically examined and diverse approaches will be tested through a selection of case studies of relevant projects in relation to the topics mentioned above. This framework also includes the implication of heritage conservation, diving into the industrial past of railroads and reestablishing a relevance to their contemporary post-industrial environment.

1.2.1 Public Space

This thesis will also address the maximization and quality of public open space that will be created along the railroad corridor as part of new development opportunities. Due to its linearity, the railway will serve as a connector, as well as increase the factor of accessibility by creating destination points along its corridor. These moments along the transportation line will become catalysts for generating public space, with respect to existing social, economic and physical conditions.

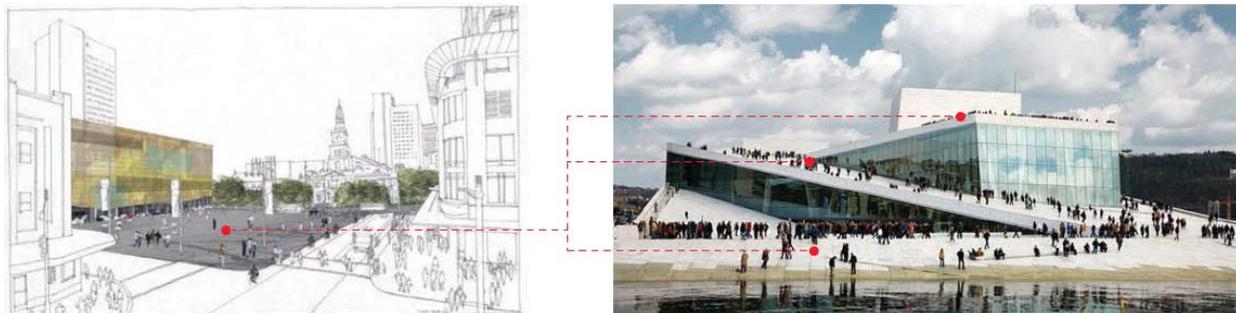


Figure 1.2 Public square vs. Oslo Opera House: Snohetta. Perception of public space has changed through time, surpassing the public square and taking new forms, perspectives and scales. Image courtesy of Art Line.

Public spaces will not be seen as singular objects within their context (such as traditional public squares), but as the active participants of a network. An integrated approach is vital in the creation of public space, pushing boundaries on how people could interact with infrastructure, architecture and the landscape. Public space will be developed at a human scale, stepping down from the large network perspective of the railroad. Public space enhances the interaction between users, improves quality of life and allows people to experience the site as an element within a bigger system.

"sense of place is a concept rapidly disappearing in a world defined by access that defines all constraints of time and geography. However, the human need to belong, to be defined by larger rhythms, and to feel a sense of fabric or continuity remains features of our biology".⁵

Public open space is characterized through phenomenology that allows the user to be completely immersed within a place, stepping away from abstractions of conventional architecture and neutral objectivity. Being able to embrace a subjective methodology allows the conversation between user and place to become relevant and not about the object itself.



Figure 1.3 Snow City. Geography transforming due to user interaction and time as a factor. Image courtesy of 4of7 Architecture.

The railroad as a landmark can also be emphasized, as it stands out within a public open space as a historical monument.

However, public space is not restricted to the ground plane. Railroad corridors have varying topographies, reaching flat surfaces, high and low lands. Due to this fact, perspective plays an important role in experiencing the site, as the landscape changes along the span of the railroad. Public space therefore becomes abstracted, allowing for an understanding of the landscape at various levels. The change in scale between these different levels affords a wide range of experiences for the user.

As stated by architect Inaki Abalos, "we can only imagine the landscape subject as the more complex learning process, calling for an initiatory crossing towards understanding the real monument to be built: contemporary public space"⁶.

1.2.2 Symbiotic Systems

"The built environment must expand within a limited domain that does not threaten the life of its natural host. In other words a mutually beneficial, or symbiotic, relationship must be established or it will be imposed by the natural domain."⁷

⁵Jessica Thayer, "Architecture of meaning", *Sense of Place*, 5 <Dec. 2011
<https://architectureofmeaning.com/category/sense-of-place/>

⁶Peter Reed, *Before and After: designing the contemporary landscape* (New York: MOMA, 2008), p.31.

Symbiosis

n. pl. sym·bi·o·ses

- 1. *biology a close, prolonged association between two or more different organisms of different species that may, but does not necessarily, benefit each member.*
- 2. *a relationship of mutual benefit or dependence.*⁸

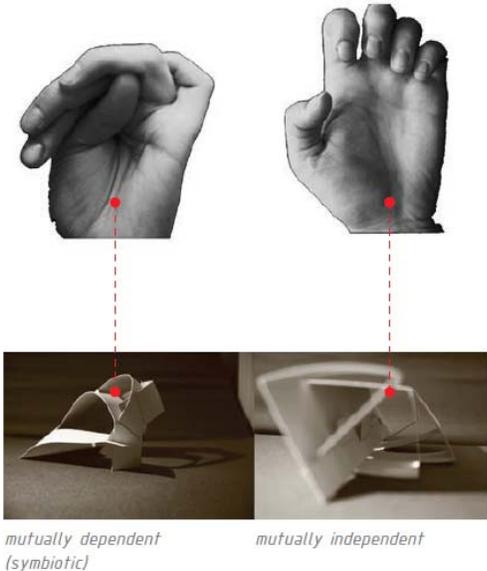


Figure 1.4 Symbiosis (mutually dependent) vs Mutually independent.
Image courtesy of The Built Domain.

Through the reactivation of the obsolete railroad, new development opportunities will arise along its corridor. The new built and open spaces that will be created will be the result of the railroad as a catalyst for urban development. These new interventions and the existing industrial infrastructure will create a new language, through which both systems can be addressed. This approach will generate a symbiotic relationship between old and new formal expressions.

The natural landscape is another element that will enter this symbiotic relationship as part of the various topographical features along the railroad corridor. Ecological factors and the natural

topography will influence any new formal explorations. This fact will result in environmentally aware proposals that will maximize the preservation of the natural landscape, materializing through new formal typologies.

The final relationship dynamic will take place between transient and static systems. On one hand, through retrofitting, the railway will once again be integrated in the greater rapid flow transportation system of the city on a large scale. On the other hand, site specific formal interventions on a human scale will be proposed, relating to the surrounding natural and social landscapes. These seemingly contrasting systems shall be interrelated, combining the connecting potential of the elevated infrastructure with the destination capacity of the site through ease of access. Therefore, the project will rely on cooperative and mutually dependent relationships between a variety of elements and scales. This will create a network responsive to

⁷Walter M. Hosack, "Cities and Design", *Symbiotic Architecture*, 28 Nov 2011
<<http://wmhosack.blogspot.com/2011/08/symbiotic-architecture.html>>
⁸*Oxford dictionary* (7th ed.). (2000). Hinsdale, IL: Penguin Press.

the potential of the chosen site, as a prototype for future developments along abandoned railroad corridors.

1.2.3 Landscape Urbanism

Landscape urbanism is an emergent practice that explores the relationship between ecology and infrastructure, as an integral approach to architectural design. Initially, landscape urbanism emerged as a reaction to landscape architecture's insignificance throughout the twentieth century. It is also a result of architecture and urban design's post-modernist theories of the network city that does not concentrate on a single subject. However, landscape urbanism touches upon various disciplines and mediums, blurring its defining boundaries. Landscape urbanism is a strategic approach to the formulation of an urban scheme by transforming processes related to landscape. This definition will be utilized throughout this thesis.

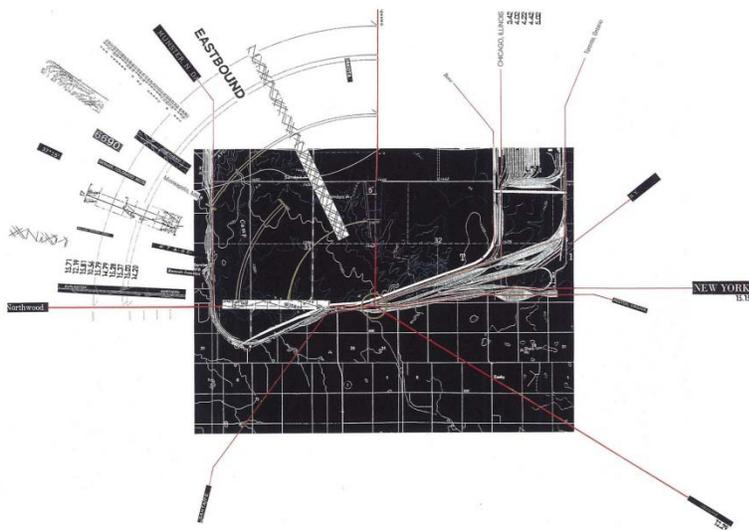


Figure 1.5 Rail Networks. Image courtesy of James Corner.

