Transit Urbanism - Creating a Multi- Modal Hub for Edmonton, Alberta

by

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CONTENTS

ABSTRACT

In 2003, Mark Ovenden imagined what an underground metro for the world might look like. It is not a proposal by any means, but rather an idea that represents a level of global connection unimaginable in our lifetime. Maps like Ovenden's have the ability to pose questions about our future and our relationship to one another in an increasingly connected world. My thesis project operates as a microscope to Ovenden's petri dish global organism. What is visible is the presence of a complete and complex network; invisible are the smaller catalysts that exist today, as well as those which may emerge over the next several decades, that have the potential to expand upon this theoretical idea. This is going to be studied within the context of the growing transportation movement currently taking place in Edmonton, Alberta. The concept of built assemblages static in time and the interaction of the people who operate within and continue to develop on top of them portrays the relationship between our humanistic desires and our intent to develop the systems that we require to grow sustainably.

ACKNOWLEDGEMENTS

CHAPTER 1: INTRODUCTION

Why Do We Move?

When we require access to something and it is not immediately within reach, we will often move to access it. This act of moving ourselves to get to where we are required to be involves variables. What do we need, how far away is it, and how are we going to get there? Are you commuting to work and what are your means of getting there?

Questions such as these define incredibly large moments that represent the experiences we have with our cities. In Canada's 2011 National Household Survey (NHS), it was noted that roughly 15.4 million citizens commuted to work while 1.1 million worked mostly from home. That means 71 % of our working population spends varying portions of their day navigating the streets, alleyways, subway stops, and bus terminals that give a city its surge of labor that fuels our economic needs as well as our urban identity. The simple act an individual's commute, whether on a city bus or behind the wheel of a car, causes a dizzying array of interactions that define how we interpret the systems in which we are embedded. For the first time in a Canadian context, the 2011 NHS reported data that expose a side of the Canada's transit identity in terms of our preferred modes of transportation.

Every individual shares in a network of infrastructure that provides their basic transportation needs. Prior to the automobile, town placement was predicated on the need for access by foot. Smaller towns connected economically were located 10 to 15 miles apart. The distance from the outskirts to the town center were no more than a 5 to 7.5 mile walk; the longest comfortable, walkable distance for merchants and consumers to access the rich economy of a town center. This is where the rules of modern town placement begin*.

Christopher Alexander was a pioneer of city planning and responsible for many of the best practices that continue to be followed today. "A Pattern Language" tells a story of organic growth, and calls upon the planner to recognize the systematic introduction of new infrastructure per the "patterns" identified. Growth in a prosperous region is inevitable. As a major city center increases in size and influence, so does the complexity inherent in having to traverse the city's intra- and inter-city networks. Contemporary cities are no longer fully accessible by foot. As cities grew transportation technology evolved. Better transportation meant that longer distances could be

travelled in less time at a much faster pace. However, this came at the cost of people's safety, the environment, and an overloaded, outdated network which has become a major concern of transportation planning today.

The Influence of Infrastructure

Infrastructure is the backbone of development, and since it is the longest lasting element of the built environment, it can support several waves of development, redefinition, and reordering over time (Lukez 2007, 37). In the context of Edmonton, a major influence on the economy was the Canadian Pacific Railway (CPR) that surged through the Alberta prairies providing goods to the cities as well as transportation opportunities for people. It was the establishment of the rail line that gave Edmonton a backbone that become a catalyst for growth, and when introduced into the city defined a prominent corridor that still marks the land today. The scale of this intervention came before the arrival of the automobile in Edmonton in 1912 and changed the face of transportation in the area*. The railway corridor created a well-defined gap between buildings, giving right of way to the early 20th century locomotives. Trains crossed the newly constructed High Level Bridge that spanned 777 meters over the North Saskatchewan River connecting Strathcona and Edmonton. With such a purposeful and lasting infrastructure that still demarcates a prosperous industry that once was, the question becomes: what is the next wave of development that the historic corridor can support now that it is no longer in service?

The Battle Over Infrastructure

When a transportation system heavily favors one mode of transportation over all others, it is difficult for the network to be responsive to emerging trends and technologies. Highways with their on ramps, off ramps, and junctions that terminate outside and within city limits are an expensive and inefficient way of addressing a problem that ultimately persists regardless of how much infrastructure is dedicated to automobiles. People are beginning to rethink what our streets are about, and who they are for*. In Edmonton, a city built for the vehicle, transportation infrastructure continues to favor the car and is what facilitates growth in the municipality. Thus, transportation networks take on a paradoxical role – they drive urban development but at the same time lead to a series of challenges (Miller et. al. 2016). Each new neighborhood building out from the core of the city

takes the form of a gridded expansion designed solely with the automobile in mind.

Moving from a model based on walkability, the highways and car congested streets have taken over, resulting in the marginalization of accessible transportation. The return to active transportation is a relatively new idea, gaining popularity as urban density increases. Both active and public transportation approaches are more sustainable ways for people to navigate our cities of the future. In Edmonton, it is incredibly difficult to secure support for investing in new and alternative methods of commuting. The current battle over the street is fierce between a small number of cyclists and a large number of automobiles. If this battleground is going to become a place of cohesion, it is essential to find a way for all modes to have equal opportunity for movement.

What is Infrastructure?

In the pages that follow, I focus on two clusters of infrastructure that periodically become intermingled. One cluster focuses on transportation - anything that is publicly accessible and most often highly visible. The systems include sidewalks, pathways, streets, train tracks, bridges and many other types of transportation networks. The second cluster consists of public amenities made accessible by the first. These amenities are a mixture of commercial business, residential as well as publicly accessed space that fills the gaps in the transportation network.

Considering what we need, how far away it is and how we are going to get there are variables unique to an individual. These variables will determine a favored mode (or modes) of transportation and how easy it is to transition between multiple modes to negotiate the city. If you want to get a coffee 150 meters away, you will most likely walk using a sidewalk or pathway. However, if you have an engagement across town, you may opt to take your car and find parking, or take public transportation. Clearly defining the infrastructure specific to each mode of transportation and obtaining a smooth transition between each one is key to achieving a symbiotic relationship between different modes of transportation. The focal point of this architectural thesis is the transit hub which links together, and defines the transition between, transportation modes. The hub is a moment of chaos with multiple modes interchanging simultaneously, but can be designed to harmonize our transportation needs.

Thesis Question

How can a city capitalize on an existing infrastructural corridor in to create a mobility HUB in Edmonton, Alberta that provides access to all transportation modes, while creating an identity through human activity to encourage public engagement in a complex system that is defined by transportation data?

CHAPTER 2: A SYSTEM IN A STATE OF EVOLUTION

The City Acts as an Organism

The act of transportation is "transhumant" (Deluze). "The transhumant does not follow a flow, it draws a circuit…" Transportation can be seen as a circuit in an intricate relationship with the overall "mechanical phylum" that is the network of transportation. It becomes something that is "ambulant"; intuition in action.

Borrowing terminology from Deluze, I define inhabitation as a *phylum*. It is the algorithmic, natural response of the inhabitant to the surrounding infrastructure. It operates within infrastructure and finds ways of navigation that may not have been obvious at the outset. I recognize the infrastructure of the inhabitant as the *assemblage*. The *assemblage* is described as a way to interpret the phylum through invention and appropriation out of a necessity for evolution. Once an interjection into the system had be determined, it affects how the *phylum* (inhabitation) reacts around it. The many historical layers that make up the infrastructure around my site are a set of assemblages suspended in time as a history of prior *phylum* changing course. The century old corridor as an *assemblage* drastically changed how the inhabitants of Edmonton and Strathcona traversed the river valley moving from one city center to the other. As the infrastructure facilitated the movement of inhabitants and their resources in a new way, the inhabitants were free to focus a new energy into developing around this infrastructure at an advanced rate.

System Layers - 1890 to Present

There are over a century of layers embedded in the current system around my site. With densification around the river valley, the system has been changing and adapting with these layers being merged together or remaining separate. I have outlined 4 layers thus far.

Layer One:

Early in 1903, prior to the High Level Bridge, the engineers of the Calgary and Edmonton Railway (C & ER), which had reached Strathcona in 1891, began surveys for a possible crossing of the North Saskatchewan River to reach Edmonton. In May of 1903 the Canadian Pacific Railway (CPR). Negotiations among CPR, Edmonton, Strathcona and Alberta were lengthy and it was not until November 30, 1909 that an agreement was signed. Initial plans called for a railway bridge,

but Strathcona pushed for a combined rail and road bridge. The final agreement included a road and sidewalk deck below the railroad and streetcar deck.

Layer Two:

The bridge was completed, and operation in April of 1913. Now joined by the High Level Bridge, Edmonton and Strathcona become one city. The tracks provided a great boom to the downtown giving the ability to bring shipped goods straight to the mills, workshops, and other industry in the neighborhood. This also proved to be a crucial element contributing to a new transportation network where train, streetcar, automobile, and people alike could populate the same infrastructure with the common goal of movement across the North Saskatchewan River.
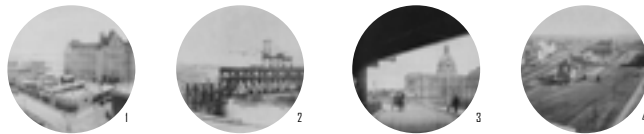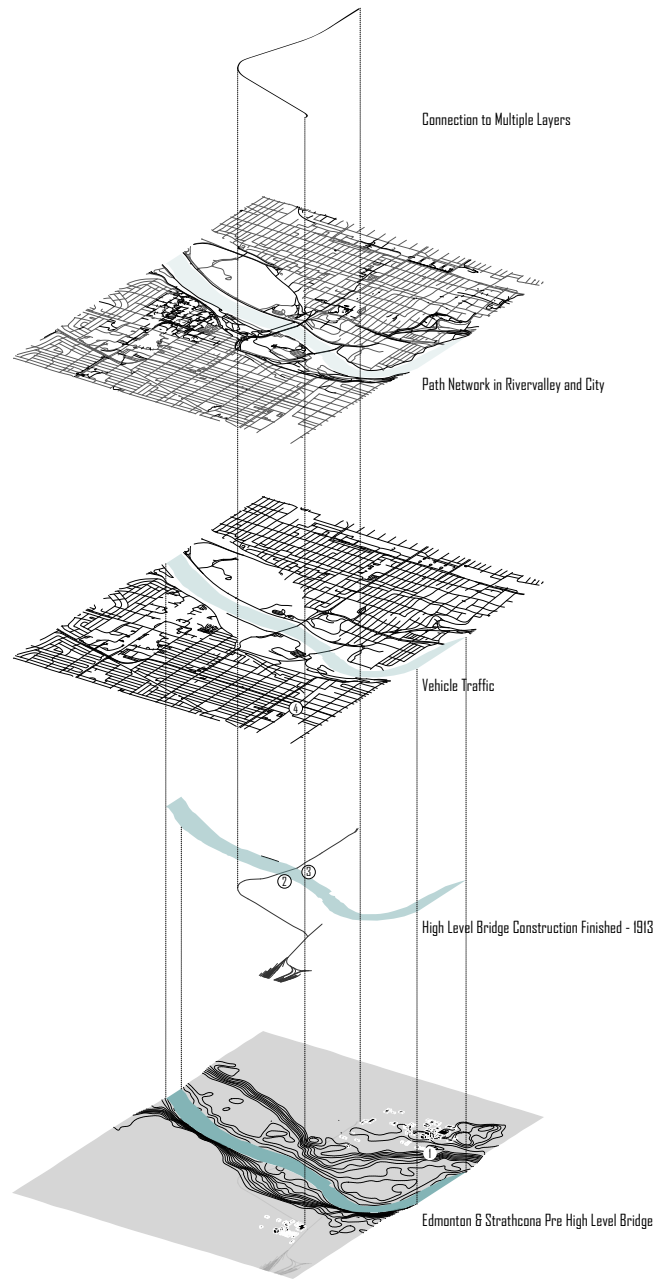
Layer Three:

With the new infrastructure providing a driving force behind downtown industry, street networks followed suite. To accommodate the population density and flows of people, this network began to expand and develop. The Strathcona rail station had many people pass through as they traveled into the city. The two scales of transportation meeting in this image result in an infrastructure trying to navigate each others paths. Some of the junctions were well thought out, while others were configured as time passed and other layers, and scales became apparent through time.

Layer Four:

As Edmonton settled around its industry and infrastructure, there was a great deal of effort to retain, and utilize the river valley and its various opportunities. A hydro electric plant was built in Rossdale, and docks for boating on the river were erected. When the industrial uses for this river started to fade, the river valley and the surrounding area became a haven for outdoor activity thorough its path network. As modes of active transport become more popular, the pathways throughout Edmonton's River Valley and city blocks become important points of infrastructure.

System Layers - 1890 - Present

Connection to Multiple Layers

Path Network in Rivervalley and City

Vehicle Traffic

High Level Bridge Construction Finished - 1913

Edmonton & Strathcona Pre High Level Bridge

Context Drawing: Four historical periods explaining the development of transit infrastructure throughout time, adding to the systematic layering of these elements over time.

Analysis of the Current Infrastructure

The investment in vehicular infrastructure around my thesis site (fig. 2) has generated the growth of and access to the densest and most populated neighborhoods of the city. Getting into the city core and manoeuvring it in an automobile has become more difficult as time progresses. The traffic patterns have demanded changes over time in sections of the site. The changing of the high level bridge from two-way traffic to one-way traffic in 1998, and the re-routing of traffic flows in and out of downtown are an example of this. The potential of train lines is in progress, but not yet fully realized as the city only continues to grow outwards with more people needing access to this crucial core by crossing the North Saskatchewan River.
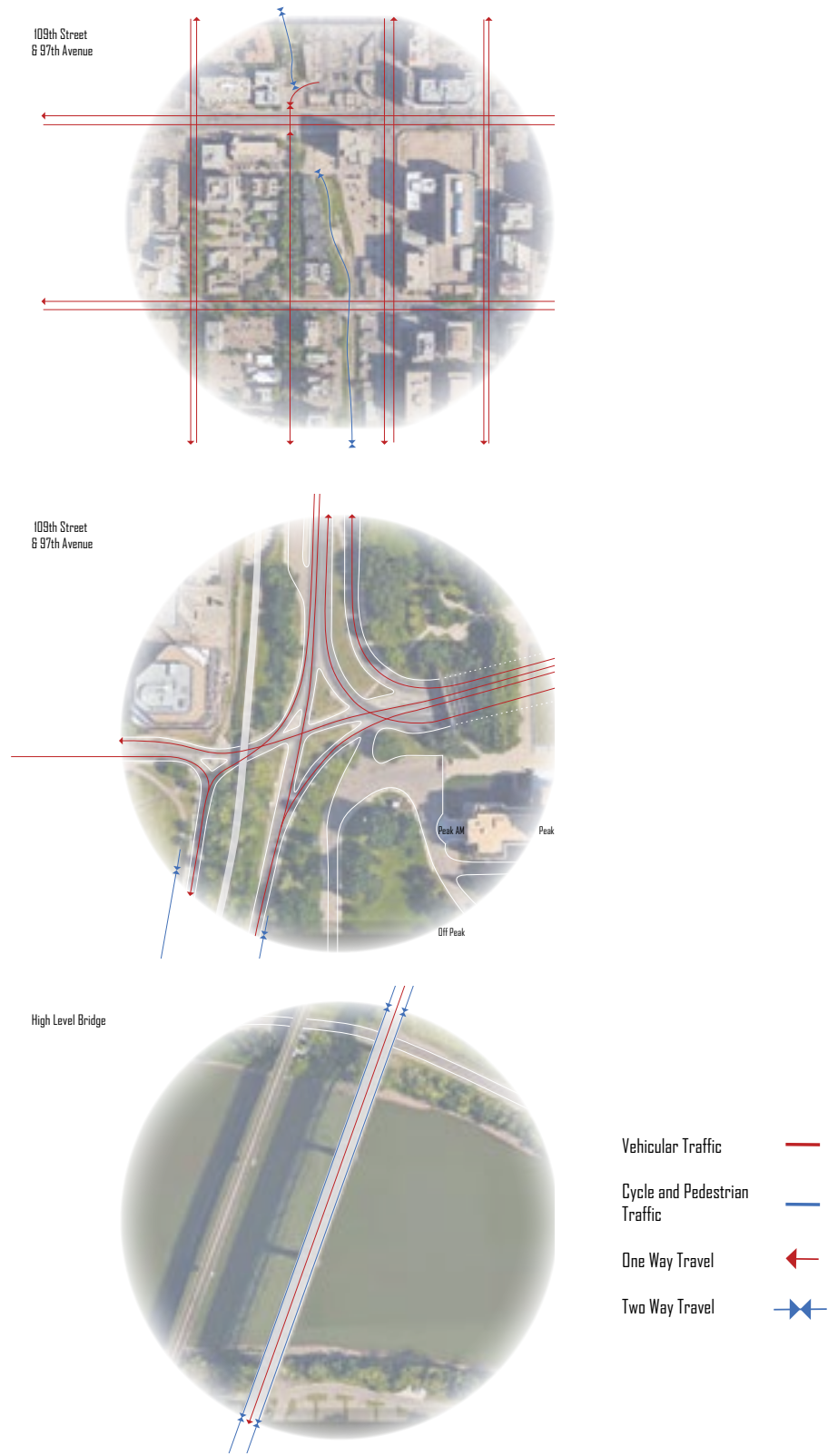
The leveraging of the infrastructure surrounding the High Level Bridge and its procession into the Downtown Core can provide an invaluable linkage to start developing the conversation about how Edmontonians traverse their city with a democratization of transportation. Currently, with motorists laying claim to the streets and other modes fighting for a piece of the infrastructure, there is a miscommunication between who has the correct answer for transportation.

Identifying Trends, and a Breakdown of the System

Specific nodes of the system are not functioning as well as others, with groups of people in the cycling community who have made this apparent (Public Consultation Reference). There are certain points where the historic rail corridor infrastructure in question interacts with existing traffic arteries that are unconsidered. The opportunities for public space, and an accessible infrastructure for everyone have the potential to set new trends and address the breakdowns of the system. The points focused on in the nodes of this project illustrate the difficulty of this communication between cyclists, pedestrians and motorists. In the interim, designing these bypasses (fig. 3. 109th Street at Jasper Avenue, 109th Street at 97th avenue and the High Level Bridge .) using the infrastructure to mediate between scales of transportation can open a rich corridor for activity.
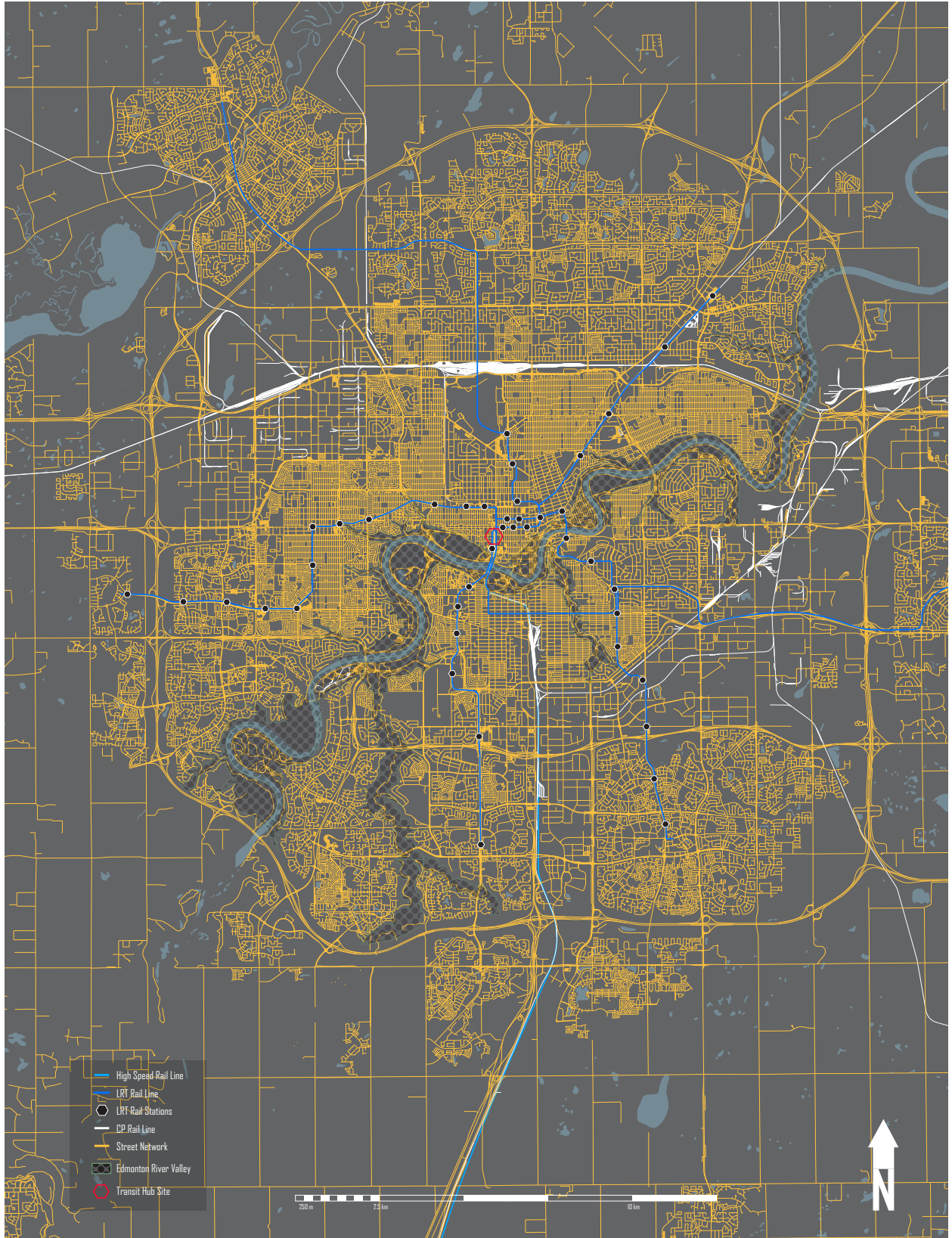
Map of Edmonton: Rivervalley, Road Network, Light Rail Network and Site Location (Open Street Map Data 2016)

109th Street
& 97th Avenue

109th Street
& 97th Avenue

Peak AM   Peak

Off Peak

High Level Bridge

Vehicular Traffic

Cycle and Pedestrian
Traffic

One Way Travel

Two Way Travel

Three infrastructure nodes defining current flow of traffic around the thesis site showing vehicular traffic in red and pedestrian/cyclist traffic on blue. (Google Satellite Imagery 2015)

Precedent Solutions for Ease of Movement

The following four collage studies are the representation of global precedents that have successfully incorporated active transportation corridors that enhance liveability and sustainable movement. Each have unique properties and circumstances that make them viable options to consider in Edmonton while developing a major Hub.

