# In the Wake of Industry: Reprogramming the Halifax Grain Elevator

by

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# Contents

# Abstract

Industrial structures in urban areas often have a contested relationship with humans because of their imposition on the landscape. With many industries now in decline, deindustrialization presents an opportunity to adapt these structures to changing values of contemporary society.

Declining grain trade in eastern Canada permits an adaptive reuse of the grain elevator in Halifax. This building and its urban surroundings are the site for an architectural intervention that uses cross-programming to juxtapose human motivations and industrial motivations. New public programs take advantage of the building's central urban location, large scale, and monumental qualities. The thesis explores how human programs can be integrated into an industrial building that is still functioning, rather than waiting for it to be abandoned or to fall into ruin.

# Acknowledgements

Thank you to my thesis committee Diogo Burnay and Steve Parcell for many inspiring and encouraging conversations.

To my classmates for making the last four years so enjoyable.

To Caitlin, Melissa, and my parents Ray and Brenda. Your support means the world to me.

# Chapter 1: Introduction

## Deindustrialization and What it Left Behind

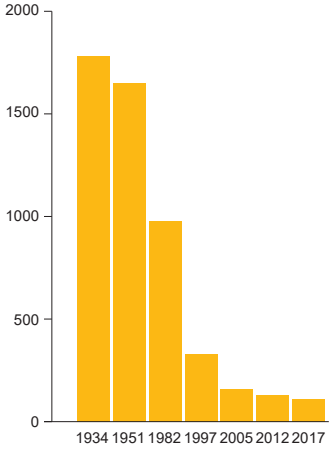
Canada, like many industrialized countries around the world, is experiencing deindustrialization (Reid and Reid 2016, 89). Deindustrialization is described as an economic shift from manufacturing to services (Mah 2012, 5). Because the economy favors manufacturing less, the infrastructure built for this becomes obsolete. The 19th century made way for industry and as it phases out, the 21st century must determine how to address the monumental structures left behind. Structures such as oil refineries, factories, and grain elevators often have a contested relationship with humans as they are disconnected from the urban landscape. Now that industry is in decline there is opportunity to adapt these structures to the needs and desires of contemporary society.

Decommissioned textile mill in Nova Scotia.

The Halifax grain elevator view from Woodside.

Although not originally built for humans, some industrial infrastructure possess architectural characteristics that are ideal for hosting public program. At the same time, this will allow the public to infiltrate buildings that they have lived in such close proximity to but have only seen from the outside.

Specifically, the Halifax grain elevator exists centrally in the city, straddled between four distinct neighbourhoods. Its height and width is imposing in the urban landscape and gives it monumental qualities compared to its surroundings. As the grain industry declines, there is potential to host new program on this site.




Number of grain elevators in Alberta by year (Alberta's Historic Places 2018).

In the 20th century, grain was an integral part of Canada's economy. Grain elevators were a physical manifestation of this technological success and gained social significance

as a symbol of Canada's thriving economy (Vervoort 2006, 204). As the grain industry fell into decline, the symbolism changed and no longer held the same pride as it once did. This is evidence of how the social and economic significance of industrial buildings can, and do, change over time.

## Proactive Approach

> It is increasingly clear that the petroleum economy and its associated operations have a limited life span. The Caspian Sea will remain beyond the moment when the last barrel of oil leaves its seabed. Is it possible to extend the momentum generated by the oil operations with a strategy that envisions the post-oil future of the sea? Can we plan for this moment as a new phase in the life of the sea, rather than passively anticipating a postindustrial wasteland? (Bhatia et al. 2011, 34)

In *Coupling: Strategies for Infrastructural Opportunism*, Bhatia contemplates the reuse of an oil rig in the Caspian Sea, recognizing that industrial infrastructure was built to last much longer than their operations. The same theory can be applied to the grain elevator – what will happen to them after industry has slowed and the monumental structures remain?

This thesis seeks to go one step further, exploring the potential of intervention before full decommission. Decommissioned industrial sites may not always be presented as neat and isolated ruins, as industrial landscapes are often comprised of many systems that are intertwined. In some industries, such as the grain industry, decommission may happen gradually over a span of decades. This thesis seeks to find ways that this problem can be addressed, and to find a proactive approach that anticipates a gradual decommission and plan for simultaneous intervention rather than waiting for total ruin and replacement.

The hybrid nature of industry and public program working together presents a new urban form.

The Halifax grain elevator is an ideal test site as it possesses common qualities that may be present on any industrial site when approaching adaptive reuse. Halifax was originally a key node in Canada's grain industry but began to face decline in the 1980s. Since then, it has slowly seen less business and now operates around half of its potential capacity of 365 silos. Although the grain trade is in decline, the Halifax Port itself is seeing increase in activity, and currently undergoing expansion. This is why the Halifax grain elevator is a good test site as it presents an example of the intertwined and fluctuating nature of industry.

## Program as a Driver for Industrial Reuse

This thesis proposes program as the primary driver for adapting industrial infrastructure to suit human use. Program is a key driver in industrial adaptive reuse because deindustrialization has made the original program obsolete, but the building remains. Economic and social forces change program over time to suit human needs, and the built environment needs to be updated to these changes. By reprogramming the building and surrounding site, industrial infrastructure can be updated to the needs of contemporary society.

## Thesis Question

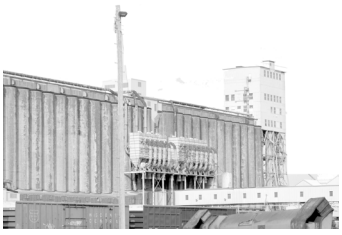
How can public programs take advantage of opportunities in declining industrial infrastructure?

# Chapter 2: Industrial Landscapes

## The Rise of the Grain Industry

Industry shaped industrial cities as they are known today. As a primary driver of the economy, industry influenced much of our built environment, through facilities designed to manufacture, and cities designed to consume. Industrial structures are the physical evidence we have of industrialization and therefore hold historical and social significance. The national and global reach of the grain trade was made possible by the expansion of railways and the new ability to transport resources and goods for long distances. The first country elevators were built along the Canadian Pacific Railway in the 1880s as a place to store grain before exporting it overseas (Vervoort 2006, 182).

Country elevator (“Postcard 873” c.1912).



Terminal elevator

There are two types of grain elevators: the country elevator (also known as a prairie cathedral) and terminal elevator. Country elevators are generally made of wood, and existed close by the farmer’s field to hold one or multiple crops after being harvested. They would then be moved to a concrete terminal elevator where many crops are held before being exported overseas. Vertical and horizontal conveyor belts move the grain up and over to get in and out of the silo, and connect to transportation. There are many country elevators over the prairies while terminal elevators exist only in port cities.

During the height of grain trade in 1933, the number of country elevators in western Canada reached a peak of 5,758 (Vervoort 2006, 182). The grain industry, especially in Canada, was prolific and supplied much of the world with

grain. During the war, Canada was named the empire's "breadbasket" (Vervoort 2006, 183) and saw much economic success from the grain trade.

### The Grain Elevator as a Canadian Icon

Modern architects praised the grain elevator for its "pure" geometry and ultimate form following function (Vervoort 2006, 193). Le Corbusier referred to concrete grain elevators and factories as "The magnificent first-fruits of the new age" in *Vers une Architecture* in 1923, while Walter Gropius wrote, "the grain elevators of Canada and South America ... are almost as impressive in their monumental power as the buildings of ancient Egypt" (Vervoort 2006, 189). In writing, grain elevators were often compared to structures such as these because of their monumental scale.

This European praise brought the grain elevator to the world's attention and was one of the reasons that Canada adopted the grain elevator as a symbol of the country (Vervoort 2006, 191). It was this type of praise that cemented the grain elevator into cultural significance as it was a physical representation of Canada's economic success (Vervoort 2006, 197). The grain elevator appeared on the Canadian stamp multiple times through the 1930s to 1960s, the dollar bill in 1954-67, and represented Canada at the Paris Exhibition 1937 (Vervoort 2006, 202).

## Deindustrialization and Decline of the Grain Industry

By 1980 the most prolific grain ports had slowed significantly (Banham 1989, 154), succumbing to the effects of deindustrialization. By 2004 only 361 primary grain elevators had license to operate (Vervoort 2006,

1913 | Halifax rail cut underway (part of the ocean terminals development)

1929 | The Halifax grain elevator is built


1930 | The grain elevator first appears on a 20c stamp

1937 | A model terminal grain elevator represents Canada at the Paris Exhibition.

1880 1890 1910 1920 1930 1940


1883-34 | Canada's first terminal elevators were built at Fort William and Port Arthur

1914-1918 | During the first world war, Canada was the empire's "breadbasket"

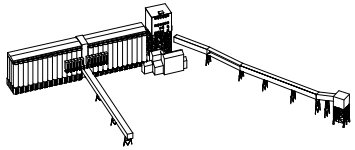
1923 | Le Corbusier publishes "vers une architecture"

1929 | The market crash lowered the amount of Canadian grain being exported.

1935 | The number of country elevators was at its peak: 5,758

1924

1936



Noteworthy grain-related historical events.

1969
Halterm opened and was the first common user terminal built in Canada.

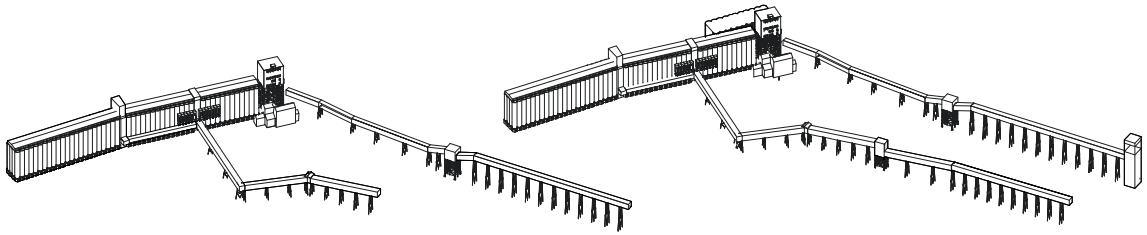
1980's
By the 1980s, massive numbers of elevators are being shut down, and are identified it as a Canadian symbol.

2004
Only 361 primary elevators had licences to operate.

1950 1970 1990 2010

1958

1967



Noteworthy grain-related historical events.

182). In *Industrial Ruination, Community, and Place: Landscapes and Legacies of Urban Decline*, Alice Mah describes deindustrialization as “an economic shift from manufacturing to services” (Mah 2012, 5). Once the economy shifted away from manufacturing as the primary economic driver, large scale industrial infrastructures were seeing abandonment. Deindustrialization was the event that changed the symbolism associated with industrial structures. Grain elevators that were once representative of a thriving economy now represented a stagnant industry.

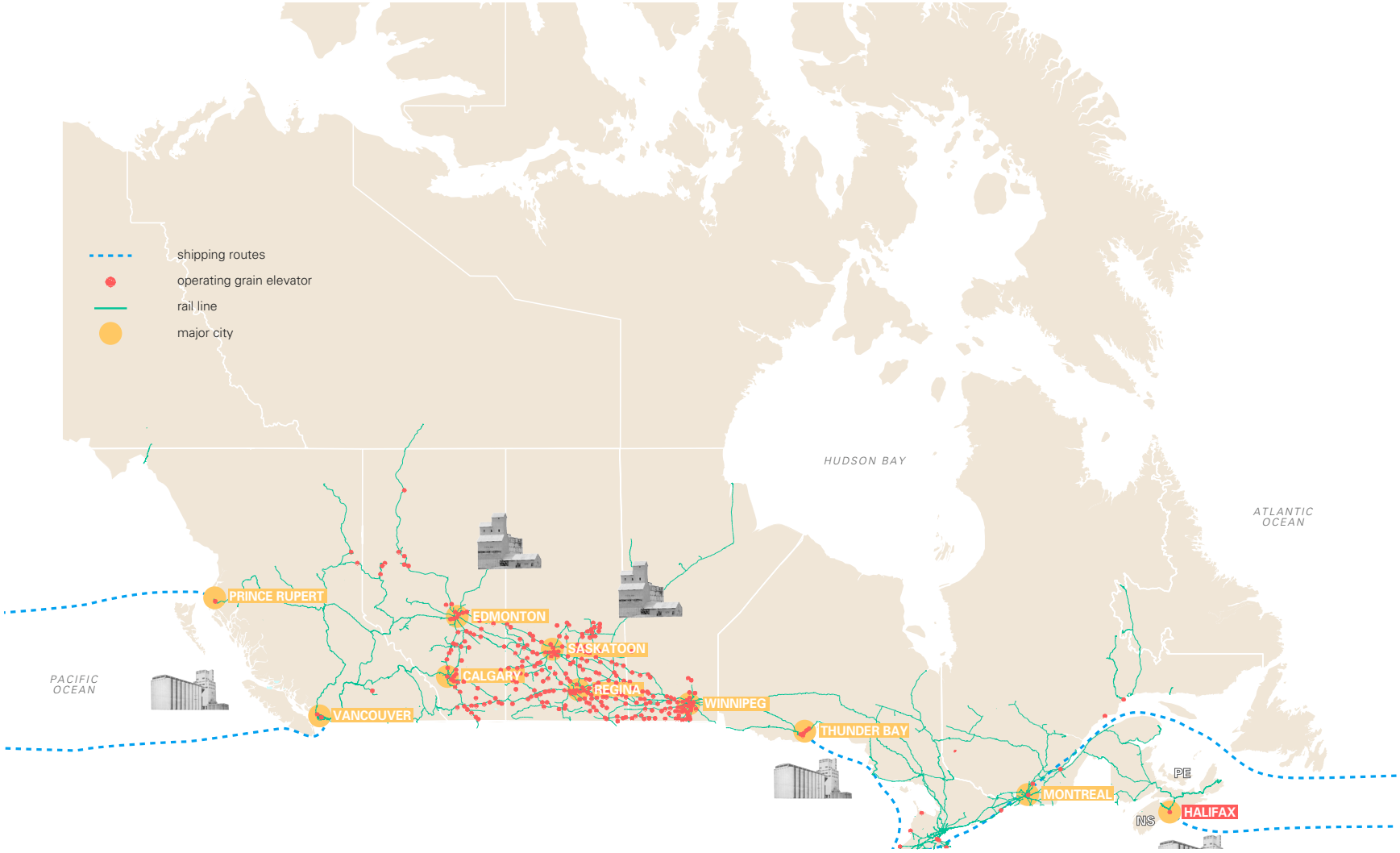
Although “deindustrialization” can be associated with a certain time period, its effects are not applied equally to all industries, or even within industries. While eastern Canada, and especially Halifax, has seen major effects of deindustrialization in the grain sector since the 1980s, western Canada is still a large exporter of grain today.

