Industrial Organicism: A New Organic Architecture to Grow the Post-Industrial Prairie Landscape

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CONTENTS

ABSTRACT

Building from the legacy and theoretical frameworks of organicism, this thesis is an investigation towards the development of true living architecture, a constructed biology existing as a function of its dynamic environment and as a form which dictates its own means of growth and evolution. The post-industrial city provides an opportune test environment to explore these concepts. Deindustrialization has left in its wake, a fragmented city littered with the voids and ruins of vacated industry. As cities look to rehabilitate these decaying places, preserving their last remaining traces of urban industrial heritage, adaptive reuse has emerged as a choice strategy of redevelopment. We find however, rather than working to reconnect waste sites with the greater city and inspiring new life, the available methods isolate them as static cultural destinations or communities of nostalgia. The following thesis acts to challenge these existing methodologies in the development of a new “organism strategy” of urban adaptive reuse. This strategy proposes renewal through regrowth and formation of an architectural organism, an entity evolving from the features of the industrial wasteland in celebration of it’s dynamic present rather than past form.

This thesis is located in the city of Edmonton, Alberta, Canada with focus on the historic Fort Road industrial region.

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CHAPTER 1: INTRODUCTION

Overview

Cities today exist fragmented, voided and wasteful; a form that continues to be a reflection of the technological innovation and subsequent urban restructure that occurred through the mid to late 20th century. City planners and designers struggle to create order among this uneven fabric as they work to fill the voids of industrial closure, inspire new life in de-populated zones, reconnect isolated places or create variation in areas of homogeneity.

Waste or "dross"[1] is a growing problem in the urban landscape and though an amount of dross is thought to be inevitable in a healthy, developing city, an expression of its natural cycles of renewal, its inefficient and poorly designed features appear to overwhelm the contemporary fabric. Replacement is the typical solution for declining spaces, the consequence of harder economic times that cities strive to hide, however, replacement as a mode of urban growth is counterintuitive, detrimental to both the continuity of the urban form as well as the conservation of city history and identity.

Adaptive reuse is the lens through which this project is viewed. It is a process of utilizing existing structures and site, transforming elements to suit new functions rather than removing them and starting anew. The objective of this project is to explore potential application of adaptive reuse in the context of the urban wasteland as a way to counter its established culture of replacement. Present strategies are limited in application and, although not their intent, are preservative in their focus. While each of these strategies are about integrating contemporary form in different ways, their basis is similar, to gracefully compliment through intervention, mainly intact structures of more or less moderate historic importance or interest.

The application of adaptive reuse to the urban wasteland is not new. For many years its strategies have been used to rehabilitate regions of decay, specifically ruins and wastelands arising from the previous industrial era. Cities seek to reinvigorate these depressed zones, constructing new urban communities over current industrial voids. The ultimate goal is to simultaneously incorporate the remaining ruins and structures, tying the space

1 Alan Berger, *Drosscape: Wasting Land in Urban America*. 1st ed. (New York: Princeton Architectural Press, 2006),12.

through some perceived historical meaning and identity. We observe this action in the development of the urban cultural district which is a recent trend among identity starved, post-industrial cities. These districts as creative-cultural epicentres are established to attract young professionals and spur growth in devalued urban regions, however, they are often criticized as communities of fantasy, isolated areas that have more in common with theme parks focused on generating a profit, than functional public spaces. Existing industrial ruins, structures and buildings form the basis of a heritage community, a region that through preserved factory buildings and rough brick facades, attempts to convey an aura of history and place. The ultimate goal is to create enthusiasm for the new redesigned space by embodying the local culture that is used to attract patrons and sell local art and artisan products.

The problem that is encountered in the above methodology is that the resulting heritage communities, through their attachment to a particular historical period and restriction in connection to the rest of the city, become static, unchanging and generally as isolated as the void it replaces. These are the conditions this thesis stands to challenge in the development of a new, organic adaptive reuse strategy of which will develop a community that not only celebrates or honours the region's industrial heritage, but is also a community in connection with the city, that is open to grow and evolve in response to its changing needs. Even as void, wastelands are not empty, they are a complex composite of disjointed forms and systems; a layered mesh of elements from different periods of time. Most of its features are defunct, the spoils of an exploitive environment pushing for innovation and change. As new forms are crudely constructed over older ones, the remnants of past activities are left behind. These scars and fragments gradually accumulate generating a landscape of stored information waiting to be extracted and used to establish new architectural forms.

This new strategy of adaptive reuse is based in organicism, specifically focusing on the concept of organism in the direction of developing a true biology, a living, evolving architectural entity that develops within the environment of the industrial wasteland. This biological layer of architecture is grown from the wasteland as it exists in its present form, inclusive of its fragmentation, void and marginality that is just as much a part of the region's industrial identity as are the historical factories and infrastructures.

A number of key principles inform the organism strategy, these include morphology, evolution and metabolism. A basis which hinges on the concept of architectural ”DNA” or genome with this project following the assertion that similar to a true living entity, built architecture contains the capacity to program and direct its own growth and development. While current methods of adaptive reuse are based on the presence of physical structure, the organism strategy instead values the site’s “DNA” as an element that can replicate form as well as direct its evolution under changing conditions.

This project’s focus is to define an organism community within a region of decaying industrial wasteland. This activity is divided into two stages, beginning with establishing the organism strategy methodolgy. This methodology outlines the basic procedure of creating an industrial organism, from the extraction of the industrial site “DNA”, the morphological development of structure, to the evolution and growth of the form. The second section is the test of the organism methodology within a selected wasteland site. Here we follow the procedure of community growth and development within the target location.

The selected industrial site is the Fort Road industrial area in the Canadian prairie city of Edmonton, Alberta. This region, once the city’s industrial heartland, built around the function and activity of industrial rail, has gradually decayed and become marginalized as industry and infrastructure have shifted and changed over the course of several decades. While not a region of the central urban core, it is an area in close connection, through infrastructure in historical rail as well as the city’s contemporary light rail transit (LRT) system. It is a key region tying together the inner and outer city spaces.

In the vast Fort Road wasteland region, the “organism community” is composed of three unique industrial organisms each of which is established in selected individual sub-sites. Though developing and growing in separation, the organisms are connected via form and complimentary program to create a cohesive community. Two of these three organisms will be fully developed through design to demonstrate their means of growth, change, programming, as well as their interaction between each other and the surrounding spaces.

Post-Industrial City

The post-industrial city is a complex urban environment that continues to present endless challenges to architects, designers and urban planners. It is an environment defined by spatial discontinuity, inefficiency, waste and void, that has developed since the early 1950's following the end of World War II. This era marked the advent of globalization and the associated restructure of industrial and economic systems that had a massive affect on the composition of the city. Decline in urban heavy industry and manufacturing followed by expansion of the urban services economy was a definitive aspect of this period, however, the transition from early industrial city to the modern service city, was far from smooth. I begin this discussion by framing the landscape of the post-industrial city, introducing its problematic nature of fragmentation, waste, and the over run of interstitial space.

A

B

Typical post-industrial urban landscape showing A)"horizontal", outward urban growth, and B) fragmentation and industrial blight; photographs from Berger, *Drosscape.*

Urban sprawl as outer growth of the city; photographs from Berger, *Drosscape.*

Urbanization is one of the most definitive trends of the later 20th century. Cities in North America and worldwide have grown at unprecedented rates and today, over half of the world's population now lives in urban areas. In Canada, the rural population has declined from 88% in 1850 to 19% in 2011 based on the current census data and at the same time, the total population has expanded from approximately 3.5 million to just over 35 million.[2] This rapid growth signaled a need for a greater degree of structure and order, and as such, cities were forced to completely rethink their approach to urban planning and development. The 1950's saw the beginnings of land-use planning and zoning as a means to establish semblance of order in the perceived chaos and mess of the turn of the century, mixed metropolis.[3]

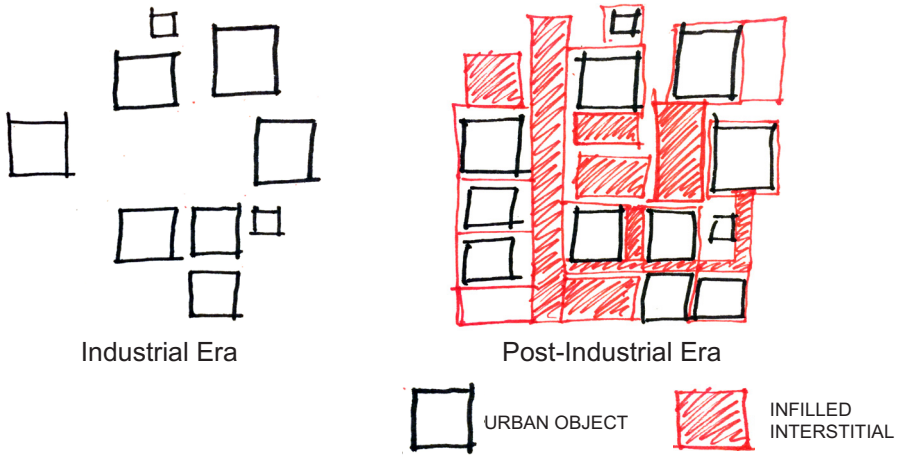
As history would come to show, the demand for perfection and order in urbanity would produce its own multitude of problems. The post-industrial city in its need for organization, has become a land of interstitial space, the undefinable connective tissue that serves to bind urban objects. While interstitial space is a necessary and unavoidable component, it has been allowed to proliferate in the modern city, its banal form coming to dominate as well as diminish the environment. This effect is observed clearly in "horizontal urbanization", the prevailing form of contemporary development that is defined by a gradual "build out" of the city as it accommodates growing need for new infrastructure and zoning separations. Alan Berger identifies this process as occurring in two fronts, the first is the

2 Statistics Canada, *Canadian Demographics at a Glance*. 2016.

3 Aspa Gospodini, "Portraying, Classifying and Understanding the Emerging Landscapes in the Post-industrial City" *Cities* 23, no. 5 (2006), 362.

external front that is exclusively new growth in the outer city.[4] This development is heavily infrastructural and low density and what is commonly referred to as “sprawl”. Sprawl is recognized as intentionally diffuse, composed of a fused conglomerate of residential and commercial enclaves liberally padded and infused with void in the form of setbacks, perimeters and infrastructures as a means to order and isolate.[5]

The second front is the “internal” frontier which speaks to the focus of this project, and refers to the diffusion of the fabric of the mature existing city.[6] This occurs in a number of ways, but generally is the result of an increasing amount of urban land being relegated as marginal, interstitial or “in-between” space through implementation of rigid zoning rules and restrictions. The city is composed of a series of individualized fragments and true open and vacant space no longer exists. Every part is now claimed, subdivided and zoned to be used in some variety to generate city income. Area that was once a “void of opportunity”, is now an interstitial, given a limited supportive role in urban service, separation, parking or other variety of infrastructural need. We also note in this landscape, the growing separation that is occurring between primary and secondary urban forms that fosters marginality. As primary elements are becoming increasingly dominant, any fragments deemed less important, more difficult to zone or categorize, are aggregated together and stripped of definition to create a homogenous marginal space.[7]



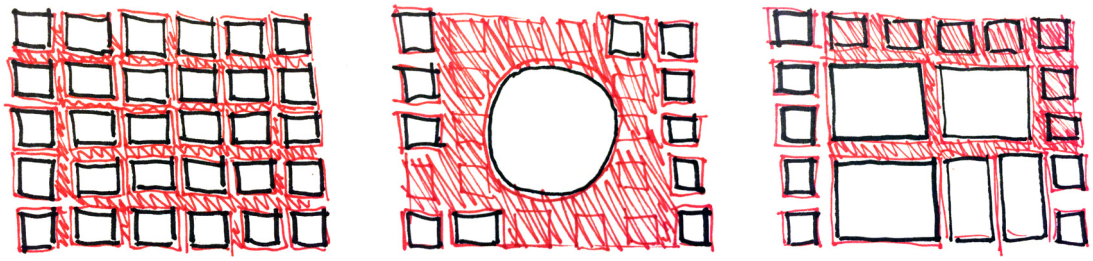
Representation of urban fabric diffusion through fragmentation and allocation of interstitial areas.

4 Berger, *Drosscape: Wasting Land in Urban America*, 27.

5 Ibid., 26.

6 Ibid.

7 Ibid.



A) Base urban fabric - Minimal interstitial space

B) Construction of new primary objects - Removal of existing elements for increased interstitial space and services.

C) Construction of new primary objects - Existing secondary forms aggregated as marginal space/elements.

Representation of interstitial space proliferation through new construction.

When discussing the post-industrial city, it is unavoidable to consider the decline of the urban industrial. As Berger states, “America is deindustrializing”.[8] This is an undeniable fact, and today the city remains littered with the fragmented residues of their original industrial and business centres. These sites linger as a definitive part of the post-industrial landscape and now a considerable source of void in the urban interior. Much of their composition is currently defined by brownfields, abandoned buildings, contaminated land, parking lots, shipping yards and a multitude of fringe businesses, the landscapes of transition often forgotten. These sites of decay are encompassed under the term “terrain vague”, an urban concept from Ignasi Sola-Morales, that unifies regions of abandonment and places of otherness,[9] “falling in between cycles of investment”.[10]

Though these places are unified under designations such as “terrain vague”, not all industrial sites are the same, nor are they free space open for new creative uses. Processes of internal diffusion are at work within these industrial sites as cities place effort into zoning and appropriating them as useable space. Vast, continuous industrial landscapes are chopped up and divided into consumable fragments that can be assigned new, contemporary functions. Though there are some exceptions, typically these sites of neglect, already deep in decline, are relegated to the realm of the marginal and interstitial, usually configured for some auxiliary function and service. With a pre-existing affiliation with industrial infrastructure, these sites often find new function in urban mobility, integrated into major transportation corridors as they are infiltrated by roadways and arterials, forming a new landscape of connective interstitial tissue.

8 Ibid., 46.

9 José Morales, “Terrain Vague,” *Quaderns d’Arquitectura I Urbanisme* 214 (1996), 120.

10 Berger, *Drosscape: Wasting Land in Urban America*, 35.

Urban landscape defined by infill of infrastructure and services based interstitial; photograph from Berger, *Drosscape*

As industrial space is gradually transformed into a vague interstitium, it loses its definition, the characters and features that create its unique identity. These residual forms, even if they are considered at times unsightly or grotesque can be incorporated into design to produce unforeseen results. Berger, paraphrasing Sola-Morales in reference to the terrain vague states that architects should "fight to keep their differences and design to resist planned continuity, using the differences of terrain vague as motivation for the architectural project".[11] He also references the evolutionary biological process of exaptation to highlight the opportunities of this practice, where organism traits originally developed for one function, under adaptive pressures, can evolve into a new form to suit a new use. He cites an example of this process in flightless reptiles that have evolved feathers used for insulation that eventually and unexpectedly would lead into a form supportive of flight.[12] This concept directly influences the position of this project which is that unique architectural form can develop from the existing complex disorder of the industrial terrain vague and that these structures will adapt and evolve new use under the changing environmental pressures of the city.

Internal city space is dynamic urban space; moulded, broken and reconfigured through decades of conflicting societal forces. This dynamic behaviour counters our use of "post-industrial" to describe the contemporary city. The term is often criticized as supporting a static interpretation of a rapidly changing space. The urban becomes fixed "in terms of a

11 Ibid., 34.

12 Ibid.

pre-industrial past rather than as an ongoing industrial process".[13] According to Cohen and Zysman, the industrial system has not been replaced, but has only become "infinitely more elaborate and the production process far more indirect."[14] It is imperative to have systems of development that can respond to this changing environment, which establish the city's dynamic landscape, not of industrial or post-industrial, but as a continuous, connected form.

Adaptive Reuse

Adaptive reuse encompasses a process of adapting an existing building or site to suit a new functional purpose. It is important to note that this definition, while unequivocally true, does not demonstrate the full breadth of this practice. It is not about monumentalizing or preserving forms of the past, but rather creating something entirely new through harmonizing existing structure with additional creative layers. As Francoise Bollack claims "existing building is the design generator, the expression of the combined work is resolutely contemporary".[15]

Interest for adaptive reuse originated from the artistic climate of the 1960's. People were reacting to the predominant doctrines of modernism; they dismissed the idealistic rational and functionalist principles they saw as limiting, to create art from the messy, damaged world around them, demonstrating beauty in the unrefined "junk" of the everyday.[16] From this grew an appreciation for texture, materiality and the value of history that connects to what contemporary architects are now trying to accomplish through adaptive reuse and the reclaim of spaces of rejection.[17] It is often assumed that only structures of high value warrant reuse, but in the practice's original sentiment, it is actually the mundane and unremarkable spaces that inspire the pursuit of these interventions, the drive to develop something exquisite from something banal.

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13 Ibid., 47.

14 Ibid.

15 Françoise Astorg Bollack, *Old Buildings, New Forms: New Directions in Architectural Transformations* (New York: Monacelli Press, 2013), 8.

16 Ibid., 16.

17 Ibid.

Reuse in the Wasteland

Adaptive reuse though, being a practice applied to a wide range of different buildings and architectures, has for many years been used for the recovery of abandoned, industrial sites. Prime targets for these activities are generally those sites with the most highly preserved industrial ruins, still containing prominent historic industrial structures and buildings. The interest of this project, however, is to expand existing strategies to suit application to regions of the industrial wasteland, areas considered unconventional due to their state of advanced degradation and decline. These regions of "terrain vague" in their variety of voided, marginal forms have drawn significant interest for urban recovery. They are a canvas, open for new interpretation and use, but also a landscape awash in a layered array of textures, forms, structures and fragments, available for endless manipulation and inspiration.

Use of the term "wasteland" can in many ways create confusion. It is often used as a blanket term describing a variety of places, which "obliterates the wide divergencies which exist between the characteristics of such spaces".[18] Wastelands, according to Tim Edensor, generally refer to a degraded and banal form of industrial environment, one without the conventional aesthetic appeal and valued characteristics, in preserved brick warehouses, decommissioned heavy machinery and historic equipment that is definitive of other forms of ruins.[19]

One of the key challenges in the application of adaptive reuse to the industrial wasteland is the question of structure. Existing form is always a necessary part of adaptive reuse methodology, required to serve as the project's "design generator". Conventionally, reuse projects find their basis in intact and inhabitable buildings, which according to Bollack are open to be cut up, intersected, wrapped and woven with new program and form in an infinite number of ways.[20] The wasteland, being an environment that has been stripped of many of its original historic buildings, invites the need to explore other possibilities of form with landscape emerging as a key concept. The structure and value of the industrial wasteland is tied to its terrain that through years of change and decline, has become a

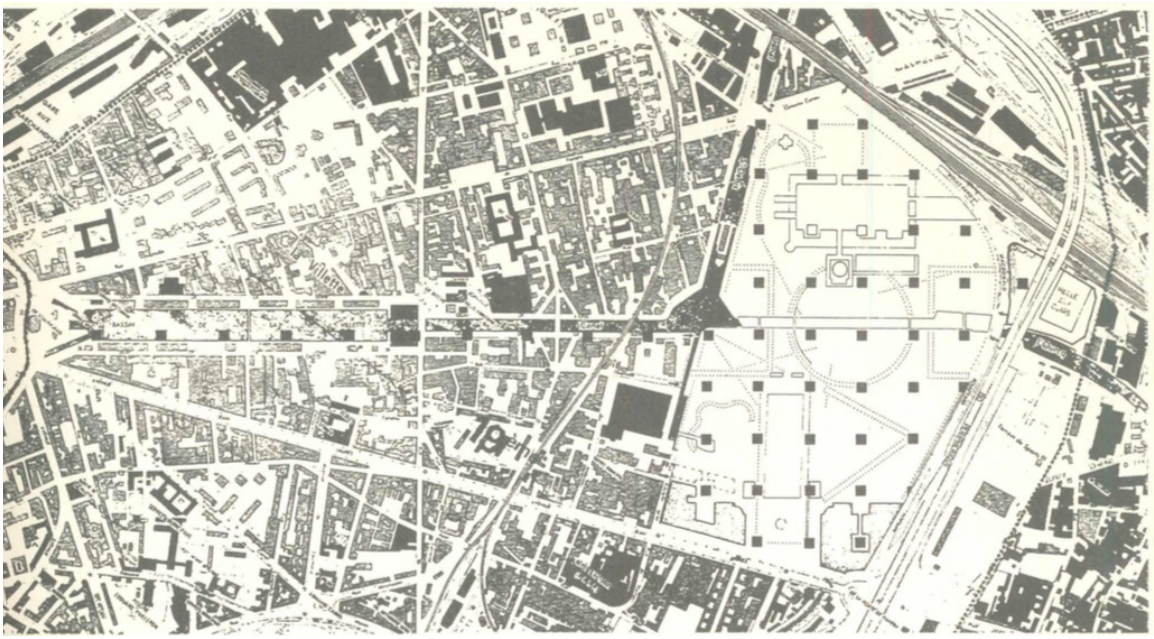
18 Tim Edensor, *Industrial Ruins: Spaces, Aesthetics, and Materiality* (Oxford [U.K.]; New York: Berg, 2005), 9.

19 Ibid.

20 Bollack, *Old Buildings, New Forms: New Directions in Architectural Transformations*, 10.

confusion of fragmented historical and developmental layers. These elements compose a landscape of information that serves as the site's basis to add and inform new architecture. The intention of this project is to establish a new strategy of industrial adaptive reuse, the organism strategy, that extracts and builds the components of its architectural form through the layered elements of the degraded waste landscape.

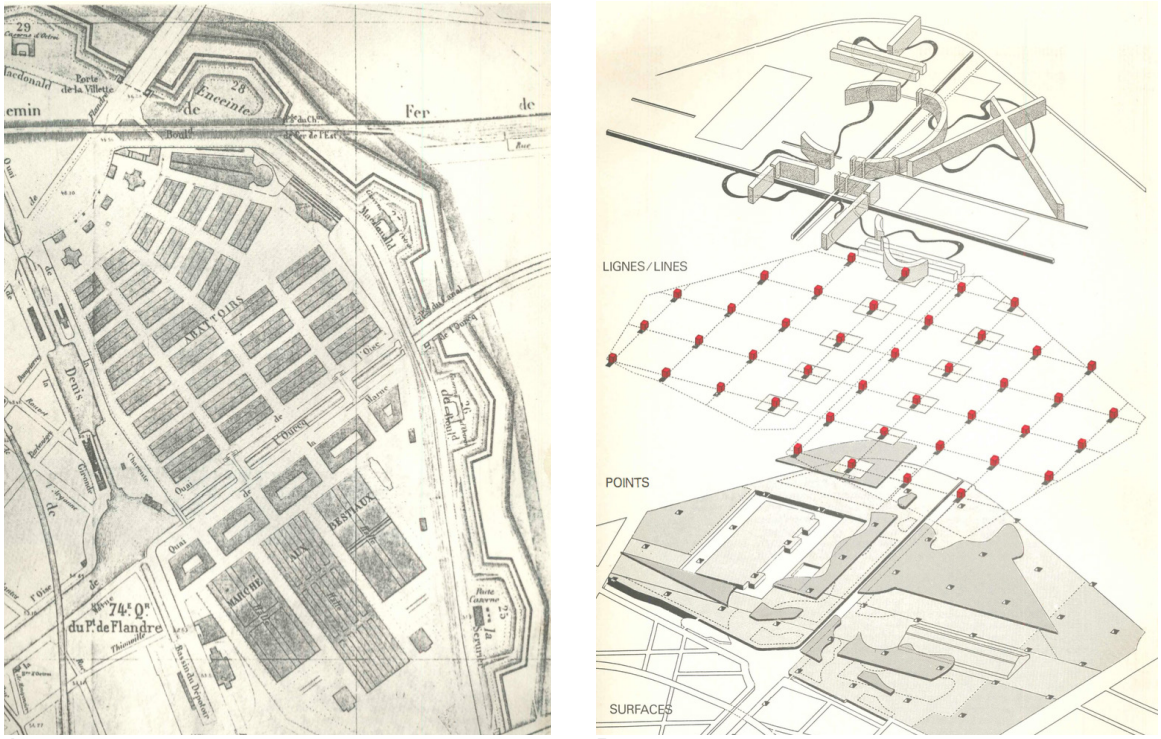
While the use of layered landscape elements as the basis for adaptive reuse is a new approach, Bernard Tschumi's Parc de la Villette in Paris is presented in this project as precedent for its development. As an entirely new construction, it is generally outside normal convention to refer to the Parc de la Villette as a strategy of adaptive reuse, this discussion however, will highlight a number of parallels. The La Villette site, prior to development, was an industrial wasteland, once a prominent industrial area containing Paris's now defunct central slaughterhouses. The design competition was conceived as a way for the city to recover this space and expand on the cultural depth of one of its key urban regions.[21] Even though the area was stripped of its original industrial forms, the fact that it was not "virgin land", already marked by a history of activity and change, would heavily influence the design proposal.



Parc de la Villette in Paris, Urban Plan from Tschumi, *Cinégramme Folie: Le Parc De La Villette.*

21 Bernard Tschumi, *Cinégramme Folie: Le Parc De La Villette, Paris Nineteenth Arrondissement* (Princeton, NH: Princeton Architectural Press, 1987), II.

Instead of introducing a new, foreign mass or object, Tschumi would opt in his design, to capture the identity of the site in urban layering.[22] He saw La Villette as not just tied to its industrial past, but as a place of complex and interacting layers that gives the site its unique energy. The site in preparation for redevelopment was cleared of its past forms, however, Tschumi designed his own abstracted system of layers, a “system of lines”, a “system of points” and a “system of surfaces”. These components were developed from the real structural forces enacting on the site and city, and would interact to regenerate the urban environment. The primary requirement of adaptive reuse is the addition of new architectural layers which navigate the space between the site’s original form and its new function. I would argue that Tschumi’s system of designed urban layers meets this need being a historic representation as well as a translational form that connects the structures of the past industrial wasteland to its new urban use.



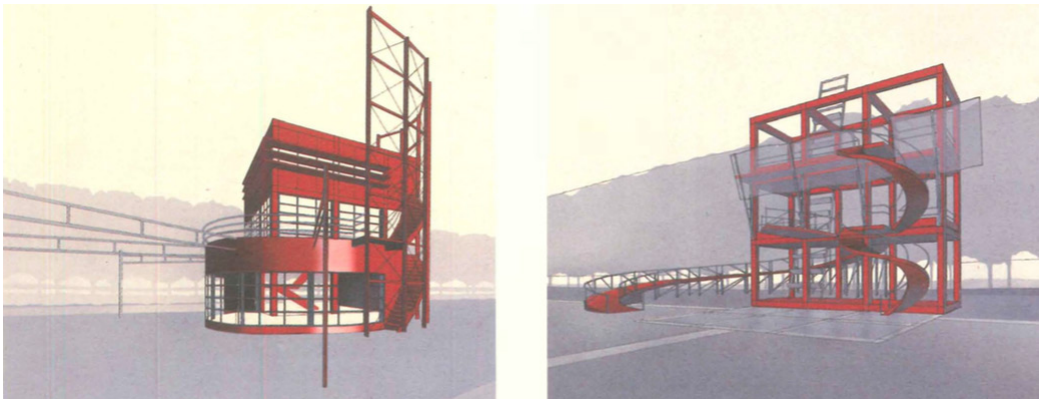
A B

Parc De La Villette, (A) Slaughterhouses at the La Villette site, Plan; (B) Design scheme of super-imposed urban layers; drawings from Tschumi, *Cinégramme Folie: Le Parc De La Villette.*

One of the criticisms of traditional strategies of adaptive reuse is its reliance on aesthetic form to generate architectural interest. These projects become tied to a vacant industrial identity, a form “emphasizing the cultural rather than the actual significance of buildings

22 Ibid., 4.

and terrains" and which "invite aesthetic experience and "textual" interpretation".[23] This process allows places to become fixed and static, adhered to past form to maintain "an experience rich with memories, associations and feelings".[24] The Parc de la Villette demonstrates a decoupling from the aesthetic to rather focus on the propagation of contemporary urban dynamics and activity. The three independent systems introduced by Tschumi were designed specifically as elements of unexpected interaction, often resulting in incoherent, but still interesting programmatic outcomes. The intention was that "the superimposition of three coherent structures can never result in a super coherent megastructure, but in something undecidable, something that is the opposite of a totality".[25]



Renders of Industrial Follies of Parc de la Villette from Tschumi, *Cinégramme Folie: Le Parc De La Villette.*

The highlight of the Parc de la Villette are the dramatic industrial follies which are found scattered throughout the site following an established point grid. Each one entirely unique, these follies are not attached to preexisting forms, but are transformations of the site's layered composition. La Villette is designed to be anti-contextual, its spaces having no real relationship with their history or surroundings.[26] As such, the focus shifts from retaining industrial meaning to the development of urban life. The folly transformations are a product of this intention, structures that seem to naturally "erupt" from the complex interaction of site activities and forces. They are both "singular points and anchoring points of possible future constructions".[27]

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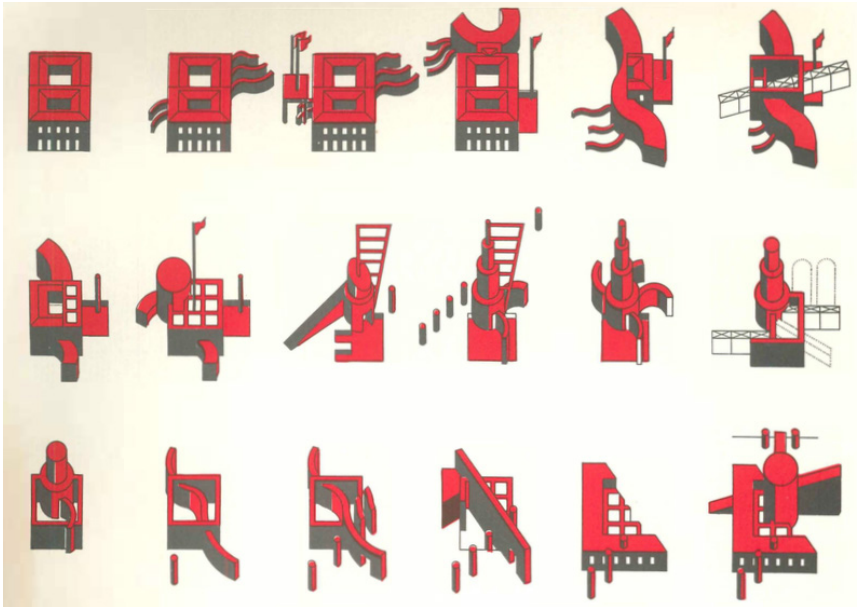
23 Sarah Hemmings and Martin Kagel, "Memory Gardens: Aesthetic Education and Political Emancipation in the "Landschaftspark." *German Studies Review* Vol 33, No. 2 (2010). 244.

