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Visions of a polycentric suburb : the evolution of car-centric design

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VISIONS OF A POLYCENTRIC SUBURB: THE EVOLUTION OF CAR-CENTRIC DESIGN

By

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Abstract

The following thesis investigates emerging issues surrounding car-centric design known as urban sprawl and questions whether or not it is feasible and appropriate for cities to continue sprawling in a car-centric manner given changing conditions. Social, political, environmental and economical concerns have surfaced putting a damper on the once great "American Dream" raising concerns that car-centric design can prove detrimental to humanity.

The roots of modernist design are discussed and the ideas behind modernists' intentions analyzed while juxtaposing modernist vision to the real outcomes of modernism. Modernist ideas are compared and contrasted to new and old theories that challenge the modernist ideals in order to propose a new direction for future urban development.

The design project takes into account the importance of connection and network through infrastructure in a globalized world. Transit infrastructure (high speed rail, improved commuter rail, rapid transit and light rail) is proposed on a number of scales in the Southern Ontario region to act as a catalyst for responsible growth interconnecting future intensified polycentric suburban cities.

Acknowledgements

I would first and foremost like to thank my immediate family; my mother, father and brother, whom have continuously offered their support not only through thesis but through my entire undergraduate and graduate careers.

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This is book is dedicated to my family

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1.0 Introduction

Cities are facing a number of pressing issues in the twenty-first century. As noted in *The Endless City* (Burdett, Sudjic, & London School of Economics and Political Science, 2007) and by Newman and Jennings (2008), an unprecedented number of people are currently living in urbanized areas. Newman and Jennings point out that at the turn of the century, half the world's population will be living in cities. *The Endless City* (Burdett et al., 2007, 8) projects by 2050, about seventy-five percent of the world`s population will be living in cities. These statistics indicate that cities will face a wide new range of new economic, social, and environmental challenges in the years to come. When considering issues of urbanization over this period, two questions come to mind: where will urbanization of the twenty first century occur, and what form will it take?

A century ago, urbanization occurred within industrial centres. With the car being a relatively new invention, urban centres accommodated the influx of people coming into cities from rural areas. Cities were centralized with commerce, industry, government and living. Now, a hundred years later, urbanization in North America is occurring in a very different way. While metropolitan areas of cities like Toronto are still seeing growth (Statistics Canada, 2007a) the predominant growth or urbanization as Kotkin (2006) points out is occurring on the periphery.

The growth on the edge or periphery of cities is known as urban sprawl (fig. 1-1). The phenomenon of urban sprawl is a planning concept of the twentieth century that advocates relatively low-density development over rural land on the periphery of urban centres (Saunders, 2005). In the years following World War Two, North American cities began seeing a radical transformation in development and infrastructure. Massive superhighway infrastructure projects occurred along with the radical decentralization of urban centres into the periphery. Industry, commerce and people moved away from cities into the suburbs. Single-family homes became favoured over the dense industrial centres. Kotkin (2006) notes that since the 1950's ninety percent of growth in metropolitan areas of the United States has occurred in the suburbs. In Toronto, this is a trend that doesn't seem to be fading. According to Statistics Canada (2007a) 2006 census data, growth in metropolitan Toronto was 0.9 percent since 2001 rising from 2,481,494 to 2,503,281. In contrast, suburban cities surrounding Toronto like Brampton, Vaughan and Markham respectively saw a 33.3 percent, 31.2 percent and 25.4 percent rise in population.

Figure 1-1. Highway 400 and 401 Interchange (Source: http://www.thekingshighway.ca)

The suburbs and decentralization were made possible due to the invention of the car and its accessibility to each individual. The car greatly expanded the possibilities for mobility and captured the attention of the great visionaries of the early twentieth century. Those visionaries were Le Corbusier, Frank Lloyd Wright and Norman Bel Geddes. Each used advancements in technology to their advantage and as Fishman (1982) notes, the car and its infrastructure attempted to aid in fixing the ills of urban living of the time. By the 1930's, conditions in industrial cities were reaching horrible standards. Like Ebenezer Howard before them, the three visionaries over the course of the decade created visions that addressed the issue in different ways. The car was used as the anchor of each vision, offering many possibilities through its potential of individual mobility. It was Frank Lloyd Wright's Broadacre City and even more so Norman Bel Geddes' Futurama exhibit at the 1939 World's Fair that predicted radical decentralized cities to come. Now some eighty years later the outcome of these visionaries can be seen in the sprawling suburbs and exurbs of North America, accompanied by an extensive network of superhighways. It is time to examine whether continuing sprawl is appropriate given new conditions of urban living in the twenty-first century.

The discourse on sprawl has increased since the turn of century. The once ideal setting and solution to the urban ills of the last century are now the source of criticism in this century. Discussions by critics like William S. Saunders (2005), Robert Fishman (2005) and Alex Krieger (2005) reveal that the suburbs are places that have spun out of control and are riddled with many issues. Kreiger (2005) reveals the shortcomings of sprawl in relation to five major elements: Aesthetics, social aspects, environment, lifestyle and self-protection. Aesthetically, sprawling communities are seen as ugly places lacking identity and character. Socially, the suburbs are conformist drab locales that tend to lead to isolation and entrapment. The environmental repercussions are potentially high due to squandering of farmland, pollution from cars, and excessive use of resources like water. Lifestyle, in turn, is suffering due to lack of cultural activities. Last but not least, incivility is fostered due to self-protection of land. Within his essay Krieger (2005) refers to the critic Randal O'Toole as a major supporter of sprawl. O'Toole argues that most people like using cars rather than transit and that transit is more expensive to maintain and build. O'Toole's argument is that we should continue as we have been because we can rather than do what we can to avoid problems down the line. O'Toole's statement supports the excessive lifestyle that is synonymous with suburban living. One example of excessive behaviour in the suburbs is car use. According to 2006 census data (Statistics Canada, 2007d) 88 percent of people (drivers and passengers) in the City of Vaughan use the car as a primary source of mobility. Only 10 percent use public transit and the rest use other modes which includes walking and biking. Similarly, neighbouring Brampton (Statistics Canada, 2007b) and Richmond Hill (Statistics Canada, 2007c) had respectively 87 percent and 83 percent use the car (driver and passenger), 10 and 13 percent used public transit and both had 3 percent use other modes of transportation . While driving is convenient it potentially has some serious repercussions on the environment. The Ministry of the Environment (2008) attribute climate change to the pumping of greenhouse gases into the atmosphere. They list the car as a major source of greenhouse gas emission. Some critics such as Richard Florida (2008) go as far as to suggest that given the emerging new economy and a shift back to urban centres, the demise of the suburbs is inevitable. While this pattern of thought is radical it reveals that the conditions of living in the twenty first century are changing.

Conditions in the city are in constant flux. In the early twentieth century, changing conditions led to the bold visions of Le Corbusier, Frank Lloyd Wright and Norman Bel Geddes. With the use of the car, these visionaries inspired massive transformations of the way the world functions. After a half century of car oriented development, new changing conditions are emerging that

question whether suburban development should continue in the same manner. Given these changing conditions, is it appropriate that suburbs continue to develop in a car-friendly manner? Is it time that the way of thinking about the suburbs changes? Should thinking about the suburbs be bold like the visionary thinking of the early twentieth century modernists? What are the visions that can be offered to the suburbs? This is the line of thinking that will frame the research over the course of this document.

2.0 Background Information

2.1 Introduction

Suburbs are the developments on the periphery of urban centres that following World War Two rapidly expanded, providing an alternative to city living. William Saunders (2005) defines sprawl as "the uncontrolled expansion of low-density, single-use suburban development into the countryside." (p. vii) Sprawl is the most significant form of city building of the last half century and in many cases went largely uncontrolled or unregulated. It is important to define what exactly the components are that make up sprawl. In *Suburban Nation* (Duany, Plater-Zyberk, & Speck, 2000) the authors quite simply define five key components that make up suburban development: housing subdivisions, shopping centres, office parks, civic institutions and roadways. Duany et al. (2000) notes that one must study these as independent elements because they occur segregated from each other. The final component, roadways, is perhaps the unique element in the group because it is the element that ties everything together. Duany et al. (2000) emphasizes roads as being important because of the connection they provide between components and that congestion occurs because of the distances between components. This observation begins shedding light on issues of car dependency and lack of a pedestrian realm.

2.2 General History of Suburban Development

According to *Suburban Nation* (Duany et al., 2000) and *Toronto Sprawls* (Solomon, 2007) it was in the post-World War Two years that sprawl emerged on the North American landscape. Policy changes in both Canada and the United States advocated the construction of low-density single family homes on the outskirts of the city. In the United States the Federal Housing Administration and the Veterans Administration loan programs provided mortgages for homes to be built. In Canada it was the Canadian Mortgage and Housing Corporation (CMHC) and the Veterans Land Act that aided in financing home construction. Sprawling communities began to evolve into the typology that exists currently. As a result of the great number of people leaving urban centres in the post-war years amenities and services would decentralize into the suburbs. Single-use zoning and planning meant that services like shopping would be incorporated in the form of strip malls. Many jobs stayed in downtown cores initially allowing commuting to occur; however, eventually jobs would move to decentralized locations with many corporations moving their head offices into the suburbs in the 1970's in the form of business parks. As a result the suburbs have become a landscape of single-use segregated zoning. In *Suburban Nation*

(Duany et al., 2000) the suburb is compared to an unmade omelette where all the ingredients are consumed separately and raw.

2.3 City of Vaughan

The Greater Toronto Area (GTA) offers an abundance of examples of sprawling communities, some of which are suburbs of suburbs. For the purpose of this thesis|project the City of Vaughan (fig. 2-1) was chosen as a site for the analysis of a suburb. It was chosen for the reason of its relatively young age: Vaughan did not become a city until 1991. It is also an interesting precedent because, unlike other sprawling communities, it is a city without a traditional downtown area. Vaughan is expanding at a very quick pace: 2006 census data (Statistics Canada, 2007a) showed that the population had increased 31.2% since 2001. Furthermore, Vaughan is a city that still has a large portion of agricultural land within its boundaries.

Figure 2-1. The City of Vaughan (Source: Google Earth)

According to the history provided by the City of Vaughan (2008a), settlement didn't emerge in the area until 1792 due to its remote location. At this time the area started seeing migration of communities from around Canada and the U.S. Between 1800 and 1840 Vaughan saw a significant population increase from about fifty-four to about 4300. This was attributed to a

larger number of British immigrants settling in this area. Originally settlers were primarily farmers but European settlement brought skilled trades to the area, setting up industry within small hamlets like Thornhill and Woodbridge. At around the same time townships were being set up in the region. The area became known as Vaughan Township in 1850, which brought municipal government to the region. Population was stagnant until the years following World War Two when a large influx of European immigrants settled in the area, raising the population total to about 15,957 by the 1960's. Industry and commerce began moving to the region at the same time. In 1971 the region officially became York Region and soon after the small hamlets merged into the Town of Vaughan. Vaughan officially gained city status in 1991.

Vaughan continues to see a large amount of growth. The City of Vaughan (2008b) predicts that by 2031 the population will increase from its 2006 amount of 238,866 people to about 430,000, with jobs increasing to 278,000. The 2006 population density of Vaughan (Statistics Canada, 2007a) is 873.1 people/square kilometre over 372.58 square kilometres of land. There are 69,535 private dwellings in Vaughan, up from 16,845 in 1986. Private dwellings are predominantly in the form of low-density single family homes. Out of 69,535 private dwellings (Statistics Canada, 2007d), 68.9 percent are single-detached homes, 8.2 percent are semi-detached homes, 9.6 percent are row houses, 5.0 percent are duplex apartments, 1.2 percent are apartments lower than five-storeys, 6.9 percent are five-storeys or more and 0.1 percent are other.

2.4 Places to Grow Act, 2005

The Ontario government, in recognizing the challenges and issues that the Greater Golden Horseshoe (GGH) region faces in the coming years, has set up a strategy for growth. The growth plan is prepared under the Places to Grow Act of 2005 (Ontario Ministry of Infrastructure Renewal, 2006). The act targets and outlines goals for growth by 2031, thirty years following the initial planning of the document. The plan recognizes that the region is experiencing fast growth and that in lieu of the benefits, if management of growth is not careful then there is the risk of negative repercussions like traffic congestion, pollution, and disappearance of valuable land. In order to avoid some of these issues the plan encompasses transportation, infrastructure planning, land-use planning, urban form, housing, natural heritage and resource protection to provide a holistic approach in planning to generate economic opportunity. The growth plan sets out a number of guiding principles as part of the mandate. The guiding principles dictate the creation of strong, vibrant communities that create strong economies, conserve and preserve natural landscapes and resources, optimize new and old infrastructure

for compact developments, promote diverse growth and promote collaboration among government and other private entities.

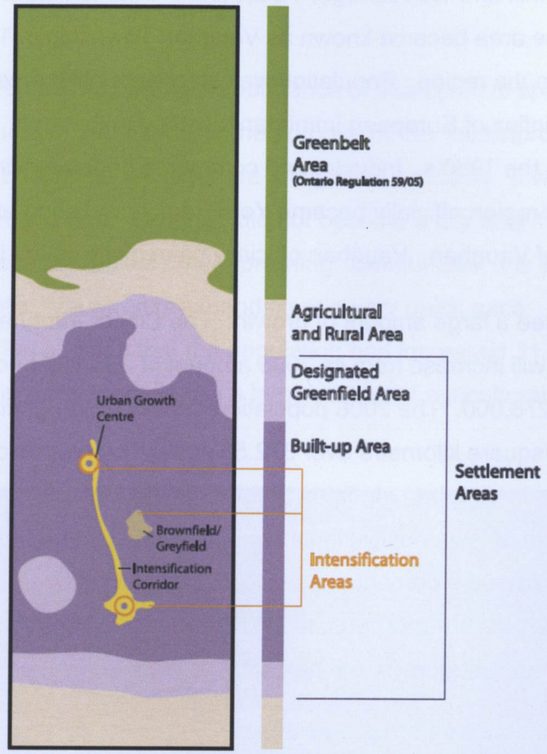


Figure 2-2. Places to Grow Growth Plan Land-use Diagram (Source: Ministry of Public Infrastructure Renewal, 2008, 52)

The plan has forecasted that the GGH region will grow by 3.7 million people by the year 2031 (Ontario Ministry of Infrastructure Renewal, 2006). The growth plan intends to guide this development in a smart cohesive manner. The plan identifies that intensification should occur in urban growth areas, built-up areas and transit corridors, along with greyfield and brownfield sites (fig. 2-2 and 2-3). The plan stresses the importance of containing development within built-up areas in order to protect rural land and the greenbelt area. The Ministry of Urban Affairs and Housing (2008) defines the greenbelt (fig. 2-3) as being "1.8million acres of environmentally sensitive and agricultural land in the Golden Horseshoe." The Greenbelt Act of 2005 was established to protect this land from urban development and sprawl.

In order to accommodate the population expected to inhabit the area by 2031, the plan recognizes that growth will occur in urban growth centres and intensification corridors located in

the City of Toronto and suburban cities located throughout the GGH region (fig. 2-2 and 2-3). Urban growth centres are to be dense and compact adding higher density in traditionally low density settings such as Vaughan and Brampton. Linking the urban growth centres and nodes will be intensification corridors where mixed use development will occur along major transportation routes. For cities on the periphery of Toronto a target has been set to two hundred residents and jobs per hectare, or 20,000 residents and jobs per square kilometre. These urban growth centres are very specific areas set out by the growth plan and include the City of Vaughan at the intersection of highways 400 and 7.

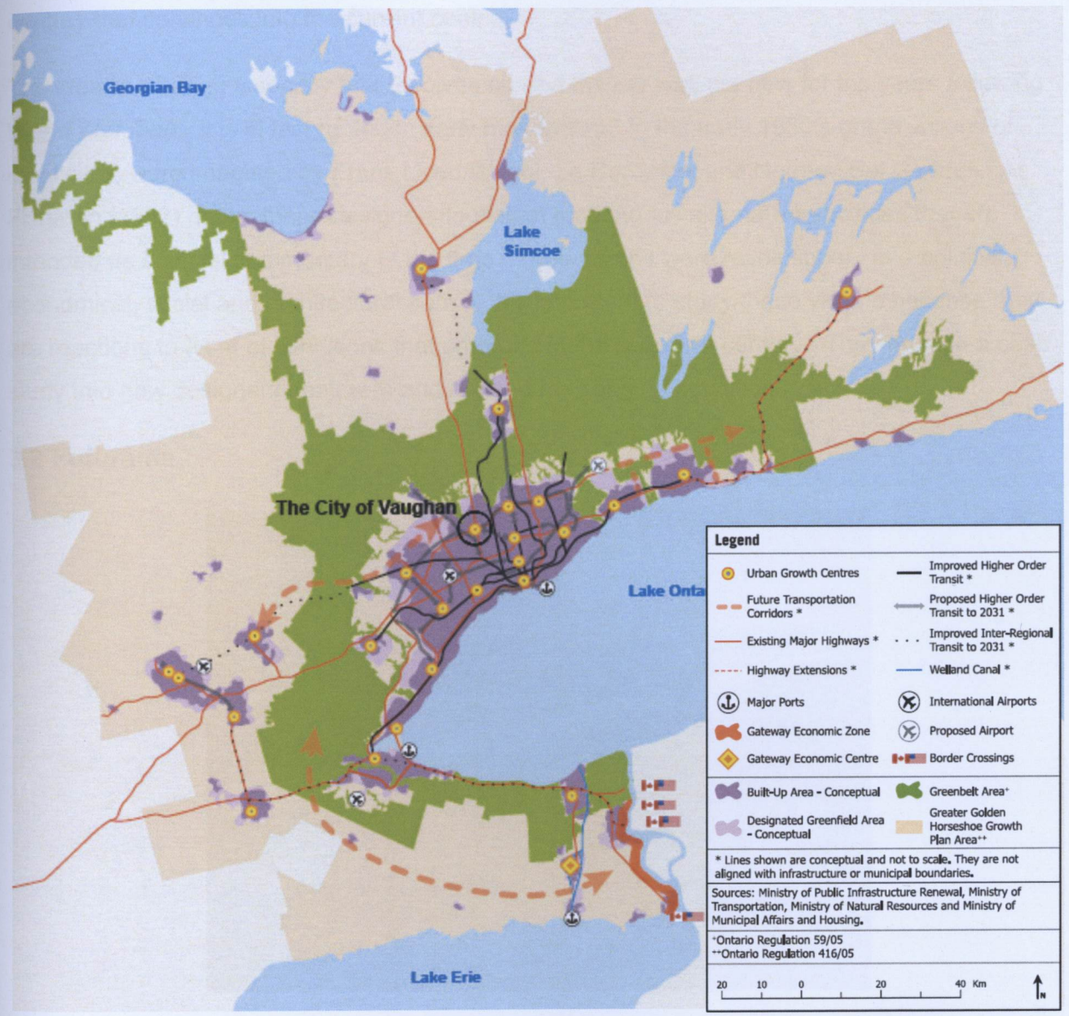


Figure 2-3. Places to Grow Concept Diagram (Source: Ministry of Public Infrastructure Renewal, 2008, 46)

3.0 Precedents

3.1 Introduction

Urban sprawl emerged due to a set of circumstances that promoted development away from urban centres out into the periphery. This set of circumstances or conditions were policies put in place by governments in post-World War Two years for housing to accommodate returning veterans. In turn, development occurred in the form of suburbs in which the primary method of mobility was and is the car. This set a development trend for the second half of the twentieth century that continues into the current century.

The idea of creating a society that revolves around the car was not new for the years following World War Two. It is in fact rooted in early modernism. In the early 1930's grand visions of ideal cities were imagined by Frank Lloyd Wright, Le Corbusier and Norman Bel Geddes. As Fishman (1982) notes, these designers looked at creating full alternative societies that are intended as a social commentary of the time. Their visions were revolutionary in a political, economical, social and architectural sense. It's important to study these visions because they are reactions to a set of conditions that emerged in the twentieth century. They provide a case study into how designers dealt with and reacted to changing conditions.

3.2 Futurama

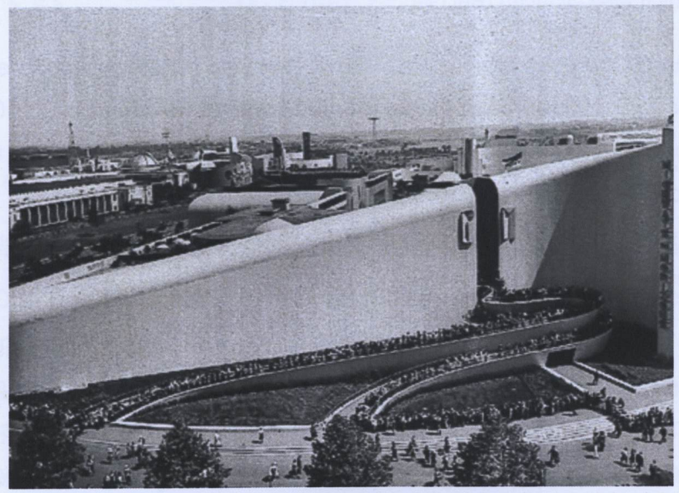


Figure 3-1. Futurama Pavilion by Norman Bel Geddes 1939 (Source: Treehugger.com)

In the summer of 1939 the Futurama of the General Motors Highways and Horizons exhibit premiered at the New York World's Fair (Bel Geddes, 1940) (fig. 3-1). It is estimated that about five million people saw the dramatic representation of America's future as designed by Norman Bel Geddes, the prominent set designer and industrial designer of the early twentieth century (Bel Geddes, 1940). The premise behind Futurama was to depict what America could look like twenty years into the future. The exhibit was presented as a series of modelled landscapes that visitors would travel through and get glimpses of superhighways, sprawling suburbs, and decongested cities. In 1940, Bel Geddes published *Magic Motorways* that is based upon the exhibit but further expands upon the reasoning behind Futurama. Perhaps the goal behind Futurama can best be described in the words of Bel Geddes himself:

> The people who conduct polls to find out why other people do things, and the editorial writers, newspaper men and columnists who report daily on the doings of the human race, all had their theory as to why the Futurama was the most popular show of any Fair in history. And most of them agreed that the explanation was really very simple: All of these thousands of people who stood in line ride in motor cars and therefore are harassed by the daily task of getting from on place to another, by the nuisances of intersectional jams, narrow, congested bottlenecks, dangerous night driving, annoying policemen's whistles, honking horns, blinking traffic lights, confusing highway signs, and irritating traffic regulations; they are appalled by the daily toll of highway accidents and deaths; and they are eager to find a sensible way out of this planless, suicidal mess. The Futurama gave them a dramatic and graphic solution to a problem which they all faced (Bel Geddes, 1940, 3 - 4)

The exhibit was about the possibilities of tomorrow, but many of the ideas were not far-fetched and could have been implemented at the time of the exhibit. Bel Geddes (1940) vision demonstrated a new extensive highway typology that weaved through various types of land conditions all across America. Planned urban centres would be reconstructed to accommodate new infrastructure. There were new decentralized cities shown on the periphery along with experimental farms.

Highways were a huge focus of the Futurama exhibit (fig. 3-2). The exhibit was meant to show the possibilities of travel that could occur throughout the United States because of the car's ability to connect distant communities together. The highway was seen as a means to create a free flowing movement of people and goods. Bel Geddes (1940) took four elements into consideration for his road design: safety, comfort, speed and economy (p. 6). He implemented these four elements in the superhighway which he designed so that the car could reach its

maximum potential. The network of super highways were imagined as direct highway routes that would be designed for optimum connection and travel times instead of the meandering routes that were based on horse and carriage tracks. Highways were designed to contain multilanes of varying speeds segregated by direction. They were meant to take advantage of the speeds that a car was capable of reaching so that travel times would be reduced. Bel Geddes (1940) focused on bottlenecks and junction points where cars would traditionally slow down and cause accidents. He proposed an alternative to the cloverleaf interchange that wouldn't require the slowdown and would make merging much safer.

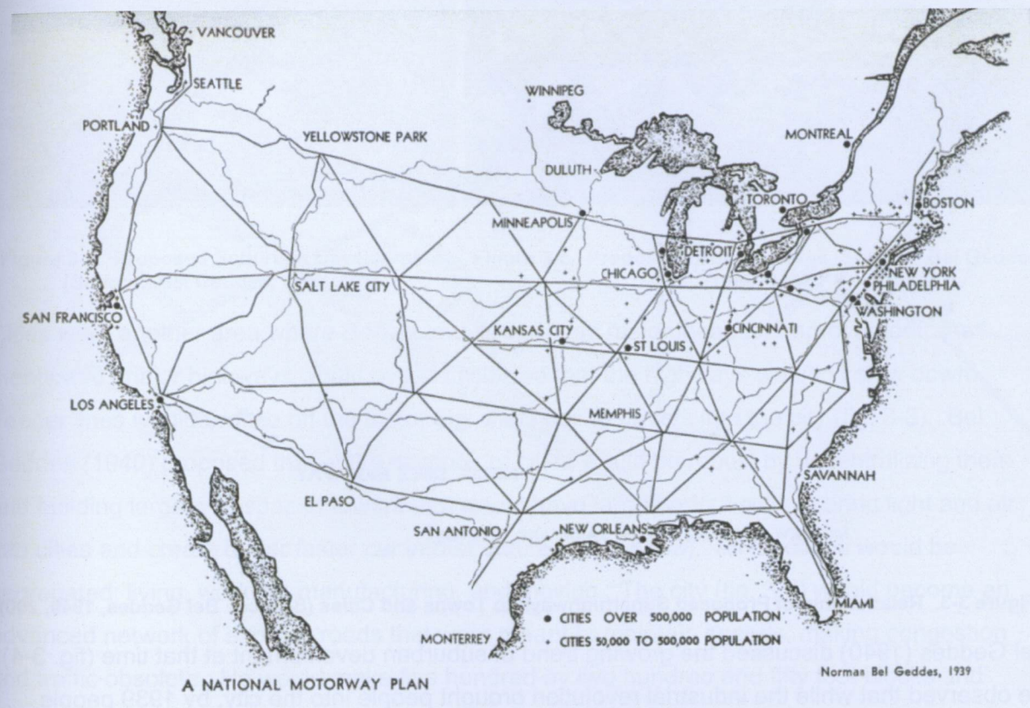


Figure 3-2. Proposed National Motorway Plan by Norman Bel Geddes (Source: Bel Geddes, 1940, 278)

Bel Geddes (1940) was very conscious of the effect this would have on the outskirts to neighbouring towns and villages (fig. 3-3). He made a case for directing traffic away from towns rather than through towns like old rail lines. Bel Geddes (1940) agreed that while putting a highway through a town removed its isolation, this would have detrimental effects on a town. The road is simply a thoroughfare for drivers; many do not stop, negatively impacting the environment. Bel Geddes (1940) argued that towns should be for the people who have specific needs in the town, such as business or living, as opposed to a town acting as a bypass for highway drivers (p. 197). He elected to have highways bypass towns instead, which he stated

was better for the town and better for motorists on the highway as well as for the route itself. Towns would then connect to the highway by secondary branches of road. His boldest statement in regards to highways and towns had to do with their locations. He felt towns could now be spaced three hundred miles apart rather than thirty because the car could now go further than a horse could before needing to rest (Bel Geddes, 1940, 200).

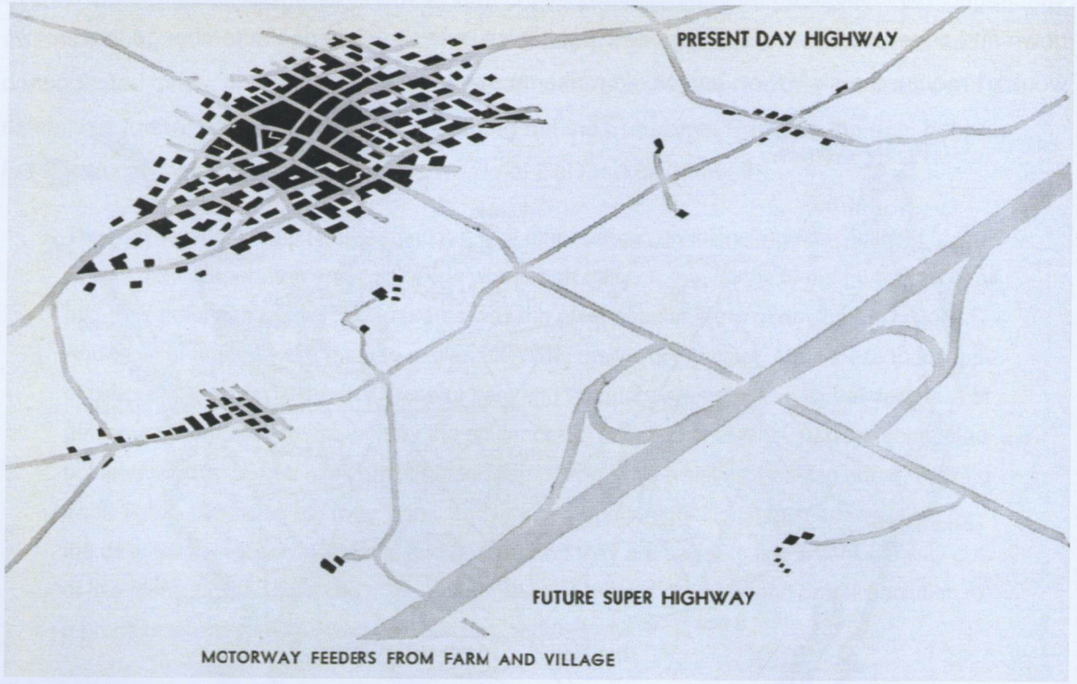


Figure 3-3. Relationship of Proposed Superhighways to Towns and Cities (Source: Bel Geddes, 1940, 200)

Bel Geddes (1940) discussed the growing trend of suburban development at that time (fig. 3-4). He observed that while the industrial revolution brought people into the city, by 1939 people preferred to move out to fresh farmland on the periphery (p. 205). However, Bel Geddes (1940) felt that the planning of these communities was dysfunctional, due to conflicting views between planners and real estate developers (p. 206). Geddes favoured a decentralized suburban model but with adequate access to the city. He never went into great detail about what these suburbs would be like, but he did discuss the connection to cities. In 1939, suburbs had about a fifty mile radius surrounding the city; however, this could grow with infrastructure improvements, mainly superhighways with feeder lines and express lines into cities (Bel Geddes, 1940, 208). This could improve shipping, increasing its range overnight from two hundred miles to between five and six hundred miles (Bel Geddes, 1940, 208).

Figure 3-4. Proposed Suburban Development (Source: Bel Geddes, 1940, 201)

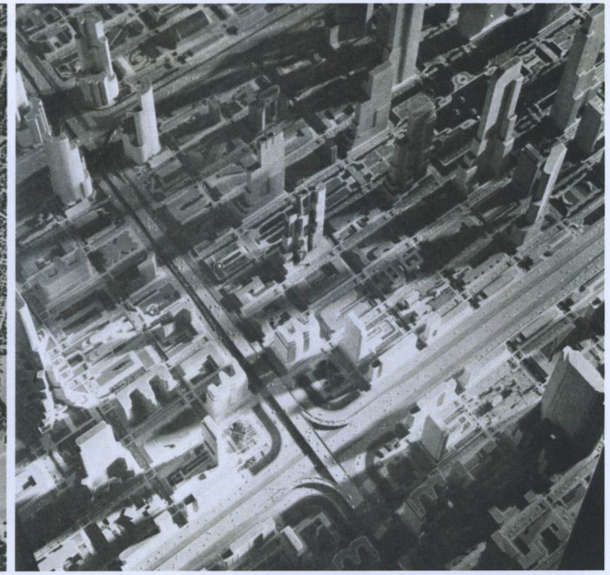


Figure 3-5. Proposed Urban Centres (Source: Bel Geddes, 1940, 217)

Cities were another area where Bel Geddes (1940) had major ideas for improvement. As mentioned, major highways would bypass cities so that the highways wouldn't slow down. Feeder lines would branch off the major highways taking drivers into the city (fig. 3-3). Bel Geddes (1940) proposed that entire sections of cities would be rebuilt by decentralizing them and building large well-spaced towers that would have large parks below to bring light and air into cities and create better faster car infrastructure (p. 242-243). All functions would be segregated; living, working, manufacturing, and moving. The city (fig. 3-5) would become an advanced network of express roads that were meant to maintain speeds, making congestion and traffic obsolete. He would make five hundred by two hundred and fifty foot blocks and every ten blocks, there would be a massive tower with large two block parks that would take up one-third of the land area (Bel Geddes, 1940, 239-241). Adjacent buildings to skyscrapers would be about five-storeys and function as rest and recreation areas. Bel Geddes (1940) proposed subway connections to suburbs. He favoured smaller city cars that would be driven into the city leaving bigger country cars and large cargo trucks in a parking lot. The same would occur for large cargo trucks. One of the biggest design features of the city was his segregation of car and pedestrian (fig. 3-6). In most areas they would be separated by elevation. Pedestrians would have walkways on an upper level and cars would be on a lower level for safety and speed reasons. Parking was taking away from the street and was therefore moved

into surrounding buildings. Lower ground levels would be designed for car displays, and upper levels would have storefronts for shoppers. The idea was that with traffic segregated, speed could be doubled (Bel Geddes, 1940, 241-242).