## Canada’s Grain Route

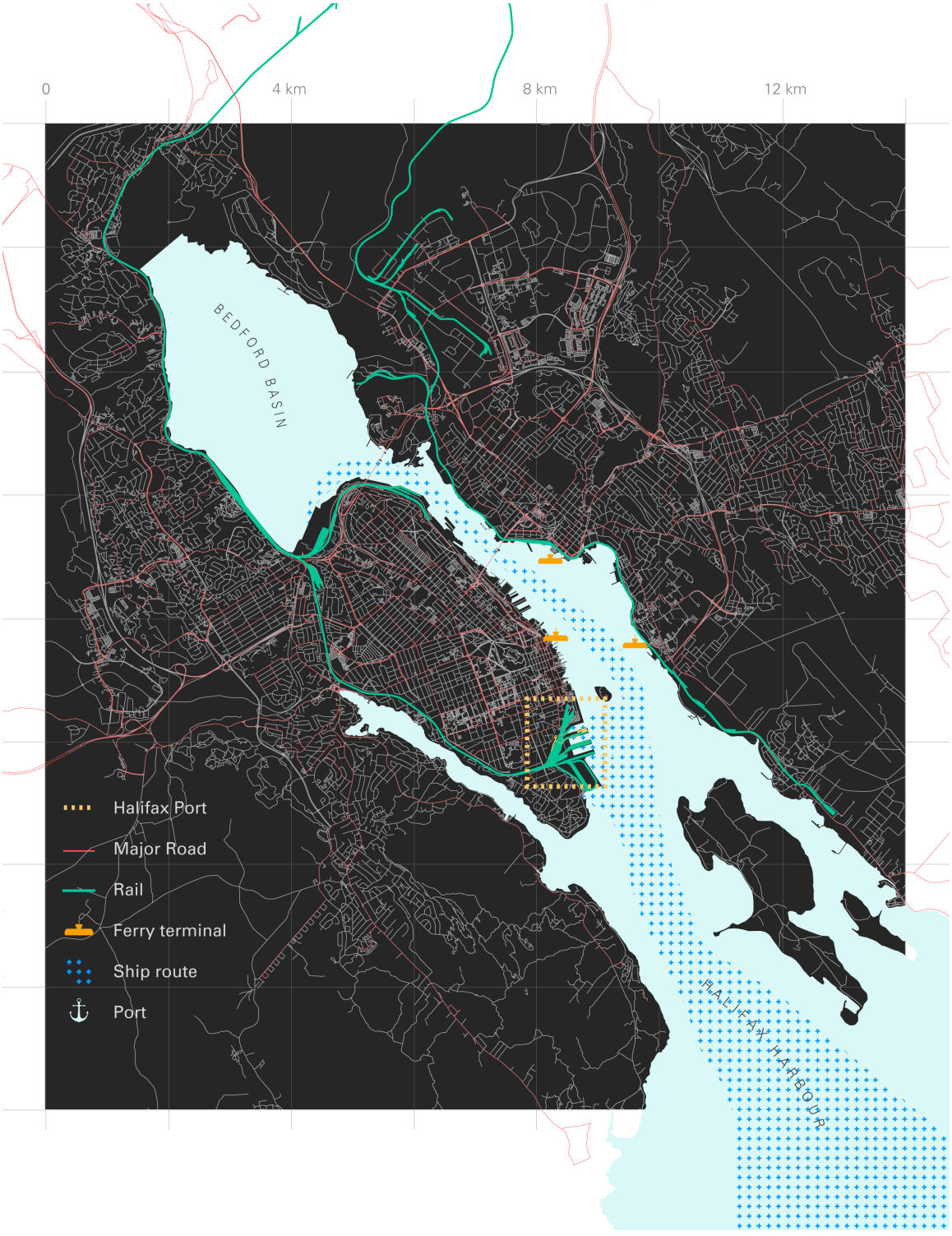
In Canada, grain crops traditionally start their journey in the prairies. Once harvested, they are transported and stored in a country elevator nearby. The crop is held there for a period of time before being processed and sold or transported further to be exported beyond Canada (Porritt 1918, 344). The last stop a crop makes before being exported overseas is in a terminal elevator. Terminal elevators are situated on in port cities on shipping routes and are designed to collect grain from the prairies by rail, ship, or truck.

Halifax was once a key connection in the worldwide grain industry, seeing its peak prior to the 1980s. From Halifax, prairie wheat was shipped to Russia and Europe, but these regions eventually became autonomous and stopped

importing grain from Canada (Brownlie 2019). Now, prairie wheat is distributed around the country and mostly exported west to Asia, leaving Halifax out of the equation. This turn of events is largely responsible for the decline in business for the Halifax grain elevator (Brownlie 2019).




Canadian grain route (grain elevator location data from Agriculture Canada).




Transportation systems on the Halifax peninsula (base map from Halifax Open Data 2019).

# Chapter 3: Human Landscapes

## Industry and City

Mah's description of the term "ruination" (as opposed to "ruin") is an accurate description of industrial landscapes going through deindustrialization. "Ruination" refers to the process which is constantly acting on the site; it is always aging, in decline, and thus in the process of being "ruined" (Mah 2012, 3). In terms of the Halifax grain elevator, this description fits the site well. It is not yet a ruin because grain is still moving through, but its primary industry is in decline. This makes Halifax an ideal test site because it provides a realistic scenario that many industrial buildings face. Often an industrial ruin does not present itself overnight and rather the economic and physical process associated with becoming a "ruin" is one that happens over years or decades.

Due to the time of industrialization in relation to the time of urban expansion, industrial buildings often exist in central urban areas. This means that while they go through the process of ruination, they are sitting on land that is extremely valuable to the surrounding community. When the first silos were built to become the Halifax grain elevator in 1924, they existed on the outskirts of the city. Today, after the city has sprawled over the peninsula, the grain elevator exists very much in the center of Halifax. Industry was not designed to coexist with urban and residential areas, so now that a large portion of the grain elevator goes unused, this begs the question – can human intervention occur while maintaining existing industrial processes?

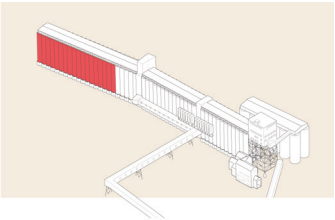
This thesis will explore ways in which existing grain infrastructure can be supported while a proactive plan can be implemented, instead of waiting for it to fall into ruin.

## Systems on Site

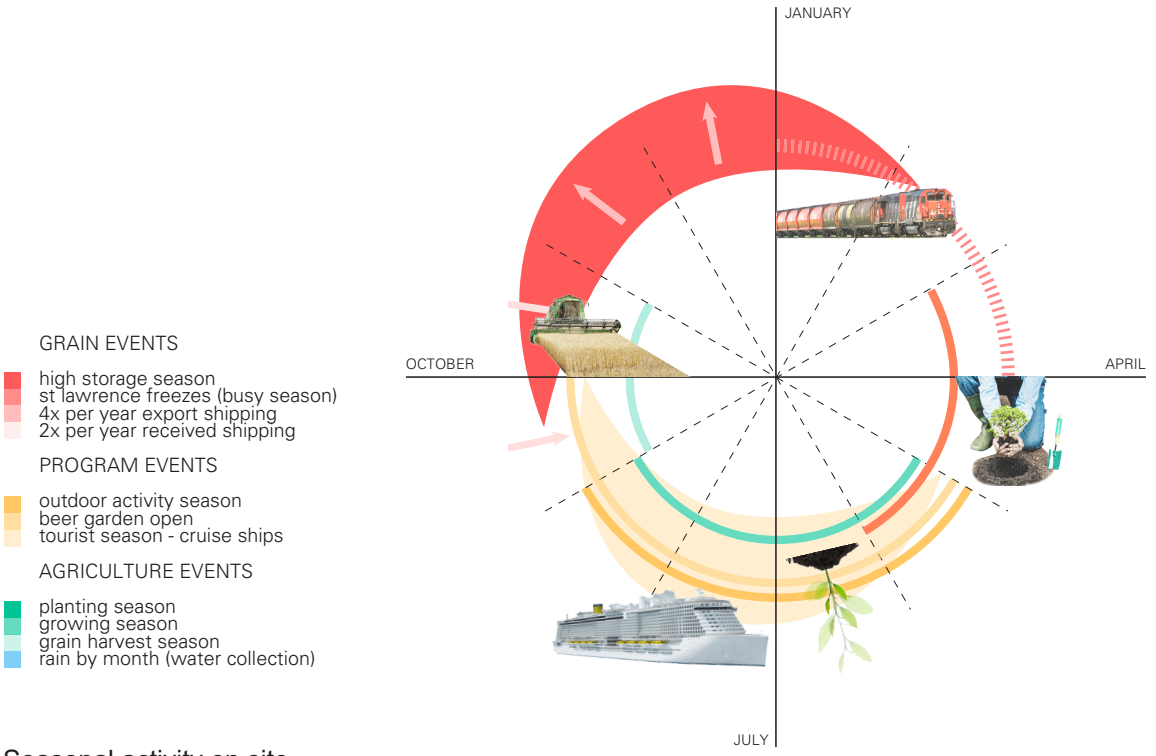
Due to the nature of grain production, fluctuations in activity are seen in each season at the grain elevator. The busy months are in the fall and winter after grain is harvested when crops are being moved, stored, and sold (Brownlie 2019). The grain elevator operates at low capacity in the spring and summer while crops are being grown and do not need to be stored. Capacity averages at 75% during busy season and is approximately 50% during low season (Brownlie 2019). Out of the 365 silos, this means that 91 silos are permanently empty.

It is worth pointing out that peak grain season and peak social activity season are opposites. The city sees a large influx of people during tourist season from May to October, when grain activity is low. Because there is less industrial activity, it is possible to host more people in the summer when the demand for recreational activities are higher.

With deindustrialization, the Halifax grain elevator has seen a shift towards more locally based systems. While Halifax used to be an international stopping point, the city now imports prairie wheat to be milled into flour at the flour mill on site and distributed around the province. As well, Nova Scotian wood pellets from Musquodoboit Harbour are a large client for the grain elevator. They are exported to Europe in the winter months and used for heating (Brownlie 2019). This thesis takes this into account the opportunity to incorporate short food supply chains into an intervention.



Highlighted in red, twenty-five percent of silos remain empty through the year.




Seasonal activity on site

## Adaptive Reuse Approach

Grain elevators have a strong social history and it is important to consider this in moving forward with adaptive reuse. The history of a city is not typically understood through the industrial ruin the way it is with statues or monuments. But, the fact is that these landscapes have contributed enormously to the growth of cities, and they often have a strong presence in collective memory and in the landscape. We understand our history largely through built environment, so should industrial ruins be recognized as a piece of heritage? Tim Edensor challenges “ordered forms of social remembering” in his text “The Ghosts of Industrial Ruins: Ordering and Disordering Memory in Excessive Space”. He says, “the effects of industrial ruins can interrogate and contest the normative ways in which memory is spatialized in the city” (Edensor 2005a, 829). This

suggests that industrial ruins may hold a valuable history that is unique to what is displayed in the urban environment currently. Mah reinforces this, noting that “despite their state of disuse, abandoned industrial sites remain connected with the urban fabric that surrounds them: with communities; with collective memory; and with people’s health, livelihoods and stories” (Mah 2012, 3). This thesis builds on the idea that industrial ruins have some value that is worth taking into account when considering new urban plans.

It should also be understood that a ruin does have intriguing qualities (Edensor 2005b, 87) and adaptive reuse of any caliber will alter this character. This is not to say that all qualities of a ruin should be retained but rather the intervention should question which qualities may be carried into contemporary society through adaptive reuse design. As discussed, the Halifax grain elevator is not yet an industrial ruin. It is a ruination, where many of the theories of the industrial ruin can still be applied to the site’s characteristics and social significance.

In terms of adaptive reuse, this thesis positions itself to be sensitive towards the intriguing qualities of the ruination, but favors contemporary social needs over the perfect preservation of the building. While recognizing that the terminal grain elevator holds a certain place in history, it is also somewhat removed from human experience because it was designed for grain. It is not efficient for humans and most of the building lacks natural and artificial light, doors and other systems necessary for human comfort.