The projects are as follows:

Cuyperpassage - Bentham Crouwel Architects - Amsterdam

Bicycle Snake - DISSING+WEITLING Architecture - Copenhagen

Lightpath AKL - Monk Mackenzie Architects & LandLab - New Zealand

Cycle Center Lookout - AWP - Newcastle

Precedent Collage: The Cuyperpassage in Amsterdam bypasses the major rail station platform, offering free movement through what would normally be a major obstacle in city planning. Architecturally, it organizes the space separating it into pedestrian and cyclist realms. With little signage the design demarcates between transportation modes using changes in materiality and a differentiation in ground height. (Bentham Crouwel Architects 2016)

Precedent Collage: The Area around Fisketorvet shopping center has been characterized by a similar problem in Edmonton. Both pedestrians and cyclists want to lay claim to the existing infrastructure for movement but move at different speeds creating a tension between the two groups. This connection separates the two offering a unique way to traverse the area. The safety of the two users increased upon completion and the bright orange pathway acts as a way-finding device as an exclusive cycling corridor. (Dissing + Weitling Architects 2014)
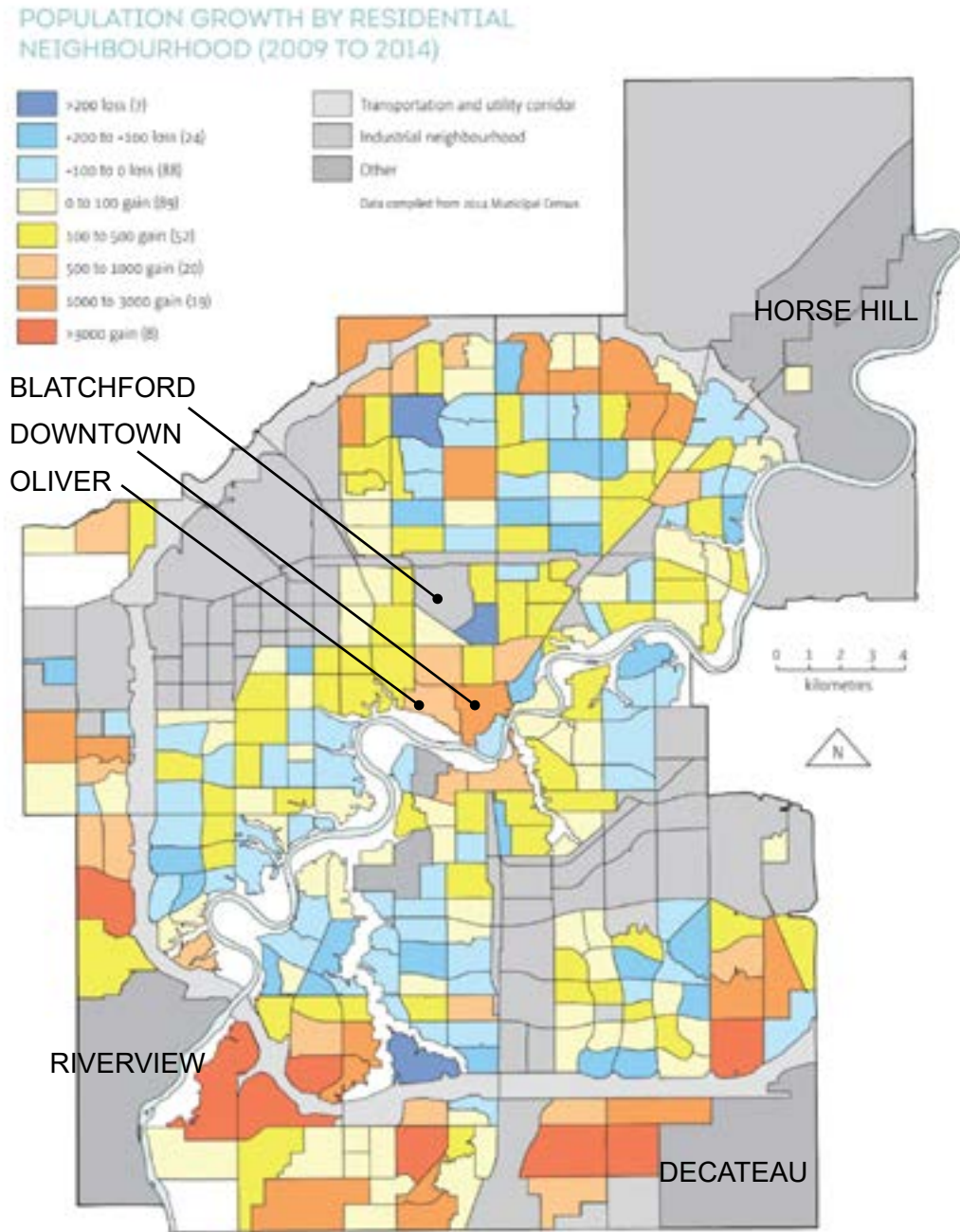
Precedent Collage: In New Zealand, the Light Path AKL is a direct reuse of a portion of highway that circumnavigates the downtown core. Not only does it complete the intercity bike loop, but it saves the city expenses in the upkeep of automobile infrastructure and the lessening of carbon emissions having added a viable cycling option. It is also incredibly visible acting as a way finding device for the population who rely on it to navigate the city. It is also functions as a visual identity for active transportation. (Monk Mackenzie Architects 2015)

Refuse + Prospect // Building for Cycling
Cycle Center Lookout - Featherstone Young, Riches Hawley Mikhail

Precedent Collage: In the Malmo-Quay Development, the newly designed cycle hub and community hall is meant to act as a landmark on the Tyne River. It is located at the intersection of Newcastle's major cycle routes. AWP says "the heritage and community spirit of Ouseburn Valley - its industrial past, identity and the values of reuse are central to the design". (AWP Office for Territorial Reconfiguration 2014)

# CHAPTER 3: EDMONTON'S TRANSPORTATION FUTURE

POPULATION GROWTH BY RESIDENTIAL
NEIGHBOURHOOD (2009 TO 2014)

>200 loss (7)
+200 to +100 loss (24)
+100 to 0 loss (88)
0 to 100 gain (89)
100 to 500 gain (52)
500 to 1000 gain (20)
1000 to 3000 gain (19)
>3000 gain (8)

Transportation and utility corridor
Industrial neighbourhood
Other

Data compiled from 2014 Municipal Census

HORSE HILL

BLATCHFORD
DOWNTOWN
OLIVER

RIVERVIEW

DECATEAU

City of Edmonton 2015 Growth Monitoring Report - Map of Edmonton: all neighborhoods showing population increase or decrease from 2009 to 2014 (The Edmonton Journal 2016)

Planned Growth

Edmonton, for the last 8 decades, has become a city built for the automobile. The personal auto-mobile is currently the most popular form of transportation for Edmontonians (City of Edmonton Census, 2016). It is also favorable for citizens living on in the suburbs of Edmonton who commute to work and school every day. Looking at the largest growth neighborhoods in Edmonton, they fall under the category of urban sprawl. Despite a dispute over the precise definition of sprawl there is a "general consensus that urban sprawl is characterized by [an] unplanned and uneven pattern of growth, driven by multitude of processes and leading to inefficient resource utilization (Bhatta et al. 2010, 30). The last three undeveloped neighborhoods on the edges of the city (Decoteau, Horsehill and Riverview) currently host an ecosystem of farmer's fields and woodland to be developed. For these three new areas, a total revenue for 50 years is expected to be $9.2 billion. Total expenses including operations, maintenance and renewal for 50 years, is expected to be $10.6 billion. Building homes in these neighborhoods will result in a $1.4 Billion net loss. The loss is subsidized by local business and other homeowners (Stolte 2016). Additional costs to the city government also stems from the necessary geographical proximity to new municipal amenities for its residents. The initial cost to developers is an approximate $3.8 Billion investment. The city would be responsible for:

- $519 Million to upgrade and maintain roads

- $347 Million for City of Edmonton Recreational Facilities

- $105 Million in waste facilities and trash collection

- $95 Million for a bylaw mandated 396 park spaces

- $65 Million for 5 Fire Stations

- $47 Million for 2 Police facilities and equipment

- $36 Million for two libraries
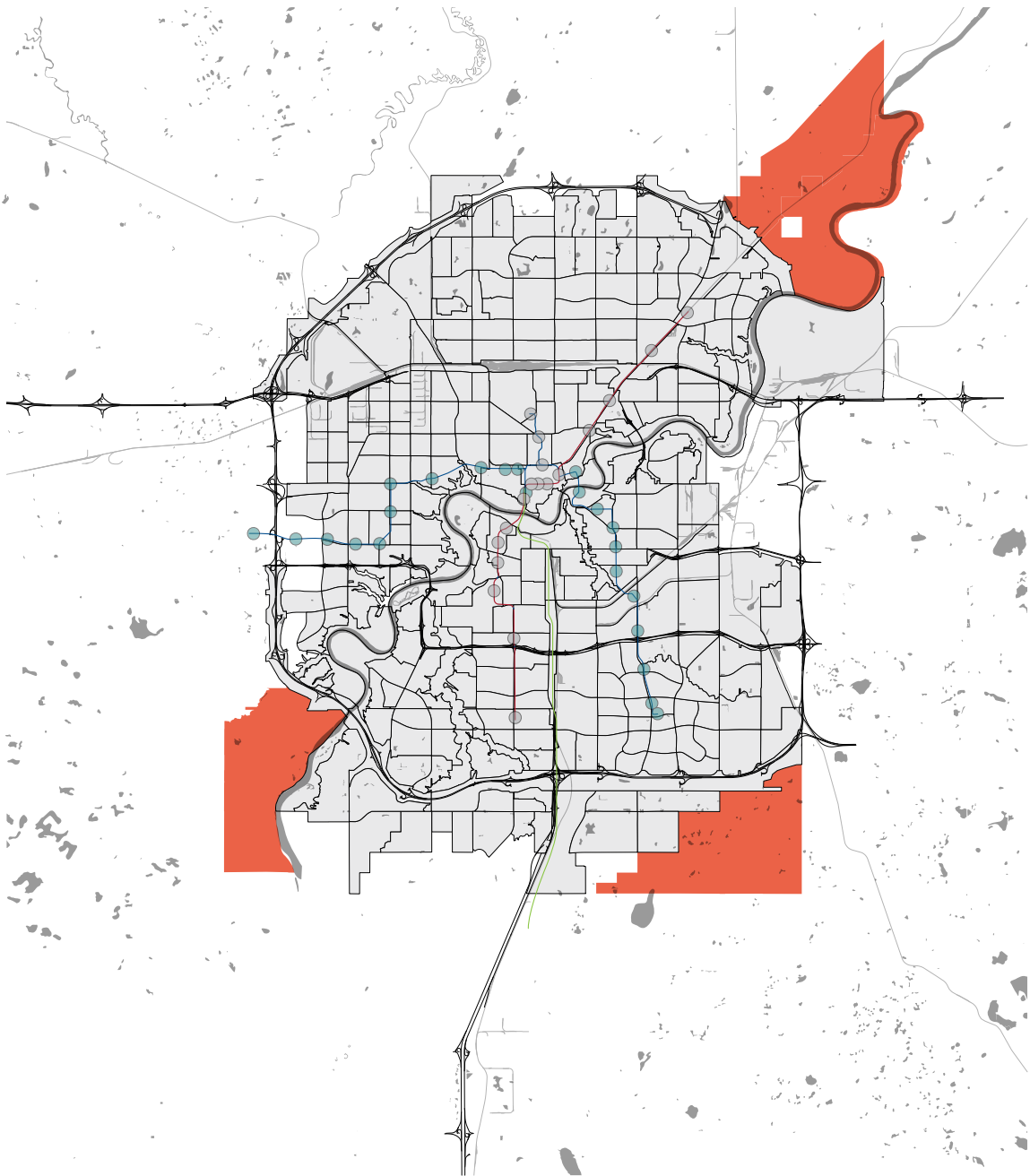
Map of Edmonton: Diagraming the three undeveloped neighborhoods including the existing and proposed LRT lines in Red and Blue respectively, and the potential High Speed Rail Corridor in green. (Open Street Map Data 2015)

The revenue generated from these neighborhoods will not outweigh the cost of low density, sprawling neighborhoods, extended road, sewage, and water infrastructure to be built and serviced. Typical sprawling growth for Edmonton is no longer a sustainable option.

Plans to Slow Sprawl

Drawing from the multiple data documents published by the City of Edmonton, three approaches (cycling, public transportation and designing for winter cities) are being discussed for the city's future. Each document acting as either a master plan or a set of design guidelines. Another influence for transportation growth contributing is Alberta High Speed Rail Incorporated, looking at the possible connection between Edmonton and Calgary via passenger rail in the coming years.

Edmonton is currently going to great lengths to connect the city through its ambitious network of light rail track and transit stations underway. This new LRT infrastructure is a major push to drive development back into the city where it becomes more affordable for the city. Developments are often attracted to major transportation hubs and the increased density promotes community livability.

Another large undertaking by the city is developing at the old Edmonton Downtown Airport which is bring shut down, re-zoned and planned as a new sustainably developed neighborhood. It provides a model for high density (upwards of 25 000 residents) and transportation modes that include connection by LRT, roadways, bicycle lanes and pedestrian walkways. The new project is named "The Blatchford Development" and is situated just north of Edmonton's Downtown Neighborhood and the thesis site.

Blatchford Development: Conceptual Renderings. (Perkins + WIll 2015)
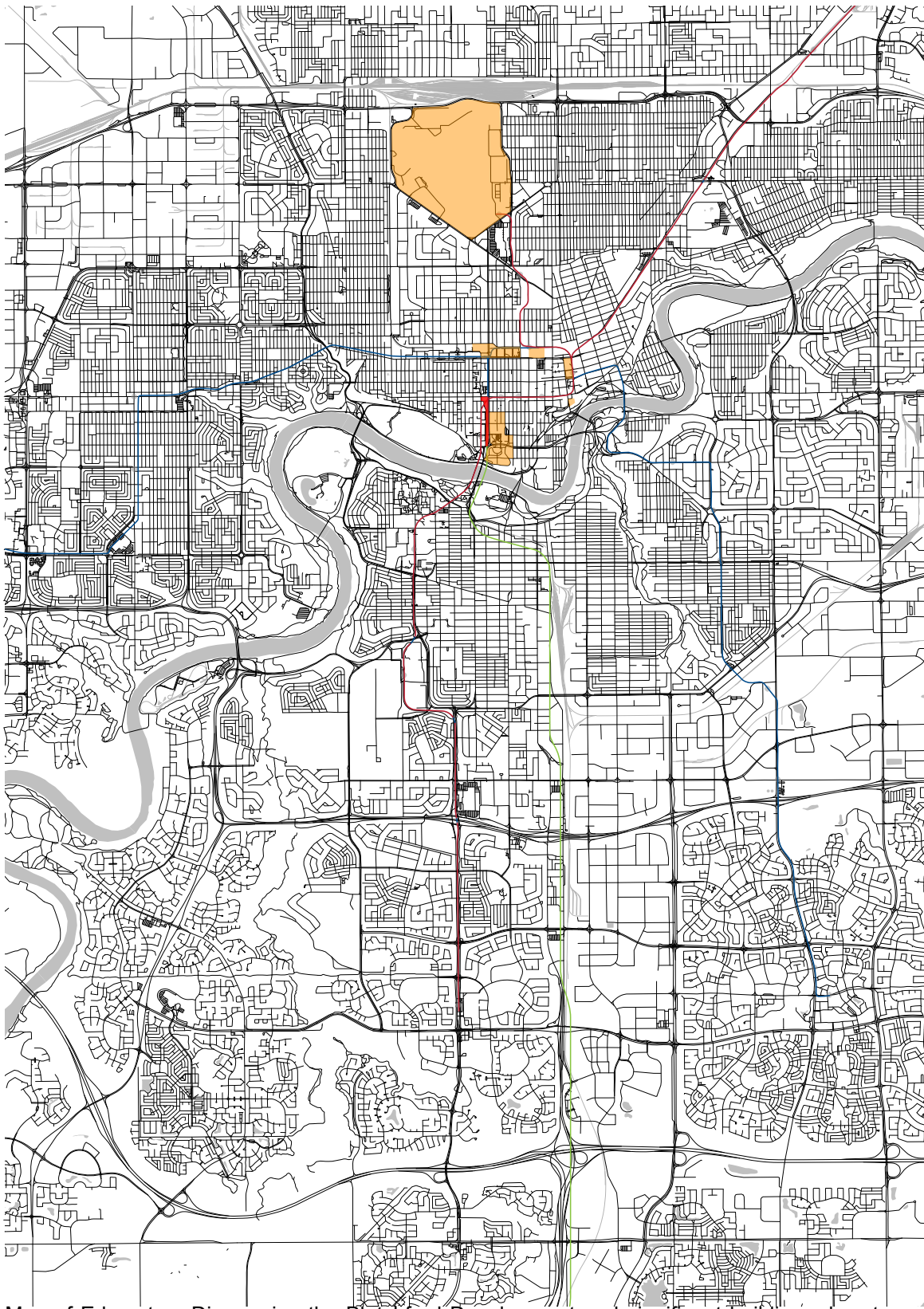
Map of Edmonton: Diagraming the Blatchford Development and significant buildings downtown. Also including the existing and under construction LRT lines in Red and Blue respectively, and the potential High Speed Rail Corridor in green. (Open Street Map Data 2014)

Shifting closer to the core, Edmonton currently has a difficult time harmonizing its modes of transportation. The city is undergoing a series of growing pains to see progress in the transportation sector regarding cyclist and drivers. Recently, local news outlets were covering the progress of the new bicycle lanes downtown, a city project approved for $7.5 million for over 7 Km of cycling lanes and traffic changes throughout downtown to be completed in 2018. This move comes on the heels of a feasibility study for implementing a bike sharing program; realizing the lack of safe cycling infrastructure available in the downtown core. Global Edmonton's news story covering the city's investment has run on their Facebook page making it publicly accessible online. The story peaked the animosity of the public. The friction comes from the motorists and active transport users alike who think this project is either a waste of money and effort, or a progressive step to sustainable urban transportation. Some of the comments included the possibility of cyclists having to "acquire their own license for operation of their vehicle, and contribute that money to the appropriate infrastructure". Others in opposition claim that the "separation between cyclists and motorists provides a more efficient commuting experience for both parties" while increasing safety.

This miscommunication comes not as a battle to be conquered by one party or another, but as an opportunity to be inclusive, and think about this infrastructure as a space for everyone. Com-

Future Downtown Bike Lanes: proposal for $7.5 million totalling 8 Kilometers. (Global Edmonton 2016)

muting by bicycle in Edmonton is seen as "alternative" in the sense that it does not conform to the original design of Edmonton as a city, however the city itself if going through an evolution.

Spaces for Every Mode

Data from STRAVA Labs through the production of their app that tracks cyclist and pedestrians across the world shows Edmonton's most popular active transportation corridors. There are especially high volumes crossing the High Level Bridge right between Edmonton's two densest neighborhoods, Downtown and Oliver. It illustrates the need for proper active transportation infrastructure and to consider it as a vital part of Edmonton's core transportation needs.

Vehicle and pedestrian counts from 2014 are available to the public that illustrate the number of daily commuters through our city accurately speculating the usage around the site selected for this thesis project. It is fine grain data of the number of vehicles and pedestrians through intersections around the site. Each intersection tells a story through data that illustrates how many
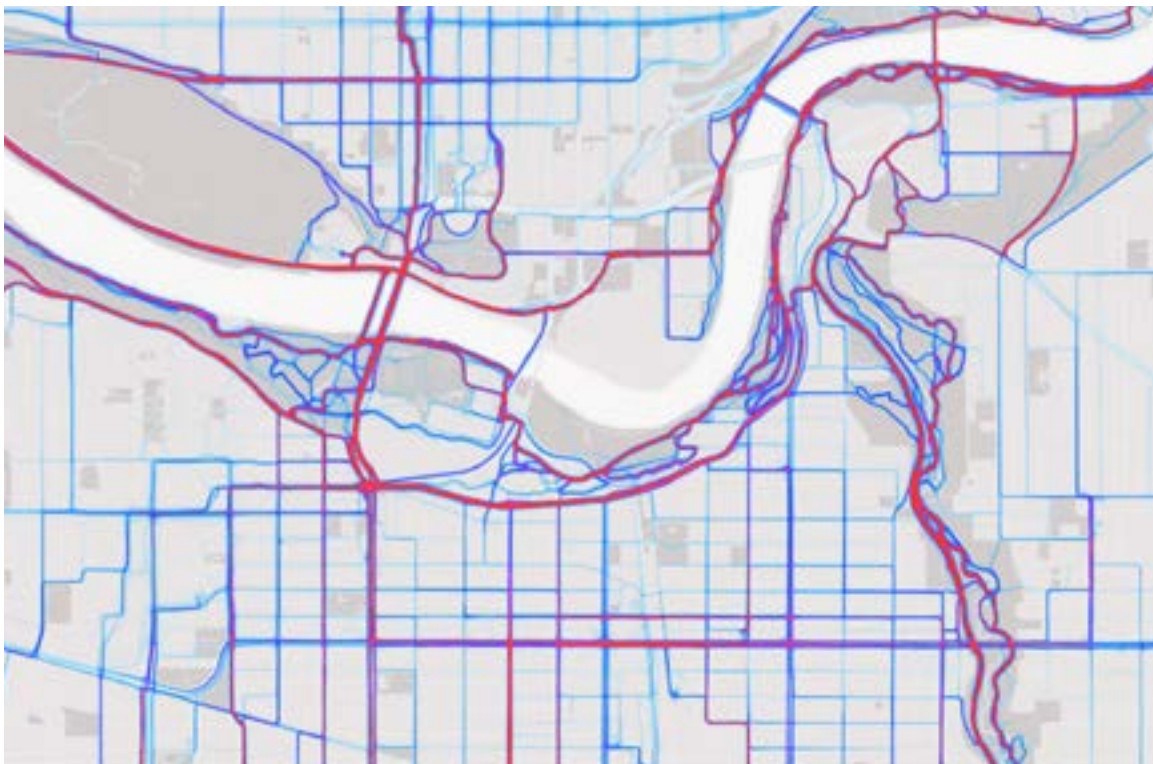

Map of Edmonton: Downtown and Strathcona neighborhoods showing the most used corridors for cycling and walking in red on either side of the North Saskatchewan River. (Strava Labs 2014)

people are using our existing road infrastructure and which ways they are moving through them. From this information it becomes essential to design further infrastructural implementations that respect the activity at its fringes.