Landscape architect James Corner states that "landscape comprises a deep and intimate mode of relationship not only among buildings and fields but also among patterns of occupation, activity and space."⁹

This practice looks at landscapes as adaptable systems that are decentralized, creating a better way of organizing physical improvements in a city through flexibility, adaptability over time

and consideration of ecological factors. Numerous landscape urbanism projects designed in recent years occupy sites that have been revitalized and reclaimed from degradation, as cities in the post-industrial era remake and redefine their urban spaces. This has been achieved by combining aesthetic and theoretical ideas about landscape, which is "an art of horizontal

⁹Corner, James. "Eidetic Operations and New Landscapes" in Corner, James (ed). *Recovering landscape: essays in contemporary landscape architecture*. New York: Princeton Architectural Press, 1999, p.154.

surfaces and systems, impermanence and change"¹⁰. The resulting constructed landscapes are site specific, catering to their environment, trying to integrate themselves seamlessly within the urban fabric.

The sites investigated in this thesis project through the case studies, are defined by their physical properties, history and program of newly created landscapes. These artificially constructed surfaces present opportunities for new public spaces by establishing a relationship between built form and nature through new typologies. The reshaping of these sites takes into consideration their functional, natural, cultural or social characteristics that define the spirit of the place.

The goal is not to simply return the landscape to an undulating natural state infused by a new program, but to also consider changes that will occur over time. Time is the most important factor that asks for new interventions to be adaptable and resilient to unpredictable demands, as the surrounding urban fabric continues to change over time. This is also evident within natural landscapes, where the different seasons create physical and phenomenological changes that characterize a place in time and space. The same flexibility and ability for change must be adopted in new developments along the railroad corridors when looking at implementing architectural ideas throughout natural and heritage rich sites.

This thesis will use the concept of landscape as the shaping element for new design, connecting the past and present through an expanded field of activities outlined through heritage, emergent typologies and socio-economic sensibilities. Landscapes can thus be conceived as a complex medium capable of articulating relations among urban infrastructure and open public space in a post-industrial city.

1.2.4 Conservation strategy: Retrofit

"Architectural conservation describes the process through which the material, historical, and design integrity of mankind's built heritage are prolonged through carefully planned interventions. Decisions of when and how to engage in an intervention are critical to the ultimate conservation of the immovable object. Ultimately, the decision is value based: a combination of artistic, contextual, and informational values

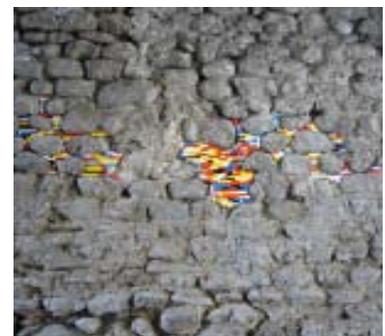


Figure 1.6 Project "20 Eventi".
Image courtesy of
Dispatchwork.

¹⁰Peter Reed, *Groundswell: constructing the contemporary landscape* (New York: MOMA, 2008), p.15.

is normally considered. In some cases, a decision to not intervene may be the most appropriate choice." ¹¹

The premise of this thesis project is to explore the potential of obsolete railroad corridors and their impact on the urban fabric and existing infrastructural networks. In order to achieve this, the railroad must be retrofitted and made able to sustain program. Retrofitting refers to the addition of new features to old systems, yet maintaining their original function. By retrofitting the railroad's potential of becoming a catalyst for urban development can be maximized and explored. Public open spaces and new typologies infused with a variety of programmes will be created. However, in order for all this to take place, the existing abandoned railroad must be conserved and its heritage value recognized as a part of the city's industrial and collective past.

*"There is a certain irony to be found in a site that once existed solely to function with the efficiency of industry now being turned over to the unpredictability of natural processes and unforeseen human activities"*¹².

The railroad will be conserved through preservation that places high regard on the retention of the historic fabric through maintenance and repair. The structure's continuum over time as a transportation line will be emphasized, allowing only for sensitive changes. Its industrial character will be embraced, revealing its rich heritage. Any new design opportunities will also be respectful of the preservation of the railroad, proposing the use of appropriate forms and materials reminiscent of its industrial past and current context.

Therefore, a positive new perception of the industrial landscape will be adopted throughout this project that will emphasize the compatibility between leisure, cultural activities, urban growth and conservation of both natural and man-made heritage.

2. Literature Review

The obsolete railroad infrastructure explored through this thesis project is part of a greater urban network, where it expands into other lines of infrastructure in order to establish better connectivity throughout the urban center. Landscape architects and theorists, James

¹¹Wikipedia: The free encyclopedia. *Architectural Conservation*, Retrieved 22 November 2011, http://en.wikipedia.org/wiki/Architectural_conservation

¹²Peter Reed, *Groundswell: constructing the contemporary landscape* (New York: MOMA, 2008),p.26.

Corner and Stan Allen, look into this concept of network as a collection of elements within a field. They discuss the concept of object versus field, placing emphasis on the relationship and space between these objects. The role of infrastructure as a design element will also be explored. Principles based on infrastructural physical and phenomenological properties will be discussed in terms of form finding that could be applied to potential design proposals when dealing with the reactivation of obsolete railroads. These theories will be applied throughout the design interventions along the reactivated railroad corridor.

2.1 From Object to Field | James Corner

The aim of James Corner's Field Operations theory is to allow design to support dynamic programmes, instead of constructing fixed buildings in which program is predetermined and rigid. The integration of existing ecological landscapes and infrastructural systems is vital in creating a highly responsive surface that would be able to support new design. Therefore, field operations relates directly to urban infrastructure, selecting the 'field' over the 'surface' in order to promote "the preparation of networks or surfaces or fields, resetting them as true urban infrastructures for the flexible support of the indeterminate ends"¹³.

Designing with fields involves a wide range of systems, scales and actors engaging the design. This allows for a complex response to the site infused with program that remains to be experienced from various changing perspectives that allows for a subjective understanding of the design.

However, in order to create these multifaceted responses to a particular site, James Corner promotes various methods of form generating. He uses a new technique of mapping that

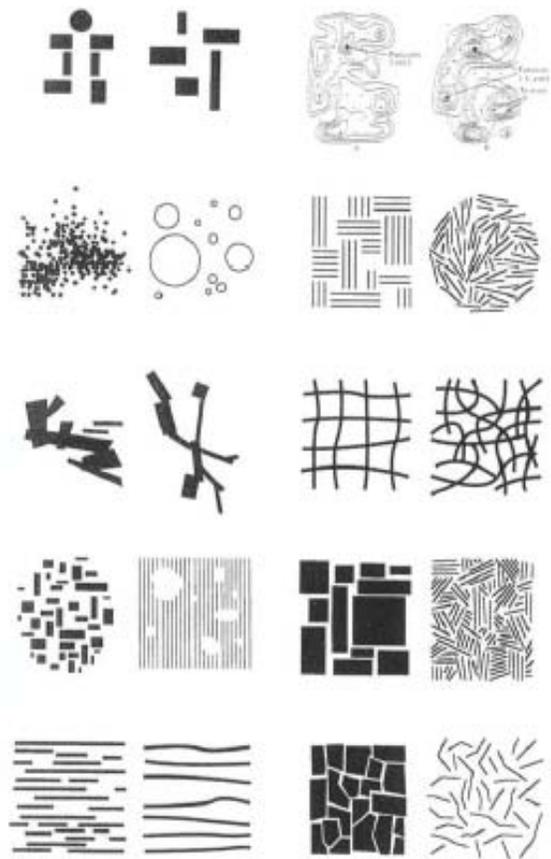


Figure 2.1 Field diagrams: James Corner. Multiplying elements of varying scales composing a range of fields. Image courtesy of James Corner Field Operations.

¹³Corner, James. "Terra Fluxus" in Waldheim, Charles (ed). *The Landscape Urbanism Reader*. New York: Princeton Architectural Press, June 2006, p. 30

overlays layers of multidisciplinary information and data through which design can be informed, changing conventional processes of design. Thus mapping does not solely refer to geographical imagining, but also works with the context through gathering and synthesizing data.