It is important to retain the character of the silos so to finally reveal to surrounding communities what it is and what they have been living near for so long. This thesis takes

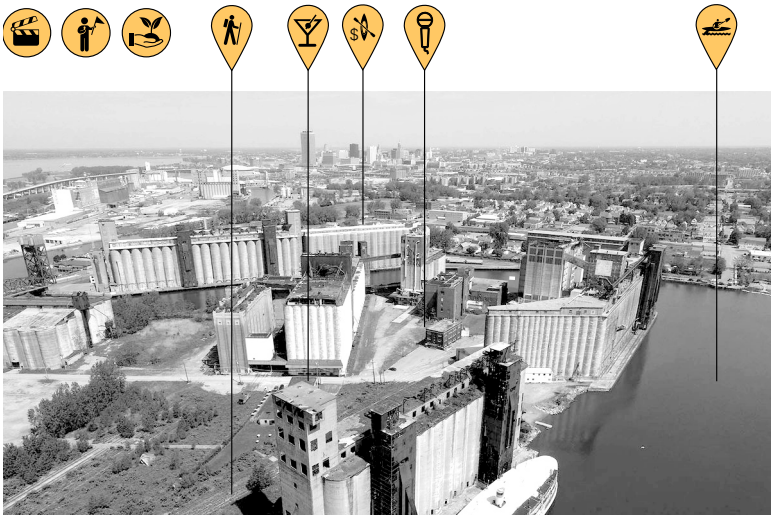
a proactive approach to adaptive reuse, as described earlier by Bhatia in *Coupling: Strategies for Infrastructural Opportunism*, in the sense that industrial infrastructure can be seen as an opportunity for moving forward with new forms of contemporary urban life.

## Case Studies

To illustrate the position taken by this thesis on adaptive reuse, a range of industrial adaptive reuse case studies are organized according to level of physical intervention. Minimal intervention refers to fewer alterations to the built form, and may rely more on programmatic intervention to change the use of the site in a significant way.

### *Low Intervention: Silo City*

Silo City in Buffalo, New York, is a cluster of grain elevators that have been decommissioned. This is a good example of minimal intervention that changed the site significantly through program. Programs were implemented that did not need built intervention and allowed people to exist on the



Silo City's added programs (base image from Buffalo News Photo 2018).

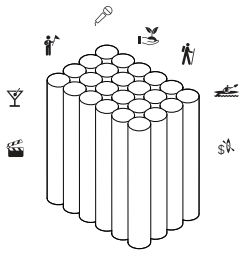
**Level of physical Intervention (low to high)**

**Silo City**

Buffalo, U.S.

Former use: grain elevators

Current use: cultural hub



**Summit Climbing Gym**

Oklahoma, U.S.

Former use: grain silos

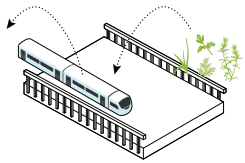
Current use: climbing gym

**The Highline**

NYC, U.S.

Former use: rail track

Current use: park

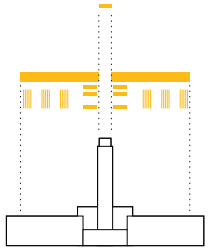


**Tate Modern**

London, UK

Former use: power plant

Current use: museum

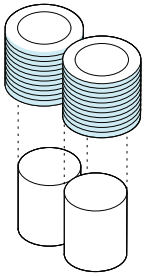


**Frosilo**

Copenhagen, Denmark

Former use: grain silos

Current use: residence

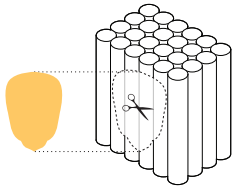


**Zeitz Museum**

Cape Town, South Africa

Former use: grain silos

Current use: museum

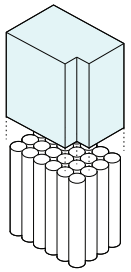


**Silo Point Condos**

Baltimore, U.S.

Former use: grain silos

Current use: residence

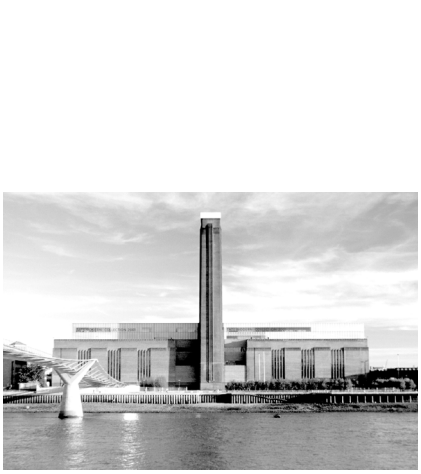


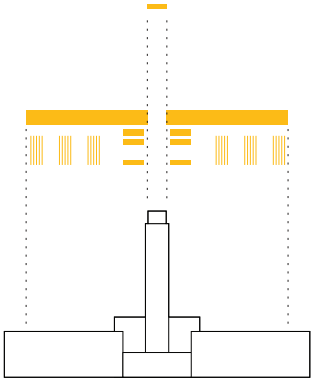
Case studies organized by levels of physical intervention.

site in a recreational way. Some of the activities include kayak rentals, walking trails, event hosting, grain elevator tours, and a bar/restaurant. A takeaway from Silo City is that there is an interest in industrial landscapes as a site to host recreational activities. It is also worth noting that the site is kept public. Industrial landscapes have such a prominent role in the history of industrial cities, so it is a natural transition that they are open for the public to explore.

***Medium Intervention: The Tate Modern***

The Tate Modern began its life as a power station on the bank of the Thames River in London, UK. The architects retained much of its character on the exterior while transforming it into a cultural building. They worked with the existing composition on the building's facade to insert windows and additions and at night, the building glows from these areas. Overall, high priority is placed on preserving the structure as a piece of history, while recognizing that it can be changed as it begins a new life. A takeaway from the Tate Modern is that the history of the building can be displayed and celebrated but the design does not need to be bound by it.





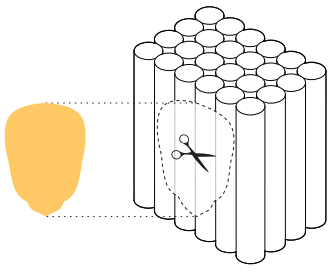
Tate Modern, photograph by Michael Duerinckx (Encyclopedia Britannica, 2020) and additions diagram.

***Medium Intervention: The Zeitz Museum***

The Zeitz Museum in Cape Town, South Africa was a completely decommissioned grain elevator before the project began, and most of the silos were removed to provide interior gallery space. The outer shell was kept so it is still apparent that its original purpose was storing grain. A takeaway of the Zeitz Museum is how the silos were cut to reveal the tubular geometry. These spaces give the visitor an idea of the scale of each silo and simultaneously turns it into a piece of art. The cutout is in the shape of a corn kernel, which was one of the grains stored in the elevator and found scattered around the abandoned building (Heatherwick Studio 2017). This not only exposes the geometry but tells the story of the building's past.

***High Intervention: Silo Point Condos***

On the far end of the intervention spectrum is Silo Point Condos in Baltimore, Maryland. Programmatically opposite Silo City, a condominium building is an inward facing program, meaning it does not allow the public to explore the site. As well, the solid concrete nature of the silos must be altered extensively to be suitable for residential spaces. Windows, doors and new building systems must be implemented to



Zeitz Museum atrium space 2017; photograph by Iwan Baan (Heatherwick Studio 2017) and corn shaped cuts diagram.


Silo Point Condos in Baltimore, NY (Parameter Inc 2010).

make the silos inhabitable. Because of this, the original use is not apparent from the exterior and the heavy additions of glass conceal the iconic wall of concrete cylinders.

## Concluding Approach

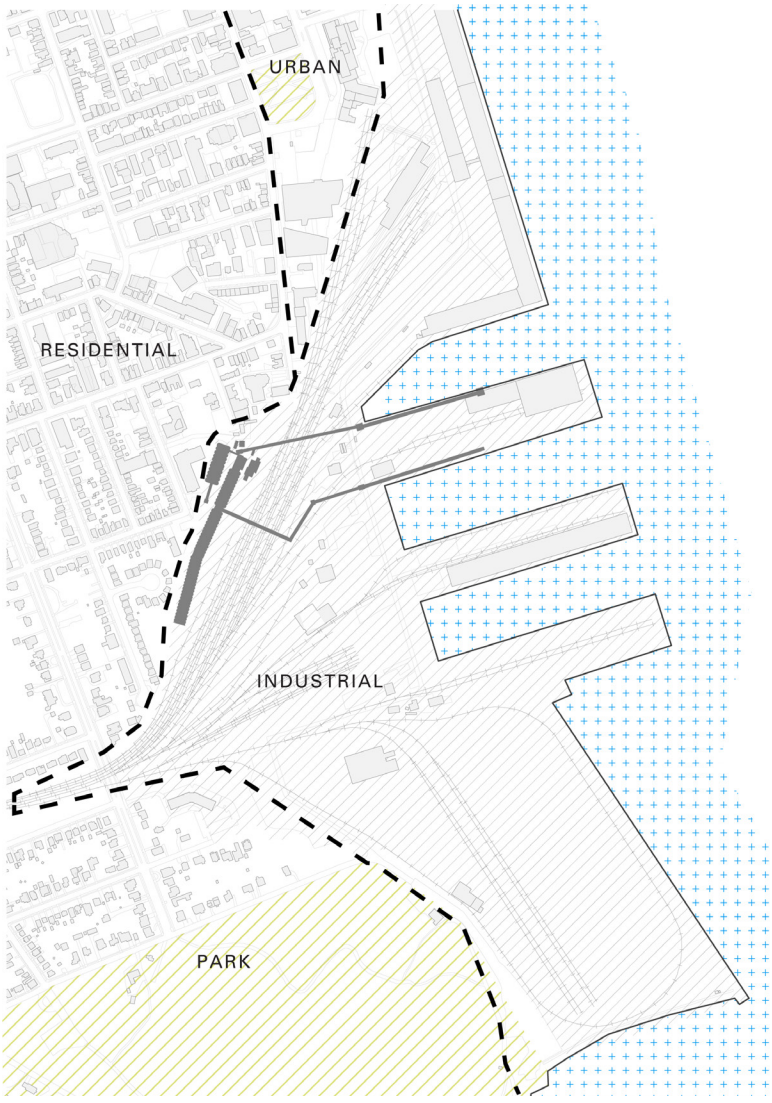
It is clear from the case studies that program is an important factor in an adaptive reuse project. The built form of the grain elevator is existing, therefore the design of program is important to direct flows and attract people to the site. That is why this thesis will explore program as a driver for architecture in the adaptive reuse of the Halifax grain elevator.

Although much of the theory covered in this section has to do with the abandoned “ruin”, much still applies to the partial “ruin” that is the Halifax grain elevator. This thesis approaches the ongoing negotiation between functional industry and public space with an exploration of how decommissioned industrial infrastructure can be leveraged for public program.

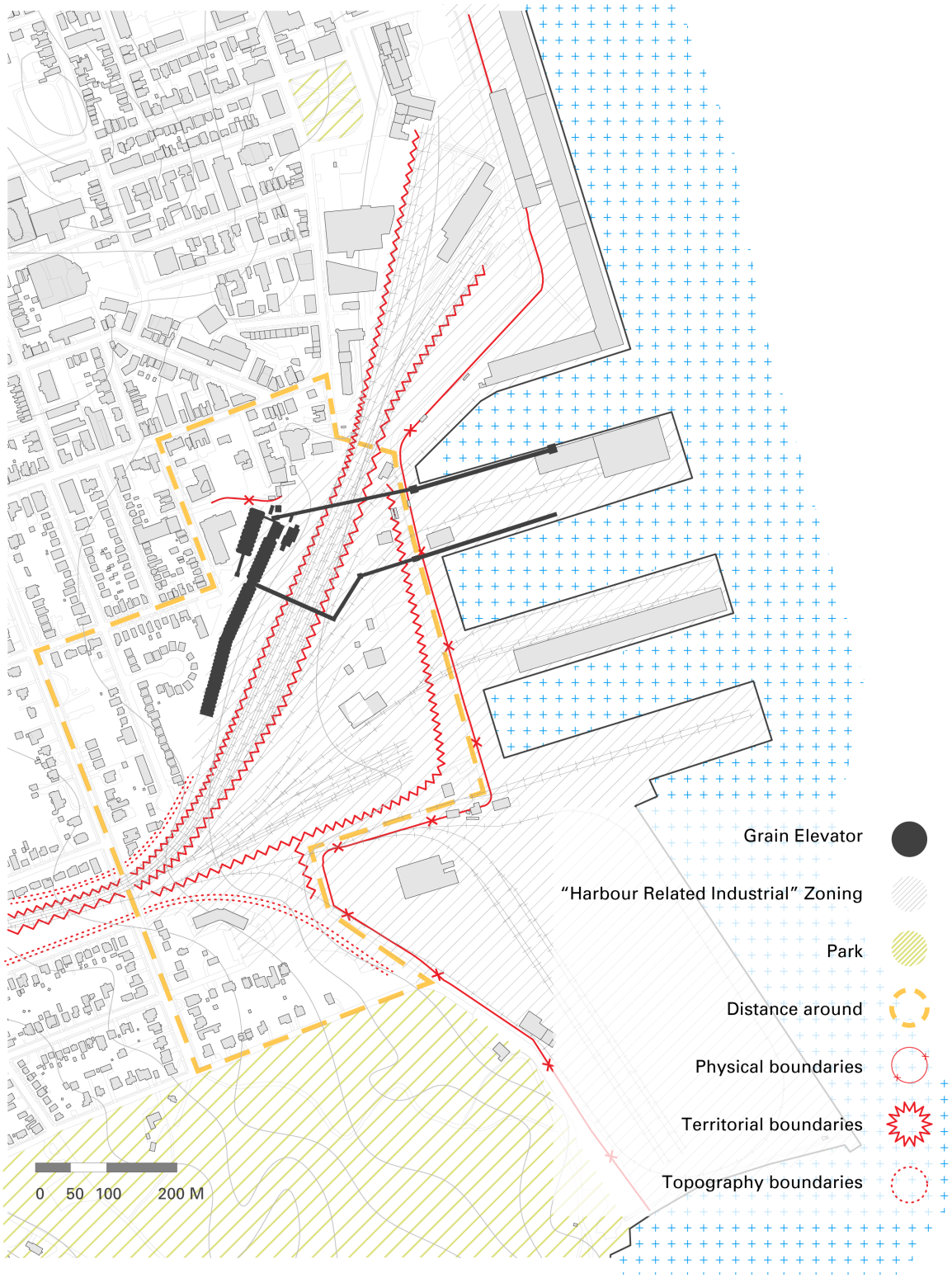
# Chapter 4: Site Study

## Four Neighbourhoods and Community Issues

The grain elevator effectively separates four distinct zones: industrial, residential, downtown, and park. Due to its time of construction, it was considered to be on the outskirts of the city, while today after urban sprawl, it is considered very much in the center of the city. Many industrial areas experience this due to the timeline of industrialization in contrast with the growth of cities. There is a clashing of




Four zones (base map from Halifax Open Data 2019).