24 Ibid.

25 Tschumi, *Cinégramme Folie: Le Parc De La Villette*, VII.

26 Ibid.

27 Ibid., 4.



Conceptual representations of the La Villette folly transformations from Tschumi, *Cinégramme Folie: Le Parc De La Villette.*

The Parc de la Villette is ultimately a deconstruction of the traditional systems of architectural organization. The design dismantles the traditional rules of “composition, hierarchy and order” with its forms instead being established through a series of “architectonic, spatial and programmatic transformations.” The intention is to nullify the relationship between program and architecture. The “park” in this process would not become a “totality”, but rather a place in transition, of dynamics, change and growth.

The ideas of dynamics and transformation that are developed in La Villette will be revisited in the development of the organism strategy. It is the objective to create a transitionary and responsive environment within the wasteland, an architecture whose structure and form is grown through a transformative process from the unrelated elements of its disjointed landscape.

Strategies of Post-Industrial Reuse

As already touched upon, there is a significant, established culture of industrial area remediation and recovery though adaptive reuse. Industrial sites are special parts of the urban realm. Areas of production, profit and exploitation, they are shaped and manipulated by the forces of capitalism that can lead to both prosperity as well as abandonment and dereliction.[28] There is something inherently inhuman and foreign about these spaces in both their composition and scale that provokes an intense curiosity. Isolated from other human channels, these landscapes are often bizarre, mechanical and grotesque that in ruin, become regions of “transgressive and transcendent possibilities”[29] unrestricted by the controls that confine other parts of the city.

Prior to developing any new adaptive reuse strategies, it is a key step to first isolate and study the existing methodologies of reuse as they are applied to the greater context of industrial ruins. This step will establish a sense of the development culture of urban post-industrial space and help structure further investigations into the industrial wasteland. The following sections will explore three of the most prominent reuse approaches with the focus being on the specific challenges and needs that direct and govern their structure. These issues include industrial site contamination, the preservation of industrial structures and the need to inspire economic activity in the interior city.

The three approaches that will be studied are isolated as the *Industrial Landscape* strategy, the *Industrial Museum* strategy and the *Industrial District* strategy, labeled in terms of the adapted program.

28 Edensor, *Industrial Ruins: Spaces, Aesthetics, and Materiality*, 4.

29 Ibid.

The Industrial Landscape

Piazza Metallica of Landschaftspark Duisburg-Nord; photograph from the website of Latz + Partner, project page for *Duisburg Nord Landscape Park*.

Of the many approaches to industrial adaptive reuse, one of the most frequent responses is the transformation of the industrial site into that of urban nature or park space. There is a certain romance involved in the return of an exploited landscape to a more natural form, allowing the emerging ecologies of the site to propagate and take hold of the landscape after being restricted by human activities for many years. One of the clear advantages to developing industrial space in this manner is that it is a direct response to the concern of ground contamination and pollution in former industrial regions, particularly of the oil, gas and chemical industries. Contamination is regularly found in all varieties of industrial ruin from degraded wastelands to preserved factories and rather than digging up and moving toxic ground which can destroy the integrity of the site, it is possible and highly desirable to remediate in situ by the addition of vegetation and other natural processes.[30]

A number of projects help define this strategy, the Fresh Kills Landfill remediation in New York, the Gas Works Park in Seattle or the High Line in Manhattan are just a few examples that standout. However, none of these so clearly demonstrate the integration of landscape

30 Niall Kirkwood, *Manufactured Sites Rethinking the Post-industrial Landscape* (New York; London: Spoon Press, 2001), 32.

and ruin as the Landschaftspark Duisburg-Nord, designed by Peter Latz and Partners. The Landschaftspark project was initiated by the need to rehabilitate the Thyssen Iron Mill in Duisburg, Germany, a fundamental industrial site of Germany's Ruhr district permanently closed in 1985 after 100 years of operation. The Thyssen Mill is an ideal heavy industrial ruin. Its beautiful, fantastic, contorted structures yearn for inhabitation, naturally composing a freakish and distorted playscape.

Integrated pathways of exploration in the Landschaftspark Duisburg-Nord; photographs from the website of Latz + Partner, project page for *Duisburg Nord Landscape Park*.

The primary challenge of this site's rehabilitation was in its high toxicity, and even today there remain areas which are too contaminated to support occupation. The design objective was to respect these areas, but also find a mode of usage through them. Latz opted for an integrative approach to the mill's transformation, "reimagining the landscape rather than forcefully reshaping it".[31] He rejected the notion of carving a rigid pathway through the ruin, a line to navigate its form, instead he would create a seamless landscape, unifying the park and ruin for creative, but also safe exploration. It's program in recreational and play sites are found scattered throughout the ruin, diving pools from the ore bunkers, climbing walls from blast furnaces and chimneys, playground equipment that "grows" in and around the industrial forms, skate parks and gathering places from the divoted and broken ground as well as dozens of others to impress a sense of freedom and imagination.

This integrative approach to adaptive reuse defines Landschaftspark's unique beauty. The site is a metamorphosis, a natural transformation of landscape from one form to another, a space of industrial function to a space of recreation. This concept was motivated by the form of the ruin, Thyssen Mill was not a monument to preserve, it was a place whose

31 Hemmings, "Memory Gardens: Aesthetic Education and Political Emancipation in the Landschaftspark", 244.

cultural significance included “its wounds and bruises, layers of experience and distant memories”.[32] In design, this decay would continue, the structures manipulated by use and natural processes. Its gardens would be wild and invasive, vegetation invading the cracks and spaces of the industrial structures. The park would remain place in process, establishing an entirely new urban ecology, a balanced habitat of people, nature, history and change.

The Industrial Museum

Zeche Zollverein Complex. Visitors Center; photograph from Wikipedia; Wikipedia’s “Zeche Zollverein” entry.

It is no secret that most adaptive reuse projects have a strong focus in preservation. The industrial remains a part of our urban heritage, a form and aesthetic that we work to keep alive in the fabric of the contemporary city. Industrial spaces are currently experiencing rebirth as centres of urban culture, following the argument that “the final stage of an industrious bourgeois existence is the aesthetic”.[33] In this process we navigate the fine line of using design as a means to propel society forward while continuing to maintain an awareness and honour for its storied past.

32 Ibid., 245.

33 Ibid., 243.

The basis of this strategy is that the industrial site is recognized as a form of urban exhibit, an artifact that is used to educate, however the site as architecture must also be an active element of the functional city and the key to the overall design is finding an appropriate balance between these two needs. The nature and condition of the ruin is generally indicative of the direction of the design, a ruin of importance is preserved as a museum, others are more relaxed in their adherence to keeping existing form, "fostering historical consciousness" as they are interpreted creatively to hold new urban program.

These aspects are demonstrated clearly in the development of the Zeche Zollverein Complex during the mid 2000's. The Office for Metropolitan Architecture (OMA) was commissioned to design a masterplan for the Zollverein Coal Mine in Essen, Germany. Zollverein is an industrial site of exceptional cultural importance, designated in 2001 a UNESCO World Heritage Site. Like Landschaftspark, Zollverein is one of the thousands of industrial sites that are scattered through Germany's Ruhr district. The Ruhr as a historic industrial conglomerate, is currently undergoing a significant cultural transformation, with Zollverein serving as its cultural and educational centre, unifying the region's industrial identity and message.[34]

(A) OMA's Masterplan with arrangement of new programs with existing mining complex (white and grey) from OMA's website, project page for *Zollverein Masterplan*. (B) Contemporary museum additions blended with the existing industrial form; photograph from Archdaily, "A Photographic Journey Through Zollverein."

Zollverein is first and foremost a museum, with the site itself an immense interactive exhibit. Its buildings and mining equipment were perfectly preserved following closure and are now protected as part of the country's textured history. The Zollverein development demonstrates the underlying aesthetic fixation that tends to direct these types of reuse projects, being that above all other needs, new architecture must translate and enhance

34 Walter Hauser, "The Ruhr Museum at the Zollverein Colliery in Essen, Germany." *Technology and Culture* 52, no. 1 (2011). 173.

the industrial personality of the existing site. At the site, modern forms are blended with the preserved image of industry, additions are given artificial industrial personas to develop the impression of an unbroken historic artefact.

Though the museum component anchors Zollverein's cultural and historical meaning, it composes only one segment of a vast complex. The area in its entirety is conceived as a creative-cultural city, the centre of a new culture based regional industry. The mining complex is repopulated with a variety of creative initiatives which serve as "catalysts for realizing new creative industries and making Zollverein a place of regional cultural identification."[35]

The Industrial District

Gooderham and Wart's Distillery District, Toronto, ON; photograph from Flickr website.

The final adaptive reuse strategy that is presented in this project is the Industrial District strategy. The Industrial District is a variation on the cultural or entertainment district, a development form that has grown popular among North American cities attempting to use entertainment, leisure and consumption to spur economic growth in their lifeless, post-

35 Phillip Dorstewitz, "Planning and Experimental Knowledge Production: Zeche Zollverein as an Urban Laboratory." *International Journal of Urban and Regional Research* 38, no. 2 (2014), 432.

industrial urban cores.[36] The motivation of this development method is to supplement the city's lost industrial economy with a new tourism-based one in the hope of generating enough interest to attract new business, young professionals and a renewed demand for downtown real estate.

The design of these districts is approached in a variety of ways, typically using the existing cultural capital of the city to enrich the space with an urban identity. An identity or "theme" is an important element used to establish the district as a distinctive area, a place of character that stands out from the rest of the mundane city. Industrial ruins are often used as the structural framework for these districts as a curiosity or artefact that will provide the project with a genuine historical texture.

Commercialized cultural artefacts of the Gooderham and Wart's Distillery; photos from Toronto Distillery District Photo Essay.

A prime example of an Industrial District is the Gooderham and Warts Distillery District in Toronto, ON. This contemporary urban community was built out of the ruins of the historic Gooderham and Warts distillery which closed in 1990. People were quickly drawn to the site for its distinctive array of preserved Victorian era industrial buildings and in 2003, the site was renewed as a cultural district and destination featuring "art galleries, performance venues, studios, restaurants and bars".[37]

Critics argue the artificiality of these cultural district projects, using the term "Disneyfication" to illustrate the prominent use of environmental engineering to manufacture the

36 Margaret Kohn, "Toronto's Distillery District: Consumption and Nostalgia in a Post-Industrial Landscape." *Globalizations* 7, no. 3 (2010), 361.

37 Ibid., 360.

desired public atmosphere.[38] Original buildings if they are still intact, are hollowed out, leaving only facades of weathered brick and steel as set pieces to provide experiential depth. The industrial ruin no matter its condition is sanitized, unattractive layers and decay removed in order to cater to a new affluent population. Additionally, we cite the impact of nostalgia which has a significant effect in the development of these particular communities. Much like a theme park, cultural districts become popular destinations by conforming to an idealized image of a lost industrial era. In reference to Toronto's Distillery District and other similar projects, Margaret Zohn sentiments, "these places elicit a longing for a time that did not really exist". Nostalgia, as Kohn discusses, is often based on a distorted past, highlighting positive aspects and similarily forgetting the negative, a situation which critics claim suspends the ability for critical assessment of the surrounding world as it is presented.[39]

Another prominent issue with "cultural district" projects is the attitude of preservation and protection that accompany them.[40] In the interest of creating a public destination, these neighbourhoods become an oasis, a city within a city as localities employ barriers, physical as well as emotional or social barriers looking to conserve the environment they have constructed. Though these measures have a basis in historic preservation, arguably it becomes more about protecting the project's profitability being an economic enterprise and upscale consumer environment.

Summary

Through a process of intense urbanization and wasteful post-industrial development practices, North American cities have experienced in the late 20th century, significant erosion of their distinctive urban forms and aspects. Adaptive reuse, as a reaction, has emerged as an important development strategy in its support of city identity through the rehabilitation of existing buildings and architecture. Recently, this approach has become widely used in the recovery of decayed urban industrial areas. Though this process generates a variety of creative urban responses prompted by the unique challenges of these sites,

38 John Hannigan, *Fantasy City: Pleasure and Profit in the Postmodern Metropolis*. (London; New York: Routledge, 1998), 73.

39 Kohn, "Toronto's Distillery District: Consumption and Nostalgia in a Post-Industrial Landscape", 360.

40 Hannigan, *Fantasy City Pleasure and Profit in the Postmodern Metropolis*, 4.

typically these developments in their attachment to historic form, are found to be intentionally static, disconnected and in isolation from the rest of the city.

This discussion introduces the need for a new strategy of adaptive reuse, the organism strategy that unlike the existing methods focused on maintaining past form, will create a dynamic, living environment from the sparse, deteriorating elements of the industrial ruin. The new industrial community will create a connection with the city with its evolving structure designed to respond to its ever changing conditions.

The next chapter will introduce the concept of living, biological architecture through several organicist theories that will be used to inform and develop the Industrial Organism strategy of adaptive reuse.

CHAPTER 2: LIVING ARCHITECTURE

Architectural Organisms

"Helix City" conceptual plan by Kisho Kurokawa from Kurokawa, *Kisho Kurokawa: The Architecture of Symbiosis*.

The "organism" is the conceptual driving force of this thesis investigation. This concept has a long history in architectural theory with the organism analogy forming the basis of the organicist tradition. The organism represents "the qualities of wholeness, of integrity, of a unity in structure such that the parts all contribute to the effect or purpose of the whole".[41] This idea of beauty through ordered unity has manifested itself through the world of art since the times of antiquity though it wasn't until the industrial revolution that the organism became associated with the machine, the physiology of a living entity in it's specified and perfect individual parts supporting the whole, mirroring the mechanized form. It became a natural transition for the architect to think of buildings in a similar manner. Buildings being in essence "a machine for living".

41 Caroline Van Eck, *Organicism in Nineteenth-Century Architecture: An Inquiry into Its Theoretical and Philosophical Background* (Amsterdam: Architectura & Natura Press, 1994), 12.

Organic architecture today, just as it was 200 years ago, is based on biomimicry within the built human environment. This concept is used to produce and test new creative forms that enlivens the human sphere. Organicism as part of its nature evolves. The practice changes and reshapes through innovation, technology and growth in knowledge of biological behaviours and systems.[42] As such, today we are developing ideas that could never have been imagined in its beginnings.

The upper limit of organic investigation is ultimately the creation of true biology. Though a lofty, seemingly intangible goal, it remains the overarching curiosity that guides interest in organicism. Architecture once reaching this point would design and perpetuate itself, no longer requiring the architect to instruct form.[43] Built space existing in complete response to the environment, the human component not given preference, but considered as just one part of a complex ecosystem. The architectural organism in the theoretical sense, bridges the space between the human and the natural realm, unifying these entities.[44]

Theoretical Origins: Organicism

Far before discussions of biology or even science, nature represented the divine, it's mysteries providing an important link between man and creator. Nature would become a theme of humanity's most revered spaces, decorative motifs adourned temples, palaces and other centres of society.[45] The forms of nature would be used to elevate the meaning of that which was man made, transcending nonliving base materials to create higher orders within the human domain.

In the 19th century organicism emerged as a definitive architectural practice. Interests shifted towards the scientific as expanding knowledge provided insight into the behaviours of life and the world. Science explored the underlying behaviours and mechanics of nature, while artists considered the philosophic, defining the relationships between nature and man, living and artificial, and contemplating the deeper unity of these reciprocities.

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42 Deborah Gans and Zehra Kuz. *The Organic Approach to Architecture* (Chichester [England]: Hoboken, NJ: Wiley-Academy; John Wiley and Sons), 2003.

43 Ibid., 40.

44 Ibid.

45 Van Eck, *Organicism in Nineteenth-Century Architecture*, 12.

Organicism as according to Caroline Van Eck is defined as “the metaphorical application to architecture of concepts originally reserved for living nature”.[46] Simply put, focus was on developing a natural or “life-like” essence within created structures - an “illusion of life” - through use of organic forms and concepts. Organicism, like other forms of 19th century art was driven by the widespread thought that “art should imitate nature”. Through forms of imitation, people believed they could begin to create life within “dead” matter that occupied and defined much of their environment.

Genetic Architecture

The development of building as an organism naturally leads to investigation of architectural genetics. Genetic process is the basis of a true living entity, a form that is capable of directing its own growth, adaptation and evolution in response to a changing, dynamic environment.

The following sections look at several prominent organicist concepts used to establish the current discourse of genetic architecture. These theories which include discussion of metabolism, evolution, morphology and genomics will be used to inform the investigation into development of an industrial organism, a living entity to rebuild the decaying landscape of the industrial wasteland.

Metabolism

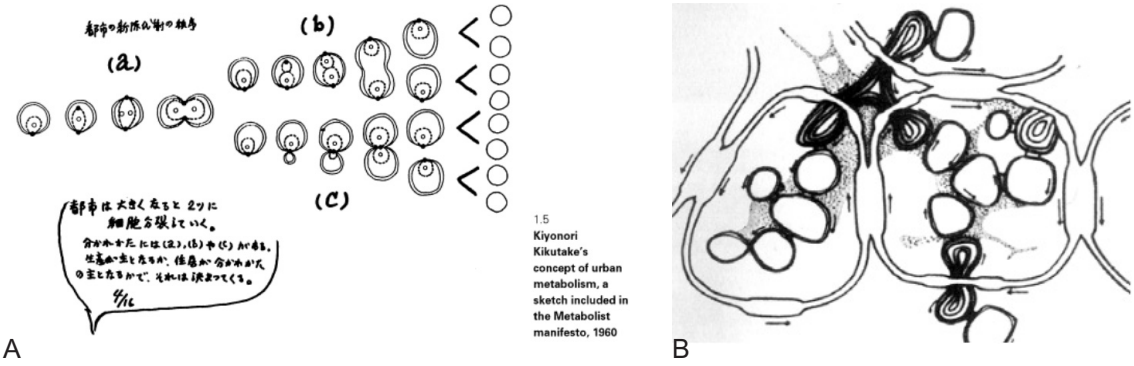
Metabolism or “metabolic architecture”, one of the earliest formal incarnations of genetically oriented architectural thought is the first organicist theory that is introduced in this project. Architectural metabolism is a concept of regeneration, urban structure conceived through a process of continuous repetition and replication of simple elements. Form and structure is devised to grow, shift and fluctuate responding to the needs of the “organism”. It fluidly expands and contracts, “underwent naturally periods of disintegration and reintegration”.[47] Metabolists envisioned a “utopia of resilience”, that the city could through its intrinsic structure and form, maintain itself through intense change and cycles of decay. In this sense of resilience, metabolist theory is thought to provide an excellent basis for the

46 Ibid.

47 Meike Schalk, “The Architecture of Metabolism: Inventing a Culture of Resilience”, *Arts* 3, no. 2 (2014), 284.

renewal of community form in the industrial wastelands, being regions in heavy depletion and deterioration.

The seeds of metabolist theory developed out of the political and social atmosphere of post-WWII Japan. A time of systemic transformation, Japan was attempting to recover from the devastation of the war, reconstruct their sense of national identity and reconfigure the city to handle the sudden urban population growth and housing crisis that occurred in the 1950's and 60's.[48] This transformative environment inspired Japanese architects to completely re-envision the basis of the city, to rewrite its structure down to its systems of order and organization. At this point in time, cities in Japan were largely without established networks of urban infrastructure[49] of which impeded efforts of recovery, architects however, looked at this as an opportunity to instate a new ideal for city form.



A B

Metabolist Sketches. Explorations into cellular metabolic process and form. A) Kiyonori Kitutake, cellular mitosis from Lin, *Kenzo Tange and the Metabolist Movement*, B) Kisho Kurakawa; Image from *Kisho Kurokawa: The Architecture of Symbiosis*.

The basis of metabolism is largely in biological form and metaphor, the theory named for the life sustaining chemical functions of living cells. Metabolists viewed the city as a single, complex organism, all elements "regarded as part of a flow, in a constant process of becoming and declining".[50] The objective was to build the city's infrastructure as a living system with its processes functioning in perfect material balance or homeostasis, minimizing waste and inefficiencies, and its form in continuous renewal through the programmed consumption and redistribution of aging or redundant elements. Urban form as the embodiment of an organism, was structured as a collection of interrelated units or "cells", individual entities that through their relationships were bound as one. Metabolist architects

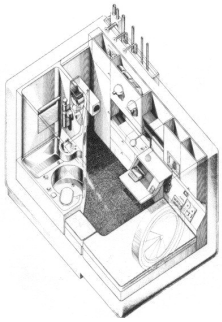
48 Ibid., 282.

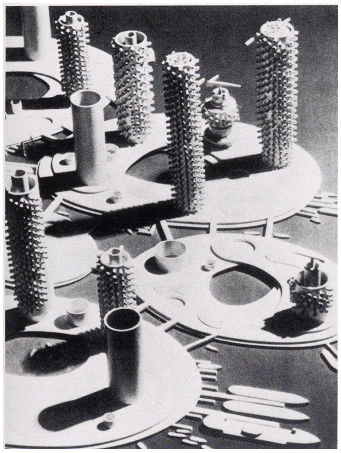
49 Ibid., 283.

50 Ibid.

held to study these relationships, to understand the basis of collective form as the forces of aggregation that guide the construction of human community.

A





B

Cellular “capsule” architecture that is associated with metabolism. A) Nakagin Capsule Tower, B) Ocean City Project; Images from Koolhaas and Obrist, *Project Japan*.

The concept of collective form was studied extensively by Fumihiko Maki, one of metabolic architecture’s principle figures. Maki was critical of the structure of the existing city, claiming it to be a static form, lacking in elasticity, flexibility as well as visual and physical character. He felt that the practice of architecture was driven entirely by the interest to create grand, perfected, individual buildings and as such, today “we suffer from an inadequacy of spatial languages to make meaningful environment.”[51] Contrary to this observation, he recognized there are many examples of rich collective form found in cities, towns and villages throughout the world, however, these structures and relationships are evolved rather than designed. Collective form is an attempt to understand the development of community environment, the fundamental basis of meaningful urban structure.

Maki identified collective form in three basic approaches, the first being compositional form, the second megastructure and the third group form. Compositional form is described as the traditional modernist approach associated with conventional architectural development. It differs from the other less familiar approaches, in that building elements through their composition creates a totality, a complete statement that is static and inflexible. This is in opposition to the group form approach which is a “system of generative elements in

51 Fumihiko Maki. *Investigations in Collective Form* (The School of Architecture, St. Louis: Washington University, 1964), 5.

space”[52]. Its form is based on the natural relationship of related elements. Importantly these elements can be freely added or removed from the ensemble while not breaking down the form of the complete structure. Group form elements have their own intrinsic linkage structure, an evolved code or program based on complex, developed social processes that create its unique greater form.

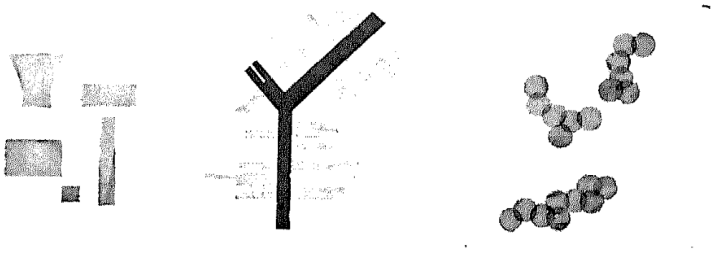
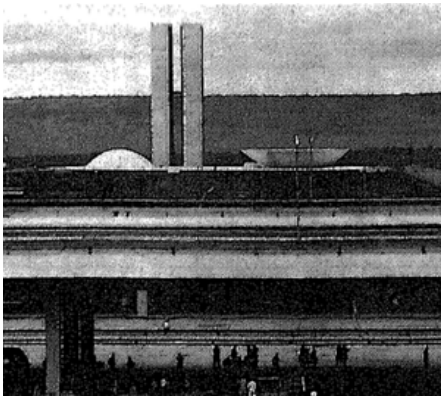
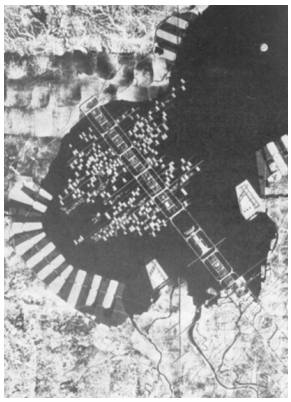


Fig. 1, Approaches to collective form. From left to right, compositional form, megaform, group form.

Diagrams representing the approaches to Group Form, reproduced from Maki, *Investigations in Collective Form.*



A) Brasila
Compositional Form



B) Tokyo Bay Project
Megastructure

C) Japanese Lineal Village
Group Form

Examples of the different approaches to collective form. Images A and C from Maki, *Investigations in Collective Form,* and B from Schalk, *The Architecture of Metabolism*.

Megastructure as compared to group form is an attempt at a designed approach to true collective form. Most definitive metabolist projects can be classified a form of megastructure. The most famous, Kenzo Tange’s Tokyo Bay is discussed as a prime example, with its immense spine of infrastructure stretched across the waters of the open bay, providing an anchor for hundreds upon thousands of urban sub-units. The project clearly illustrates the megastructure as a designed urban community, an artificial landscape, open-ended form that can be continually expanded and retracted for necessity.[53]

52 Ibid., 14.

53 Schalk, “The Architecture of Metabolism”, 288.

Tokyo Bay, like other metabolist megastructures, came under criticism for its reliance on implemented technology. The fear of realizing such massive scale, utopian projects was that the technology of its base framework would eventually become obsolete, making the community an anchor on the city. Critics also questioned the judgement of the architects on such ambitious, city scale projects, being heavily focused on form and aesthetic rather than mastering the specific technological details.[54] The metabolists suggested a notion of free development, individuals empowered to construct their own spaces “plugged into” the greater megaform, however provided no detail to how it is to be executed.

The concept of linkage concludes Fumihiko Maki’s investigation into collective form. Neither community nor cluster can exist without a notion of bonding. It is the glue that creates a environmental composition from scattered site elements.[55] The discussion of linkage is particularly relevant in reference to the industrial wasteland, being that the primary concern is with establishing a sense of urban structure from the region’s broken and unrelated fragments. In group form, linkage is an evolutionary element, developed through social process. This is the challenge of genetic urban design, how to create through design action, a naturally evolved environment, or rather establish a process that takes scattered pieces and from them develops an essence of deep community and structural order.

There is great difficulty in understanding the hidden social complexities of evolutionary linkage. As Maki states, “whatever we use to determine the form of linkage in urban design must come from a body of largely untapped information about cities as we know them”.[56] The only evidence of these genetic processes is the existing morphology of the forms that result and to even just scratch the surface of their understanding is exhaustive investigation into their forms. Despite this complexity, Maki identifies a number of basic operations that are shared in the morphology of known examples of group form which can be used in design to attempt to artificially generate a socially connective form from unrelated fragments. The five identified operational categories of linkage are: 1) Mediate, 2) Define, 3) Repeat, 4) Functional Path, and 5) Select, and are defined in the following diagram series.[57]

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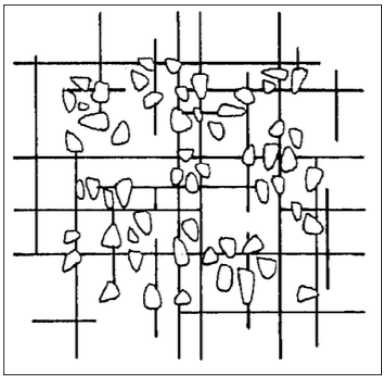
54 Ibid., 290.

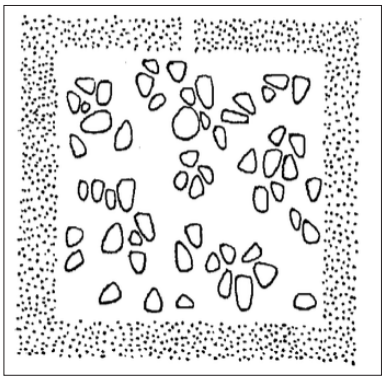
55 Maki, *Investigations in Collective Form, 35.*

56 Ibid., 32.

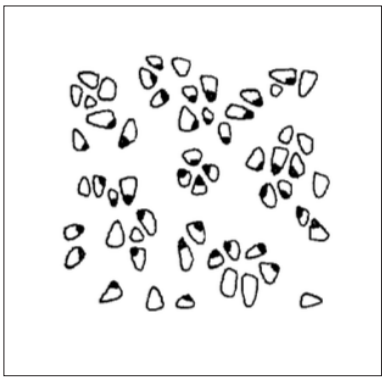
57 Ibid., 37.



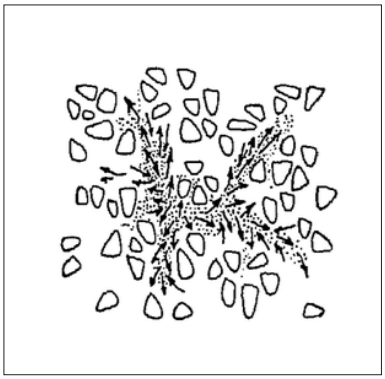
1) Mediate:
Connection of elements with intermediary forms and spaces.



2) Define:
Enclosure of elements within a form of barrier to unify the internal forms and separate from external.



3) Repeat:
To link elements through some form of common feature.



4) Functional Path:
The creation of a path of sequential activities. Concept based on rituals that it is common community practice to arrange primary activities in sequence in space.

5) Select: (Undiagrammed)
Establishment of inherent formal unity through initial selection of site.

Diagrams of metabolist group form operations established by Fumihiko Maki reproduced from Maki, *Investigations in Collective Form.*

Though this project is being approached from primarily a genetic perspective, these morphology based operations will be included in the exploration for the wasteland community. Genetic architecture, though our focus, remains a highly abstract, developing concept and as such the complete architectural organism will depend on a variety of supportive organic concepts that include metabolist bioform, collective form and megastructure to seed a functioning, connective urban space.

Evolution of Form

Metabolism provides an excellent introduction to the genetic basis of architecture, but the directive of this project is to establish a specific genetic mechanism for architectural development. As we transition into a deeper discussion of genetic structure, it is important to discuss further the greater concept of biological evolution and explore its analogy within man made or artificial forms. This exploration can provide a great deal of information about how entities change as a living process.