Design critics and senior lecturers, Janet Abrams and Peter Hall expand on the concept of mapping as a design process, stepping away from traditional practices. They write in their book 'Else/Where: Mapping' that "there are three types of space that can be conceivably mapped, from information space (finding patterns in large quantities of data), to physical space (orienting the body to the physical environment), to social space (representing relationships between people)". Therefore, instead of relying on semiotics, human behavior and interaction are at the core of such data investigation. These techniques will be used throughout this thesis exploration of site and fields of information between infrastructure, social landscapes, ecology and heritage.

The concept of field operations also focuses on ecological systems and the processes that occur within them, as well as biodiversity as design instruments for a self-sustaining landscape. A layered system is therefore created, with no single authority.

According to James Corner, "such a dynamic, open-ended matrix can never be operated upon with any certainty as to outcome and effect. It escapes design, and even more so, planning". (Corner, J. 2003).

Mapping and working with ecological systems employ present data and allow for flexibility towards future changes. Time is always a factor that James Corner is very aware of in his exploration of the field. This thesis will use these concepts in order to address any design opportunities along the corridor, where landscape, culture and infrastructure begin to form a layered field.

2.2 Field Conditions | Stan Allen

"A successful urban surface predicts and anticipates future needs: as such the urban surface is dynamic and responsive; like a catalytic emulsion, the surface literally unfolds events in time."¹⁴

¹⁴Wall, Alex. "Programming the Urban Surface" in Corner, James (ed). *Recovering landscape: essays in contemporary landscape architecture*. New York: Princeton Architectural Press, 1999, p. 233

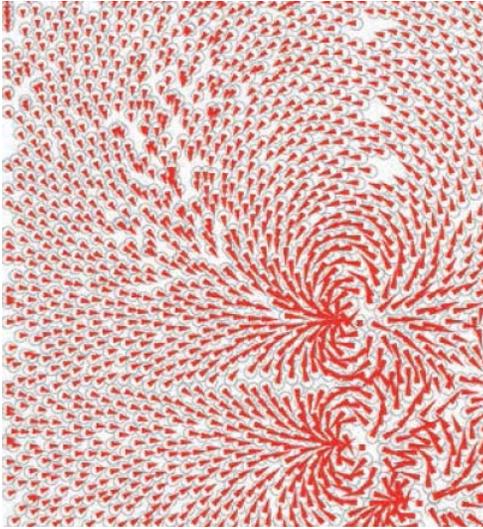


Figure 2.2 Field Conditions: Stan Allen. Nodes are created in a field where higher concentration of elements takes place, similar to infrastructural systems. Image courtesy of Stan Allen Architect

Architect Stan Allen also looks at the concept of field. Similar to Corner, he focuses on a series of layers rather than a single object, and how these fields could be programmed. Allen argues that the landscape needs to be considered as a field within an active stage, moving away from cliché 'green and organic' designs and heading towards an interplay of flexible surfaces activated by program. He enforces the shift from a single built form to an integrated network approach that is highly characteristic of landscape architecture. In his essay entitled 'Field Conditions', he also mentions the importance of infrastructural elements of the modern city and how architects could learn from their open ended networks, such as railroad corridors in this case.

Architect Alex Wall supports Stan Allen's theories of designing a field rather than an object by emphasizing the importance of the urban surface as the origin of new designs. Wall outlines the urban surface as a connective tissue that activates program through a variety of activities, without solely concentrating on designing in the space between buildings. By reactivating abandoned railroads in urban centers, new program can be infused within their corridors that will animate the urban surface currently underused in such spaces. The linearity and connectivity on a city wide scale allows for this to occur at numerous points along the corridor, creating new typologies in a series of nodes.

Alex Wall takes this notion further, arguing in his essay 'Programming the Urban Surface' that contemporary urbanization places too much emphasis on forms rather than processes. Here, a question of specific techniques is eliminated and the process in itself is the guiding design element.

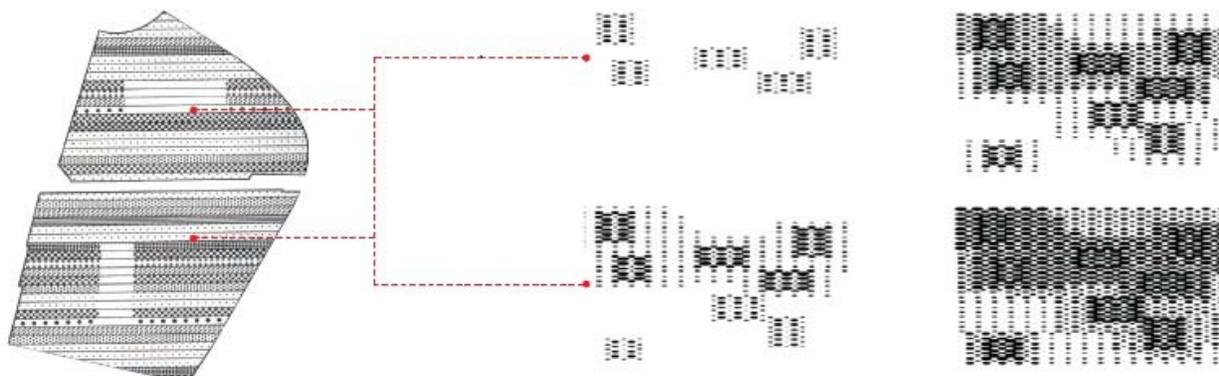


Figure 2.3 Downsvievw park proposal: Tschumi Architects. “Surfacing” takes a critical look at the role of notation on a surface and its relationship to the surface’s ability to hold program. Image courtesy of Tschumi Architects

Therefore, he calls on “a fundamental paradigm shift from viewing cities in formal terms to looking at them in dynamic ways. Hence, familiar urban typologies of square, park, district, and so on are of less use of significance than are the infrastructure, network flows, ambiguous spaces, and other polymorphous conditions that constitute the contemporary metropolis” (Alex wall, 1999).

2.3 Infrastructure Landscape | SWA

“By repositioning infrastructure as a viable medium for addressing issues of ecology, transit and habitat, infrastructure and landscape become two systems integrated within the same field, incorporating program seamlessly through form”¹⁵

Landscape infrastructure.

(land-skāp' infra-struk'cher) n.

A methodology that expands the performance parameters of a designed landscape to a multi-functional, high performance system, including those systems originally ascribed to traditional infrastructure.¹⁶

¹⁵SWA Group, *Landscape Infrastructure: A tool for making our cities better*, 2 Dec. 2011 http://swacdn.s3.amazonaws.com/1/d281f914_swadesignbriefing-landscapeinfrastructure.pdf

¹⁶SWA Group, *Landscape Infrastructure: A tool for making our cities better*, 2 Dec. 2011 http://swacdn.s3.amazonaws.com/1/d281f914_swadesignbriefing-landscapeinfrastructure.pdf

This thesis focuses on the reactivation of abandoned railroad corridors that are missed opportunities in fortifying the infrastructural network of a city. Infrastructure is the backbone of a city, especially transportation infrastructure that makes fast connections across vast surfaces. This has made possible the rapid growth of urban centers and cannot be left ignored by allowing parts of it to become obsolete.

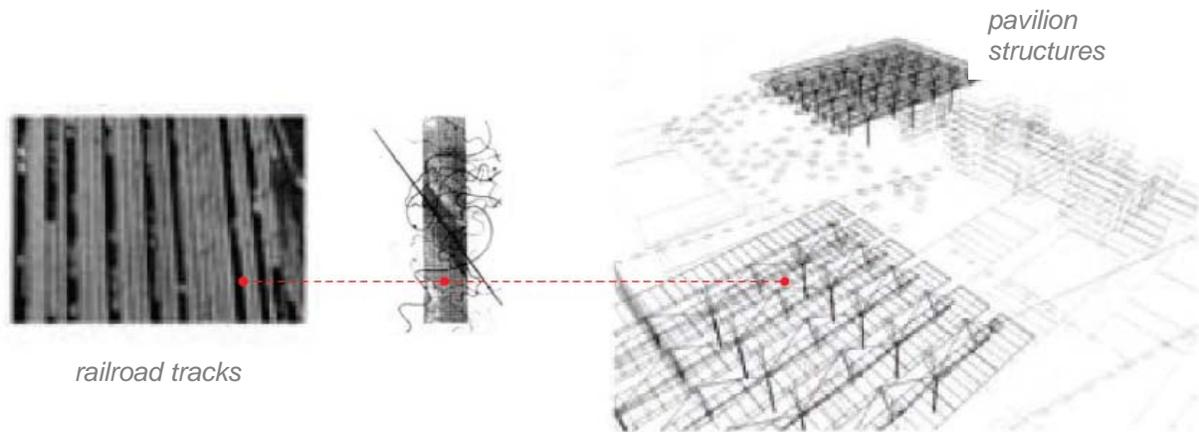


Figure 2.4 Barcelona Manual: Stan Allen. Learning from an obsolete railroad in terms of ordering principles, unplanned actions for the future, allowing local conditions to influence design over rigid regularity and acknowledging the importance of the historic site.
Image courtesy of Stan Allen Architect

Architecture firm SWA makes a case for infrastructure as a design element, emphasizing its role in city development. They combine landscape and architecture through a theory of integral approach. This theory proposes the conservation of space and showcasing of various programmes by layering and combining natural and man-made systems into one successful form. These designs aim at maximizing public space by freeing surfaces from any obstacles that would take away from the natural features of the newly created landscape.