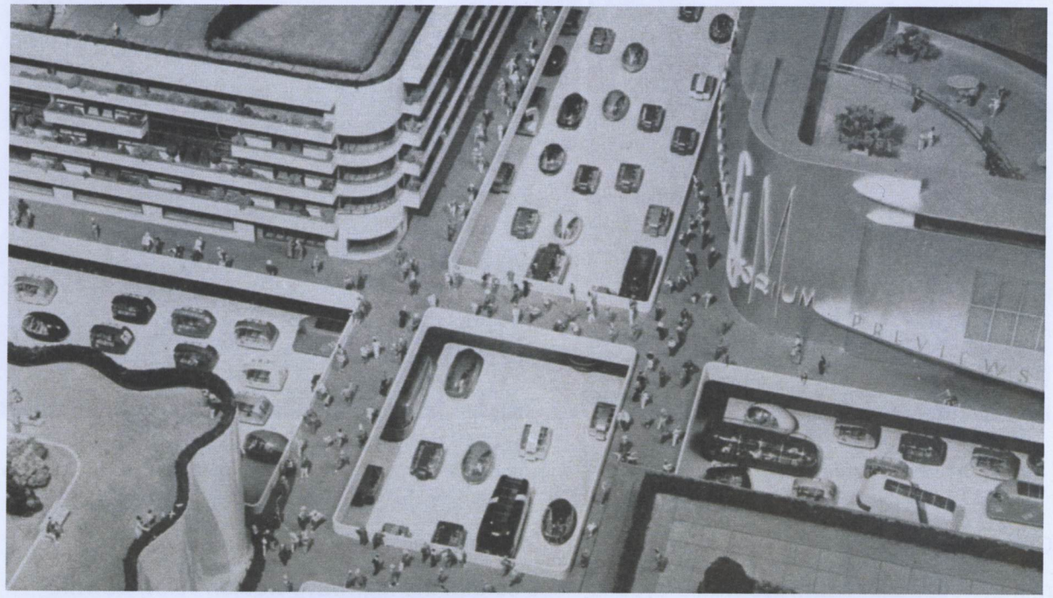


Figure 3-6. Segregated Pedestrian and Vehicular Traffic (Source: Bel Geddes, 1940, 238)

In order to understand the cultural impact that Futurama had on the United States and beyond, it is important to understand the state of roads and highways, and the cultural context in 1939. The car had only been around for about thirty years in 1939, so it was a fairly new invention that was becoming more popular. By 1938 there were three million cars on the road; Geddes predicted that in twenty years there would be six million (Bel Geddes, 1940, 31). Unfortunately the road system in place was deemed inadequate to service the increased use and did not maximize the full potential of the car. Bel Geddes (1940) stressed issues of connectivity across the country, the lack of safety on the roads, the low speeds that cars were faced with, traffic congestions, and that progress in road planning was far behind that of other types of travel methods, such as rail, plane, and ship (p. 34).

Theatrics added to Geddes' exhibit, which should be no surprise given his past as a stage designer. According to *Designing Modern America* (Innes, 2005) it was regarded as one of the most popular exhibits at the fair (p. 120). Bel Geddes tapped into car culture and the certain future that it was facing in America. The car companies were heavily involved in this vision; General Motors was the lead sponsor who built this elaborate display. In return for the millions

spent on the model they got enormous public exposure. The impact was huge. The idea of Futurama was held onto throughout World War Two and similar ideas resurfaced after. By the following New York World's fair in 1964, many of the ideas in Futurama had become a reality. Futurama brought to the table the idea that communication and transport were the keys to bringing everyone together in the modern world (Innes, 2005, 121).

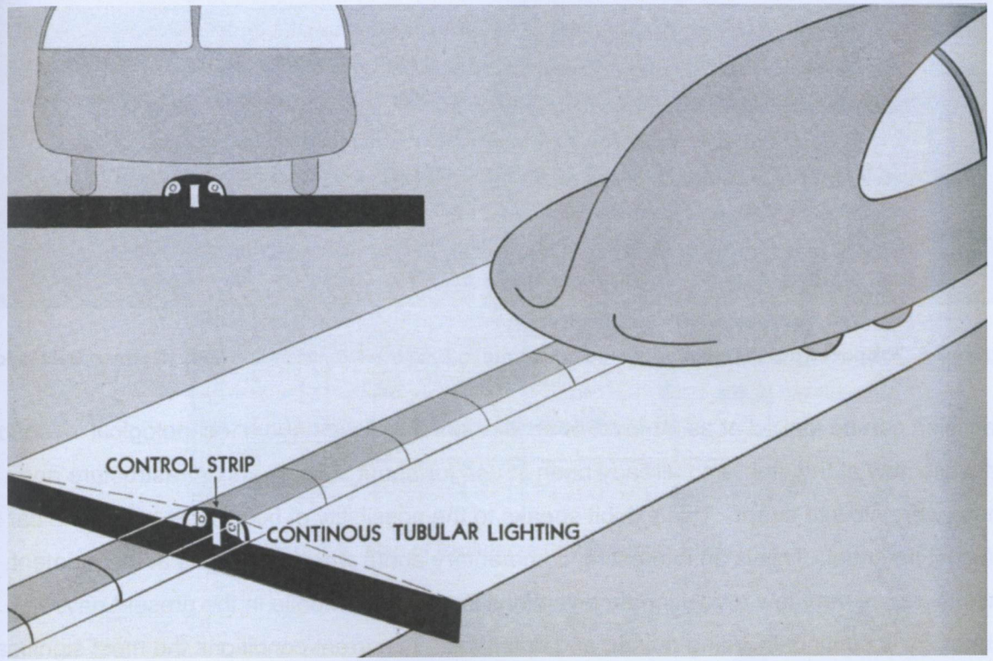


Figure 3-7. Proposed Car Rail System for Superhighways (Source: Bel Geddes, 1940, 138)

There were a number of elements that were never implemented to this day, which may be a result of Futurama being too far ahead of his time. Bel Geddes (1940) envisioned safety items that were meant to reduce human error. He acknowledged that no matter what rules were put in place, driving would always be subject to error and distraction (Bel Geddes, 1940, 74). Bel Geddes (1940) proposed a number of electronic or automatic devices that would minimize human error. Safety control features in cars would control merging and speed. He developed a track system for the highways (fig. 3-7) that would lock cars into a lane and control speed and merging. Speed reduction points were proposed for certain areas. Radio waves and booths would be set up to monitor speeds and direction (Bel Geddes, 1940, 74-75)

While there were some ideas in the Futurama exhibit that can be discarded or never came true, Bel Geddes for the most part was able to paint a realistic vision of what was to come for the

American landscape. One does not have to look further than a map of the United States to see the vast network of highways and its elements that exist today (fig. 3-8). What exists and what Bel Geddes had envisioned is incredibly similar.

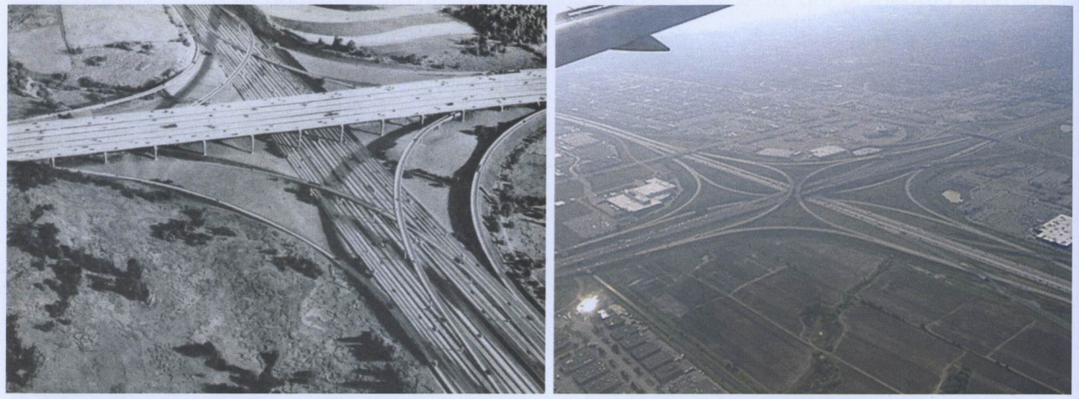


Figure 3-8. Proposed Futurama Interchange compared to Existing Interchange Credit: Norman Bel Geddes and Panoramio

The vision can be looked at as a model of adaptation. Here we have a technological invention that while new at the time, had already been in use for about thirty years; infrastructure and culture were slow to adapt. This exhibit speaks to the possibility of being able to use the car to its fullest potential. This is an interesting commentary about where society is at the moment. While there are very few revolutionary inventions like the automobile in the present day, technology is continually being refined and optimised. In current conditions the most significant technological leap is perhaps the computer which has greatly assisted in improving communication. Here is a tool that is truly in its infancy in terms of its capabilities. Society may be at the point where taking a step back is necessary to process where civilization is at the moment. A great leap is perhaps inevitable to take us to the next significant stage of human development.

3.3 Broadacre City (see Appendix A-E)

Frank Lloyd Wright was another visionary of the early twentieth century to propose a new idea for living in a bold way much like Le Corbusier, Ebenezer Howard, and Norman Bel Geddes. Wright proposed a radical transformation in the way cities are designed. In the twenty-first century, Wright's vision of a radical decentralization may not seem like a bold vision given the sprawl that exists. At the time, however, Wright's vision was radically different from the dense

centralized industrial cities like New York and Chicago. Frank Lloyd Wright envisioned Broadacre City as a new model of living that challenged the industrial city (fig. 3-9).

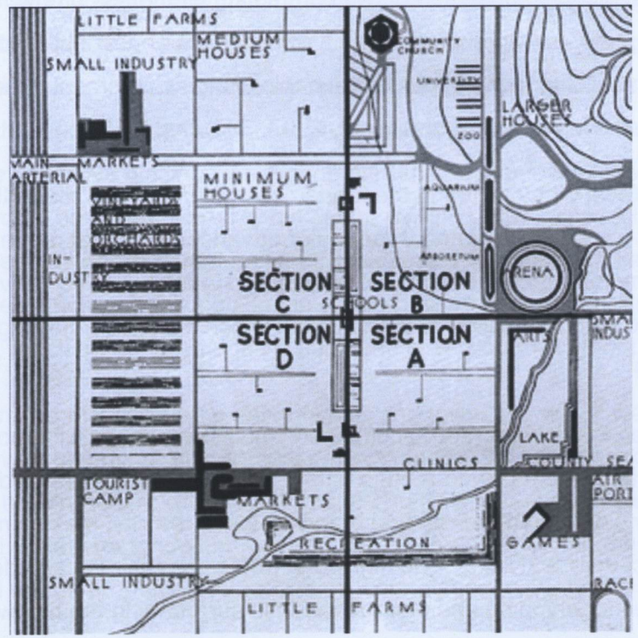


Figure 3-9. Map of Broadacre City (Source: Flickr)

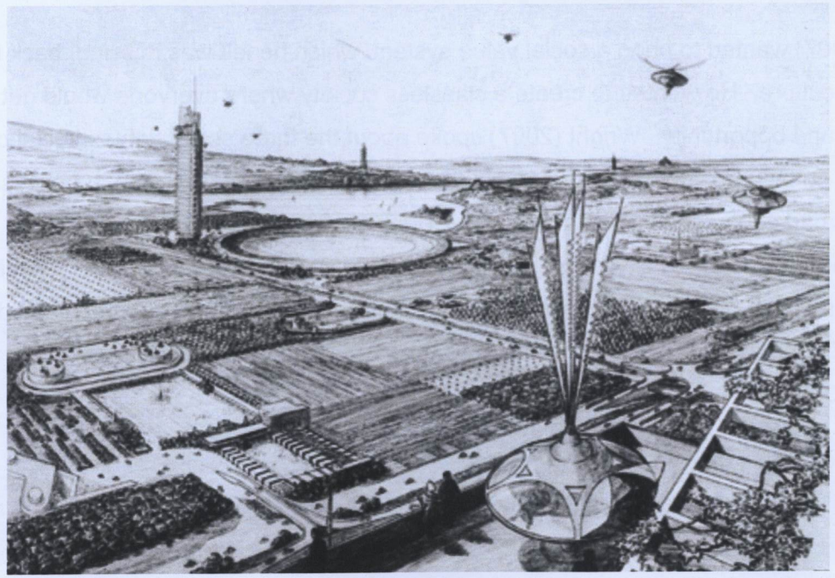


Figure 3-10. Mixture of Rural and Modernism in Broadacre City (Source: www.fba.fh-darmstadt.de)

In their introduction to Frank Lloyd Wright's 1935 Architectural Record article, LeGates and Stout (2007) note Wright`s distaste for the industrial city. This distaste led Wright to propose a vision that had a balanced combination of two contrasting elements: one was to regress into a town-like setting to restore a more intimate style of living to Americans; the other was to incorporate modern building techniques and technological advancements and use them for improving living conditions (Legates and Stout, 2007, 325) (fig. 3-10).

Wright (2007) saw technology as being the fundamental element that made the urban centre irrelevant or extinct (p. 326). He noted three major advancements that made this possible: the car which allowed mobilization; the radio, telephone and telegraph which advanced communication; and standardization and production which advanced building techniques (Wright, 2007, 326):

Returning to the idea that Wright (2007) combined small town values with modern techniques, the highway and road system played a huge part in making the decentralized vision happen. A main superhighway would feed the city and branch out into the city, making mobility easy for residents to conduct daily activities. The highways would be multi-use and decluttered. There would be truck lanes for shipping and storage facilities surrounding the highway. Burning coal would occur at mines and power would then get transferred to the source directly from the mines (Wright, 2007, 327).

Wright (2007) wanted to bring a social value system, which he felt was missing, back into the American culture. He wanted to create a classless society where everyone would get equal treatment and opportunity. Wright (2007) spoke about the three social rights: social credit, land to be held on by use, and public ownership (p. 327). This was a reaction to the excesses that Wright felt had consumed industrial society. Commuting gets eliminated in this new configuration because the city is laid out in a way to make things self sufficient. Distribution, for instance, is automatic and direct, and would occur in the place of origin. Wright would provide a minimum of one acre of land per person, but larger amounts would be given as required (Wright, 2007, 327).

The structure of the city would have correlated farms, smokeless, gasless industry, decentralized schools, various residential conditions, home offices, safe traffic, and simplified government (Wright, 2007, 327). Everyone in the city would be employed through little farms, little homes, and little factories. Wright (2007) claimed that unemployment would not be an issue and that there would never be enough labour or under consumption (p. 327). The city

would be about four square miles and contain space for about 1400 families (Wright, 2007, 327). Every Broadacre citizen would have a car and access to a safe multilane highway. Highways would have no grade crossings or left turns, but rather on and off ramps. Roads would not have curbs or ditches. Wright (2007) proposed varying housing typologies for Broadacre City. There were professional houses with labs, minimum houses with workshops, medium houses with workshops, larger houses, and machine age luxury houses (Wright, 2007, 329). All would use extensive glazing with rooftop gardens. Copper was seen as a unifying element. Homes would be prefabricated to cut costs. Wright (2007) also included some apartment towers seen as deprogrammers for city dwellers who needed to ease into the country life. There would be a segregated school in the centre of town along with galleries, concert/lecture hall, small gardens, zoo, large pool, and play grounds (Wright, 2007, 329).

Wright (2007) eliminated major governments of cities and towns the way it was known to be, and replaced them with one minor government per county (fig. 3-11). The architect would have a prominent role in the Broadacre City (p. 327). The county would choose the architect, who would be agent of the state for land improvement and allotment, ensuring that planning and development would be run properly. Public utilities were placed in the hands of the state and county.

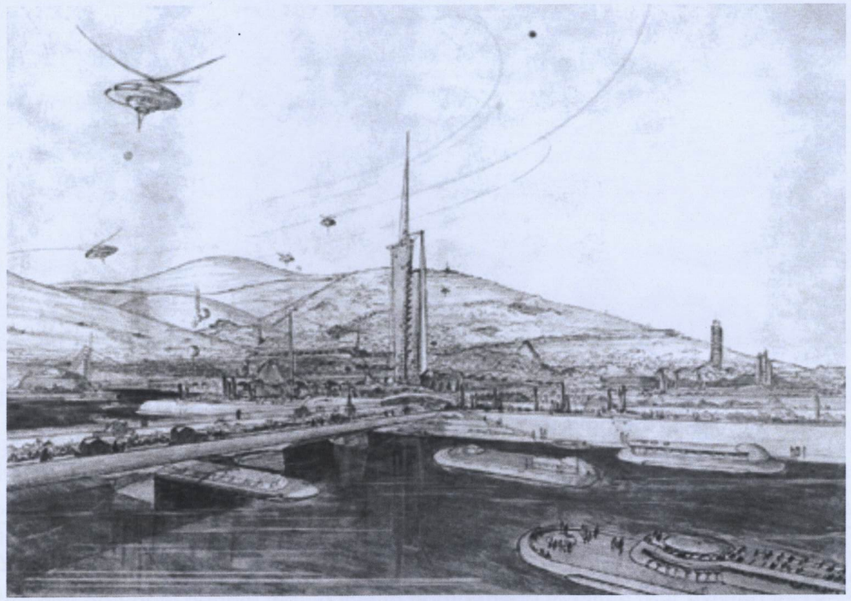


Figure 3-11. Image of the County Crafts and Architects Tower in Broadacre City (Source: www.fba.fh-darmstadt.de)

Architecture would be considered “organic”, meaning that form would be determined by function and climate combined (Wright, 2007, 328). Architecture was landscape and vice versa, with a heavy aspect of cultivation incorporated. Buildings would not have a great distinction between each other. Wright (2007) wanted to ensure a certain type of harmony and uniformity (p. 328).

Wright (2007) was very specific also on the landscape integration of Broadacre City. Trees were planned for privacy and division. Although roads wouldn’t have tree-lined streets to keep the openness, they would run perpendicularly (fig. 3-12). Wright (2007) describes grouping of specific trees, flowery meadows in parks with mature trees and streams (p. 327). There was certain sense of romance and integration with nature inherent in the design. Housing was placed in amongst productive crops belonging to residents.

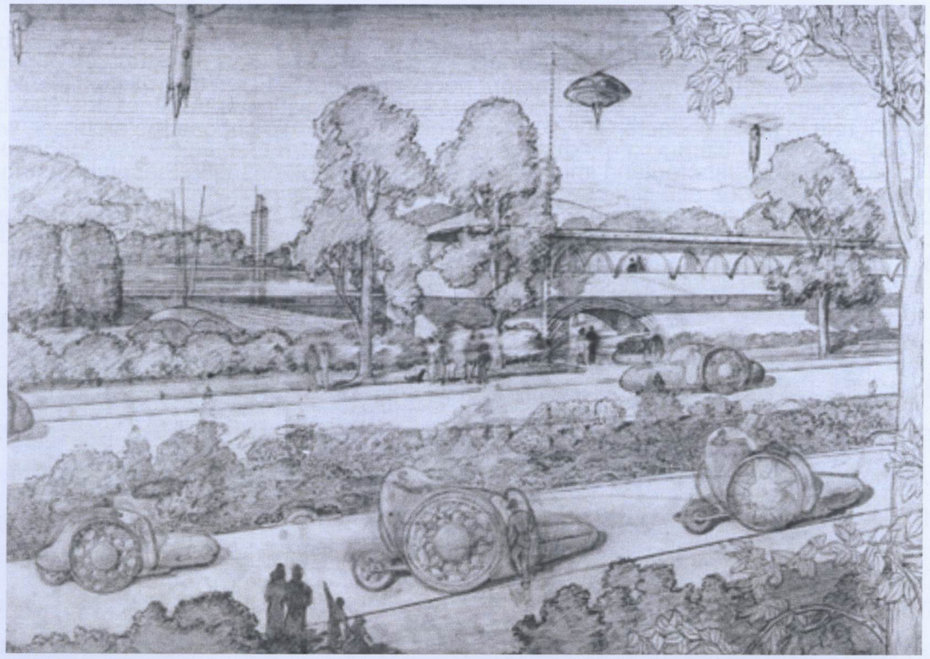


Figure 3-12. Image of Tree-Lined Streets in Broadacre City (Source: www.fba.fh-darmstadt.de)

Wright (2007) envisioned vehicles that went beyond the technological capabilities of 1935 (p. 329). He described an aeroplane called an aerator that would rise up and down like a helicopter. It would be radio controlled for 200mph and be able to land anywhere, even on one’s doorstep. He spoke of a 200mph monorail that was meant for long distances. The car was meant to handle all further commuting (Wright, 2007, 329).

Wright (2007) concluded that Broadacre city thrived on change based on the growth of people and the nation (p. 330). He viewed life in industrial cities as unwholesome, and hoped that that Broadacre City model would replace industrial cities within three to four generations (Wright, 2007, 330).

3.4 Radiant City (see Appendix F-J)

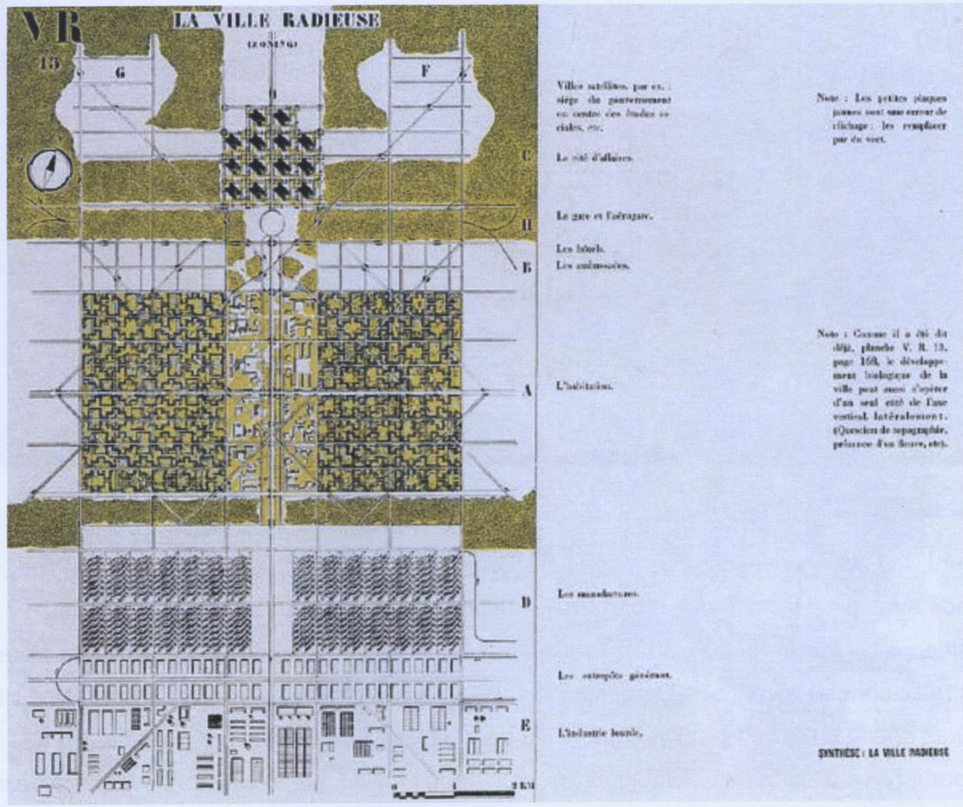


Figure 3-13. Plan of Radiant City (Source: expositions.bnf.fr/)

Radiant City (fig. 3-13), or La Ville Radieuse, is the vision of a city proposed by Le Corbusier in 1933. Le Corbusier had proposed many visions for cities leading up to Radiant City, but each differed slightly according to his evolving ideas. He began with La Ville Contemporaine (fig. 3-14) in 1922 and would later refine this proposal in Radiant City (Le Corbusier, 1967). As with Frank Lloyd Wright and Norman Bel Geddes, Le Corbusier (1967) proposed a radically different model of the city and how people would live in comparison to cities that existed in 1933. Once again, the car played an influential role in defining this city. Le Corbusier (1967) proposed a centralized city for a half million people that would be intensely segregated by uses (p. 168). He

created distinct zones of usage: a commercial sector, a residential sector, an industrial sector, and anchoring them in the central axis, the civic sector. Unlike his Plan Voisin where he proposed demolishing a section of historic Paris in order to incorporate a new modern city, Radiant City was proposed to be a brand new place on fresh land.

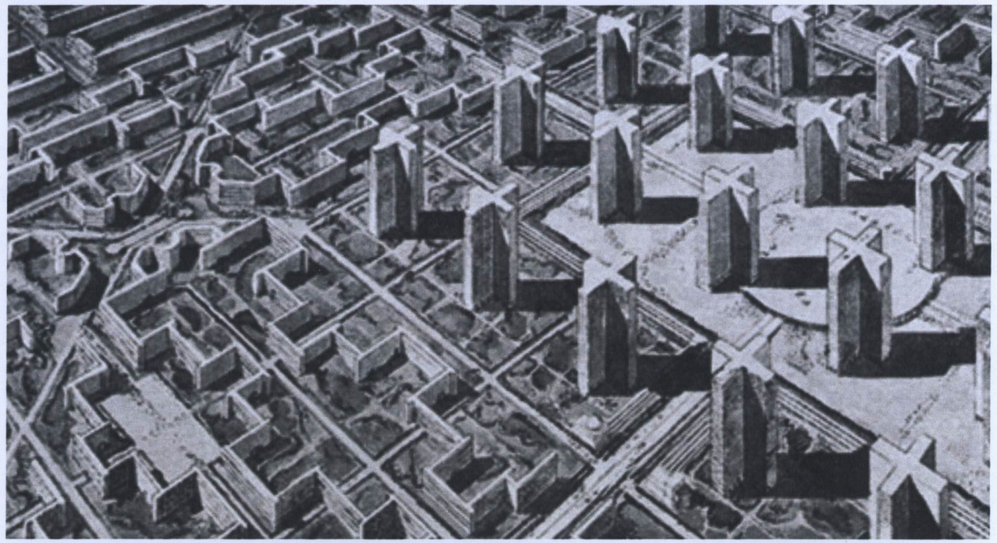


Figure 3-14. Image of La Ville Contemporaine (Source: http://mintfish.wordpress.com/category/architecture/)

Radiant City can be described as a spacious contrast to existing cities like Paris, New York, and Buenos Aires where the dense urban fabric made the cities feel suffocated (Le Corbusier, Boesiger, & Girsberger, 1967, 332). Cities were riddled with poor living conditions that were often referred to as slums. Le Corbusier, like Wright and Bel Geddes, wanted to create a city that was decongested and which brought light and air into its dense fabric. He created a comprehensive vision that he would never implement himself, but would nonetheless have an impact on how cities would develop around the world.

As noted by Peter Hall (2002), Le Corbusier's outlook on city design changed substantially over the course of a decade leading from La Ville Contemporaine, a city for 3 million inhabitants to La Ville Radieuse, a city for half a million inhabitants. The biggest motivation for change came from his political views, which Hall (2002) correlates to the impact that big events like the Great Depression had on the economy. La Ville Contemporaine was influenced by capitalism in that it favoured the upper class. In Ville Radieuse, Le Corbusier removed class and made everyone's living conditions equal at $14m^2$ per person. Size of living space was in turn based on family size instead of class.

Like the other visionaries, Le Corbusier (1967) was influenced by the technological advancements of his time. The areas where this impacted most were in building technique and road design. Le Corbusier's (1967) vision freed up the ground floor, removing the street as it existed. To do this Le Corbusier (1967) proposed lifting all buildings on pilotis and roads above ground (p. 168) (fig. 3-15). These left approximately eighty-eight percent of the ground plane free and open, aside from the space that services such as the stairs and elevators required (Le Corbusier et al., 1967, 332). While the car was important to the function of the city, Le Corbusier felt that the pedestrian realm and the car should not meet and should be kept separate. The residential and business area followed this pattern. Parking platforms would be raised to the second level. By freeing up the ground floor Le Corbusier (1967) allowed for social interaction to occur uninterrupted by streets. The area within buildings would be occupied by green space for activities and incorporated space for libraries, schools, and other amenities for living. All this was made possible through advancement in building technology, in particular with concrete construction.

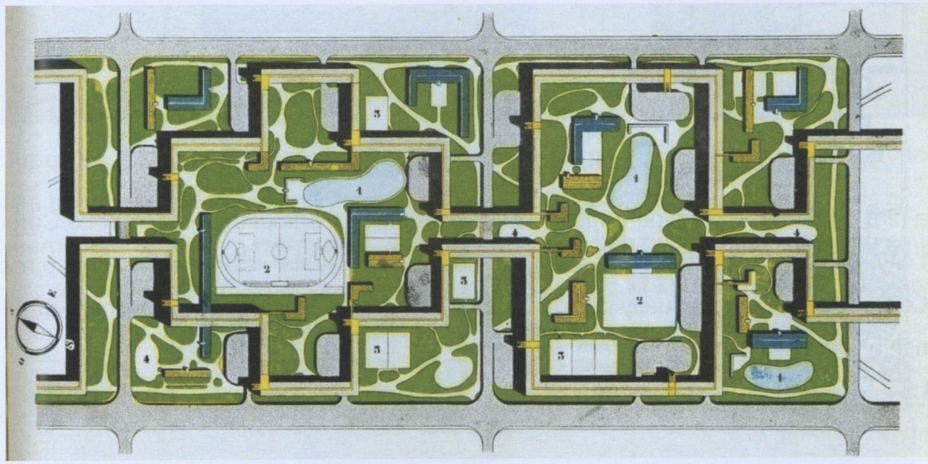


Figure 3-15. Image of Housing in Radiant City (Source: Le Corbusier, 1967, 163)

As already mentioned, Le Corbusier (1967) segregated city by use. The residential area was placed in the middle of the layout so that residents were always central to where they were going. The commercial centre along with hotels and embassies lined the upper portion of the layout, with industry on the lower portion. Rail was implemented into the scheme, running through the industrial area and through the city. The rail station was located in the centre of the city and had an airport located on top.

3.5 Brasilia (see Appendix K-M)

Figure 3-16. Aerial Image of Brasilia (Source: Google Earth)

Brasilia (fig. 3-16 and 3-17) is perhaps the best example of the implementation of Le Corbusier's radiant city. The Lucio Costa designed city is the closest that his vision would come to reality. While Le Coubusier didn't actually design Brasilia, his influence is undoubtedly there due to his relationship with Brasil and its modern architects. Lucio Costa, Oscar Niemeyer and Burle Marx all had a connection with Le Corbusier. While the form of the layout of Brasilia is different than Radiant City, the idea is very similar. The city is laid out with heavily segregated uses like in Radiant City. There is a central axis which contains civic areas. There is a residential section, commercial section, ministry section, hotel section etc. incorporated into the shape of a bird or aeroplane.

Figure 3-17. Congresso Nacional in Brasilia (Source: Mark Siemicki)

Staublie (1965) in his book on Brasilia described the layout of the city and its residential blocks. In the wings of the Brasilia exist the residential blocks as laid out by Lucio Costa. These residential blocks are referred to as Super-Quadra (fig. 3-18). Each Super-Quadra has between eight and eleven six-storey buildings that are raised off the ground by pilotis. The programming of each Super-Quadra is interesting and unique. Each Super-Quadra has a kindergarten and elementary school along with a retail strip. Retail strips (fig. 3-19) consist of eighty-eight plots, forty-four on each side of a street that measures about 3.5m by 10m. Each row of forty-four units was to have a restaurant and tearoom. Every four Super-Quadra, referred to as a neighbourhood unit, has a supermarket, secondary school, sports club, cinema and a church. There are about 3000 people per Super-Quadra. The built-up area in a Super-Quadra amounts to between ten and fifteen percent, leaving the rest to park space with many amenities.

Figure 3-18. Aerial Image of the Super-Quadra in Brasilia (Source: Google Earth)

All the services needed for living are contained within neighbourhood units so that people can stay within this area having no need to go elsewhere for living needs. Each side of a residential section is bounded by a highway, making the blocks pedestrian friendly, but contained. Leaving the superblocks would require other transportation requirements especially since crossing highways is a major challenge.

Figure 3-19. Image of Commercial Street in Brasilia (Source: Mark Siemicki)

In June of 2008 I had the chance to go to Brasilia and experience the Lucio Costa designed city first hand. Upon entering the city the first thing that becomes evident is the massive scale on which the city is based upon. It appears as if the city were designed at a human scale, then was scaled up 2 to 3 times. This felt true in particular in the central axis where the civic programming was located. The sheer size of buildings and landscape made walking around the city daunting. While the buildings were stunning, one needed a vehicle of some sort to move from monument to monument. The influence of the car was undeniably present in the entire scheme. The roadways were all highways which made the entire place feel as though the pedestrian has been neglected. Crossing the street became instead crossing a highway. This further reinforced the segregation of the entire scheme into uses.

I felt as though there were two sides to Brasilia, the virtual side and the real. On the one hand there was a very unnatural manufactured quality to the scheme, but on the other hand there were definite signs of real life. Former work camps remained which had a real quality. Satellite cities had emerged with a character more in tune with the rest of Brazil. In the Costa scheme the place that seemed the most human was the Super-Quadra. These residential areas, in contrast to the rest of Brasilia, had a very intimate serene quality to them. They were at a human scale, there were many mature trees between buildings, and there seemed to be life in the park areas. Residents were in close proximity to shopping and services. Two things were to be evident in regards to the design. One was the building's interaction with nature and climate; in Brazil's warm climate a building raised off the ground within a park functions given that the climate allows for year round access to the park amenities. The other is that Brazilian culture is more in tune with this type of living. From what was observed, high density living is very common and accepted in Brazil, especially compared to Toronto. Also, Brazilians seem to enjoy leisure and spending time outdoors socializing. They seemed to inhabit the park space around apartments quite well. Perhaps the biggest flaw that can be observed is that the Super-Quadra's are sandwiched between highways, which make them feel somewhat isolated. A certain tension exists between the scale of these neighbourhoods and their integration to the scale of the rest of the city. While the scale of the neighbourhoods feels human, the rest of the city does not. This tension existed in many areas. While each location had its beauty, the segregation and long distances in between seemed unnecessary and perhaps a relic of a certain time when there was optimism for planning around the car in such a manner.

What comparison can then be made between this car oriented development and the suburbs? The suburbs in many ways are developed in a similar manner. Uses are segregated and dispersed over long distances. The scale is similar and designed to match that of the car instead of the pedestrian. The highway acts as a major method of transportation but creates similar barriers, making integration into the entire scheme difficult. The major difference is that in Brasilia there is a more structured planning than in the typical suburb. More attention was paid to creating an entire scheme where the residential was one branch of many. In the suburbs planning is chaotic and most of the emphasis is spent on laying out residential cul-de-sacs by developers. Perhaps a more useful comparison is the ways in which residential neighbourhoods differ in the two schemes. In Brasilia the scheme is much more communal and incorporates many of the functions necessary in day to day living, while in suburbia living is

much more private and secluded due to subdivided individual lots. The necessary amenities are spread out over long distances.

3.6 St. Lawrence Neighbourhood

Figure 3-20. Aerial Image of the St. Lawrence Neighbourhood (Source: Google Earth)

Similar to the ways in which the modernists of the early twentieth century responded to changing conditions, the late twentieth century saw a response to other issues as a result of modern building. In the 1970's, the City of Toronto wanted to build a community from the ground up on old industrial land as a way to revitalize the inner core and attract new residents downtown. As Sewell (1993) and Gordon (2001) describe in the post-World War Two years, new housing took on two forms of development: sprawling neighbourhoods on the periphery of the city and urban renewal, which the city adopted as its official planning for low income housing following the war. Urban renewal was influenced by the ideas of Le Corbusier. Entire sections of downtown were rebuilt as segregated communities detached from the existing grid. By the 1970's this model of development was proving to be troublesome. It created segregated neighbourhoods disconnected from the city.