A proposal for the Edmonton multi- modal Hub is an opportunity to turn a massive exchange into a pleasant and manoeuvrable space for the city and its commuters. The transportation pieces include:
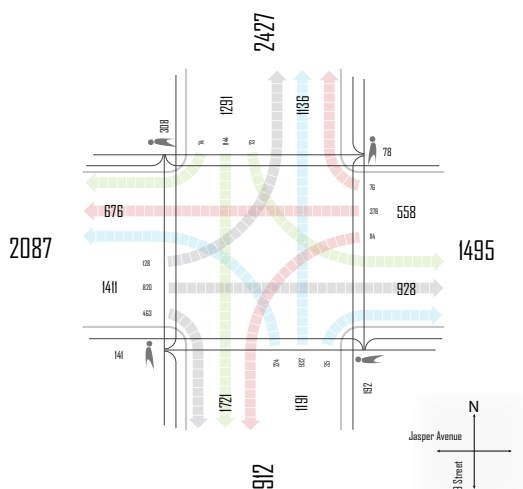

109th Street
& 97th Avenue

1. Intersection of Jasper ave. & 111 St.

2. Intersection of Jasper ave. & 110 St.

3. Intersection of Jasper ave. & 109 St.

4. Intersection of 100 ave. & 109 St.

5. Intersection of 99 ave. & 109 St.

109th Street
& 97th Avenue

6. Intersection of 97 ave. & 109 St.

Peak AM   Peak PM

Off Peak
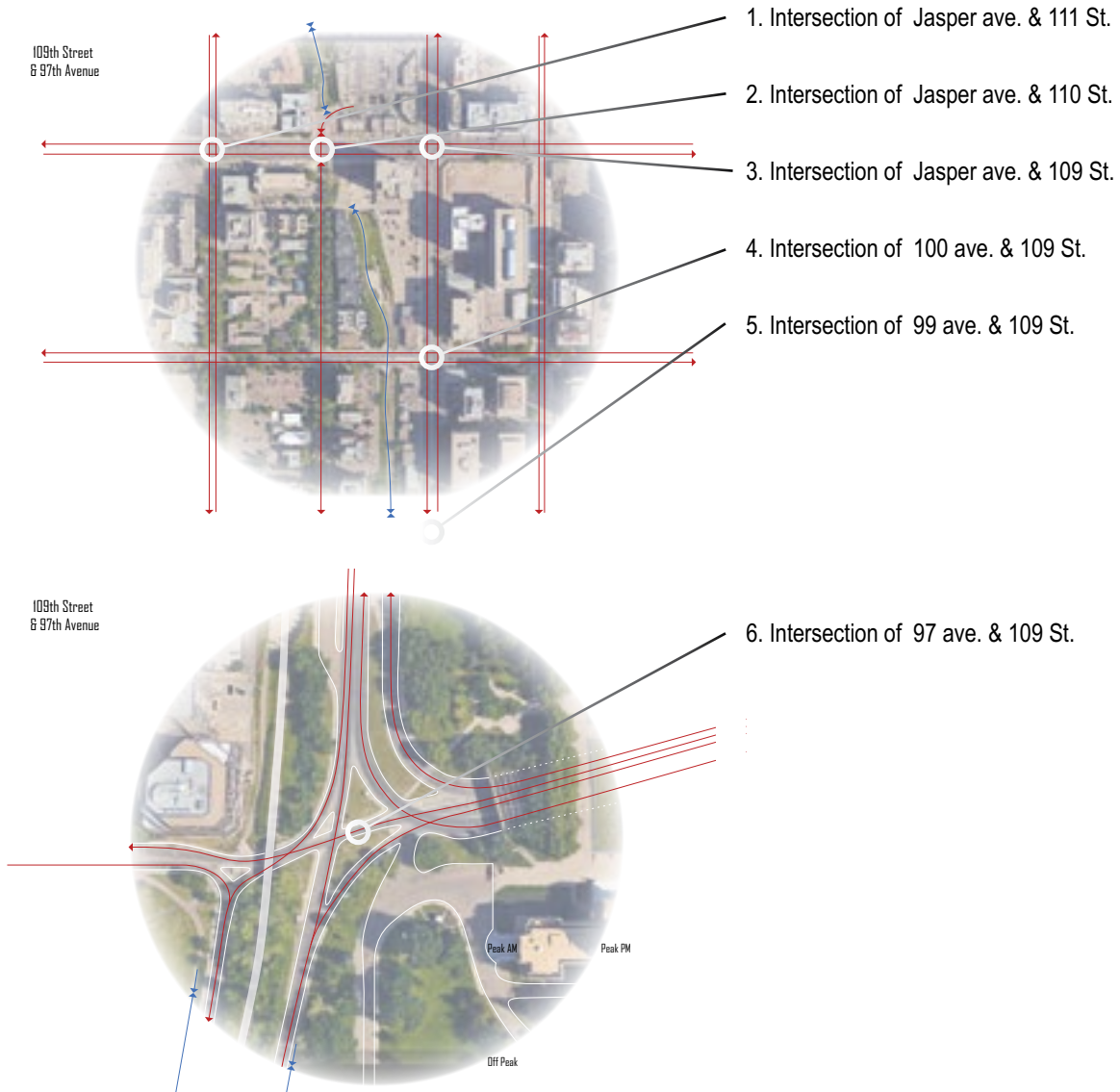
Thesis Site. Intersection Maps: Defining intersections of interest. (Google Satallite Imagery 2016)
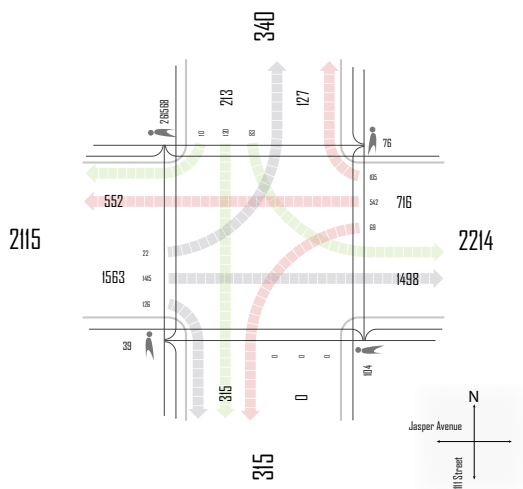
1. Intersection of Jasper ave. & 111 St.
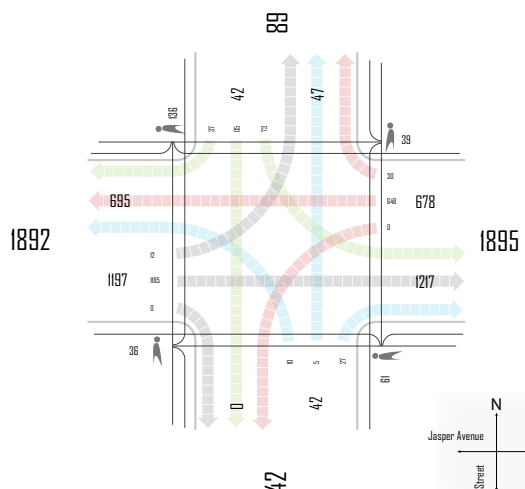
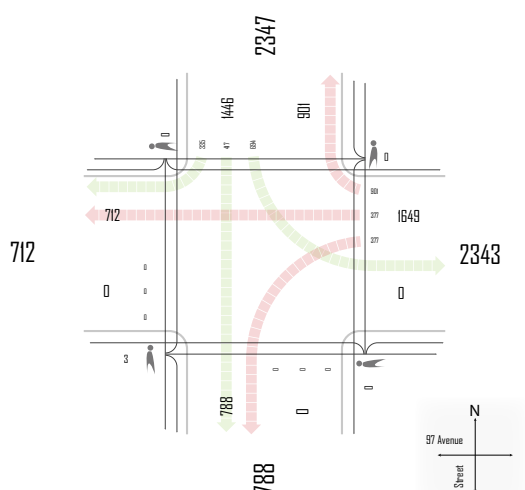2. Intersection of Jasper ave. & 110 St.

3. Intersection of Jasper ave. & 109 St.
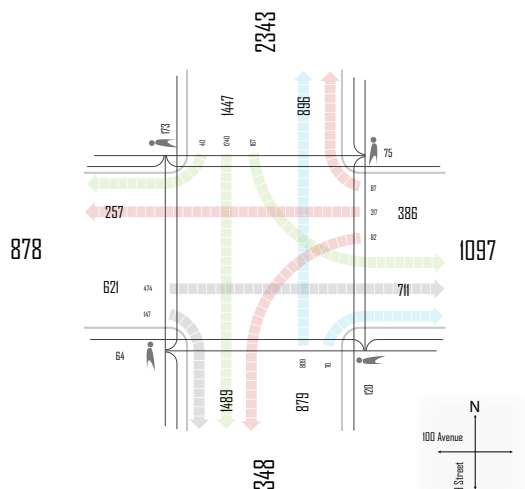
4. Intersection of 100 ave. & 109 St.
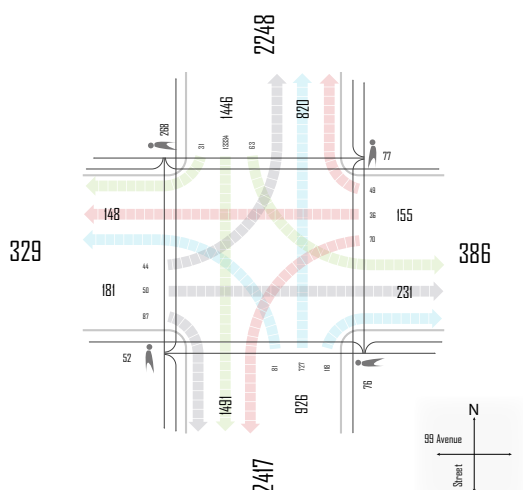
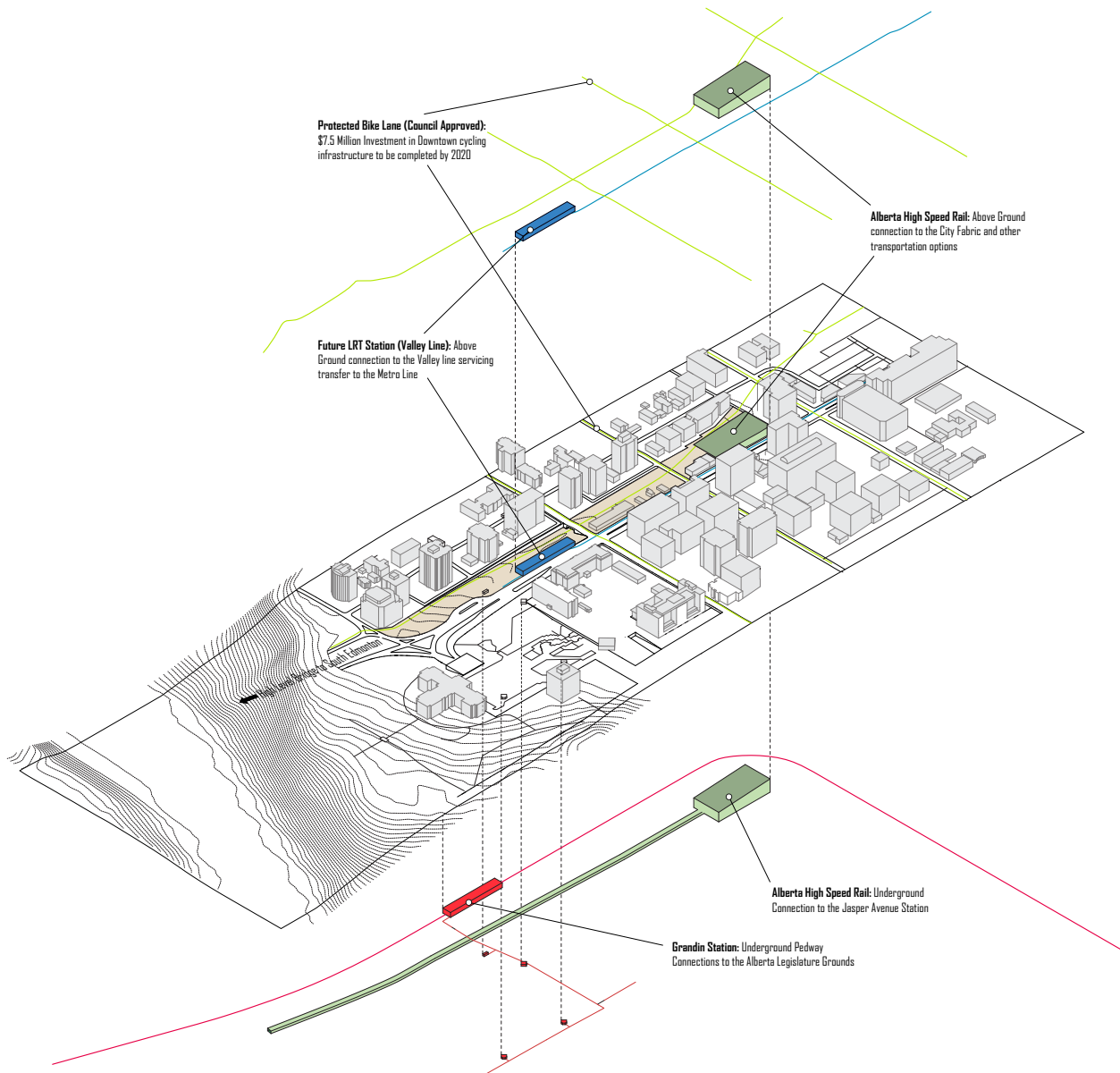

5. Intersection of 99 ave. & 109 St.

6. Intersection of 97 ave. & 109 St.

Intersections of interest: Defining peak hour traffic patterns for motorists and pedestrians. Data from (Edmonton Open Data Portal 2014)

- Edmonton High Speed Rail Station connecting to Calgary via Red Deer.

- Curb Level LRT stop for counsel approved festival line.

- Active Transportation corridor shared with cyclists, pedestrians and the Edmonton Street Car.

- Existing roadway network to be left in tact and connected to from the multi- modal Hub.

The interaction between provincial commuters, municipal commuters and people involved in re-creation or tourism on this site requires a precise allocation of movement in order to achieve harmony. These users do not want to feel forced into unnatural transportation patterns, thus the inclusion of all citywide activity is important to understand the functionality of the space.

CHAPTER 4: PLANNING FOR EDGE CONDITIONS

Protected Bike Lane (Council Approved):
$7.5 Million Investment in Downtown cycling infrastructure to be completed by 2020

Alberta High Speed Rail: Above Ground connection to the City Fabric and other transportation options

Future LRT Station (Valley Line): Above Ground connection to the Valley line servicing transfer to the Metro Line

Alberta High Speed Rail: Underground Connection to the Jasper Avenue Station

Grandin Station: Underground Pedway Connections to the Alberta Legislature Grounds

Historic Railway Corridor Diagram: In a present context, the portion of the corridor North of the North Saskatchewan River is shown with important transit networks. Data from (Edmonton Open Data Portal 2014)

Architecturally Responding to the Urban Landscape

> In regards to looking "lifelike" or what some would regard as organic, the hopes are that it becomes more fluid, adaptable and responsive to change . As a critique, the architect may generate forms that resemble nature, but preform very few, if any, of the dynamic structures and forces that exist in nature. If anything, the architect does not so much imitate the forms of nature as model the natural process of form generation. (Allen 2011, 20)

Stan Allen discusses how advanced architecture, in a way, is fighting to mimic a biological model. The new natural and organic however, is the immediate city around us. The most effective way for architecture to adapt through its surroundings is to consider the activities that exists at its fringes. Allowing fringe activities to infuse new infrastructure with embedded information about their origin and purpose, will produce a more informed circulation design.

Swooping spans that resemble wind and the river over a gridded core, or a curvilinear pinch point at the end of a large mass to imitate a drop of oil are examples in Edmonton that have adopted the narrative of a cities identity at the scale of large civil infrastructure. These examples lend themselves to the Art Gallery of Alberta, and the massive Rogers Place arena home to the Edmonton Oilers professional hockey team. But what if we can push architectural expression to emote a deeper identity of a city? What if it spoke true to the neighborhood in a present and future sense that reflects its culture of movement?

The Preferred Transportation Methods of the Surroundings

Thinking of this relationship between the biological to the geological, a parallel trend to form generation looks not at the biology of individual species but to the collective behavior of a transportation systems as a model for cities, buildings, and landscapes. Treating our public realm as an entire ecological system using the notion of a "landform building" opens the possibility to transcend the traditional architectural scales and include time as a factor that is ever present in our cities:

> Architecture is situated between the biological and the geological - slower than living beings but faster than the underlying geology. Resistance and change are both at work in the landscape: the hardness of the rock, and the fluid adaptability of living things. (Allen 2011, 34)

Envisioning Fringe Spaces

This looseness or "loose space" as Caroline Chen refers to it is a crucial and completely natural part of a functioning and healthy community. To dive into the programming of loose spaces, it is important to understand two things about Chen's essay in Insurgent Public Space. First, the site of study that is Beijing, does not stand still. With a population around 15 million and a transient community of foreigners, Beijing is witness to similar visions of New York or London. Active Beijing residents are fighting to carve out public space within the vastness of their city to claim as their own for activities that bring them together. Second, this loose space results when residents liberate designed public spaces such as parks, plazas and parking lots from the limits of the original, intended program and piggy-back new and foreseen functions of their own choosing on the space.

The excitement of this guerrilla urbanism is perpetuated by a dynamic that dates back millennia. Is the variety of this activity in these loose spaces a tribute to the flexibility and creativity of the residents of Beijing, or is it an implicit critique of existing city design? I feel that these two mentalities manifest in a spectrum of activity that can sometimes be defined as both a critique and creativity. Chan promotes the community value in these loose spaces, and explains its role amongst non-architects:

Looseness in a city expresses the desires of users – such as the elderly – that may otherwise be overlooked by designers and planners. Not only do these "loose spaces" provide a forum for residents to articulate their spatial needs for daily taichi and yangge, they also allow others to have little access to the planning process to appropriate to open-endedness of these spaces for their own needs.

To study the Beijing residents, or residents of any city for that matter, we must divert our focus from the monumental markers of city in transformation to the daily activities of people who inhabit the ground. Chan and her colleagues focused one of their four areas on the Mingguang Qiao, a concrete pad underneath a freeway overpass. Large concrete columns support the freeway overhead, while doubling as a backdrop for musicians and dancers at this wide flat space. Yangge is a dance originating from the peasants in northern China holding deep political and religious values that manifests as a modern act to promote community involvement at any age and healthy living. Here at the Mingguang Qiao, it would seem a deserted and uninhabitable space until matched with the special typologies required for Yangge: (1) Flat, paved areas; (2) Overhead lighting for

evening activity; (3) Overhead protection from the sun during the late morning; (4) large enough to accommodate 30 – 60 dancers; (5) distance from residential and office buildings due to excessive noise being produced .

While producing civic space attached to public infrastructure, what do the Yangge dancers at Mingguang Quio have to teach us while considering a transit hub in Canada? Beijing residents are actively tailoring a city to fit the contours of their everyday lives, defining spaces for the old and the young. This form follows culture, and just like Allen stated, buildings (or infrastructure) are "hard, stubborn and slow". What gives life and meaning to its existence is the "collective behavior of ecological systems" that inhabit the area that has been designed. The most interesting thing about Yangge dancers is that their cultural activity gives meaning to a place designed out necessity in a way providing more significance than the engineer of this overpass could have ever conceptualized. In a reverse engineered proposal of this phenomena of guerrilla urbanism, I would promote the ground up approach understanding the significance of spaces carved out in a densifying area of the city. What would it look like to design these fringe areas and leftover space while cramming the transportation infrastructure in-between the voids reversing the hierarchy of space?