Such strategies will be employed in the design of this thesis project at the ground level, where built form and the ecological field will mould together to create a dynamic and highly flexible public domain. These interventions will interact with the railroad as the origin of their design principles.

3. Precedent Review

The following precedents look at the role of conserving and retrofitting existing infrastructure and at the creation and maximization of public open space. These case studies also begin to analyze the reintegration of abandoned infrastructural lines within the transportation network of the city and the development potential resulting from such interventions. The behavior of the city fabric as a reaction to these changes will be addressed and the growth opportunities due to the infrastructure lines as catalysts for new development will also be investigated within each example.

3.1 Heritage Conservation + Retrofitting impact on Public Space

3.1.1 New York High Line: James Corner + Diller, Scofidio & Renfro



Figure 3.1 High Line: James Corner.
Image courtesy of ArchDaily.

The High Line is a 1.5 mile long park designed on top of an abandoned railway. The railroad track has been revitalized and made to service the city once more, but as a leisure destination, while maintaining its connecting potential. The design has been chosen based on the results of the 2004 proposal competition for the redevelopment of this abandoned elevated freight railway that crosses west Manhattan, passing through 22 blocks of city fabric.

Landscape architect James Corner was inspired by "the melancholic, found beauty of the High Line, where nature has reclaimed a once vital piece of urban infrastructure, refitting this industrial conveyance into a post-industrial instrument of leisure"¹⁷.

The new design explores the relationship between plant life and pedestrians, coining the term 'agri-tecture', by combining the organic elements and building materials at different scales, accommodating the wild, the cultivated, the intimate, and the hyper-social¹⁸.

¹⁷DeZeen. *The High Line by James Corner Field Operations and Diller, Scofidio + Renfro*, 20 July 2012, <http://www.dezeen.com/2009/06/15/the-high-line-by-james-corner-field-operations-and-diller-scofidio-renfro/>

Initially, the High Line was a high paced linear speedway for trains. The speed is now contrasted with the slow pace of the railway as a linear park. Here the landscape is the vital variable in creating a destination point, without devaluing the intended use of the High Line as an urban connector. The new public space created is characterized by contrasting elements such as the paving versus the planting system, hard and soft surfaces and high use areas versus abundantly vegetated sections. The seemingly opposing areas are connected by gradients, allowing for a smoother shift when experiencing the park.

The High Line also interacts with the surrounding urban fabric, as it is in close proximity to the buildings that flank it. The park sometimes crosses through buildings or causes them to take certain formal properties, forcing them to stretch over or bend, giving way to the linear landscape. Stairs and ramps slope down to reach the ground floor at various locations to allow for easy access at any point along the linear elevated path.

3.1.2 Duisburg-Nord Landscape Park, Germany: Latz + Partner

The Thyssen Steelworks is the site for this landscape park in Western Germany. The place is characterized by a rich industrial past, with engine houses, mill buildings, bridges, gas tanks, empty coke and ore bunkers, as well as traces of railroads. Therefore, the design of the proposed landscape park relies on the conservation of this heritage incorporating each existing element as monumental sculptures serving new programmatic activities.



Figure 3.2 Duisburg-Nord Landscape Park: Latz + Partner. Image courtesy of Latz + Partner.

The design combines industry and nature through phenomenological experiences, setting a new standard for environmental, economic, and social transformations. The design relies heavily on the existing infrastructure, making the preservation of heritage a priority. The system of pathways throughout the park echoes the networks of rail lines, steel catwalk, canals and bunkers on site, transforming their original functional uses to contemporary landscape

¹⁸DeZeen. *The High Line by James Corner Field Operations and Diller, Scofidio + Renfro*, 20 July 2012, <http://www.dezeen.com/2009/06/15/the-high-line-by-james-corner-field-operations-and-diller-scofidio-renfro/>

features. this adaptive reuse of the existing industrial elements characteristic of the site, preserve the rich past by combining new paths and elevated bridges with the old, thus creating a multi-sensory experience for the visitors of the park. The bike and pedestrian paths act as connection lines for the entire park, bringing together the various site conditions and newly created plazas, gardens and recreational areas.

The design also employs perspective as a strategy for observing the site from various vantage points, by elevating pedestrian bridges adjacent to the linear rail tracks crossing the entire park. Through the process of changing perspectives, one can "look down on the grid of ore and sintering bunkers, now transformed by recreational programs such as children's playgrounds, rock climbing clubs, and meditative, enclosed gardens"¹⁹.

The formerly contaminated site also uses native plants, which over time will improve the quality of the soil and allow for other species to appear as well. Due to the original industrial pollution, the architects take advantage of the existing sewage channel by pooling together the system of water retention with the canal, creating environmental remediation.

The landscape park does not solely revitalize the area, but also conserves the industrial heritage of the site. It gives new value to old infrastructure through the reprogramming of each element in a considerate and efficient manner. Hence the park simultaneously exists both as a destination and a journey.

3.2 On Ecology

3.2.1 Ponte Parody, Italy: UN Studio

The project is an attempt at re-stitching the local urban and economic fabric of the city and to revitalize the waterfront area. The design attempts to establish connections between the various harbor districts in its surroundings, while adding programmed spaces that are considerate of the existing infrastructure.

"The juxtaposition of varied circulation typologies creates an innovative extension for the city center which not only organizes the position of program, but also optimizes pedestrian flows within and atop the building"²⁰.

¹⁹Peter Reed, *Groundswell: constructing the contemporary landscape* (New York: MOMA, 2008), p.124.

²⁰ArchDaily.*Ponte Parodi/UN Studio*, 20 July 2012. <http://www.archdaily.com/188744/ponte-parodi-unstudio/>



Figure 3.3 Ponte Parody: UN Studio.
Image courtesy of ArchDaily.

The project is adjacent to a historical area and a commercial center as well, making this location a prime destination for a variety of users. A new typology is therefore created, submerging the program below ground in order to not overshadow the adjacent buildings, and to optimize public space. The new circulation network takes into consideration the topography of the region, as well as the recent physical, economic and political developments within the city.

The interior/exterior interplay is maintained throughout the entire site by way of skylights on roofs. These become pathways, voids of terraces and outdoor public areas and provide a seamless integration within the landscape. Therefore, even though the project reaches a height of 20 meters, it still manages to camouflage itself into the landscape, giving priority to historical buildings.

3.2.2 Giant Interactive Group Corporate Headquarters, China: Morphosis Architects

The giant campus combines various programmatic functions through a folded landscape, creating a flexible network of frames that peak through the undulating ground cover. The buildings also interact with the adjacent lake by joining landscape to environment by cantilevering portions of the building over the water.

The landscape hosts various functions integrated below the freed ground plane, through carved out spaces that promote social interactions such as plazas, outdoor breaks and recreational spaces. These spaces stretch towards the water's edge where a continuous outdoor walkway flanks the lake. On the other side however, the program is more structured, as the building rises above the landscape. The East campus office building houses three distinct zones: open, non-hierarchical office space.



Figure 3.4 Giant Interactive Group Corporate Headquarters: Morphosis Architects.
Image courtesy of Flickr.

The main circulation spine is an enclosed walkway that bridges over the street connecting the two campuses. The networking of circulation stretched outside the office building and dives below the ground cover. The infrastructural qualities of the walkway are exposed through industrial trusses and revealed steel beams, contrasting the undulating green landscape of the ground plane. By pushing program below ground, energy efficiency and occupant comfort are increased, as the landscaped roof provides thermal mass, limiting heat gain. The central circulation spine and the recreational spaces are the interface for social hubs. The building's narrow profile also ensures the well-being of the employees with optimal access to light, accentuated through a series of skylights.

The thoughtful planning of the design led to a well-integrated building, not only within the landscape but also well balanced within its own functions, putting the human experience first before any ambitious expression.