When the city decided to redevelop the St. Lawrence neighbourhood (fig. 3-20 and 3-21), a decision was made to create a new model of development. Urban renewal developments were

beginning to show issues of poor living conditions due to high concentrations of lower income residents. The city decided it was best to create new residents on old industrial land rather than clearing existing buildings to create high rise towers. The St. Lawrence neighbourhood was mandated to fit into the existing fabric and character of the neighbourhood. There was to be a mix of affordable and market housing along with mixed use of the ground floor to provide amenities to the community. The project was developed in three phases taking a few decades to complete. It is reported by Gordon (2001) that a total of 4310 units were provided on fifty-six acres of land, which resulted in the area housing about 10000 people (p. 1). While the resulting buildings are not considered the most aesthetically pleasing, the planning process and resulting community is largely considered a success.

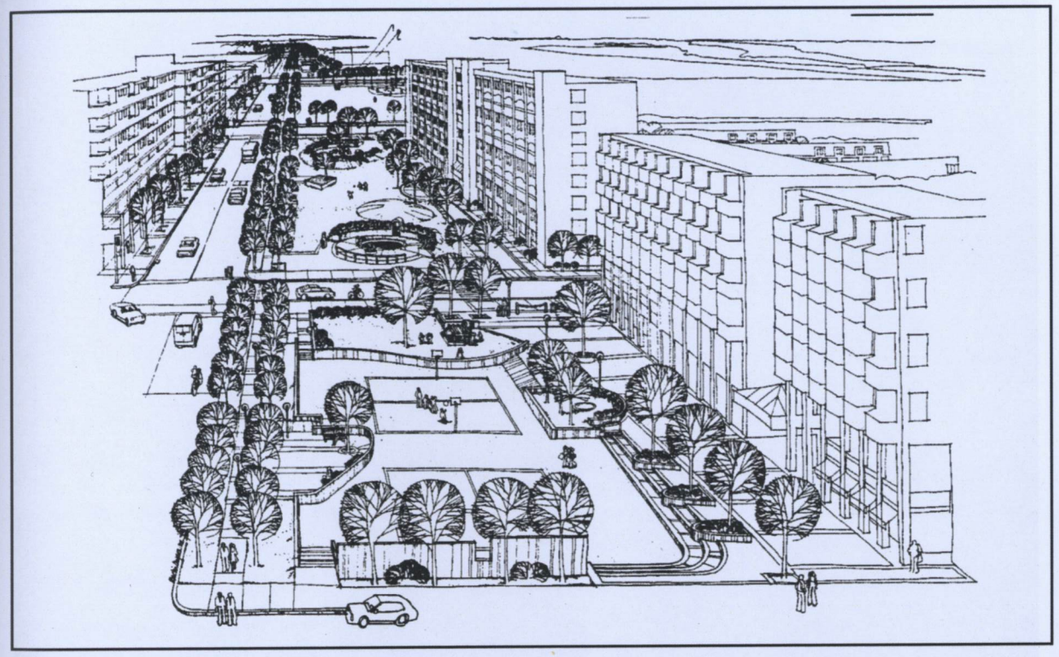


Figure 3-21. Rendering of David Crombie Park in the St. Lawrence Neighbourhood (Source: Gordon, 2001, 3)

The St. Lawrence neighbourhood is significant because of the planning methods used. It contradicts the elements that compose the modernist visions. The development is mixed-use rather than segregated use. Housing is provided for mixed incomes rather than single income. Development is geared towards the pedestrian rather than the car. Buildings are placed sensitively into the urban fabric respecting the existing context rather than having entire neighbourhoods torn down to accommodate Corbusian style towers. The street grid was

continued through the development rather than having the grid cut off as in urban renewal projects. The density was mixed rather than having all buildings high density. All these elements combined were significant for the time and for the planning process. According to John Sewell (1993), this community directly addressed the issues of modern planning that were proving to be quite destructive. This mixed-use community grew naturally out of what existed rather than having a new typology superimposed generically into an existing context. This is one of the issues with modern developments like Brasilia or a typical suburban community. St. Lawrence, on the other hand, blended into the surrounding context through human scale and materiality.

Figure 3-22. Image of Residential Buildings Facing the Street and Linear Park in the St. Lawrence Neighbourhood (Source: Mark Siemicki)

One interesting issue that an analysis of St. Lawrence brings to attention is the typology of living which the area adopted. One of the guiding principles of the design was to have all buildings face directly onto the street (fig. 3-22), unlike modern towers that had entrances hidden within private streets. What is also interesting to note is the way by which communal living was

integrated into the project. Figure 3-23 shows the different levels of public and private elements in the design of the neighbourhood. There is a mixture of three different levels of communal living. A linear park lines the section between Jarvis Street and Parliament Street, and this completely public space brings the community together. It provides landscaped space to those in high density living that may not have access to a yard or open space. This concept provides a potentially animated element to the area, creating an anchor for the community. In addition, there are semi-private communal areas that are part of high density buildings. These areas are shared courtyards within the buildings, offering a bit more privacy to residents. Finally, there are private spaces attached to the town houses in the development, for those who may not be inclined to communal living and prefer privacy. The three types of spaces show the diversity which the neighbourhood planning adopted as part of their mandate.

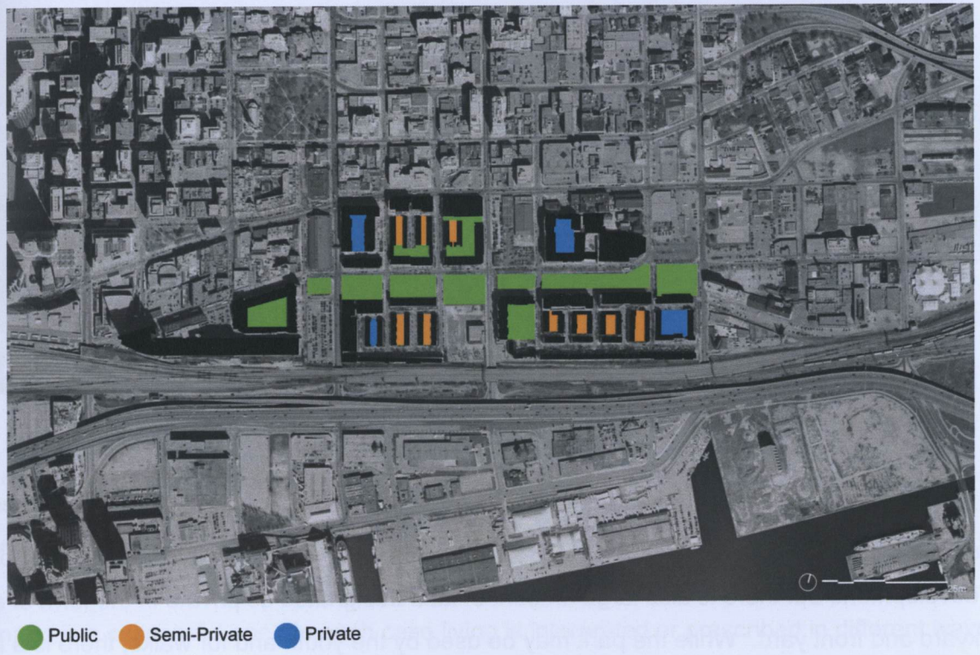


Figure 3-23 - Map of Communal Space in the St. Lawrence Neighbourhood

It is interesting to contrast these examples with modern communal living found in the suburbs and in the Super-Quadra of Brasilia. Brasilia (fig. 3-24) shows that the entire area of land within the Super-Quadra is considered communal space. The idea was similar to Le Corbusier's Radiant City in which the tower was lifted off the ground so the only elements touching the ground are the services of the building, freeing up the entire ground floor for leisure space.

These areas are aesthetically pleasing, with an abundance of mature trees and plenty of green space in which to conduct outdoor activities. One issue is that there appears to be too much communal space and very little private space for personal gatherings. It is interesting to compare this style of living with the St. Lawrence neighbourhood, where residents are given a choice of living options. In Brasilia residents are forced to live a certain way which is a staple of modern planning. Modernists were idealists and dictated how people should live.

Figure 3-24. Map of Communal Space in a Brasilia Super-Quadra

In contrast, analysis of a suburban area (fig. 3-25) shows that there is a public park as part of the development, but there is also large amount of land designated as private in the form of a backyard and front yard. While the park may be used by the youth and for walks, there is a high probability that the yard is where intense communal living occurs. This is by far the most overwhelmingly private of the three comparisons. It has the appearance of being very isolated. Since each development has its own park, the result is a number of public parks concentrated into one area. This means that each development uses that park rather than having a large communal park as part of a number of developments, as in St. Lawrence. So, in turn, the park is actually semi-private as it is exclusive to the development. Semi-privacy is reinforced by the backyard of homes in a development facing the park. The park is also blocked by a fence.

These two gestures suggest a struggle between public and private by buildings turning their backs on the park, unlike in St. Lawrence where one of the planning guidelines was for buildings to face the street and parks.

Figure 3-25. Map of Communal Space in a Suburban Neighbourhood

3.7 Analysis

These proposals all present a variety of lifestyle options and living conditions. Living is not defined as the living units or homes but all the various conditions that are combined in order to live. How all these variables are combined can perhaps determine whether or not the living scenario is a successful one. In each case living is interpreted or prescribed in different ways as a result or reaction to what conditions are occurring at the moment. The early 20th century visions of Frank Lloyd Wright, Le Corbusier and Norman Bel Geddes were all reactions to similar conditions. Cities at the time were feeling the repercussions of the industrial revolutions. There were poor living conditions, pollution, and density issues. Furthermore, there was a huge leap in technological advancement. The suburbs evolved from the car and the 20th century visions. St. Lawrence neighbourhood then responded to the conditions laid out by suburbanism

and modernism. All these visions responded to the conditions of their times. Studying these visions offer insight into success and failure.

The one thing which all these visions have in common is that they all proposed radical change on a large holistic level. The ideas were bold in thought because bold new visions were required. Even St. Lawrence neighbourhood was on a large scale, encompassing about 56 hectares of city land. Each vision took into account every aspect of living and each took a different approach. Le Corbusier and Lucio Costa approached city design as segregating uses but maintaining a centralized city. In each scheme the residential sector represents the heart of the city. The residential sections are designed to promote communal living, and they contain all the amenities needed to live within one's superblock. Schools, recreation, and retail were part of these areas so that commuting outside of one's superblock was a last resort. The city was then layered with an extensive highway system which eliminated streets that were on a human scale. While the idea of staying in one's residential area was a good notion, in reality many of the amenities that people need are outside of the superblocks, requiring commuting by car. Travel distances are enormous since uses are segregated throughout the city.

One of the issues with the visions of Frank Lloyd Wright, Le Corbusier and Lucio Costa is that they were too prescriptive in nature. This is why they are labelled as ideal cities because in order for them to work they need to function according to the plan. A person can't be expected to live the way one envisions but the person can be persuaded. One issue with these visions is that people were told how to live, and options weren't considered. It can be considered unrealistic for Frank Lloyd Wright to expect that everyone own land and work the land. And in contrast, St. Lawrence represents a plan that allowed for flexibility in becoming its own entity over time. In addition, conditions are always changing, and these visions didn't necessarily account for these changing conditions. What happens when one can't rely on a car anymore? This is the result of designing in a prescriptive context. In hindsight some of the ideas proposed seem illogical, however, that is within a twenty-first century frame of reference.

What these visions also demonstrated is the effect of incorporating technological advances into a scheme as a primary focus for implementation. As with many visions, mobility was accounted for in respect to the car. In the current context the car is no longer a novelty and can't be looked at as a primary source of mobility, but instead a tool in a repertoire of multiple mobility options like rail, bike or walking. Perhaps what those schemes did was influence the establishment of

infrastructure, which suggests that now it's about adapting that infrastructure to our current conditions and using it to our advantage.

4.0 Current and Changing Conditions

4.1 Analysis of a Suburb - Vaughan

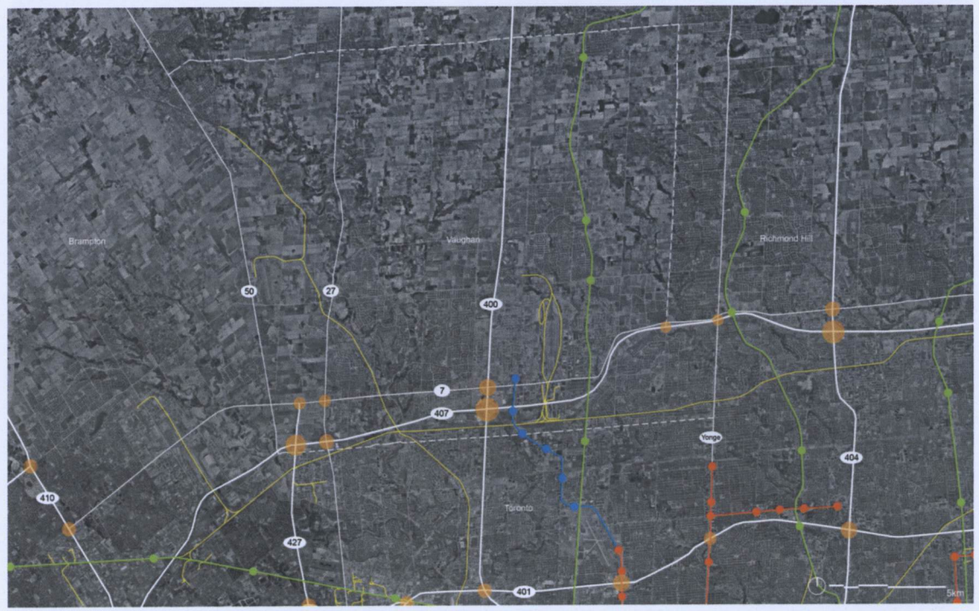


Figure 4-1. Contextual Aerial Image of Vaughan

A typical suburb was analyzed in regards to current and changing conditions to determine whether car-friendly suburban development is appropriate for the twenty-first century. As mentioned earlier, the suburban city chosen is the city of Vaughan (fig. 2-1 and 4-1). Vaughan is located north of Toronto and neighbours Brampton to the west, Richmond Hill and Markham to the east, King to the north and Toronto to the South. Figure 30 shows the context that surrounds Vaughan and its neighbouring areas. The main Highways that run through Vaughan are highway 400 and highway 407. Highway 400 provides an important connection to Barrie in the north. There are two GO transit lines that run through or close to Vaughan. One is the Barrie line which connects Barrie to downtown Toronto. The future expansion of the subway line from Downsview to York University will terminate in Vaughan at Highway 7 and 400, providing a future subway connection to the city of Toronto. Vaughan is also serviced by rail lines that provide connection to freight trains for industrial uses.

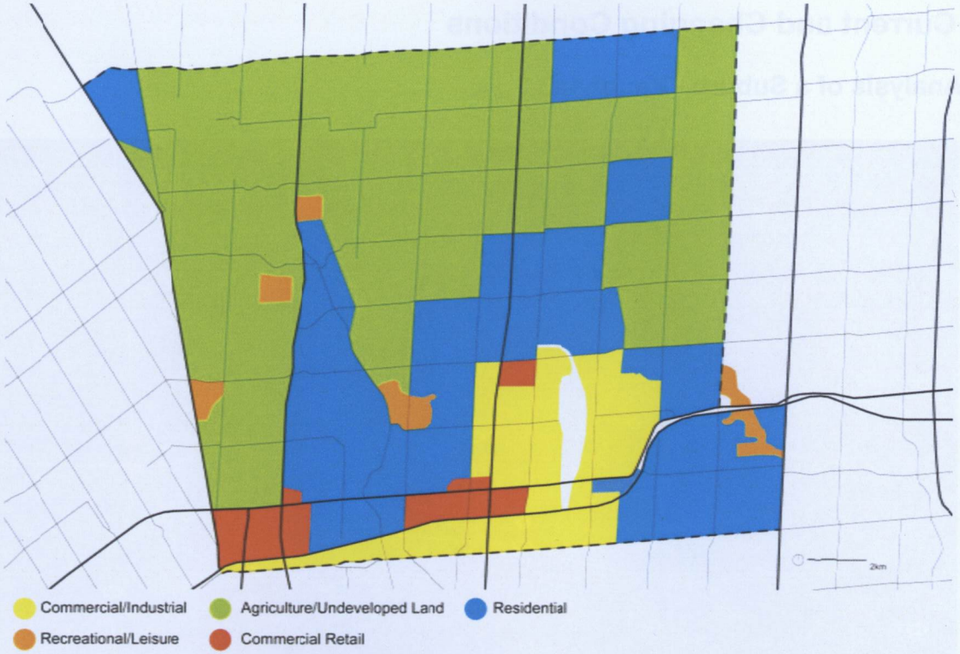


Figure 4-2. Land-Use Map of Vaughan

When viewing a land-use map of Vaughan (fig. 4-2) it becomes clear that the land is laid out in single-use zoning as pointed out by *Suburban Nation* (Duany, 2000). As the radius of distances points out, the amenities are spread out well beyond a walkable distance, demonstrating that the scale of the city was designed to coincide with the scale of the car rather than the pedestrian. Daily tasks like shopping or going to work need to be done through use of a vehicle. Further exploration of the suburbs (fig. 4-3) shows what kind of amenities are located within residential areas. These amenities are mostly schools, community centres, libraries and churches. The red dots that represent commercial retail on the diagram indicate that some retail is available within residential areas; however these are mainly strip malls. Major retail outlets are located within shopping areas in malls and big box stores. Leisure facilities are scattered throughout the city of Vaughan in the form of golf courses and a theme park. Commercial offices and industrial facilities are grouped closely along highway corridors and rail lines.

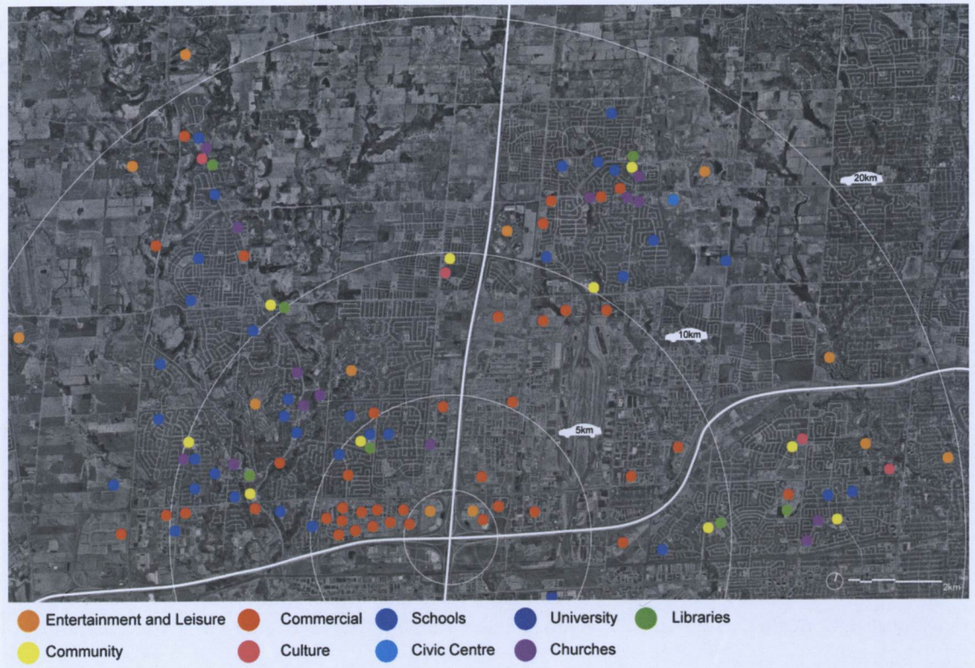


Figure 4-3. Amenities and Services in Vaughan

When comparing Vaughan to the visions discussed earlier (fig. 4-4), (Broadacre City, Radiant City, Brasilia), one can see similarities and differences in the ideas. Each car-oriented design has segregated use, reflecting the use of the car as a means of transit. When analyzing use a little more closely one can see that a big difference between the suburb and the visionary designs is planning. The suburbs appear to have a general use plan, albeit chaotic and unplanned, unlike to the visions of Brasilia and Radiant City. These two visions had very rigid planning and order to their schemes, creating a centralized access of activity which encompassed the needs of a city. The same can be said for Broadacre city which was all-encompassing in its planning; while at first it seems random and similar to a suburb, it is in fact a strategically mixed-use zoning that is carefully laid out. There is a general zoning of industry, retail, academic, and recreational, with the housing mixed within and clustered in the middle similar to Radiant City. The suburb in contrast has retail, commerce, industry, living and recreation, with no cultural facilities. There is no civic identity present. Density is also different in the suburb and the visionary schemes. In the suburb all the structures are relatively short buildings fewer than five storeys, while in Brasilia and Radiant City the height of buildings are much taller making the city more compact. Broadacre City is a mixture of heights, although, Frank Lloyd Wright preferred shorter buildings to taller ones.

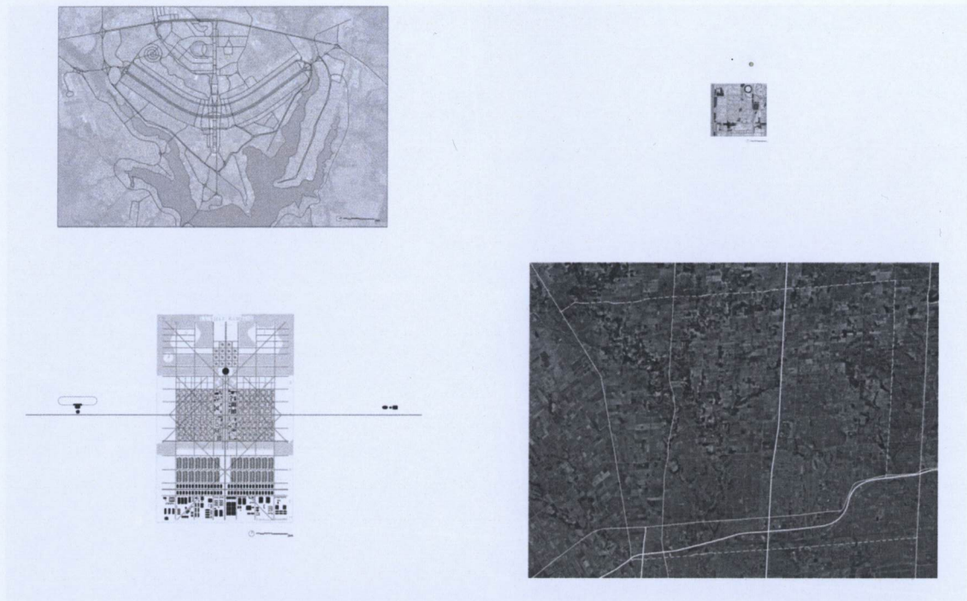


Figure 4-4. Scale Comparison Between Brasilia, Radiant City, Broadacre City and Vaughan

It's difficult to determine the success of Broadacre City since it was never constructed. Radiant City however can be analyzed somewhat through its realistic incarnation Brasilia. What becomes evident in both Brasilia and Vaughan in the large scheme of things, both are out-of-scale in relation to a pedestrian, which makes the creation of a social heart difficult to accomplish. Mobility is planned according to task; shopping becomes separate from working, leisure, and living. One moves from point A to point B living in contrast to a mixed-use city like Toronto where these functions can occur constantly.

Things appear differently when these sites are studied at a closer scale. According to Farr (2008), "most people will walk a distance of approximately one-quarter mile (0.4 kilometres) before turning back or opting to drive or ride a bike rather than walk." (p. 128). ..The following section compares four areas and their proximity to amenities and services within a half kilometre distance. The four areas are a Super-Quadra in Brasilia (fig. 4-5), a typical suburban cul-de-sac in Vaughan (fig. 4-8), a traditional neighbourhood in Toronto (fig. 4-6) and the St. Lawrence Neighbourhood in Toronto (fig. 4-7).

While Brasilia (fig. 4-5) was developed in a car-friendly manner, the residential areas were meant to be all encompassing of needs for living. Within a half kilometre there are schools, libraries, churches, retail strips, recreation facilities and high density towers. This promotes a communal living that is meant for people to be in at all times and only when necessary.

However, the main issue that working and culture occurs in separate areas; a car is then needed to access these areas. The Super-Quadra are also bound between two highways, making them feel secluded and claustrophobic. Through observation, however, there is a communal vibrancy present in the Super-Quadra due to the fact that there is mixed usage and a pedestrian realm.

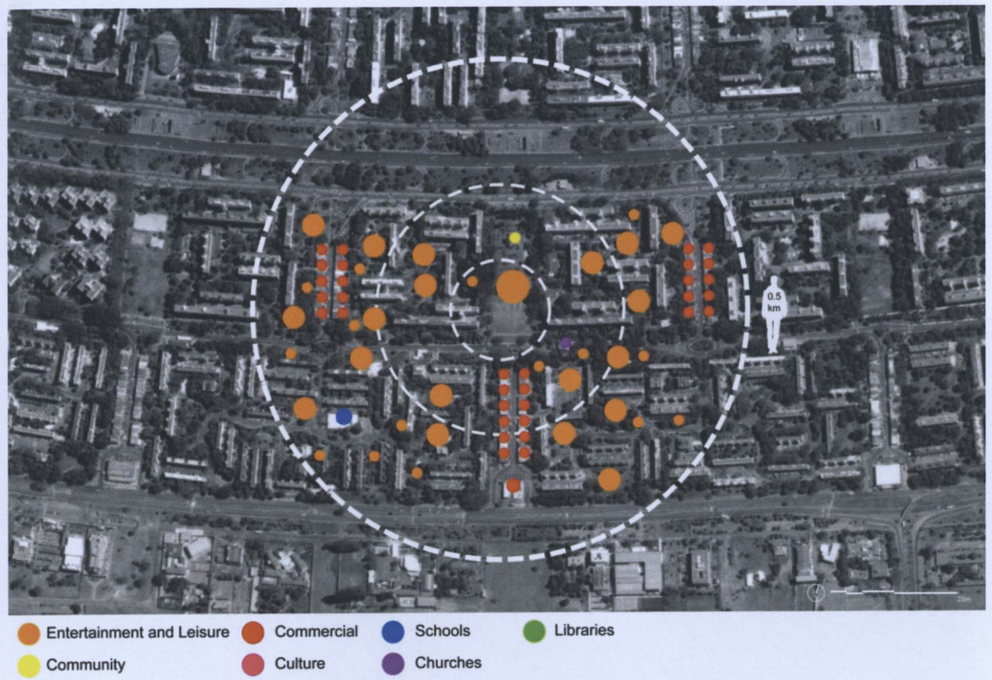


Figure 4-5. Amenities within Walking Distance in Brasilia

Within a half kilometre radius of a house in a traditional Toronto neighbourhood (fig. 4-6) there is an abundance of amenities available. There is access to a variety of transit lines in and out of the city, there are retail shops, schools, community facilities, churches, medical facilities, parks, etc. Many of the requirements for living are found here. Access to transit provides access to cultural facilities, and car dependency is minimal. The neighbourhood is not bound by highways or busy thoroughfares like in Brasilia or the suburbs, so it does not feel isolated. There is an animation at various times of the day of social interaction. Working and living can occur in the radius. This neighbourhood makes a case for mixed-use and pedestrian oriented development. It is important however to look at it as an extension of the greater city. This neighbourhood would perhaps have a different dynamic if it wasn't part of Toronto but rather a suburb; it too would lack a social heart and gathering area.

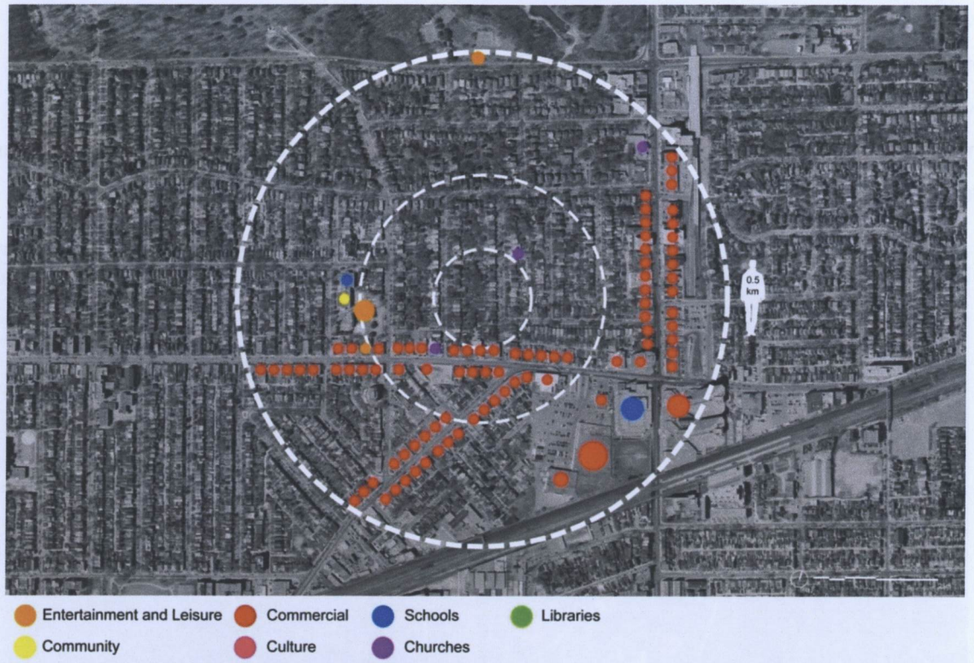


Figure 4-6. Amenities within Walking Distance in a Toronto Neighbourhood

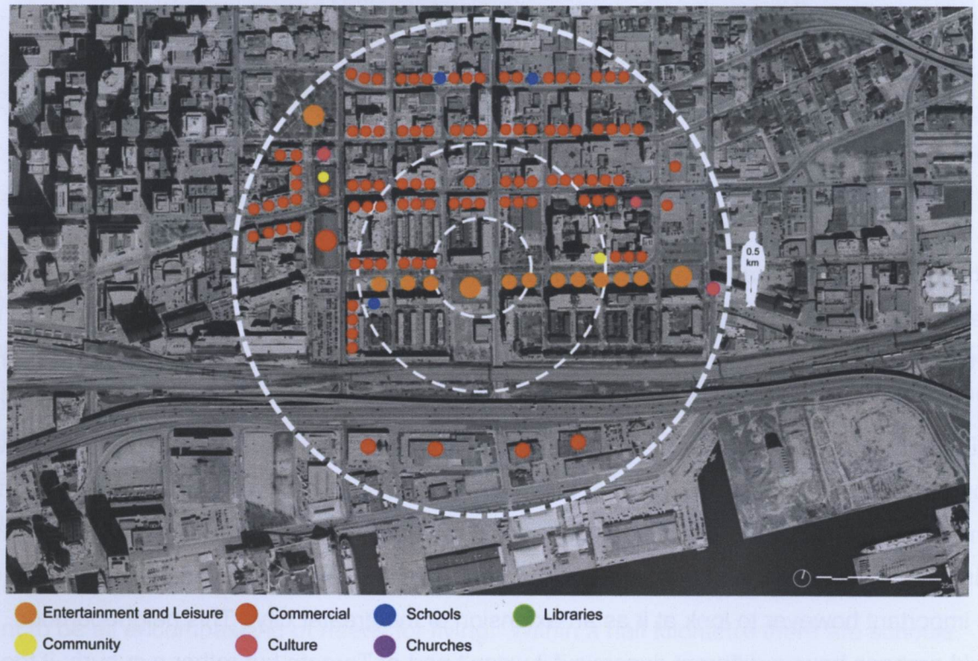


Figure 4-7. Amenities within Walking Distance in the St. Lawrence Neighbourhood

The St. Lawrence neighbourhood (fig. 4-7), like the traditional neighbourhood, is designed on the principle of mixed-use. It has the same amenities as a traditional neighbourhood; transit, retail, schools, community facilities, parks, etc. It is further connected to the city as part of the downtown core. There is a close proximity to work and cultural facilities.

The amenities within the suburban neighbourhood (fig. 4-8) are similar to those of Brasilia with the lack of one element - retail shopping. Within the half kilometre radius one finds a park, community facility, church, school and homes. There is no commercial area where people could shop and work so all other functions occur outside of the residential zone. While the scale of a neighbourhood is on a pedestrian scale the entire city is not. The same task that could take 10 minutes in traditional neighbourhood by foot could take 10 minutes by car in a suburban neighbourhood. This model fosters the idea of isolation and entrapment unless a person has a car to partake in other social activities.