The complexity of my site proposes multiple connections at the level of provincial rail traffic meeting neighborhood rail lines, and proposed active transportation corridors. Much like the Yokohama Port Terminal, the site functions as a level of infrastructure and public amenity, shaping and channeling the moment of passengers while it creates new public space at the city's core. How then can this intricate transportation infrastructure be thought of as an opportunity to grow from existing public space informing opportunities in the build landscape of the site? The complex choreography of movement, service and public space crave a form of landform building that becomes relatable and relevant as the programming becomes introduced over the site. "Urban infrastructure," James Corner writes "sows the seeds of future possibility, staging the ground for both uncertainty and promise. The preparation of surfaces for future appropriation differs from merely formal interest in single surface construction. It is more strategic, emphasizing means over ends, and operational logic over compositional design." This operational logic is what I hope to embody as staging for the Edmonton transportation hub leading up to and after its completion.
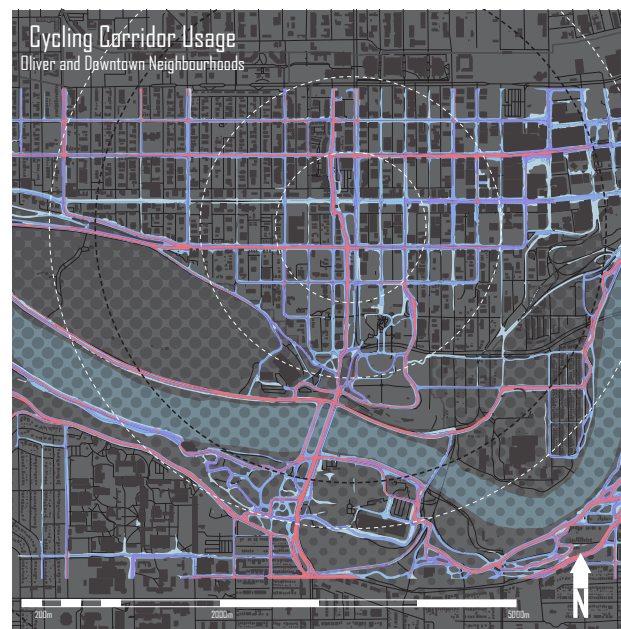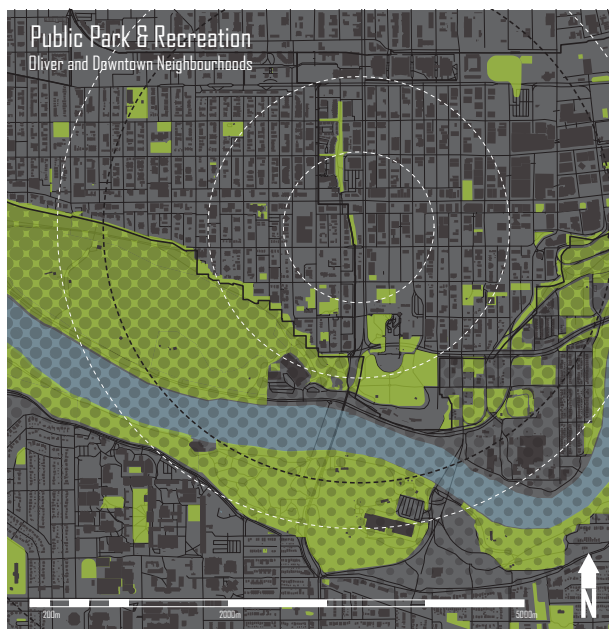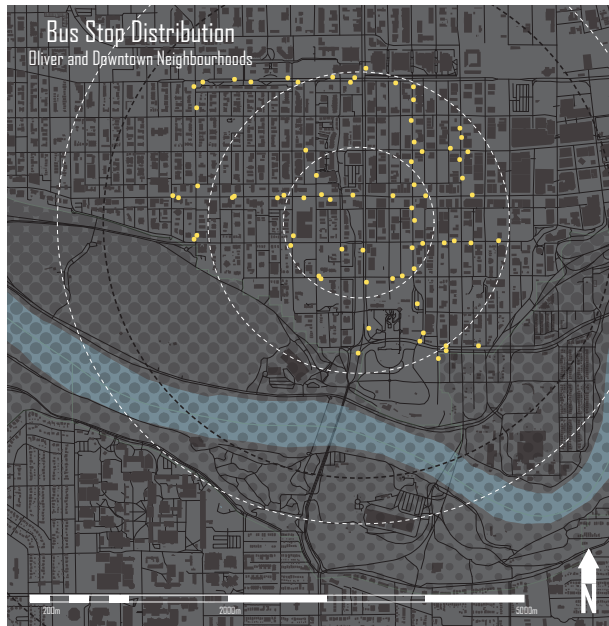
The Impact of Transit on Community Livability
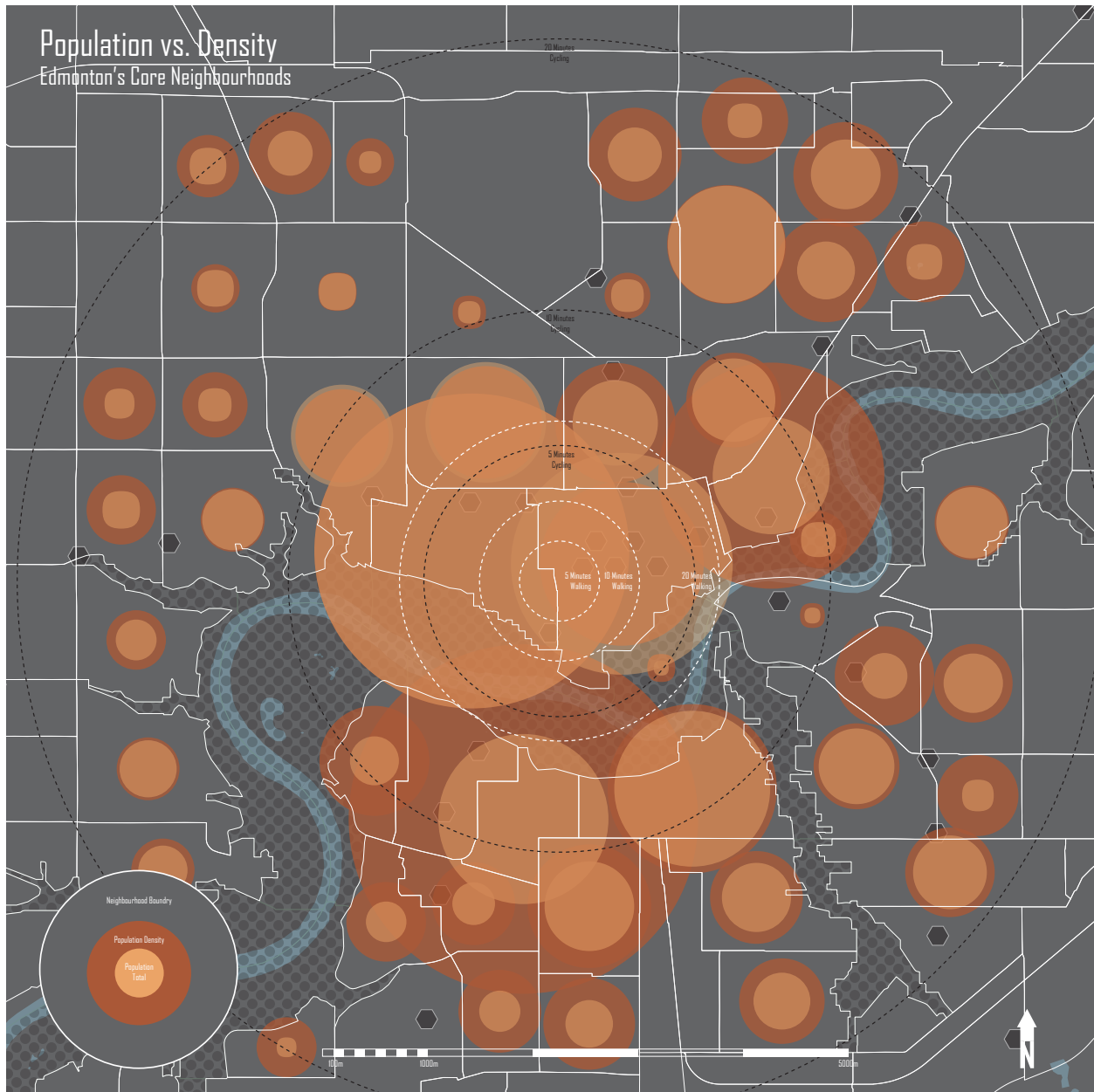
Population versus Density: Mapping exercise to compare Edmonton's densest and most populated neighbourhoods. Data from Data from (Edmonton Census Tracts 2016)
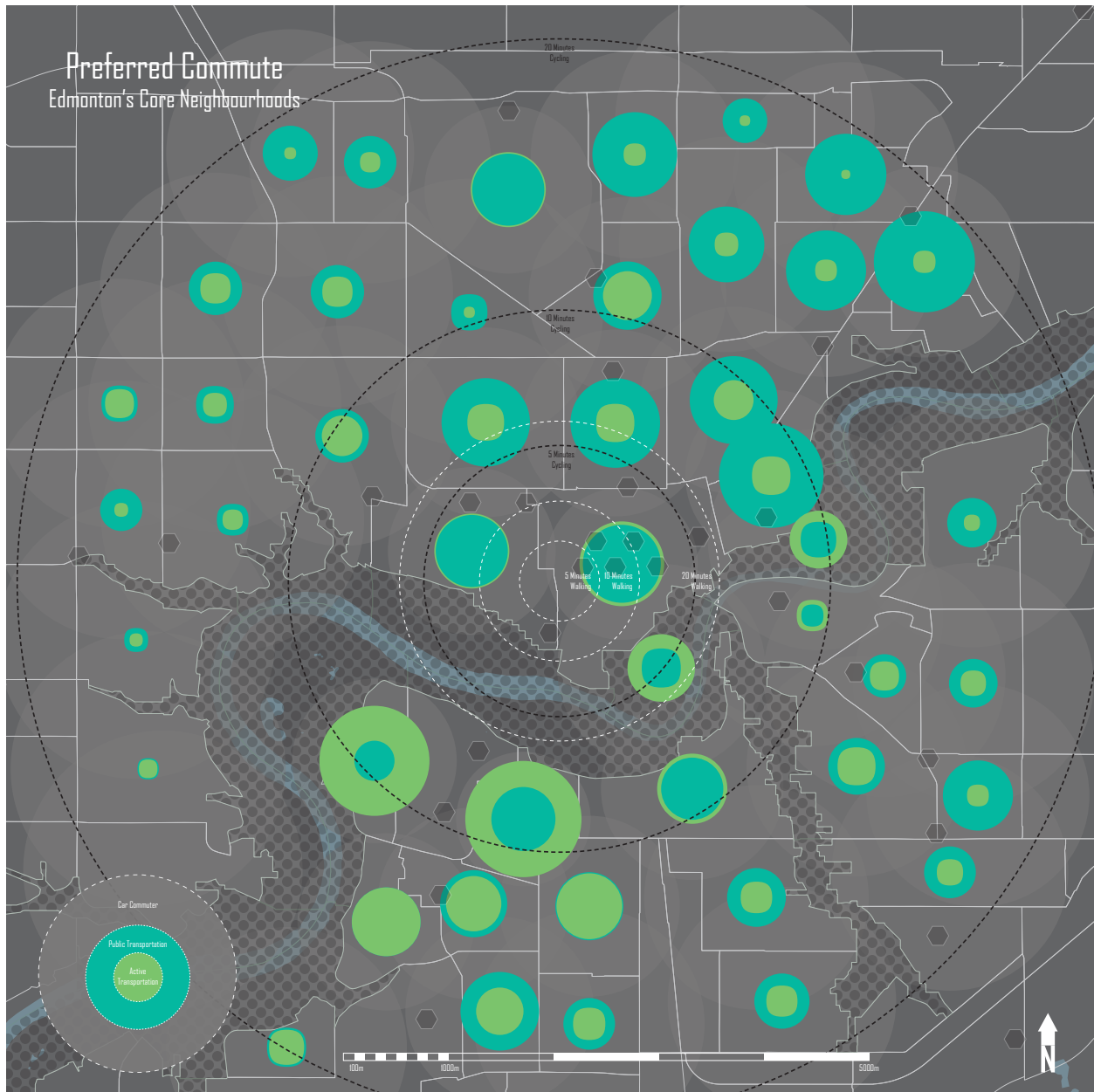
Preferred Commute: Mapping exercise to compare Edmonton's most popular forms of commuting to work. Data from (Edmonton Census Tracts 2016)

Neighborhood Attributes: Mapping exercise to illustrate important elements that exist around the thesis site. Neighborhood boundaries and data from (Edmonton Open Data Portal 2014)

Liveability can become a contested issue mostly depending on who is supplying the definition whether it is academics, policy makers, or a private provider (Lloyd (2016) believes there is an important role of developing policy to enhance liveability as a way to manage sustainability and preserve functional and strong communities who's role can change at different points in time. When one talks about the impact of transit on this topic, it can be assumed that it has a vital gap to fill in the discrepancies between classes and commuter. Cited from Miller et al. (2016) An ef-

fective transportation network is an essential driver for the economic and social development of a city. Transportation systems have been described as the "lifeblood" of cities in recognition this critical role (Vuchic 1999). Quoted from Miller et al. (2006) Manheim (1979) wrote on viewing transportation systems as holistic entities, with a focus on multimodal solutions that take into account social, economic, political, environmental, and other considerations . All of these become important when discussing success in a transit system, however this paper will dig deeper into the social considerations, specifically social liveability.

Once again, from Miller et al. (2016) the 'triple bottom line' discusses the issues of sustainability in transit in three categories (Pei et al. 2010). They are defined as follows by Low (2003):

- Environment: the environmental or ecological dimension considers the impacts of human activities and developments on changing local and global environments

- Economy: the economic development is the process of a community's growth or progress towards economic goals, such as increased wealth, employment, productivity or ultimately welfare

- Social: the social dimension of sustainability often is described as dealing with issues of equity and inclusion (Low 2003).

Using the two concepts from the social branch from the 'triple bottom line', equity and inclusion, we can discuss the implications of this vital part of the transportation system. It begins to ask important questions about whether access to transit is a human right. Wellman (2012) argues that access to transportation is determinative of many quality of life indicators like health, employment, and education. Without the ability to travel within cities, individuals are effectively barred from resources necessary for empowerment, societal engagement, and productivity . Quoted again from Wellman, "Thus, lack of car ownership and inadequate public transit service in many central cities and metropolitan regions with high proportions of 'captive' transit dependents exacerbate social, economic, and racial isolation, especially for low-income people of color" (Bullard 2003 para. 6). These transportation deserts undoubtedly make it extremely difficult for citizens to maneuver their community, effectively impacting the liveability of a community negatively. If the residents of a community have little to no access of essential services, then the standard of living drops substantially. Planning of transit systems alone does help to provide access for people, but they are

seen to go hand in hand with social engagement and interaction if they are to be most successful.

Drawing from Lloyd (2016), what are the implications for planning and delivering more liveable communities? Walters and Rosenblatt (2008) believed these changes to be a contemporary re-configuration of the ideal of community and how people engage with community on a daily basis. This plays directly into what Wellman (2016) discussed in his paper, emphasizing the unique programs and actions some transit agencies have implemented to address, stem, and correct transportation accessibility imbalances . In one of his four case studies in a small metropolitan area in the Deep South of the United Stated, reflects a creative, unique approach to quality of life improvements for transit dependents and illustrates the promise of collaborating and networking with area non-profits as well as transit authority. Wait times, as notoriously published by the local newspaper, can at times exceed two hours, exacerbating already-long travel times and reducing riders' ability to seek preventative health vcare from other community resources. At the agency's terminal, and at no cost to the individual, they can be tested for AIDS and other sexually transmit-ted diseases and prostate cancer as well as discuss personal nutrition with a Registered Dietitian. Proximity in poorer regions if the United Stated prevents many of the community members from accessing essential services, labor opportunities, and with the long wait times for simple day to day operations are less likely to seek improvements in their livability.

This section introduces the impact that transit has on community liveability. Liveability, although contested in definition between different groups, was defined loosely from the 'triple bottom line' from Lowe (2013). Equity and inclusion became topics of discussion, and how transit may provide one with livability aspects relating to human rights. When combined with an important activity per-taining to health and wellness, transit takes on a new meaning. It does flip the accessibility and service dichotomy on its head, but proves that there is an important relationship between the two.

CHAPTER 5: DESIGN

This thesis has a foot in two worlds, Architecture and Urban Transportation Planning. The urban transportation planning data from chapter four is helping to describe a story of movement and trends at a city scale while the architecture is orchestrating the movement at points of potential chaos. The design of the project will be broken into two main components, the Urban Surface and the built architecture of the transit hub. The Urban Surface provides movement in the larger areas for all modes of transportation while the architecture is the machine that provides the exchange from one mode to another. Programmatically I am designing the infrastructure that is to exist for the necessary movement of people first and foremost. I do this while suggesting appropriate activities and amenity that can be developed in the space in and around the multi- modal transit hub that are activated as a by-product of the necessary architecture.

The behaviors of the intersections between urban planning and architecture start to convey a narrative that drive the necessary steps of the design. If you imagine that each individual interacting with the transit hub has a unique journey through the city, what would it look like to track that movement as individuals traverse the proposed urban landscape?
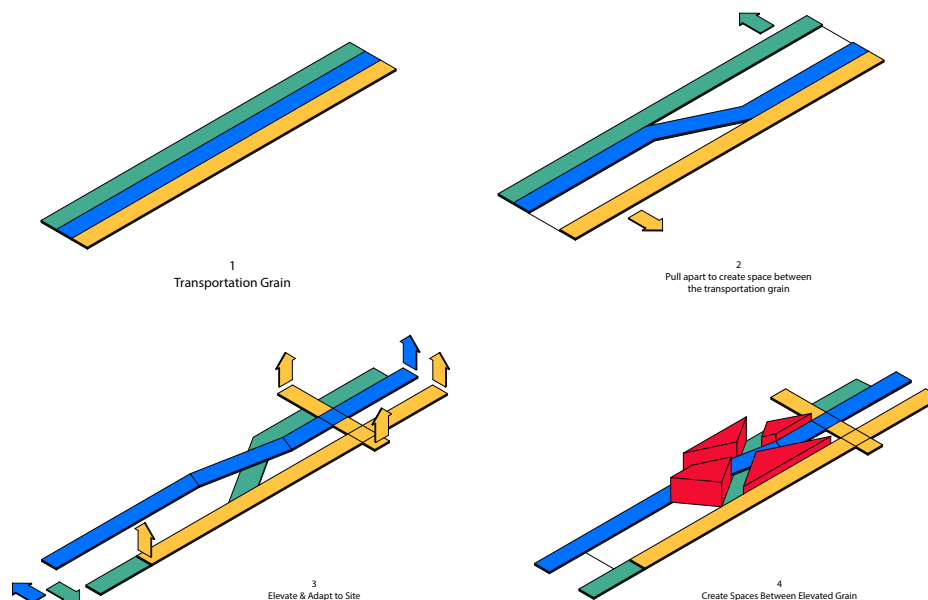
Design Principles: Diagram of design strategy for transportation flows.

The three sections to discuss for designing the transit hub are the Individual Experiences of the commuters, the Network Flows that exist to assist individuals in movement, and the Junction Points that transition and orient the transit users. Much consideration went into the data and analysis of understanding the actions and requirements of the first two to generate the architecture of the latter.

Individual Experience

To better understand all individuals participating in the system, a cast of characters helped to define a narrative that describes their unique needs from the beginning of their commute to their destination. This in turn could act as a final check to confirm that their movement between stages at the transit hub could be well articulated. In this approach, it becomes clear that the users are defining the requirements of the system that then get to fulfill their role as a final test.

The characters defining the system can be seen below:

High Speed Rail Commuter

Active Transportation Commuter

Pedestrian Commuter

Pedestrian Commuter

Pedestrian Recreation

Light Rail Transit Commuter

Motorist

Recreation Field

Municipal LRT

Pedestrian Corridor

Plaza +1

Lobby +1

CITY

Active Transportation Corridor

RAPID TRANSIT

Lobby -1

Vehicle Drop Off

Amentity
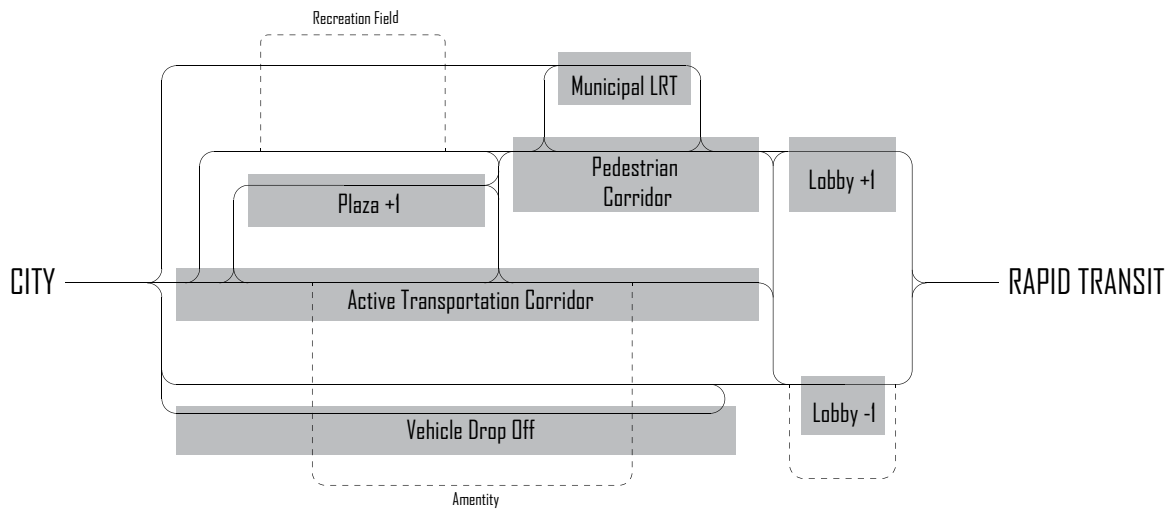
Circulation System Diagram of transit Hub: Each gray box contains a built area of the hub that carries a transit mode for users to navigate between represented by the lines. The dashed lines show where the no transportation programming are located in the system.


	HSR Day Commuter	Edmonton to Calgary (City to Rapid Transit)
	Active Transportation Commuter	Home to work (City to City via Active Transportation Corridor)
	Pedestrian Commuter	Home to work (City to City via transit hub)
	Pedestrian Recration Walkser	Home round trip (via Dog Park / Plaza)
	LRT Day Commuter	City to City (via LRT)
	Pedestrian Recreation	Recreation destination (Market)