3.3 On Connectivity

3.3.1 Yokohama Ferry Terminal, Japan: FOA



Figure 3.5 Yokohama Ferry Terminal: FOA.
Image courtesy of Flickr.

The Yokohama Ferry Terminal prioritizes public space without compromising the infrastructural systems that it hosts. FOA achieved connectivity through the layering of infrastructural and civic programs, topped by a landscaped roof that hosts public spaces along the waterfront.

"The project is generated from a circulation diagram that aspires to eliminate the linear structure characteristics of piers and the directionality of the circulation"²¹.

²¹ArchSpace. *Foreign Office Architects Yokohama Ferry Terminal*, November 18 2011.
http://www.arcspace.com/architects/foreign_office/yokohama/yokohama_index.html

Therefore, the terminal becomes a destination rather than solely a transition space that connects the city to the waterfront. Ergo, the pier becomes a fluid space, where uninterrupted and multidirectional space interlocks to encourage social interactions. The linear infrastructure of fixed orientation is submerged below the active public space, which becomes an extension of the urban fabric rather than a singular object in the landscape. The folding planes of the roof host various parts of the program alternating between covering and revealing spaces. The folded ground distributes loads through the surfaces, directing them diagonally to the ground. This technique is mindful of the Japanese topography that is high susceptible to seismic movements. Furthermore, the folding planes produce unique spatial qualities that highlight the continuity between indoor and outdoor spaces, maintaining a constant conversation between the two. Therefore, continuous spaces are created that are also differentiated along the length of the ferry.

Below, the flow of the infrastructural systems is controlled with differing intensities between the city and post, as well as the inhabitants and the ship passengers. Ultimately, through this project FOA explores mobile conditions of use by defining the limits and nature of the ground plane and then surpassing them through changing surfaces and public spaces. The integration of infrastructure within the structure of the areas of social use have been successful in showcasing the most important element of the building; the public space, which allows the land occupied by the terminal to be used as a park, reclaiming the site for the city once again.

3.3.2 Seattle Olympic Sculpture Park: Weiss/Manfredi Architects

The Olympic Sculpture Park is a response to the degraded side of a former fuel storage and transfer station in downtown Seattle. The intervention is an eight and a half acre public space that achieves a forty foot grade change from street to sea level. This is an ambitious project of an urban scale that not only repurposes existing under used lands, but also acts as a lateral connector across two lines of infrastructure. Here the opportunity that presents itself for redevelopment is manifested through the three remaining parcels of land; the in-between spaces left over by the four lane street and the railroad present on site. The resulting form create a unified space that incorporate the existing infrastructural conditions, but also accommodate for the Seattle art museum's public and artistic program through the creation of an outdoor sculpture garden. Ultimately, the design constructs a new topography, creating connections and reshaping the existing ground plane.

Therefore, a 2200 foot zigzag path emerges, bridging the existing transportation systems through a continuous landform, opting for an integrated approach. The design works as a network of circulation, allowing for accessibility to come to the forefront.



Figure 3.6 Seattle Olympic Sculpture Park: Weiss/Manfredi Architects. Image courtesy of ArchDaily.

A planting plan has also been developed in association with landscape architect Charles Anderson, echoing the three archetypal landscapes of the North West,

appropriate for this area. The park pavilion connects to a dense evergreen forest with an understory of ferns, as this is the most sheltered part of the site that also contains stepped green terraces. Furthermore, a deciduous forest of aspen trees is the second landscape as part of the design, representing the seasonal changes experienced in the city. Finally, the restored shoreline and newly created beach are the catalysts for change throughout the city's coastline. All these ecological considerations are part of the adaptive reuse of this site, which was becoming a wasteland, overwhelmed by the existing the transportation lines.

"The landscapes of this new urban park are designed to impart spatial, color, and textural variety while framing views of art, the city, and the dramatic background of the Olympic mountains. The design not only brings sculpture outside the museum walls, but also brings a new experience of nature to the city".²²

3.4 On Development

3.4.1 L23 Condominiums, New York: Neil Denari Architects

Similar to the standard hotel, the L23 condo is a high rise building adjacent to the high line. However, in this case the residential structure interacts differently to the elevated infrastructure, by allowing it to impact if formal and programmatic properties.

²²Peter Reed, *Groundswell: constructing the contemporary landscape* (New York: MOMA, 2008), p.116.

*"we wanted to make new architecture that honors the old in certain ways, but stands as an elevated works, integrated with the high line in a new way"*²³



Figure 3.7 L23 Condominiums: Neil Denari Architects. Image courtesy of ArcSpace.

The architecture of the L23 bends and folds, challenging conventional geometries and responding to the High Line formally. The building increases in size dramatically from the ground floor to the higher levels, creating a slender footing allowing the building to slightly cantilever over the High Line. The most expressive side of the condo faces the park, reflecting the social and interactive qualities of the High Line. The tapered form also allows for perspective views of the surrounding cityscape, while generating a more slender appearance, making it more hospitable to the adjacent buildings.

The structure of the L23 relies on steel frame construction with diagonal perimeter bracing that eliminates the need for columns and promotes an open plan and free flowing circulation. The structure therefore also allows for floor to ceiling visual spans that create a visual connection to the high line, establishing an indoor outdoor language.

The range of privacy of spaces is addressed on the east facade that is clad in stainless steel panels, concealing private life. The pattern of the panels changes according to the structure beneath, generating different visual effects. The steel surfaces will also change throughout the day depending on the position of the sun, reflecting the high lines ability to change in character according to the seasons.

The condo interacts with the heritage park of the high line is a more expressive way than the standard as it responds to the bridge through changing scale, form and structure, with the highest level of expression at the level of the high line. The podium terrace is at the level of the park as well, relating to the landscaping through its own green roof.

²³ArchSpace. *Neil Denari HL23*, November 18 2011. <http://www.arcspace.com/architects/denari/hl23/hl23.html>

3.4.2 The Standard Hotel, New York: Polshek Partnership

The hotel echoes the architectural purism of the international style and borrows from the Corbusian vocabulary. The building is adjacent to the high line elevated park and stretching over it with the help of its five massive 'pilotis' that support the large structure over the heritage landscaped infrastructure below. The High Line seems to slice through the hotel, making the standard the only building to span across the park.

The imposing yet sleek skin facade of the building reflects the neighborhoods that host it; the once gritty warehouses of the meatpacking district that have currently been used for high-end fashion showrooms and art galleries. The rooms are oriented in two dimensions, with windows either occupying the width or the length of the spaces, providing a variety of changing views into the surrounding neighborhood and the park below.

The building is almost perpendicular to the High Line, challenging the linear course of the park with its large glass walls. This perspective is a unique condition along the landscaped bridge. However, this interaction is not successful in creating a relationship between the hotel and the park neither through formal gestures or programmatic elements. The large discrepancy in scale between the infrastructure and the building is even more evident due to the chosen placement of the hotel and further emphasize the incompatibility between the two systems. Consequently, a large lack of public space awareness is present, with the missed opportunity of creating a formal rapport with the public realm through more than just transparency and perspectives.



Figure 3.8 The Standard Hotel: Polshek Partnership. Image courtesy of ArchDaily.

4. Design Project

4.1 Design Problem

This thesis aims at looking into the retrofitting potential of obsolete railroad corridors in the post industrial city of Toronto. By reactivating these lines within the overall transportation

network, they become the life lines of the city. Their ramifications plug into the larger network and allow for the free flow of public transit to service adjacent communities as well as the rest of the urban fabric, thusly maintaining continuity.

The possible design opportunities will be explored by generating new typologies and working with natural and built landscapes in an integral way. The corridors will therefore become catalysts for future urban growth, introducing mixed use programmes and creating the much needed open public space that will create better interaction between communities and improve quality of life. The design will introduce ecologically aware design that combines man-made and natural systems. This dialogue will create flexible spaces that will be defined by user behavior.