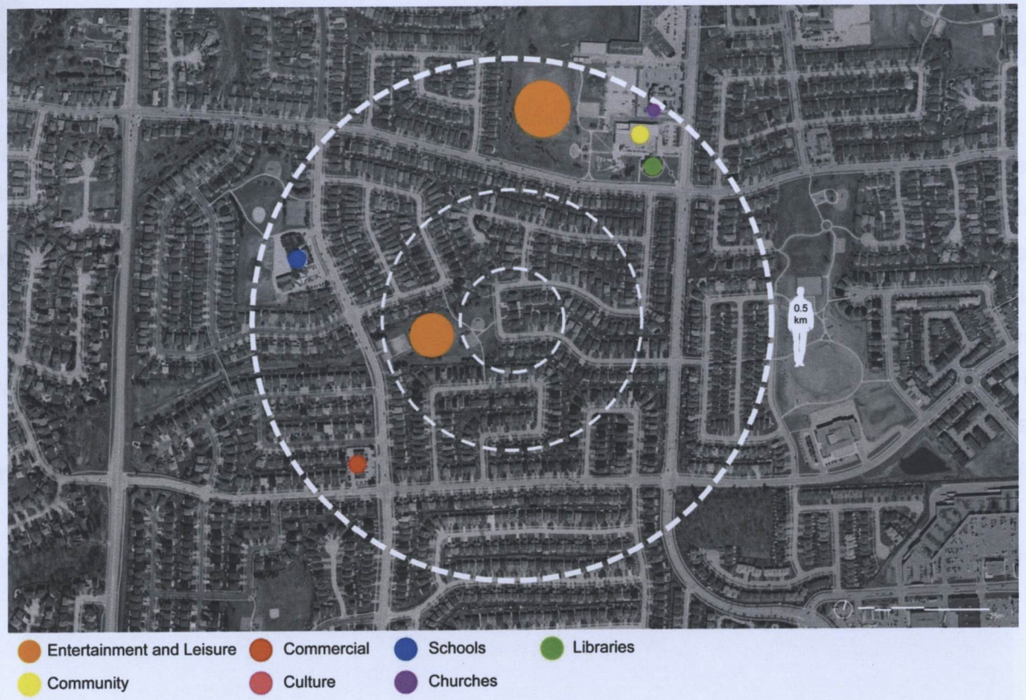


Figure 4-8. Amenities within Walking Distance in a Suburban Neighbourhood

4.2 Density in the GTA

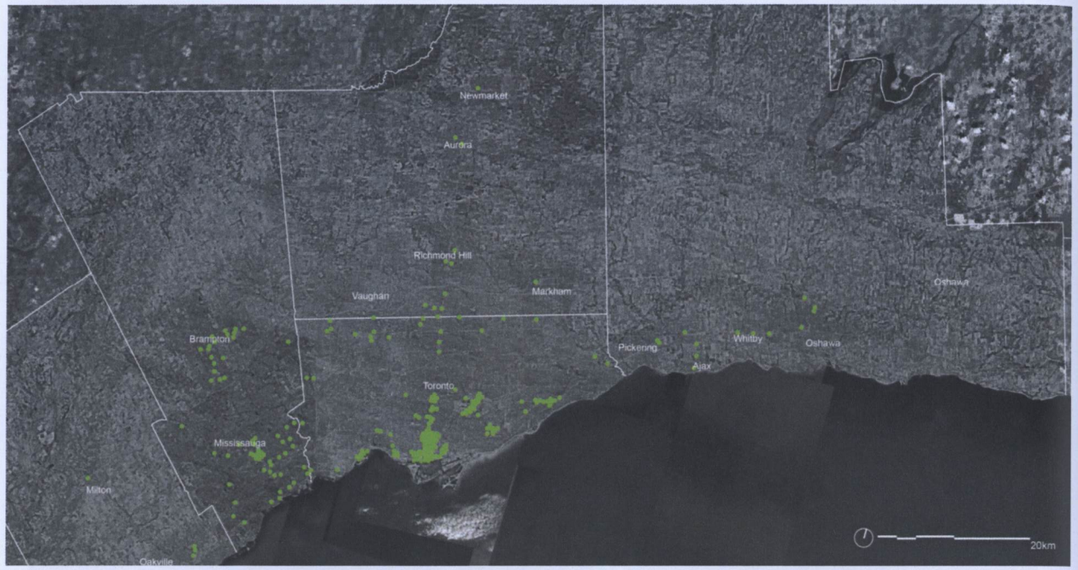


Figure 4-9. High Density Dwellings in the GTA

As part of the growth plan outlined by the Government of Ontario (Ontario Ministry of Infrastructure Renewal, 2006), new developments are to develop with a higher population density in mind. The city of Toronto for instance is required to adhere to 40 000 people /square kilometre. The city of Vaughan and other urban growth centres require a lower number but still ambitious. They are required to have a 20 000 people/square kilometre population density. This implies that within the growth area a high density development is mandated. For the most part development in Toronto and the GTA is mainly low-density. This is evident when viewing a density map of the region (fig. 4-9). The map shows how much high density development there is in the GTA. Each dot represents a small clustering of towers. It immediately is shown that there is very little high density development even within the city of Toronto.

Location	Population Density
1. Radiant City	100,000 people/km^2
2. Brailia Super-Quadra	41,758 people/km^2
3. St. Lawerence Neighbourhood	44,053 people/km^2
4. Suburban Neighbourhood	4,075 people/km^2
5. Manhatten	27,257 people/km^2

Figure 4-10. Population Density Comparison

Development in Vaughan needs to look to other models to achieve the standards that the government has laid out (fig. 4-10). A density study of a typical suburb development (fig. 4-11) shows that the area has a population density of 4 075 people/square kilometre. This demonstrates that single family homes do not provide an adequate amount of density to meet the required numbers. This scheme would need to be layered five times over to achieve that type of density creating buildings of at least five storeys. One can begin to see the potential of density options when a number of schemes get overlaid on top of the suburban development. Radiant city (fig. 4-12) was proposed to have 14-storey buildings within superblocks that housed 16 000 people, achieving a population density of 100 000 people/square kilometre. Brasilia (fig. 4-13) achieved a population density of about 41 748 people/square kilometre through 6-storey buildings within a Super-Quadra. The St. Lawrence Neighbourhood (fig. 4-14) achieved a population density of about 44 053 people/square kilometre. The whole island of Manhattan has a population of 1,537,195 (U.S Census Bureau, 2008) as of 2000 and a population density of 27 256.9 people/square kilometre. If the island were overlaid on along the highway corridor of the 400 and 407 (fig. 4-15), there would be almost enough room for two full Manhattan's. Therefore almost 3 074 390 people could be easily accommodated within the boundaries of Vaughan. This almost meets the population growth expectation of 3.7million people in the Greater Golden Horseshoe region by 2031.

Figure 4-11. Population Density of a Suburban Development

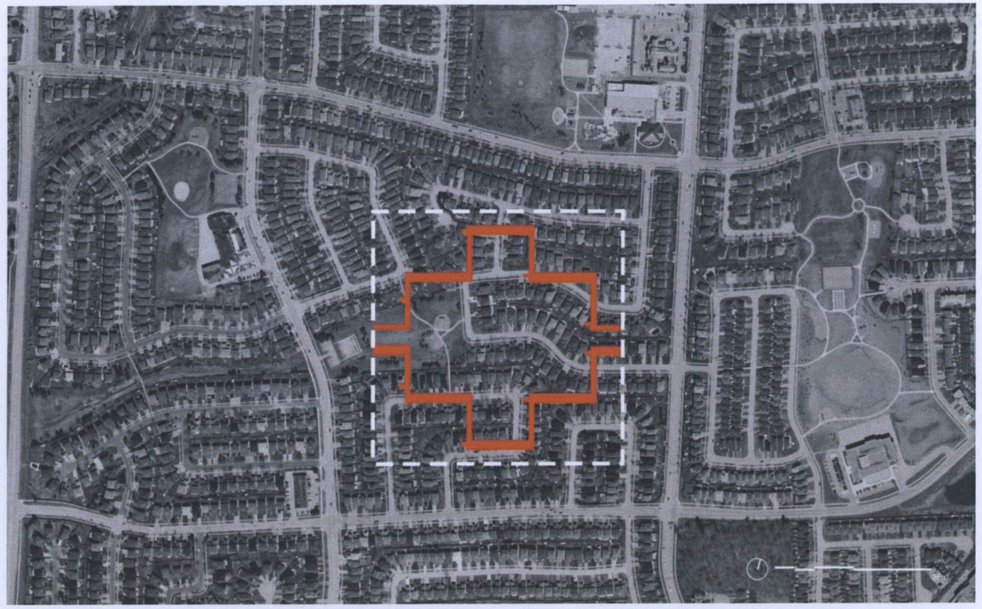


Figure 4-12. Population Density of Radiant City

Figure 4-13. Population Density of a Super-Quadra in Brasilia

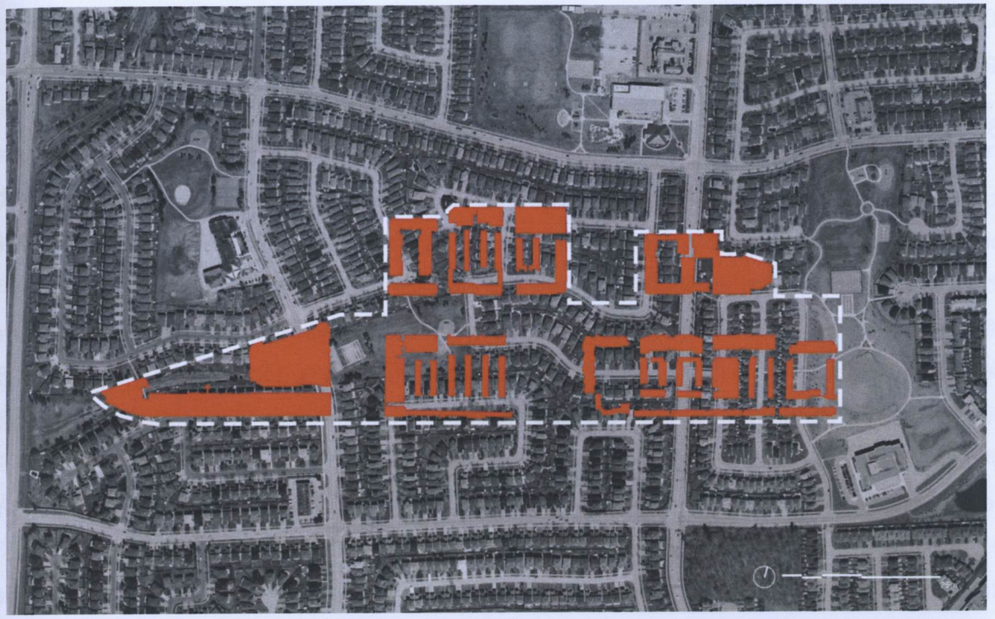


Figure 4-14. Population Density of the St. Lawrence Neighbourhood

Figure 4-15. Density Overlay of Manhattan Island Over Vaughan

Therefore density is an issue in Vaughan. If growth patterns continue in their current trend most of the remaining land would be used for housing by 2031 with the expected population growth of

430 000 people. This leaves little room to grow within Vaughan's existing boundaries suggesting that intensification needs to occur.

4.3 Complexity and Diversity in Cities: Contemporary Theories on City Design

In order to better understand issues in the suburbs it is important to view them in a holistic manner to determine whether a city like Vaughan is able to be sustainable. Sustainability in this sense is not simply referring to its energy consumption or use of green technology but rather sustainability on a holistic manner where environment, economy, culture and governance are incorporated as one. As guide to determining sustainability of Vaughan the criteria outlined by Newman and Jennings (2008) (fig. 4-16) will be used as a reference. They have outlined ten principles in which to follow when designing a city in response to issues that the majority of cities are facing with climate change, water security, urban decay and uncontrolled growth on the periphery of cities. These principles introduce the idea that a city is a dynamic, complex entity much like an ecosystem. In recent years viewing the city as an ecosystem has become important as a way of understanding this complexity. With a new understanding of the city a new approach to their design can be considered in hopes of providing a new conceptual framework for designing in twenty-first century conditions.

1. Vision	Provide a long-term vision for cities based on sustainability; intergenerational, social, economic, and political equity; and their individuality.
2. Economy and Society	Achieve long-term economic and social security
3. Biodiversity	Recognize the intrinsic value of biodiversity and natural ecosystems, and protect and restore them.
4. Ecological Footprints	Enable communities to minimize their ecological footprints.
5. Model Cities on Ecosystems	Build on the characteristics of ecosystems in the development and nurturing of healthy and sustainable cities.
6. Sense of Place	Recognize and build on the distinctive characteristics of cities, including their human and cultural values, history, and natural systems.
7. Empowerment	Empower people and foster participation.
8. Partnerships	Expand and enable cooperative networks to work toward a common, sustainable future.
9. Sustainable Production and consumption	Promote sustainable production and consumption through appropriate use of environmentally sound technologies and effective demand management.
10. Governance and Hope	Enable continual improvement based on accountability, transparency, and good governance.

Figure 4-16. The Ten Melbourne Principles for Sustainable Cities (Source: Newman and Jennings, 2008, 10)

A city is complex, dynamic and ever changing entity with many components that support its function. This model acknowledges the inherent complexity of cities and by applying systems thinking suggests an alternative to current city design. In recent years the study of ecosystems has led to a new type of science that applies systems thinking to the understanding the patterns and processes of an ecosystem. This new science as discussed by Kay (2008a) attempts to challenge conventional reductionist science which functions in a linear manner. Traditional science is insufficiently equipped to deal with sustainability because of lack of understanding of the ecosystem. He states that, "this enhanced understanding of systems, as complex systems, forms the backdrop for navigating a path to sustainability" (Kay, 2008a, 11). In a process that takes into account complexity there is a new understanding of the world that acknowledges the interconnectedness of species and organisms, hence nonlinearity exists. Kay (2008) points out that a bit of an overstatement to say everything is connected; however unsuspected and surprising connections exist.

Similarly, Newman and Jennings (2008) also discuss systems thinking in relation to ecosystems. The systems perspective is justified by looking at the relationships and interactions between all parts in a system so an integrated solution can be obtained unlike reductionist science which only seeks a solution for one of the parts without necessarily taking into account the other parts. Context is important. The entire system needs to be considered along with the wider system within which it is situated. Newman and Jennings (2008) deduce that focus and attention must be paid to relationships and processes so that the emergent properties and complexity of living systems can be better understood. They see modernism as a reductionist approach in respect to factors of city design which can lead to undesirable results, as we have seen in our discussion of the suburbs.

Newman and Jennings (2008) bring to attention Hartmut Bossels (1998) study (as cited in Newman and Jennings, 2008) of sustainable ecosystems. Bossels (1998) states that in self-organizing systems, sustainability and viability is dependent on system characteristics being in a satisfactory state. So in turn he defines the characteristics of the systems and analyzes both sustainable ecosystems and sustainable societies (appendix N and appendix O). Bossels (1998) analysis (as cited in Newman and Jennings, 2008) of ecosystems falls under five characteristics and his analysis of societies adds another three characteristics. In order for an ecosystem to be sustainable it must be healthy (effective), it should generate zero waste; it must be self-regulating, resilient and self-renewing, and flexible (Newman and Jennings, 2008). In

addition to those five a sustainable society needs to be ethical, psychologically fulfilling, and cooperative (coexistent). Appendix N and O summarize the findings of Bossel (1998) by Newman and Jennings (2008).

Bossel (1998) provides a definition of sustainable ecosystems but Kay (2008b) along with Lister (2008) begin applying the definition to cities. Their studies are focused on applications of the ecosystem to the planning process but their insights provide important context when the discussion moves to city design. They imply that a linear process is flawed because it works under a notion of hierarchies which do not in fact exist so it is advocated that management shift from a top down approach to a collaborative one that encourages self-organization. Kay's (2008b) approach suggests that a variety of experts in various fields work together with citizens to create informed results. Lister (2008), building on the ideas of Kay (2008b) states that the ecosystem approach and systems thinking encourages a move from decision making that is concerned with prediction and control to one that is more organic, adaptive, and flexible in management. There is no certainty and predictability so decisions in the process should be discussed, debated, negotiated and ultimately learned rather than pre-determined by rational choice. Lister (2008) also promotes a move from top-down isolationist approach to one that is intentionally adaptive so that the process is about learning and changing rather than reacting to change.

As mentioned earlier Newman and Jennings (2008) apply the ecosystem approach to cities by offering a guiding framework called Cities as Sustainable Ecosystem (CASE) (fig. 4-16) as an attempt to re-imagine human settlement to ultimately move towards a model of sustainability that has a symbiotic relation with nature. Sustainability depends on cities learning and basing development on patterns and processes of natural, sustainable ecosystems, achieving ecological regeneration, healthy communities, and viable economies. Their approach attempts to bring focus of cities back to a local level in response to globalization, so in turn a city can be more successful if social, environmental, and economic factors can be integrated at these local levels. What these principles offer to cities is organization and guidance, which if absent can lead to devastating and misguided results. Most of the principles and guidelines outlined by Newman and Jennings (2008), however fall outside of the responsibilities of design. Most in fact rely upon policy implementation. Although these points are important, this paper is interested ultimately with the translation of the ecosystem approach to the built realm. The one point which begins describing the built form of a city is principle five, model cities on

ecosystems. By defining cities as places where humans live, interact with each other and with other living organisms as well as abiotic elements much like an ecosystem, Newman and Jennings (2008) are able to create various models for sustainable development. These models are intended to demonstrate how ecosystems can guide cities and development.

Using the concepts of Hartmut Bossel (1998) written about earlier, Newman and Jennings (2008) first model applies an understanding of how ecosystems function based on systems thinking and applies those principles to cities. Newman and Jennings (2008) applied the two Bossel models to create their own model for cities as sustainable ecosystems (appendix P). The model defines urban social and institutional strategies and urban form and infrastructure based on the eight characteristics defined earlier in the paper. Of interest in this analysis is how it impacts urban form and infrastructure. The model advocates the creation of dense, polycentric, compact, mixed-use cities that are walkable and transit oriented. It encourages responsible resource use through cyclical industrial processes, clean energy production, conservation, and efficient use of water, energy and food among other things.

The second model presented by Newman and Jennings (2008) introduces succession principles and its impacts on city form and structure (appendix Q). This is based on the notion that at times ecosystems are prone to disturbances in order to renew themselves and enable invigoration. In cities this suggests that there will always be areas that become degraded and require revitalizing from time to time. In many former industrial cities this is seen in old warehouses that have been adaptively reused for new creative business leading to regenerated areas.

The final model by Newman and Jennings (2008) offers understanding of how cities are shaped based on human patterns and processes or emergent behaviour. In this case the emergent factor is personal mobility. They state that historically the average travel-time budget, which means the time spent travelling to and from work in one day, is about one-hour which is the desirable maximum amount of time a human would like to travel based on the transitional time between productive work and recreation. Cities have over time developed to be about one-hour wide according to this principle. The proportion has changed due to the mobility technology available.

Newman and Jennings (2008) note that as technology has "improved", city density has diminished. Traditional walkable cities were highly dense settlements with central social hearths. They provided compact space within walking distance of nature and agriculture. Transit oriented cities of the 1800's were medium density and developed around rail stops and transit stops. Walkable villages formed outside of cities around transit stops, but nature was preserved in between. Some transit lines could span twenty to thirty kilometres but still adhered to the half hour of travel rule. Current city development in the post-world war two years was based on car mobility and therefore expanded in proportion to the car. Suburban growth is unsustainable so Newman and Jennings (2008) offer a potential model for development on a regional scale.

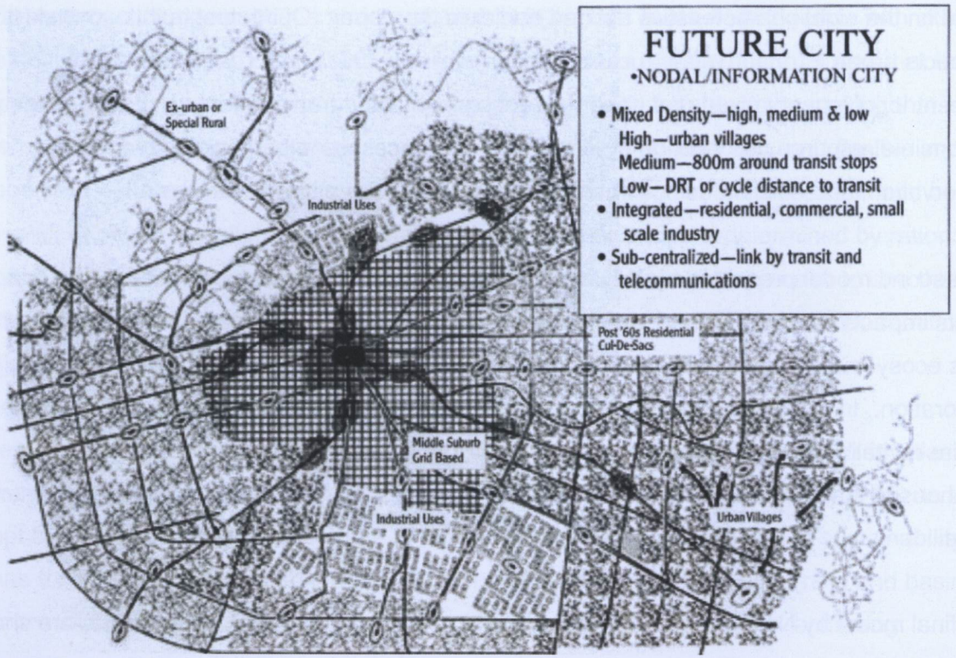


Figure 4-17. Future City Schematic of a Multi-Nodal Mixed-Use Compact Developments (Source: Newman and Jennings, 2008, 132)

Newman and Jennings (2008) suggest that suburban cities could become a network of high density urban ecovillages interconnected by transit (fig. 4-17). These developments would be compact, mixed-use and walkable, as suggested earlier by their findings. They advocate establishing a park system that would surround cities containing integrated support systems of urban agriculture, and stormwater and wastewater management systems, and links to the surrounding bioregion. They suggest that these urban ecovillages can become knowledge and service centres of the new economy in socially interactive centres. These centres could feed

not only the local economy but the global one as well. Interestingly this concept is very similar to the idea of traditional dense compact cities; however, these are decentralized polycentric cities servicing the whole rather than a centralized monocentric city that services the whole or cities within cities. This suggests that with advancement in transit and telecommunication this model becomes feasible however there are questions to implementation and efficiency of transit. Will these nodes be retrofitted into existing suburban developments or are they to be placed on green fields? Does this park system require demolishing existing suburban cities or is to be assumed that park space is somehow readily accessible?

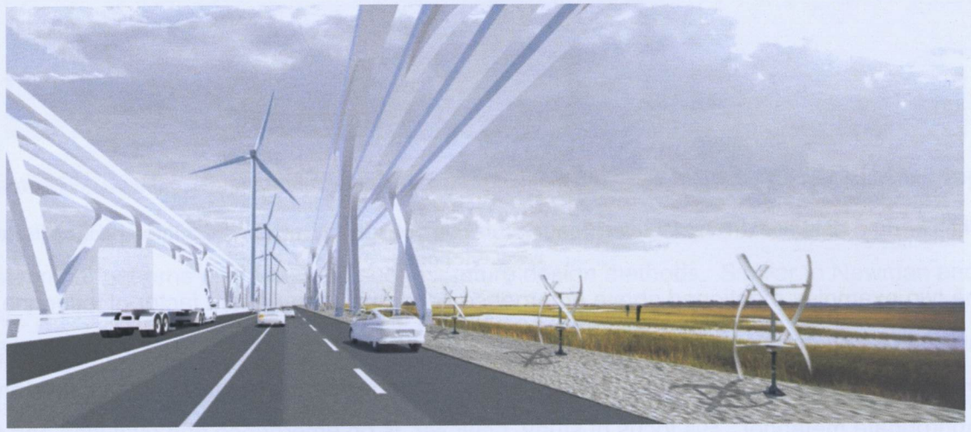


Figure 4-18. A re-imagined Post-Carbon Highway demonstrating how the superhighway can become a hybrid of uses (Source: www.rvtr.com)

Creating a system of scattered urban nodes implies a certain degree of nonlinearity to the transit which makes the system inefficient. Newman and Jennings (2008) warn that if highways are built this will encourage further sprawl, which may be true, however, there view may also be somewhat short-sighted by not considering the possibilities of the highway. RVTR's Post-Carbon Highway project (Thün and Velikov, 2009) (fig. 4-18 and fig. 4-19) demonstrates the possibilities of a superhighway beyond simply being a car mover. The project focuses on the highway 401 corridor which runs through Ontario from the border at Windsor to Quebec. It is one of the longest and busiest highways in North America and ships a huge number of goods due to its accessibility to the United States. Unfortunately RVTR (2009) acknowledges that its original function as an efficient car and transport system is failing and the possibilities of the highway need to be re-imagined. They propose that the highway become a hybrid integrated network of uses that combine car mobility with transit, rail, and energy production among other things in a post-carbon world. The post-carbon highway then becomes a new lifeline that could allow for dense compact development to occur at various nodes along the highway. While there

is no guarantee that this is an ideal situation it does deal with the issue of efficient accessibility that could become a new emergent factor for city development. This could then be applied to the existing highway network which suggests a different kind of highway expansion. The project is in many ways what Newman and Jennings (2008) suggest, although the diagram is interpreted differently.

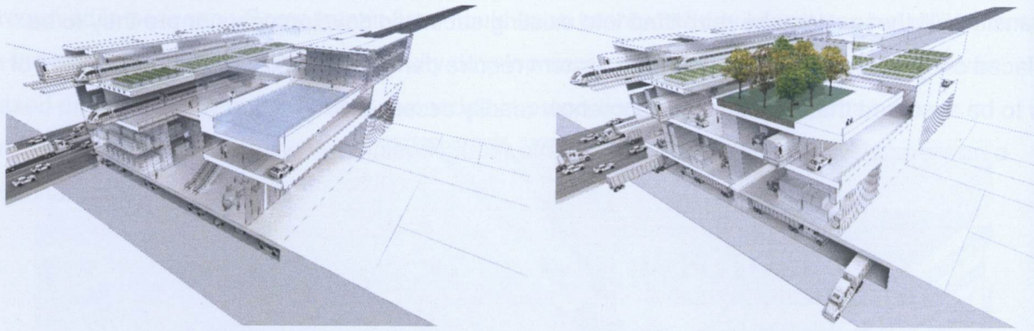


Figure 4-19. Multimodal Transfer Interchanges showing potential development at interchanges (Source: www.rvtr.com)

In the two examples mentioned above emergence becomes an important factor of influence. Changing certain components and codes in a system can lead to interesting new results over time. Stephen Marshall (2009) also acknowledges that considering the city as an ecosystem is an appropriate metaphor. His focus of study, however, is on emergence and evolution and their application to the physical urban realm. He (2009) defines emergence as results emerging from individual behaviour of an actor over generations of repetitions. It is a product of evolution creating surprising form, unanticipated results due to the rules which apply. The result is usually unanticipated but the task is intentional. Marshall (2009) provides an example of emergence though beehive planning (fig. 4-20). In a beehive there are three land uses: Egg, Honey, and Pollen. A concentric pattern emerges naturally exemplifying natural zoning with eggs in the middle, pollen on the inner layer and honey on the outer layer.

Evolution, Marshall (2009) explains, is a term for the long-term iterative changes that occur in the environment as a result of emergence. Evolution is used as a generic term so it may apply to a biological definition and non-biological definition meaning it can apply to inanimate objects. Evolution is based on reproduction, variation (mutation) and selection so an organism either adapts or becomes extinct. In artificial evolution however there is the presence of a designer and human influence.

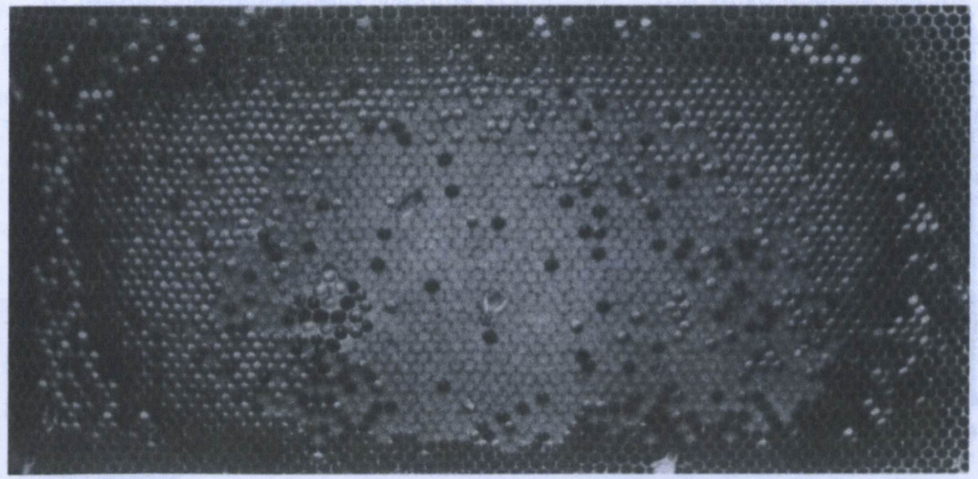


Figure 4-20. Beehive demonstrating concentric development due to emergence (Source: Marshall, 2009)

Marshall (2009) applies emergence and evolution to the urban context in order to define development patterns over time and suggest future design methods. Similar to Newman and Jennings (2008) acknowledgement of the influence of mobility on settlement patterns, Marshall (2009) uses emergence to explain traditional concentric patterns of development along with current sprawling patterns similarly accessibility is what dictates development. Traditional cities developed organically around a hearth due to accessibility of commerce and culture. In the post-war years accessibility changed drastically due to the car and telecommunication advancement and as a result sprawling communities formed. Marshall (2009) states that all this is part of our urban evolution, the long-term transformation of successive iterations of adaptive change including increments of purposive designs. Design evolved from primitive huts, to traditional cities to modernist cities. Just as in biological evolution, modernism can be seen as a large scale mutation that created a massive disturbance which didn't allow for proper adaption, hence the eventually failing.

As a result of his research Marshall (2009) creates the evolutionary approach that acknowledges the city as a collective entity or ecosystem with co-operating and competing co-evolving parts. There is no known target form or direction, the result is unexpected, unpredictable and in many ways uncontrollable. This method advocates that change occur in increments rather than in large scale planned visions, and acknowledges that the parts are not necessarily working in the best interest of the whole but rather for the best interest of the parts. There is a call for a deregulated planning of cities with more occurring through citizen, legal,

economic and political involvement. Planning should be about maintaining current viability and avoiding major disturbances, hence an incremental approach to design on a block by block basis. Marshall acknowledges that in the ecosystem paradigm there is no known optimal form but rather an evolving one. Marshall (2009) identifies five principles to the evolutionary approach: Make each step viable now, proceed by small innovations and avoid large scale monstrosities, avoid suppressing "unsolicited" novelty, discard moribund modals, and devolve decision making.

Figure 4-21. Laneway housing in Toronto (Source: www.toronto.ca)

While Marshall (2009) doesn't offer any examples of the form in which evolutionary paradigm invokes, some examples can be considered when viewing this philosophy. Marshall describes the paradigm as being flexible and adaptable, but implies this on a local small scale level. He is in preference creating buildings on a project to project basis like urban infill rather than creating large scale disturbances like the modernist projects of the past. One such example could be laneway housing (Crowther, 2008) (fig. 4-21) in which empty lots in laneways evolve into housing opportunities. Marshall's (2009) view is short-sighted in respect that his unplanned approach is perhaps an isolationist view; however he does bring attention to the fact that there appear to be natural forces at play when it comes to city design. Perhaps it is about striking a

balance between unplanned and over-planned. What can be concluded is that the urban fabric is influenced by emerging factors. Some of the current factors that have emerged are environmental concerns, congestion, social issues and globalization among others that have been discussed earlier. The form will be dependent on whatever the newest factor of mobility will be. Personal mobility has always been important in shaping a city but it may be more important in the future given the global and regional interconnectivity, accessibility and connection that is evident. The result may mean that car dominance should end and other forms of transit should become once again important in moving people efficiently. The Post-Carbon Highway (Thün, Velikov, and RVTR, 2009) offers an interesting case study into how existing infrastructure can become a hybrid layering of mobility (fig. 4-22) with the latest in high speed rail and rapid transit making the highway once again an efficient mover of people and goods. Looking at the morphology of Highway 401 (fig. 4-23) shows that the city morphed gradually towards the highway. This is perhaps an unintended result, however now the reverse can happen where the future city can emerge from the highway. Dense compact development could line and bridge over the highway, as if it is the modern day canal or channel, gradually swallowing up former suburban developments and replacing them with dense compact urban areas until new factors emerge that will change conditions once again.

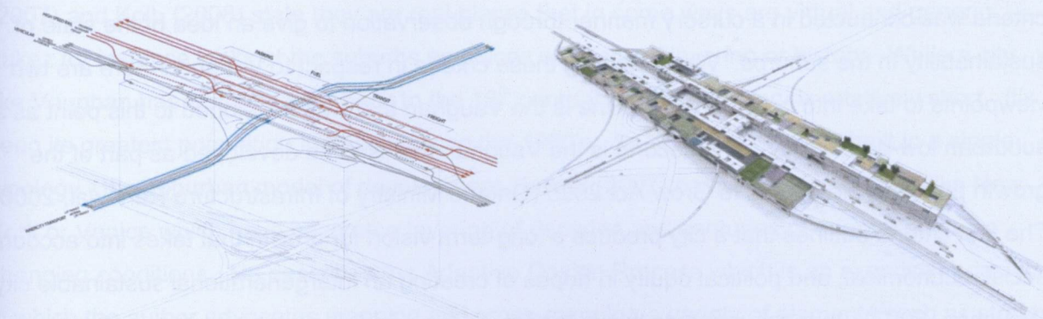


Figure 4-22. Multimodal Transfer Interchanges demonstrating the layering of mobility and uses that could occur on the highway (Source: www.rvtr.com)

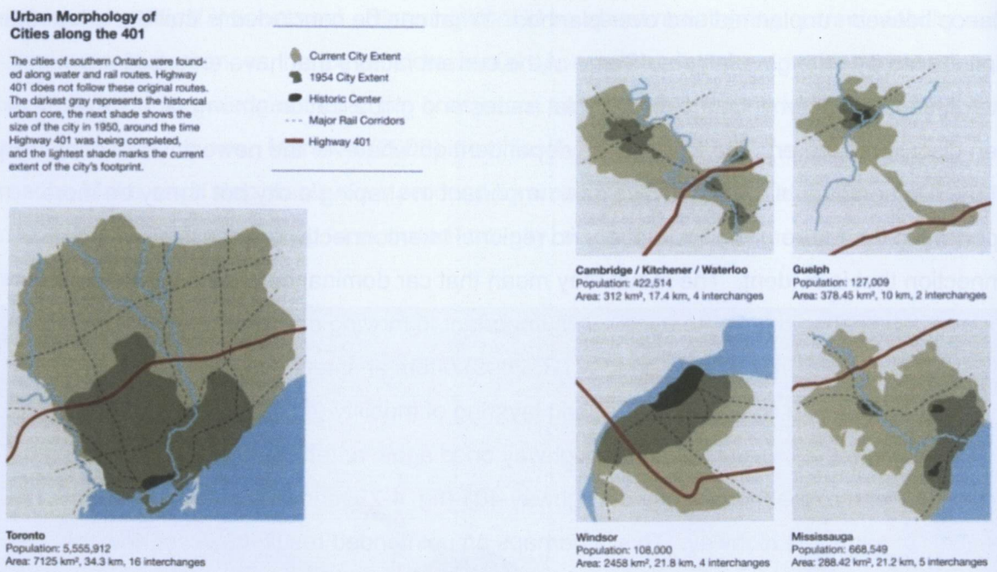


Figure 4-23. Urban Morphology of Cities along highway 401 (Source: www.rvtr.com)

At this moment it's important to switch the focus back to the other principles outlined by Newman and Jennings (2008). As mentioned earlier most of the principles and guidelines outlined by Newman and Jennings (2008) fall outside the design realm so analysis of these criteria was conducted in a cursory manner through observation to give an idea of the state of sustainability in the suburbs. When viewing these criteria in respect to Vaughan there are two viewpoints to take into consideration. One is the Vaughan that was developed to this point as a suburban low-density city. The second is the Vaughan that is to be developed as part of the growth plan and the Places to Grow Act 2005 (Ontario Ministry of Infrastructure Renewal, 2006). The first criteria outlines that a city produce a long-term vision for growth that takes into account social, economical, and political equity in hopes of creating an intergenerational sustainable city (Newman, 2007). In many respects this is the key to the principles outlined because it is the mandate for implementation of the remaining nine points.