Six narratives: Types of commuter and their basic route from home to destination.
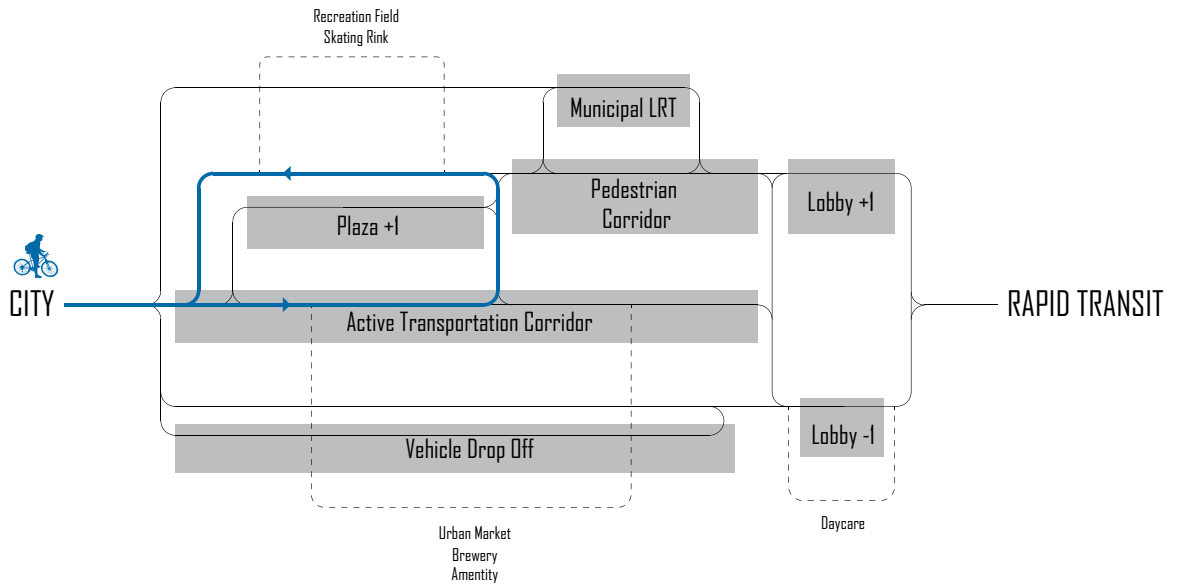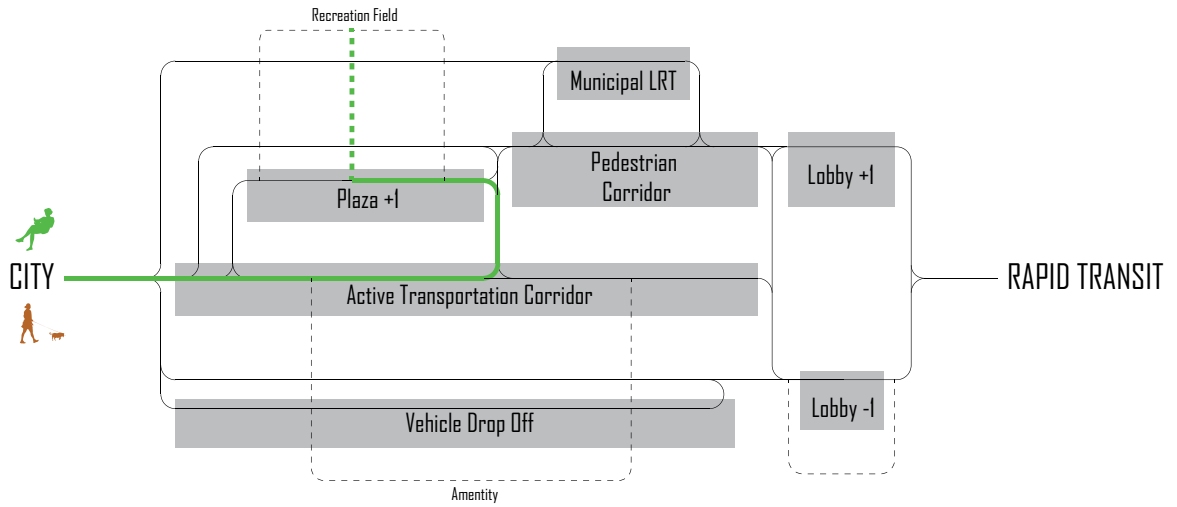
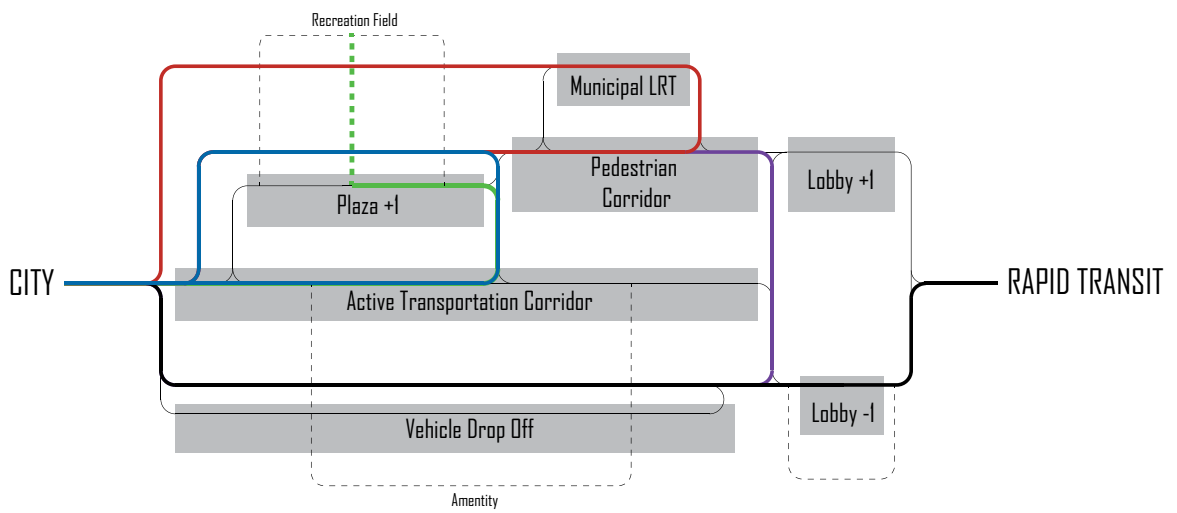Active transportation commuter.
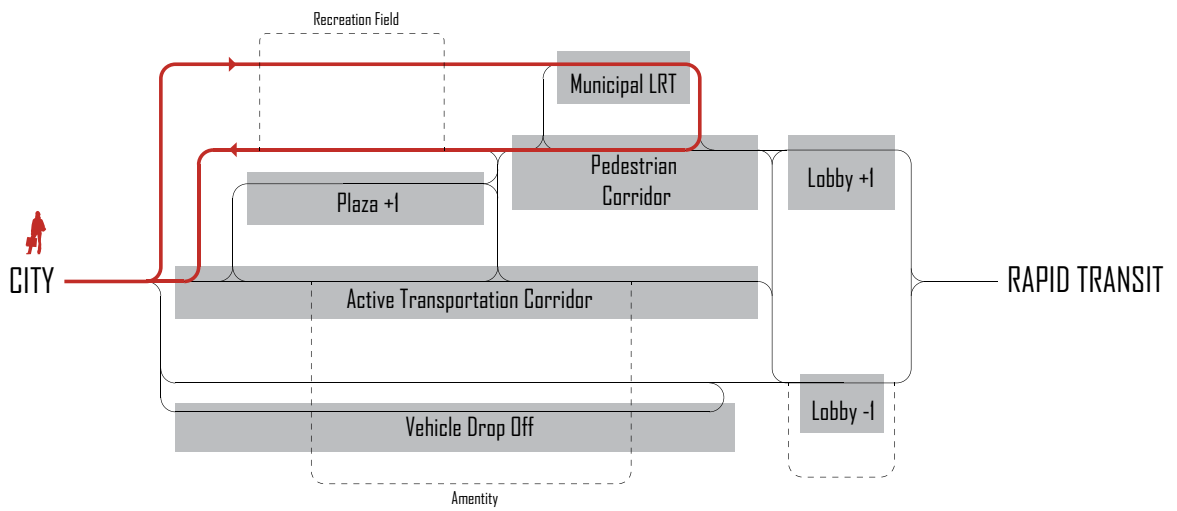
LRT commuter
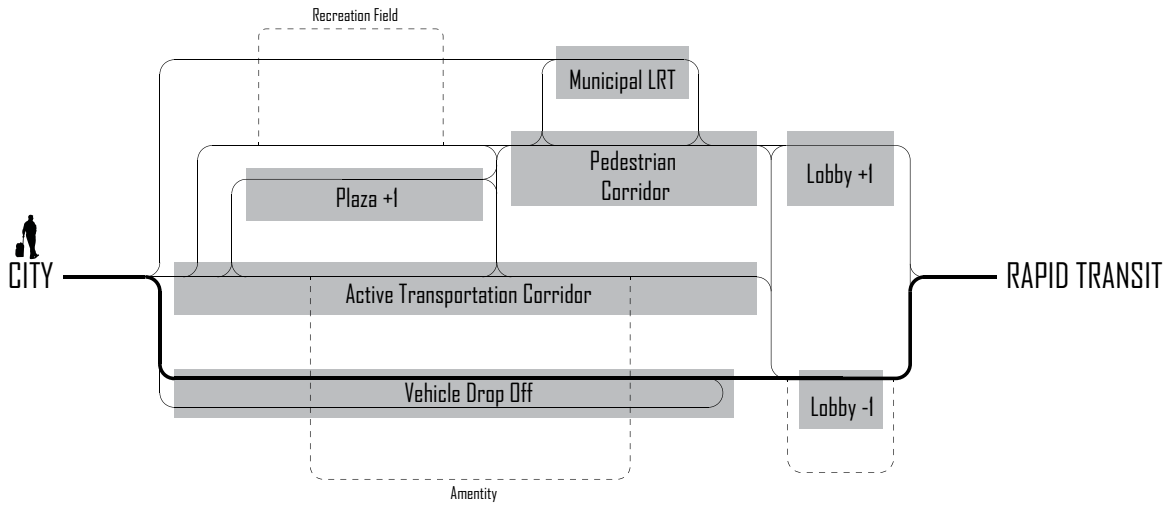
High speed rail commuter.
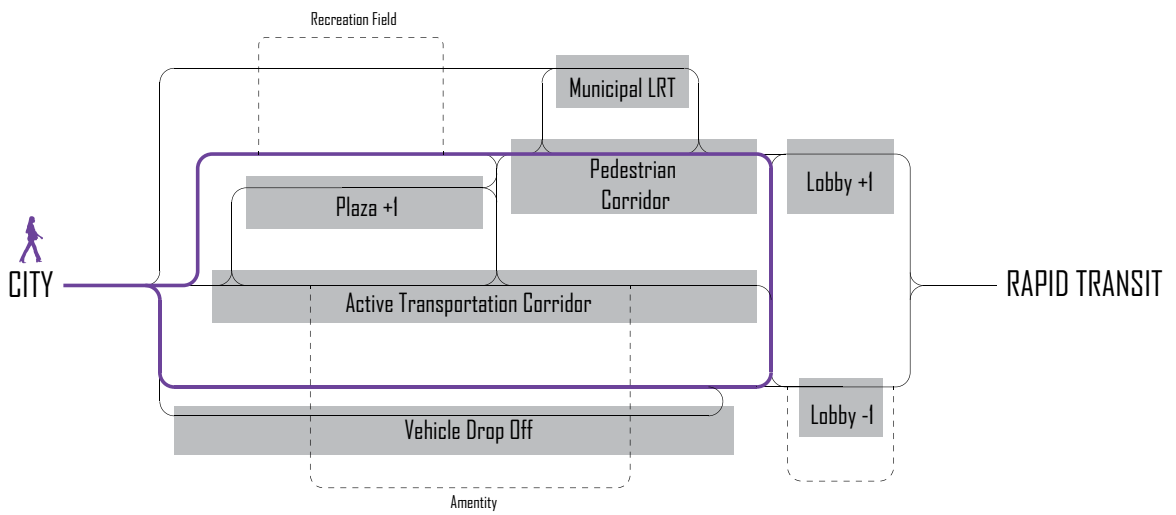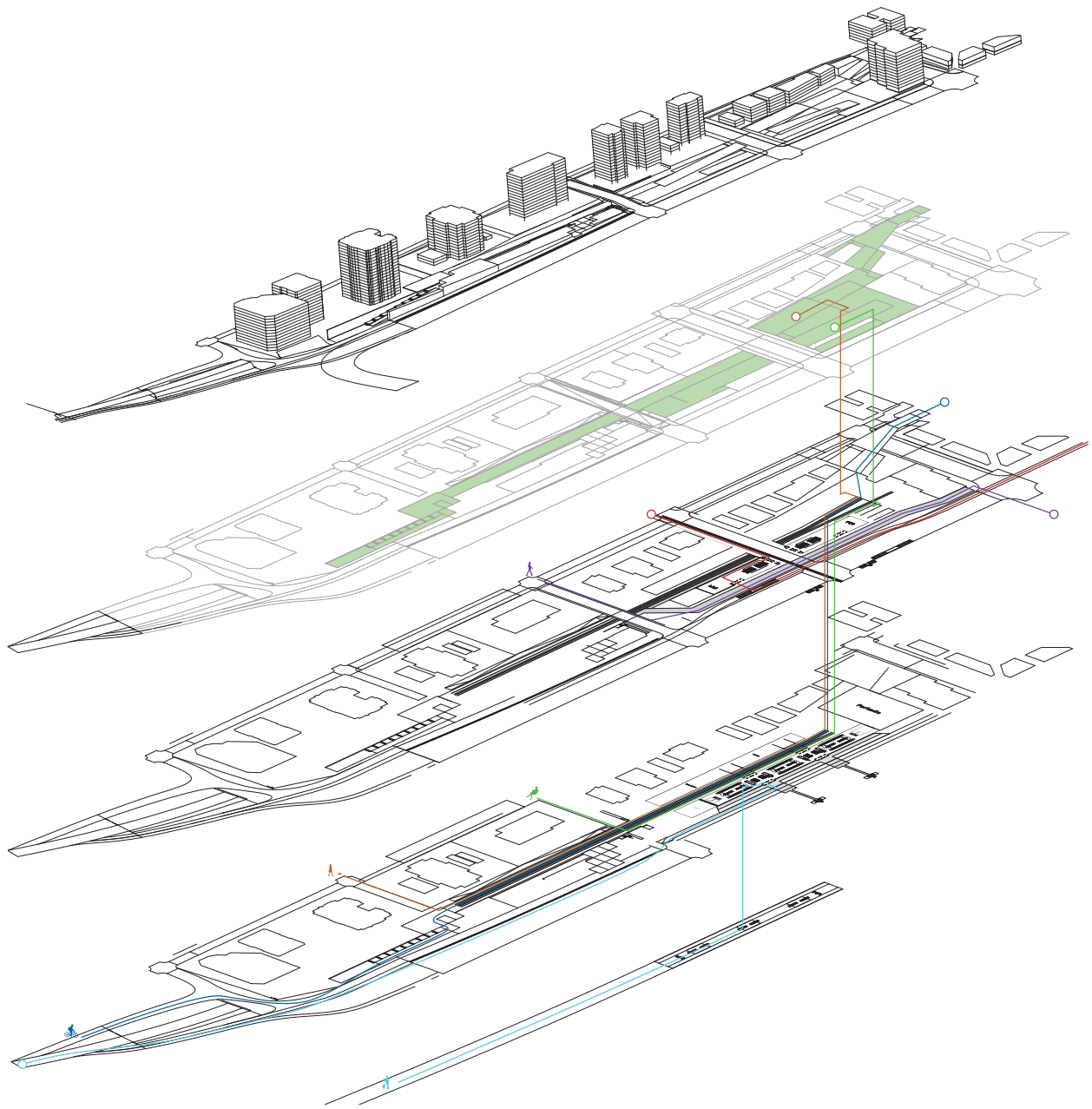

Pedestrian Commuter.

Residents using recreational facilities.

All commuter examples overlaid.

Commuter Characters integrated into site context.

Network Flows

The network flows are a collection of zones in which the characters are commuting through. Each individual mode dictates the allocation of that specific zone. These zones specific to a mode are classified as: Walking, Cycling, Driving and Rail (Light and High Speed).

Each zone is represented in the isometric drawings that color codes its use (fig. Xx). The initial planning exercise of distinguishing the different flows and optimizing them is a key part of achieving a high functioning system. Traditionally, each mode can be classified based on its exclusivity of right-of way. The following table describes the instances of class A, B and C right of way which plays a major role in ease of movement for individual modes.

When designing a new streetscape to incorporate Class A right of way across multiple transportation modes, it can cause a shortening of the cross streets to provide extra room for added infrastructure. The diagram on the next page illustrates the difference in changing from the existing system to a Class A. When incorporated into the area of the site, it can be achieved with little to no change in the width of the street. This is an important element to retain since it would disrupt the already established car network that Edmontonians rely on. The goal is not to replace one with another, but rather provide more and better options for commuters of all types.

	Class A Exclusive right-of-way and separated from cross traffic	Class B Exclusive right-of-way, NOT separated from cross traffic	Class C Mixed with traffic, including mixed with pedestrians.
Rail	Most rail rapid transit, using "third rail" power sources. Most classic "subway" and "metro" systems.	Most "light rail" in surface operations. Parts of some European and Australian tram networks.	Most North American streetcars. Many European and Australian trams.
Bus	Separated busways: (Brisbane, Ottawa, Bogotá, Freeway bus/ HOT lanes.	At-grade busways: Los Angeles Orange Line, Western Sydney busways, etc.	Buses in mixed traffic

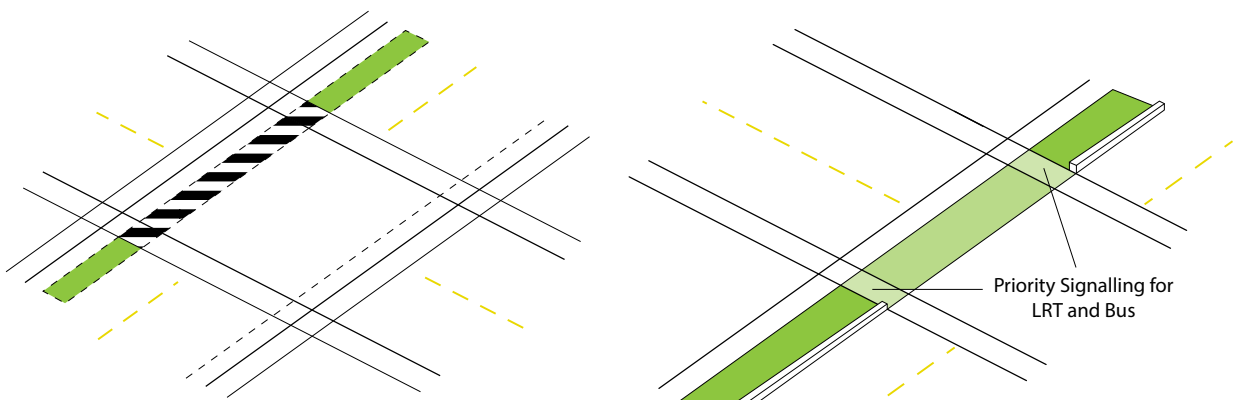Classes of Right of Way: Defining Class Characteristics (Transportation Research Board 2013)
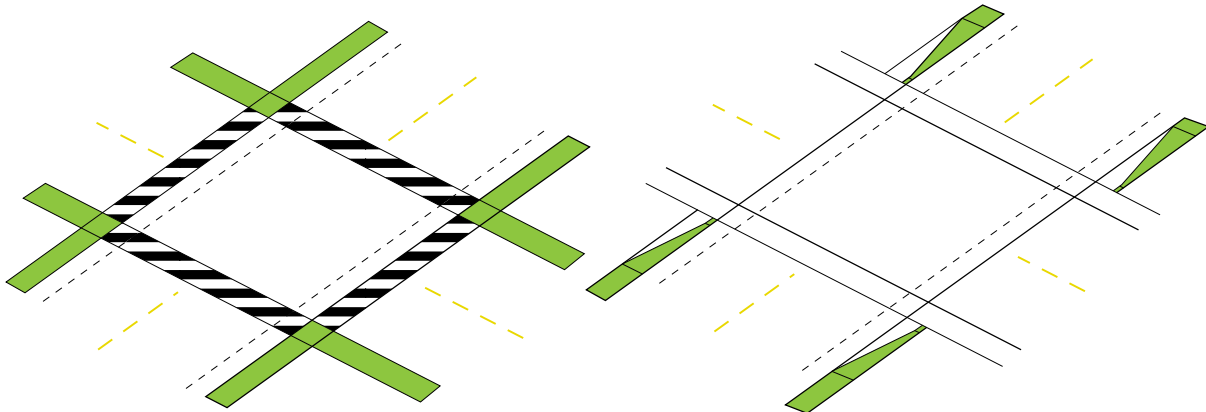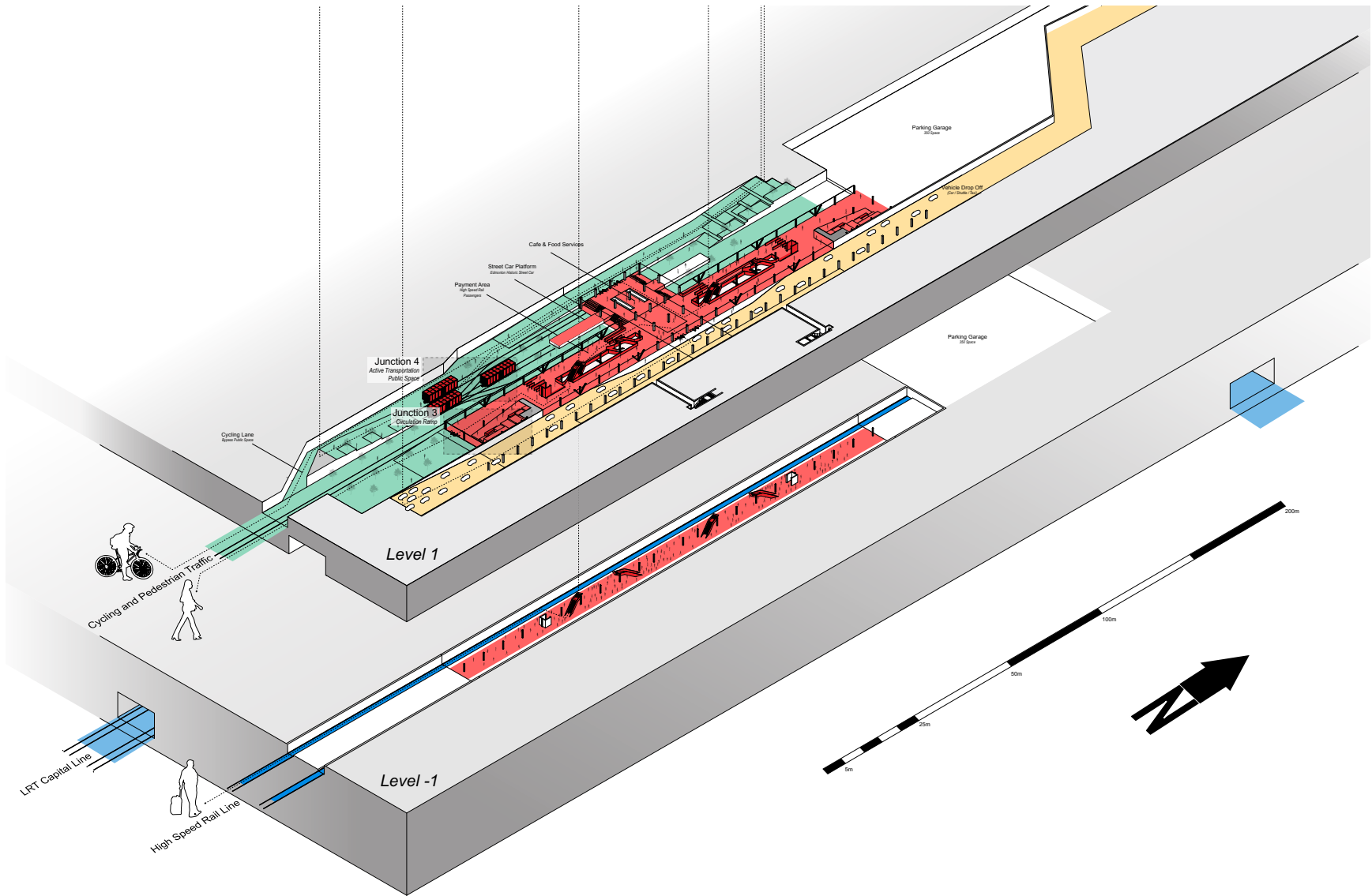
Pedestrian
Existing

Pedestrian
Class A
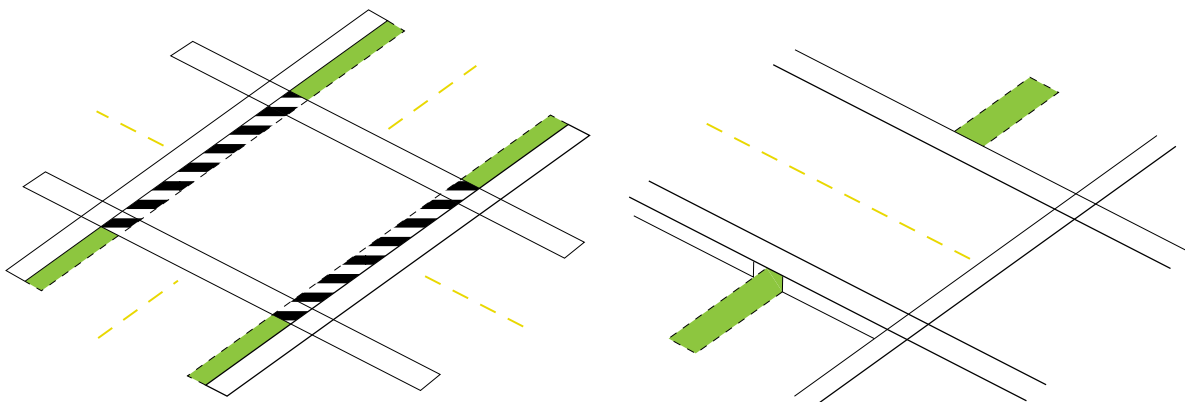
Cyclist
Existing

Cyclist
Class A

Transit
Existing

Priority Signalling for
LRT and Bus

Transit
Class A

Diagram of Class A Right of Way: Defining Existing and a Transformation to Class A

Parking Garage
250 Space

Vehicle Drop Off
(Car / Shuttle / Taxi)

Cafe & Food Services

Street Car Platform
Edmonton Historic Street Car

Payment Area
High Speed Rail Passengers

Parking Garage
250 Space

Junction 4
Active Transportation Public Space

Junction 3
Circulation Ramp

Cycling Lane
Bypass Public Space

Cycling and Pedestrian Traffic

Level 1

Level -1

LRT Capital Line

High Speed Rail Line

200m

100m

50m

25m

5m

N

System Isometric: Level 2 Connecting to the street level fabric.