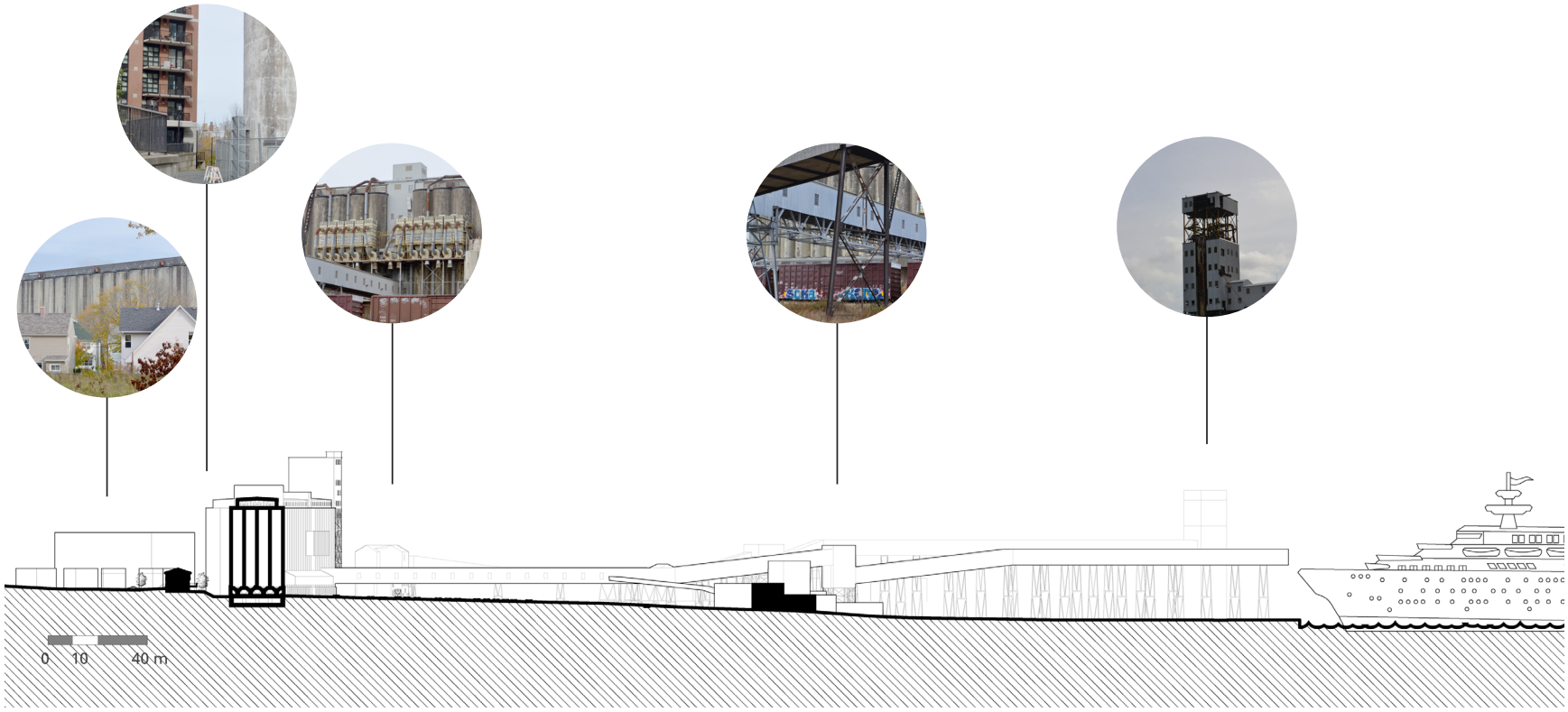

Map showing connectivity and barriers in relation to the site (base map from Halifax Open Data 2019 and HRM 2019).

zones, especially with the suburb directly west of the grain elevator. Some houses and a condominium building come within a few meters of the grain elevator, and many houses exist in its shadows for a part of the day. Not only does the wall of silos block sunlight, but it blocks harbour views. The suburb behind the grain elevator would have sight lines directly to the harbour (and waterfront access if it was not zoned for industry) if the grain elevator did not occupy its vertical and horizontal space.

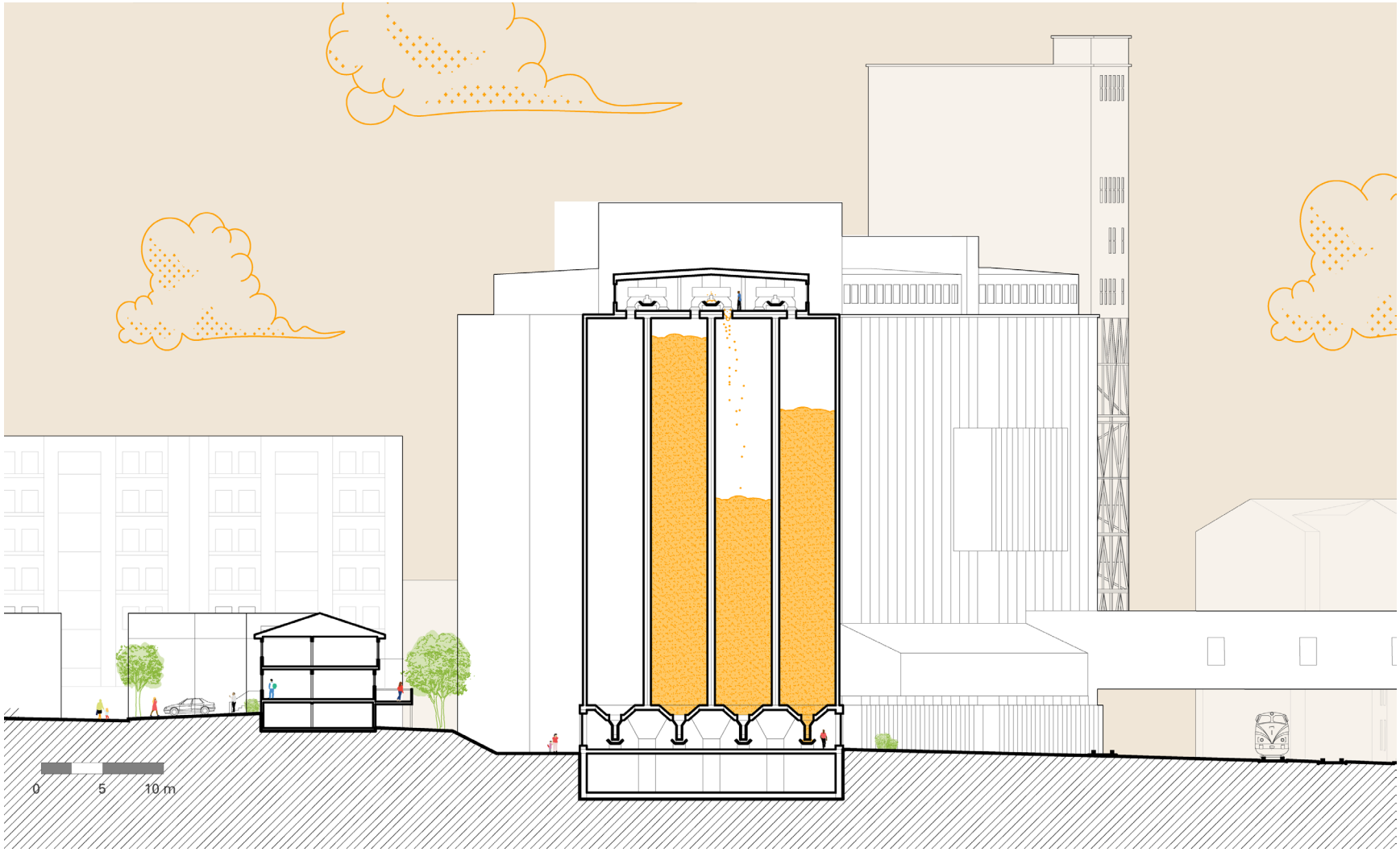
The grain elevator has a contested relationship with the residents to the west, but it is also on the first point of contact for people entering the city by boat or cruise ship on the east. Ships coming into the city dock at the port, and the industrial area is the landing point for tourists and seafarers alike. Although these two groups of people exist in close proximity to each other, the grain elevator is a barrier between east and west. As mentioned, the grain elevator separates these four neighbourhoods because of its size in combination with the rail tracks. This leaves little pedestrian access and residents wanting to cross the site must loop all the way around the grain elevator, as shown on the site map. Because the grain elevator has such a wide reach across the site, it could potentially be a connector instead of an inhibitor.

### Dichotomy: Disdain and Curiosity

There are multiple attitudes towards the grain elevator from people who live around it. It is sometimes viewed as a negative element in the community, an industrial building existing too close to living quarters. At the same time, it is a place where some go to have wedding photos taken or for others, their favourite place to run. The problems that



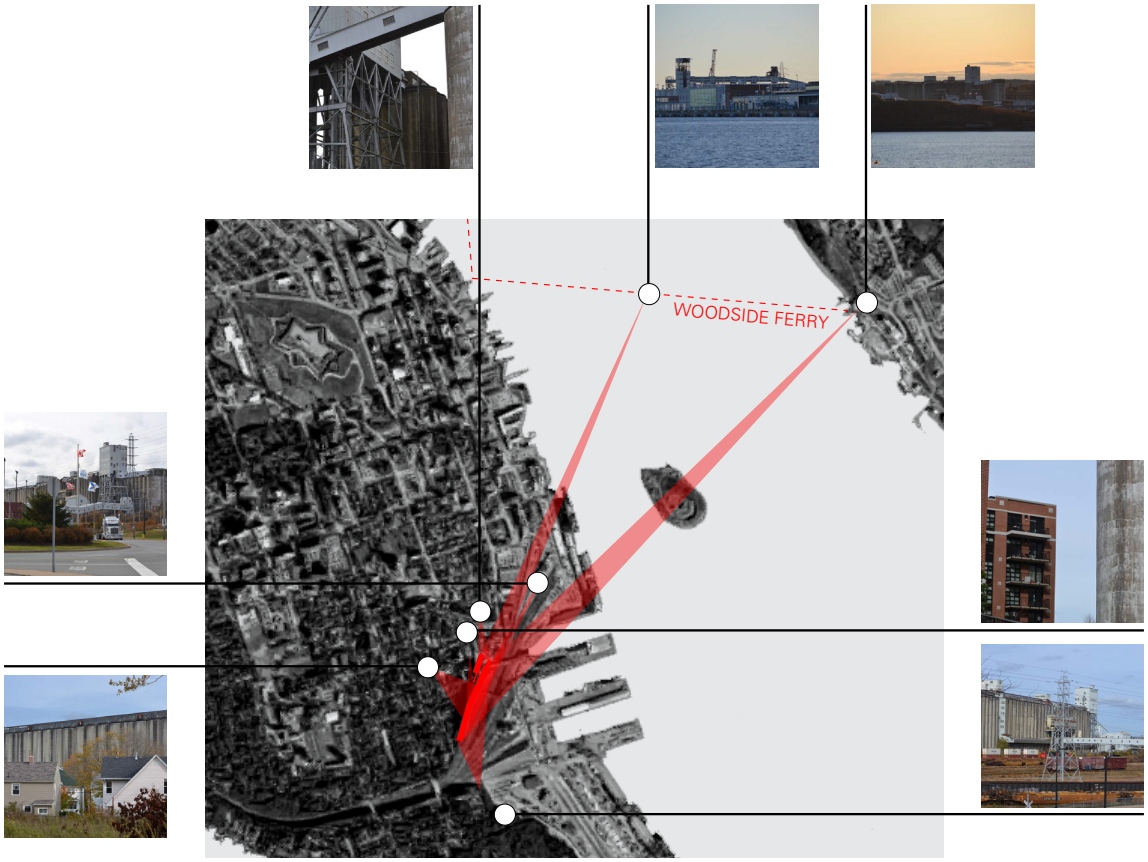

Long section showing multiple edge conditions.