The chosen site is located within the largest green corridor in city, the Don Valley. Within

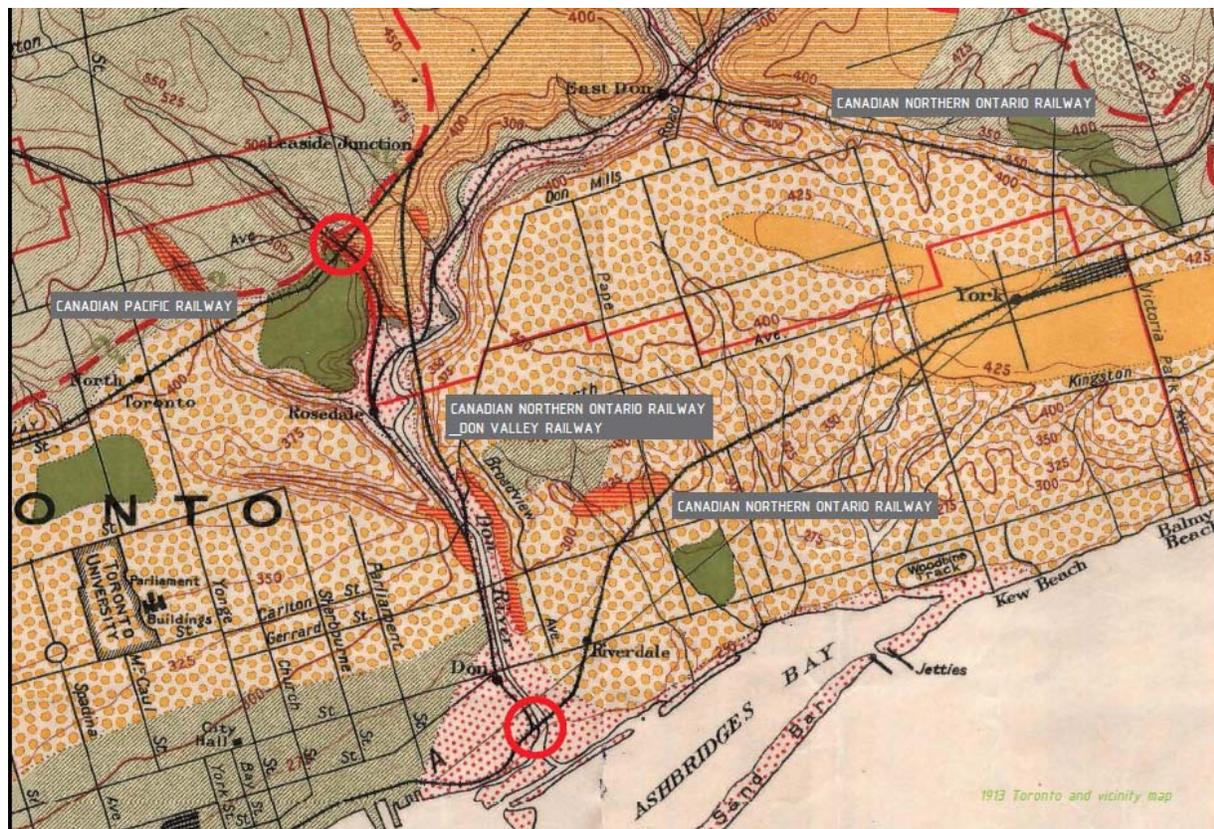


Figure 4.1 1913 Toronto and vicinity map (obsolete railroad showed as part of the CNOP).
Image courtesy of the Historical Atlas of Toronto.

this ecological belt, infrastructural lines connect the city North-South, uninterrupted. As part of these lines, an obsolete railroad track is also present. This railroad dates back to 1935 and was part of the Canadian Northern Ontario Railway and is a rich part of Canadian heritage.²⁴ The

²⁴ University of Toronto, Tracing the Social and Environmental History of the Don River. July 11 2012
http://maps.library.utoronto.ca/dvhhmp/resources/don_river_presentation.pdf

railroad was instrumental to the growth of Toronto as an urban center and allowed for the city to be well connected within a rapid transportation network.

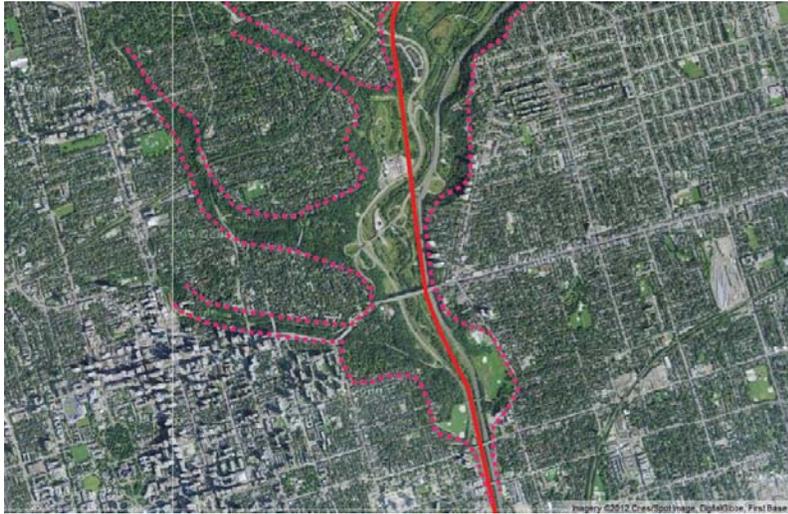


Figure 4.2 Don Valley (pink) and obsolete railroad (red)
Image courtesy of Google Maps.

However, today the railroad has become obsolete and the Don Valley's natural landscape has begun to claim it. This railroad has great connecting potential as it runs parallel to the Don Valley Parkway and Bayview Avenue that connect the downtown to other regions of the city. Along this corridor the public transit available is express and does not stop in any of the neighborhoods

along its span. Therefore communities within the Don Valley are physically separated by these lines of infrastructure

The railroad is located within the Don Valley ravine; a natural and sensitive environment that the city has been protecting from over development. The city's Ravine By-Law ensures that any changes made within this area are appropriate and respectful to the ecological landscape.

Ravine by-law (Toronto municipal code ravine and natural feature protection - 658-2. permit required for prohibited activities):

- a) no person shall, on any land in a protected area, injure or destroy any tree unless authorized by permit to do so.
- b) no person shall, on any land in a protected area, place or dump fill or refuse or alter the grade of the land unless authorized by permit to do so²⁵

The preservation of the natural environment will be an integral part of the design explorations for the potential developments in this area.

Keeping all this in mind, this thesis project proposes the creation of an LRT station along this natural and infrastructural corridor. The LRT line will become the life line of the city feeding

²⁵Toronto Municipal Code."Chapter 658".*Ravine and natural feature protection*. Toronto: City of Toronto, 2002.

life into existing veins of transportation and directing the flow of traffic and people to adjacent neighbourhoods. It will also revive the currently highly inaccessible Don Valley and bring ecological awareness to an area that has been somewhat neglected within the city by creating a natural park enjoyed by all. The revitalization of this railroad track as an LRT line will inspire new higher density developments in the adjacent urban fabric, as a large amount of people will be introduced into these areas through the station and stops along the railway span. The LRT station will not only be a transient point along the railroad but also a destination; the gateway into the Don Valley Park.

4.2 Sensitive Ecology and Natural Context

Throughout the late 1800s, the lower section of the Don River was straightened in order to create an appropriate shipping channel that would expand the city's industrial lands through the introduction of railways along this corridor. Continuing on into the mid-twentieth century, the don was a 'working river', tolerating heavy industrial developments, pollution and flooding. On the other hand, the valley also served as a leisure destination, where locals would skate, sled and picnic, using this area all year round. By the early 1980s, the quarry was almost exhausted and the brick production came to a halt, provoking an initiative to turn the site into a housing area, which was never executed.²⁶



Figure 4.3 N-S Don Valley flooding in 2005, 2008 and 2012 respectively.
Image courtesy of CP24 and National Post.

The railroad is located in the floodplain of the Lower Don River, where the branches of the river converge 100 meters to the South, separated from the site by the railroad. This floodplain and the slopes of the Don Valley ravine make up a system of parkland that due to the 1954 Hurricane Hazel flooding, has been abandoned by the locals, in terms of residential or recreational uses, leaving behind a green corridor. The Don Valley is predisposed to flooding

²⁶ Hayes, Derek. *Historical Atlas of Toronto*. Toronto, Vancouver: Douglas and McIntyre, 2008.

due to its topographic features. Peak flows normally take place in late February and September, however flash storms that commonly occur in the summer can also be a flooding threat. In 2005, a very strong summer storm caused short term flooding within the Don Valley. Events such as this have also been recorded in 2005, 2008, 2010 and recently due to thunderstorms that have caused floods and landslides.²⁷

This corridor displayed a potential for development and the introduction of the Don Valley Parkway and the Bayview extension took place, in an attempt to reconnect the city through this area. However, in time, the Don Valley seemed more appropriate as a valuable green space, stepping away from the urban and industrial uses it once hosted. Brick Works was one of the remediation projects in the area, encouraging new public use and healthy development.