44

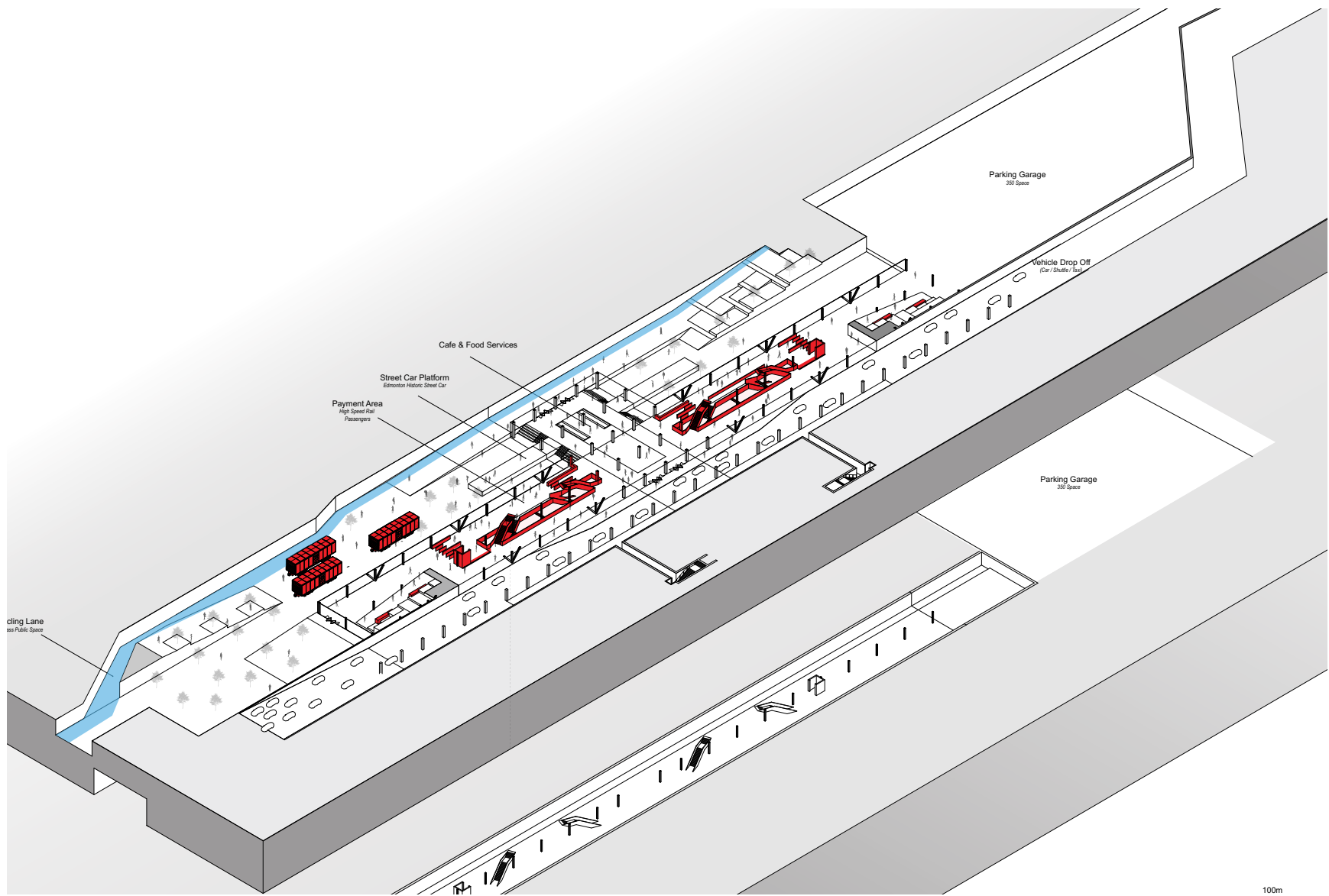**Edmonton Transit HUB
System Isometric**

- *Active Transportation Network (Cycling and Pedestrian)*
- *Junction Points (Circulation / Rest)*
- *Interior Hub Circulation (Pedestrian)*
- *Vehicle Transportation Network*
- *Level 1 Drop Off / Pick Up (Car / Taxi / Shuttle)*
- *High Speed Rail Line From Calgary*
- *Municipal LRT Transportation Network*
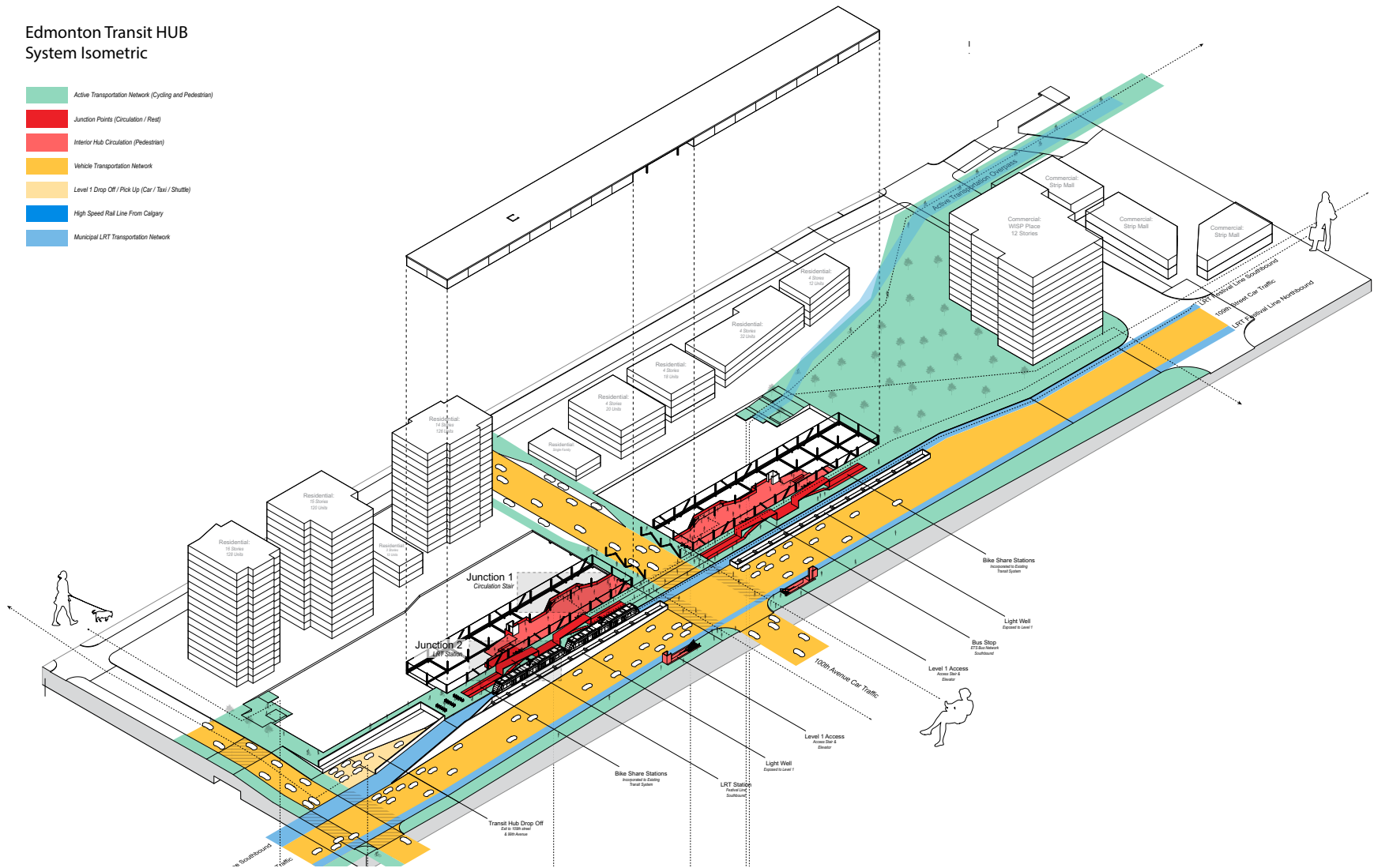
System Isometric: Level 1 and -1 Defining the active transportation corridor, station layout and connections from external sources.

45
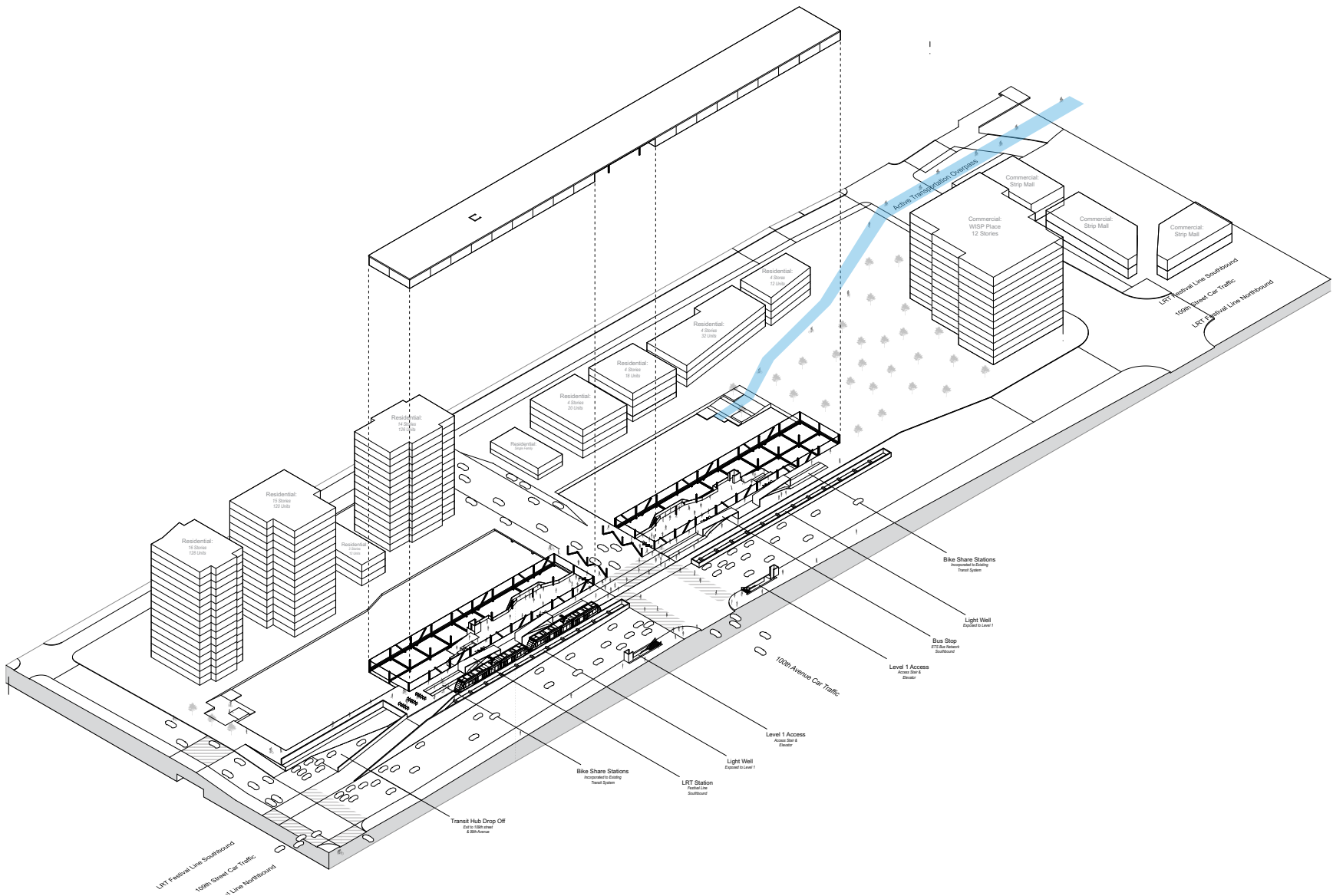
Isolating the bike path on level one of the transit hub.

Parking Garage
350 Space

Vehicle Drop Off
(Car / Shuttle / Taxi)

Cafe & Food Services

Street Car Platform
Edmonton Historic Street Car

Payment Area
*High Speed Rail
Passengers*

Parking Garage
350 Space

cling Lane
ss Public Space

100m

Isolating the bike path at street level of the transit hub.

Winter Design Considerations

Edmonton is embracing its climactic identity of a mostly cold winter city. In 2016 it released Winter Design Guidelines: Transforming Edmonton into a Great Winter CIty. It discusses the goals and approaches for implementing design strategies for architects and planners. Seen below is a diagram of some of the basic principles promoted in the Winter Design Guidelines. The transit hub features elements considered by the city to be important aspects when designing a space that positively contributes to the cityscape year round.

I will outline three important aspects in the design of the transit hub that help give a more habitable environment during the winter months. First, the active transportation corridor which will be the most used space by pedestrians is sunken into the ground by one story. This change in elevation combined with the surrounding buildings shields from winter winds. Second, the active transportation corridor is unobstructed to the South, providing the area with optimal sun exposure. Third, the interventions that come in the form of the train car pavilions add touches of color to offset the darkness or stark white during the daytime providing visual interest.
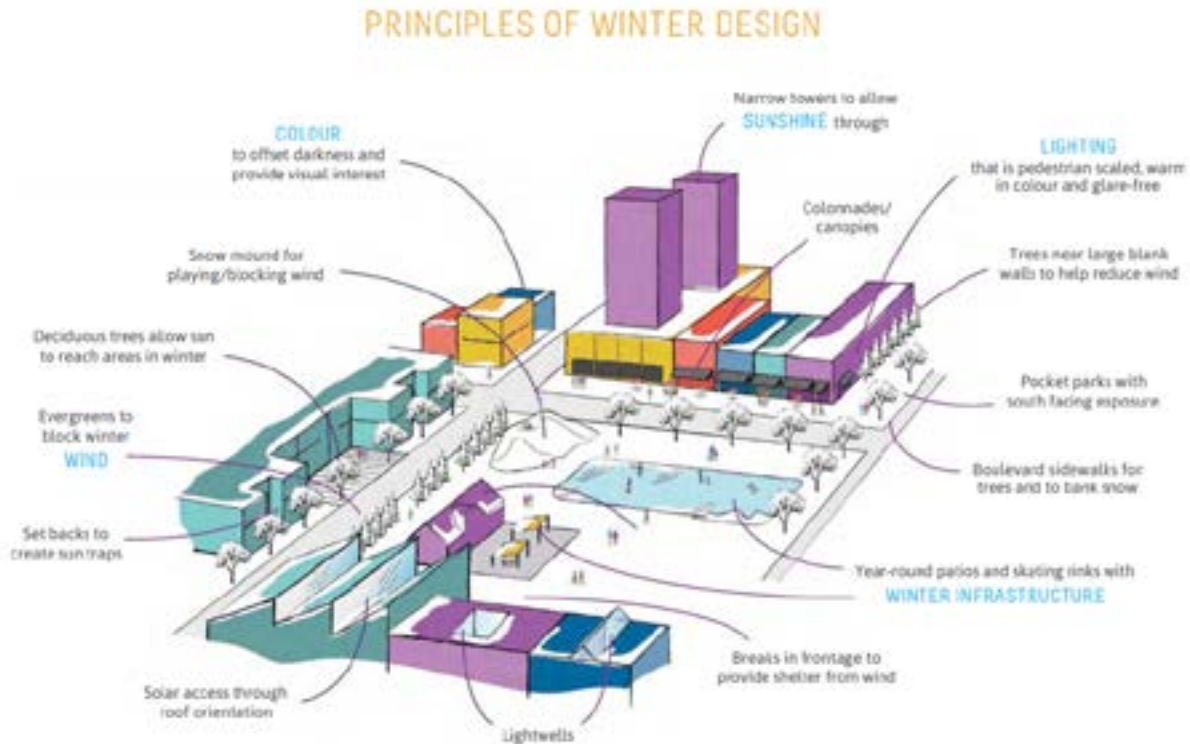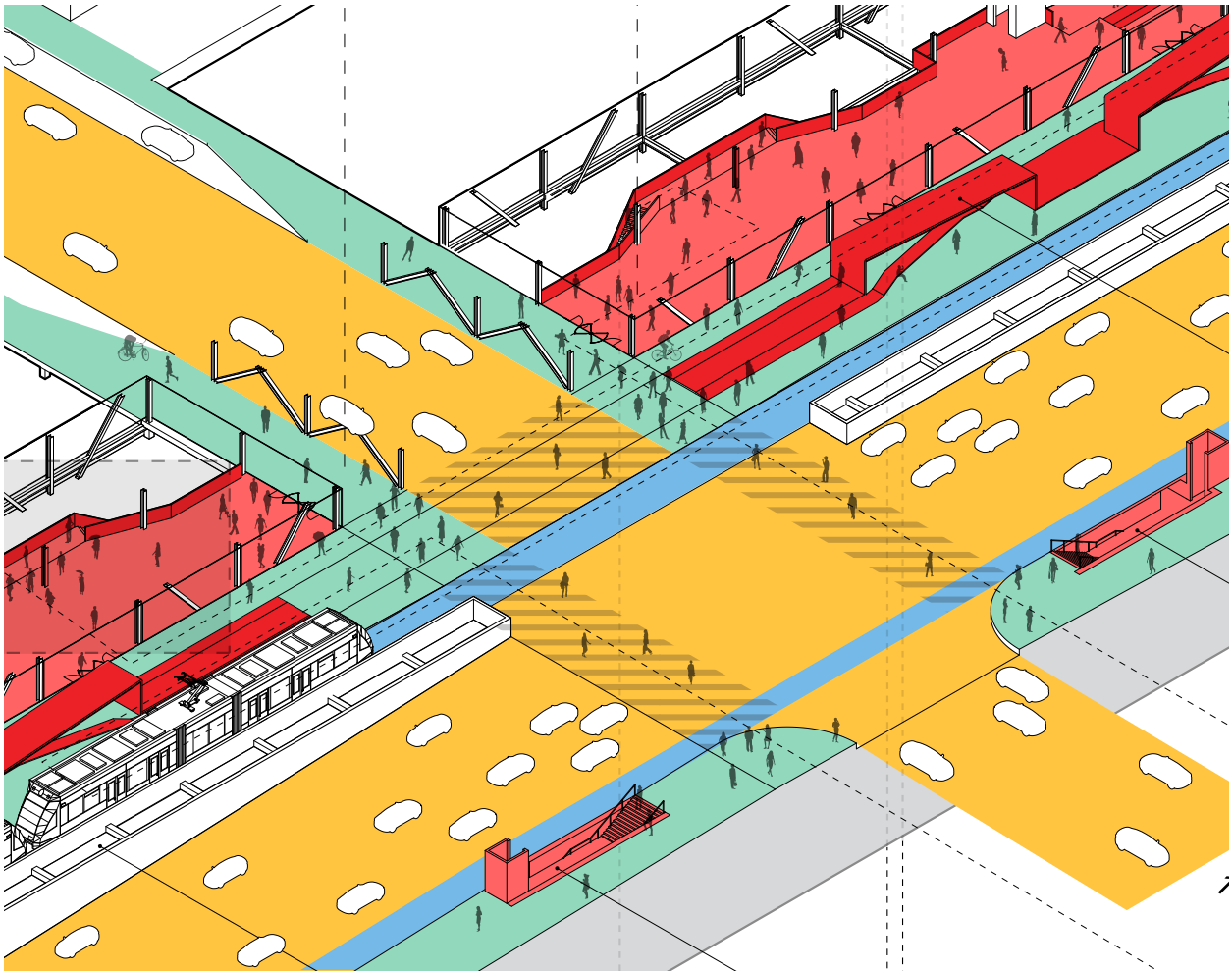

Principles of winter design: creating better winter environments (City of Edmonton 2016)
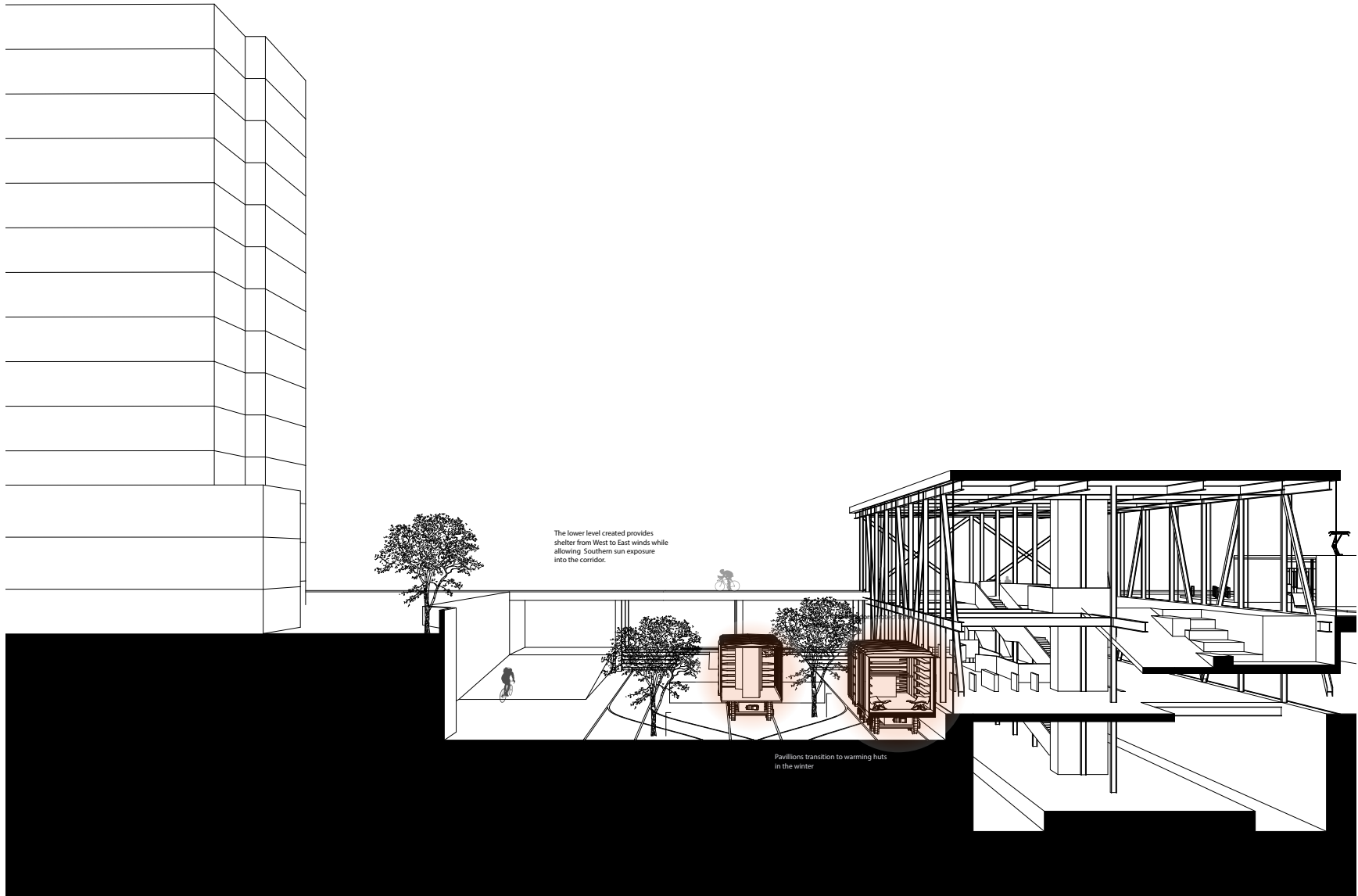
The lower level created provides
shelter from West to East winds while
allowing Southern sun exposure
into the corridor.