Evolution as a general concept was conceived far before people developed any understanding of its underlying mechanism. Initially a process of morphological transformation, it was observed through meticulous study of the fossil record. Early scientists began to identify clear patterns of connected form in a variety of collected archeological specimens though the manner of how and why these processes occurred remained unknown. A mechanism for evolution would not be proposed until Charles Darwin recorded this same phenomena within that of living organisms. These observations brought him to develop the groundbreaking theory of evolution by means of natural selection, undoubtedly the "most important event in nineteenth century biology".[58]

Natural selection is based on the inherent struggle for survival among organisms living in an environment with limited resources. Only organisms with the combination of traits best suited for their environment would have an evolutionary advantage and survive to reproduce. This process is what is referred to as "survival of the fittest". The key to this process is that "within one species all individuals are not exactly identical; they vary in all sorts of

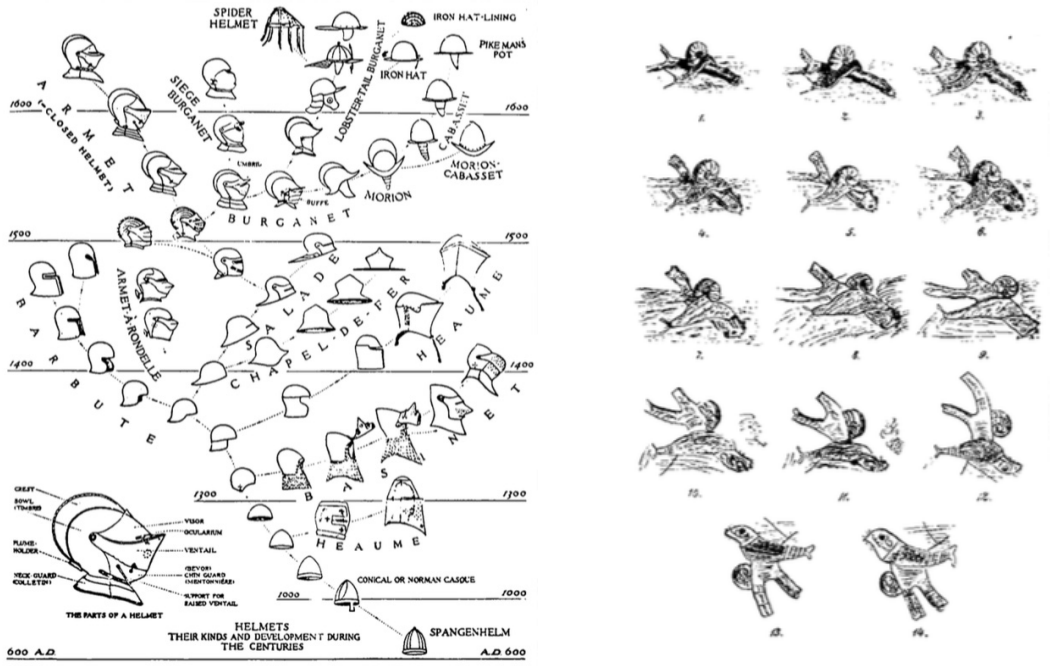
58 Philip Steadman, *The Evolution of Designs: Biological Analogy in Architecture and the Applied Arts* (Cambridge Urban and Architectural Studies; no. 5. Cambridge; New York: Cambridge University Press, 1979), 71.

ways”[59] and these unique organisms are repeatedly tested against their environment, resulting in a gradual adaptation to surroundings and morphologic change.

Not only biological forms, but also non-living, man-made elements in tools, artifacts and buildings are observed to have a natural basis in evolution. Just as organic fossils were collected, there is a long record of preserved anthropologic artifacts that show a process of morphological transformation almost identical to its biologic counterpart. Though the mechanism differs, there exists a clear analogy between the adaptation of living organisms via natural selection and the development of tools and buildings through use and modification.

The link between this biological evolution and evolution of artifacts and technology, is explained through the parallel between biological heredity and basic copying. Both systems are based in replication and on the fact that the occurrence of copying errors is unavoidable. No two copies of any complex form are ever perfectly identical, but instead are an accumulation of many minor or almost invisible variations. In biology, morphology is codified. The structure of every living organism is contained within a universal code or genome that is found in every cell of its body. The genome is defined through deoxyribonucleic acid (DNA), an unimaginably complex molecule that programs and instructs the biological processes that define a particular organism. The biological genome, as it replicates, regularly incorporates errors in its code and just as people fix errors when they copy artefacts, DNA has its own mechanisms for repair. Mutations occur when an error is missed or cannot be fixed and are propagated into subsequent copies. Usually these mutations are problematic, and just as people discard items that do not serve their function, mutated organisms most often are nonviable. In rare instances a genomic mutation will program a trait that provides an organism with a distinct advantage, improving survival, thus being passed on to subsequent generations through inheritance. Innovations in built form works in a similar way, sometimes errors in form lead to unexpected and valuable new uses which lead to either tools of improved function or occasionally completely new tools with new functions (ie creating a new “species”).

59 Ibid., 72.



A B

Evolution of technology and art, A) Morphological change in Helmets. B) Morphological shift from successive copying of a drawing without original for reference; sketches from Steadman, *The Evolution of Designs*.

Art, much like functional tools, also shows evidence of evolutionary process. Anthropologists Henry Balfour and Lane Fox Pitt-Rivers observed this effect as they studied evolution in decoration. They found that even without clear function to gauge usefulness of a morphological trait, forms would be assessed according to other (most likely) aesthetic standards and still exhibit evolutionary shift.[60] This has direct architectural application, architecture having both functional and artistic characters. Much like decorative form, many aspects of building designs are determined not through function, but aesthetically through the critical eye of the designer.

An interesting part of Balfour and Pitt-Rivers studies highlights how interpretation and ambiguity of features manifest new characteristics and produce morphological shift. They found that as artists copied decorative motifs, new meanings and completely unrelated ideas emerged due to the new layers of interpretation enacted on the piece. Literal forms would rapidly become abstract as ideas were misunderstood or mistaken in translation.[61] These evolutionary behaviours allude to the ideas of Thom Mayne who understands city

60 Ibid., 100.

61 Ibid., 104.

through its dynamic, heterogenous, layered and fractured nature. Mayne claims that ”diversity is the natural evolution of things. To accept this dynamic state rather than to look for a replacement with something fixed, or stable, is to utilize the tremendous energy of the city”.[62] It is interesting to consider how architects can harness these forces, how they can facilitate this evolutionary behaviour to propagate diversity and thus grow new and completely unimaginable forms.

Genomics

The next aspect of genetic architecture brings the discussion into a highly conceptual space. This project maintains that the concept of genetic architecture is a developing science with no finite answers, only explorations into hypothetical spaces and forms. Genomics is concerned with the development of a genetic mechanism in architecture, a system analogous to the DNA or genome of the biological form. The presence of DNA or rather genome denotes that of a true biology, a living entity that can self replicate, naturally creating new variations to be tested against the continuously changing environment. Architecture does have ability to evolve, but as discussed in the previous section, it is a function of our own human evolution. Genomics absolves that architecture, at some theoretical end point can become its own organism, naturally adaptive to its surroundings.

Form is not static. It is changing, it is dynamic, always connected and responding to the greater environment. Form is not created, but evolves through relationships. It starts as one thing and through outer forces becomes another. There is no beginning nor end and this is true for the artificial just as it is for the organic. The developing science of morphogenomics is based on these notions, any form in an existing state can be understood and mapped in terms of its generative morphology, thus we can uncover the formative relationships which shape all architectural form.

The morphological genome exists in the conceptual, however, Haresh Lalvani through his morphogenomic research conceives of a theoretical structure. The genetic code is proposed to take the form of a “hyperuniverse”, a theoretical space entirely of mathematical

62 Thom Mayne, Introduction to *Morphosis: Connected Isolation*. Architectural Monographs no. 23. (London: Academy Editions, 1993), 10.

function where every relationship of life and form exists and interacts continuously.[63] The "hyperuniverse" describes all possible morphologies, "it is infinite and open-ended". Every architectural form, past, present and even future exists within this mathematical space and each of these forms has a unique genetic code called a "morph-code" that identifies its exact morphological makeup or rather its location within the "universe".[64]

The "morph-code" is considered analogous to an organic genome "an epigenetic code that exists in parallel with the biological genetic code captured in the DNA sequences".[65] It is a codified map of all the forces that compose an architectural form, just as DNA is a map of the forces that compose an organic form. While a complete understanding is currently considered an impossibility, conception of a structure is the first step in developing a greater understanding. The directive of this activity is to begin to bridge the space between the artificial and the natural so that one day we can reach the "upper limit definition of organic architecture".[66]

63 Gans, *The Organic Approach to Architecture*,117.

64 Ibid.

65 Ibid.

66 Ibid., 124.

CHAPTER 3: METHODOLOGY

The following section outlines an organism based strategy of adaptive reuse that is the main objective of this thesis. This strategy, inspired by the decaying industrial wastelands, aims to create dynamic form through growth and evolution of site, challenging the predominant static and nostalgic methods of adaptive reuse.

Understanding the Industrial Wasteland

Before approaching the anatomy of the organism strategy, this discussion begins with a brief introduction to the basic structure of the urban industrial wasteland. In later sections this project will go into greater depth as we introduce the design site. Industrial wastelands are found in almost every city in North America. They are regions most inhabitants are happy to ignore; forlorn, endless, desolate landscapes on the edge of highways and arterials, understood mainly from brief interaction along the daily commute. If we wish for an appropriate rehabilitation strategy, it is important to first understand the basic composition of these areas; their existing forms, elements and systems that can be used to develop an urban identity and structure vibrant and productive community.

Every industrial wasteland is a unique space, a product of their city and their combination of fundamental industries. Wastelands are found as shipping ports, railroad and dock yards, factories and plants, industrial warehouses and contaminated fields. Together however, these areas are considered marginal land, places of supportive and secondary uses, heavily infrastructural, voided and lacking in human interaction.

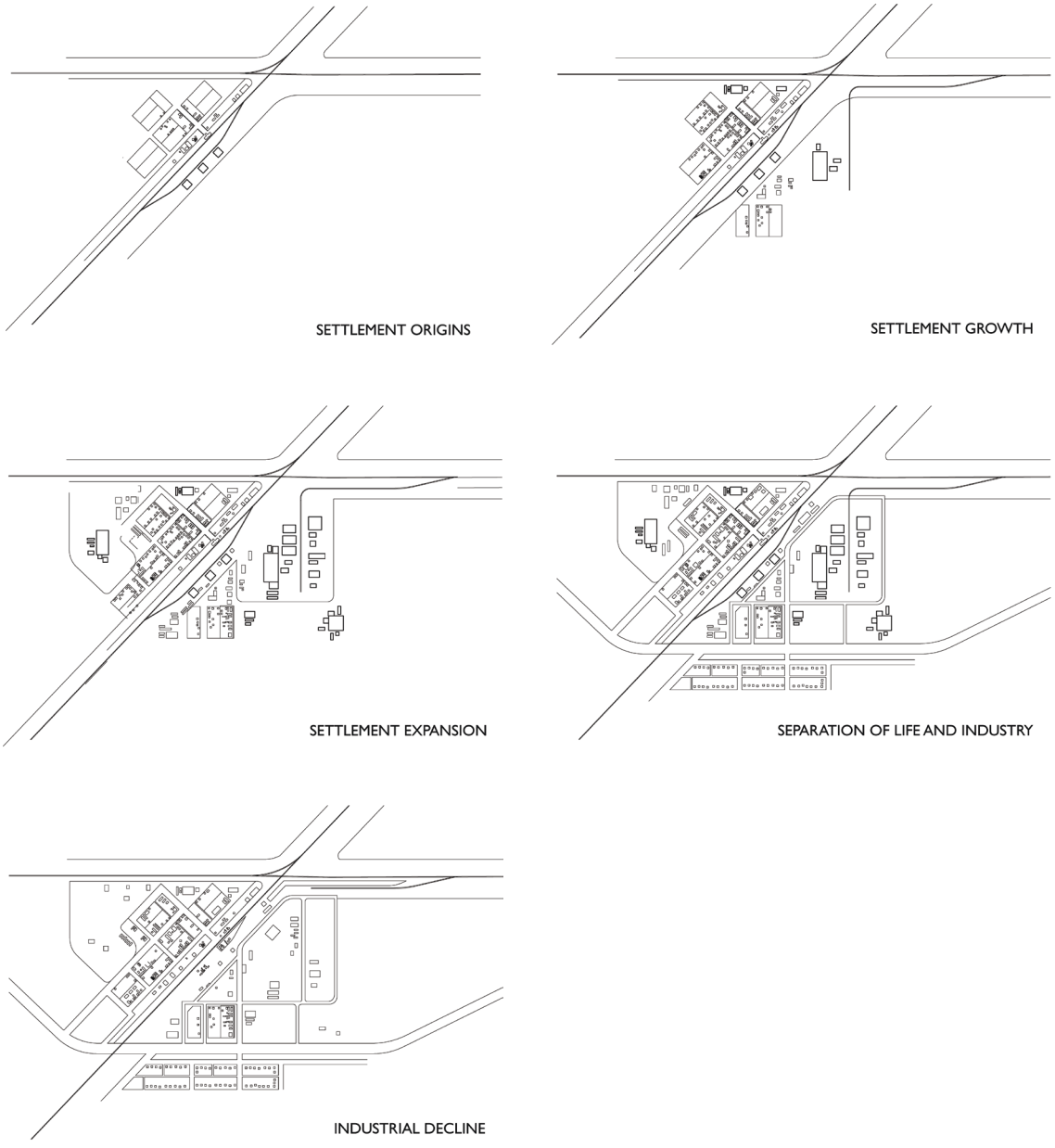
Most current industrial wastelands have a long and varied history in development. At one time they were considered the city's fundamental industry and business regions, places that would come to seed the patterns of urban development and growth. Over years however, as places of capitalist exploitation they have been manipulated, used and abused in the interest of maximizing profit. This careless activity has lead to a degradation of the landscape and generally lowered productive value.

Aerial view of an industrial wasteland - Fort Road Industrial, Edmonton, AB from Google Maps, “Cavalia Big Top Panorama”.

Current wastelands are found in a variety of states of use. Some have been completely abandoned, left in a state of ruin and awaiting redevelopment, but more often they exist in marginal use as cities attempt to extract, with minimal investment, as much value from their spaces as possible. The original continuous factory and industrial landscapes are divided and rezoned for many different uses, typically as mixed industrial and commercial space, municipal services or to accommodate growing demand for infrastructure. The industrial landscape becomes a fragmented mixture of marginalized urban support, infiltrated with private warehouses, industrial storage, auto repair and salvage yards, parking and other miscellaneous uses.

Forlorn forms and textures of industrial wastelands.

Historic remnant has also become an important element of wasteland regions. These areas are a patchwork of mixed interests, started and failed initiatives, overlain fragments of long abandoned systems and elements that nobody bothered to fully repair or clean up. The wasteland is a composition of scattered, industrial information.



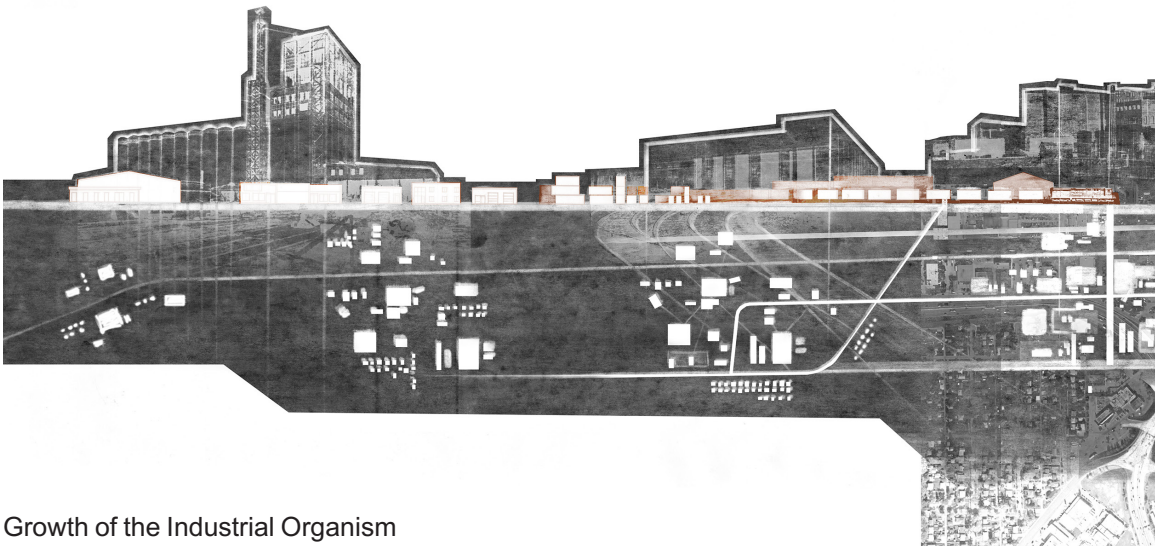
Process of Development and Deterioration of the Urban Industrial

Adaptive Reuse: The Organism Strategy

The main purpose of this thesis is to explore the revitalization of the industrial wasteland; to establish an essence of life and community within its desolate fabric and reconnect its marginal spaces with the greater city. In the past, renewal strategies have been based on clearing or cleansing space of decay and deterioration, constructing architecture unconcerned with what came before, however, the organism strategy aspires to develop form built or rather grown from the elements and frameworks of the existing site. The intention is to work towards establishing a community of transition, an area in continuous growth and evolve of its existing state that is resilient and resistive to the inevitable cycles of decline and renewal.

The use of organic form and concepts is prompted by the wasteland's unique environment of deterioration. The ruin, in this situation is not discrete in the form of a building or structure, but instead is a complex landscape of interacting elements, broken and confused, and a challenge to interpret into architecture. For this reason, organic form is introduced as an interpretive layer, a means of translating disconnected and disjointed elements into a unified and fluid inhabitable form.

The utmost goal of the organism strategy naturally is to establish an architectural organism within the industrial wasteland. The organism not only represents an organic layer



Growth of the Industrial Organism

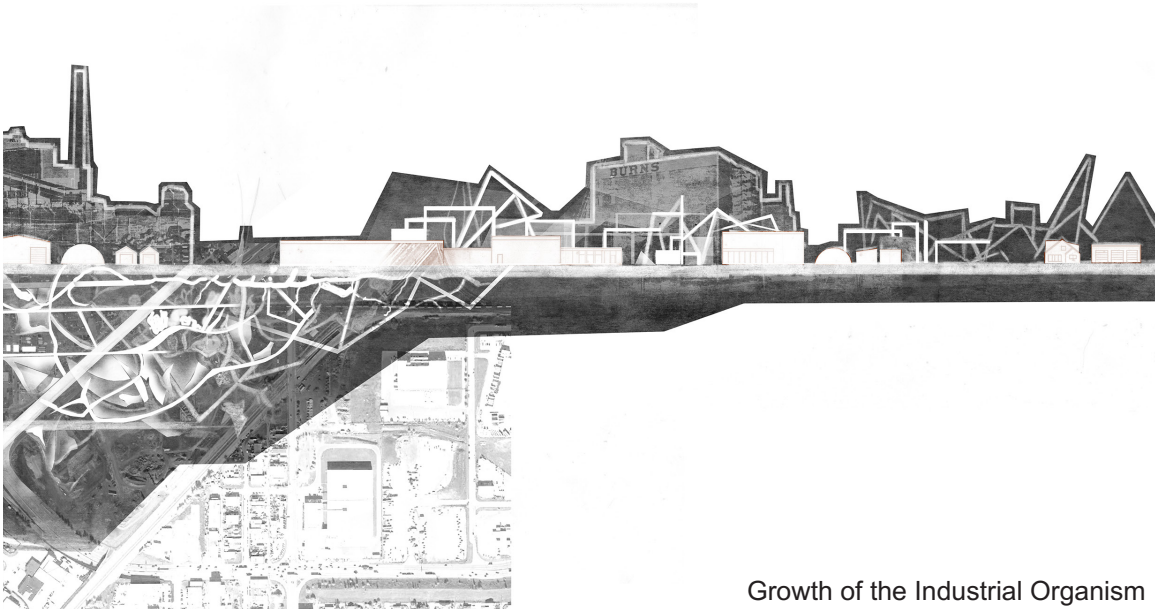
of structure and space, it is a true biology that becomes an extension of its own dynamic, changing environment. Here the wasteland is transformed into a living entity whose structure perpetually develops through the addition, consumption and evolve of new constructed forms, forgoing disruption caused by replacement.

The process of creating this architectural biology within the industrial wasteland is broken down in the following three sections:.

The Architectural Genome: The first of these sections introduces the organism concept and structure, its overall processes of life, growth and development, as well as the key discussion of the architectural genome or “DNA”. Here we explore what is architectural “DNA”, how this information is stored within the site and how to extract this information to be used in the production of form.

Morphological Growth: The second section describes the next stage of organism development of morphological growth from site “DNA”. This stage is the establishment of new structure and form from the transformation of the compositional genome.

Evolution: The last section describes evolution of the organism as the final stage of development, how the organism can grow to become an entirely new architectural form.



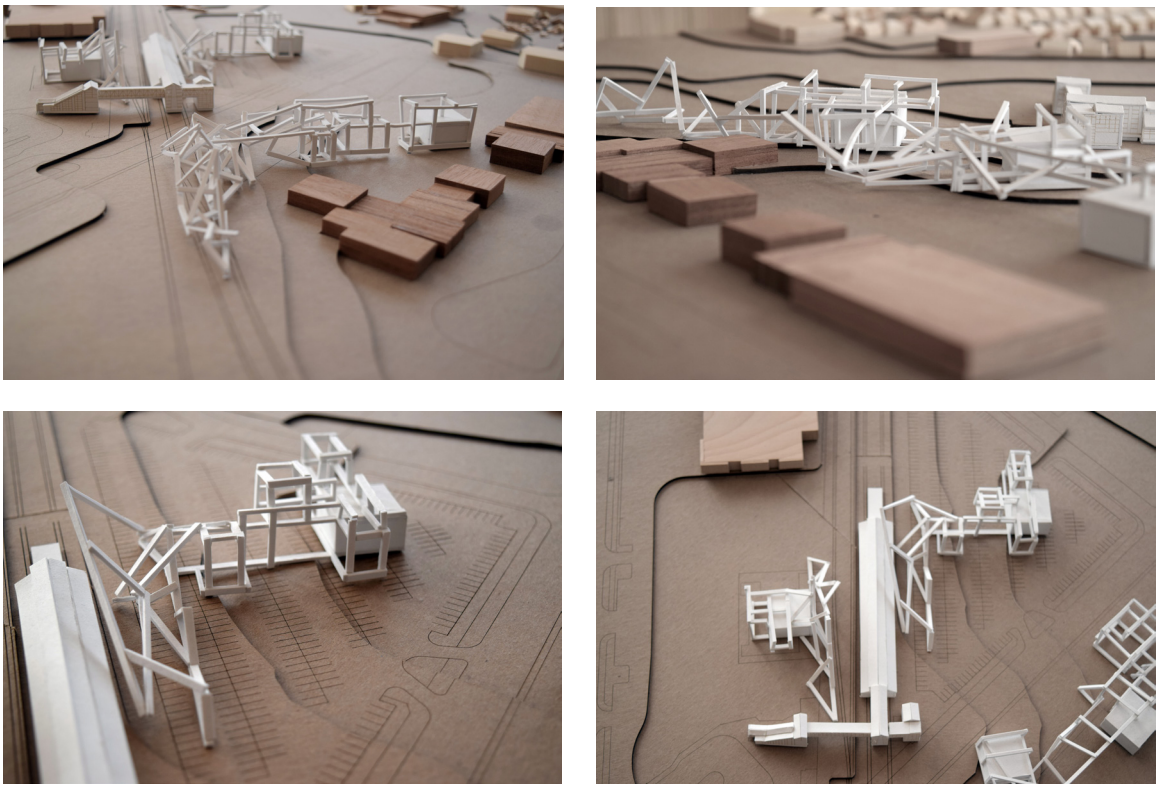
Growth of the Industrial Organism

The Architectural Genome

The concept of the industrial wasteland organism originates with that of a rhizome. Rhizomes are unique organisms, interconnected entities that live and grow as a unified mass among the deep layers of the landscape. The rhizome's structure emerges to the surface periodically through outgrowths, reacting to, as well as being manipulated by its surroundings. The industrial organism is envisioned as behaving in a similar manner, a continuous form winding, connected through the disparate spaces of the wasteland. Its basic structure being enacted upon and claimed by the varying conditions of the regions it occupies.

At its core, this is a discussion about architectural or site "DNA", the genetic information that is stored within a place and how it can be used to program new form. As already discussed architectural genetics is a complex, highly theoretical field steeped in mathematics and scientific algorithm. While this project is not an exploration into the science of artificial life, it is interested in how these conceptual ideas begin to translate or manifest in the material world, the wasteland being a potential region of benefit.

Model of the experimental "rhizome" form of the industrial organism.



Examples of Industrial Organism “Rhizomes”, structures that are influenced by the conditions of their site.

Clearly, artificial and built structures do not have the same systems of growth as do natural living entities. They are without a universal molecule that directs self replication, this thesis however, asserts that architecture does have a significant capacity to program its own development and it is in morphology itself that the basis of its genome is formed. Form is a powerful tool in that it can be used to map growth and progression, analyzing many iterations to understand the process of how one element morphs into another seemingly unrelated form.

The two concepts of the rhizome and the genome work in unison in this strategy to create a singular living entity. One concept is used to develop connectivity among the broken and disjointed spaces of the wasteland, the other is used to create unique form as an extension of the existing industrial identity.

Upon selecting an appropriate waste site for community development, the extraction of site “DNA” begins with analysis of its layered elements. Every industrial site has a unique imprint of features that has developed over time and all features contribute to the site’s

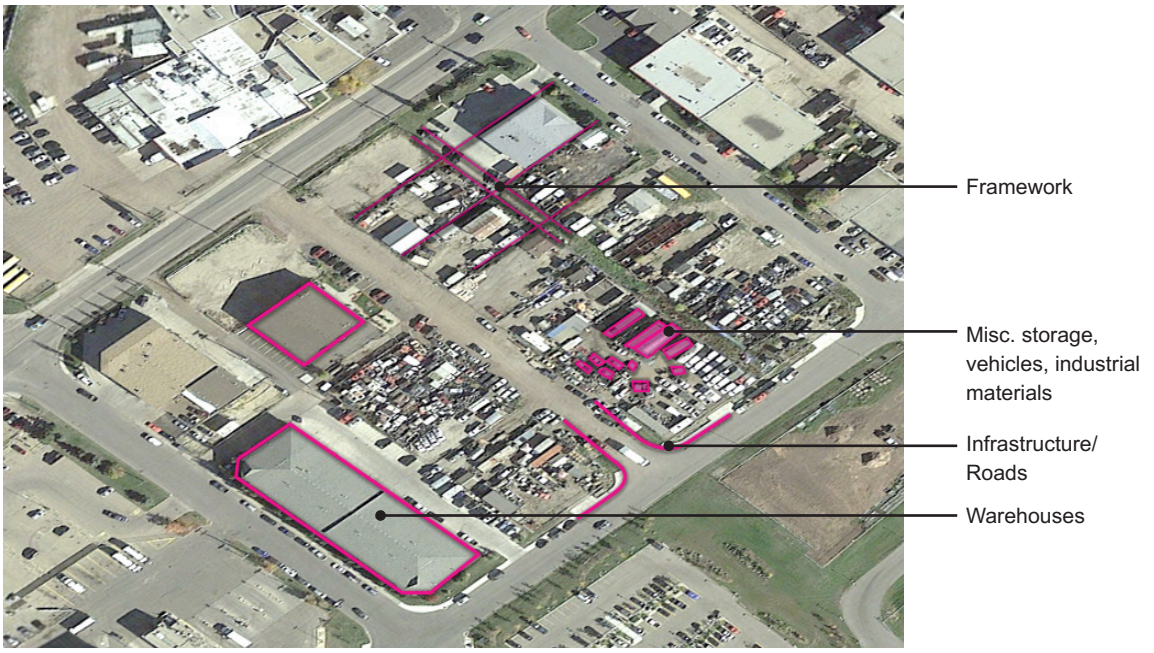
overall DNA signature, inclusive of its prominent buildings, to its temporary elements that scatter the landscape. In this adaptive reuse strategy, it is the “DNA” of the forms that is considered of value rather than the existing physical structure. The genome can replicate architectural form, but under the influence of new environmental forces and programmatic needs, these forms are manipulated and combined into new varieties.

The “DNA” of the existing industrial site comprised of fragmented layers of infrastructures, buildings, lots and residual forms.

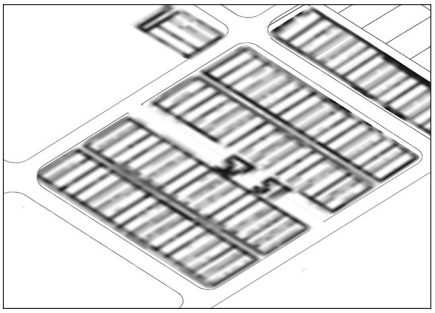
Grown architectural form from the interaction of the site “DNA”. The potential exists for creation of unexpected forms as the different “DNA” elements interact with each other as well as the current environmental forces.

Conceptual interpretation of the process of site “DNA” extraction and translation into architectural form.

The methodology of “DNA” extraction is best illustrated using an example industrial wasteland site. Here we explore the process of breaking down area into its compositional genomic elements, a step that is required to isolate their individual morphological characters.



Example Site: Mixed business industrial block



Subdivisional Framework

Elements of Site

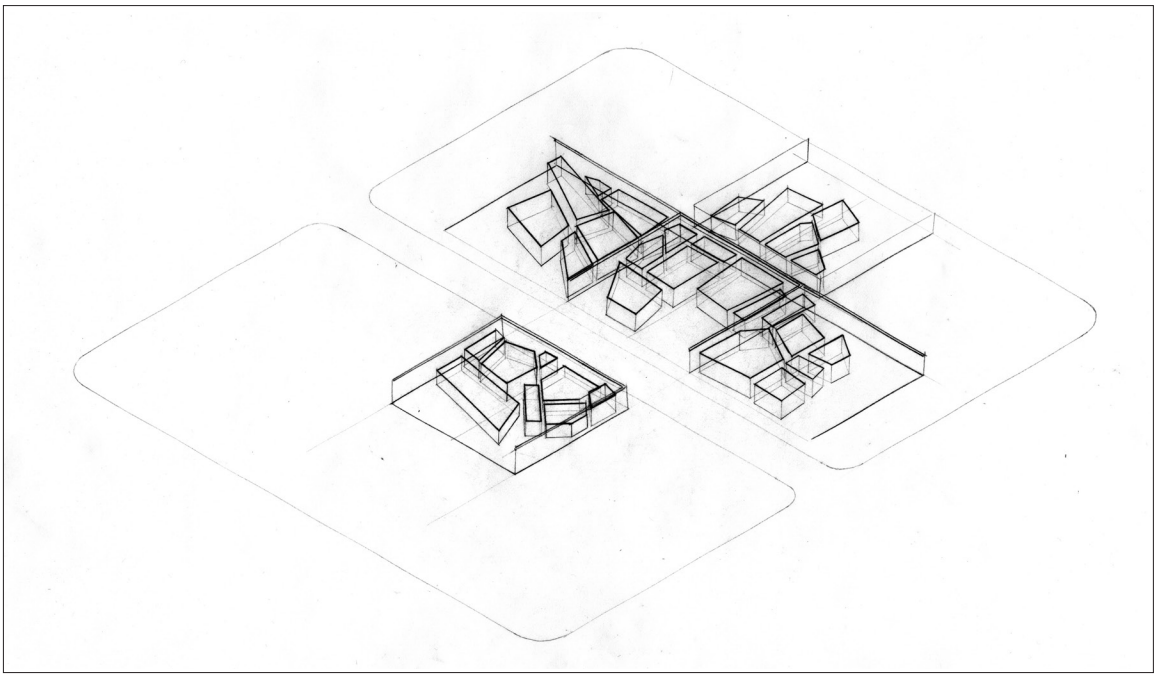
The example site that is shown above is a mixed business industrial block, a typical landscape of the urban industrial. The block provides a simple framework for business activity, being subdivided into a series of regular cells that can be combined in different ways to support a variety of uses. Areas such as these provide excellent sites for community development being sites of existing activity, though marginal, and filled with a variety of mixed industrial forms that can be translated into new architecture.