In regards to Vaughan, the development vision up to this point has been of sprawling low-density segregated communities. This followed the developer driven model that is seen across North America in which control and vision was given to separate players rather than development in a holistic manner. As a result industries and homes have been built separately of each other and gone uncontrolled. Development has occurred as a monoculture which

implies that should a condition change or be imposed the results could be devastating. For instance what occurs if the car no longer exists?

The city of Vaughan falls under the growth plan for the GGH for 2031 (Ontario Ministry of Infrastructure Renewal, 2006) and in conjunction they have created their own vision plan called Vaughan Vision 2020 (The City of Vaughan, 2008). The goals are created in order to implement the growth plan of 2031. At the moment Vaughan meets very little of the criteria or the criteria are difficult to determine because not all are easily quantifiable. Empowerment for instance becomes about setting up programs and outlets for community involvement that relies on hope for change. Many of the criteria are about implementation of strategies rather than through built form. Vision is the strategy and the rest follow. Economy and Society, Biodiversity, Ecological Footprint, Sense of Place, Empowerment, Partnerships, Sustainable Production and Consumption, and Governance and Hope are not things that can be built but are part of strategies and laws of governance and are about creating community awareness for people, politicians, developers, professionals to get onto the same page. In terms of built environment, the criterion that specifically applies is modelling cities based on ecosystems and biodiversity. The rest of the criteria act as informants for programming the spaces.

Sense of place is a vital attributes that is missing in most suburban communities. As Lukez (2007) and Kolb (2008) state they are real places that in some ways are virtual and generic. Lukez for instance looks at the suburbs as places with lack of layering or history. While a city like Vaughan has history dating back to the 18th century, its urban history is relatively short. It's seen its greatest population increases since the 1960's. Its history is of being built in a single typology - the suburban model of development. Lukez (2007) compares this to cities like New York or Venice which have become a layering of decades and centuries of adaptation to changing conditions. He describes the Adaptive Design Process which is an exercise in design in which the author advocates mapping and cross-mapping a variety of elements such as street patterns, topography, sights, sounds, smells, etc. in order to find identity in generic places. This process is to view transformation of the suburbs in the context of the past, present and the future. Kolb (2008) adds to this argument by looking at these places as real but in many ways generic and virtual and begins looking into possible solutions. Both authors look at New Urbanism. While the mandate of New Urbanism is in theory good, New Urbanist communities are not any more real than a suburban community. They are designed based on creating traditional neighbourhoods in the suburbs that incorporate higher density and transit and are pedestrian friendly. They rely on nostalgia for their building and character. The biggest issue

with new urbanism is its virtual character but as separate on a city scale. As pointed out earlier part of the success of a traditional neighbourhood in the city is it's connectivity to the city. New Urbanism acts on a community scale rather than a regional scale.

Another initiative is the smart growth movement that looks more holistically and regionally for its planning. Its mandate on goals of "directing growth, preserving land, reducing auto dependence, controlling rate/amount of growth, redesigning communities, altering perception of the environment, encouraging regional cooperation and altering the housing market" (Kolb, 2008, 185). Kolb points out that the one thing missing in smart growth is social and economic equity.

Kolb (2008) suggests some solutions for sprawl. In one case he discusses working within the current framework. There is an abundance of wasted space in the urbanized in particular in the suburbs. Alan Berger (2006) defines wasted space as drosscapes, "the inevitable wasted landscapes within urbanized areas that eternally elude the overly controlled parameters and scripted programming elements that designers are charged with creating and accommodating in their projects." (p. 12). Both Berger (2006) and Kolb (2008) see potentials in this space. Berger (2006) lays out a number of criteria for looking at drosscapes Part of his strategy is a call for designers to be innovative collaborators within many disciplines. Drosscapes require adaptive re-use and reintegration in a positive way. As Berger (2006) points out drosscapes are the interstitial spaces leftover from urbanization. The drosscapes that dot the suburban landscapes are those of parking lots, contaminated industrial sites, and opportunities around infrastructure. Highways and the lands surrounding take up an abundant amount of space and have potential for diversity in use. Working within the current framework requires ingenuity and creativity. Sometimes the existing conditions require bold steps in order to reconfigure what exists for the best solution.

Landscape Urbanism as outlined by James Corner (2006) provides a potential design philosophy for approaching the design of suburbs in a holistic manner. He advocates an interdisciplinary approach to creating hybrid spaces that incorporate nature and landscaped space with the dual function of creating infrastructure. This idea has its roots in the practice of Frederick Law Olmstead. Mossops (2006) essay attempts to bring the discourse back to urbanism and landscape in the form of Landscape Urbanism to reengage the designer through the exploration of infrastructure and it's relation between natural processes and the city. She cites some examples of the past such as Frederick Law Olmstead who interweaved

infrastructure, flood and drainage and urban planning in a close collaboration with other disciplines. Early in the twentieth century the two were intertwined; however they have diverged over the years. Jacqueline Tatom's (2006) essay once again stresses the importance of Landscape Urbanism: the integration of landscape architect, civil engineer, architect for the design of the public realm on the scope of the urban highway. The essay argues how the urban highway been treated poorly historically and is a major threat to the neighbourhoods they run through. The essay becomes an analysis of historical and present precedents that have gotten the idea correct: Paris and it's boulevards, New York and the Henry Hudson Parkway, Boston's Emerald Necklace, and Barcelona's Cinturion. While there are examples of landscapes weaving with highways to create hybrid spaces it is unclear at the moment how new suburban development will be incorporated into this landscape of infrastructure and dross.

5.0 Design Direction and Principles

5.1 Summary and Hypothesis

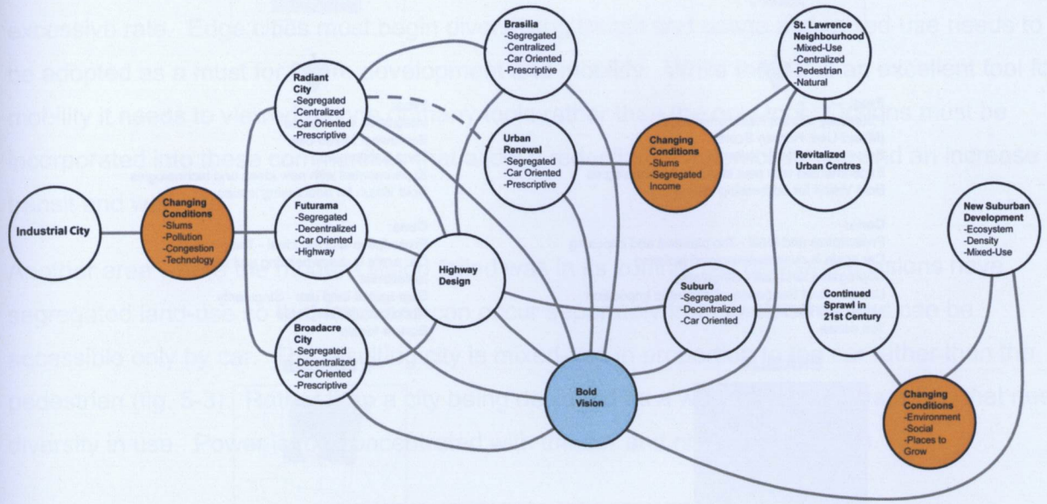
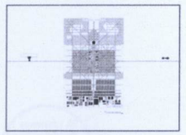


Figure 5-1. Summary Diagram Development of the Past to Changing Conditions

At the beginning of this document the question was posed in regards to whether or not it is appropriate to continue car friendly development given changing conditions. Through an analysis of presenting of material about changing and current conditions and building a case referencing past visions and reactions to these, the statement can be made that in the twenty-first century continuing to develop in a car- centric manner is not appropriate or sustainable. It can be observed that at this moment in history the conditions are provoking a big change similar to those that the modernist faced, however the context is quite different (fig. 5-1). With acknowledgement that there is issue occurring on the periphery the next step is to suggest a direction to create a solution.

Studying the visionary urban plans of modernism, the realization of modernism and the reaction to modernism reveals much about some of the successes and failures of this school of thought (fig. 5-2 and Appendix R). In one respect modernism was bold in its vision and dealt with the conditions of the time however in another respect it was ideal and prescriptive. Modernism has left a legacy of connectivity that offers many possibilities for the future. The highway networks were built for speed and efficiency but were never properly integrated into the urban fabric. While congestion plagues many systems, there is no reason why this network couldn't

RADIANT CITY



Pros:
Potentially Vibrant Residential Area
(Mixed-Use, Human Scale)
Extensive Highway Network
Experimented with new ideas and technologies
Bold Vision for addressing issues

Cons:
Prescriptive and ideal - Too planned and imposing
Car scale is overwhelming and isolating
Segregated land use - Singularity
Uncontextual Response - Geometric Imposition
Linear and Machine Like
Too dense

BROADACRE CITY

Pros:
Integration with Nature
Somewhat Mixed-use
Land Entitlement
Experimented with new ideas and technologies
Bold Vision for addressing issues

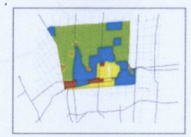
Cons:
Prescriptive and too ideal - Too planned
Car scale is overwhelming and isolating
Isolationist
Segregated land use - Singularity
Uncontextual Response
Bizarre Ideals

BRASILIA

Pros:
Vibrant Residential Area - Mixed-Use, Human Scale
Extensive Highway Network
Experimented with new ideas and technology
Bold Vision for addressing issues

Cons:
Prescriptive and ideal - Too planned and imposing
Car scale is overwhelming and isolating
Sterile environment
Segregated land use - Singularity
Uncontextual Response - Geometric Imposition

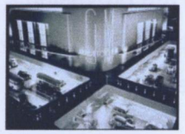
SUBURB



Pros:
Residential Area Family Oriented
Extensive Highway Network
Experimented with new ideas and technology

Cons:
Generic
Car scale is overwhelming and isolating
Sterile environment
Segregated land use - Singularity
Low Density - Inefficient use of land
Congestion

FUTURAMA



Pros:
Extensive Highway Network - Regional
Experimented with new ideas and technologies
Bold Vision for addressing issues
Connectivity and inclusivity
Efficiency

Cons:
Prescriptive and too ideal - Too planned
Car scale is overwhelming and isolating
Segregated land use - Singularity
Intrusive to landscape

ST. LAWRENCE

Pros:
Vibrant Residential Area - Mixed-Use, Human Scale
Integration into city fabric
Reuse of underutilized land
Mixed income housing
Diversity in Density

Cons:
Area lacks vibrancy - Retail and Office missing
Linear Park incomplete
Aesthetically unpleasing

Figure 5-2. Case Study Summary

be optimized and integrated as part of a system that moves away from solely the car to one that is diverse in its modes of transportation.

The car has been used as a primary source of mobility and continues to be used at an excessive rate. Edge cities must begin diversifying transit and usage and mixed-use needs to be adopted as a must for future development and mobility. While the car is an excellent tool for mobility it needs to viewed as one of many tools rather then the only tool. Options must be incorporated into these communities that allow a reduction in automobile use and an increase in transit and walking.

Another area where the modern vision failed was in its zoning. All car-centric visions have segregated land-use so that functions can occur separately from each other and can be accessible only by car. The resulting city is mixed-use in proportion to the car rather than the pedestrian (fig. 5-3). Rather than a city being designed as a whole it's the parts within that need diversity in use. Power is too concentrated with the car and not the pedestrian.

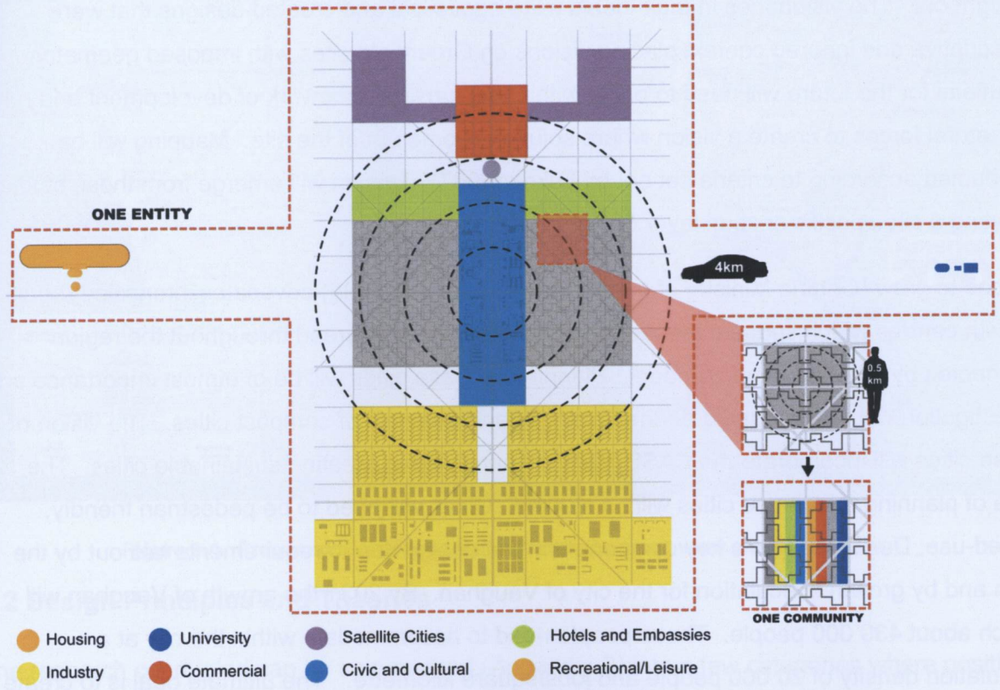


Figure 5-3. Diagram illustrating Modernist Car-Centric City Designed as One Entity to the Scale of the Car Rather than Designed to the Scale of the Pedestrian

Future design will encompass a big picture scenario where various elements that been look at separately or in segregation of each other need to be brought together and viewed in a holistic manner. Cities need to be viewed as ecosystems using the criteria set out by Newman and Jennings (2007). This system will assist in creating a city that functions in a cyclical manner rather than as a linear industrial process. The CASE approach will be investigated further and a comprehensive analysis conducted on the city of Vaughan in order to determine how to make it a sustainable ecosystem. One of the lessons of studying the visions of Frank Lloyd Wright, Le Corbusier and Norman Bel Geddes is that each one thought in a bold radical fashion in order to react to their conditions. While 80 some year's later hindsight reveals weaknesses in their plans, the point remains that they dealt with a dilemma in a bold way. Now it is time to also think in a bold all encompassing frame of context.

Lessons however must be learned from the mistakes of the visionaries and dealing with reaction. The St. Lawrence neighbourhood shows a case of dealing with an issue but approaching it less as a reaction and more as a planning process that made the vision well thought out. The visionaries in their ideals were egotistical and created designs that were prescriptive and ignored context placing visions on Greenfield sites with imposed geometry. Solutions for the future will need to occur within the current framework of development and rely on natural forces to create a vision where solutions come out of the site. Mapping will be conducted according to criteria set out by Lukez (2007). Design will emerge from these studies creating a site specific second layer of history and identity.

Places to grow (Ontario Ministry of Infrastructure Renewal, 2006) advocates intensified urban growth centres which suggest the creation of compact cities spread throughout the region connected by intensification corridors. Planning of these cities will be of utmost importance and investigation will be conducted on the feasibility and potential of compact cities. The vision of these cities will incorporate the CASE planning principles in creating sustainable cities. The idea of planning mixed-use cities will be studied. Cities will need to be pedestrian friendly, mixed-use; Density will be a key component in the design due to requirements laid out by the plan and by growth speculation for the city of Vaughan. By 2031 the growth of Vaughan will reach about 430 000 people. These people need to accommodate within the city at a population density of 20 000 people and jobs/square kilometre. The ultimate goal is to create the next layer in the evolution of Vaughan and sprawling cities everywhere in hopes of fostering a sense of place and identity.

Places to grow isn't specific about what a city should look like and what development will be beyond 2031 targets. It isn't clear whether all population will be accommodated within a growth centre or if growth will occur in various areas of a city. What is clear by the mandate is the desire for a greater interconnectivity between cities within the region and putting a cap on low-density urban sprawl. What is possible is a connection beyond simply a car network but one with a network of various transit options. As Southern Ontario is part of the Great Lakes Megaregion which desires connectivity between Toronto and the surrounding major cities, this plan could also plug into the high speed rail network proposed by the Regional Plan Association (2009) (fig. 5-4).

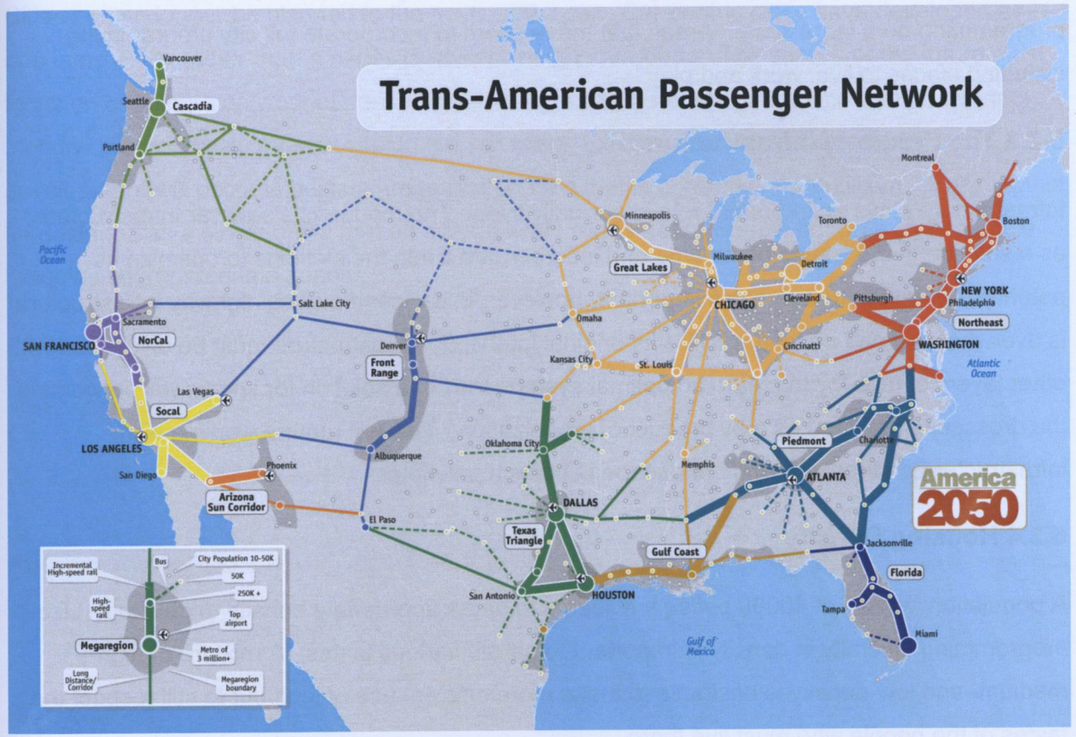


Figure 5-4. Proposed High Speed Rail Network (Source: www.america2050.org)

5.2 Design Principles and Theories

The research conducted can be summarized (Appendix S) into a few categories where positions must be taken in order to move from research to theory to design. The research can be broken down into seven categories; the car, amenities and program, infrastructure, housing density, social interaction, connection and city scale.

5.2.1 The Future of the Automobile

The car will remain relevant as personal mobility will always be desired by people. What is troubling about cars is the dependency we seem to have on them. Our dependency on cars must be reduced and they can no longer drive the design of cities but included as a part of a diverse transportation network.

5.2.2 Amenities and Programming

Mixed-use neighbourhoods seem to inherit a vibrant character over cities with segregated land use zoning. Diversity in programming on a smaller scale is preferable over diverse programming on a large scale. Areas that thrive seem to incorporate full city programming including places to live, work and play.

5.2.3 The Future of Infrastructure

Infrastructure plays an important role in our daily lives. The modernists saw car infrastructure as a solution to the issues of the time and incorporated it into their visions to optimize its potential. Infrastructure remains important, however, in car-centric cities highway infrastructure is overwhelmed and no longer fulfills its original intention. Infrastructure must be diversified with other layers of mobility to create an optimal system. Part of a solution for sprawl will be working the drosscape provided as a by product of urbanization. This will require working with infrastructure and mobility and Landscape Urbanism principles.

5.2.4 Housing Density

A population density of 40000 ppl/sq.km seems to be an appropriate density to develop. Like programming diversity in density is important to satisfy various tastes. A mixture of high-, medium- and low-density is desirable to make more efficient use of land but to still respect the tastes of the people who must live there.

5.2.5 Social Interaction

Healthy social interaction is important while a person also needs privacy. A mix of varying types of communal spaces is important in avoiding the isolation now beginning to show in the suburbs. These spaces should be very communal; like parks and squares, moderately communal; private courtyards, and private; terraces and private yards. Accessibility is also important so access to hangouts must be easy and provided.

5.2.6 Network and Connectivity

Connection was important to the modernist however their view of connection was binding various uses together rather then binding various neighbourhoods with full amenities together. The suburb of the future will contain small pockets of compact mixed-use nodes that will be interconnected by various transportation types.

5.2.7 The Scale of a City

Cities can no longer be planned to the scale of the car. Car-centric cities have developed as one large entity rather than a series of diverse neighbourhoods. The suburb of the future must focus on creating a network of dense compact nodes that are transit oriented and pedestrian friendly. Human scale must outweigh the car scale. Existing context is important as development will occur in built up areas and on land that is currently underutilized. A city cannot be designed as a single entity that on a large scale reads as mixed-use but on a human scale reads as segregated into zones.

6.0 Design Project

6.1 Introduction – Project Description

What suburban cities desperately need is a vision that re-imagines the landscape as it is and transforms it into a diverse landscape of thriving communities and neighbourhoods bustling with people and activities. This vision must will incorporate the strengths of existing suburban communities but look to move away from the generic image which the suburbs are known to have. This narrative of this project begins a half a century ago when a dream was born, a modern dream that included having a car, buying a house with a huge lawn and having a family far away from the city. This dream has given rise to sprawling communities that have become cities in themselves but different from traditional cities: Cities within cities that have no clear urban centres other then historic downtowns.

This project intends to offer a vision for these modernist sprawling cities and move them into the twenty-first century by focusing on stitching together the fabric and building communities within cities. What is being proposed is a polycentric suburbia where cities will become a network of multiple dense urban nodes where people will live, work and play. These nodes will be a part of an interconnected network that allows for freedom of mobility by many means of transit so that the entire regional landscape becomes accessible. These nodes will curb growth on Greenfield sites by focusing on intensifying underutilized lands surrounding highways and built-up areas to accommodate new communities.

Cities were originally built away from highways but over time development moved towards highways as if it were a magnet. The highway has become the canal of the future, however it is not embraced the way in which cities traditionally embraced infrastructure. This project intends to be a second wave of modernism by embracing the desire for speed and connectivity through infrastructure but by approaching the situation in a new way. Rather than segregating and isolating the highway as originally intended, the highway can be integrated and diversified to accommodate a variety of mobility and uses.

This project is about connectivity and speed but it is also about slowing down and living. The urban nodes will be about living. Nodes will be equipped with everything desired for sustaining a community and a city. Leisure activities will be available but also places to work and to build an economy whether in an office or at home. There will be destinations in nodes to promote

visitors or for one to leave one's node and visit another. The project is a vision for a twenty-first century polycentric suburb.

6.2 Network and Connectivity – Site and Context

The design project focuses on building a diversified transit network on a variety of scales. The Southern Ontario region also known as the Greater Golden Horseshoe (GGH) Region (fig. 6-1) is the canvas chosen to test the idea of networking in a region. This is a region that according to Places to Grow (Ontario Ministry of Infrastructure Renewal, 2006) is rapidly expanding its population. By 2031 the population is expected to grow by 3.7 million people making the population 11.5 million. This section will look at connectivity on a few scales; the regional, the city and the community in demonstrating improved connectivity.

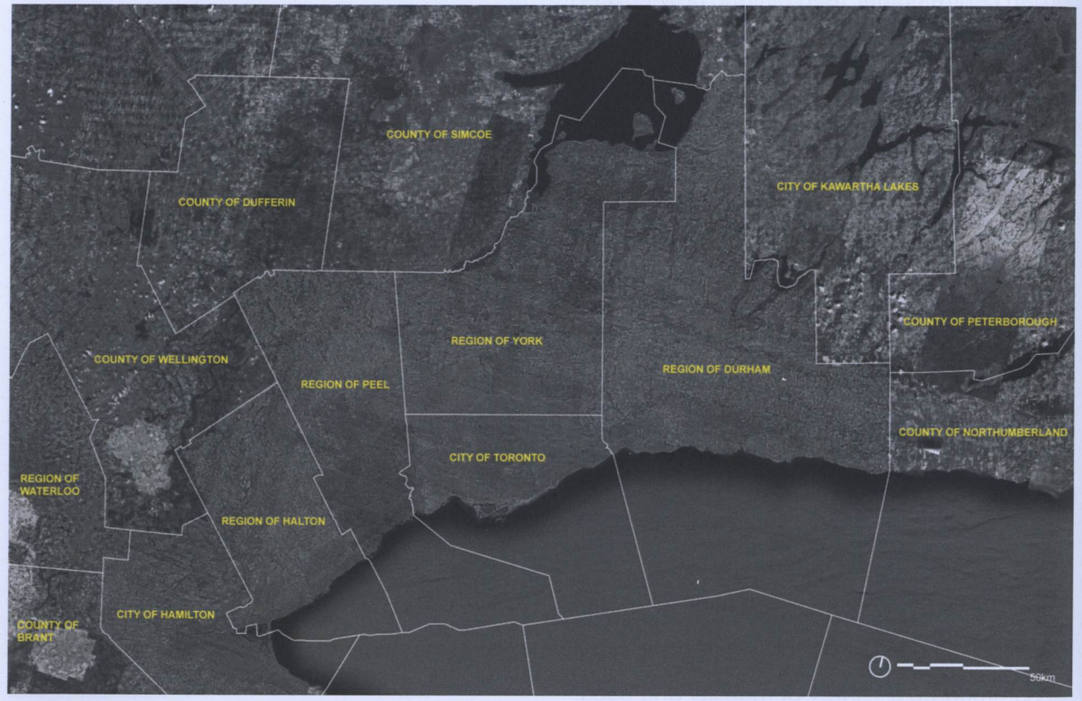


Figure 6-1. Greater Golden Horseshoe Region

6.2.1 Regional Connections

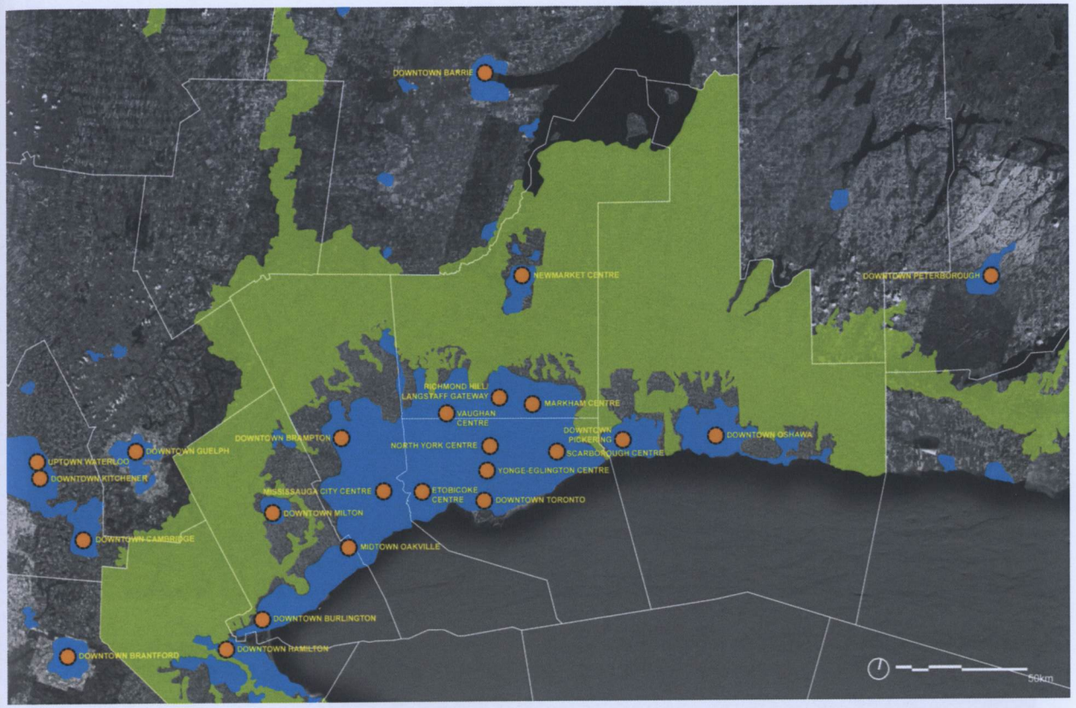


Figure 6-2. Proposed Intensified Urban Growth Centres in the Greater Golden Horseshoe Region. The green represents the greenbelt that is to be preserved. The blue represents the existing built-up area.

Places to grow have outlined a number of Urban Growth Centres (UGC) (Ontario Ministry of Infrastructure Renewal, 2006) that are to be intensified with higher density developments to curb urban sprawl (fig. 6-2). Urban Growth Centres are currently connected by a highway, rail and transit network (fig. 6-3). The existing rail and transit network, however, is limited in its connectivity which creates heavier reliance on the car and highways for mobility. Building upon places to grow, the thesis|project envisions an improved transit network within the region that would provide greater interconnectivity between UGC's (fig. 6-4). Transit would include improved commuter rail and rapid transit . Also, a high speed rail system would be introduced providing connection on a larger scale between Toronto, Montreal and the United States (fig. 6-5).

Figure 6-3. Existing mobility network within the Greater Golden Horseshoe Region. The red represents existing highways. Yellow represents existing rail and transit. Purple dots represent airports.

Figure 6-4. Proposed rail and rapid transit network within the Greater Golden Horseshoe Region.

Figure 6-5. Proposed high speed rail network within the Greater Golden Horseshoe Region.

6.2.2 City Connections

Figure 6-6. The City of Vaughan located within the proposed network

Continuing with the previous study, Vaughan was used as the case study for further implementation of a network and node system within the built-up area (fig. 6-6 and 6-7). The existing highway, rail and TTC line (fig. 6-8) is expanded to include rapid transit (fig. 6-9) and high speed rail (fig. 6-10) by adding to the existing network which creates a diverse mobility system. The points where these major transit lines meet can become multi-modal hubs that create development opportunities (fig. 6-9 and 6-10). Within the city of Vaughan (fig. 6-11) a system of Light Rail Transit (LRT) (fig. 6-12) is added to a number of important roads connecting them to rapid transit lines proposed which creates a number of nodal developments (6-12) within the city of Vaughan resulting in a polycentric landscape interconnected by transit.

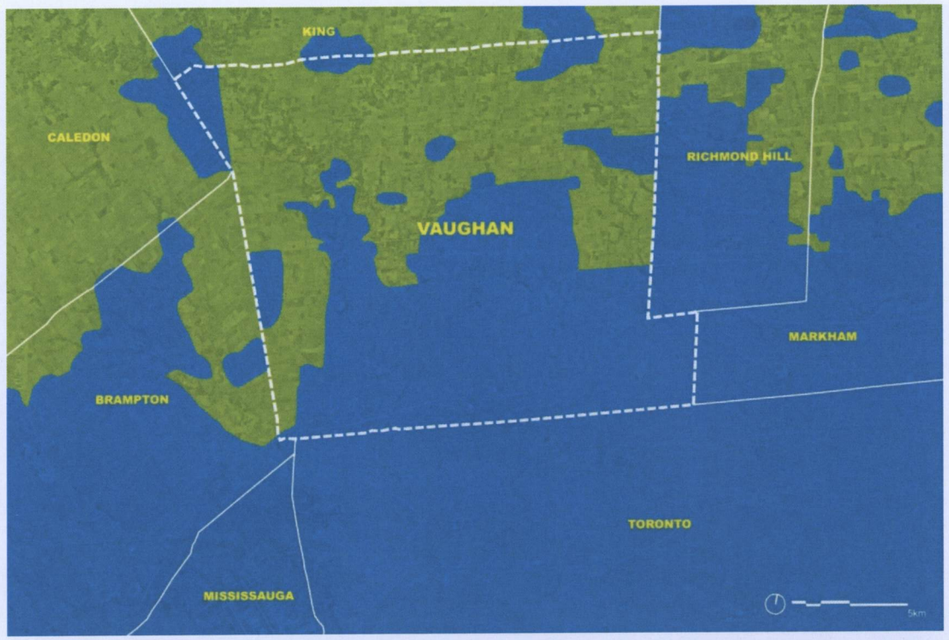


Figure 6-7. Built-up area within the City of Vaughan and the neighbouring cities. The blue area represents built-up area. The green represents Greenfield land.