Pavillions transition to warming huts
in the winter

Incorporating Winter design principles into the transit hub.

System Isometric: Illustrating stitching back into the city fabric from the hub.

Traditional transit practices apply this matrix to produce more sophisticated public transit, but it became apparent that this right-of-way logic could be expanded to include pedestrians and cyclists in the overall network of transportation. It is crucial for any transit initiative to strive for optimum efficiency if it is to be adopted by more commuters, and if the transit goals of a city are to promote other alternatives than it should consider the opportunities to apply a Class A right-of-way to as many modes as possible. In this design proposal, it was of great importance to provide a safe, and efficient way for pedestrians and cyclists to achieve a Class A standard in as many places as possible. By pushing the major active transportation corridor away from the busy roadways while simultaneously giving it free movement underneath 99th and 100th Avenue as well as overpassing Jasper Avenue allows for a Class A movement through Edmonton's busiest neighborhoods. This rule was broken only when a cycling or pedestrian path needed to be tied back into the existing grid.

Residential:
4 Stories
32 Units

Residential:
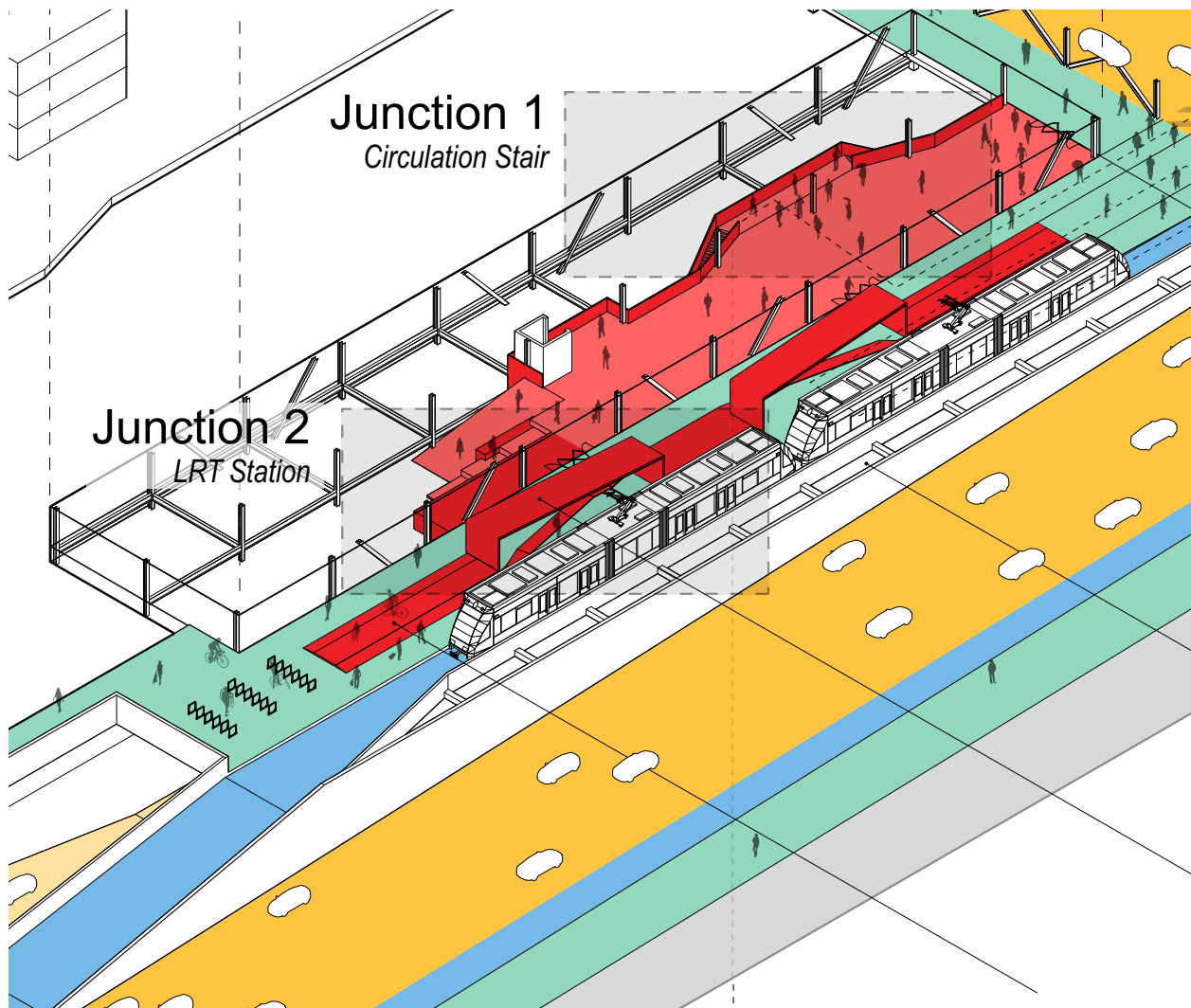*4 Stories*
18 Units

Residential:
4 Stories
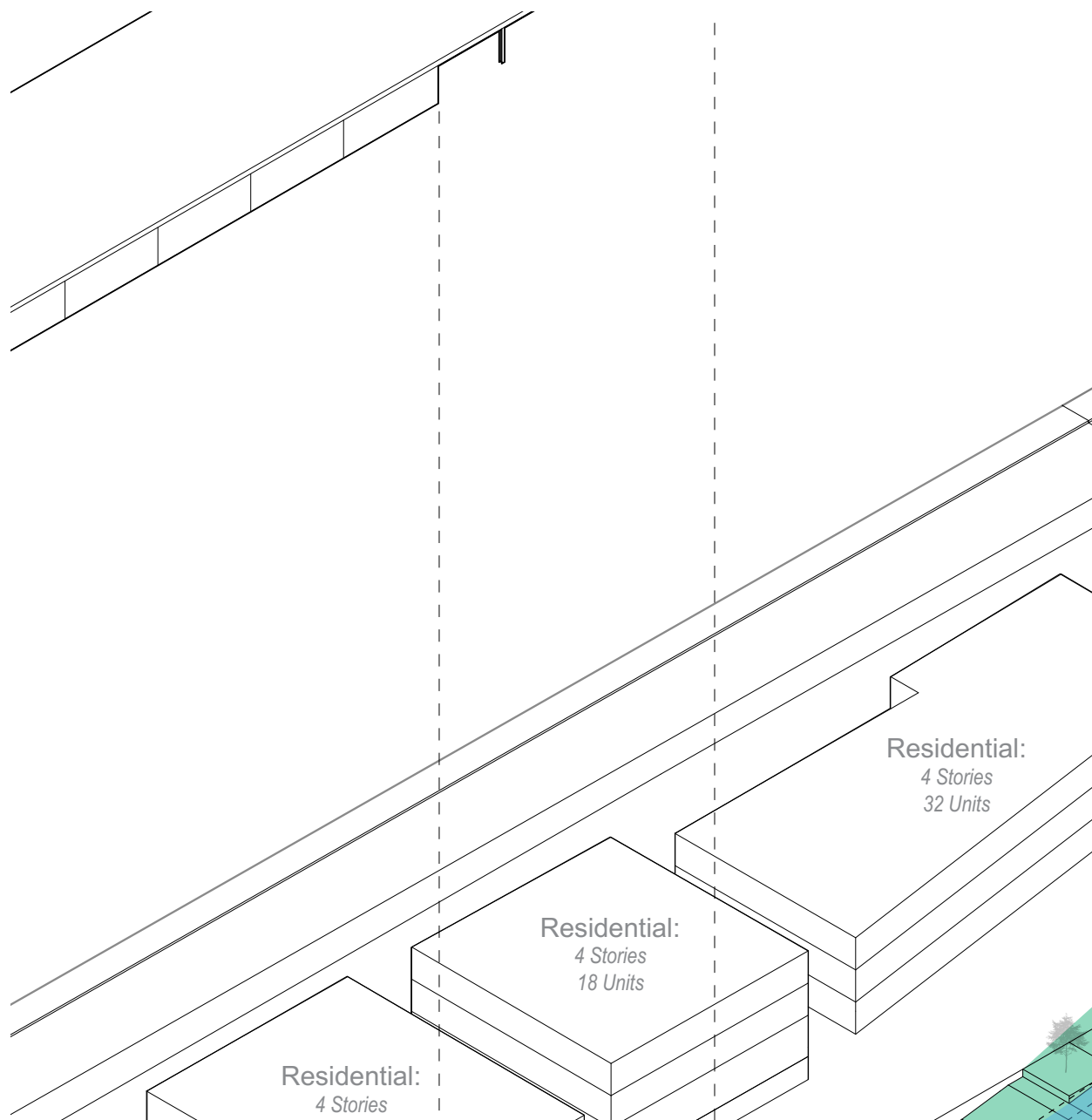
System Isometric: Layout and circulation between zones of the transit station.

Providing this standard of access to active transportation opens opportunities to incorporate bet-ter accessible public space and moments to transition with ease. Bus and rail right-of-way in this thesis conform to Edmonton's strategy to incorporate them with the existing street network, but still allow them to retain an independent station platform parallel to 109th Street. The only excep-tion being the High Speed Rail that is required to have a Class A standard in any context which is located a level below ground in the transit hub.
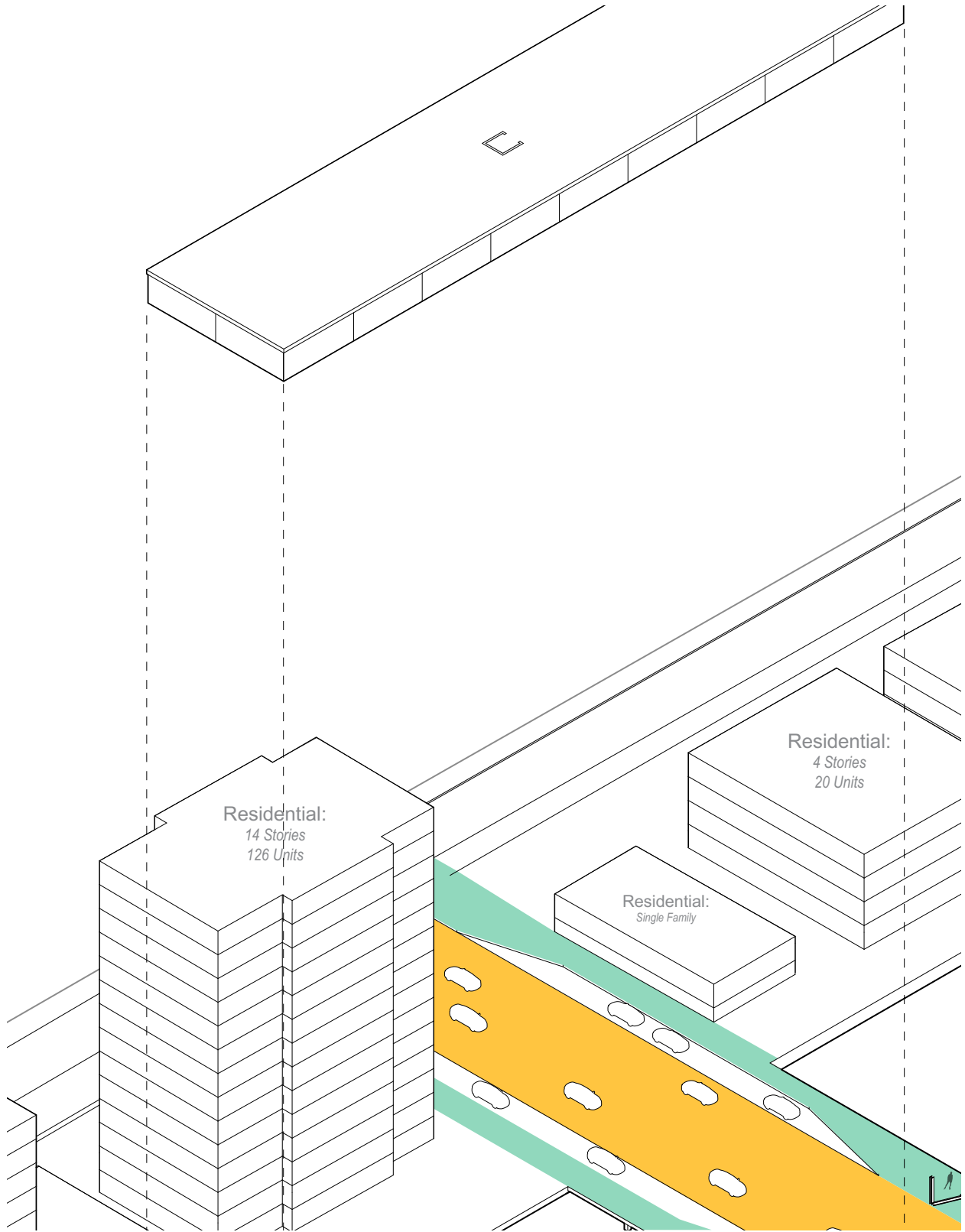
Junction Points

Following the optimization of flows across the site, the architecture of the transit hub is intended to negotiate intense transition of individuals between modes. An example of this would be a pedestrian walking from their home to transition to the Light Rail Transit system to complete their journey arriving at a destination much further away. The moment at which a pedestrian becomes a light rail commuter is a shared experience amongst many others where the architecture can safely and efficiently complete the transition. This example and many others occur at the "junctions" that have been designed to assist in this process that also define an identity for the hub. These "junctions" also serve secondary purposes to provide public amenity for the users of the transit hub.
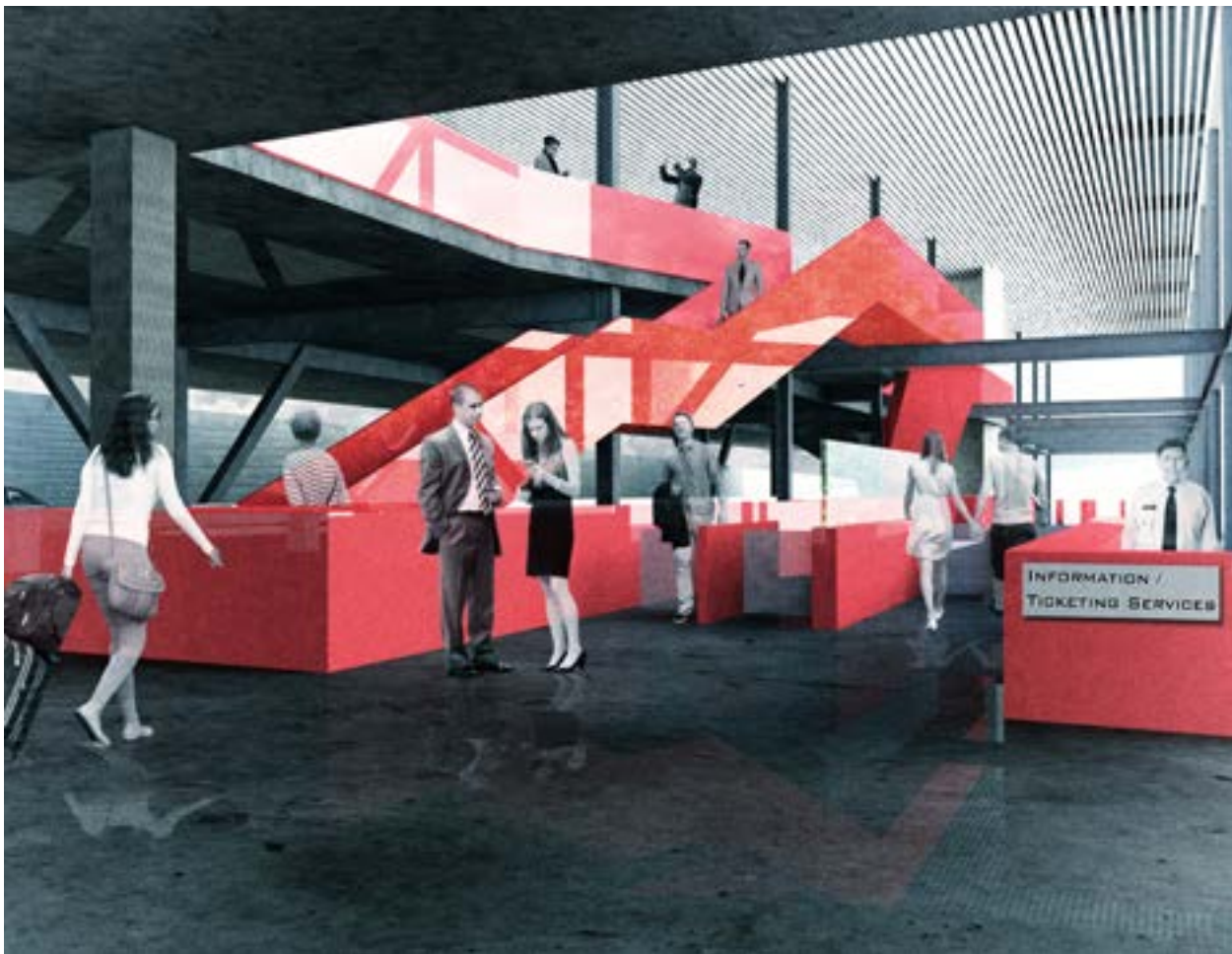
Junction 1
Circulation Stair

Junction 2
LRT Station

System Isometric: Locating Junction Points 1 and 2.

Residential:
4 Stories
20 Units

Residential:
14 Stories
126 Units

Residential:
Single Family

System Isometric: Locating Junction Points 3 and 4.

Circulation Stair

The main vertical circulation stair joins all three levels of the transportation hub through the center of the building. Like its counterparts, it is a red steel element signifying its way-finding function. It can be followed and seen from all entrances to indicate a direction of movement and is situated in two locations of the station near the major program elements required for changing modes. These major elements include, ticketing and waiting areas for High Speed Rail Commuters, food services, and major thresholds to the rest of the transit hub.

Rendered image of Junction 1, The Circulation Stair.