Apart from its organizational framework, other forms contribute to the site's complete identity and should also be considered. This includes buildings and warehouses, the surrounding road network, the layers of building foundations and parking lots, the broken and unkempt edges, and even the scattered abandoned vehicles and industrial storage. Each of these elements carry a "DNA" that instructs their type through form as well as their relationship with associated structures.

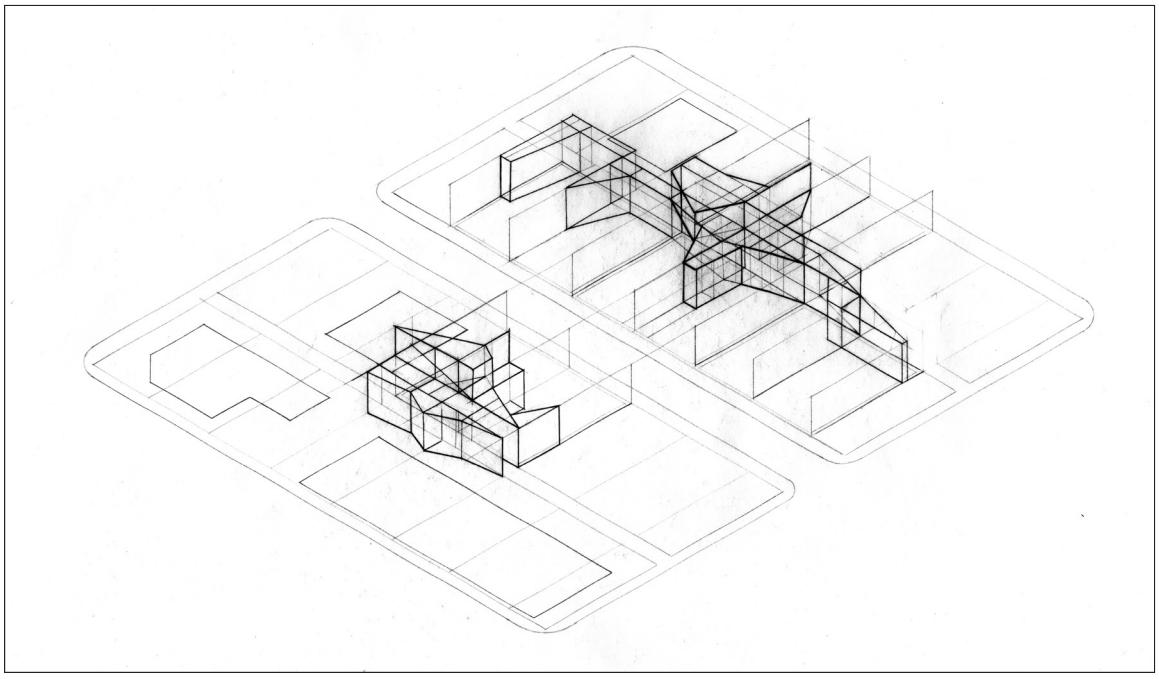
Morphological Growth

Once genomic site elements are identified, the next step in the process is using abstraction to explore the morphology of the forms. The following set of diagrams illustrates several morphological abstractions of various features of the industrial business block. It is important to note these explorations are experimental, that here we are testing methods of interpretation. It is the hope that in the future as biological ideas progress, morphologies will be codified, using algorithm to analyze and evolve structure. Currently it is the role of the architect to define the form and pertinent relationships. In addition, there is significant opportunity for the use of computer modeling to assist extraction of genomic information, however, as this project rests in conceptual application to a certain environment and not in manufacture of analysis methods, instead interpretation is done using drawing and physical modeling as an unrestricted explorative method.

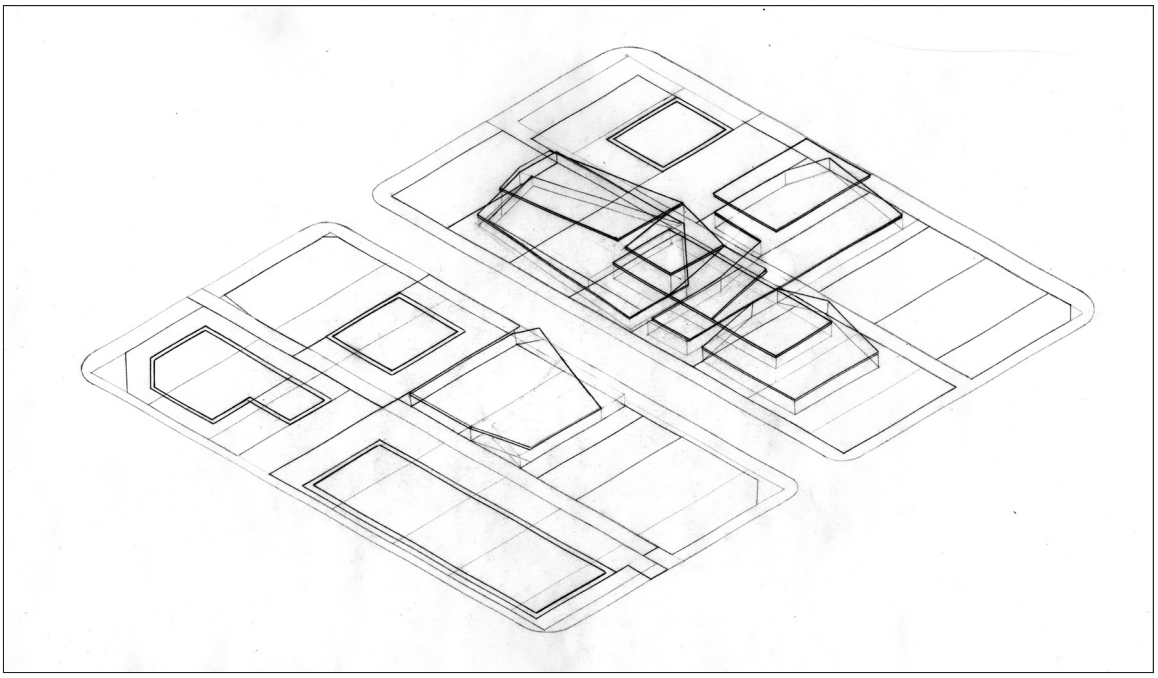
For the mixed business industrial block, three primary transformations are conceived and are shown in the following images 1-3. The first is the transformation of the vehicles and storage elements of the block. From these elements we extract a morphology of clustering and aggregation. The second transformation is of the block's existing divisional elements and framework. The genome of this element continues to create forms of spatial division and separation. The third transformation is of the fragmented layers of the site. As a methodology of adaptive reuse, it is the impression of program that generates the morphological growth, the specific type of reuse program will establish how the "DNA" will morph the new form. For example, if the site was being rehabilitated as a park space, the same genome will morph a very different structure than if the site was being developed as a school.



Genomic Transformation 1: Aggregation of abandoned and industrial elements.
An extraction of the disarrayed vehicles, industrial materials and items that fill the spaces of the industrial block.



Genomic Transformation 2: Divisional Elements.



Genomic Transformation 3: Site Layers

Evolution

The organism strategy is an approach to urban design that is open-ended and layered. The extraction and morphological growth of the site genome can continue through many iterations as new, unplanned programmatic needs are discovered. The development continually builds upon itself as new forms are added and consumed by the organism. The intention is to find value in the disarray of the wasteland, to accentuate the underlying orders that become hidden through void and eventually the site will naturally evolve its own order that guides its function and development.

The final stage in the organism strategy is the step of evolution and it is at this step that the process of site transformation creates an entirely new form of unexpected function from the original industrial “DNA”. Like reptiles evolved appendages for flight from forms for insulation, industrial elements spawn new function as the site accommodates the growth of community.

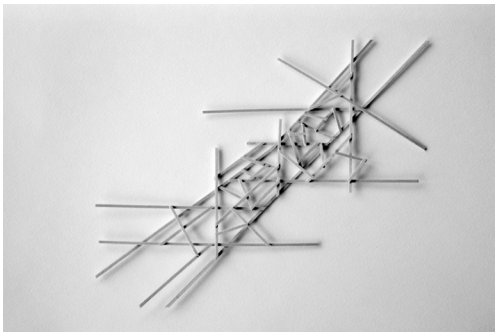
The evolutionary stage, for the needs of this project remains mainly in the theoretical as focus for the design stage will be on the genome and morphological stages, but evolution is the natural progression of this developmental process. Structures in the organism strategy are not planned or zoned elements, but erupt through community adaptation.

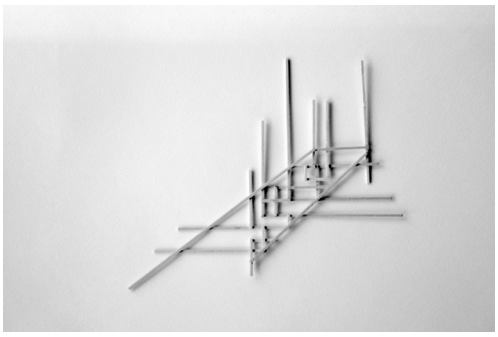
Site DNA

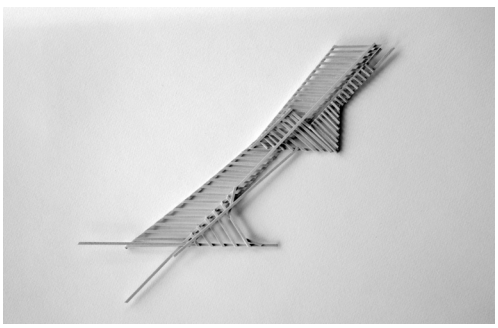
Site Morph

Site Evolution

Conceptual represenatation of the process of site morph and evolution of form at the business block site.







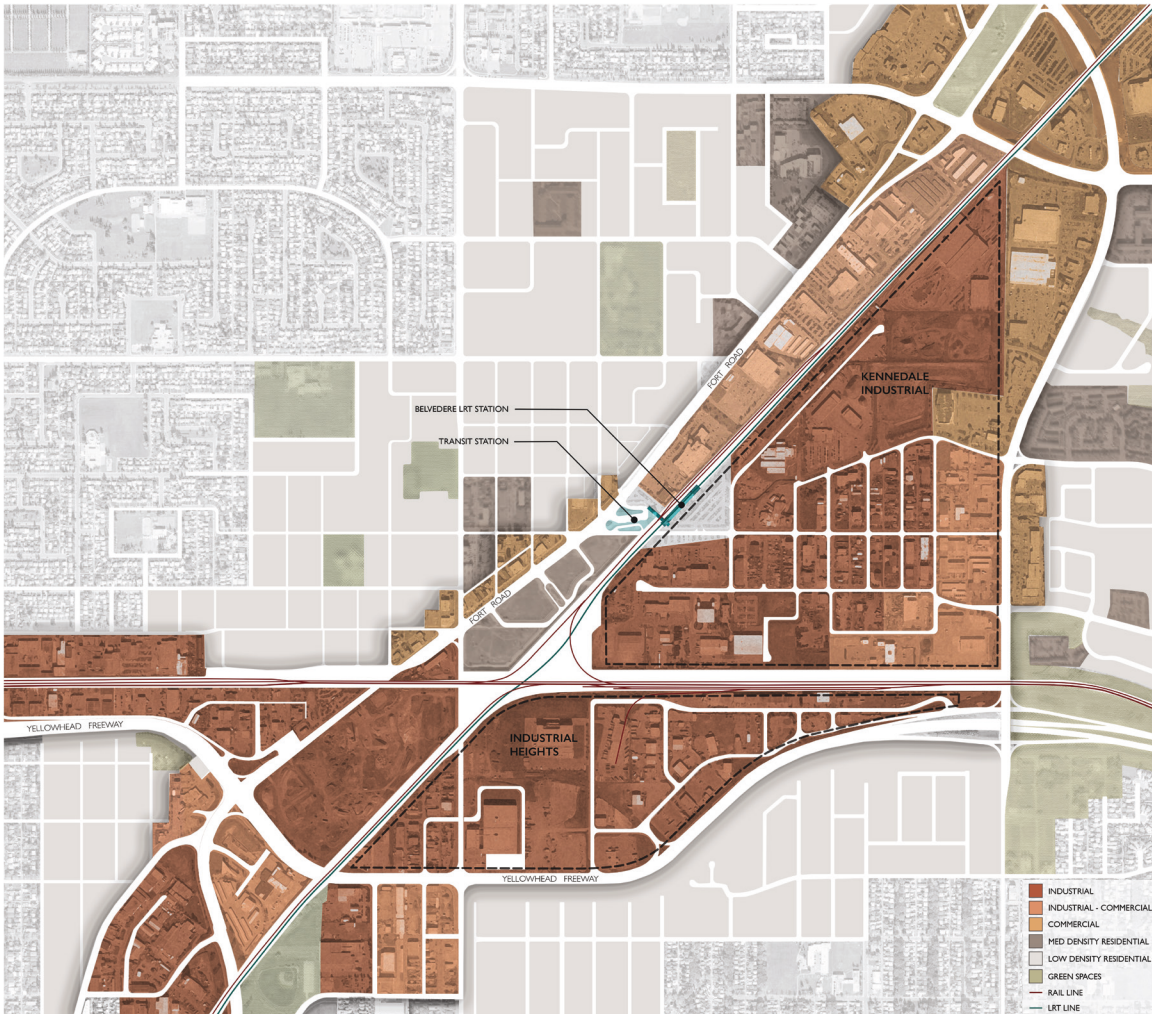
Evolution of order from the fragmented industrial wasteland.

CHAPTER 4: DESIGN

The Test Site: Fort Road Industrial Region

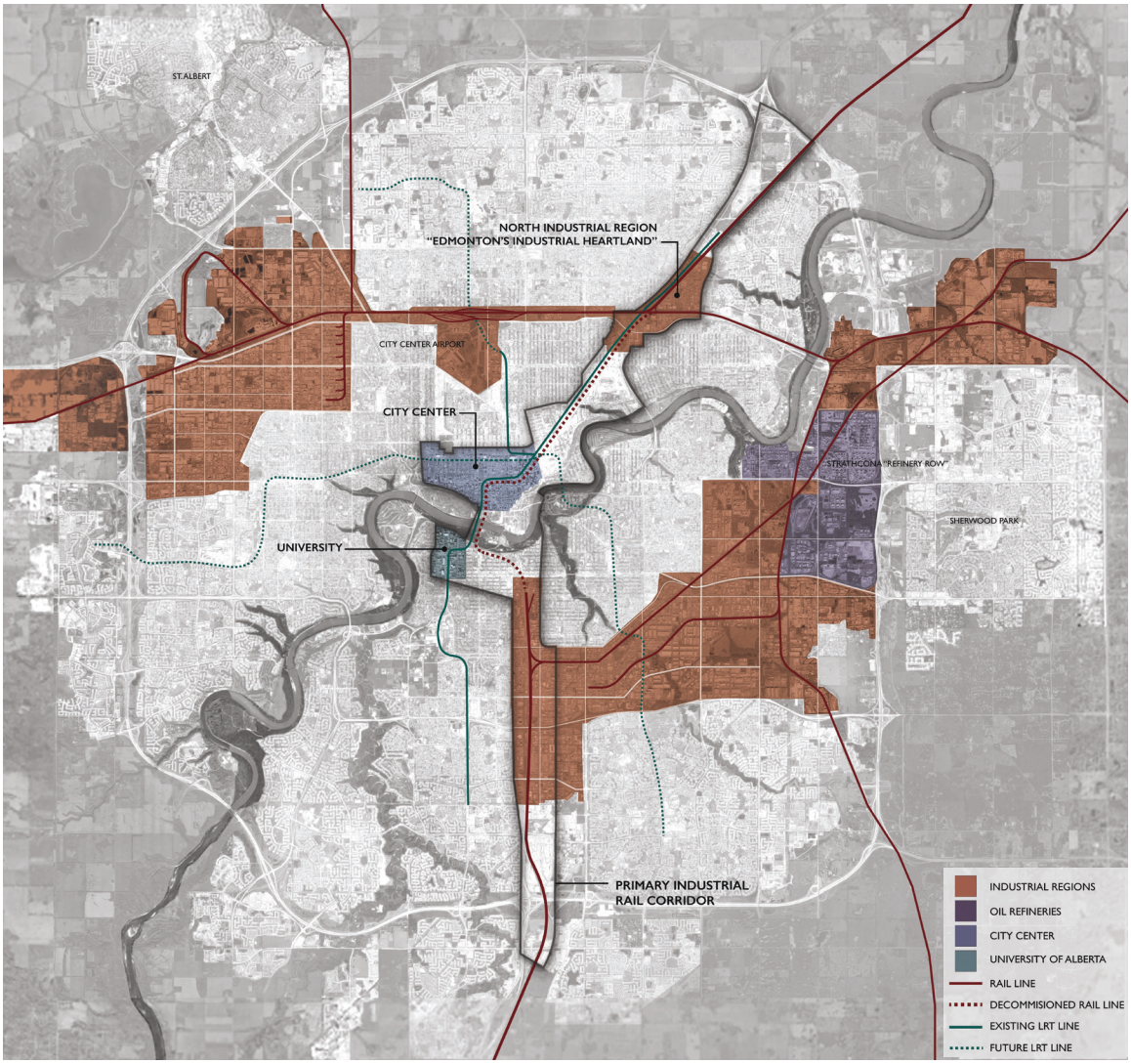
The organism strategy has been explored through its methodology of genomic definition, growth and evolvution, but the definitive part of this project is to test these principles through the actual design of an industrial organism community. The first stage in this process is to select a candidate industrial site for development.

The location that has been selected in this study is the Fort Road Industrial Region in the central northeast of Edmonton, Alberta. This region has a long history of industrial activity and development, a rail oriented business community that has been in operation since the early 1900's.



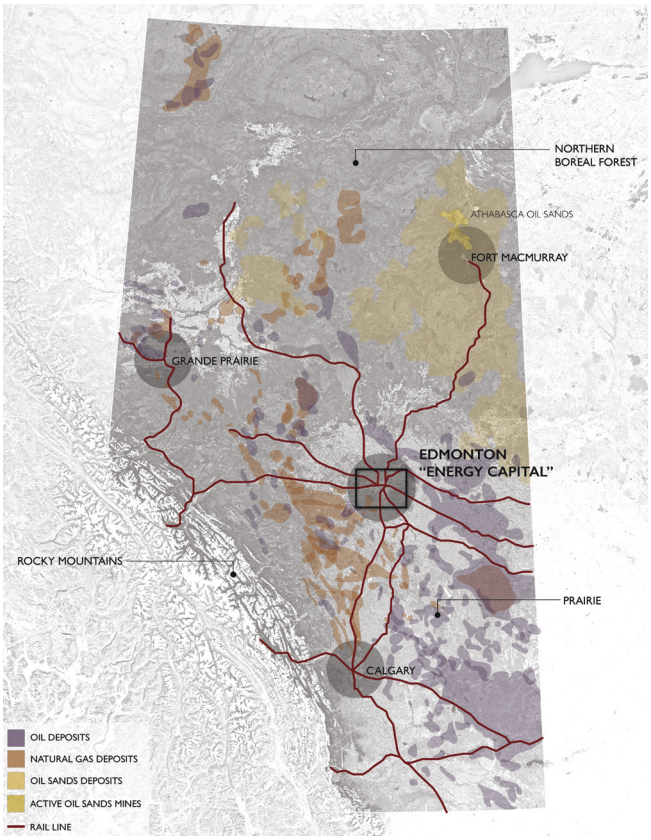
Fort Road Industrial Region, North Edmonton's historic "industrial heartland"

The Fort Road Industrial Region is just one of Edmonton's many vast industrial areas. Industrial space and activities are in the city's forefront, much of its fabric being prevailed by immense industrial and commercial regions that gives many parts of the city a distended or forlorn appearance. The city itself has a lengthy industrial history, being one of western Canada's primary industrial hubs, a "blue collar" city of the prairies that stands as the operational epicentre of Alberta's energy and fossil fuels industry. Most of Edmonton's current industrial areas function in support of this industry, heavily focused in petrochemical services and supplying the demand for equipment manufacturing, chemical processing, research, oil refinement and pipeline infrastructure.

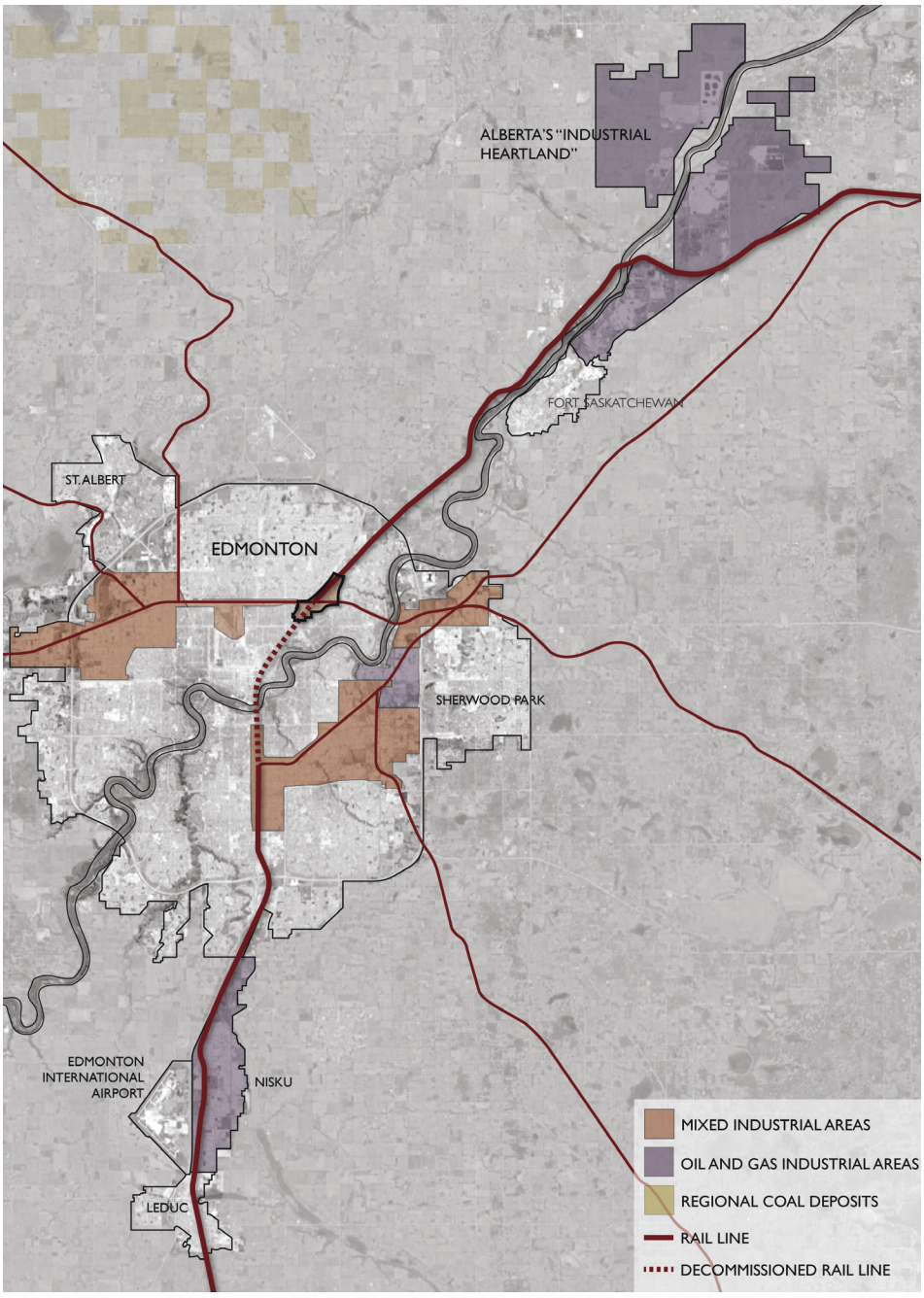


City of Edmonton and its network of urban rail (industrial and light rail transport) with affiliated industrial regions. Highlighted in this map is the historic primary industrial rail corridor, Edmonton's earliest rail line running north-south through the city and intersecting the Fort Road industrial region or historic "industrial heartland". Base map from Google Earth, "Edmonton". Transit data from Canadian National; Online CN network map, "Edmonton" and City of Edmonton, *Long Term LRT Expansion*.

Strathcona "Refinery Row" along the city's eastern border is one of Edmonton's major chemical operations and important part of the city's landscape. The presence of this operation and others in the city's surrounding regions supports and contributes to Edmonton's identity in heavy industry. Base map from Google Earth, "Edmonton". Images from Jackson, "Gallery: Aerial photos of Edmonton's new suburbs".



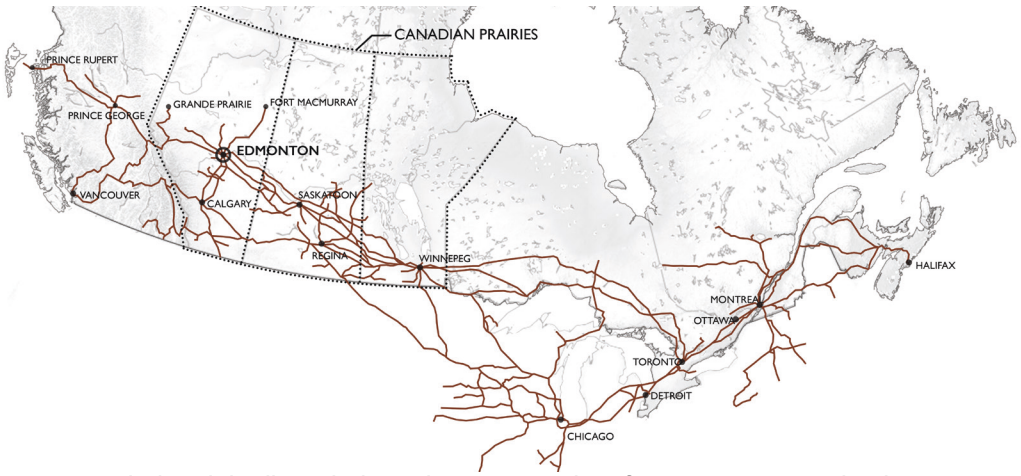
Edmonton at the centre of Alberta's fossil fuels extraction network. Map of the province of Alberta with major fossil fuels deposits, rail networks and urban centers. Data from Canadian National, CN Rail Map and Canadian Pacific, CP Rail Map and National Energy Board, 2001.



Industrial Transport Corridor: The Fort Road region is along the direct connective line stringing together the industrial centres of Edmonton, Nisku and Alberta's "Industrial Heartland" found just North of the city of Fort Saskatchewan. Base map from Google Earth, "Edmonton". Transit data from Canadian National; Online CN network map, "Edmonton".

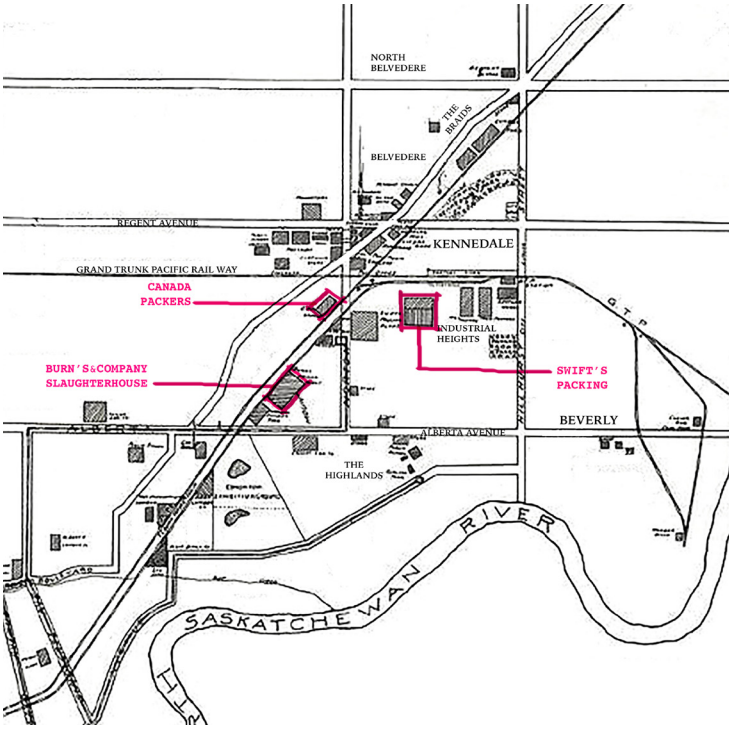
Much of Edmonton's urban and industrial development has been connected to the operation of rail infrastructure. Canada's Pacific Railway (CPR) expanded through the west in the late 1800's and Edmonton was established as a major node of resource exchange between eastern and western Canada. With train operation came a massive influx of people, workers searching for economic opportunity in unclaimed land. Rail provided the foundations of urban development as businesses and industries aggregated at ideal sitesaround its framework. These simple areas of economic activity would rapidly develop into major urban or industrial centres as people and additional services came in droves to benefit from their function.

The expansion of rail was pivotal in establishing the Fort Road Industrial Region. In 1905, the Grand Northern Railroad was extended north, crossing the North Saskatchewan River and connecting the sister town sites of Edmonton and Strathcona. By 1912, these cities would become annexed as one, defining Edmonton's urban core.[67] At the same time, a new centre of industry in Edmonton's North was being established along the rail corridor that would become a regional agricultural hub based around livestock movement and processing. By 1909, the community of North Edmonton became a major point of rail exchange with the arrival of the Grand Trunk Pacific Railroad from the east. The intersection of the two primary rail lines would define this region inspiring further industrial development and growth.