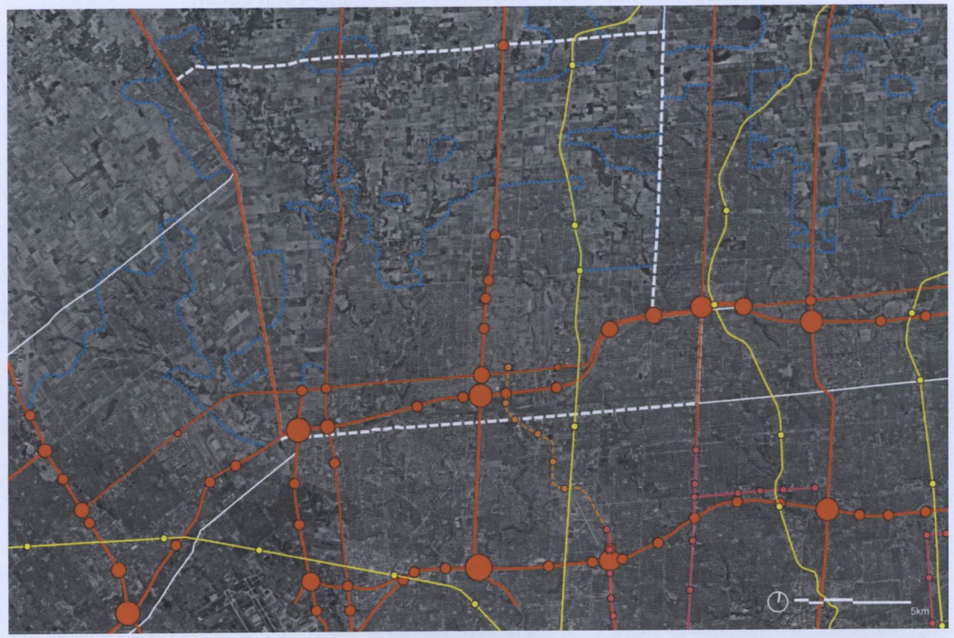


Figure 6-8. Existing mobility network within the City of Vaughan and the neighbouring municipalities. The red represents existing highways. Yellow represents existing rail. The pink represents existing the TTC. Orange represents proposed TTC subway expansion into the City of Vaughan.

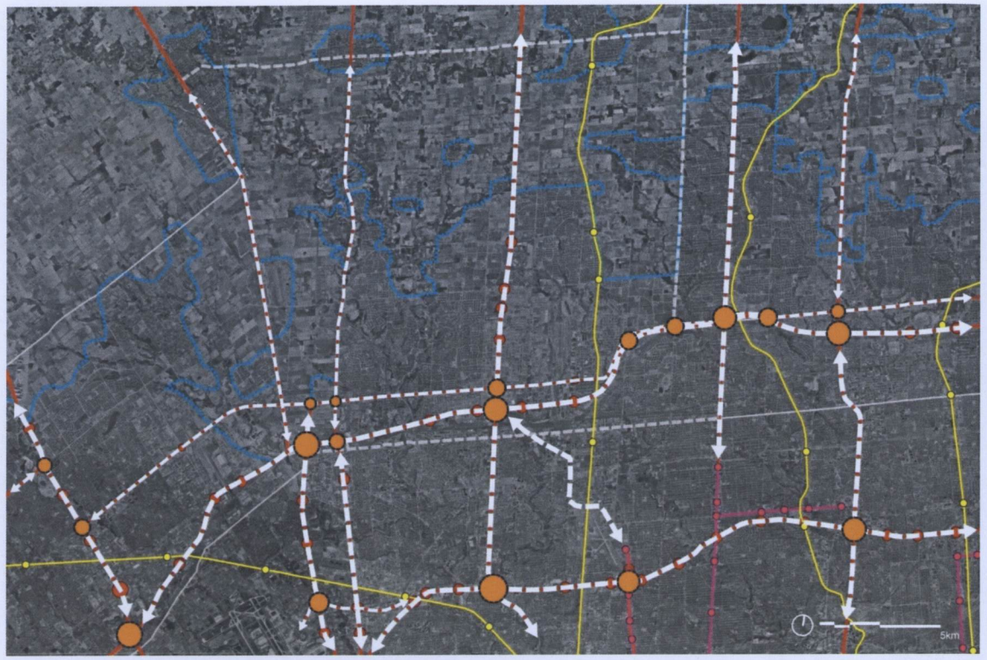


Figure 6-9. Proposed rapid transit network connecting Vaughan and its neighbours. Orange dots represent transit interchanges where future development can occur.

Figure 6-10. Proposed high speed rail network running through the City of Vaughan.

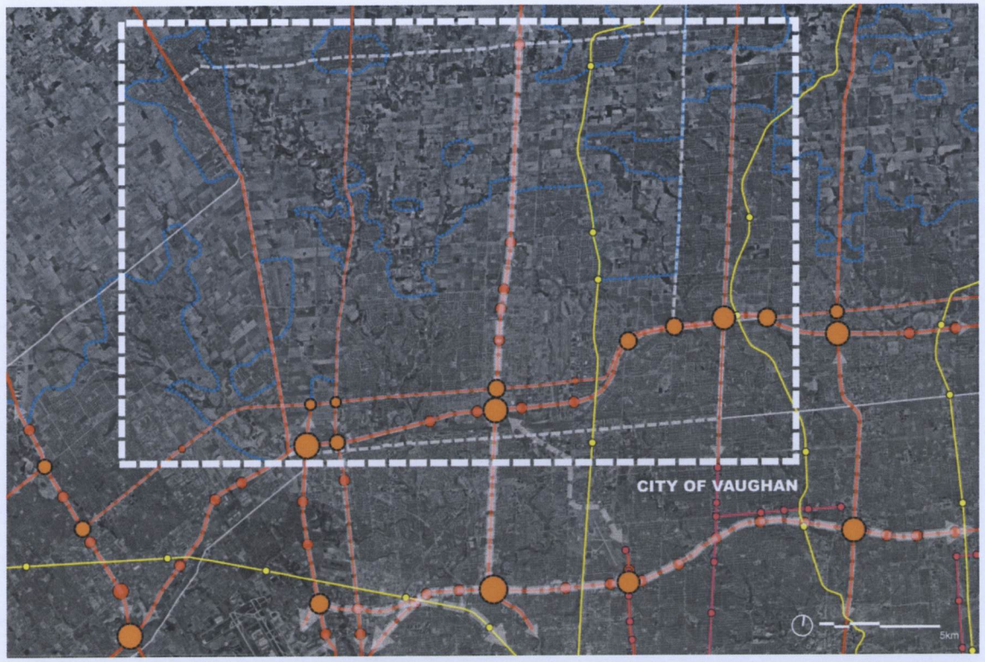


Figure 6-11. The City of Vaughan study area.

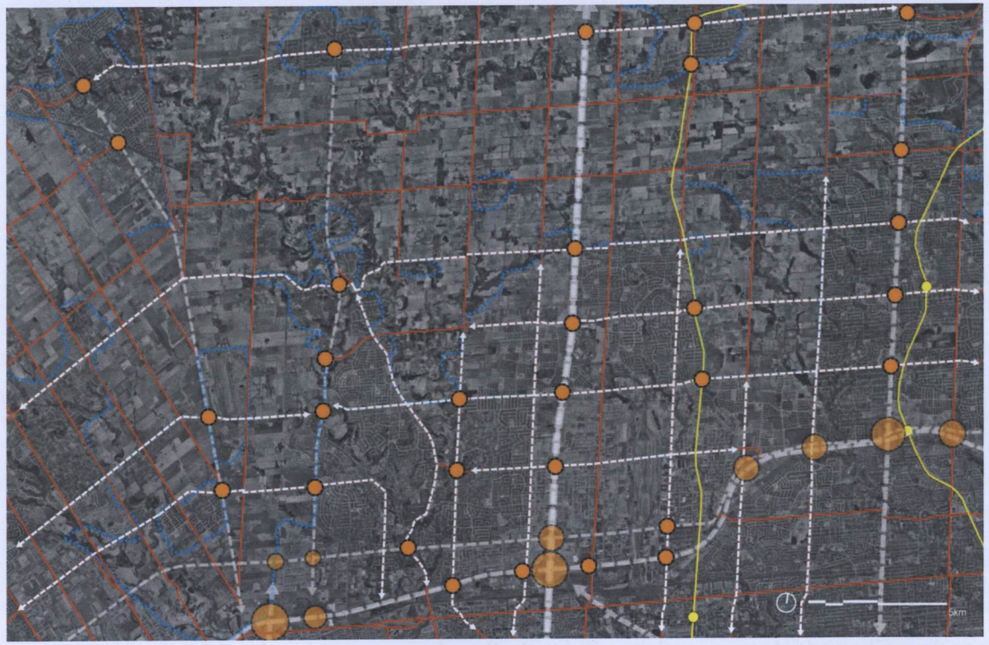


Figure 6-12. Proposed LRT lines within Vaughan. Orange dots represent areas of development within Vaughan.

6.2.3 Stitching the Suburban Fabric: Nodes and Green Corridors

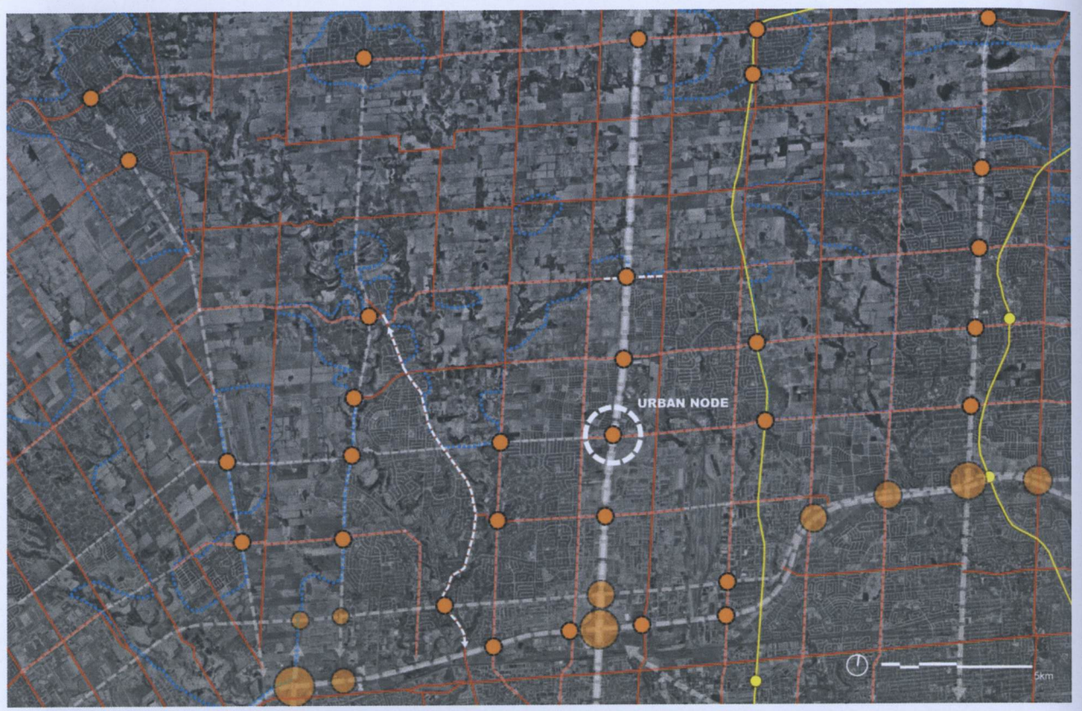


Figure 6-13. Urban Node study area located at the intersection of Highway 400 and Rutherford Rd.

The focus further zooms into a single node that is located at the intersection of Highway 400 and Rutherford Road (fig. 6-13, 6-14 and 6-15). The available land within the interchange is used as developable land for the proposed community due to its proximity to transit and its size is appropriate for a walkable neighbourhood being within half a kilometre (fig. 6-14). At the moment the suburban fabric is a scattered mess of segregated function with the highway and is a major barrier (fig. 6-16) between functions. It is accessible mainly by cars (fig. 6-15) acting as a scary crossing for pedestrians. The plan calls for the highway to become less of a barrier in order to stitch and unify the suburban landscape (fig. 6-17). This entails reconfiguring the interchange (fig. 6-18, 6-19 and 6-20) so that the highway entrance is streamlined and sunken underground. The overpass is maintained over the highway but becomes a boulevard that is slowed down and diversified with LRT, car and bike in order to become more pedestrian friendly. The highway is then layered with a rapid transit metro line and high speed rail for further diversity and interconnectivity. This site then becomes prime land for development as it is a major multi-modal point (fig. 6-21) that is built-up with a central amenity space

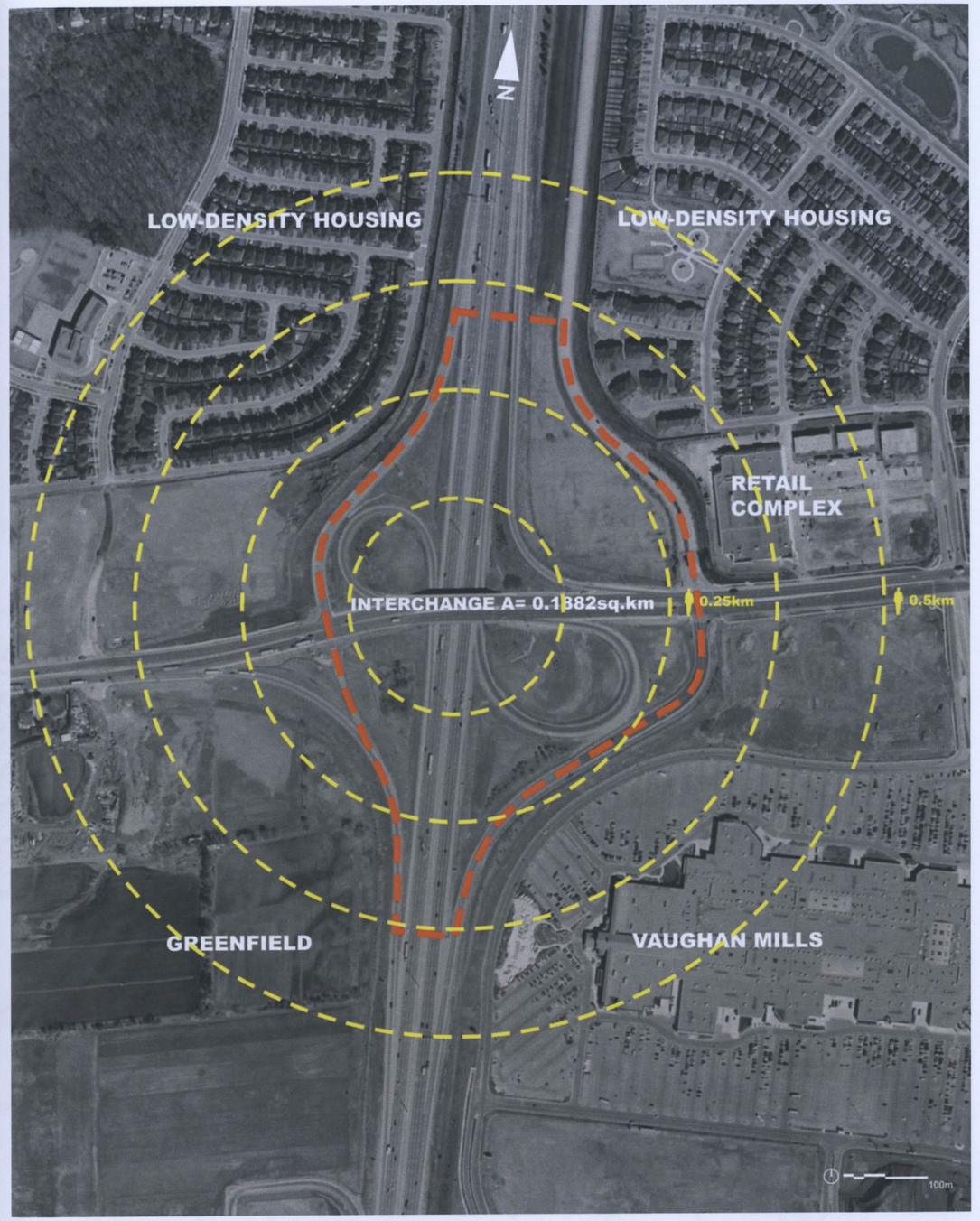


Figure 6-14. Aerial image of the interchange located at the intersection of Highway 400 and Rutherford Rd.

offering multiple activities (fig. 6-22). Towers and surrounding buildings that incorporate housing and other mixed functions are added around the central space offering a variety of densities (fig. 22). The boulevard that runs through the site can be further intensified in the future (fig. 6-23). The result is a new urban fabric with abundant of green and pedestrian space (fig. 6-24) running through the site. The surrounding context with parks, forestry, courtyards and Greenfields can be stitch together to create a network of pedestrian accessible green space appropriate for walking and biking. The central amenity space becomes a unifying point where neighbourhoods and existing commercial areas can converge creating a vibrant public area with gardens, sports, public plazas and other leisure activities (fig. 6-25 and 6-26). Within the development connective green corridors run in between housing areas acting as communal areas where they become areas of high social interaction similar to common areas found in Brasilia and St. Lawrence Neighbourhood.

Figure 6-15. Existing condition of the interchange. Currently the interchange is dominated by the car.

Figure 6-16. Diagram illustrating the barrier that the interchange imposes on pedestrians and the surrounding neighbourhoods.

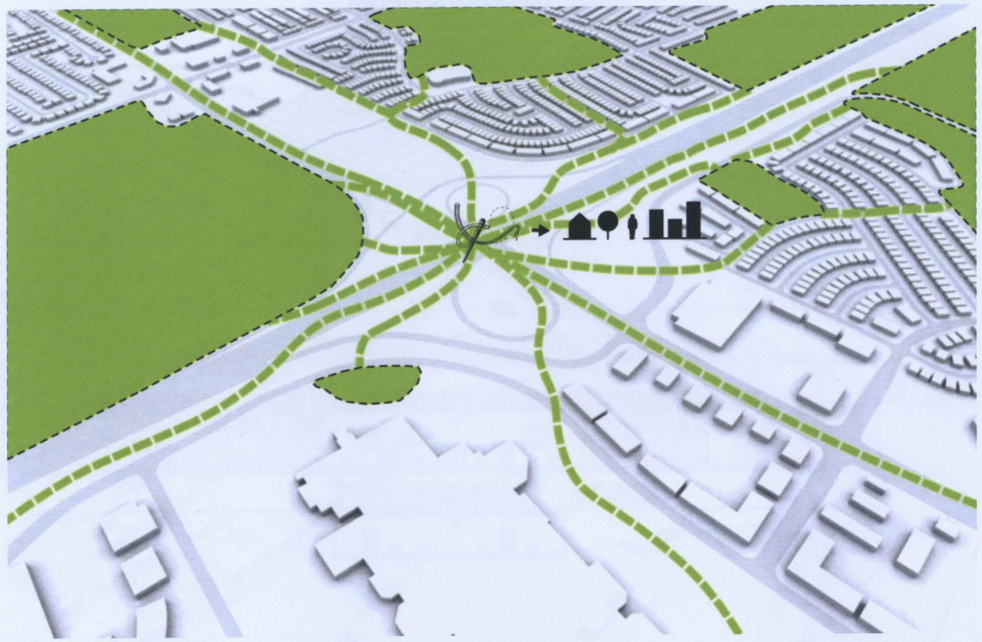


Figure 6-17. Diagram illustrating the proposed intention of the stitching the existing fabric with built form, green space and people.

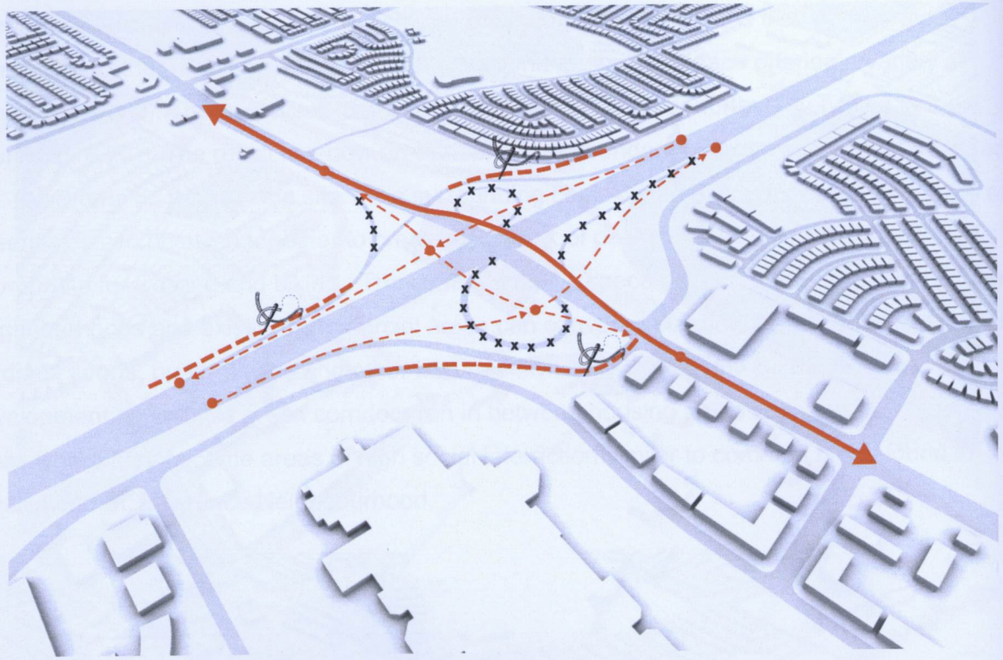


Figure 6-18. Diagram illustrating the proposed removal of the current interchange configuration. On- and Off- ramps are sunken underground. Dots represent new tunnel entrances. The overpass is maintained and transformed into a boulevard.

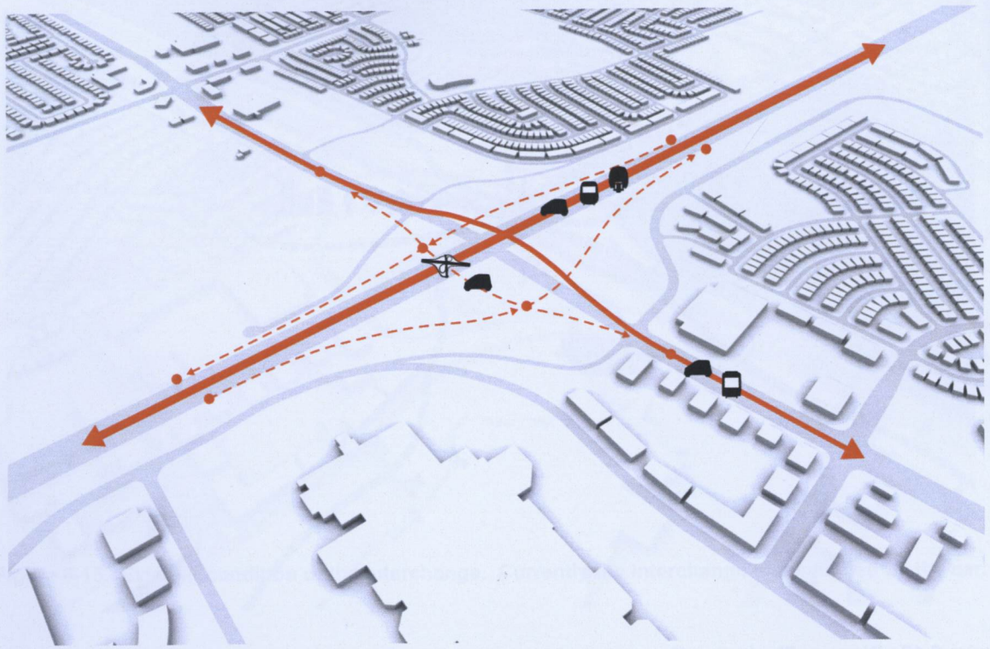


Figure 6-19. Diagram illustrating the new interchange configuration. The highway is layered with high speed rail and metro in addition to car use. The boulevard is layered with an LRT line.

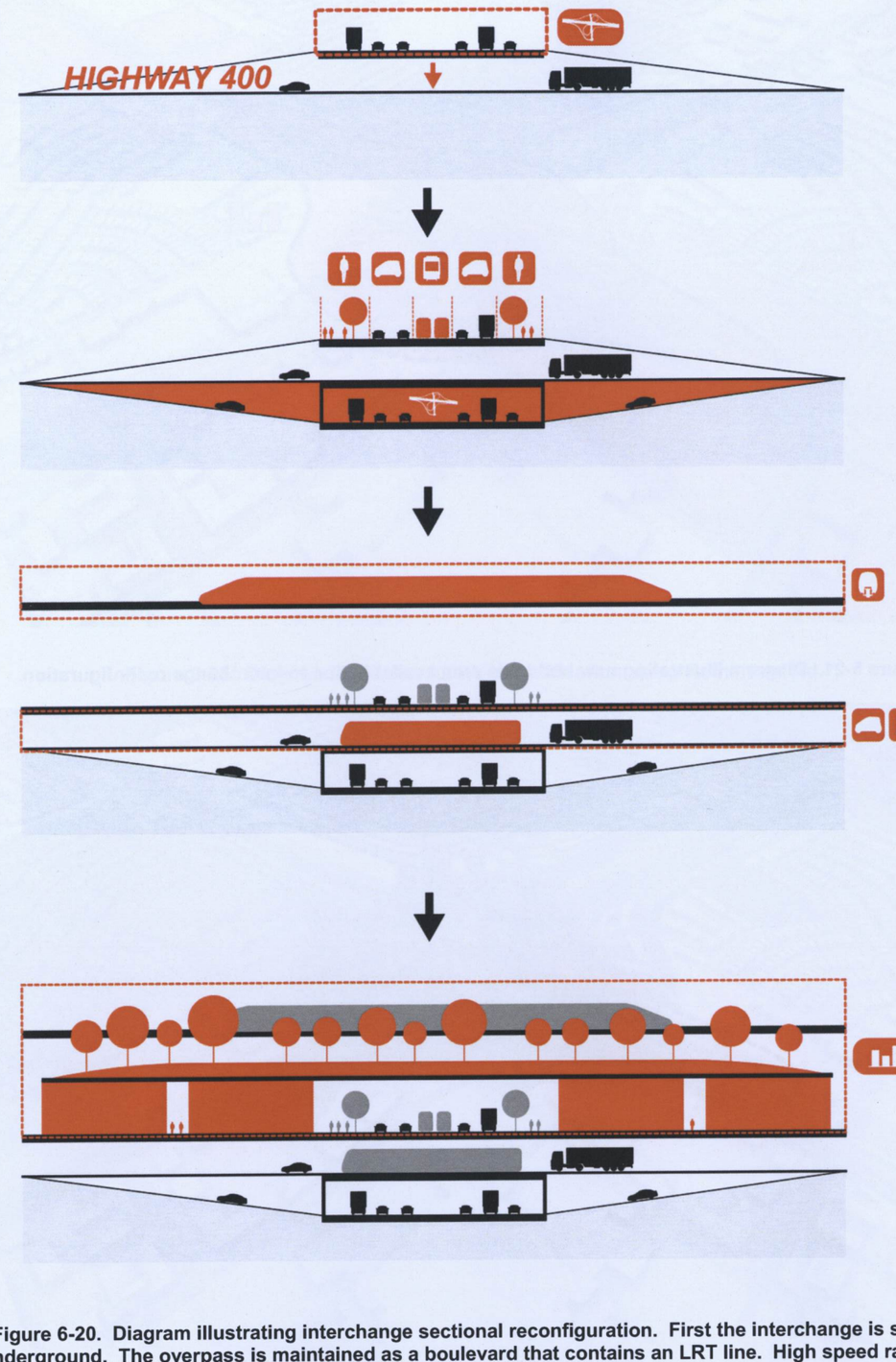


Figure 6-20. Diagram illustrating interchange sectional reconfiguration. First the interchange is sunken underground. The overpass is maintained as a boulevard that contains an LRT line. High speed rail and a metro line are layered onto the highway. The area over the highway allows for development possibilities

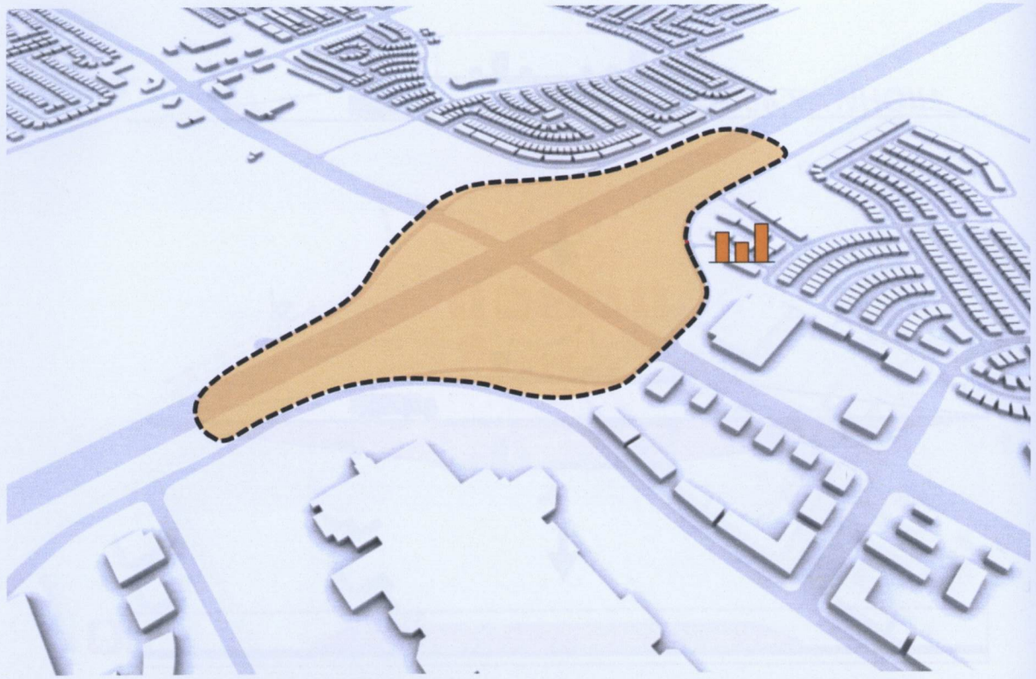


Figure 6-21. Diagram illustrating new buildable area available due to interchange reconfiguration.

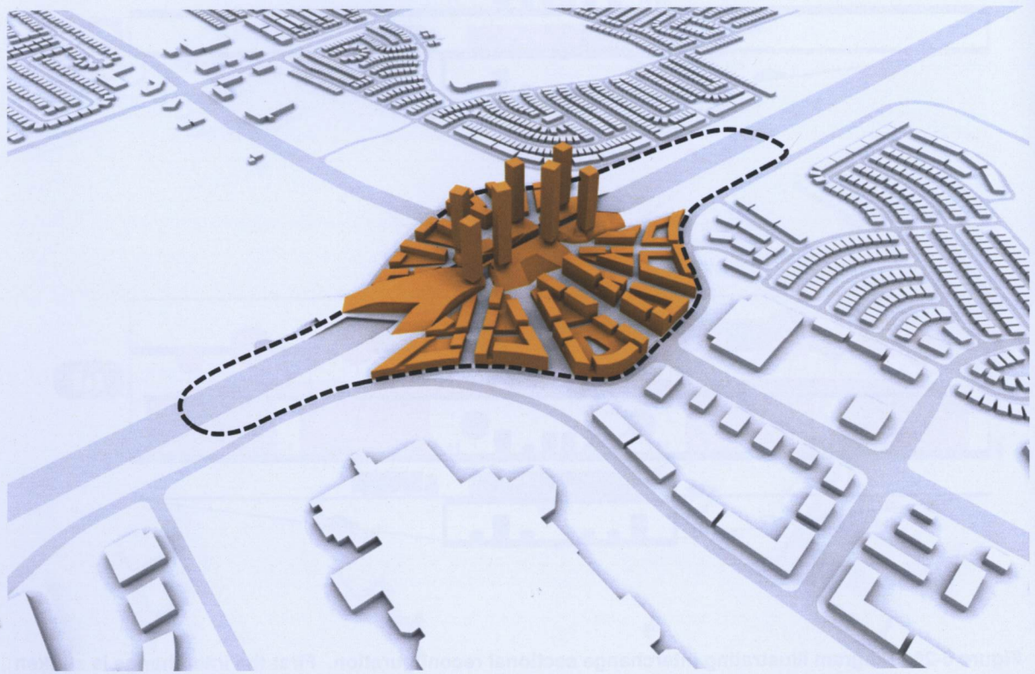


Figure 6-22. Diagram illustrating new built form above the interchange.

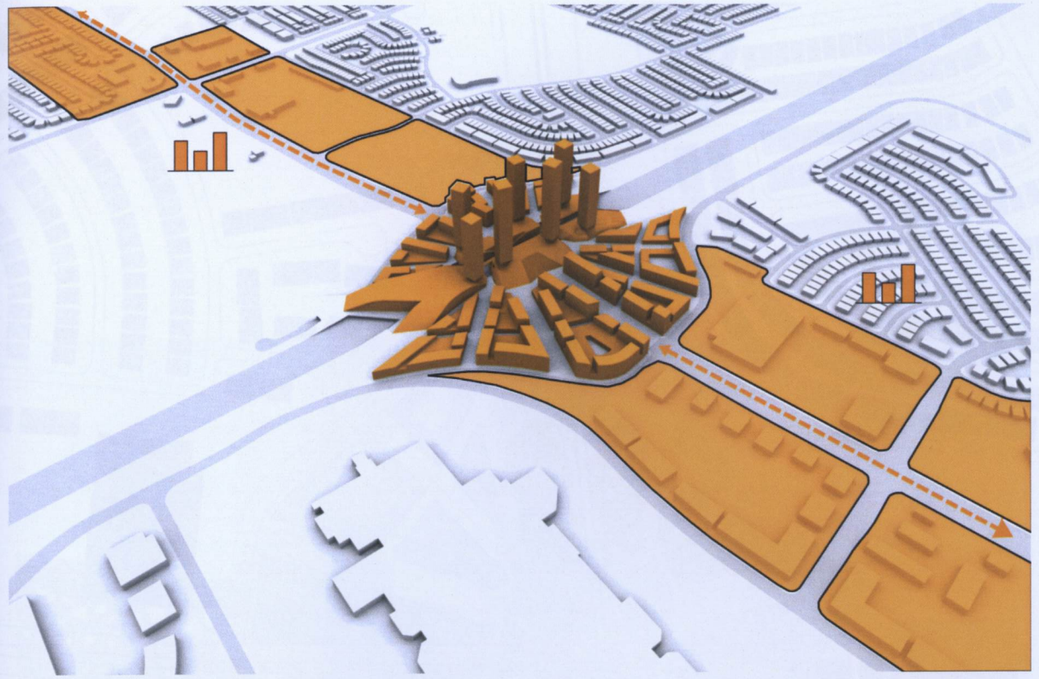


Figure 6-23. Diagram illustrates future intensification along Rutherford Rd.