Section showing the difference in scale between the grain elevator and adjacent suburb.

Adjacent apartments in close proximity to the grain elevator.

are encountered when industry and urban/residential zones mix are evident around the edges of this site, but that may contribute to the curiosity it evokes. It is possible that it is viewed by some in a negative light because the city has not had a chance to be close to it and the intriguing aspects of the grain elevator have so far been inaccessible. Currently, it has a mysterious presence in the city. It can be seen from numerous places such as Citadel Hill, across the harbour in Woodside, arriving on a cruise ship, and from many high elevation points in the city. Declining industry opens the opportunity for the grain elevator to be seen inside and out by the public.




Fragments: The grain elevator can be seen from many points around the city (base map from Google Maps 2019).

## The Architecture of Grain Elevators

### Specificity of Form

One of the reasons grain elevators became popular with modern architects is that their form is dictated purely by efficiency. It is very functional in storing and moving of large quantities of grain, and that is the purpose it was designed for. This proves an issue when adapting to an inhabitable use, because it the solid concrete silos were not intended for human inhabitation.

The vertical strength of a silo is provided by uninterrupted reinforced concrete for the entire height of the silo. Altering the silos for human inhabitation requires cuts to be made for doors, windows, and buildings systems, which begin to reduce the strength of the reinforced concrete.

Large alterations of the silos may mean that an alternate structure is needed to support the remaining silos. Most of the building is for the storing of grain, and currently humans may only access the top and bottom floors and workhouses but they may not go inside the silos.

Although the silos were designed for maximum vertical strength, they were not designed with decommission or demolition in mind. The concrete silos have already outlived the industrial period and are projected to last much longer. Moving forward with the knowledge that a building will change use over time is important to address in any intervention.

### Navigating the Movement of Grain

Examining the way grain moves through the building reveals which areas can be cut and still facilitate grain processes.

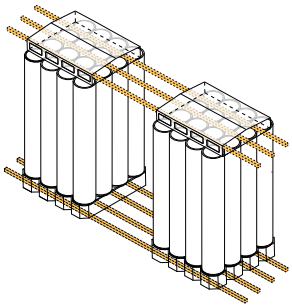
Grain arrives by rail, truck or ship. If it arrives by rail or truck, it is taken in the track house where it moves along an underground conveyor belt into the building. If it arrives by ship, the grain is taken along the galleries and enters the building this way. Once the grain is in the building, it moves along a conveyor belt to workhouse 1 where it goes up one of the elevators. The iconic wall of concrete silos is representative of the grain elevator, but the “elevators” actually exist outside the silos in external buildings. These are what lift the grain up to then be stored in the silos. Once it is at the top, it may be weighed or tested for quality. From there it goes along one of the horizontal conveyor belts and a machine directs it into its appropriate silo. It may be stored in the silo for varying amounts of time, either while it is being sold or while it awaits transport to a processing facility or elsewhere. When the crop needs to exit the silo, the bottom of the silo is opened to pour the grain onto the bottom conveyor belt and it can be directed to the export gallery for shipping or be packed for rail or truck. In some cases, it is directed along the gallery to be milled at the flour mill.

### Alteration Opportunities

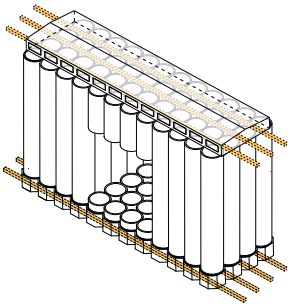
Grain moves horizontally through the building only on the top and bottom floors, and vertically at a few intervals. The majority of the building is silo space where grain is stored. Because the transportation of grain uses specific parts of the building, the silos can be altered in certain areas and still allow grain to move through efficiently.

If an intervention uses the silos’, top floor and bottom floor, then this means grain cannot be stored but it also cannot pass through on the conveyor belts. This may be called a “full cut”.


How grain moves through the grain elevator.



“Full cut”



“Floating cut”

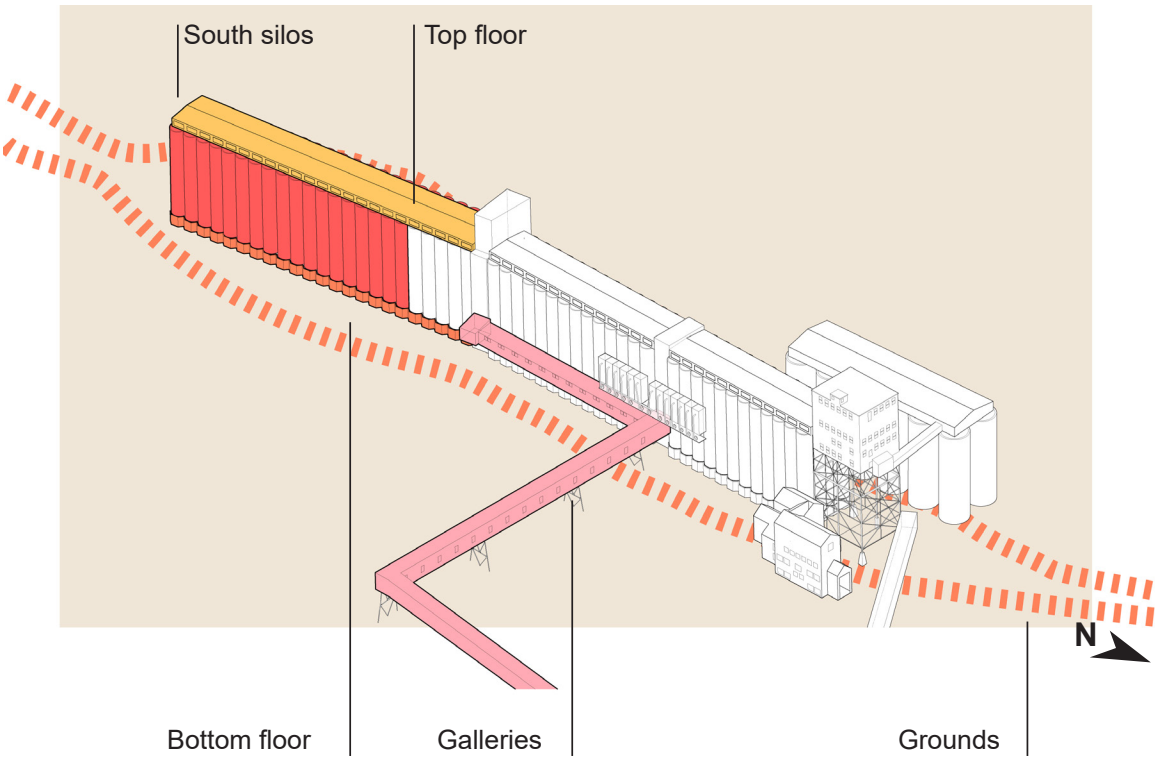
If a silo is cut in the center, between the top and bottom conveyor belts, then those silos are not suitable to store grain but grain can still move along the top and bottom floors. This may be called a “floating cut”.

Grain enters and exits the building on the north side, where the galleries attach to the building. This means that the silos on the south end of the building can be altered without affecting the current grain operations. With this in mind, and the knowledge that only 75% of the silos are ever in use at one time, the 25% of the silos on the south side of the building can be used for intervention without interfering with the grain processes that are currently running. While full cuts utilizing the top and bottom floors can only exist on the far south end, there can be a “floating cut” anywhere and grain can still move horizontally and vertically. If these cuts are used throughout the building, especially on the south side, then intervention can occur while allowing existing grain processes to run. Below, areas of intervention have been identified that will still allow existing grain processes to run.

## Architectural Opportunities

From the residential perspective, some of the negatively perceived built qualities of the grain elevator could be considered advantages if looked at from a human inhabitation point of view.

The grain elevator is iconic in the landscape. Its height, scale, and form distinguish it from other buildings, and has the spatial potential to host a wide range of programs. Here, a program needing large space could exist inside the city limits when it would typically be built outside the city today.




Areas available for intervention: South silos, top floor, bottom floor, galleries, and grounds.

The height of the grain elevator presents challenges with access to sunlight and views for the community to the west, but the top floor of the grain elevator provides sweeping views of the harbour and city behind. Because of the residential nature of the zoning around it, the grain elevator is likely to be the tallest building for a long time and retain its views. Pedestrians have no access to these views as current operations run, but if the top floor were accessible it has the opportunity to facilitate views rather than prevent them.

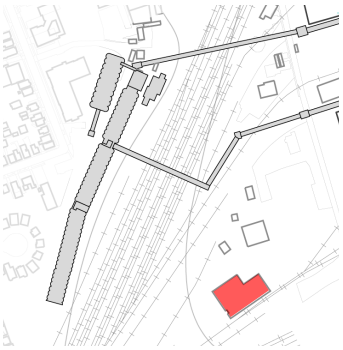
Grain infrastructure is most evident in the concrete wall of silos, but its horizontal reach to the harbour can be considered another opportunity. The galleries for exporting

and importing grain are only used a handful of times per year and reach directly to Marginal Road and the harbour. On a site where pedestrian connectivity is an issue, the grain elevator is well connected to transportation routes.

The grain elevator is also intertwined with other industries on the site. The flour mill may have a place in new public program, demonstrating a short food supply chain. A portion of the wheat that is brought to the grain elevator is already milled next door at the flour mill, and new public program may suggest furthering the chain to incorporate processing and potentially consumption of a final wheat product on site.

The shortening of food chains may start to connect to contemporary values. As seen in history, social significance of buildings change over time as values change. When grain elevators were revered as a Canadian icon, the grain industry was thriving. As industry fades out, the grain elevator loses that symbolism because its associated economic value has shifted. If the building were to host short food supply chains, this may be representative of contemporary values of sustainability, and the grain elevator takes on a new symbolic nature.

View of the harbour from the top of the grain elevator.



The flour mill adjacent to the grain elevator highlighted in red (base map from Halifax Open Data 2019).

## Economic Opportunities

Economic drivers are important in the realization of a building. Mah states that deindustrialization was caused by an economic shift from manufacturing to services (Mah 2012, 5), so this begs the question - what type of services could be hosted in the grain elevator that may fit with the current economic model? The thesis takes on a “Trojan horse” approach where multiple scales of entities take over what was once one massive industry-scale entity. Intervention of the unproductive footprint may hold economic opportunity for a host of key players.

The grain elevator owner may be motivated to implement intervention by leasing out or selling individual or multiple silos to businesses. This may help to offset the profit that is being lost by the downturn of the grain industry. At the same time, business owners may see a potential novel experience that comes with hosting a business in the grain elevator, especially with service-based programs that bring users into the space.

Residents may have motivation for intervention because of the potential the grain elevator has to host public program and address shortcomings of the site. Overall, the value of the grain elevator does not live up to what it was years ago because the economic situation has shifted. Through intervention, the silos have the opportunity to regain status as an important cultural symbol.

# Chapter 5: Program Development

As discussed in the case studies, program is a key driver for industrial reuse projects. Program selection is important because this will activate the movement and diversity of people and activity through the site. Designing program in this way takes a different approach to building in the sense that the built environment is already there and it is the program that is to be designed and serve as a catalyst for architecture.

This thesis takes on an experimental program approach that draws from different theories to select programs to be implemented in an adaptive reuse of the grain elevator. Theories are chosen from multiple sources that use the study of program as a driver for architecture. Each theory is applied to a different scale of intervention: extra-large, large, medium, and small. Organization by scale is borrowed from Rem Koolhaas and Bruce Mau's book, *S, M, L, XL.* In this case, they organized by scale of the project, while it is applied to this thesis as a way to categorize scales of intervention. This serves to organize the interventions into a kit of parts for different scenarios of industrial adaptive reuse with regards to grain elevators. As time moves on and a larger portion of the grain elevator becomes decommissioned, multiple scales of interventions may be implemented according to the amount of space that is available.

This chapter outlines each research method with respect to intervention scale, how it can be applied architecturally, and a list of associated programs that will inform the intervention.

## Extra-Large

Extra-large interventions facilitate urban connections and are not bound by any number of silos. They may be large-scale and signal to pedestrians that there is human activity in a previously industrial building. These can be in the form of cut-outs or attachments to the original building, using materiality to distinguish human activity from industrial activity.

Extra-Large interventions will be used to address previously stated urban-scale concerns such as connectivity and take advantage of architectural opportunities that the grain elevator presents. There is no singular theory associated with extra-large interventions, rather, urban-scale precedents will be studied in the next chapter for extra-large-scale design.

## Large

### *Program Research*

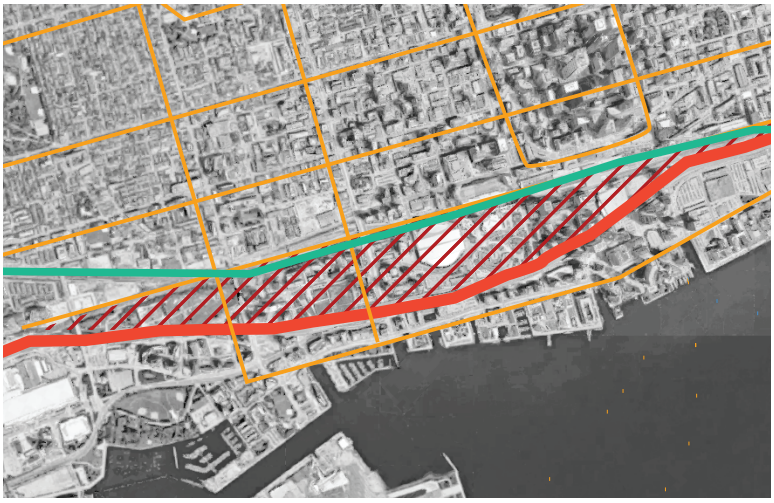
Large interventions are classified by the alteration of twelve or more silos for a program, and operate under Bhatia's theory in "Residual Islands of Plurality" that lands isolated by industry are areas where large public program can be accommodated (Bhatia 2009, 46). The author dissects the CityPlace, Toronto, ON, as a case study but the Halifax Port can be compared in the same way.