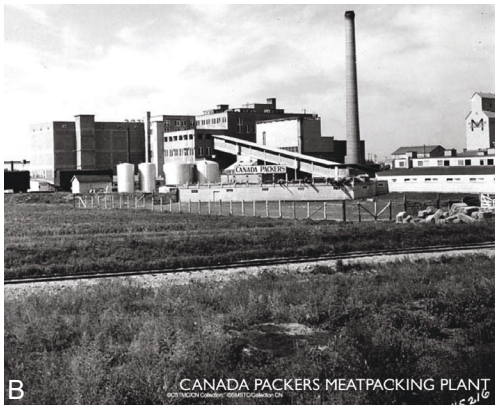


Edmonton as an industrial railway hub, an important point of resource connection between eastern and western Canada. Map of the Canadian continental railway, includes both Canadian National (CN) and Canadian Pacific (CP) networks. Data from Canadian National, CN Rail Map and Canadian Pacific, CP Rail Map.

67 Michael Broadway, "Alberta Bound: Canada's Beef Industry." *Geography: Journal of the Geographical Association* 82, no. 4 (1997), 377.



Map of the original community of North Edmonton that would be known as North Edmonton's "Industrial Heartland". This area would provide the historic framework for the Fort Road Industrial Region. Base historic map from Groundzero Productions Edmonton, "Packingtown" media project.



Historic photographs of original slaugherhouse facilities in the Fort Road Industrial Region.
A) Burn's Slaughterhouse; ND-3-1554; Glenbow Museum Archives and B) Canada Packers Plant; CN005488; Canada Science and Technology Museum.

The North Edmonton industrial community was the site of several of Canada's first prominent industrialized meatpacking and slaughterhouse operations that supported much of the area's economy. The Swift Canadian meatpacking plant was the first, constructed in 1907, the Burn's and Company slaughterhouse established in 1911 and Canada Packers came later in 1936.[68] These facilities were tied heavily to rail which maintained a steady

68 Ian MacLachlan, *Kill and Chill: Restructuring Canada's Beef Commodity Chain*. (DesLibris. Books Collection. Toronto, Ont.: University of Toronto Press, 2001), 198.

supply of cattle, sheep and hogs from the major ranching operations of central Alberta, and a direct export line to national and international markets.[69] From these primary processing facilities grew a network of related business and services, that included tanneries, auction houses, stockyards, agricultural support as well as commercial shops and hotels, establishing a thriving regional community.

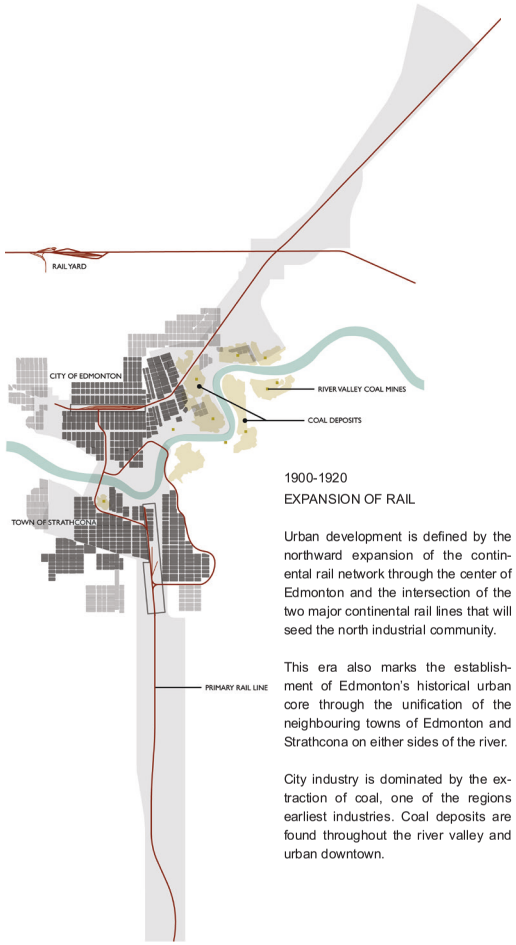
Prosperity of the area would continue up until the early 1970's when the processing plants began to experience heavy economic losses. Market demand for beef at this time began to decline and competition increased from US based companies.[70] Due to a number of complex factors including industrial restructuring and the decoupling of major transport from rail lines to roadways, many of the older urban slaughterhouses and plants were forced to close. Major producers streamlined their network of operations, replacing many old facilities with new, integrated rural plants that were more efficient and cheaper to operate.[71] In 1978, the Burn's meat processing operation in North Edmonton was the first of these facilities to close, with the building being demolished a decade later. The others, after changing hands several times, would eventually follow suit, the original Swift's plant closing in 1997 and being demolished shortly after in 2002.[72]

69 Broadway, "Alberta Bound: Canada's Beef Industry", 377.

70 Ibid.

71 Ibid.

72 MacLachlan, *Kill and Chill: Restructuring Canada's Beef Commodity Chain*, 197.

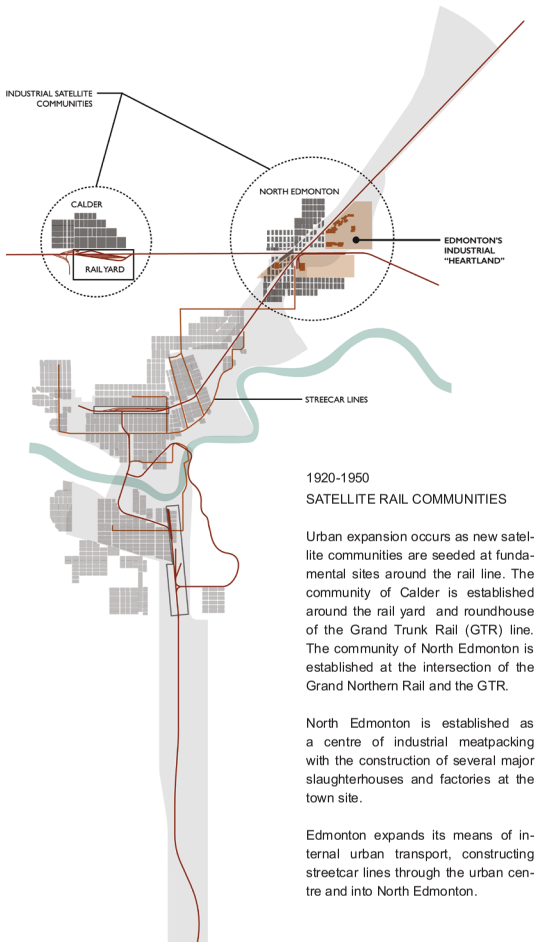


1900-1920
EXPANSION OF RAIL

Urban development is defined by the northward expansion of the continental rail network through the center of Edmonton and the intersection of the two major continental rail lines that will seed the north industrial community.

This era also marks the establishment of Edmonton's historical urban core through the unification of the neighbouring towns of Edmonton and Strathcona on either sides of the river.

City industry is dominated by the extraction of coal, one of the regions earliest industries. Coal deposits are found throughout the river valley and urban downtown.

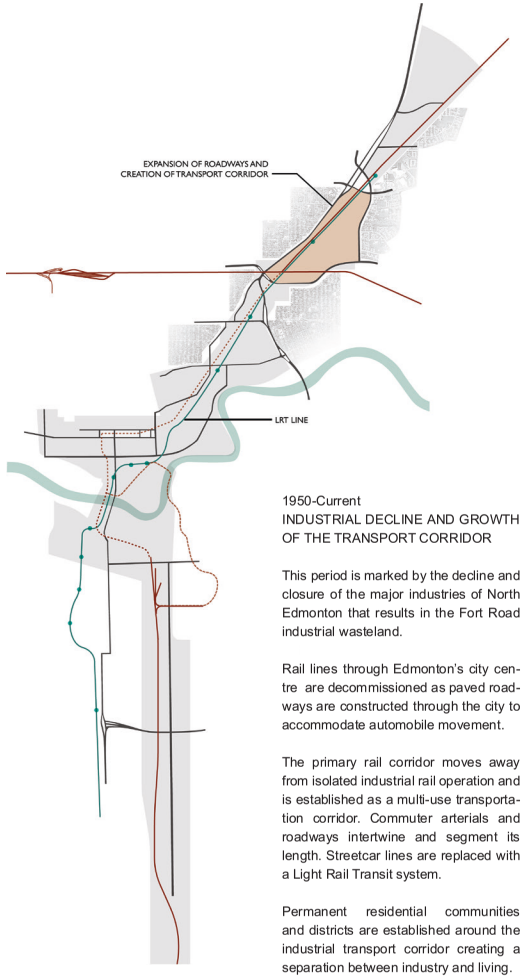


1920-1950
SATELLITE RAIL COMMUNITIES

Urban expansion occurs as new satellite communities are seeded at fundamental sites around the rail line. The community of Calder is established around the rail yard and roundhouse of the Grand Trunk Rail (GTR) line. The community of North Edmonton is established at the intersection of the Grand Northern Rail and the GTR.

North Edmonton is established as a centre of industrial meatpacking with the construction of several major slaughterhouses and factories at the town site.

Edmonton expands its means of internal urban transport, constructing streetcar lines through the urban centre and into North Edmonton.



1950-Current
INDUSTRIAL DECLINE AND GROWTH OF THE TRANSPORT CORRIDOR

This period is marked by the decline and closure of the major industries of North Edmonton that results in the Fort Road industrial wasteland.

Rail lines through Edmonton's city centre are decommissioned as paved roadways are constructed through the city to accommodate automobile movement.

The primary rail corridor moves away from isolated industrial rail operation and is established as a multi-use transportation corridor. Commuter arterials and roadways intertwine and segment its length. Streetcar lines are replaced with a Light Rail Transit system.

Permanent residential communities and districts are established around the industrial transport corridor creating a separation between industry and living.

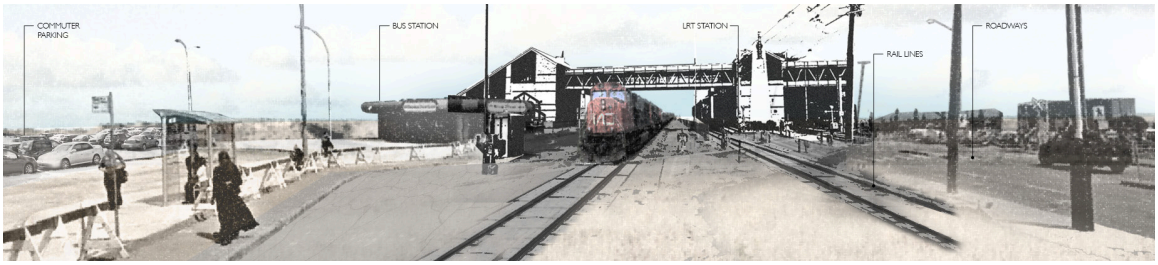
Series of diagrams showing the creation of the Fort Road Industrial Wasteland through the process of Edmonton's historic development.
A) 1900-1920: City Establishment and Rail Line Expansion, B) 1920-1950: Growth of Satellite Industrial Rail Community,
C) 1950-Current: Rail and Industrial Decline.

The Industrial Wasteland

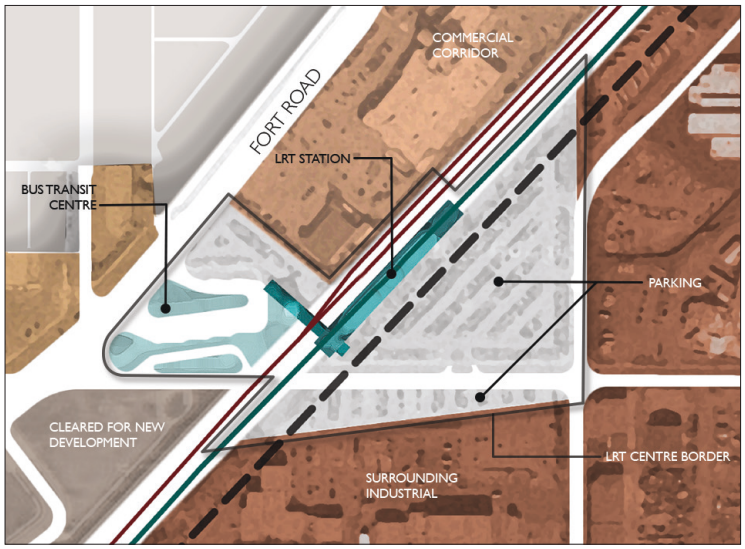
Decline in the North Edmonton meat processing industry had a heavy affect on the entire region. Associated shops and business rapidly shut down, laid off workers vacated the area along with their families and even though Edmonton has other thriving industries as previously discussed, the Fort Road area was never able to recover from this loss. The region as it exists today, is an area of high complexity not easily understood or explained, an island of awkward, deformed and infrastructural urban fabric embedded within an expanse of homogeneous residential neighbourhood. The space, somewhere between urban void and industrial, is probably best defined through its natural state of disorder, being a mixture of diffuse and incongruous industrial and commercial land fragments, cut up and divided by the infiltration of major rail lines and roadways. As the region continues to deteriorate, approaching the need for a complete reimagining to attract new life and purpose, it is no simple task to connect and develop meaning through a space of such derangement. The objective here is to use the organism strategy to replenish the area though its own disorder, to allow patterns of growth and structure to develop naturally though metamorphosis and evolution of the fragmented elements.

The Fort Road region referred in this project though not a formally designated district, is composed of the mixed industrial and commercial areas that border Edmonton's historic Fort Road. An immense, triangular section of land, it is roughly defined by the intersection of three major transportation arteries, Fort Road, Yellowhead Freeway and 50th street which also serve to isolate the wasteland from the surrounding residential. Within this space is the collection of layered and interacting fabrics, districts, components and infrastructures that together compose the disjointed wasteland landscape. The following section will illustrate this region through the isolated analysis of these contributing forms under the headings of "infrastructure", "rail" and "industrial business", looking closely at their components and current urban function that will be used to inform an approach to the integration of new programmatic and structural layers.

Infrastructure



Wasteland of the Belvedere LRT Station. Site Collage.



Elements and features of the Belvedere LRT Station site set within the Fort Road industrial wasteland.

Discussion of the forms and features of the fort road wasteland will begin with that of infrastructure, made up of definitive elements that includes the areas's roadways, introduced light rail public transit system (LRT) as well as the original industrial rail lines (which will be outlined in a separate section). As the region's historic industrial role gradually diminished, its transportation and connective role in turn increased. The primary rail corridor remained an important channel of transport and urban movement, however the locomotive was mostly traded for the vehicle, and its area was bordered and intertwined with paved roadways and commuter arterials. This space would become an important connection from the outer city to the downtown as urbanites began to migrate from Edmonton's centre to its rapidly expanding and sprawling suburbs. Unfortunately in terms of the wasteland, the presence of high volume traffic had an isolating affect on the industrial area, a condition that would facilitate further degradation of the region.

Another important infrastructure that stands today as a primary element of the wasteland is the Light Rail Transit (LRT) system that was integrated with the rail corridor in the mid 1970's. The LRT was constructed to replace the aging streetcar system that operated among the developing communities of early Edmonton. Though the line has been expanded in recent years, its initial leg operated between the industrial and business centres of the north city community and the downtown, tracing the original path of the decommissioned main line rail tracks.

The system's original terminus was the Belvedere Station, located at the urban centre of the still active industrial meatpacking district, established to support the area's continued business growth. Unfortunately, with the region's decline, the station could never function in this purpose and now stands as the last remaining primary form among a landscape of decay and marginality. The station and its supporting elements are now an object of discord, an urban fragment in disconnection from its setting.

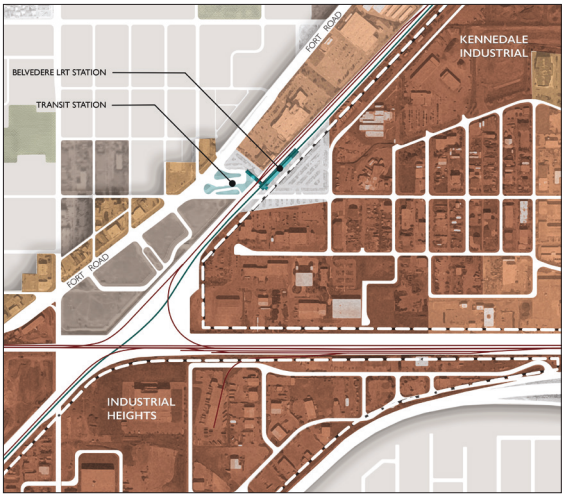
Today the Belvedere station has been transformed into a commuter hub and much like the paved arterials, is concerned with providing a direct and efficient line of movement between the external and internal city. To support this new function, in the late 1990's, the station was modified with a covered platform as well as a massive expanse of parking lots to suit the need for urban "park and ride". Also constructed to complete this hub was a bus transit centre that serves to bring people from all over the north city to the site. In this use, the environment of the station has become both desolate and uninviting, a space created around vehicle and movement rather than people and interaction. As a whole, the LRT station is representative of the manner of disconnection that occurs in periods of urban decline, fragmentation through loss of the connective elements that bind together and unify urban space.

Business and Industry

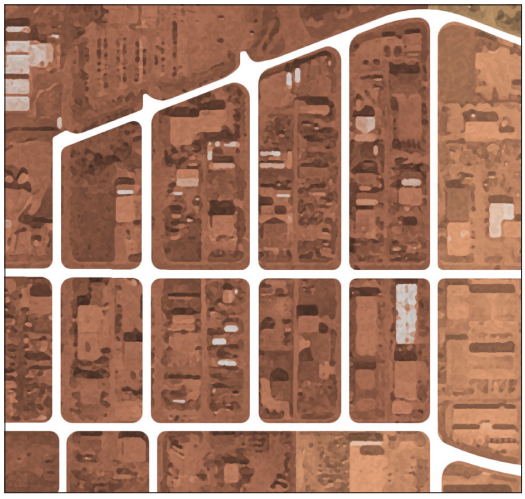
Streets of mixed warehouse businesses among transportation infrastructure. Site Collage.

The mesh of prominent roadways and infrastructures defines a series of disconnected urban fragments and fabrics which contain the remaining business and economic functions of fort road. In these regions, industrial has become a loose term as they are gradually being rezoned to accommodate a variety of commercial activities and resident services. The result of this process is a type of poorly organized and marginal industrial that is a diffuse mishmash of mixed private businesses, commercial warehouses, city maintenance operations and storage.

The two main districts of “Kennedale” and “Industrial Heights” comprise most of the formal area of the industrial wasteland, occupying the space along the eastern side of the LRT commuter corridor. While these areas appear as heavily voided, they are actually divided into discrete urban plots and neighbourhoods providing serviced land supportive of a wide variety of mixed shops and private business ventures. A significant portion of these lands are city owned, being a convenient site for urban service and maintenance coordination primarily in recycling and refuse, as well as infrastructural service and repair.

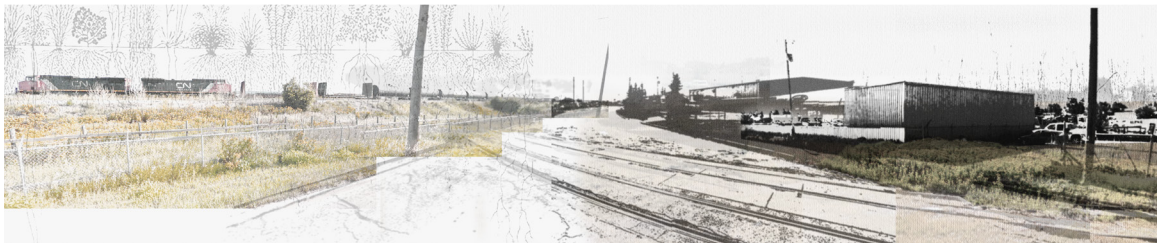


Fort Road Industrial Districts of Kennedale Industrial and Industrial Heights.



Divided mixed industrial-commercial business area in the wasteland.

Rail

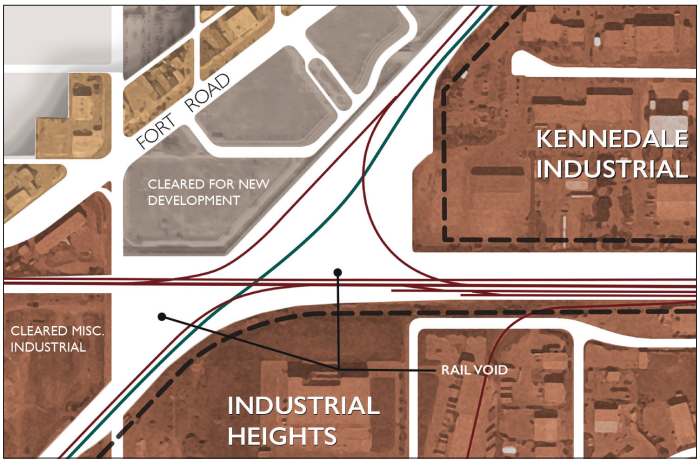


Void of the Rail Corridor. Site Collage.

Rail is another infrastructural element, but will be discussed alone as a historic form of significantly different purpose from the site's other infrastructures. Rail in Edmonton, even as its industries have experienced substantial upheaval over the years, lingers as a fundamental urban system, associated with the city's active industrial regions and one of the primary means of transport for the oil and gas industry.

The fort road region was constructed around the operation of two major rail lines, originally the Grand Northern Railway running north-south and the Grand Trunk Railway running east-west. Due to the region's industrial decline, rail through fort road is now a latent element, still in operation, but largely detached from the area's current business activities. The rail line today stands as a symbol of North Edmonton's history, a landscape element that continues to provide the area with urban structure and historical texture.

The two primary rail lines operate through the region's industrial areas, bisecting the wasteland's main industrial districts with a laneway of void that pads rail operation. Within the region's centre, the lines converge creating a massive junction, a voided area prevailed by the train activity.



Focus on the area of the rail junction of the fort road wasteland.

Industrial Organisms

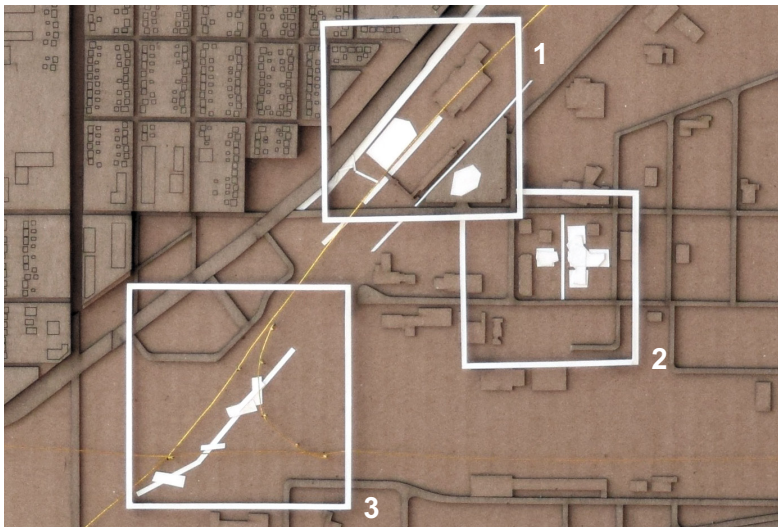
Within the vast expanse of the industrial wasteland, the challenge of establishing a community environment is overcoming the intense separations, both physical and psychological that govern the region. In traditional development methods that employ land use planning and zoning, this is accomplished by starting anew, stripping areas of their deeper orders, and overlaying new, imported organizational structures. We find however, that the existing void is simply replaced with new forms of void, the region becoming no more “alive”, just reorganized and detached from its regional history.

Using the organism strategy of development, community spaces and structures are grown from the existing facia and elements of the wasteland, building from determined sites of historic, functional and compositional interest that often become lost among the immense regional void. The initial task is to define these particular sites of value so that we can begin tracing and developing a line of urban connection between them. Each defined site will seed a unique industrial organism of which will grow and evolve from the composition of its existing industrial terrain.

Site Strategy

Within the Fort Road industrial region, I am proposing that the organism community is developed primarily from three main sites or sub-organisms. Each of these sites is compositionally unique and incorporates in some manner the wasteland’s more definitive characters and forms. The first organism site is based from the Belvedere LRT and transit station. This station is the region’s most prominent structure and an important regional element that serves as the primary transport hub and connection to the downtown business centre. The second site is comprised of a section of the existing mixed use business community that is representative of the wasteland’s main activity and function. The third site is based on the rail line junction that serves as the area’s historic industrial centre. Together, these three unique sites form the centroids of the organism community with their compositional “DNA” directing its growth and expansion into new areas.

Fort Road Industrial Region with its arrangement of connected industrial organism communities.
(1) Belvedere LRT Station, (2) Mixed Business Community, (3) Rail Line Junction.

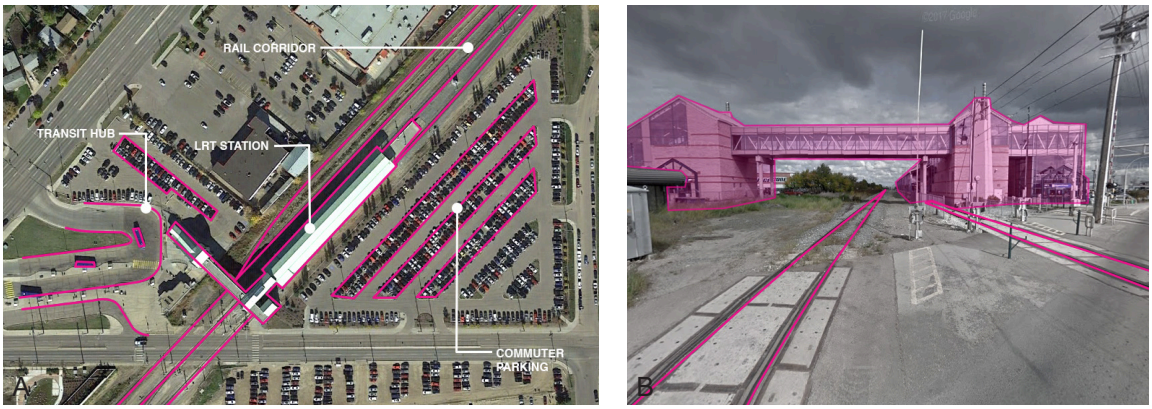


Organism Community Region: (1) Belvedere LRT Station, (2) Mixed Business Community, (3) Rail Line Junction.

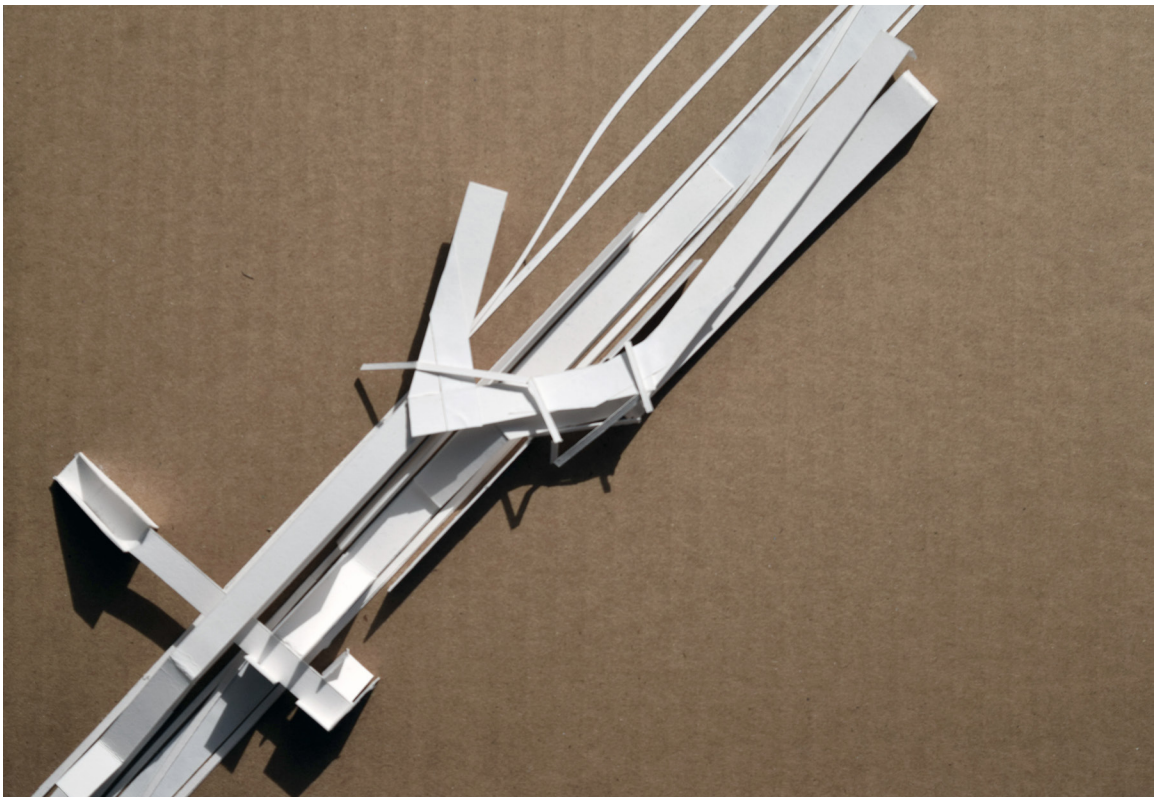
Upon selecting community sub-sites, primary focus of industrial organism development turns to creating a scheme for the extraction and growth of structure. To initiate this process, a unique organism concept is established for each of the sites. The objective is to create an organic analogue of each industrial site using true biological forms and processes that include cellular replication, symbiosis and rhizome growth. Organic form as discussed in the methodology section, is applied to the site and used to develop connectivity and help govern the process of genomic structural growth.

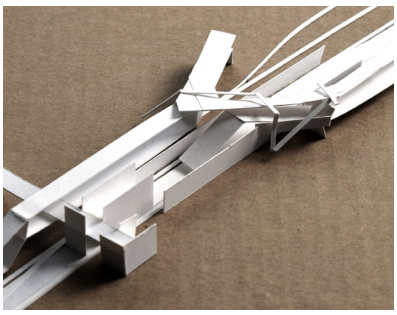
Starting with site 1, that is based around LRT and industrial rail infrastructure, this organism invokes the biological concept of symbiosis. This particular concept is used in reference to the variety of activities, functions and forms that intermingle and occupy the rail corridor at this site. It is a location of high activity and movement, and the careful balance and interaction of elements is a primary site characteristic. The organism builds from this character, a symbiotic entity that interacts with these intertwining rail elements providing an added layer of urban inhabitation.