Figure 6-24. Diagram illustrating connectivity through the site.

Figure 6-25. Site Plan of the proposed urban node.

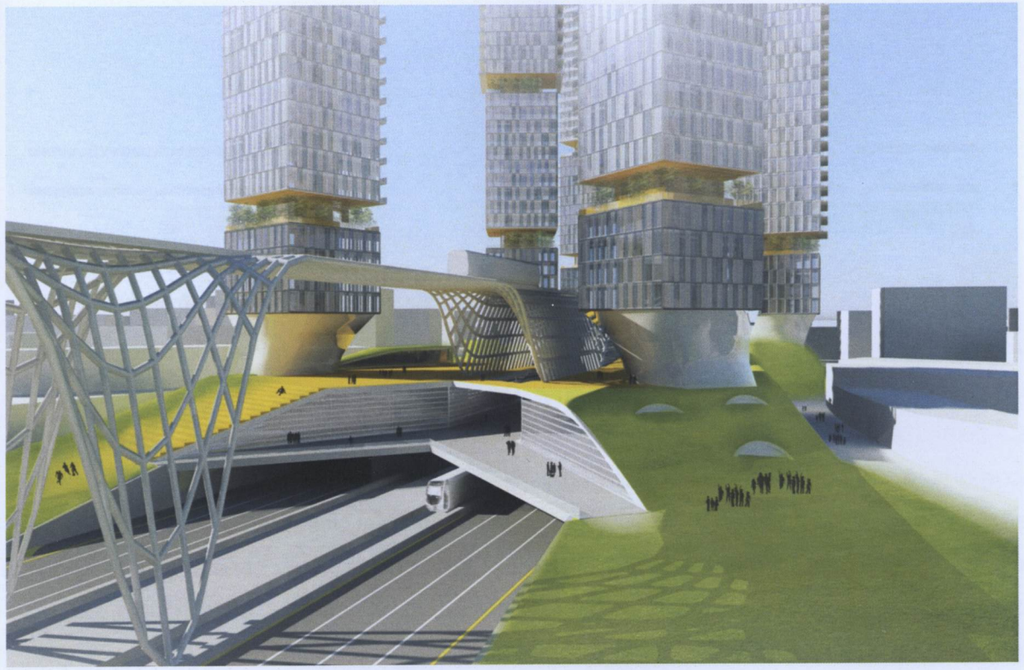


Figure 6-26. Aerial image of the proposed urban node.

6.3 Relationship to Infrastructure and Transit

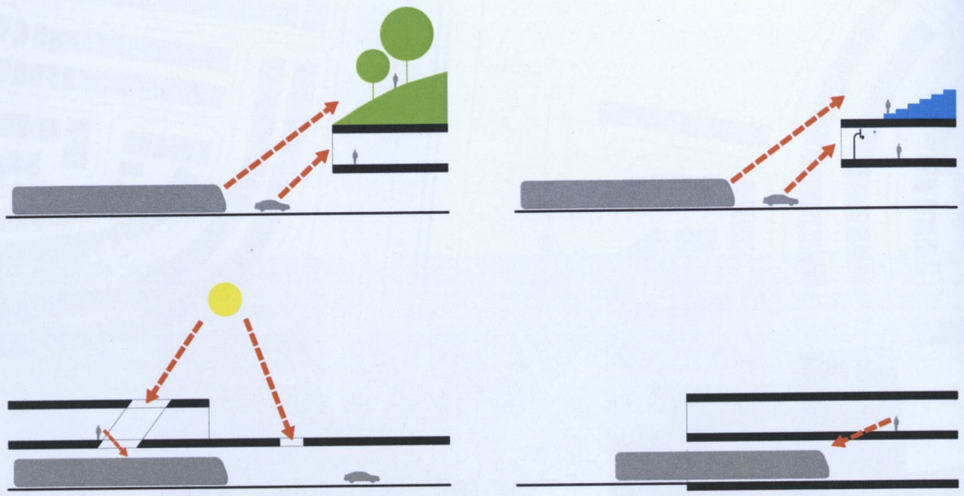


Figure 6-27. Diagram illustrating proposed connection between people and infrastructure.

Carrying on with a modernist tradition, the project re-imagines the relationship between built form and the existing infrastructure (fig. 6-27). Up to this point the highway network was established and cities gradually built up towards them however they have never been incorporated into built form. The urban node embraces the highway as part of the lifeline that keeps the city alive. It treats the highway much like traditional cities treated the canal or river. Built form bridges over the highway providing views from the highway to the buildings and vice versa (fig. 6-28 and 6-29) while also connecting the urban fabric as discussed earlier. The highway is layered with a variety of transit options so as not be focused only on the car. By providing more mobility options car use can be diminished significantly and the highway can once again become the efficient people mover it was intended to be in the beginning. Its linearity provides a good base for creating efficient transit running in a straight line.

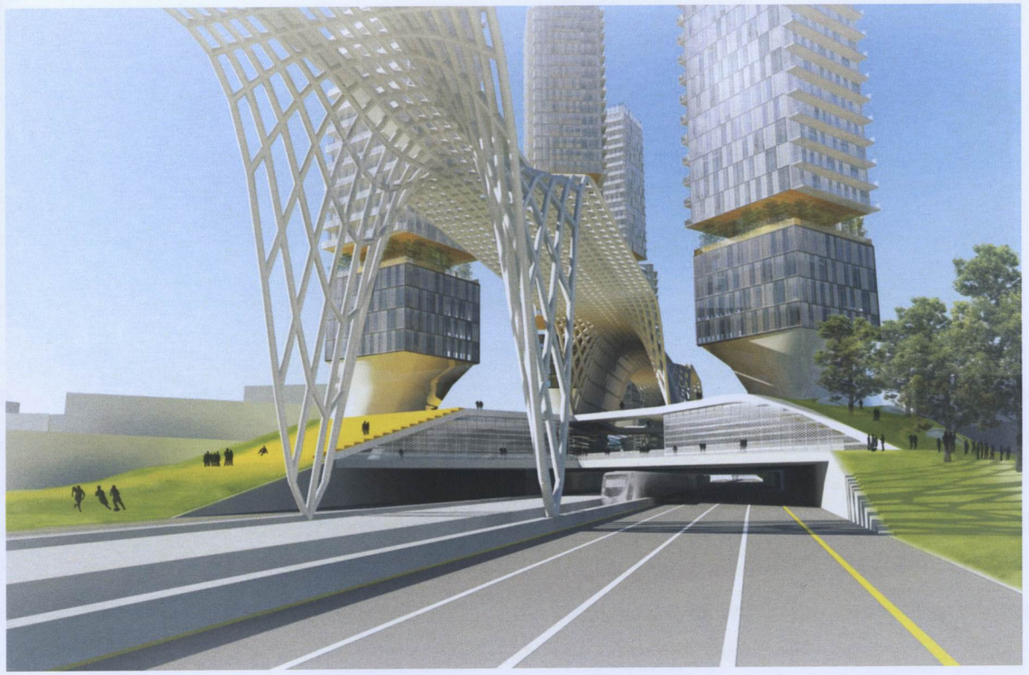


Figure 6-28. Image of the urban node from Highway 400 travelling south.

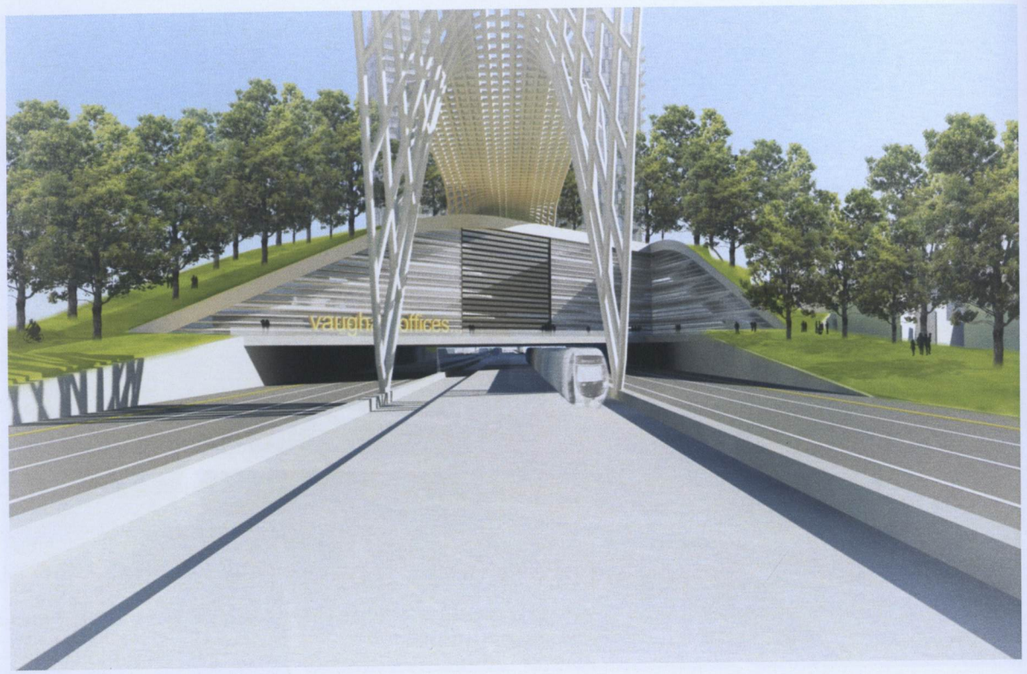


Figure 6-29. Image of the urban node from Highway 400 travelling north.

6.4 Programming

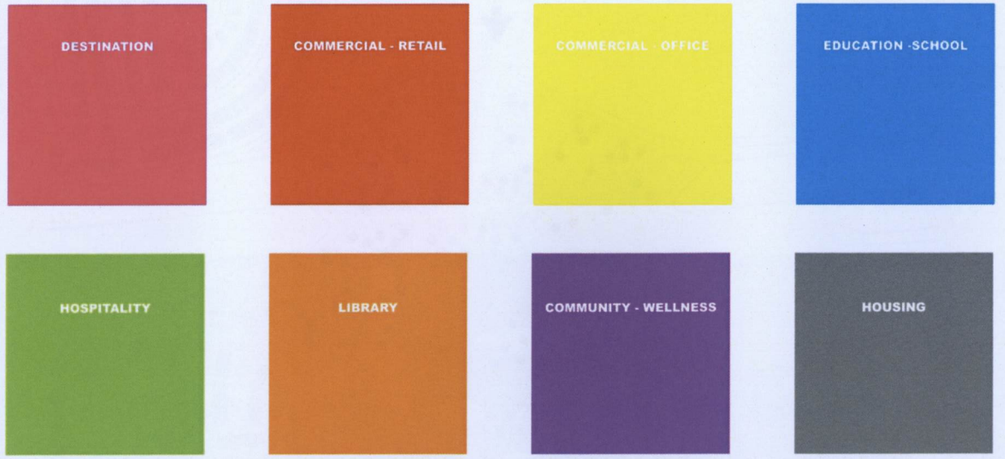


Figure 6-30. Proposed program to be included within the urban node.

The urban node is designed to provide a full range of programming (fig. 6-30) in order to become a vibrant neighbourhood. Research indicates that communities of about 7500 people, which is the estimate of the population in the node, should have access to all amenities required for living within walking distance (fig. 6-31 and 6-32) rather than all the amenities spread out and segregated only accessible by car as in modernist visions and suburban cities. The St. Lawrence Neighbourhood offers an example of a vibrant community that is mixed-use. The only programmatic element missing within the area is workspace which the urban node contains. This is important to further diversify use and build a local economy within the node. The central amenity space contains all community programming along with a major office space (fig. 6-33, 6-34, 6-38 and 6-39). The entire facility is pedestrian friendly and creates a vibrant central core for the node and neighbouring communities. Each node is anchored by a major destination facility that encourages inter-nodal travelling and establishes a hub of activity providing a daily influx of people. This can be imagined as a college, theatre, gallery, library etc.

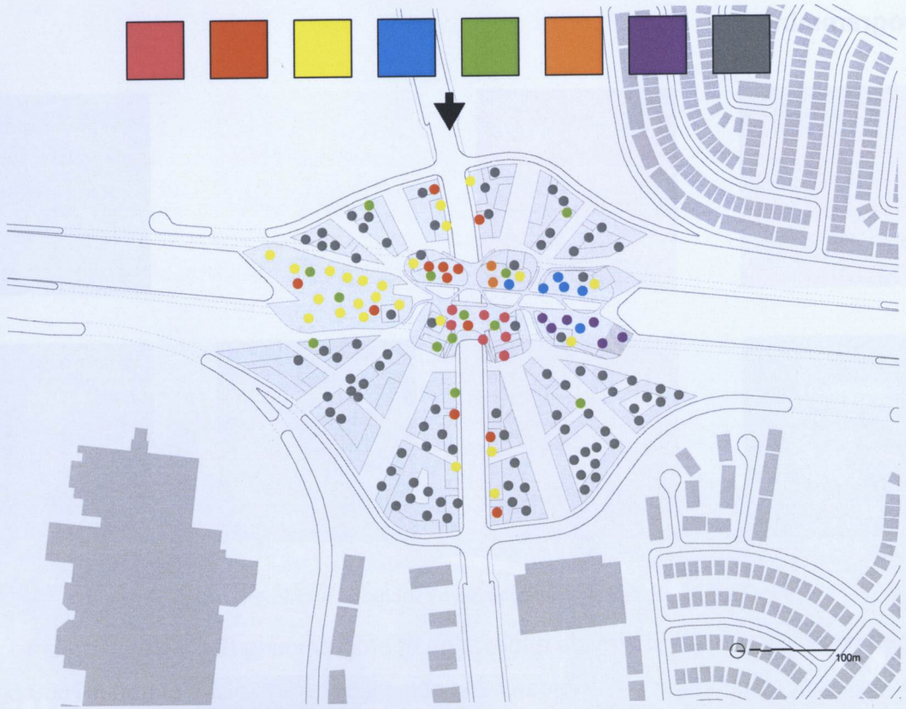


Figure 6-31. Diagram illustrating dispersing of program within the site.

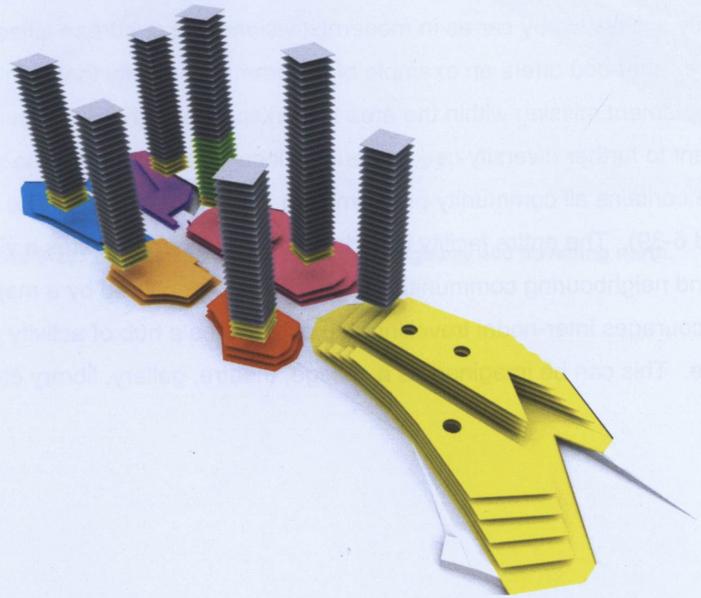


Figure 6-32. Image of the programming within the central amenity space.

Figure 6-33. Image of the proposed office space within the central amenity space.

Figure 6-34. Image of the walkway within the central amenity space.

6.5 Housing and Density

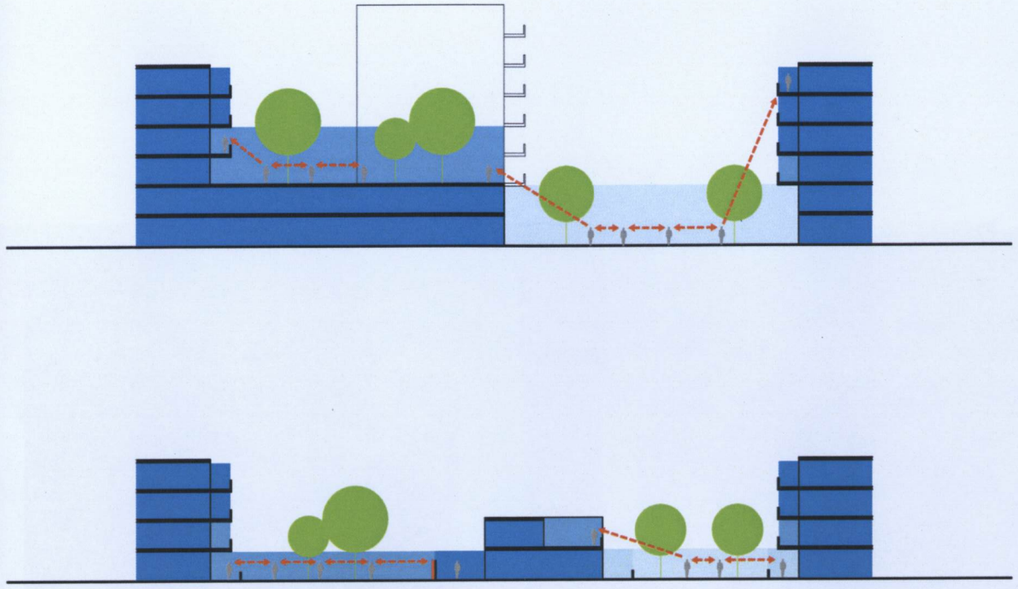


Figure 6-35. Diagram illustrating varying degrees of social interaction within the proposed housing. The colours coincide with the degree of social interaction. Light blue is very public. Dark blue is very private

The housing is the final piece of the puzzle in terms of design. Housing provides a variety of social interaction providing many options for residents (fig. 6-35). It was designed to include a mixture of densities and housing types. The central area that is most accessible by transit will be the highest density in the forms of point towers that attract a young professional living. Along the boulevard buildings are also high density but in the form of lower rise buildings ranging from 6-10 storeys (fig. 6-36 and 6-40). Further in the site density ranges from medium to low depending on location. Areas closely tied to existing neighbourhoods diminish to 2-storeys (fig. 6-37 and 6-41). Areas tied to commercial uses maintain medium density at about 4-6 storeys. There are very public areas with high social interaction. Semi-public areas contain some privacy but are still high in interaction. Semi-Private areas are communal but contained within buildings. Finally there are private spaces in the form of terraces and private gardens.

Figure 6-36. Image of a pedestrian corridor looking towards the central amenity space. This area includes retail at grade, office space on the second level and housing on the upper levels.

Figure 6-37. Image of a pedestrian corridor looking towards an existing Vaughan neighbourhood. This area is mainly housing with some retail at grade.

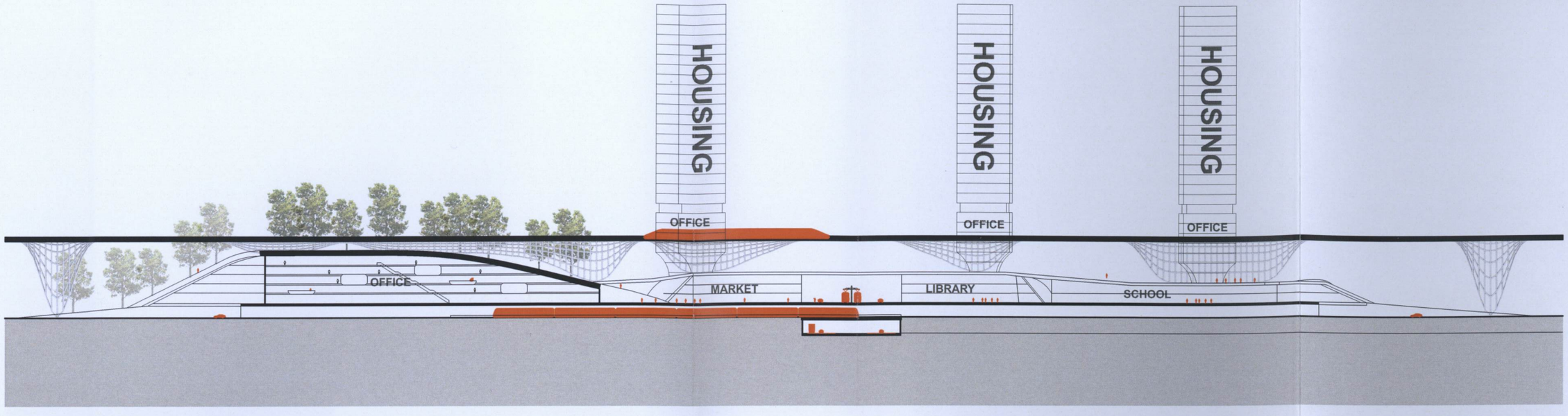


Figure 6-38. Section A (fig. 6-25) cut through the central amenity space looking west

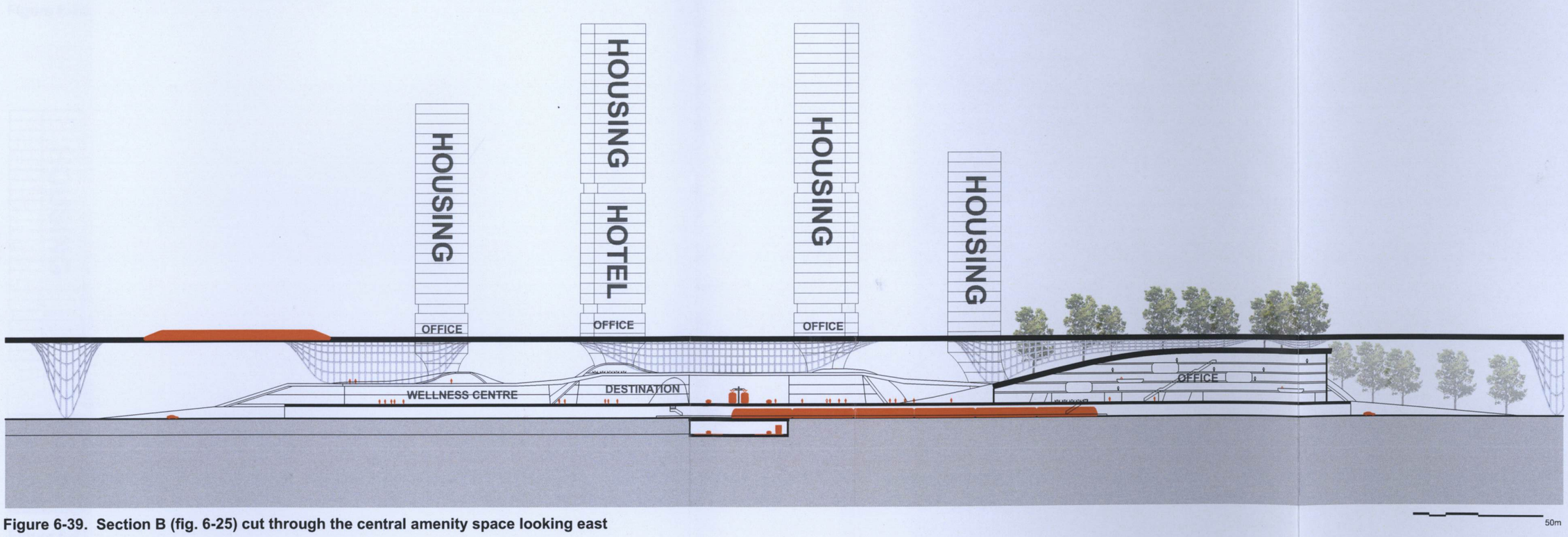


Figure 6-39. Section B (fig. 6-25) cut through the central amenity space looking east

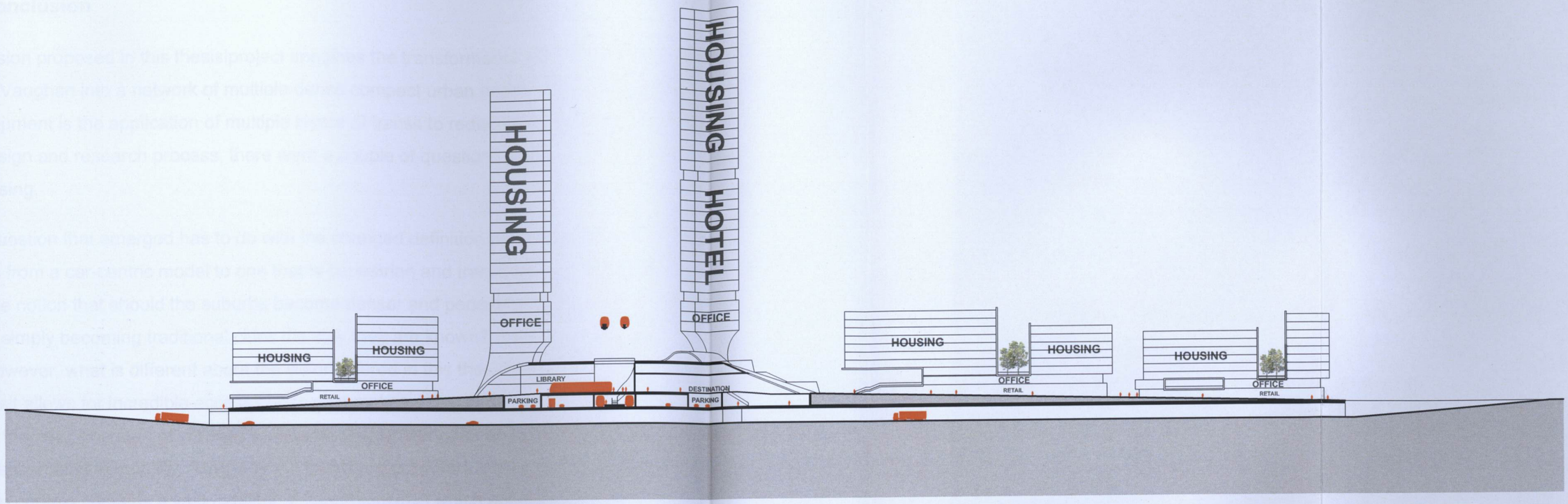


Figure 6-40. Section C (fig. 6-25) cut through the boulevard looking north

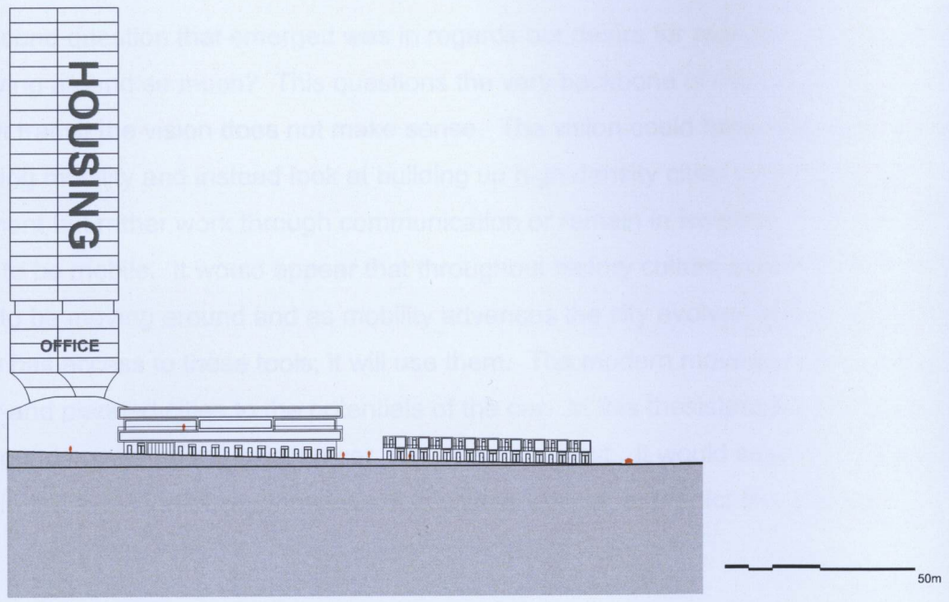


Figure 6-41. Section D (fig. 6-25) cut through a pedestrian corridor looking north

6.6 Conclusion

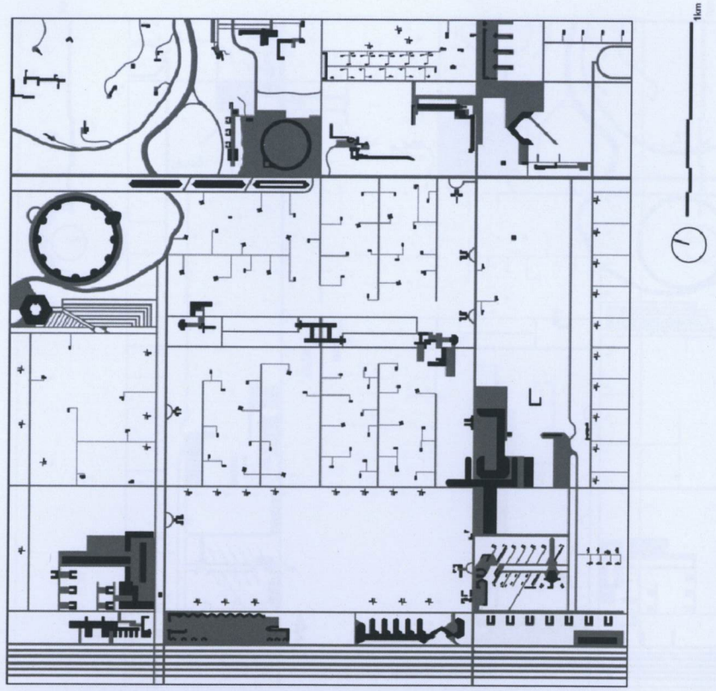
The vision proposed in this thesis|project imagines the transformation of the sprawling suburban city of Vaughan into a network of multiple dense compact urban nodes. The catalyst for this development is the application of multiple layers of transit to reduce car. Having gone through the design and research process, there were a couple of questions that emerged that are worth discussing.

One question that emerged has to do with the changed definition of the suburban city when it moves from a car-centric model to one that is pedestrian and transit friendly. What puzzled me was the notion that should the suburbs become denser and pedestrian friendly then are they not in fact simply becoming traditional cities the way they are known? Perhaps to some extent they are; however, what is different about the vision offered in this thesis|project is that applications of transit allows for incredible accessibility which makes a decentralized model pedestrian and transit friendly. The idea of creating a network of polycentric nodes is one that takes advantage of advancements in mobility. One way the thesis|project differs from a traditional city is that the existing context contains a vast network of superhighways which are improved upon. Modernism introduced the highway network for efficient movement of the car. The thesis|project diversifies this network so that it may move people more efficiently that promotes the emergence of urban neighbourhoods.

The second question that emerged was in regards our desire for mobility. Why do we need to be moving around so much? This questions the very backbone of the entire thesis|project. Without transit the vision does not make sense. The vision could have rejected the notion of improving mobility and instead look at building up high density cities that don't require movement but rather work through communication or remain in isolation. Perhaps it is human nature to be mobile. It would appear that throughout history culture evolves with mobility. We desire to be moving around and as mobility advances the city evolves accordingly. As long as society has access to these tools, it will use them. The modern movement took advantage of the car and planned cities to the potentials of the car. In this thesis|project communities were built around improving the existing car network with transit. It would seem that this is the next phase in the evolution of city; however, it is always difficult to predict the unknown.