"Residual islands" are classified by land cut off by industry. This could be in the form of rail, highways, transportation systems, industrial buildings, and in Halifax's case, the grain


Urban scale considerations (base map from Halifax Open Data 2019).

elevator. Bhatia argues that there are certain characteristics that make industrial areas ideal for public program. The ambiguous nature of residual islands make them feel like “no-man’s land”, and because the land does not belong to anyone, it can be an attraction point for “everyone” (Bhatia 2009, 45). As well, the fabric of industrial areas is typically populated with large-scale buildings, where large public programs such as the CN Tower or Rogers Centre fit in compared to downtown cores where the fabric is comprised

The Halifax Port, NS surrounded by infrastructure (base image from Google Maps 2019).



CityPlace, ON surrounded by infrastructure (diagram information from Bhatia 2009, 47 and base image from Google Maps 2019).

“Residual Island”

Rail

Major Road

Public Transit

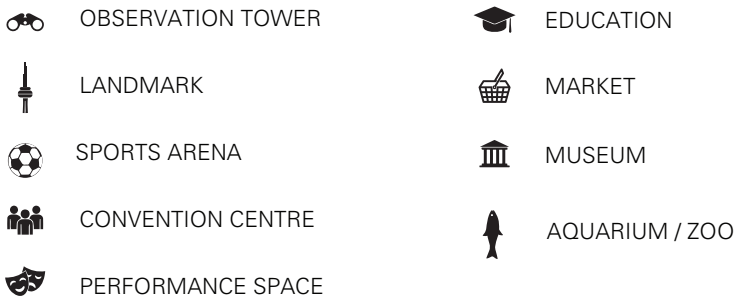
of smaller buildings (Bhatia 2009, 46). Finally, residual islands are often in central locations within the city due to the nature of the time they were built with regards to city sprawl. This means that they are also often well connected to the rest of the city by public transit.

***Intervention***

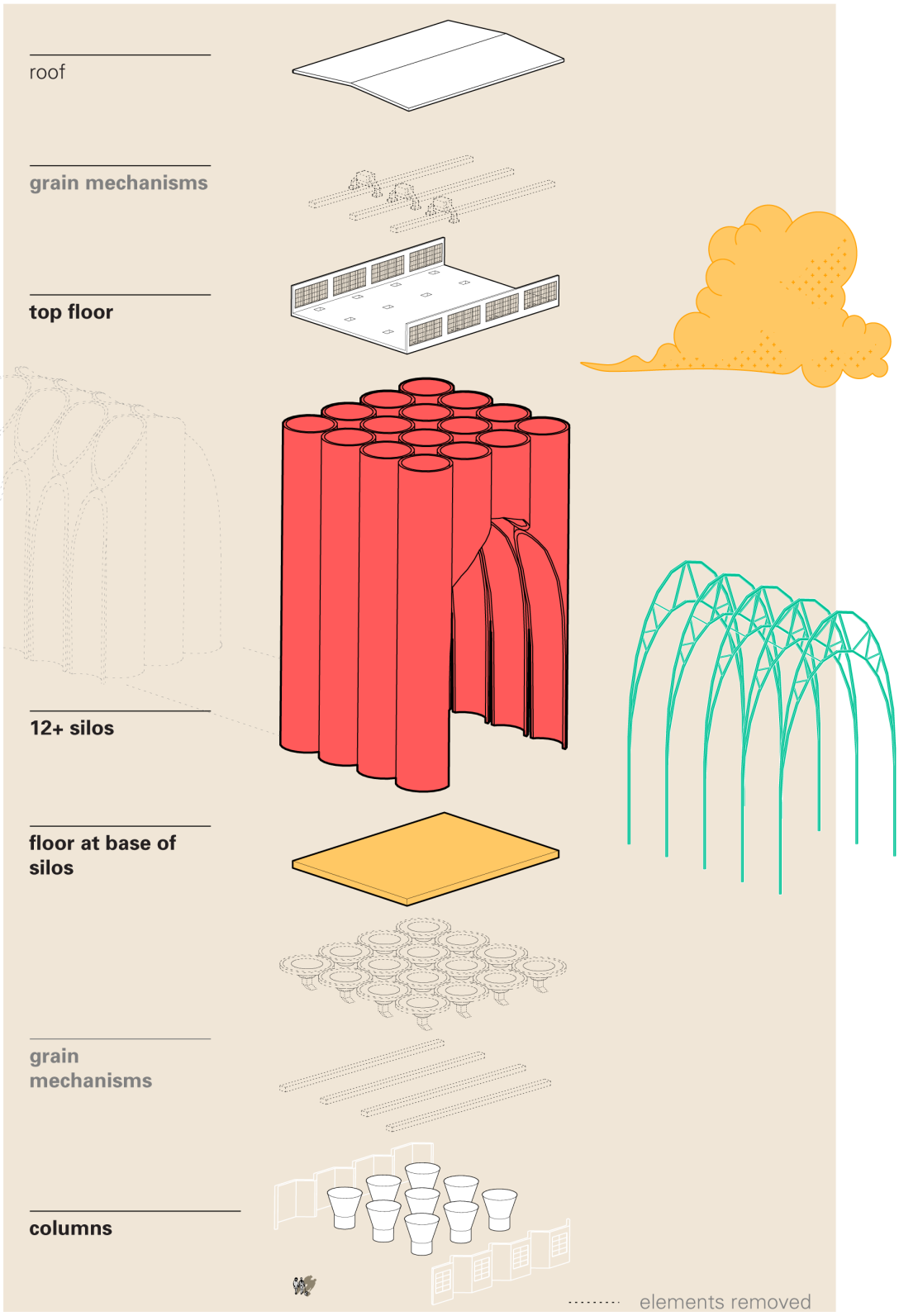
A cut to facilitate large public program would be restricted to four silos across the building but would be flexible in its longitudinal direction. Carving out many silos may require an additional structural system. This would reveal the dramatic geometry of the silos, and show the quality and number of silos. If a large intervention uses the top and bottom floors, circulation up and down should be considered.

***Applicable Programs***

Large public programs were gathered from the study site in CityPlace, Toronto, and locally. Large public programs




List of applicable programs with icons.



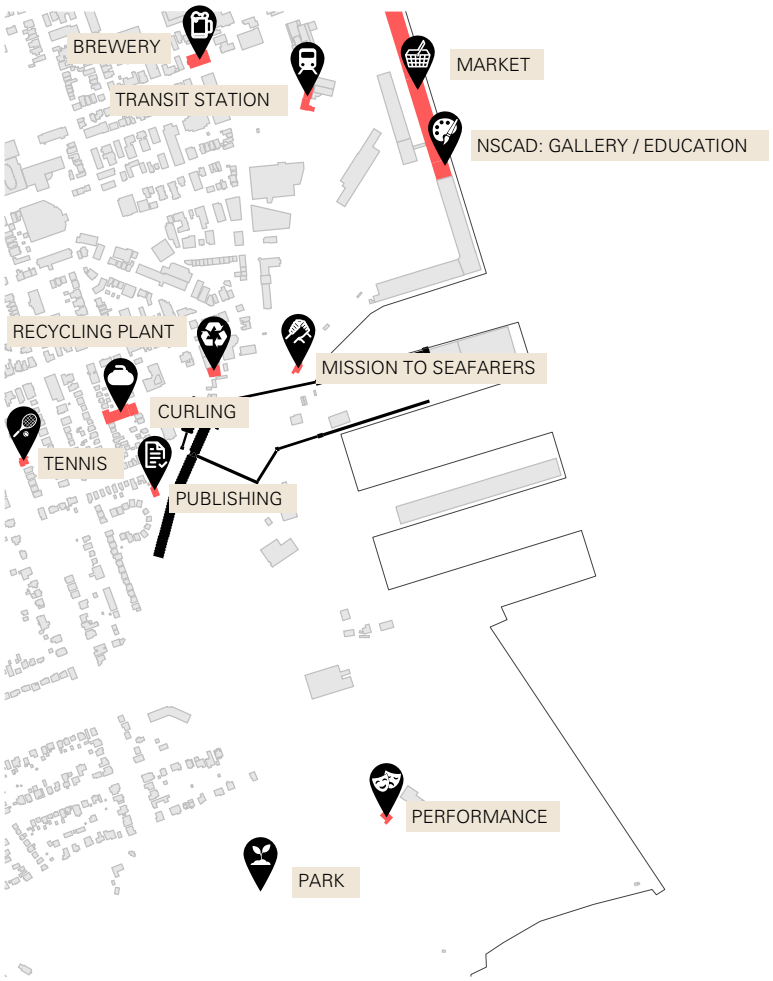

Large size intervention considerations.

include (but are not limited to): banquet hall, education centre, large performance space, large sports arena, and observation tower.

## Medium

### *Program Research*

Medium interventions use five to twelve silos and draw from existing program around the site that could potentially be built upon or host a satellite program in the grain elevator. This scale of intervention applies Mah's statement that




Map of potential medium sized programs to host in the grain elevator (base map from Halifax Open Data 2019).

deindustrialization was due to an economic shift from manufacturing to services. In this case, existing services in the area are drawn upon and tested in the intervention. The idea is that a diverse list of programs can be compiled and therefore a diverse group of users are attracted to the building.

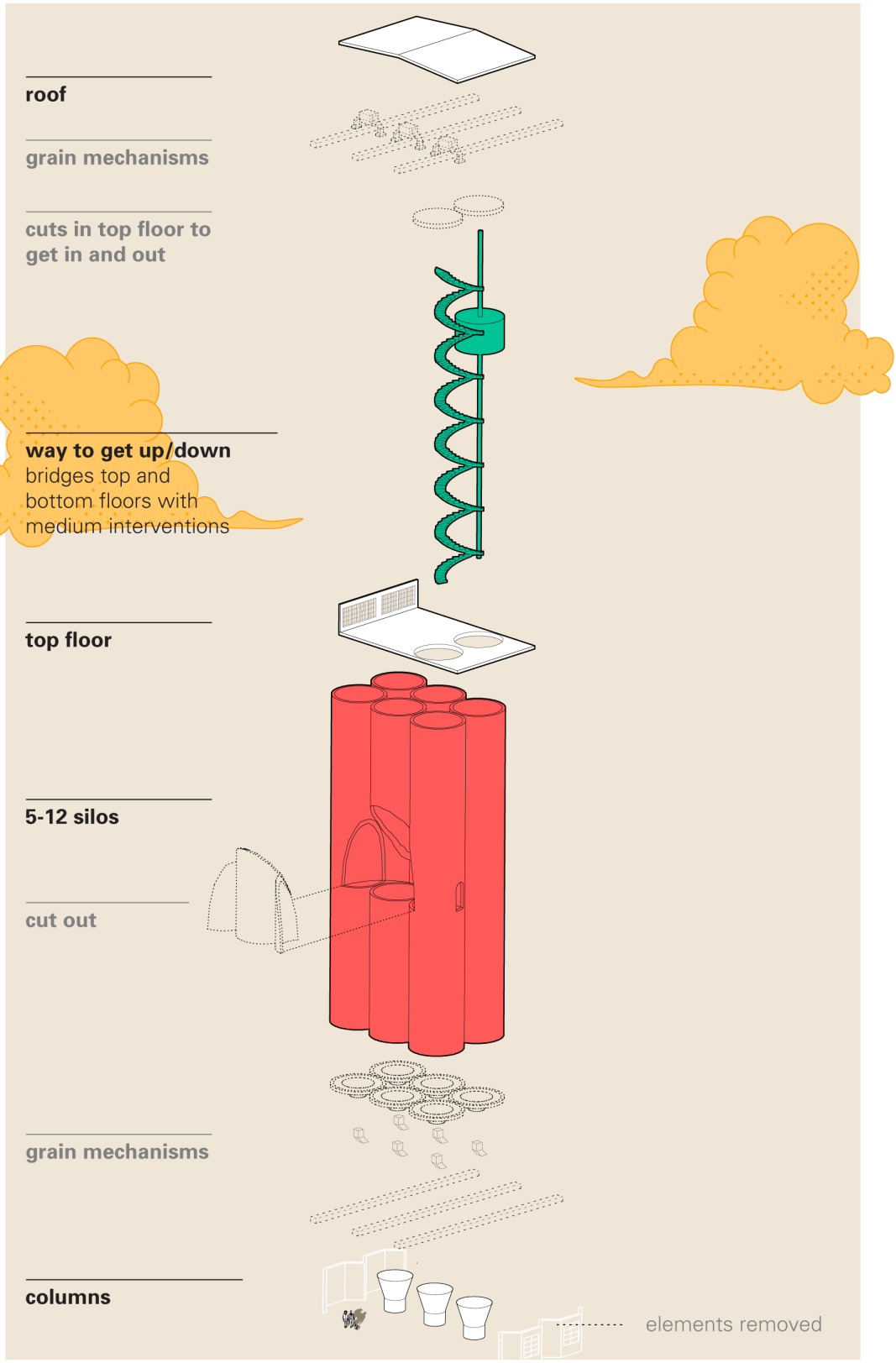
Koolhaas's theory in his Parc de la Villette proposal states that adjacent programs will have a "horizontal skyscraper" effect that promotes social encounters because the programs are juxtaposed in unusual ways (OMA, n.d.).