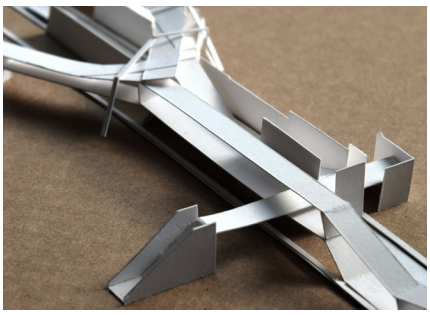
Lichens as symbiotic organisms provided inspiration for form development in concept 1.
A) Lichen Cross Section Drawing, B) and C) Examples of Lichen Species, Images reproduced from Gilbert, *Lichens*.



Site 1: Belvedere LRT Station. A) Existing site plan with highlighted site elements, B) View of the Belvedere LRT Station with rail corridor. Base images from Google Earth, “North Industrial”.

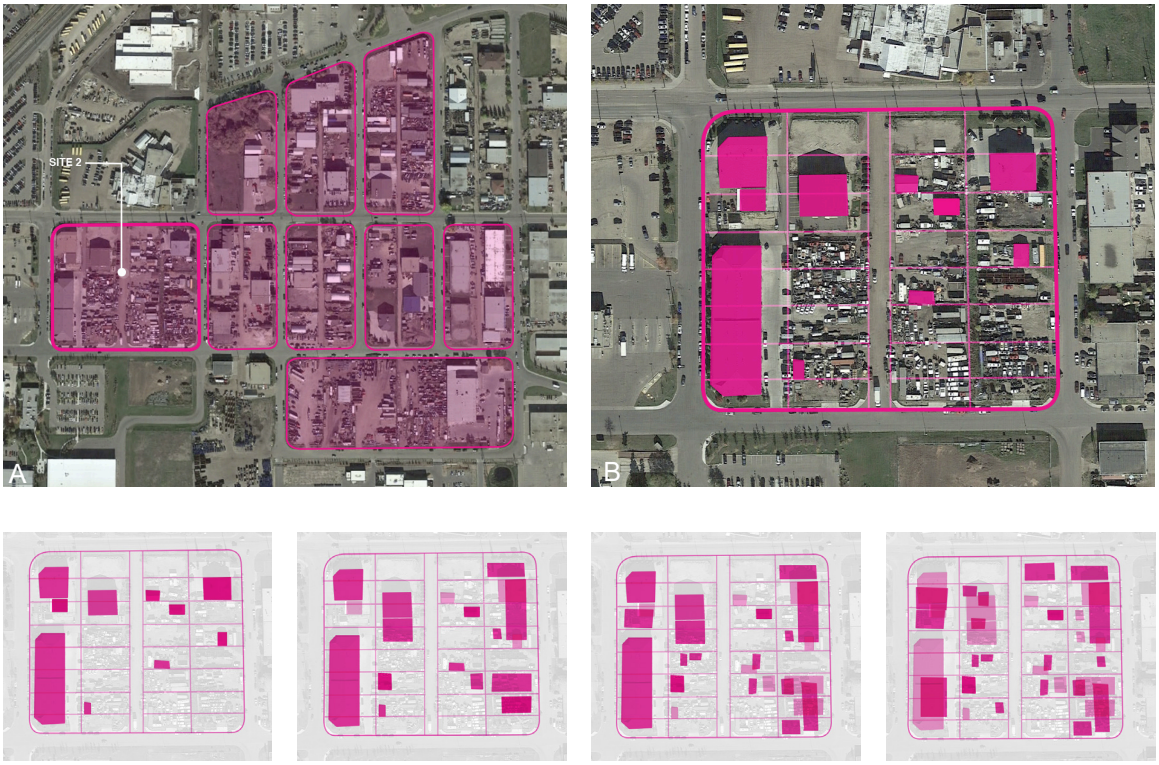






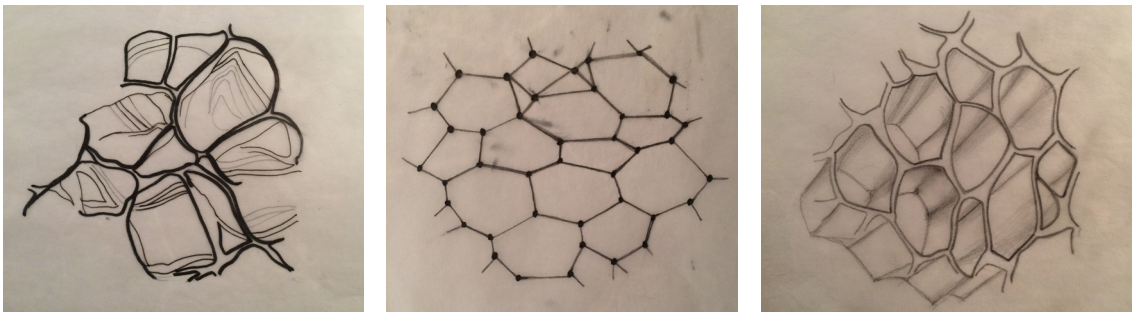
Organism Concept of Site 1: Conceptual model showing symbiotic organism structure that grows through and around the rail corridor, incorporating the rail infrastructure and transit station.

The organism concept of site 2 is based on cellular replication and mitosis that draws from the behaviour of addition and aggregation of the disarrayed forms in the mixed business block. The existing form of the industrial block already conveys a notion of cellular behaviour, from its arrangement into a series of functional units to the basic subdivision of each unit into equal lots. The block is then occupied by a variety of private businesses that freely use these subdivided lots to suit their individual needs. The warehouses and structures are continuously manipulated, added and removed as businesses close and change. This idea of change, restructure and movement guides the conceptual development of the industrial block.

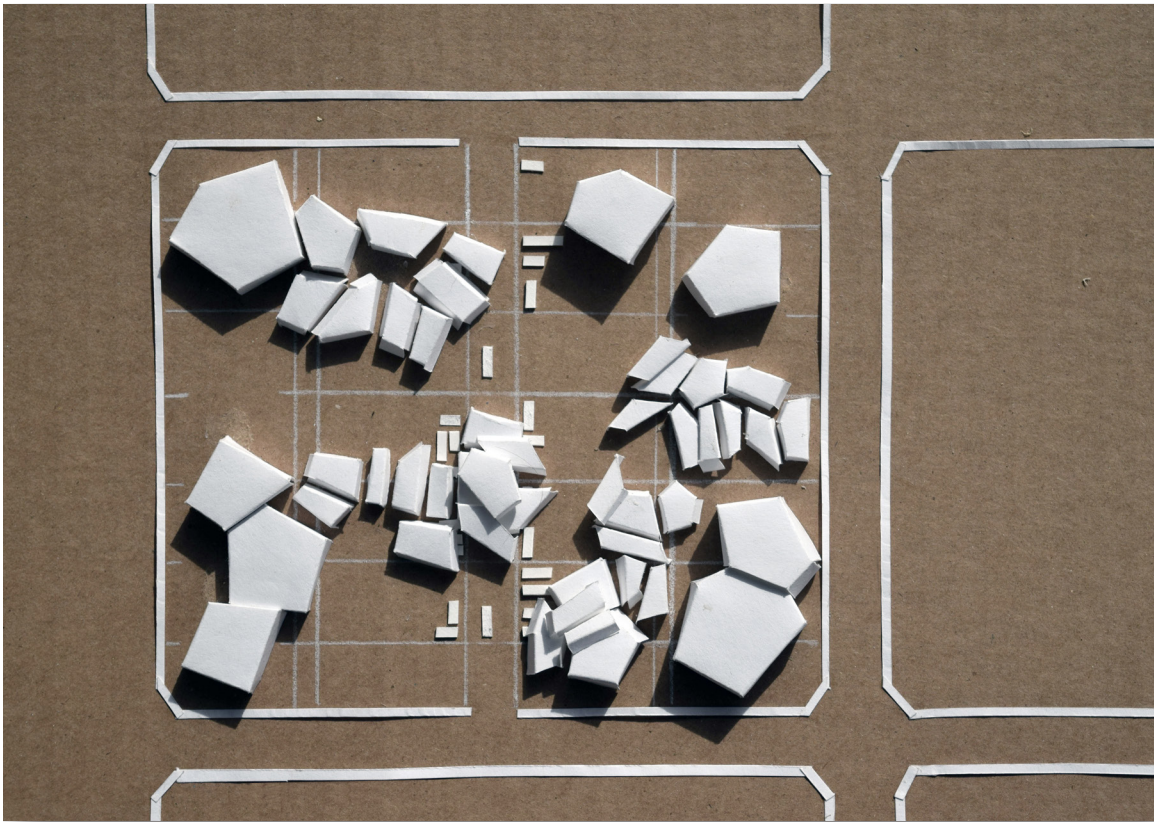


C

Site 2: Mixed business industrial block showing organic cellular form and arrangement. A) Expanded view of entire industrial business area, B) Site 2 industrial block showing arrangement of warehouses with industrial storage and salvage lots as well as subdivisional structure, C) Diagram series of change and movement of structures in the industrial block over time. Base image from Google Earth, “North Industrial”.

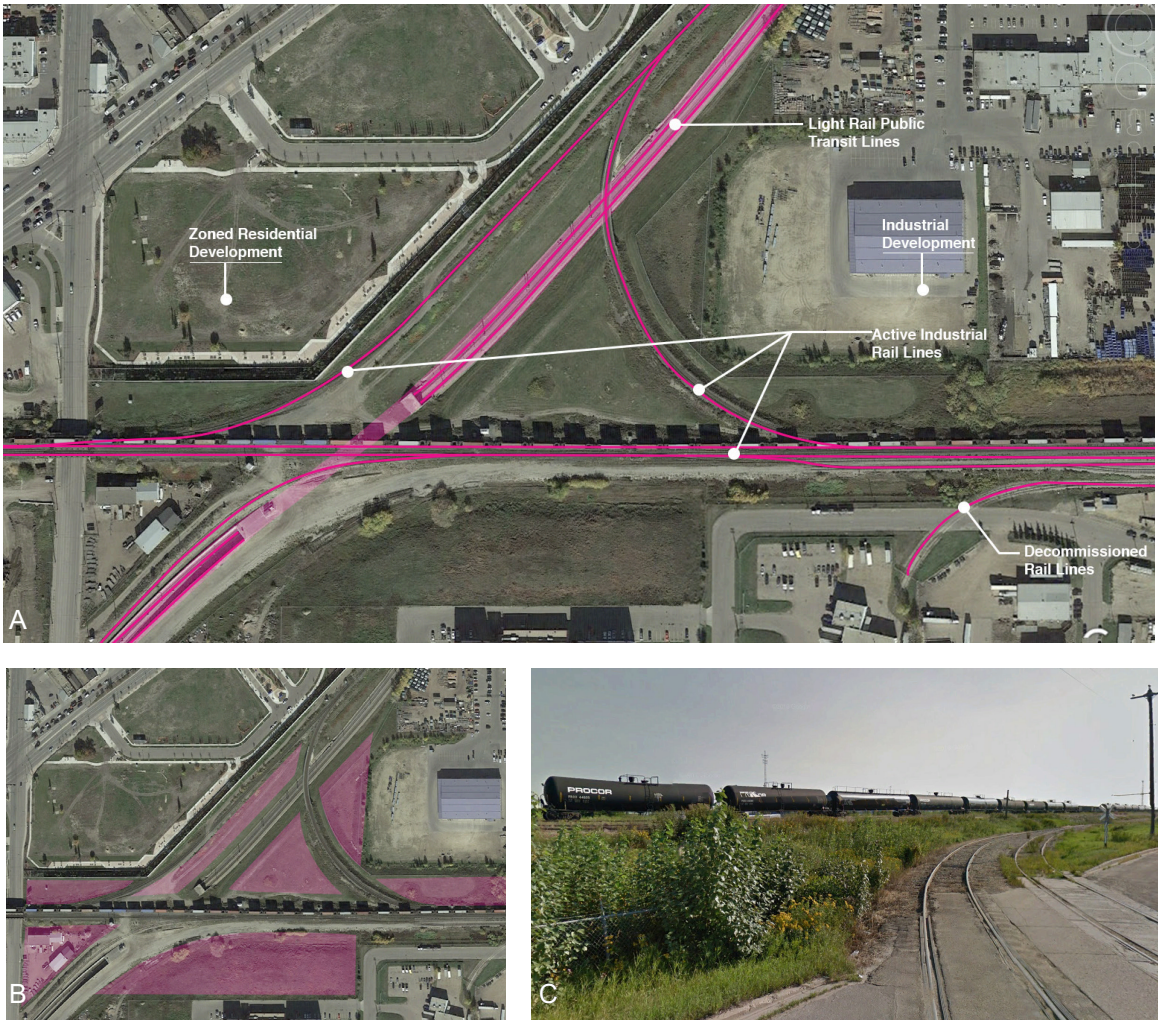


Sketches of cell forms and structures, explorations for the organism concept for site 2.

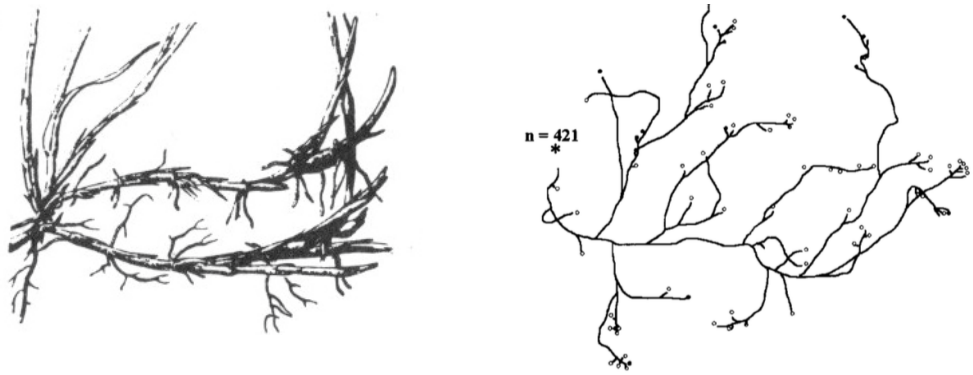


Organism Concept of Site 2: Conceptual model of cellular growth of the industrial warehouse and business forms.

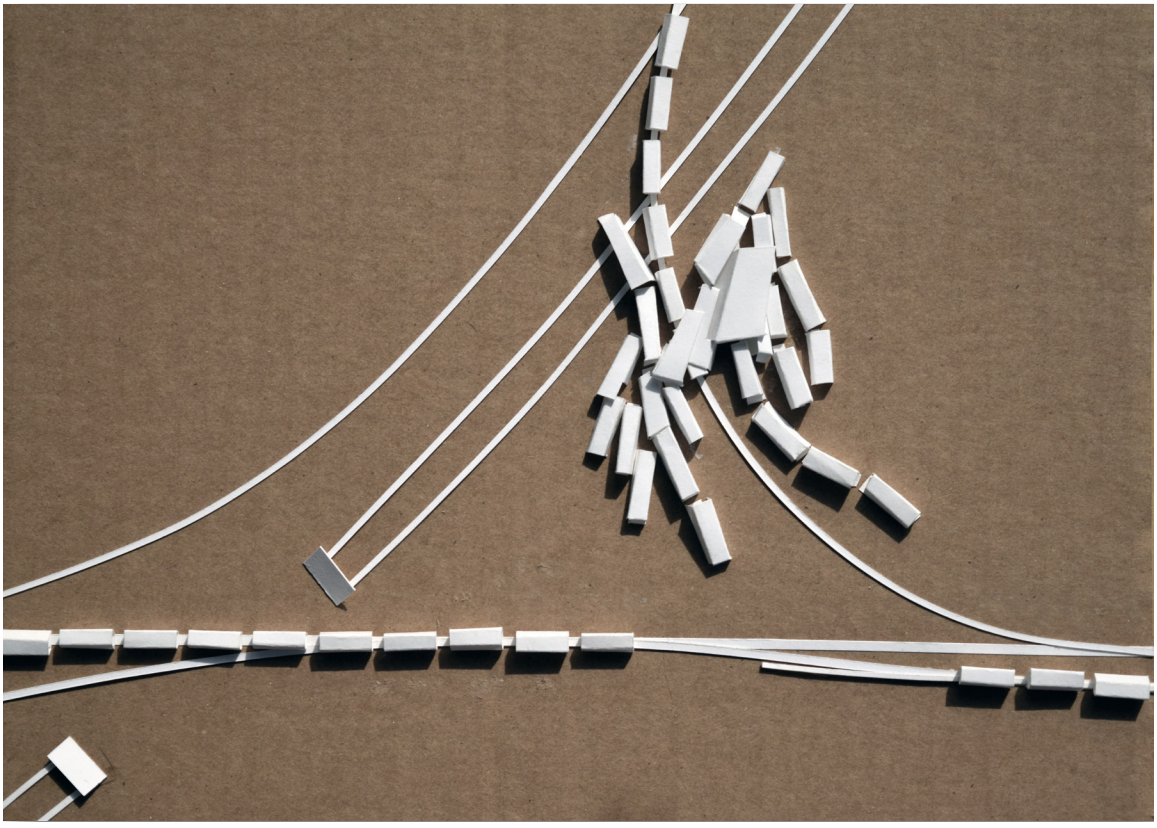
Site 3 is situated on the central rail junction of the Fort Road industrial region. Rail sustains the identity of the area, a fundamental historical infrastructure and through each of the sites, the organism community is tied either directly or indirectly to its form. The junction, where the major rail lines intersect, establishes the region's nucleus. Historically, this site has been a no man's land, a place that exists for the locomotive. It is important to create an architecture that will bring people into this area, while also allowing rail activity to continue. Building on the idea of connecting open space through form, the site's organism concept invokes the idea of rhizome. The rhizome spreads and weaves through the region, one connected mass that ties discrete spaces together.

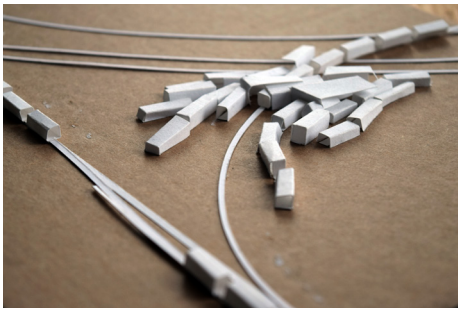


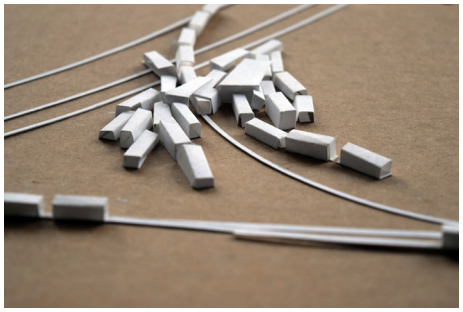
Site 3: Rail Line Junction, site plan. A) Highlighting site forms of interwoven rail lines, B) Showing open negative spaces created by the intersecting rail lines, C) View of rail edge. Base image from Google Earth, "North Industrial".



Patterns of Rhizome growth influencing the organism concept of Site 3 from Klimeš, “Phragmites Australis at an Extreme Altitude”







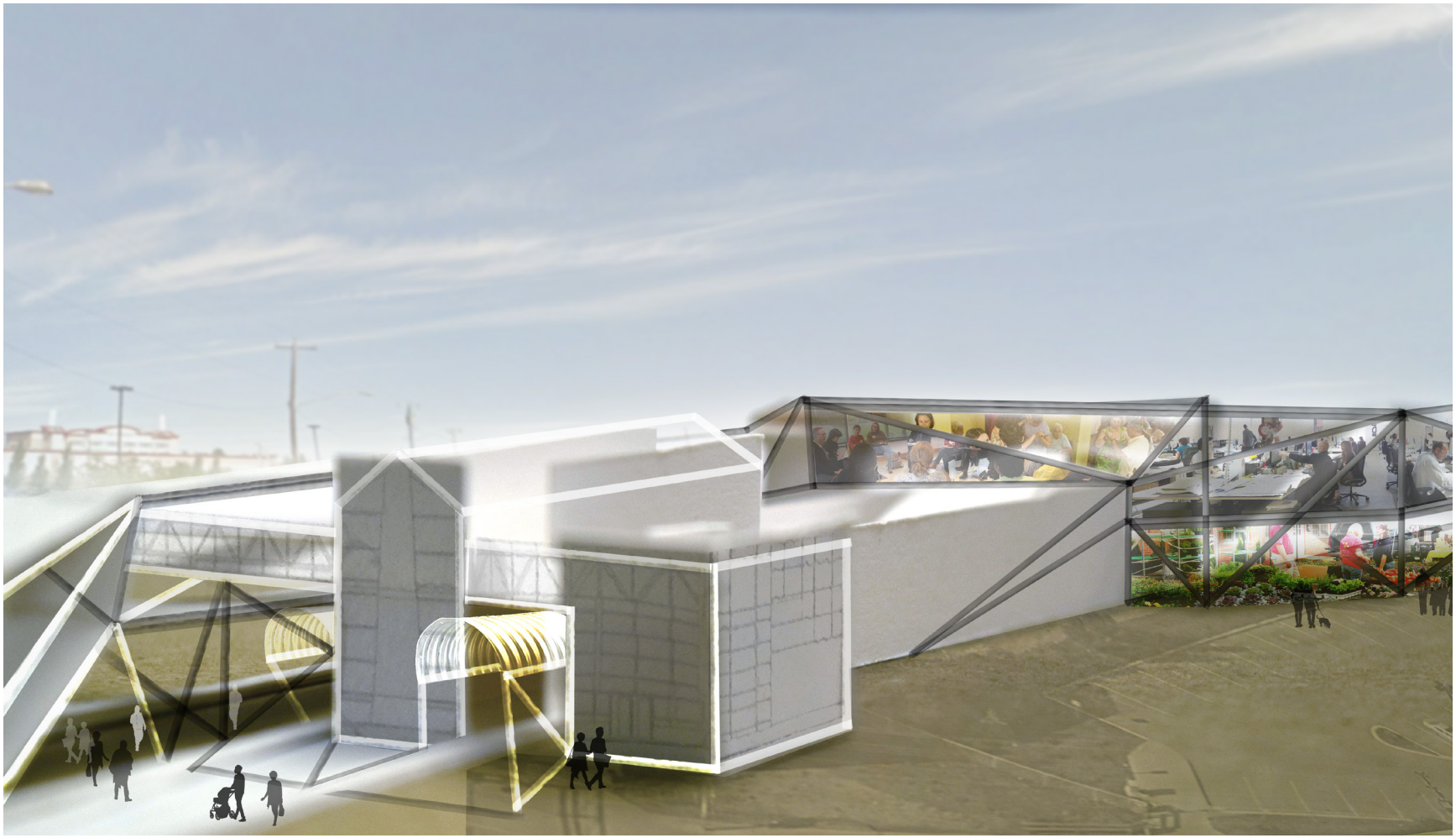
Organism Concept of Site 3: Conceptual model of cellular growth of the industrial warehouse and business forms.

Programming the Organism

In traditional adaptive reuse, it is primarily program that drives change to building and site. The same is for the organism strategy where the imprint of program is what motivates the metamorphosis of site genome and the growth of its structure and form. Each sub-organism of the industrial organism community is given a unique urban program and in organic growth, transforms the wasteland into a complete multifaceted community providing space for living, work, recreation, entertainment, commerce and many other services. The program for each sub-organism is established in an intuitive manner, based on the site's existing industrial components and activities.

Site 1, as previously established, is associated with Edmonton's LRT system being centred around the Belvedere LRT Station, a major commuter node providing direct connection to the downtown business core and other main urban areas. The presence of the Belvedere station was one of the main draws to selecting the Fort Road region as the project test site. The station exists as an important piece of transportation infrastructure in promotion of the walkable city, however, in its current state, isolated in the wasteland, provides little or no benefit to its specific locale and surrounding neighbourhoods. There is a prominent need for site improvement, to develop the area in promotion of urban densification and walkable, transit oriented living.

As the existing centre of regional activity and movement, it was decided for site 1 to build on and add to this function, developing the area as a community centre and hub, a place for meeting, interaction and enjoyment as well as movement and exchange. For this development, additional program is required for the site that includes a market, a cafe and a cultural/community centre. As well, due to the site's connection through light rail to the downtown business centre and universities, I propose to provide program for business activity and connection, including office and meeting/event space.



Concept rendering of site 1 industrial organism. Representation of growing symbiotic structure intertwining the existing Belvedere LRT Station and rail lines with proposed community, business and market program.

Site 2 is composed of a selected industrial business block in the wasteland's mixed business district. This area stands as the wasteland's business centre, containing a variety of mixed private commercial and industrial ventures, however, we find many of these are considered in the margins of urban industry as salvage yards or miscellaneous material and equipment storage. While it is this project's intention to maintain the region's function in industrial business, it is also to encourage growth of urban life and development of city industry. In site 2, I propose to develop this area as a live-work community, a centre for entrepreneurs, growing business and creative development. These elements will provide more layers of use, diversifying the region's urban profile and inspiring life and activity. As new businesses grow and thrive in the organism, there is ample space available for on site industry expansion.

In seeding this community, site 2 will be programmed as a start-up business campus. The startup campus is a multifunctional business facility made up of connected private venture spaces of different sizes and forms. It is designed to support growing businesses at all stages of development, from idea conception to initial manufacture and operations. The campus includes shared facilities for networking, events and meetings, a place for creative minds and people with a variety of different skills to connect.

Living space will also be included as part of the start-up campus in an initiative to create a connected live-work environment that is found nowhere else in Edmonton. These spaces will be directed towards mature university students and personnel who are looking to develop their research for the commercial sector and who require an integrated approach to life and work to streamline their creative development.

Concept rendering of site 2 industrial organism. Representation of cellular structure and integrated live-work units in the start-up campus.

The industrial organism for site 3 is proposed to have a focus on urban recreation. Recreation is an important part of a functioning community and currently the wasteland has no designated space for these activities. We find site 3 is abundant in open space, a void that is defined and kept by the presence of rail and train movement that to this point has provided a deterrent to inhabitation. The active train lines crisscross through the site, sectioning and subdividing the space with the intention to use the organism architecture to navigate these areas to connect and unify, transforming the region into one continuously inhabitable and explorative space.

Concept rendering of site 3 industrial organism. Representation of rhizosomal recreational facility that grows around and incorporates the train and industrial rail line.

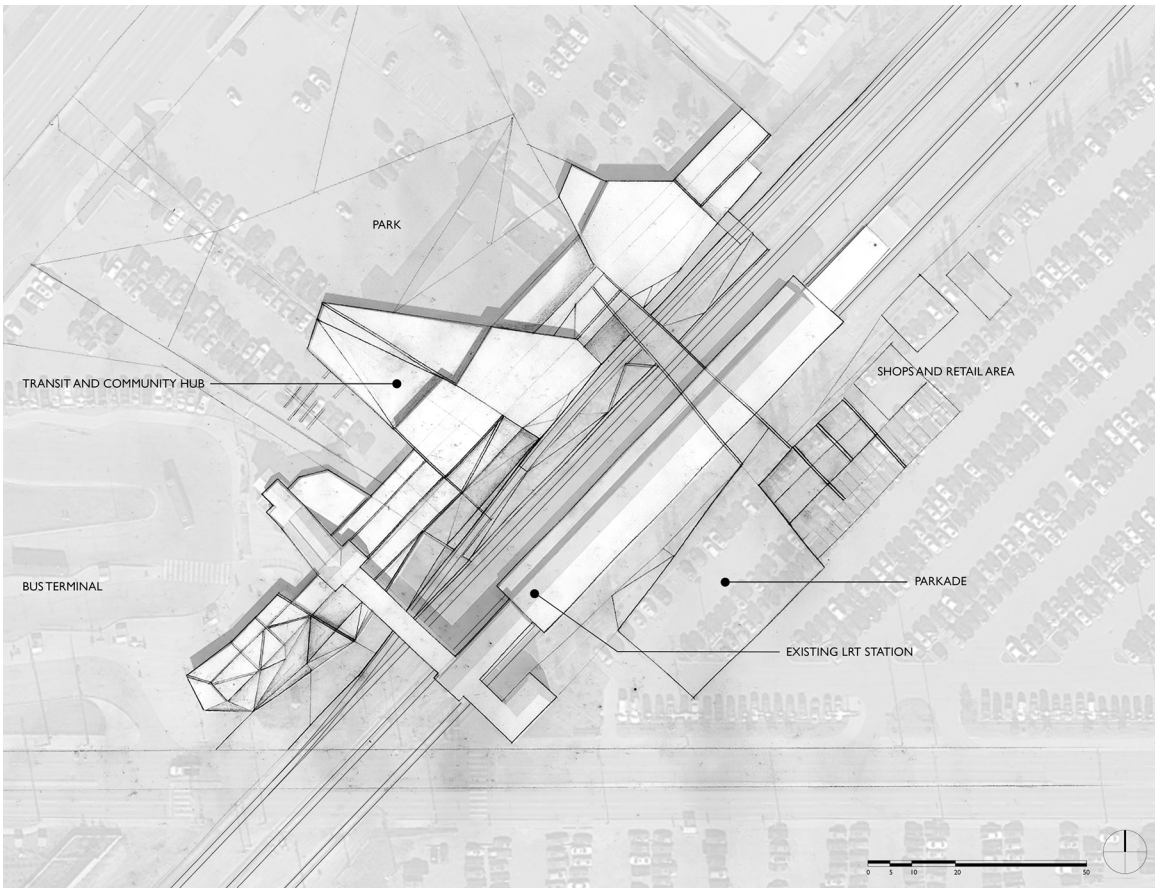
Site Design

Following the establishment of each individual organism concept, the next step in the process of organism design is using the selected program to morph an accompanying form and structure from the "DNA" of the site. This section follows translating the conceptual organism into the structural organism. At this stage, this project will focus on the development of sub-organism sites 1 and 2, the symbiotic LRT market community and the mitotic industrial live-work campus, leaving site 3, the recreational rail facility to remain at the conceptual level.

Sub-Organism 1: Symbiotic LRT Community

The following series of drawings defines and illustrates the application of the organism strategy methodology to the Belvedere LRT Station site. This section focuses primarily on the proposal of form and structure of the symbiotic industrial organism of which is developed through the extraction and morph of site "DNA".

As discussed in the previous section, one of the objectives in this project is that the Belvedere LRT Station site is transformed into a community hub, the centre of activity and movement for the organism community. The existing commuter transit station will be augmented with additional programming to support this development, coming in three forms. The first form is community program that includes a community and cultural centre, marketplace, cafe and public outdoor space. The second program form is space for business activity in support of the site's direct connection to the downtown business core. The business program will include a small office area that accommodates several professional or creative businesses and event/conference space for networking. It is the interest to draw into the Fort Road region new creative professionals and developing a line of exchange between the Fort Road and other urban areas. The third programmatic form is a transportation program to better support the site's commuter and movement activities. This program includes an expanded bus transit centre and a space for secure, indoor bicycle storage.