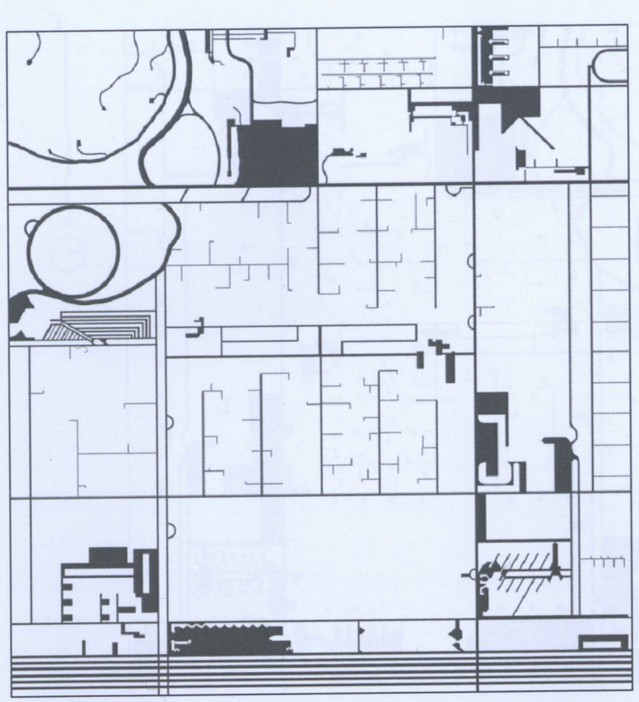
Appendix A

Map of Road and Buildings in Broadacre City



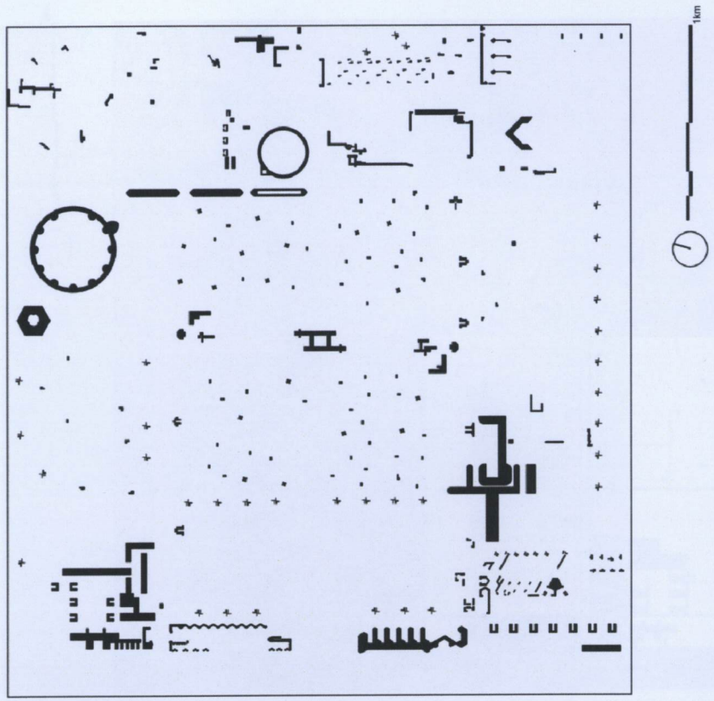
Appendix B

Map of Roads in Broadacre City



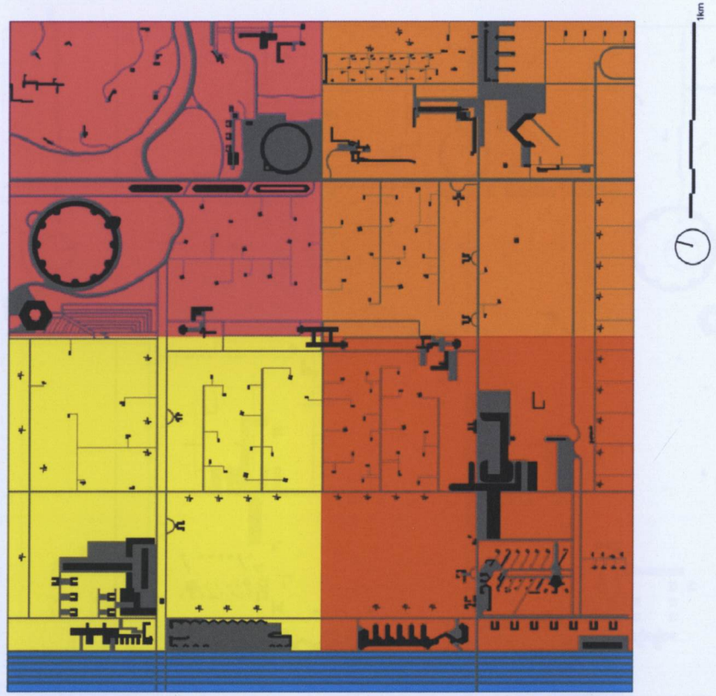
Appendix C

Map of Buildings in Broadacre City



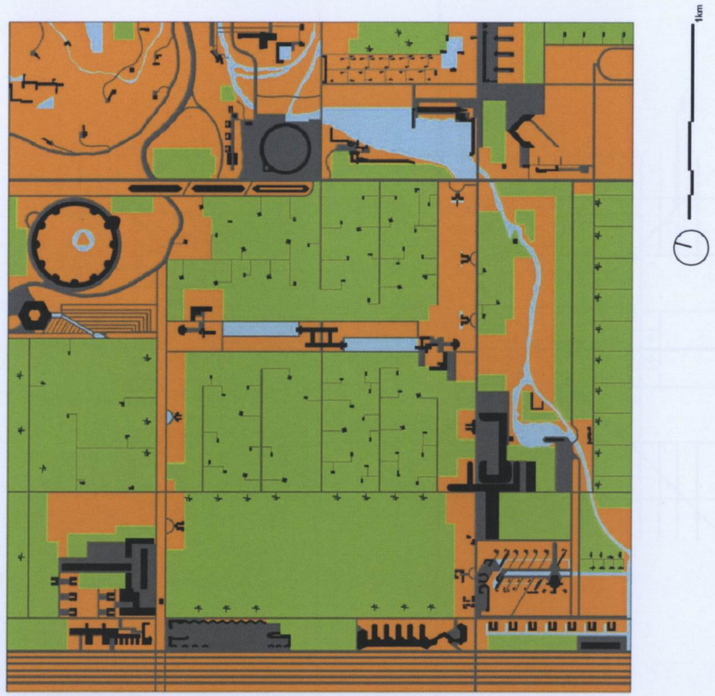
Appendix D

Map of Land-Use in Broadacre City



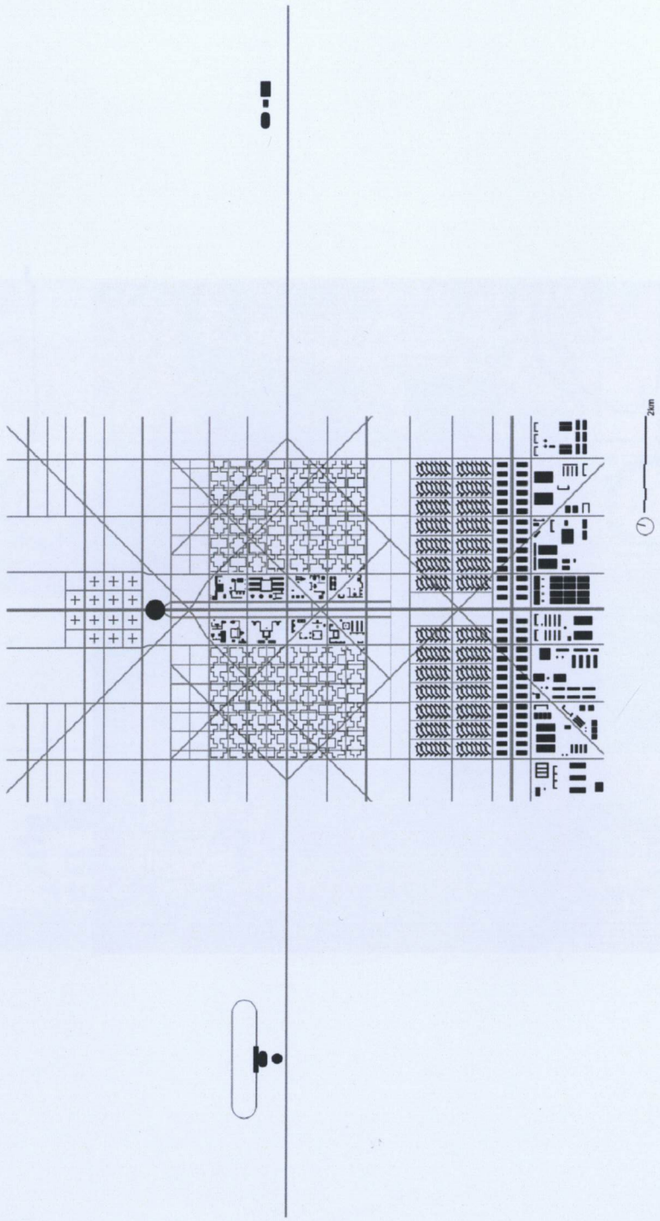
Appendix E

Map of Landscaping in Broadacre City



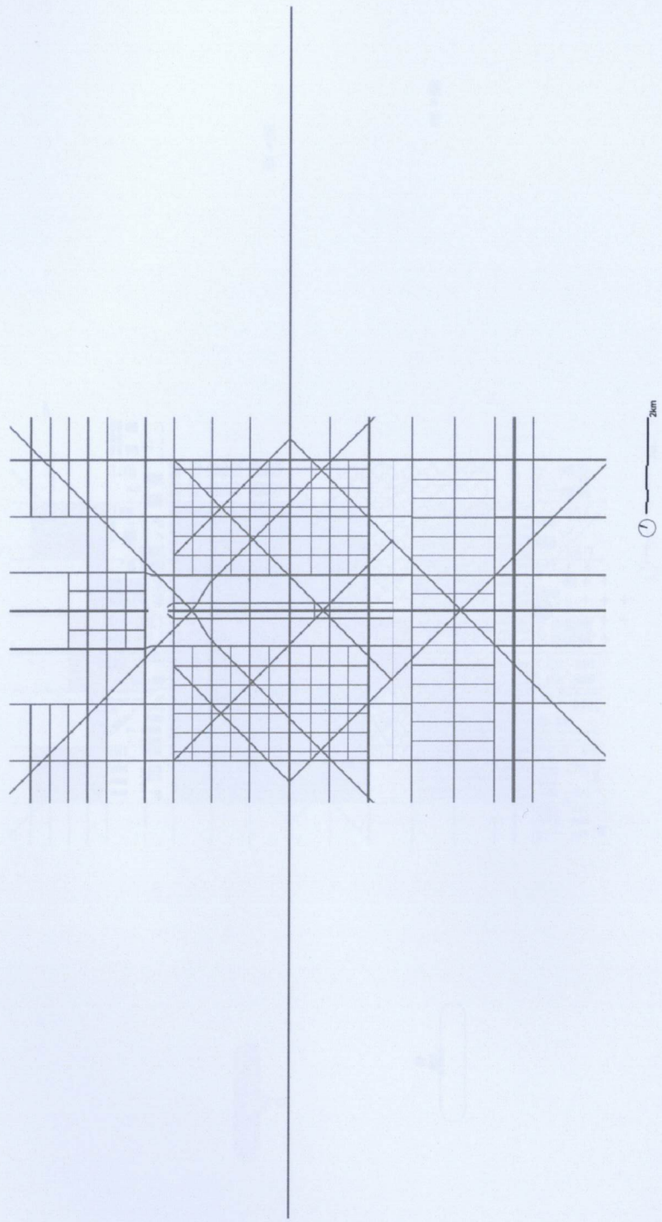
Appendix F

Map of Roads and Buildings in Radiant City



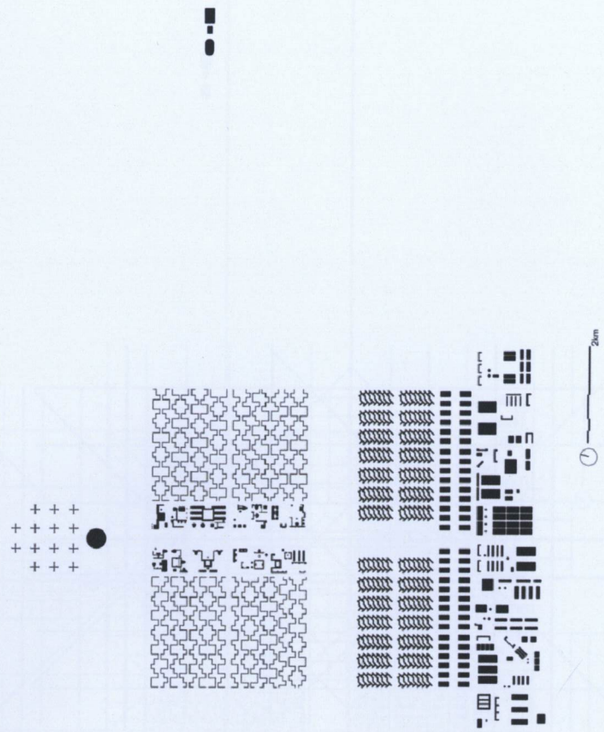
Appendix G

Map of Roads in Radiant City



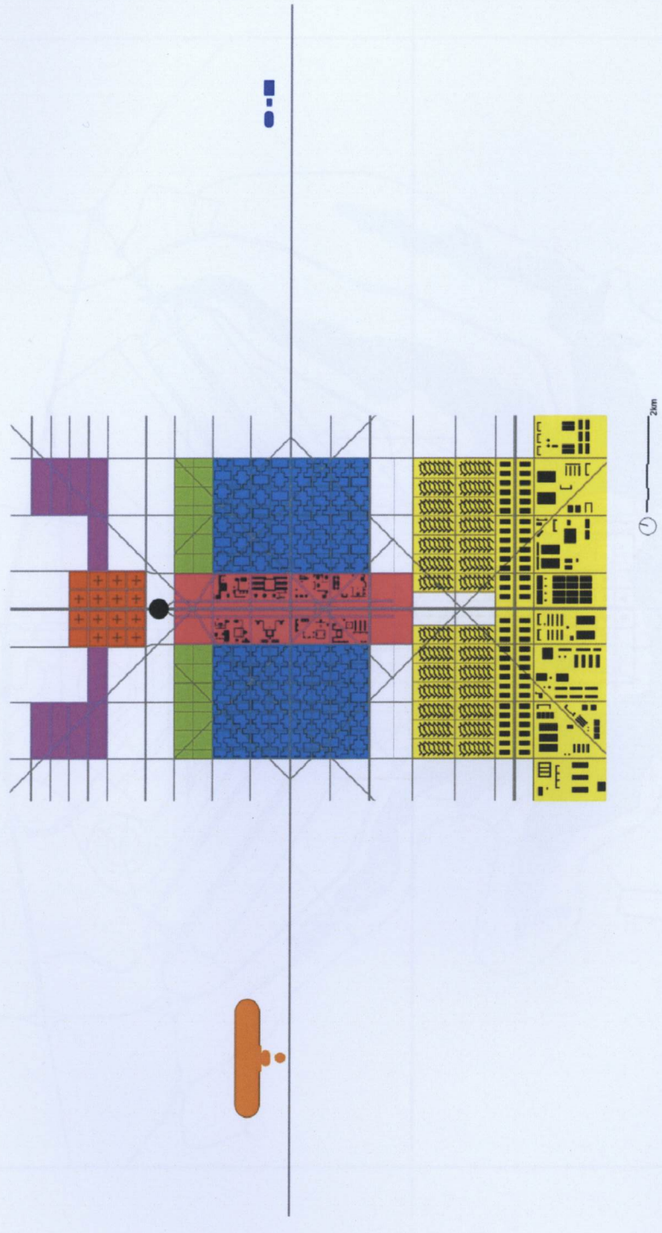
Appendix H

Map of Buildings in Radiant City



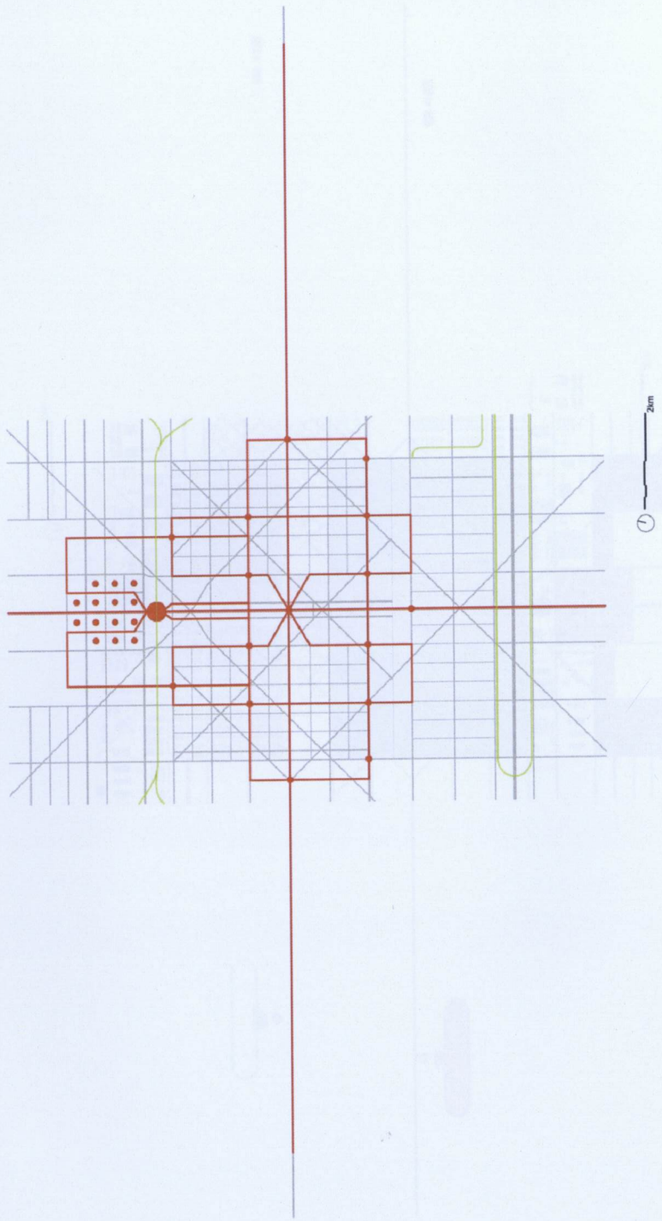
Appendix I

Map of Land-Use in Radiant City



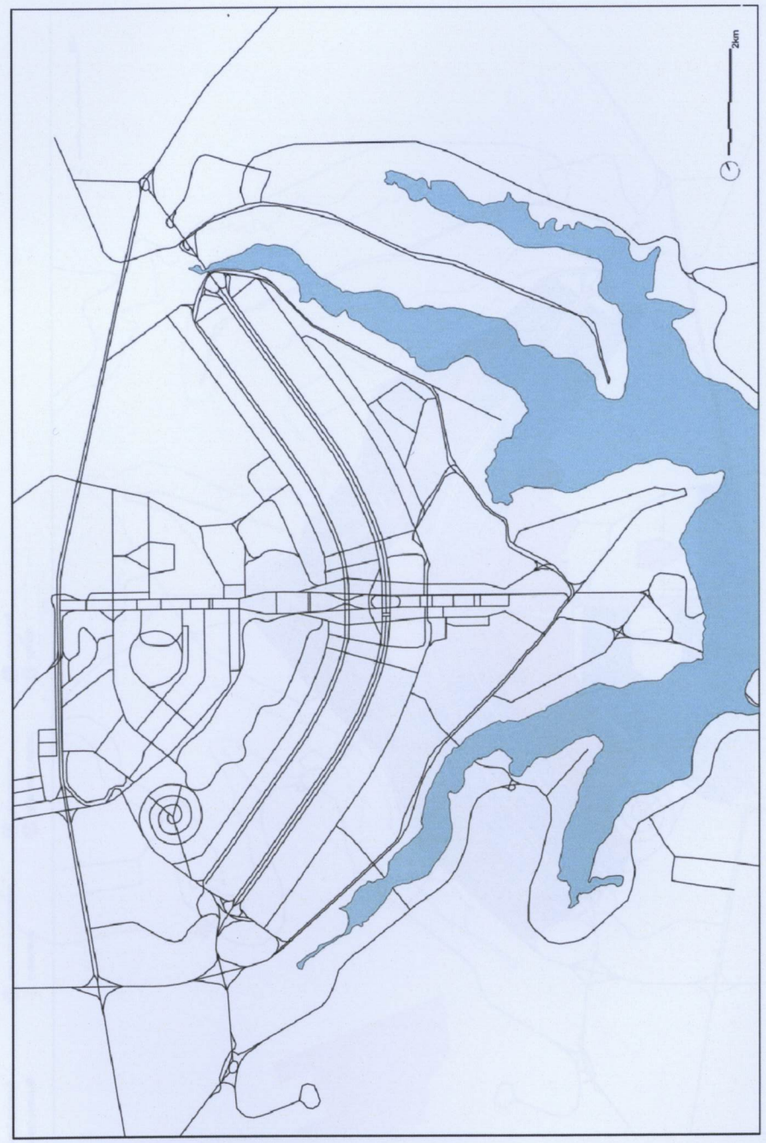
Appendix J

Map of Transit in Radiant City



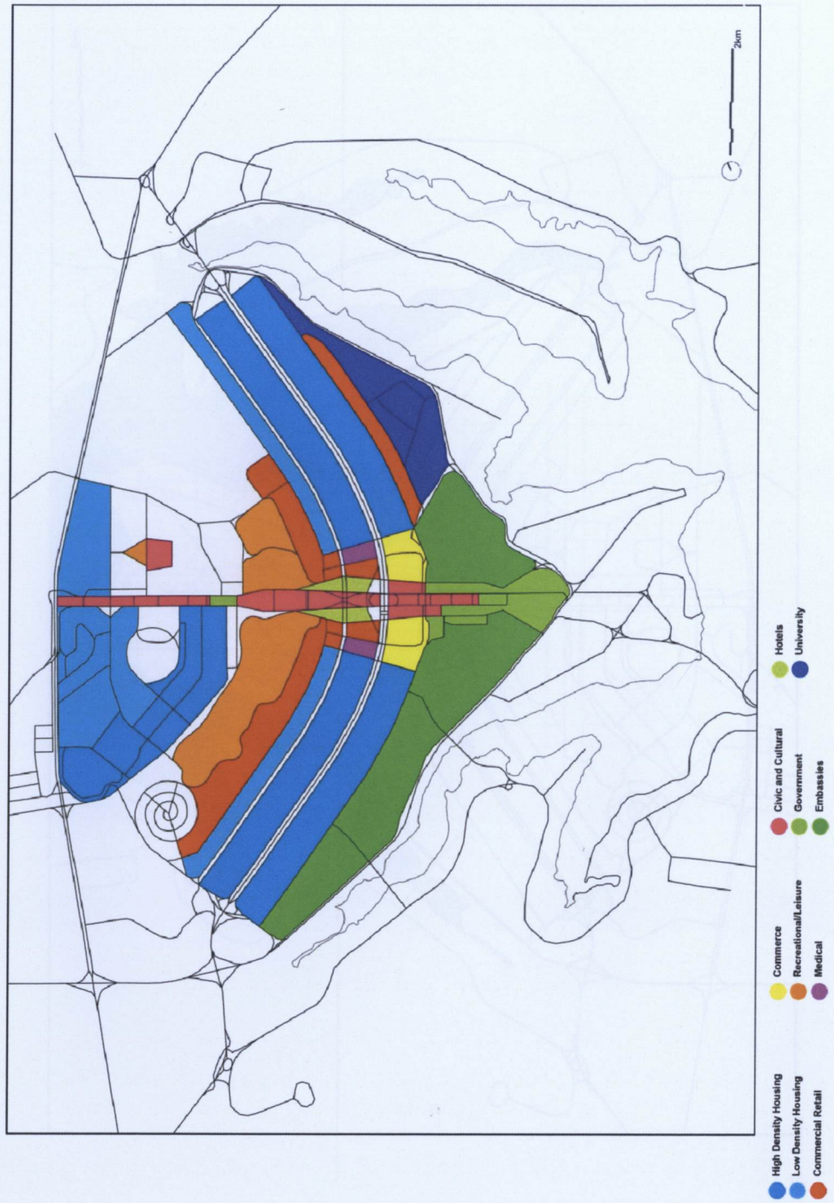
Appendix K

Map of Roads in Brasilia



Appendix L

Map of Land-Use in Brasilia



Appendix M

Map of Transit in Brasilia

Appendix N

Characterisitics and Strategies of Sustainable Ecosystems – Image Credit
Newman, P. and Jennings, I. (2008). *Cities as sustainable ecosystems: Principle and practices.* Washington D.C.: Island Press

Table 5.1 **Characteristics and Strategies of Sustainable Ecosystems**

Characteristics	Strategies
1. Healthy (Effective)	• Use of solar energy • Autotrophic or regionally autotrophic system • Conservation of energy through proximity • Cycling of matter • Integration of functions • Erosion control • Network coevolution
2. Zero Waste	• Cycling of matter • Filtration
3. Self-Regulation	• Negative feedback loops, facilitated by proximity and functional matching
4. Resilience and Self-Renewal	• Diversity • Panarchy (nested adaptive cycles); ecological memory • Positive feedback loops
5. Flexibility	• Networks

Source: Adapted from Bossel 1998.

Appendix O

Characterisitics and Strategies of Sustainable Societies – Image Credit
Newman, P. and Jennings, I. (2008). *Cities as sustainable ecosystems: Principle and practices.* Washington D.C.: Island Press

Table 5.2 **Characteristics and Strategies of Sustainable Societies**

Characteristics	Strategies
1. Healthy (Effective) 2. Zero Waste	• Renewable energy use • Low consumption and waste production • Local, needs-based, egalitarian economies • Maintenance of ecosystem functioning • Food production systems that incorporate strategies of sustainable ecosystems (e.g., diversity, nutrient cycling)
3. Self-Regulating	• Place-based communities allowing for self-regulation through closed feedback loops • Human population below carrying capacity
4. Resilient and Self-Renewing	• Adaptive learning • Democratic structures • Small communities with simple institutional structures • Maintenance of panarchies
5. Flexible	• Democratic, decentralized communities
6. Ethical	• Respect for land and people, sustained by strong emotional connections to place through continual engagement
7. Psychologically Fulfilling	• Equitable and cooperative social structures • Varied activities • Stories, rituals, and interaction with the land
8. Cooperative (Coexisting)	• Contentment through satisfaction of basic human needs • Cooperation and alliances • Gifts and trading of surpluses for peace initiatives

Source: Based on Bossel 1998

Appendix P

Characterisitics and Strategies of Sustainable for Case – Image Credit
Newman, P. and Jennings, I. (2008). *Cities as sustainable ecosystems: Principle and practices.* Washington D.C.: Island Press

Table 5.3 **Characteristics and Strategies for CASE**

Characteristics	Urban Social and Institutional Strategies	Urban Form and Infrastructure
1. Healthy (Effective)	• Bioregional, needs-based economies • Local/bioregional self-sufficiency (food, water, and energy) • Promotion of conserver lifestyles by meeting needs with resource-intensive or nonmaterial satisfiers • Cooperative interactions • Stable populations	• Sustainable agriculture; industrial ecology • Walking-based cities with transit for energy efficiency • Use of solar energy • Compact urban form to minimize land use and maximize green space • Protection and restoration of surrounding ecosystems through a system of static and dynamic reserves
2. Zero Waste	• Conserver lifestyles—Reduce, Reuse, Recycle!	• Closure of nutrient loops in food production • Recycling of wastewater • Closure of material loops in industrial systems • Harnessing of waste heat • Organic architecture to reduce heat-island effect • Fuel conservation through walking and clean-energy transit
3. Self-Regulation	• Local and bioregional governance structures	• Visibility of processes • Integrated systems for water, energy, and food
4. Resilience and Self-Renewal	• Bioregional, place-based design • Local/bioregional economies • Polycentric institutions and adaptive management	• Compact buildings • System of static and dynamic reserves, with reserves in city linked to bioregional system
5. Flexibility	• Civic participation • Partnerships and networks • Decentralized, polycentric structures • Place-based decision making (from regional down to precincts)	• Polycentric urban design (linked ecovillages) with walkable centers
6. Ethics	• An ethic of care, nurtured through a process of reinhabitation	• Visibility of biodiversity and ecological processes in the city • Walkable town centers
7. Psychological Fulfillment	• Cultivation of a sense of place through frequent, varied interactions with nature and bioregional celebrations • Meaningful livelihoods and flexible work patterns • Opportunities for creativity • Civic involvement in restoration activities, community service work, and community gardening	• Place-based design • Compact urban design for easy access to activities
8. Cooperative (Coexistence)	• Peace initiatives and community development • Trade surpluses • Links between bioregions; global cooperation	• Interregional linkages and biodiversity corridors

Source: Based on Bossel 1998.

Appendix Q

Summary of the Ecosystem Succession Model – Image Credit
Newman, P. and Jennings, I. (2008). *Cities as sustainable ecosystems: Principle and practices.* Washington D.C.: Island Press

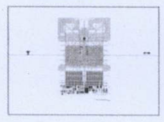
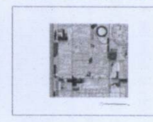
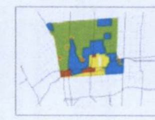
Table 5.4 **Summary of the Ecosystem Succession Model**

	Young Ecosystem	Mature Ecosystem	City Strategy
Energy & Materials			
Gross productivity	Rapidly increasing	Stable and less	Reduce energy in total
Net productivity	Rapidly increasing	Zero	Reduce energy per unit of economic output
Efficiency	Low • Wastage of energy and materials • Process inefficiencies	High • Waste organic matter an important energy source • Recycling of materials • Conservation in the use of materials • Processes more efficient	Recycle waste More balanced economy (more high-level functions)
Trophic structure	Producers mainly	Balance of producers, consumers, decomposers, and integrative species	More functional diversity
Space			
Spatial efficiency	Low Dispersed form Low structural diversity • Small structures only • Lateral patterns only • Small variety in shape	High Compact form High structural diversity • Structures both large and small • Lateral and vertical patterns (stratification) • Large variety in shape	More compact city More diverse built forms
Information			
Community diversity	Low • Few functional niches • Generalists	High • Many functional niches • Specialists	More diversity in community activities
Community organization	Low • Little interconnection	High • Much interconnection	More networks linking the diversity (social capital)
Governance			
Environmental control	Low • Resource availability external to biotic system • Climate unbuffered • System instability	High • Resource availability controlled within the biotic system • Climate buffered • System stability	More effective governance to provide system stability

Source: Newman 1975

Appendix R

Case Study Summary

	RADIANT CITY	BRASILIA	BROADACRE CITY	SUBURB	FUTURAMA	ST. LAWRENCE
						
MOBILITY	PREDOMINANTLY CARCENTRIC WITH EXTENSIVE SUBWAY RAIL LINE PASSES THROUGH THE CITY	PREDOMINANTLY CARCENTRIC SUBWAY, BUS, RAIL AVAILABLE	PREDOMINANTLY CARCENTRIC RAIL PASSES THROUGH THE CITY	PREDOMINANTLY CARCENTRIC BUS, RAIL AVAILABLE	PREDOMINANTLY CARCENTRIC SUBWAY, RAIL, BUS AVAILABLE	PREDOMINANTLY PEDESTRIAN AND TRANSIT ORIENTED
HOUSING DENSITY	HIGH DENSITY ~100000 PPL/SQKM	HIGH DENSITY ~40000 PPL/SQKM	LOW DENSITY ~74 PPL/SQKM (entire city)	LOW DENSITY ~4075 PPL/SQKM	LOW DENSITY ~? PPL/SQKM	HIGH DENSITY ~40000 PPL/SQKM
HOUSING TYPE	APARTMENTS BUILDINGS THAT OFFER 25SQ/M PER PERSON	APARTMENTS BUILDINGS WITH SOME TOWNHOMES	MOSTLY SINGLE FAMILY HOMES WITH SOME APARTMENTS	MOSTLY SINGLE FAMILY HOMES WITH SOME APARTMENTS	MOSTLY SINGLE FAMILY HOMES WITH SOME APARTMENTS	MIX OF HIGH, MEDIUM, LOW DENSITY APARTMENTS AND TOWNHOMES
SOCIAL INTERACTION	LITTLE PRIVACY VERY COMMUNAL	LITTLE PRIVACY VERY COMMUNAL	HIGH PRIVACY SLIGHTLY COMMUNAL	HIGH PRIVACY SLIGHTLY COMMUNAL	HIGH PRIVACY LARGE COMMUNAL AREAS	MIX OF COMMUNAL AREAS VERY COMMUNAL LARGE PARK SEMI PRIVATE COURTYARDS PRIVATE LAWNS
INFRASTRUCTURE	DOMINATED BY SUPERHIGHWAYS	DOMINATED BY SUPERHIGHWAYS	DOMINATED BY SUPERHIGHWAYS AND LOCAL HIGHWAYS	DOMINATED BY SUPERHIGHWAYS AND LOCAL HIGHWAYS	DOMINATED BY SUPERHIGHWAYS	DOMINATED BY TRANSIT AND LOCAL ROADS
CONNECTION	PLANNED CITY WITH EXTENSIVE INNER CITY HIGHWAY NETWORK INTEGRATED INTO A REGIONAL HIGHWAY NETWORK	PLANNED CITY WITH EXTENSIVE INNER CITY HIGHWAY NETWORK INTEGRATED INTO A REGIONAL HIGHWAY NETWORK	PLANNED CITY WITH EXTENSIVE INNER CITY HIGHWAY NETWORK INTEGRATED INTO A REGIONAL HIGHWAY NETWORK	UNPLANNED CITY WITH EXTENSIVE INNER CITY HIGHWAY NETWORK INTEGRATED INTO A REGIONAL HIGHWAY NETWORK	PLANNED CITY WITH EXTENSIVE INNER CITY HIGHWAY NETWORK INTEGRATED INTO A REGIONAL HIGHWAY NETWORK	PLANNED CITY INTEGRATED INTO EXISTING CITY FABRIC AND INFRASTRUCTURE
AMENITIES	SEGRAGATED INTO ZONES PROPORTIONAL TO CAR	SEGRAGATED INTO ZONES PROPORTIONAL TO CAR	SEGRAGATED INTO ZONES PROPORTIONAL TO CAR	SEGRAGATED INTO ZONES PROPORTIONAL TO CAR	SEGRAGATED INTO ZONES PROPORTIONAL TO CAR	INTEGRAGATED INTO THE DEVELOPMENT
SCALE	CAR SCALE	CAR SCALE	CAR SCALE	CAR SCALE	CAR SCALE	HUMAN SCALE

Appendix S

Research Summary

CAR

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The car will remain relevant as personal mobility will always be desired by people. What is troubling about cars is the dependency we seem to have on them. Our dependency on cars must be reduced and they can no longer drive the design of cities but included as a part of a diverse transportation network.

AMENITIES

↓

Mixed-use neighbourhoods seem to inherit a vibrant character over cities with segregated land use zoning. Diversity in programming on a smaller scale is preferable over diverse programming on a large scale. Areas that strive seem to incorporate full city programming including places to live, work and play.

INFRASTRUCTURE

↓

Infrastructure plays an important role in our daily lives and the modernists saw car infrastructure as a solution to the issues of the time and incorporated it into their visions to optimize its potential. Infratstructure remains important however in carcentric cities highway infrastructure is overwhelmed and no longer fulfills its original intention. Infrastructure remains important however must be diversified with other layers of mobility to create an optimal system

HOUSING DENSITY

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A population density of 40000 ppl/sq.km seems to be an appropriate density to develop. Like programming diversity in density is important to satisfy various tastes. A mixture of high-, medium- and low-density is desirable to make more efficient use of land but to still respect the tastes of the people who must live there.

SOCIAL INTERACTION

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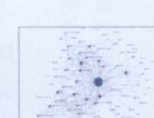
Healthy social interaction is important while a person also needs privacy. A mix of varying types of communal spaces are important in avoiding the isolation now beginning to show in the suburbs. These spaces should be very communal; like parks and squares, moderately communal; private courtyards, and private; terraces and private yards. Accessibility is also important so access to hangouts must be easy and provided.



CONNECTION

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Connection was important to the modernist however their view of connection was binding various uses together rather then binding various neighbourhoods with full amenities together. The suburb of the future will contain small pockets of compact mixed-use nodes that will be interconnected by various transportation types.

CITY SCALE

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Cities can no longer be planned to the scale of the car. Carcentric cities have developed as one large entity rather then a series of diverse neighbourhoods. The suburb of the future must focus on creating a network of dense compact nodes that are transit oriented and pedestrain friendly. Human scale must outweigh the car scale. Existing context is important as development will occur in built up areas and on land that is currently underutilized. A city cannot be design as a single entity that on a large scale reads as mixed-use but on a human scale reads as segregated into zones.

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