4.3 Built Context

The Don Valley that hosts the obsolete railroad to be revitalized contains various areas of interest, such as Brick Works, Riverdale Park and existing pathways leading into the ravine and towards the Don River. All these man-made and natural elements of the Don Valley constitute the collective memory of the city.

Brick Works is a heritage site located along the railroad corridor, in the Northern part of the Lower Don Valley ravine, setting the Eastern boundary of downtown Toronto. As a ravine and waterway, this green corridor has been the catalyst for the city's cultural and economic development, as well as sustaining agricultural and industrial growth. Also, as a vital transportation corridor, the Don Valley has aided in the expansion of Toronto, connecting all the various neighborhoods and extending the city beyond its human scale communities. Therefore, it began as the industrial backbone of the city at the beginning of its development, due to its proximity to the Toronto harbor, natural resources, waterpower and clean water. Growing working class communities began to expand in the area with the construction of mills, breweries and distilleries, which included the original Don Valley Pressed Brick Works.

Brick Works contributed greatly to the considerable growth the city had undergone throughout the late 18th century. The company was the largest and most significant brick manufacturer in Canada. Brick Works relied on locally extracting clay, shale, sand and water from the adjacent canal built near the industrial pad. The bricks manufactured on this site were

²⁷ Aileen, Donnelly. National Post, *Thunderstorms across the city cause flash foods, landslides*. Toronto, 2012.

sold throughout Canada and contributed to the construction of the most famous buildings in Toronto.²⁸

The railroad and the Brick Works site have both been abandoned until recently, when the old factory has been recognized as an important piece of heritage and revitalization efforts have taken place. The site was solely accessed by occasional dog walkers, joggers and marginalized social groups, demising its potential more and more. As a result of this, "Brickworks still feels remote, despite its location in the heart of the city, within walking distance of tens of thousands of people, and within easy reach of a number of important pieces of infrastructure"²⁹.

The Don Valley contains a variety of changing landscapes and topographies that have allowed for areas of recreation and leisure. Riverdale Park is one of the more successful parts of the park, as it is used in the winter and summer in the service of a range of activities. In the summer field sports are often played there and in the winter the natural slopes of the ravine are used for tobogganing.

The site is surrounded by a variety of neighborhoods, ranging from low density upper income to low density working class to Canada's highest density and poorest area towards the South (St. Jamestown). Currently, the site can only be accessed via Bayview Avenue or the Don Valley Trail. This is ironic since the Don Valley Parkway flanks the location, as well as a number of arterial roads, such as Bloor Street, Danforth Avenue, Broadview Avenue, Mount Pleasant road and the Yonge/Bloor-Danforth subway lines.

4.4 Infrastructure Connectivity

The infrastructural lines within the Don Valley are uninterrupted North-South connectors, with express modes of transportation connecting the downtown core to the Northern neighbourhoods. The new LRT line will allow access into the Don Valley corridor, creating not only an efficient North-South connector, but also a destination. This will be established through the use of the LRT railroad as the main spine of the green corridor, with stops and a station along its span that will create ramifications feeding into the adjacent neighbourhoods and connecting to the public transportation network and the streets of the city. The East-West disconnect will be addressed through extensive bicycle trails that will expand throughout the park and through new streets that will spread throughout the Don Valley, similar to the existing River Street.

²⁸Evergreen Brick Works. *Final Masterplan*. Toronto: Evergreen, 2006.

²⁹Ibid



Figure 4.4 N-S connectors (E-W separators) Bayview Avenue, Railroad, Don River, DVP Highway, flanked by park space on either side.

The system of railroads forms the heritage network within the city, as these infrastructural lines sustained industry and helped develop communities along the Don Valley by also transporting passengers over large areas. However, the heavy industrial nature of the valley created polluting effluents that remained a serious problem well into the twentieth century.

In 1888 the CPR was granted permission to build a branch line extending directly into downtown Toronto. Freight traffic opened on the Don Branch in 1892 and the following year the railways corridor was opened to CPR passenger trains. The corridor remained in use for over a century. With the cessation of CP's passenger train service and a decline of industry within the city's core, the trains have stopped running, but the track is still in place. All lines are operational except for the Don Branch that is now obsolete, with the other railroad within the Don Valley supporting express high speed GO Transit rail service and occasional freight trains.

The official terminus of the Don Branch is at Queen St Bridge overpass. The Don Station was once located here. The track then connects southward to the Union corridor parallel to the Gardiner Expressway.

4.4.1 Toronto Central Waterfront Masterplan: West 8 and DTAH

The Central Waterfront, 3.5 km of Lake Ontario shoreline immediately adjacent to the downtown business district, is one of Toronto's most valuable assets and the most underdeveloped. The Don Valley revitalized LRT line extends towards the waterfront and crosses through this masterplan in order to connect into the infrastructural network at Union station.



Figure 4.5 West 8 masterplan for the Central Waterfront development. Image courtesy of West 8.

Currently, there is no coherent vision for the Central Waterfront visually or physically. Therefore West 8 and DTAH have created a fundamental objective that would address the inconsistency of this location and create a new architecturally consistent vision for this area. The new Don Valley LRT line would merge with this masterplan. This fact will also address the reconfiguration of the Queens Quay Boulevard, whose ramifications lead into Union Station. The centrally located streetcar track of the boulevard will be reconstructed and extended over the full length of the street, which will be an extension of the Don Valley LRT line. The street will then be transformed into a tree lined recreational zone, including a promenade and bicycle track that will also connect with the bicycle trails within the Don Valley and the Ontario shoreline. The masterplan has already begun, as "the first phase of realization is now underway and includes the design and construction of Queen's Quay Boulevard and the design of public space wave decks, timber bridges, and seven slip heads".³⁰

³⁰West 8, *Toronto Central Waterfront*, 30 July 2012 http://www.west8.nl/projects/all/toronto_central_waterfront/

The LRT line will therefore seamlessly integrated itself within the downtown infrastructural network through the streetcar track along the Queens Quay Boulevard and reach a variety of neighbourhoods through Union Station's numerous ramifications.

4.4.2 West Don Lands Masterplan: Urban Design Associated and DTAH



Figure 4.6 Masterplan perspective of the West Don Lands.
Image courtesy of Cicada Designs.

The West Don Lands, located at the bottom of the Don Valley, are also being transformed from former industrial lands into a sustainable, mixed-use, pedestrian-friendly, riverside community. The lands, owned by the Provincial Government, occupy a heritage rich and ecologically unique site at the original mouth of the Don River. “While the river has been channelized and the shoreline has shifted south, the essence of the site remains a low-lying river delta”³¹.

The masterplan has been set in motion through remediation efforts of the lands in addition to construction of flood protection landforms, addressing the flooding issues of the Don Valley Ravine. The design also addresses issues of connectivity by creating new pedestrian and bicycle pathways that will become extensions of the Don Valley Trail system. The Don Branch railroad that is currently obsolete also has the potential of connecting to the downtown through the Don Lands that will become a node along the extended railroad.

Both the Central Waterfront and West Don Lands masterplan show the potential of the Don Branch railroad of connecting into future developments in the city that will ensure better connectivity throughout the urban fabric.

³¹ Waterfront Toronto, *Planning West Don Lands*. 4 August 2012
http://www.waterfronttoronto.ca/explore_projects2/west_don_land/planning_the_community

4.5 Don Branch Railroad as an LRT Line

By retrofitting the Don Branch as a light rail transit transportation line, LRT stops will be created along the Don Valley, decreasing speed of traffic and increasing accessibility and connectivity along the corridor. The line will connect into the current city grid, passing through Union Station and closing in a loop along Dufferin Street where it will create an incentive for a much needed revitalization effort through transit oriented development.

There will be a stop at the heritage site at Brickworks, at the Prince Edward Viaduct at Bloor, at Gerrard St where the city fabric gathers itself close to the lines of transportation, at Dundas, then Queen; serving the West Don Lands and on to Union station and the Central Waterfront. The largest disconnect occurs between Gerrard and Bloor where an LRT station will be created as the official gateway into the Don Valley as a park, creating new public spaces and bridging the now separated communities through physical and programmatic strategies.

4.5.1 Transportation Spine



Figure 4.7 The currently obsolete Don Branch Railroad (yellow) within the infrastructural grid of the city.

The Don Branch will become the main spine of the city, with its ramification pumping life into the city's main organs, such as the downtown, adjacent neighbourhoods and underdeveloped zones. So far, the Don Valley has been a successful high speed transitional corridor, however, by retrofitting the railroad as an LRT, the Don Valley will become a destination with gateways into the park at the various stops along the line. This will incite the creation of new arteries focused maximizing bicycle and pedestrian access through small roads such as Pottery Road and the pathways, such the Don Valley trail. Consequently, new nodes of development based on the location of each LRT stop, will increase

density as part of transit oriented developments along the Don Valley.