Site Plan of the Belvedere LRT Station Industrial Organism shows the relationship and connection between the existing LRT station and the added evolved organism around the rail corridor.

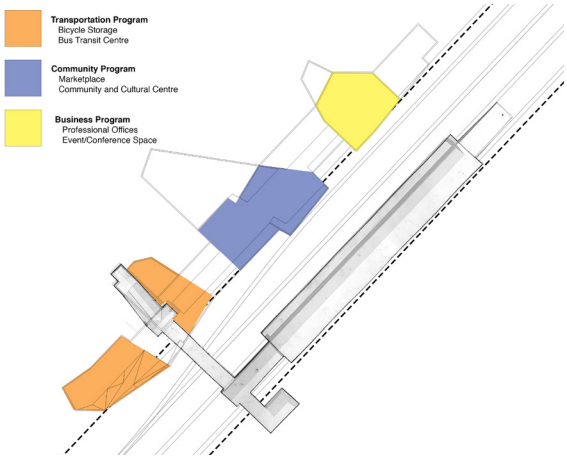
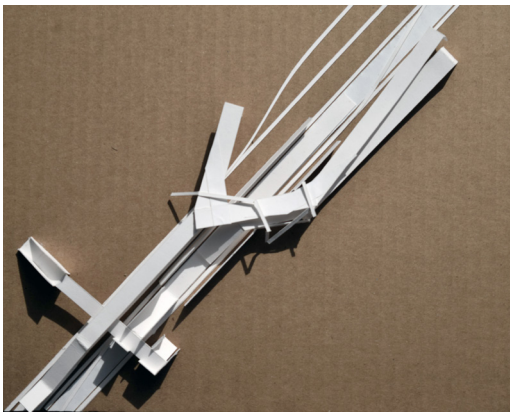


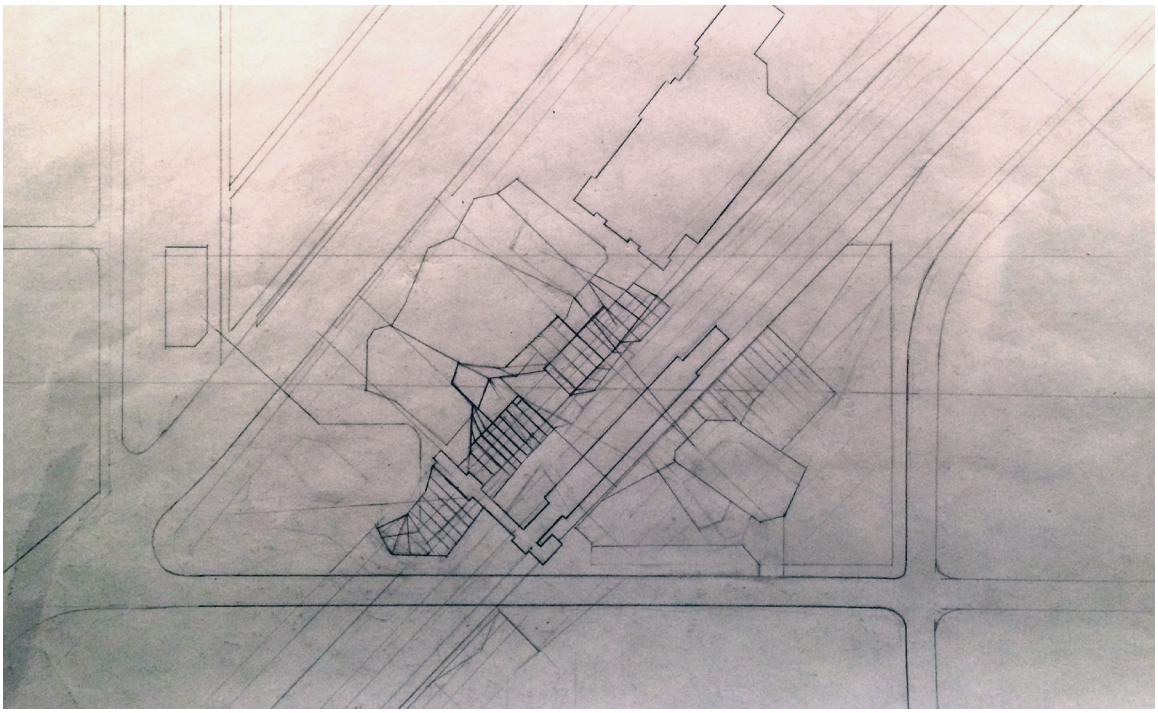
Diagram of organism program arrangement, programmatic nodes to generate growth of structure around the rail corridor.



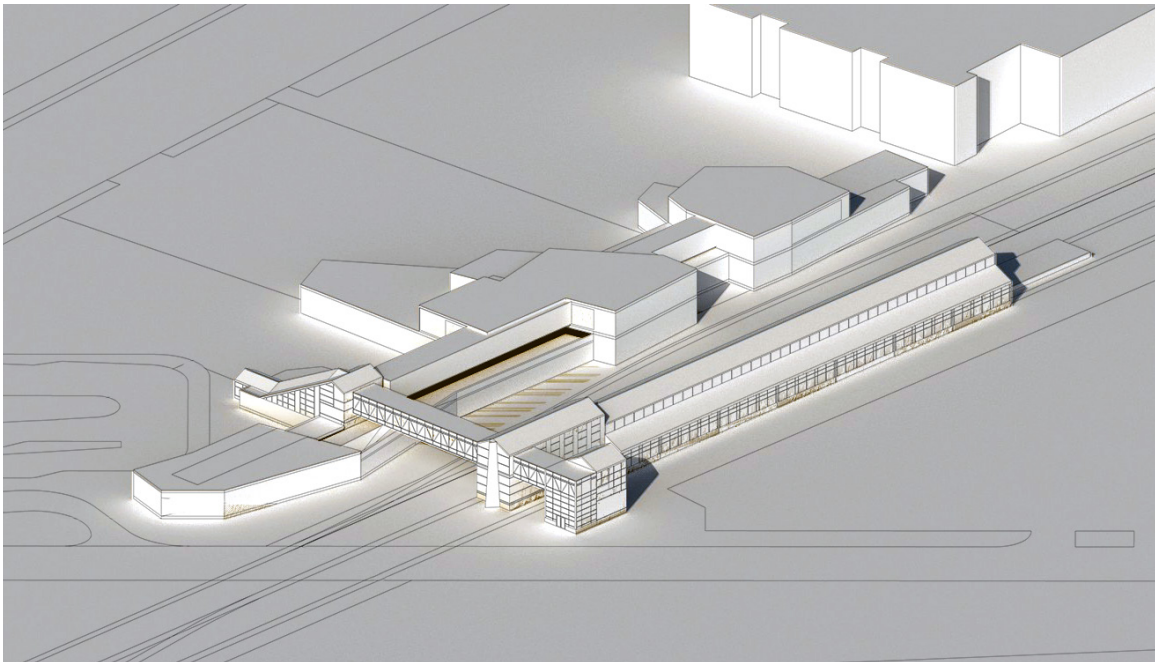
Symbiotic organism concept creating an entity unified with the rail lines and corridor.

The introduced programmatic elements are arranged within the site, adjacent to the existing LRT structure. They are defined as nodes along the rail corridor and as they inspire the growth of structure and form, will enclose the space around the rail lines creating a unique urban-industrial environment and refuge. The arrangement of the program nodes is historically based, reflective of the past relationship of business and rail, and even if the original structures have been removed, they can be referred to through abstract form. Rail lines and corridors are the primary historic industrial structure of the Fort Road region, and as such, are celebrated in the organism community. Rail also is used functionally as a connective element, a form that helps fuse together incongruous industrial space.

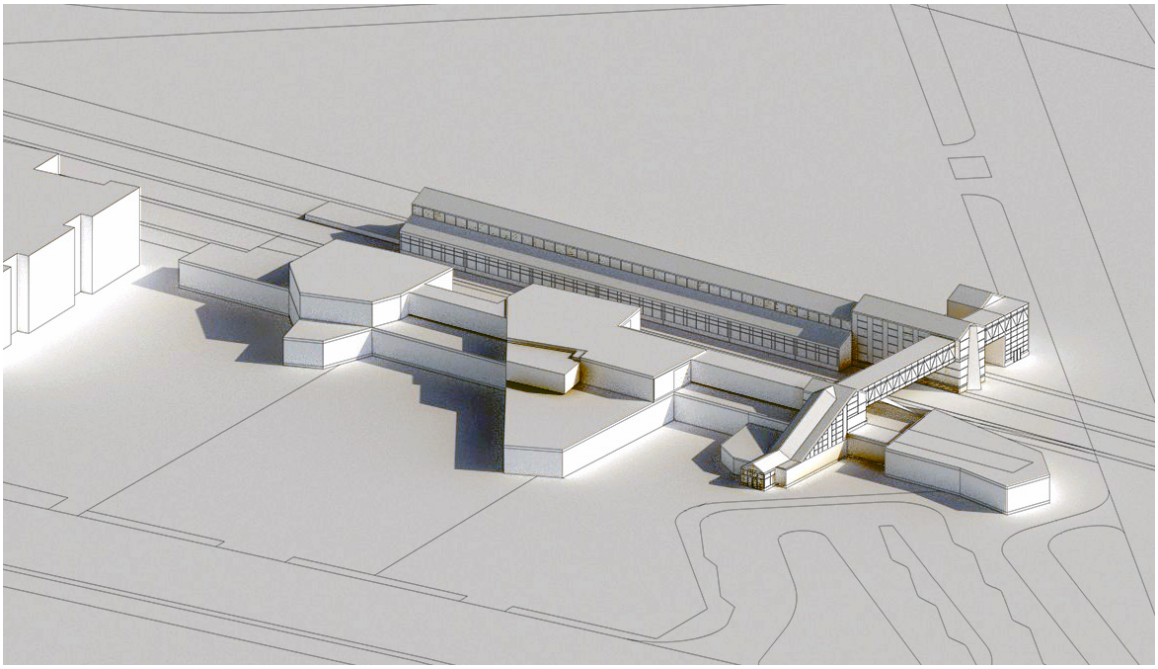
One of the main themes of the organism strategy is the development of structure as landscape. Structure evolves from the ground, generated from the fragmented and broken elements, the remains and traces of past buildings, equipment and systems. These elements meld together as their “DNA” morphs to create a unified, and even often nonsensical form. This idea of landscape is clearly demonstrated in the LRT community sub-organism as the symbiotic form establishes itself within its environment, becoming a part of the rail corridor, the parking lot, the existing transit building and will continue to grow and integrate with new elements as new programs are added, becoming part of the symbiosis.



Sketch of structural concept and morph of existing elements that include the parking lots, LRT station, rail lines and neighbouring structures.



Southeast Isometric View of the Symbiotic LRT Organism.



Southwest Isometric View of the Symbiotic LRT Organism.

The design drawings demonstrate a clear relationship between the form of the organism and the form of the existing LRT Station. This is an intentional relationship as the structure of the new transit organism is generated from the “DNA” of the of the existing station. The new entity develops as the station’s organic antipode, working with the existing to enclose and complete the definition of the rail corridor.

The existing Belvedere LRT Station has an distinctive form and structure. A simple, modern building, designed in the iconic image of a cattle shed. The form pays homage to the historic livestock industry that defined the Fort Road region. It is the intention of this project to leave this building mainly intact, a clear symbol of the region’s past, that the organism works to compliment, structuring the area around this building to define a place for urban inhabitation and enjoyment.

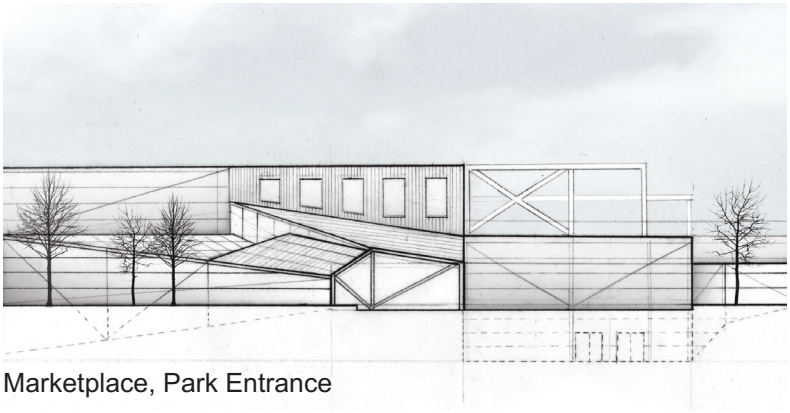
Images of the existing open air Belvedere LRT station structure showing the distinctive glass-walled shed form constructed from structural steel.

A

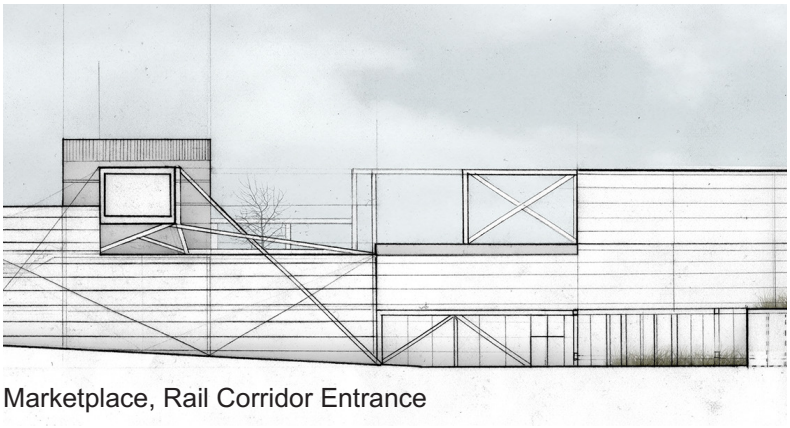
B

Industrial Organism Elevations. Showing steel structure and glass curtain wall facade morphed from the genome of the existing Belvedere LRT Station. A) Southeast Elevation, B) Northwest Elevation

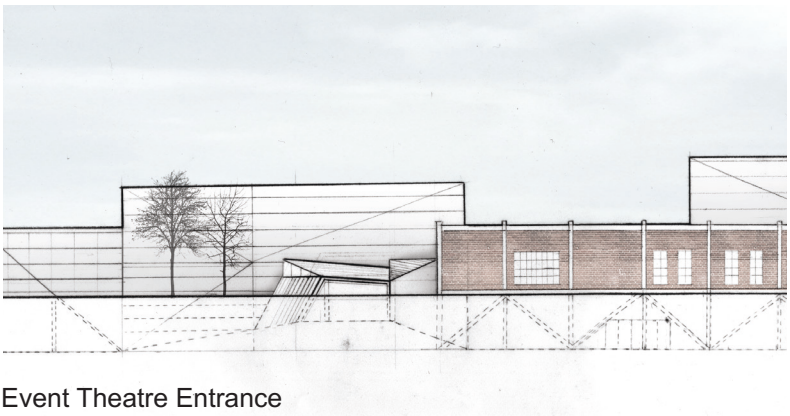
The organism's structure being primarily based on the "DNA" of the LRT station is constructed from similar materials specifically using an exposed steel structure and glazed curtain wall facade. These elements being constructed in a new location, interacting with foreign elements, under new programmatic demands are manipulated, taking on potentially wild new forms.



Marketplace, Park Entrance

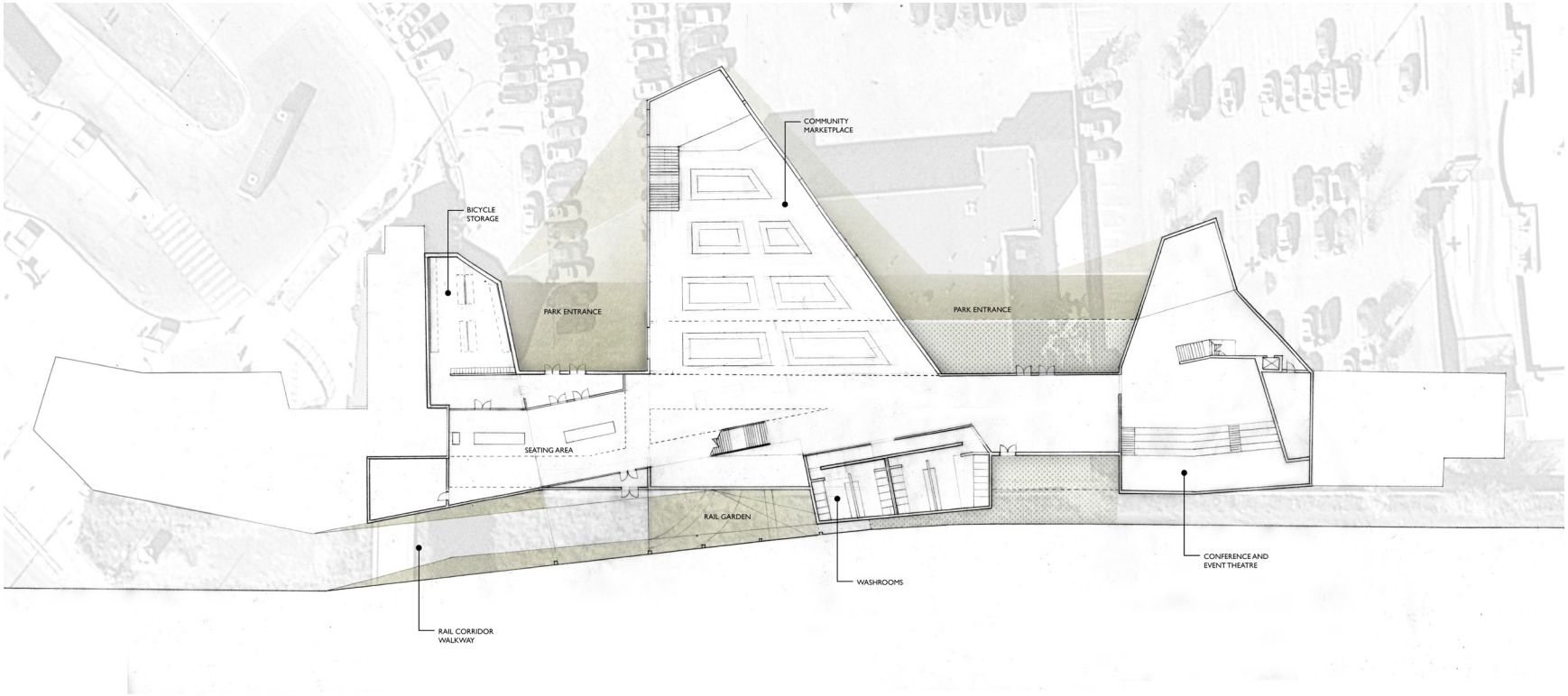


Marketplace, Rail Corridor Entrance

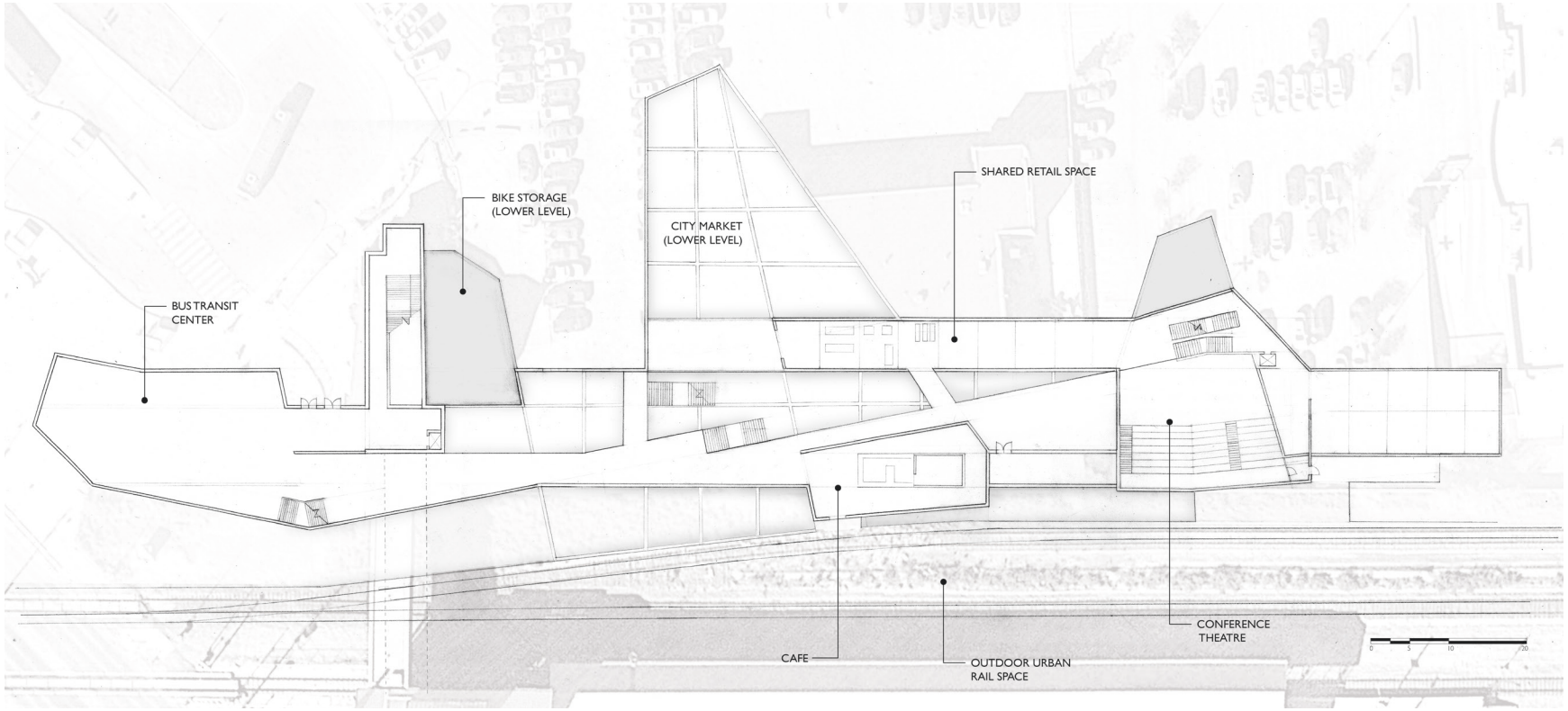


Event Theatre Entrance

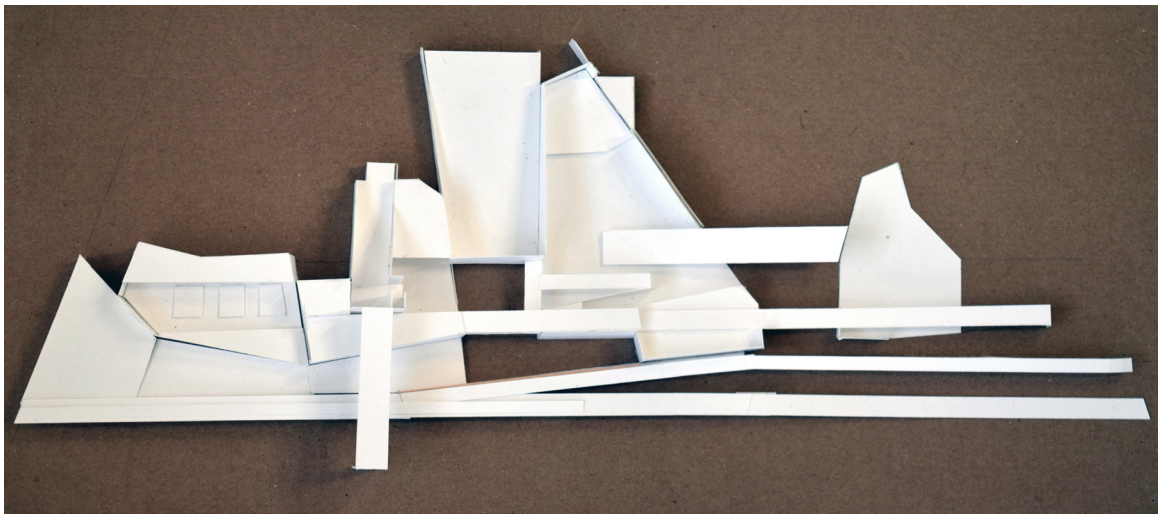
Highlighted segments of the organism elevation showing structure created through evolve of the LRT station "DNA".



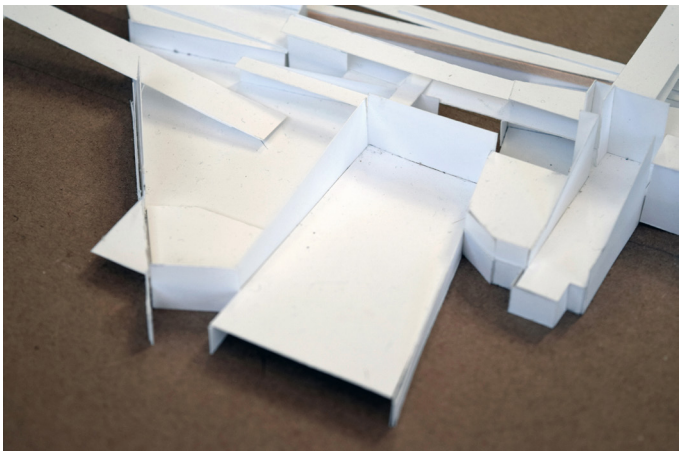
Lower Floor Plan of LRT Community Organism. Program includes the community marketplace, bicycle storage facility and the conference / event theatre. These program nodes are connected by circulation space that is an extension of and in connection to the rail corridor.



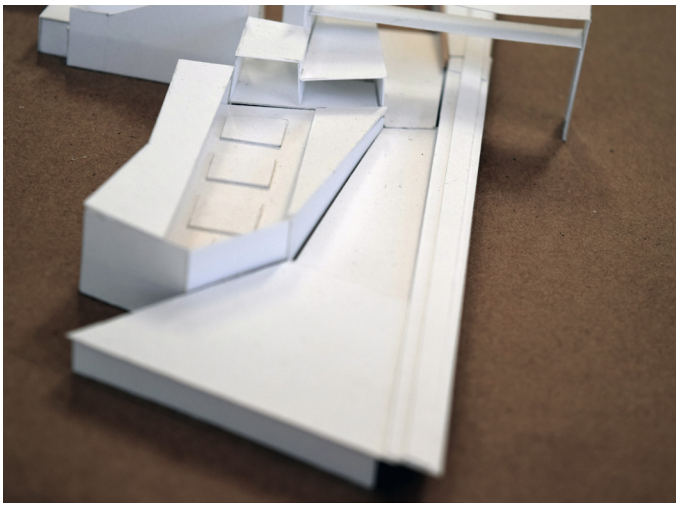
Upper Floor Plan of LRT Community Organism. Program includes the bus transit shelter and hub, cafe, shared retail space and professional office space. From the public cafe, visitors have access to and can inhabit the rail corridor and explore the areas around the nonfunctional rail lines.



Complete model showing all programmatic spaces and their relationship to the rail lines.



North main entrance sloped from street level



Rail Corridor Walkway cut into the landscape along the rail line

Sketch model of the landscape form of the LRT organism showing the interaction of spaces and integration of the form with the rail corridor and rail infrastructures as well as the parking lots on the opposing side.

Images of the existing rail corridor. Typical urban rail space. Uninhabited and in a vacant and unkempt state. Images from Google Maps, “Belvedere LRT Station”.

Render of the developed rail corridor showing introduced inhabitation areas. One of the main objectives of this organism development was to begin to establish the declining rail lines and corridors as connective urban space.

Sub-Organism 2: Live-Work Campus

The objective of the second industrial organism as previously discussed, is the development of a growing live-work community within the industrial business district of the Fort Road region. The district in its entirety encompasses a vast area that is mostly uniform in composition, a neighbourhood of mixed industrial and commercial warehouses arranged in a network of regular city blocks. Here we focus on one of these blocks to establish the organic architecture and seed the community. The intention is that as the organism grows, its form will spread outward, invading and becoming established in new parts of the district.

Industrial Business District with growing live-work organism.