***Intervention***

A medium-sized intervention may take advantage of the views on the top floor or exist in part of a silo. These interventions will need to also create circulation to get in and out of the silo from the top or bottom floors and strategize ways to clump silos together and make cuts for medium-sized interventions.

***Applicable Programs***

Service-based programs from around the area were mapped and include (but are not limited to): brewery, transit station, bakery, market, education or exhibition gallery linked to NSCAD University, energy storage, recycling plant, curling, tennis, publishing, mission to seafarers, garden/ greenhouse, performance/theatre, and park.

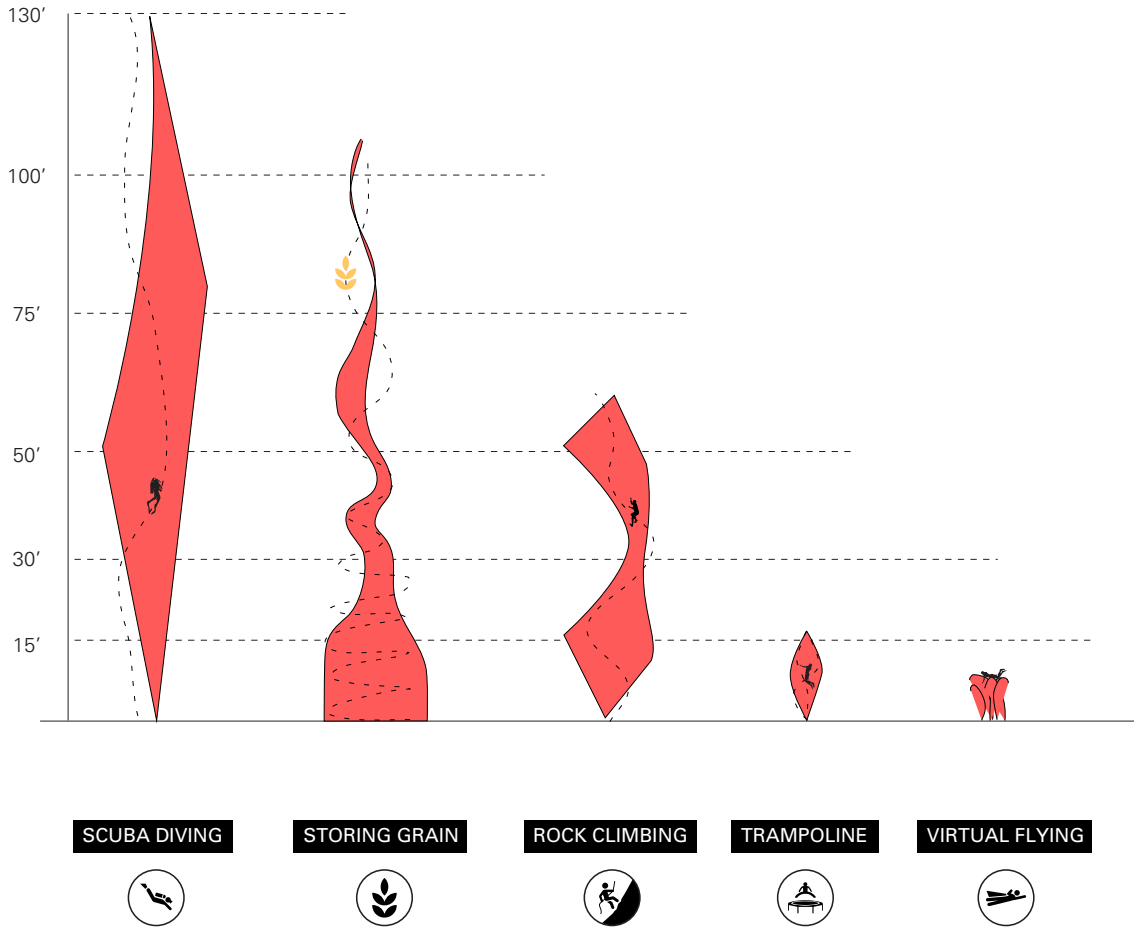



Medium-size intervention considerations.

## Small

### *Program Research*

A small intervention consists of one to four silos and adopts Bernard Tschumi's theory of "cross-programming". Cross-programming is defined as "the application of program to a space that was not intended for that program" (Tschumi 2012, 195). In his text, Tschumi gives an example of cross-programming as using a church for bowling.




Potential "small" sized programs that align with the vertical silo geometry.

Tschumi was getting at the same idea as Koolhaas' horizontal skyscraper when discussing the mixing of programs in that the "juxtaposition and combination of a variety of activities will encourage new attitudes and perspectives" (Tschumi 1987, 1).

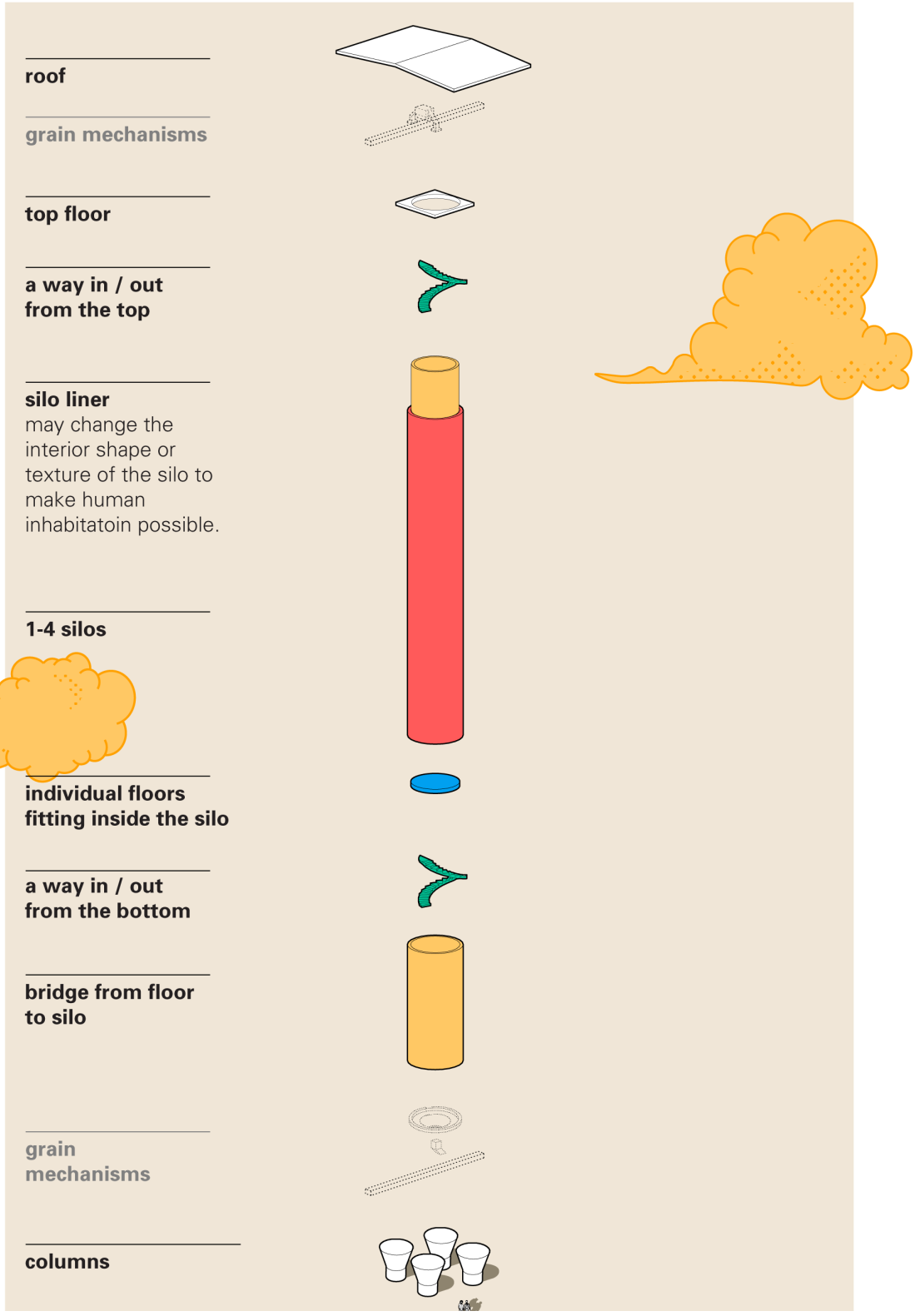
In terms of the grain elevator, using the existing building differently than the function it was designed for is an integral part of the thesis. The changing of program over time allows the building to take on new meaning. Tschumi describes the interchangeability of form and function while writing about cross-programming for his proposal for Parc de la Villette:

> there is no longer any fixed relationship possible between architecture and program, architecture and meaning. It has been suggested, in discussing La Villette, that architecture must produce a distance between itself and the program it fulfills (Tschumi 2012, 194)

Cross-programming can be applied to the Halifax grain elevator by working with the existing geometry of the silo. Programs are gathered that already utilize a vertical space and could exist in a single silo. Allowing a human to exist within a silo and understand the scale and height compared to their own body tells the story of the rest of the building, as silos are repeated throughout.

***Intervention***

A way to get into and out of an individual silo is needed, and according to the program, it may be at the bottom, top, or middle. The top and bottom floors may be used as an access point to enter and exit the silos. Depending on the needs of the program, a liner that fits inside the silo may also be needed. For example, a rock climbing wall will need a liner for attaching grips.




Small-size intervention considerations.

***Applicable Programs***

Programs were gathered that already use a vertical space, or the spatial requirements of the human body correlate with the dimensions of the silo. Small programs include (but are not limited to): scuba diving, rock climbing, trampoline, virtual flying, and water collection.

## Choosing Program

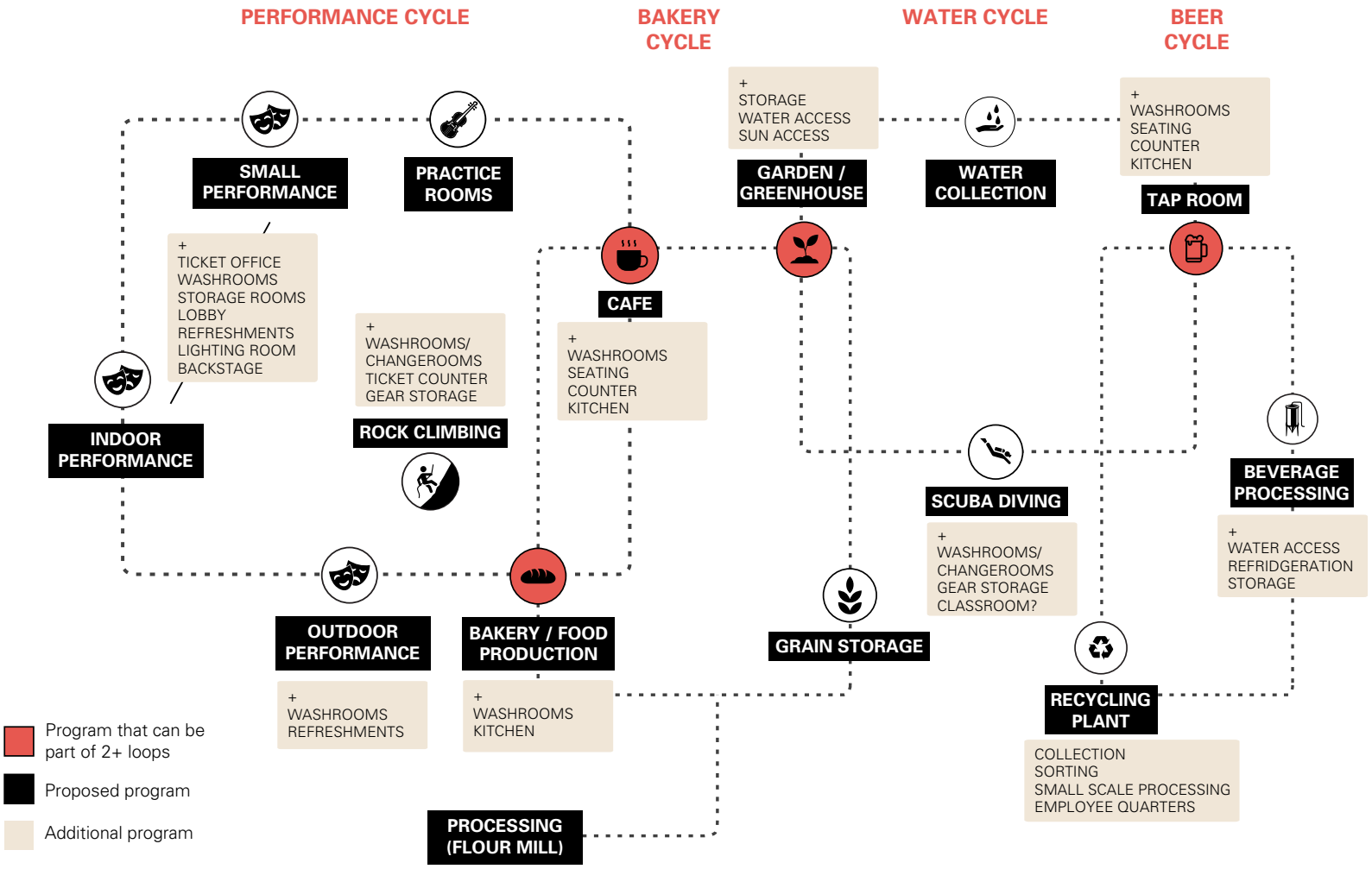
After the process of expanding possibilities of programs to incorporate into adaptive reuse of the grain elevator, the programs were narrowed down to fit more specific categories. Programs are tailored to maximize potential of the concrete grain silo and allow the user to experience the latent qualities of the silo.