The LRT station is adjacent to the recreational area of Riverdale Park, Rosedale Ravine and the heavily forested area containing numerous discovery walks. Therefore, the station has the potential of tying into the existing pedestrian pathways, Don Valley Trail, with direct access from Bayview Avenue and the ability to bring more people into the recreational areas of the park that are currently mostly used only by adjacent communities that can directly access them from each side of the ravine.

4.5.2 Increased Density along Don Valley Corridor

The reactivation of the Don Branch railroad as an LRT line will create new nodes of development along the Don Valley as a transportation corridor. As a result, dense, walkable communities centered on this high quality train system will emerge. This approach is characterized by the theory of Transit Oriented Development (TOD), which will make it possible to live a higher quality life without complete dependence on a car for mobility and survival.



Figure 4.8 Atlanta Belt Line. Image courtesy of Perkins+Will.

Similar to the Atlanta Belt Line, the Don Branch will connect public park space with adjacent communities through mixed used developments of increased density at each node along the railroad. As such, The Belt Line is currently a circle of underutilized railroads is planned to evolve into an infrastructure framework that will layer rails, trails and green space seamlessly connecting 45 neighborhoods³². Similarly, along the Don Valley corridor at the edge

³² Perkins+Will, *Atlanta Belt Line*. August 3 2012 <http://www.perkinswill.com/work/atlanta-beltline.html>

of the ravine new edge of development for mid-rise pedestrian friendly nodes of growth will take place.

4.5.3 Retrofitting of the Obsolete Railroad's implication within the Don Valley as an Ecological Site

The Don Valley is part of an extensive system of green spaces/parks extending throughout Toronto. The green corridor of the Don Valley is the largest park with the most connecting, recreational and ecological potential. It is a protected ravine, as stated above, characterized by numerous species of fauna and flora and natural extreme topography. Consequently, the LRT station proposed within this ecological site will support bio diverse and cultural activities, such as hiking, bird watching and natural history studies, as well as water purification of the Don River. The building aims to minimize its presence in the landscape by embedding itself in the topography of the berm system that is lifting the railroad above flood levels. The folded planes leading to the waiting platforms are characterized by a variety of permeable materials such as wood, water and pervious concrete pavers.

Also, the station will function as a gateway into the Don Valley Park, raising ecological awareness through its programs of outdoor leisure activities, farmers markets, ecological awareness center and gallery engaging visitors in a conversation about the relationship between built and natural systems. As stated in the report '10 Messages for 2010: Urban ecosystems' by the EEA (European Environmental Agency), "With good design, urban areas can provide opportunities, not merely threats, to ecological diversity. Nature is dynamic whilst architecture is static: the two systems are in conflict unless attention is paid to zones and layers"³³. As a result, the proposed LRT station layers various systems of materials, green spaces, built forms and public spaces in order to provide the variety and relief needed to benefit and highlight its rich natural environment.

4.6 Design Principles

The railroad is currently at the lowest level within the Don Valley, contained by natural and man-made barriers of the Don River, DVP and Bayview Avenue. Since the railroad is in a floodplain and ravine that tends to often flood with large storms, making the line of transportation inaccessible, the new LRT will be lifted through a berming system that will

³³ Edwards, Brian. NBS, *Biodiversity: the new challenge of architecture*. 4 August 2012
<https://www.thenbs.com/topics/environment/articles/biodiversitynewchallengeforarchitecture.asp>

prevent its flooding. This way public transit will always be accessible, even when the highway and streets are flooded.

In order to access the railroad from the park a ramping system zigzags across the topography of the berm, reaching the top waiting platforms servicing the line. The waiting platforms are connected by an overpass. Furthermore, the station bypasses the adjacent infrastructure through connecting bridges extending from multiple levels and connecting into urban grid. The main entry points into the station start with access from Bayview Avenue where a drop-off area is created. The main entrance is located off of the ramping system above all possible flood levels. The station is therefore directly below the tracks creating a cavity into the berm, carving a cave like space. Furthermore, the station creates a node within the park that connects into the existing Don Valley Trail through pedestrian and bicycle pathways that are anchored by a large outdoor auditorium along the riverside boardwalk

The following is a summary of the design principles guiding the design of the retrofitted railroad as an LRT line:

- Retrofitting the obsolete railroad within the Don Valley
 - introducing a new LRT system on the line
 - the LRT line taking the function of the lifeline of the city
- Lifting line due to floodplain
 - accounting for the 1-2m flooding levels that often occur within the Don Valley
 - lifting the line through sloped earth berms - using fill materials to minimize cost
- Creating LRT stops
 - making the park more accessible by connecting the LRT stops to bicycle trails and adjacent neighbourhoods
- Implementing station
 - building within the landscape - creating new typologies
 - using the ground plane as an interwoven field of program integrated within the landscape
 - the design will incorporate a variety of scales and programmes that will be experienced at various planes of interaction
- Connecting into existing infrastructural networks
 - the new LRT railroad will continue through the West 8 masterplan leading towards the waterfront and ultimately towards Union station

- bicycle paths and new streets will improve the currently nonexistent East-West connections within the Don Valley
- Increasing accessibility with the Don Valley as park
 - through the introduction new pathways and streets, as well as the LRT line stops and station, the Don Valley will be a more easily accessible park that could be enjoyed in its entirety
- Optimizing public open space
 - whether within the park or the LRT station, public space will be maximized through a variety of programmes
 - giving access to the adjacent communities and the city to the largest ecological area that has great potential for a successful linear park

"the challenge for this project, therefore, is to stitch the site into the fabric of the city, making it feel accessible and close-at-hand - one of the jewels in a necklace of truly important civic places that make-up the city"³⁴.

The design uses mapping as a strategy for establishing boundaries and ensuring that the adjacent communities are reconnected across the corridor. East-West connections allow for maximum accessibility to the station and connect people to the rest of the city. The ground plane is animated, allowing the station to become a park within a park, the Don Valley. The concept of network and public space manifests at different scales. Therefore the ground plane becomes the most important design opportunity as it hosts the point of entry into the chosen destination and supports open public space. The ground level is composed of changing folding planes, using the existing topography. Program is integrated within the folding planes of the landscape, maximizing open public space above and bringing ecological awareness to the park through a hierarchy of permeable materials. Therefore the Don Valley becomes a linear park and transportation corridor, pumping life into the veins of the city. It is the main spine and lifeline of Toronto with the new LRT station as the gateway into the rejuvenated park.

The station itself is not only a destination but also a journey with its winding ramps, tunneling gallery and linear platforms that all connect public spaces through changing planes of varying materials. The new station is the main gateway into the Don Valley highlighting its potential as a recreational linear park and not just a green space separating urban fabric. As part of the retrofitted railroad of the LRT line, the station is a node with expanding ramifications

³⁴Evergreen Brick Works. *Final Masterplan*. Toronto: Evergreen, 2006.

within the park and over the East-West barriers outlined above. The railroad is thus reinstated as a main transportation spine in the city, yet servicing the corridor by its frequent stops, instead of serving solely as a transitional linear void.

4.7 Design Summary

The design of this thesis project has explored The Don Branch railroad's retrofitting potential within a post industrial city as part of a larger network of built and natural systems. The railroad was been treated as a historical landmark linking the present to the past, as a testament to the city's collective memory, showcased and once more given a function of transportation. The railroad becomes a connector, rather than a disconnecter, transforming into a principal artery pumping life into the city's veins and connecting its main organs. Thus the city is serviced through its infrastructural network, whose increased efficiency allows for high levels of accessibility and circulation flows within the city.

The design interventions are mindful of the ecologically sensitive corridor that the railroad belongs to. The Don Valley adds character to the journey along the corridor as the largest natural area in Toronto. By slowing down traffic through the LRT function given to the railroad, the nodes along the line become gateways into the park. The Don Valley thus becomes better serviced and taken care of, with more people being able to visit it and learn about its importance as a natural landmark in the city. Consequently, built and natural systems become symbiotic, allowing for both networks to rely on each other; the railroad as the man-made infrastructural spine, and the Don Valley Park as the green lungs of the city. Retrofitting the railroad as an LRT line allows for maximum permeability throughout the city fabric, connecting numerous neighbourhoods, developing the transportation corridor as a successful park and stimulating new mixed use edge of development due to the newly created nodes along railroad.

4.8 Design Drawings

To follow.

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