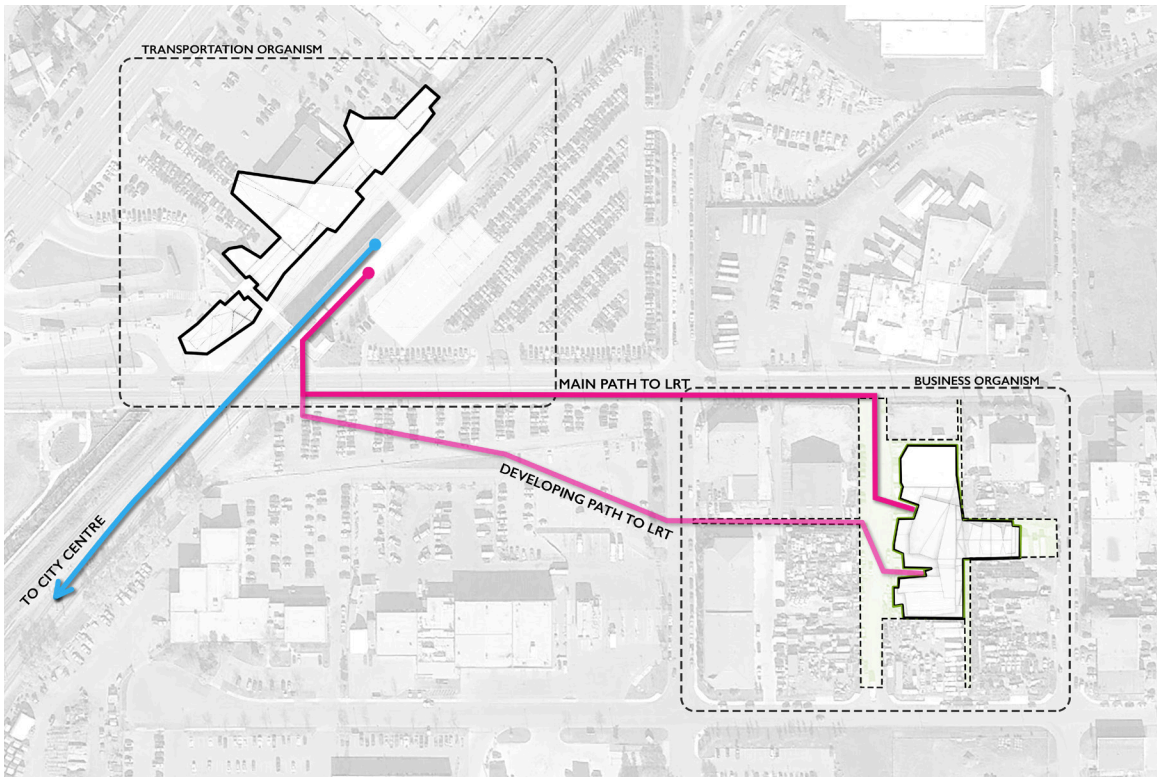
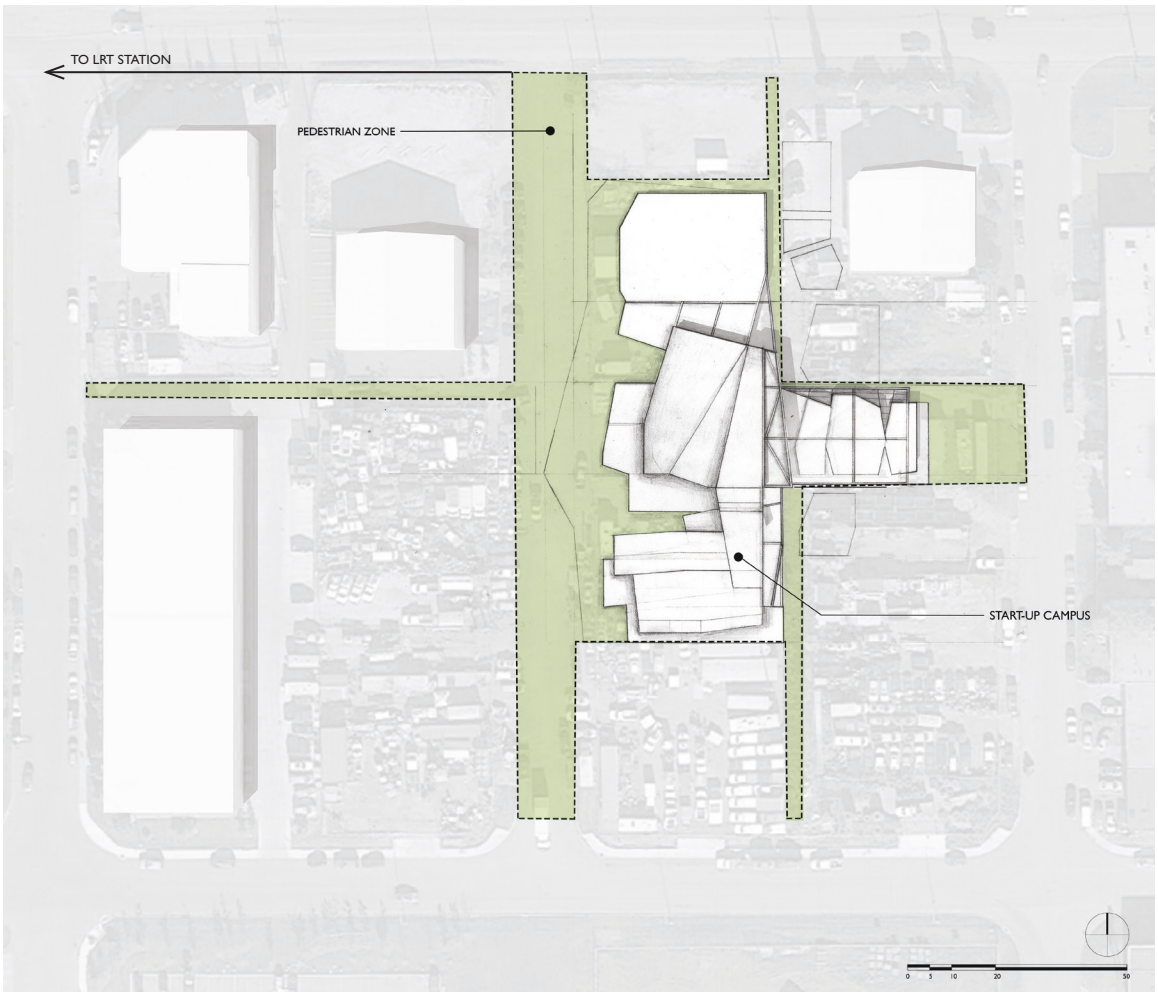


Diagram of pedestrian connections between sub-organism 2 and the LRT Station.

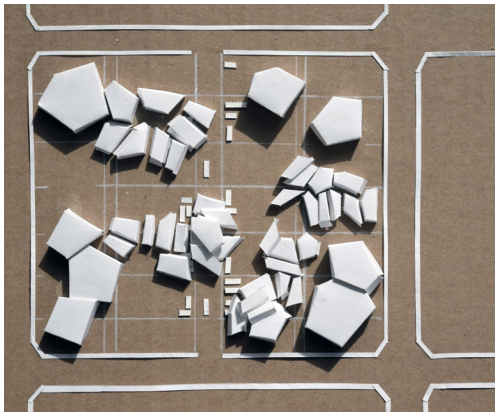
The block established as organism site 2 is chosen, not for its specific features that are similar compositionally to the other district blocks, but for its proximity to the Belvedere LRT Station. The objective of the organism community is to engage with this system, connecting the industrial wasteland with the rest of the city and encouraging community development around pedestrian movement. The organism through its design, establishes the industrial block as a walkable neighbourhood, defining a car free zone within the vehicle dominated industrial environment. The evolving organism structure generates and defines urban pathways and pockets of recreation space through the block to support outdoor living and movement to and from the LRT station.

The overall design intention is the cultivation of an urban community form that functions comfortably within and as an integrated part of the existing industrial environment. The added spaces and structures intermingle and interact tectonically with the disarrayed and unkempt existing elements creating a collage of continuous industrial form. The design discussed in this project is simply the seed of this community and as new structure is added over time, the new and existing will further enmesh.

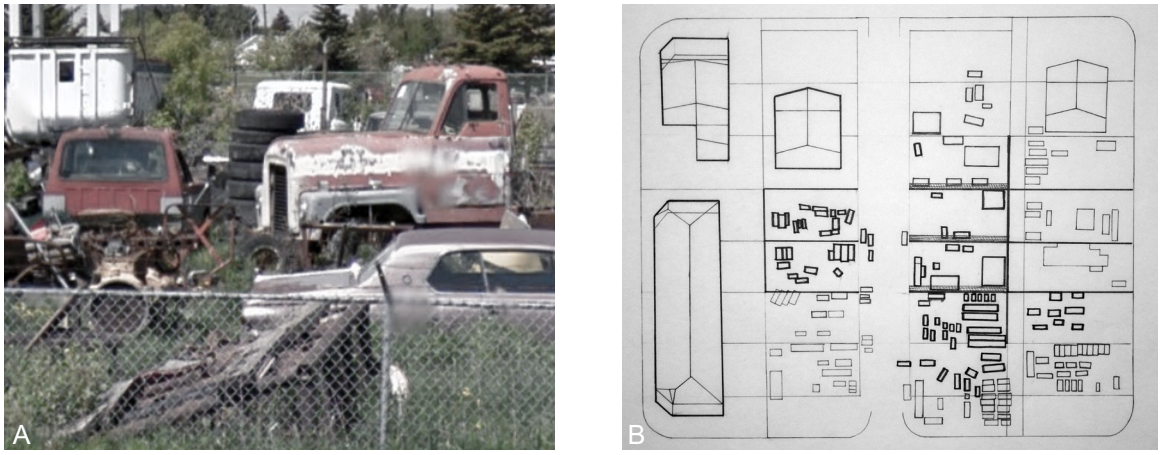


Site Plan of the Live-Work Industrial Organism shows the clustered and tectonic forms of the start-up business campus. The Live-Work community is seeded to establish a central pedestrian zone and connective pathways through the site.

Development of form and structure begins with the arrangement of program. One of the challenges of working in the industrial block is how to approach introducing program into an active space. Typically, only void is viewed as urban opportunity, however, the landscape of the wasteland stands as a patchwork of active and latent elements, both contributing to its form, but also restricting new uses and thus pronouncing the area's deterioration.



Organism Concept for Site 2. Clustered cellular forms.



A) Salvage yard and disarrayed elements found in the industrial block, B) Plan sketch of industrial business block with the elements that contribute to the site's genome. Includes the warehouses, salvage lots, broken and decaying storage forms, divisional structures.

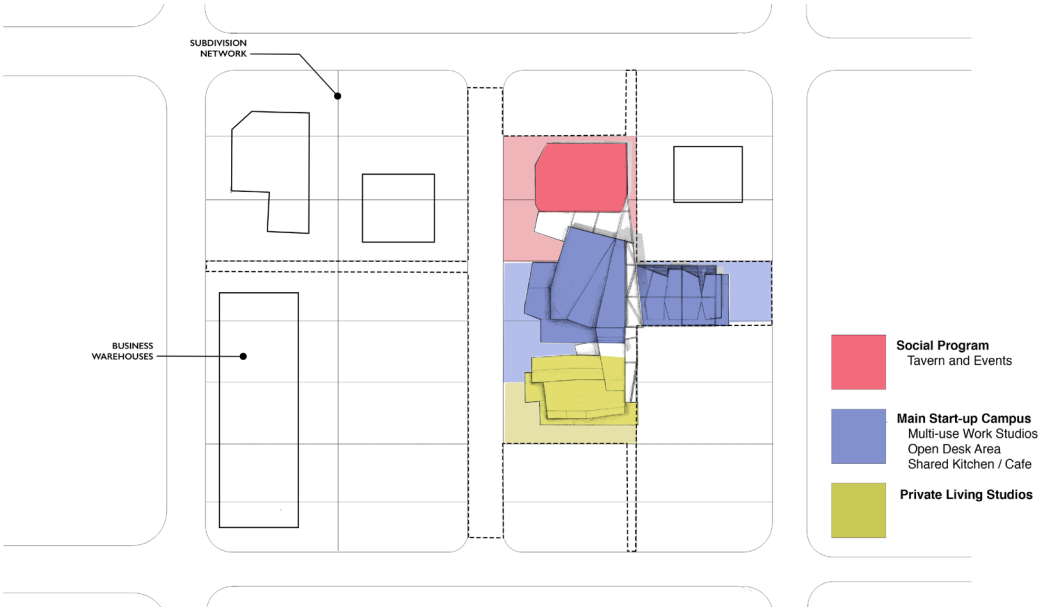
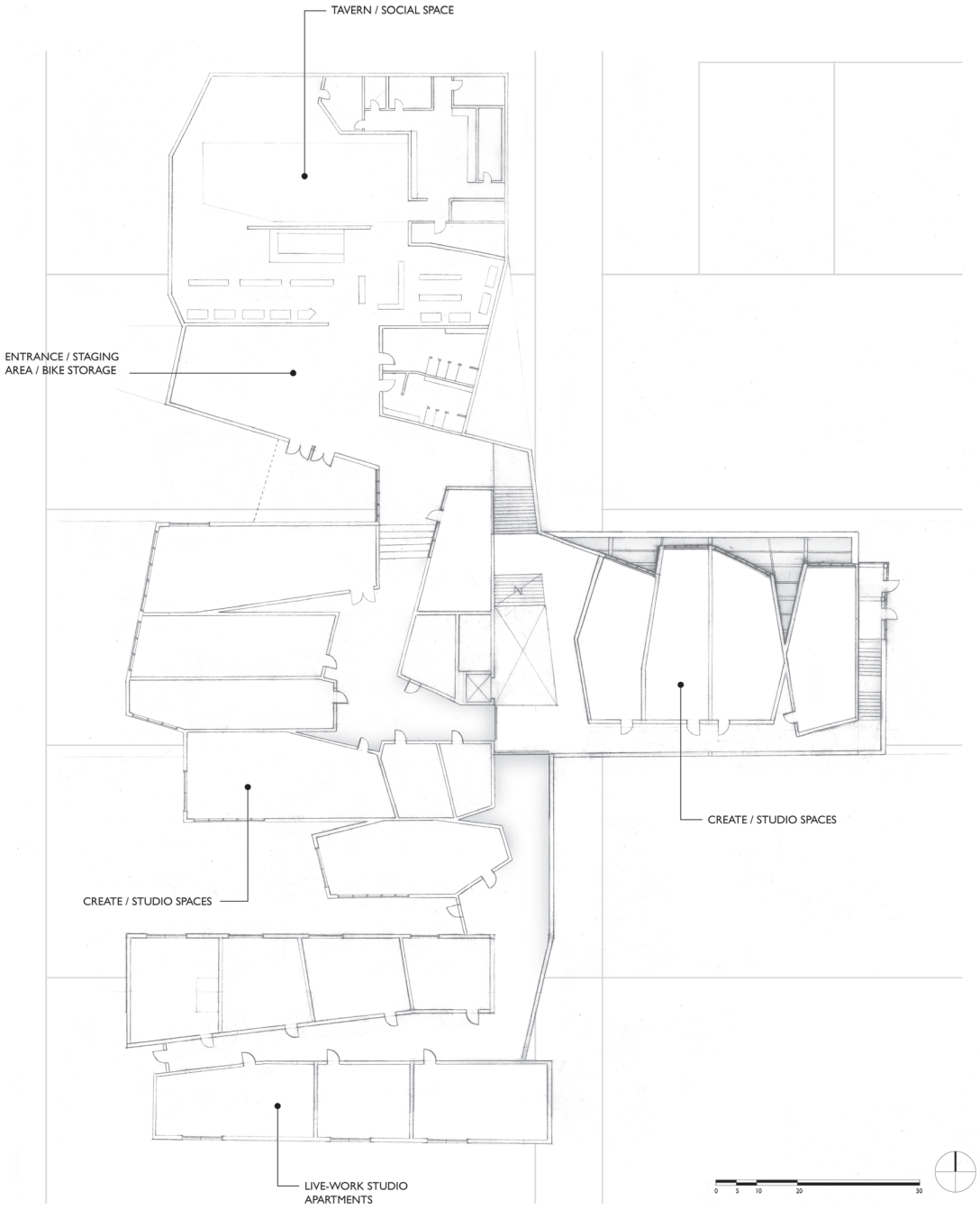


Diagram of organism program arrangement, campus programmatic nodes of social space, work space and living space are separated and spread in the block among different subdivisions.

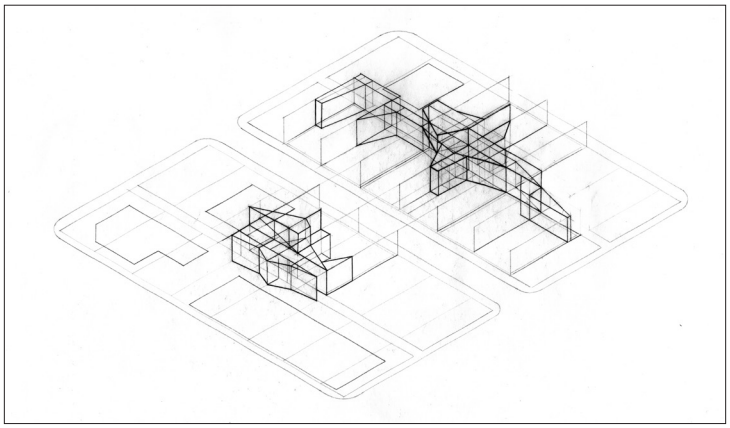
The design block is filled with active shops and businesses, though most are considered marginal as salvage yards, vehicle repair or private construction supply. It is the intention of this project to not strip away and clear these elements from the site, but develop with them, allow their function as part of the site's identity with the intention of creating an organic design archetype that harmonizes and integrates marginal with primary forms. The live-work community program is positioned within several select subdivisional plots, using this framework as both a organizational tool as well as a site element that will contribute to the evolved organism structure.

The start-up campus is introduced to this site, conceived as a programmatic seed for the development of this live-work community. It is composed of a collection of adaptable work and office spaces to accommodate start-up businesses of a variety of sizes and types. These work spaces are aggregated together and share meeting, event and social areas to minimize costs and provide opportunities for networking and interaction.

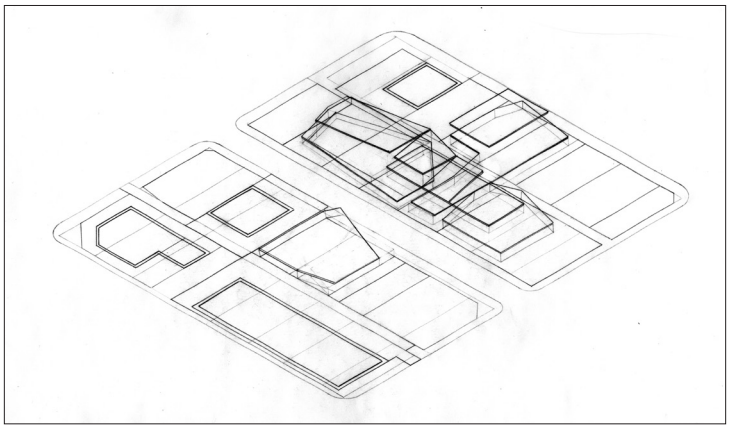


Main Floor Plan of start-up campus showing program arrangement following subdivisional structure. Form development through evolve ties these program nodes together and creates an explorative circulation structure.

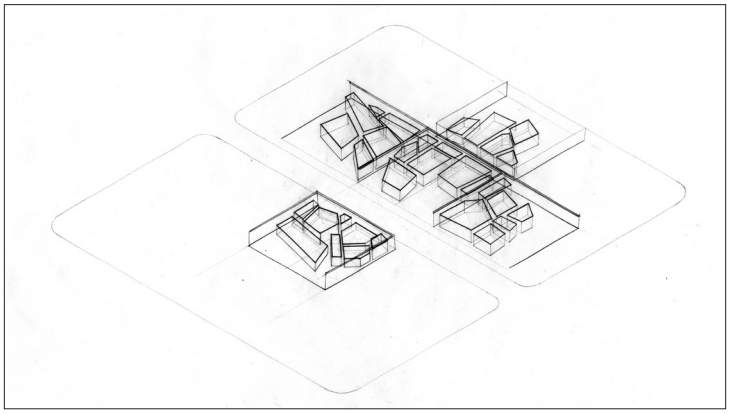
Structure and form of the live-work organism is based on and extracted from the disarrayed elements of the industrial block, the “DNA” of the warehouse forms, broken vehicles and equipment, industrial materials, underlying organizational frameworks and distended ground layers. With no existing historic forms to attach to, the forms rely on the textures of the wasteland, the marginal, forgotten elements to provide a structural basis.



Morph of Site Divisional Structure

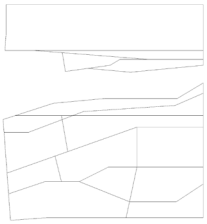


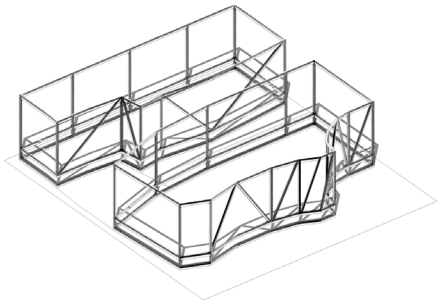
Morph of Industrial Surface Layers

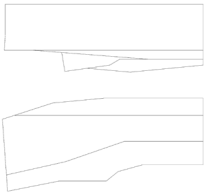


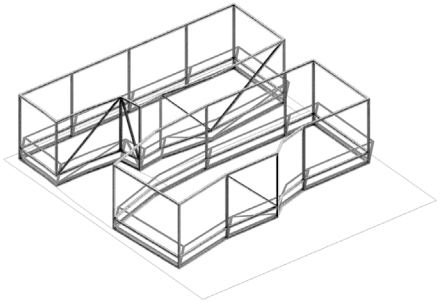
Morph of Industrial Salvage and Storage Elements

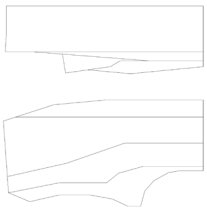
Organism Structure Development: Studies of site “DNA” morphological transformations.

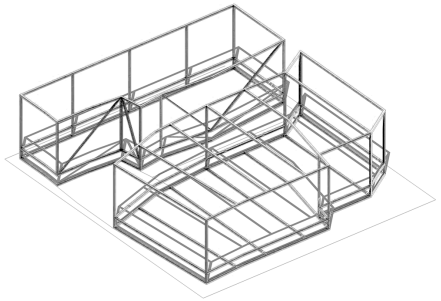


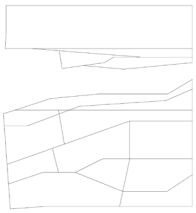


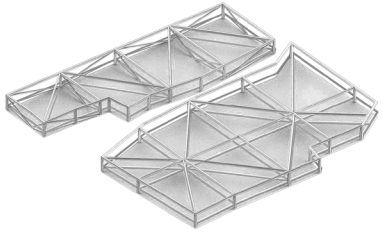




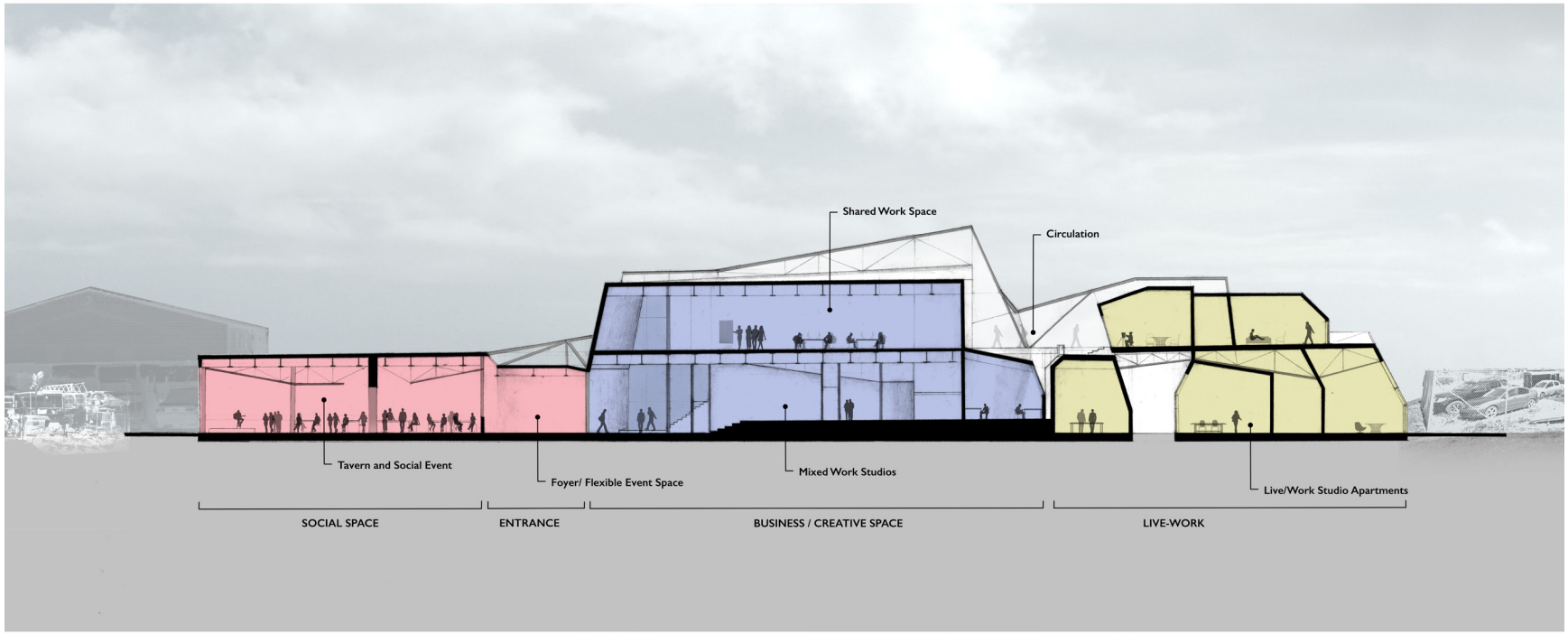






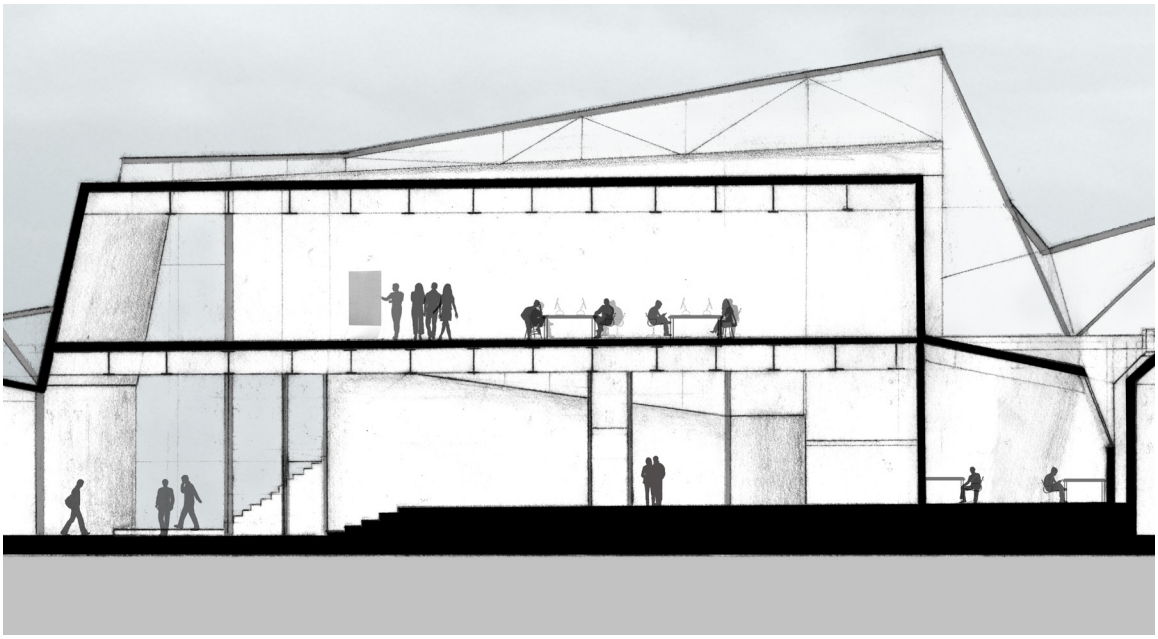


Explorations of Structural Frame Morph based on salvage lot forms.

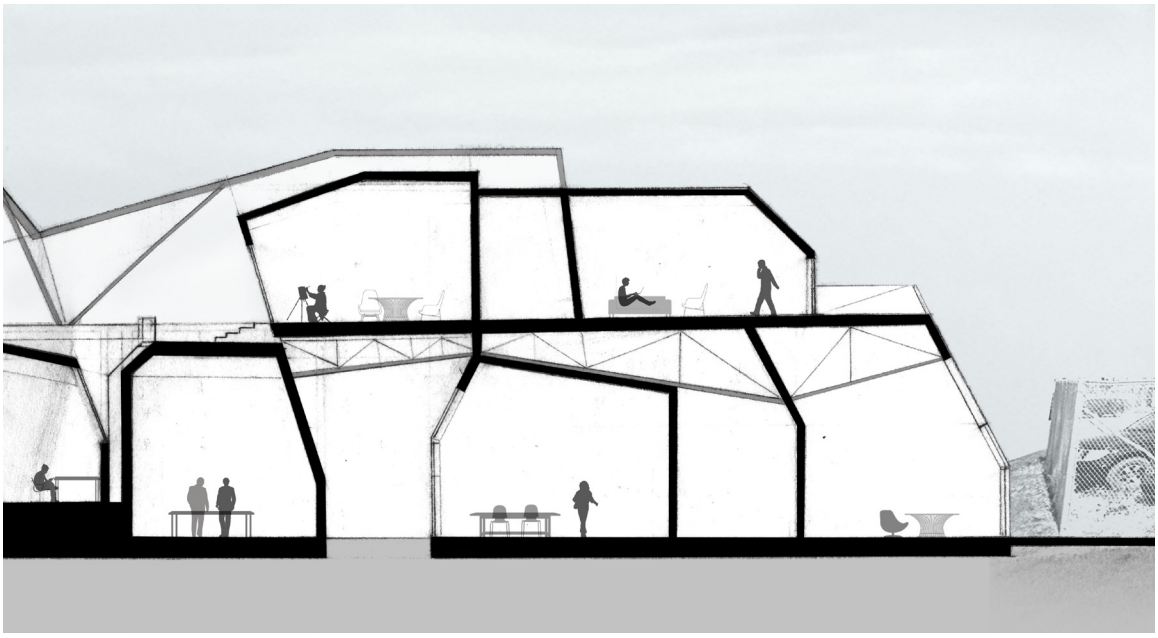


N-S Section of Start-Up Campus Final Design.

Design Section - Focus of Social Program Area



Design Section - Focus of Mixed Business Campus Area



Design Section - Focus of Live-Work Studio Area

CHAPTER 5: CONCLUSION

With this exploration into the industrial organism, the hope is to inspire renewed interest towards the revitalization of urban and community use of complex industrial wastelands and other under-utilized post-industrial landscapes. These are not lost regions suited for a gradual descent into marginality, secondary service and interstitium, but remain places with significant potential through layers of underlying history and identity. I believe the strategies presented in this study can be reproduced in any form of wasteland or industrial environment in any city in the world. It is a move towards a more connective cityscape, beyond the condition of disjointed urban development that has become normalized over the past 50 years.

This project has presented an outline for a new adaptive reuse strategy, one based around that of a living organism which cultivates an essence of new life in the disarrayed and stagnated environment of the industrial wasteland. Strategies of adaptive reuse are regularly utilized in the contemporary city, primarily employed in cultural projects to enrich the atmosphere of the urban environment, however the traditional reuse methodologies are attuned to produce static and isolated spaces often centred in the cultivation of consumer activity. Countering these approaches, the organism is not only conceived to grow structure from the elements of the wasteland, but foster community in the unification of the fragmented landscape and in creating an open-ended architectural environment supportive of functional evolution and change.

In the confines of this thesis it is impossible to explore the extents of the repurpose of the wasteland as an urban community. The scope of this project however, is establishing the seed of community growth, centred primarily on the conception of the organism and methodology of architectural form generation out of residual fragments of the ever-changing industrial system. The designs proposed indicate the beginnings of a resilient system, a series of separated entities in a voided landscape that will continue to develop indefinitely, growing and evolving in new ways as components are added and integrated into the greater body. This attempt is to suggest a new conception of community, one not tied to rigid rules of zoning and separation, but allows harmony between a mixture of city programs. Industrial spaces are integrated with residential living, consumer areas, parks and cultural zones, the city becoming a mesh of heterogeneous form and activity.

Genetically based architecture is in the forefront of this thesis and is an important area of environmental research. It is the leap to creating human environment as a true, self-sustaining artificial life, but clearly is not yet a resolved approach. This is an expanding field of which we have only begun to scratch the surface and often explorations open up more questions than they provide answers. This project, building from several lines of research in organicist theory, biomimicry and genetic concept, proposes a structure for a transformative and self-evolving form within a real environment. While, we cannot yet omit the role of the architect or designer as a guiding force, the design and methodology explored in this thesis takes these ideas from the theoretical and into the city.

Thesis Presentation: *Industrial Organicism*

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