Junction 1
Circulation Staircase
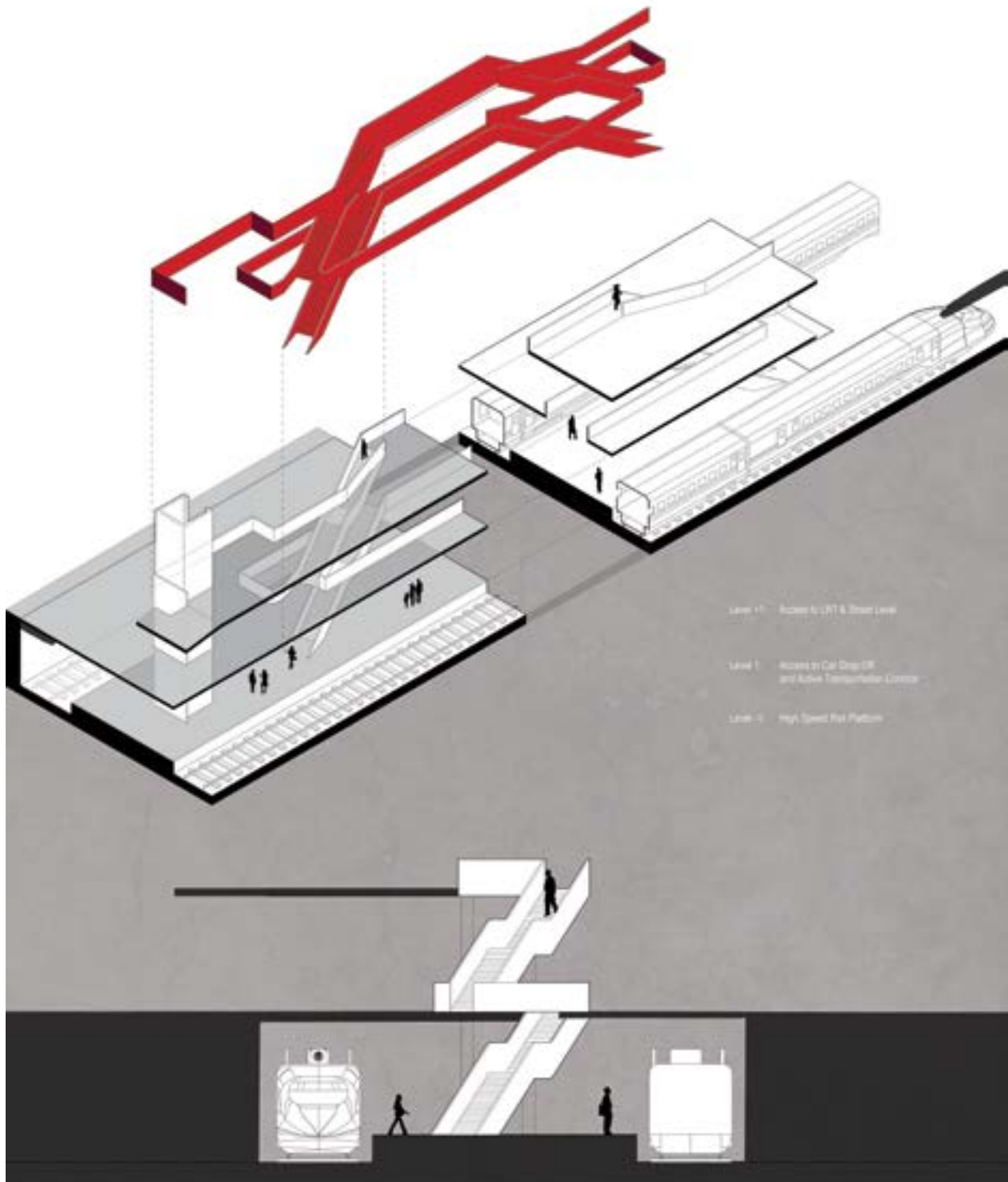
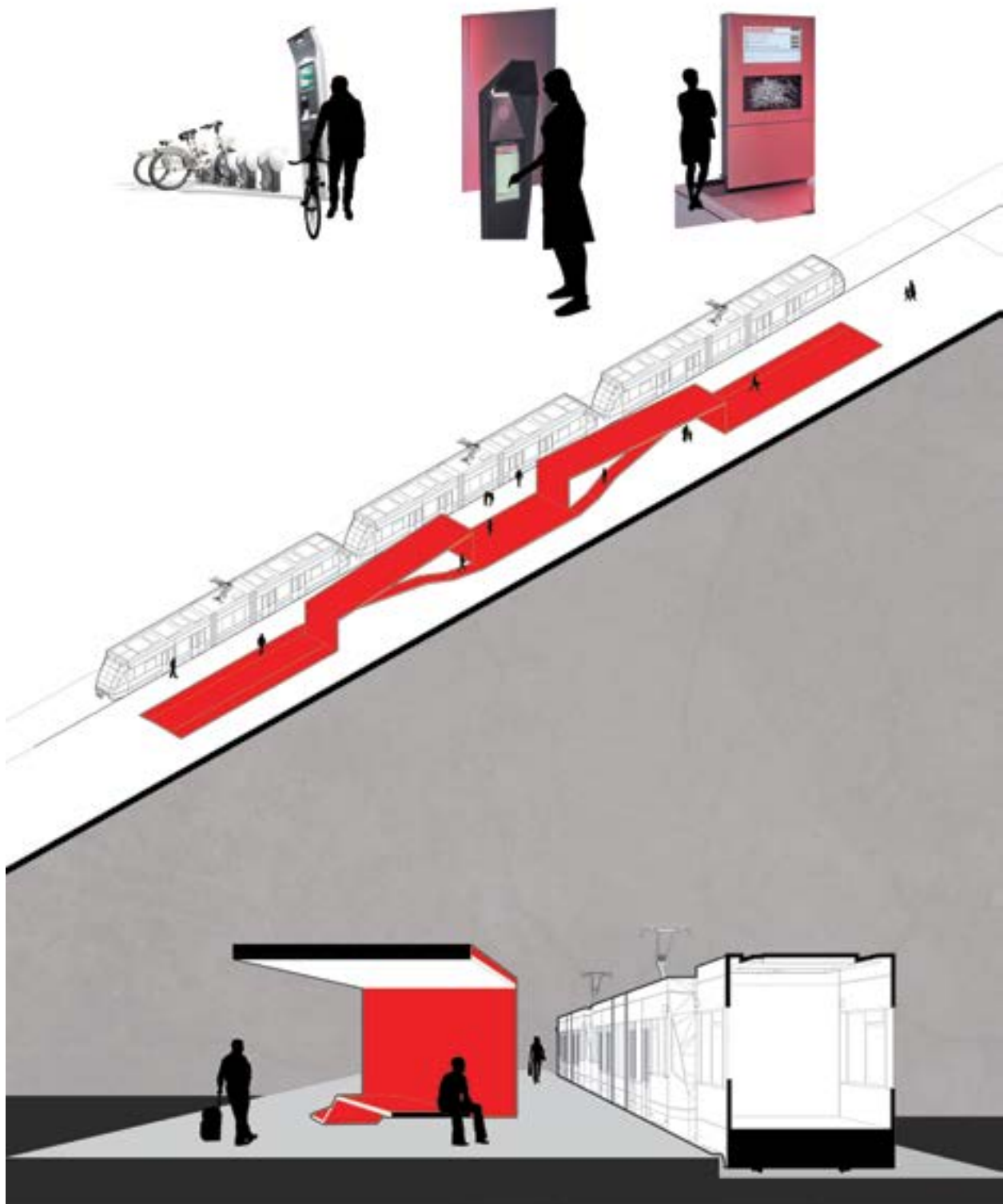Isolated Drawing of Junction 1, The Circulation Stair.

LRT Station

A major factor in Edmonton's public transit mentioned previously is the LRT (Light Rail Transit) network. Any successful rail transit station incorporates a few standard elements and w ill go above and beyond to incorporate new technology to enhance a commuter's experience of the system. The LRT station designed for this hub includes LED displays offering real time information on connecting busses, trains and bike sharing availabilities, a heated and covered shelter protecting from potential inclement weather, seating, waste receptacles, and bike sharing terminals.

Rendered image of Junction 2, The Light Rail Transit Station.

Isolated Drawing of Junction 2, The Light Rail Transit Station.

Circulation Ramp

The circulation ramp begins to enter the realm of public amenity while still providing a sloping circulation throughout the transit station. Placement of lockers, washroom facilities, and seating are dotted along the incline offering views to the active transportation corridor to the West. Like the eddy in a stream the red elements encourage interaction that pulls individuals away from the flow of traffic to engage with the specific element. Seating is staged by the exterior movement and public space.

Rendered image of Junction 3, The Circulation Ramp and Amenity Space.

Junction 3
Circulation Ramp and Restin Spot
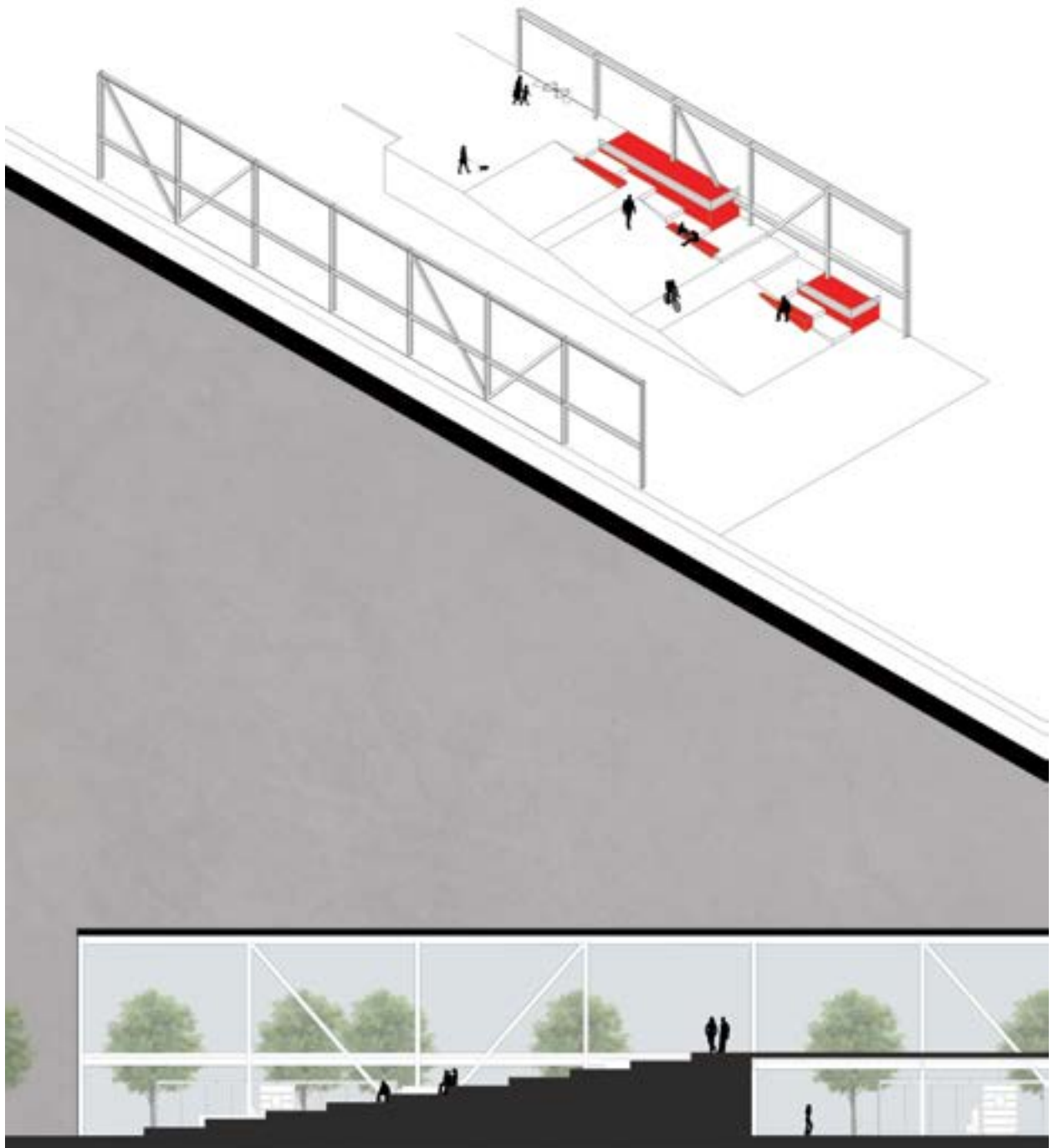
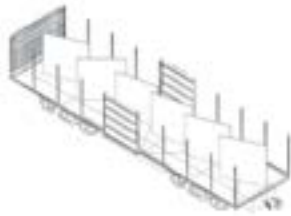Isolated Drawing of Junction 3, The Circulation Ramp and Amenity Space.

Public Space Along the Active Transportation Corridor

The final junction incorporates public spaces associated with larger social entities located throughout Edmonton. The three boxcars house pavilions that offer satellite services from their counterparts embedded in Edmonton's identity. Theses entities are: The AGA (Art Gallery of Alberta), Edmonton Public Libraries, and the Winspear Center. The AGA car offers opportunities to house work from artists that engage park users as well as commuters in new and changing ways that provides a dynamic element to one's commute. The Winspear Center, a prominent theater in Edmonton's Downtown, provides a venue for artists to perform for events or during peak hours of pedestrian movement through the area. The Public Library car offers access to books and magazines to be enjoyed during moments of leisure or extended waiting periods. Each of these pavilions represent the notion of connection in a social sense while existing in a system of connection that physically moves inhabitants throughout Edmonton.
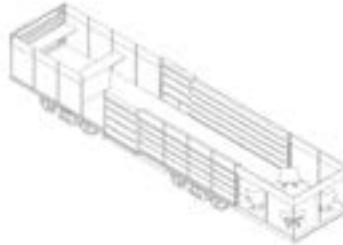

Rendered image of Junction 4, Public Space along the Active Transportation Corridor.
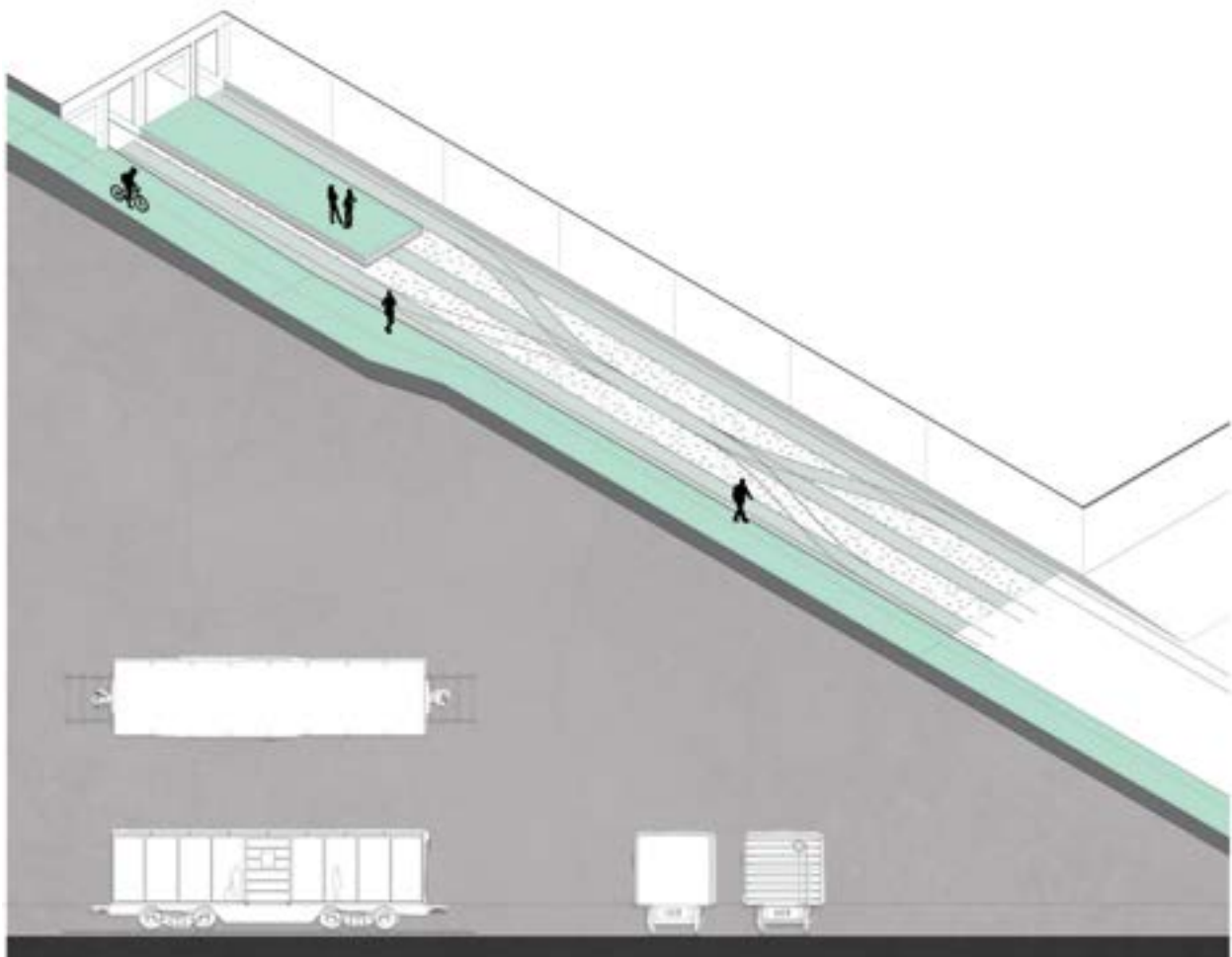
Junction 4
Active Transportation & Public Pathway

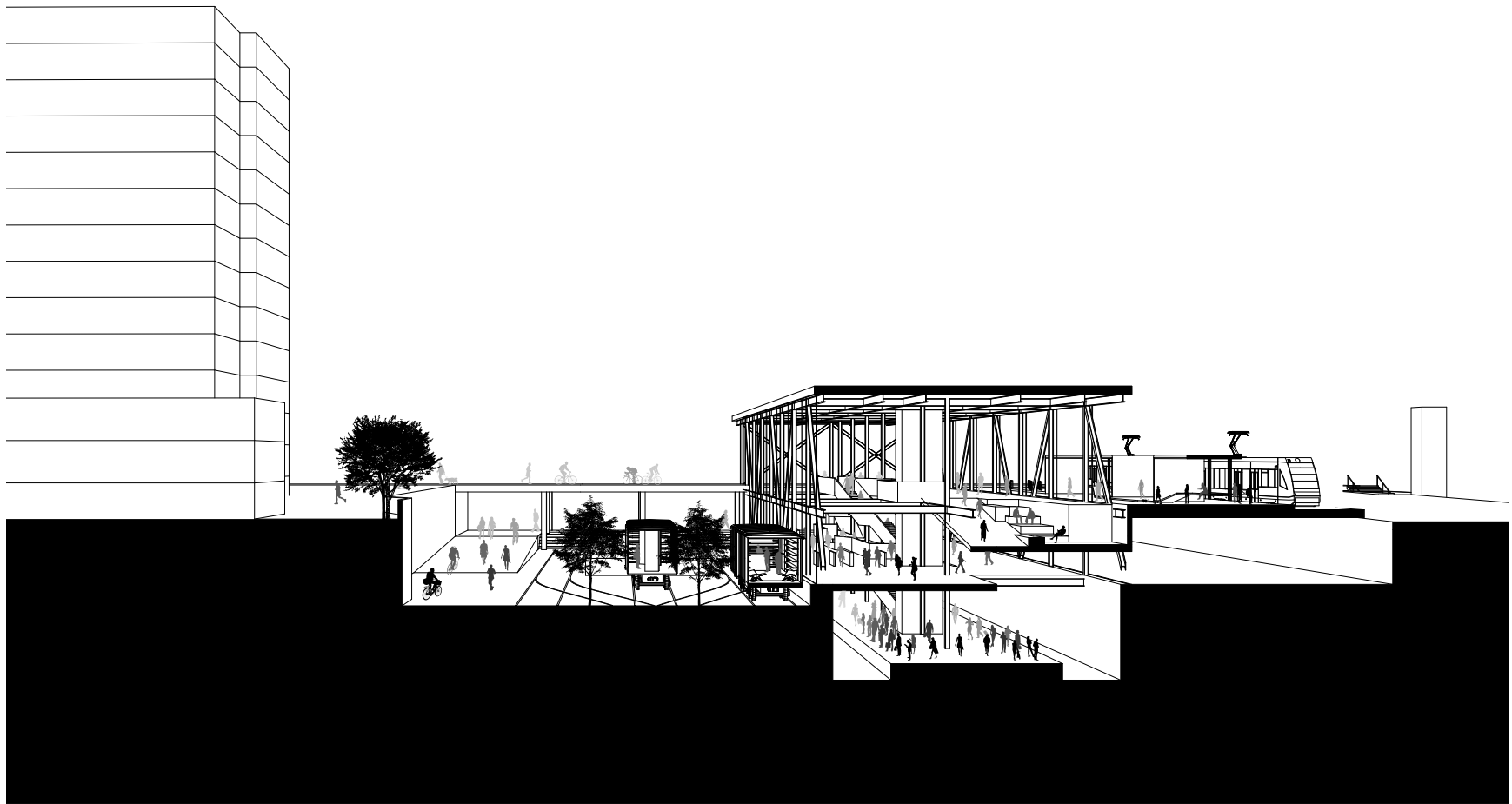AGA Pop up Art Gallery Pavilion
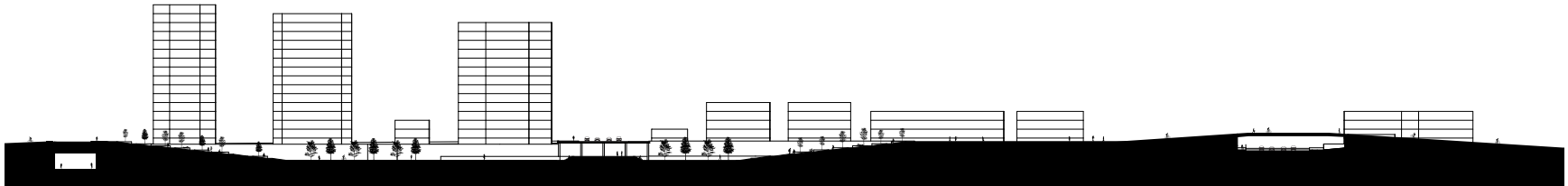
Edmonton Public Library Pavilion
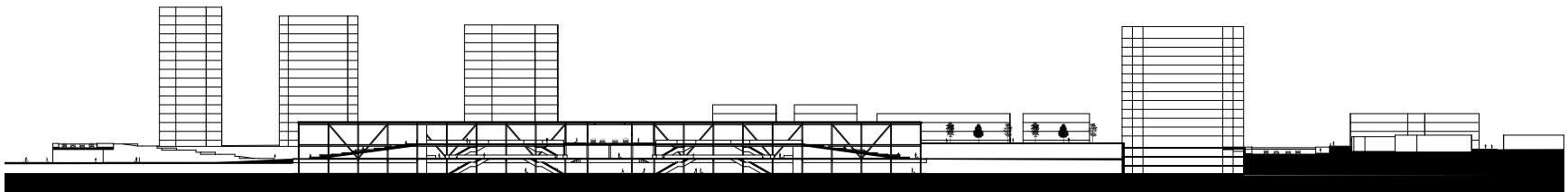
Winspear Center Stage Pavilion

Isolated Drawing of Junction 4, Public Space along the Active Transportation Corridor.

Section Perspective looking North crossing the sight just South of 100 Avenue.

Populated section through the active transportation coridor.

Populated section through the interior of the transportation hub.

CHAPTER 6: CONCLUSION

The architecture of the city evolves not by rapid change or fluid transformation, but incrementally because of the collective intelligence embedded in the layers of its formal structure. Hardness and persistence of urban form are capable of accommodating change over time. The systems that Edmonton rely on are ever changing and based on the assemblages that define its patterns. There is an opportunity to repurpose the assemblages of our history to structure a new phylum that suits current transportation requirements. The site examined embodies all the characteristics of Edmonton's transportation identity. It presents an ideal site upon which to conduct an urban planning experiment that embraces the city's defined transit goals as outlined in "The Way We Move".

This space is ingrained in the infrastructure, imagination, and collective memory of the city, and forms a part of its authenticity of place as defined by its history. Further to its historical importance, this infrastructural landscape could service our new needs as a transit dependant society. By stitching all the ideal transit modes and public spaces of the hub into the existing system, a space that was once the primary industrial economic driver, can evolve to contribute to a more democratic transportation system.

There is little information available regarding the future development of this corridor. This can be an opportunity to suspend the skepticism of transportation futures and envision a highly connected city that provides access and opportunities for users in all demographics. Future technologies and practices will impact our vision of transportation as we move forward to build the infrastructure that connects us. In one of these futures it is possible to imagine a well-connected hub with a multitude of transportation opportunities to democratize the way in which we access our city, make the connections understandable and enjoyable, while providing as many opportunities to incorporate a Class A transit experience for all modes working in unison.

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