The gathered programs are put together and from there, connections were identified between programs able to support each other and form program cycles. Programs can be part of a cycle if they support other programs in the

Program icons gathered from research.

set. For example, the following proposed programs cycles diagram illustrates how a bakery and cafe can be added to the existing grain storage and flour processing facilities to create a closed loop system. Grain may be imported from the prairies, processed at the flour mill, baked into goods at the bakery, and sold and consumed in the cafe. This program cycle increases the input for industrial systems as well as supports public program on site. Program cycles such as this are encouraged to encourage symbiotic relationships between human and industrial systems.

Programs are favored that can support other programs and create self-sufficiency to continue the trend towards localized systems that are already apparent around the site. These program cycles will be used later to move from diagram to building.




Proposed program cycles with secondary programs.

# Chapter 6: Design Intervention

## Addition and Subtraction

There are two methods of alterations: subtraction and addition. Subtraction refers to the taking away of material from the existing building, whether removing building parts or cutting into the concrete silos. Subtraction reveals characteristics and inner workings of the existing building (such as how it works and how it was built). On the other hand, addition to the building can include new forms or replacement of sections for the purpose of human inhabitation. Through details in materiality and form, additions convey the relationship between human and industry.

## Urban-Scale Intervention

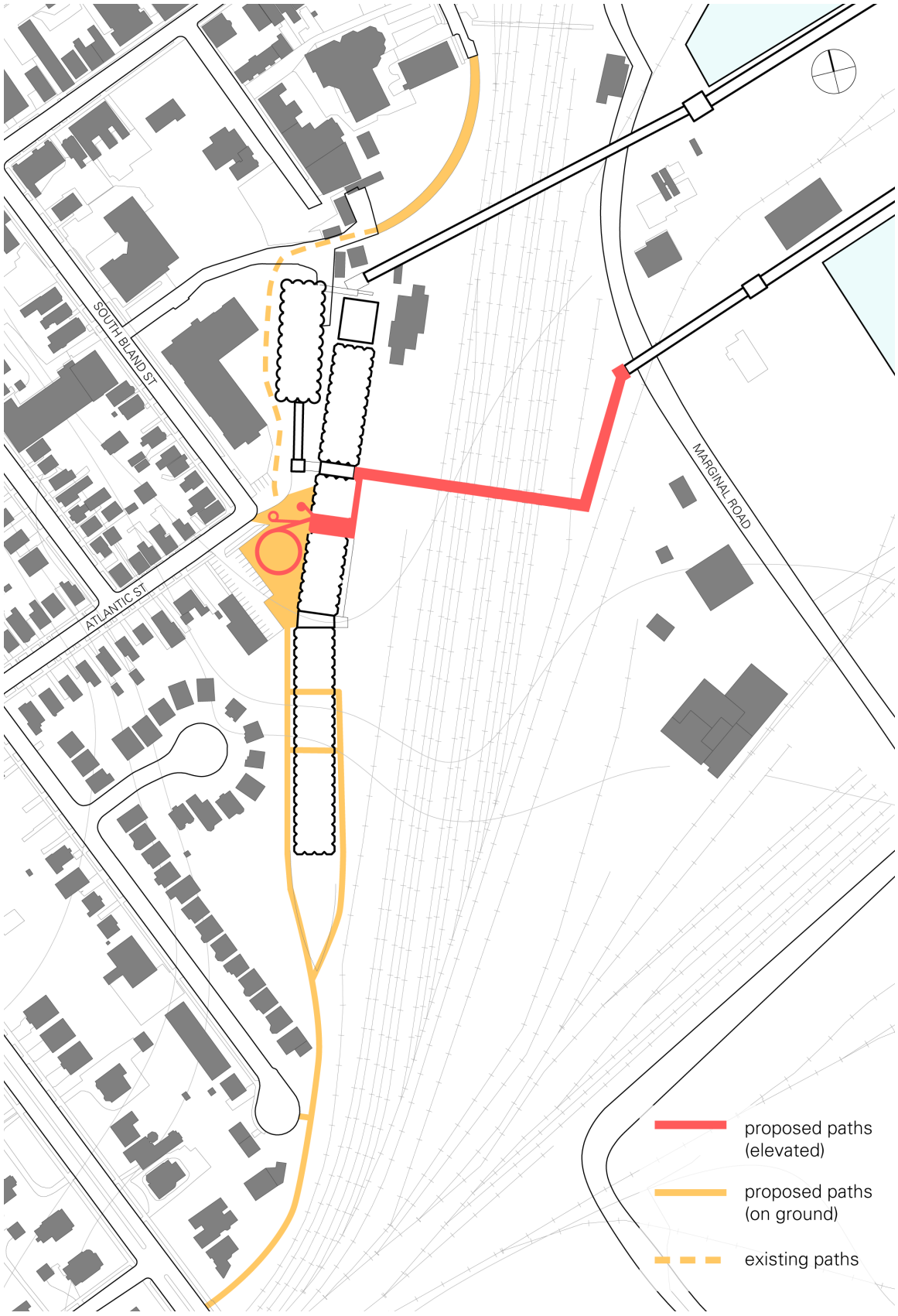
Urban-scale issues are addressed with a “cut” in the silos that is integrated with the addition of paths connecting the grain elevator to dead ends around the site. The paths are also a way to bring the pedestrian closer to the structure and explore areas that have previously been inaccessible. The paths extend from the streets along the galleries, leading the pedestrian through the same route grain would take to be exported overseas, and then back down to Marginal Road. The paths at ground level allow the pedestrian to walk next to the grain elevator and take in the height of the silos compared to the human body. Paths allow porosity between the two sides of the site, and lead to the cut, which is a puncture in the silos that connects the pathways and transforms the grain silos from a barrier into a passage: from an opaque wall into a place where views can be taken in.

The “cut” is at the corner of Atlantic Street and South Bland Street, an existing pedestrian intersection. It allows grain to move above and below it and people to move through it. This location is chosen because of its connectivity with the suburb to the west and the ability to connect through to Marginal Road to the east. The cut is made in the center of the silos to avoid the top and bottom conveyor belts and leads the pedestrian over the galleries. These obstacles elevate the cut, and in order to enter, pedestrians may use one of the multiple systems: stairs, ramp, or elevator, each providing a different experience. Their circular forms resemble the silos and allow pedestrians to ascend and take in the site as a whole, building up to the city and harbour views at the top. The multiple routes also create a plaza in front of the cut which signals that there is human program in the previously industrial-only building.

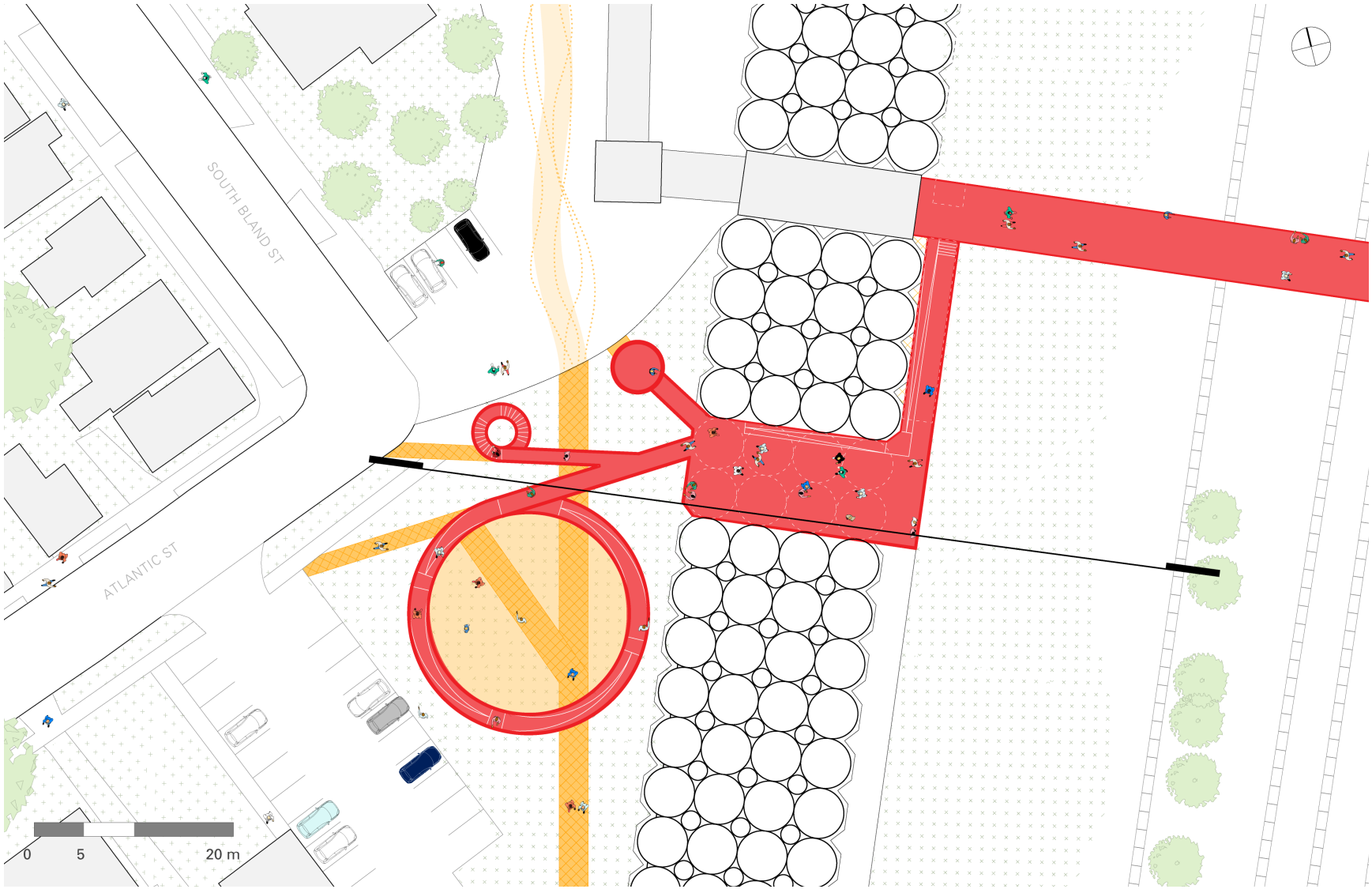
John Hejduk’s Wall House was studied in the design of methods to enter the cut. In Wall House, the ways of entering are separated from the building. They are separated visually and structurally and this celebrates the idea of “going in” or “going up”. In the case of the grain elevator, separating the stair, elevator, and ramp is used as a method to not interfere with the grain silos but it also allows the pedestrian to view where they are going from afar and the circular nature of the stair, elevator, and ramp gives full rotational views of the site before entering the cut.

John Hejduk’s Wall House; photograph by Liao Yusheng (John Hejduk 2012).

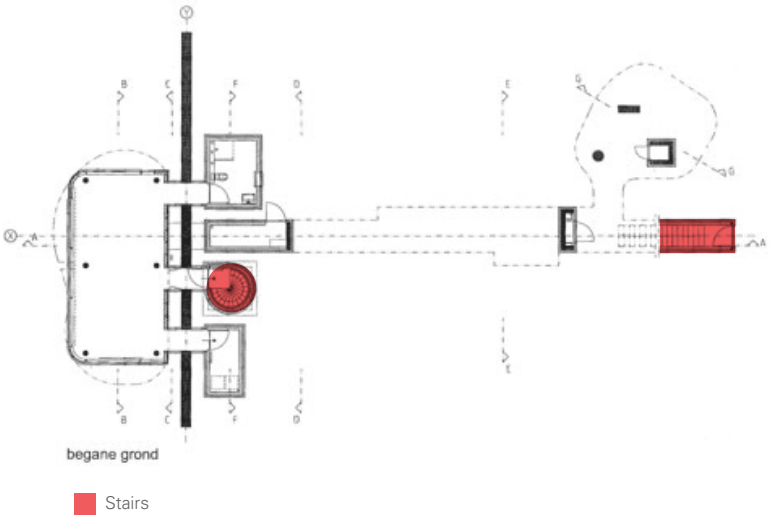
The 3 methods of ascending are clad in red, appearing visually as a ribbon through the cut which indicates the human path. The methods of ascending differ from the efficient switchback stairs seen around the site, as they are not only a passage, but also a place to linger, as seeing an object from different viewpoints can be an event in itself.




Site strategy (base map from Halifax Open Data 2019)




Site Plan (base map from Halifax Open Data 2019)

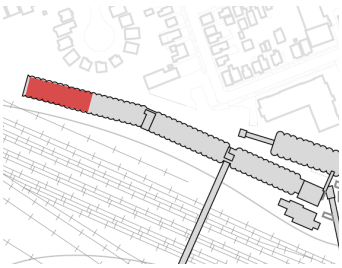



Wall House with entrance locations highlighted in red (base image from Hejduk 2012).

Stairs are traditionally used to transport a person up or down to a destination, but in this case, the experience along the way is equally important.

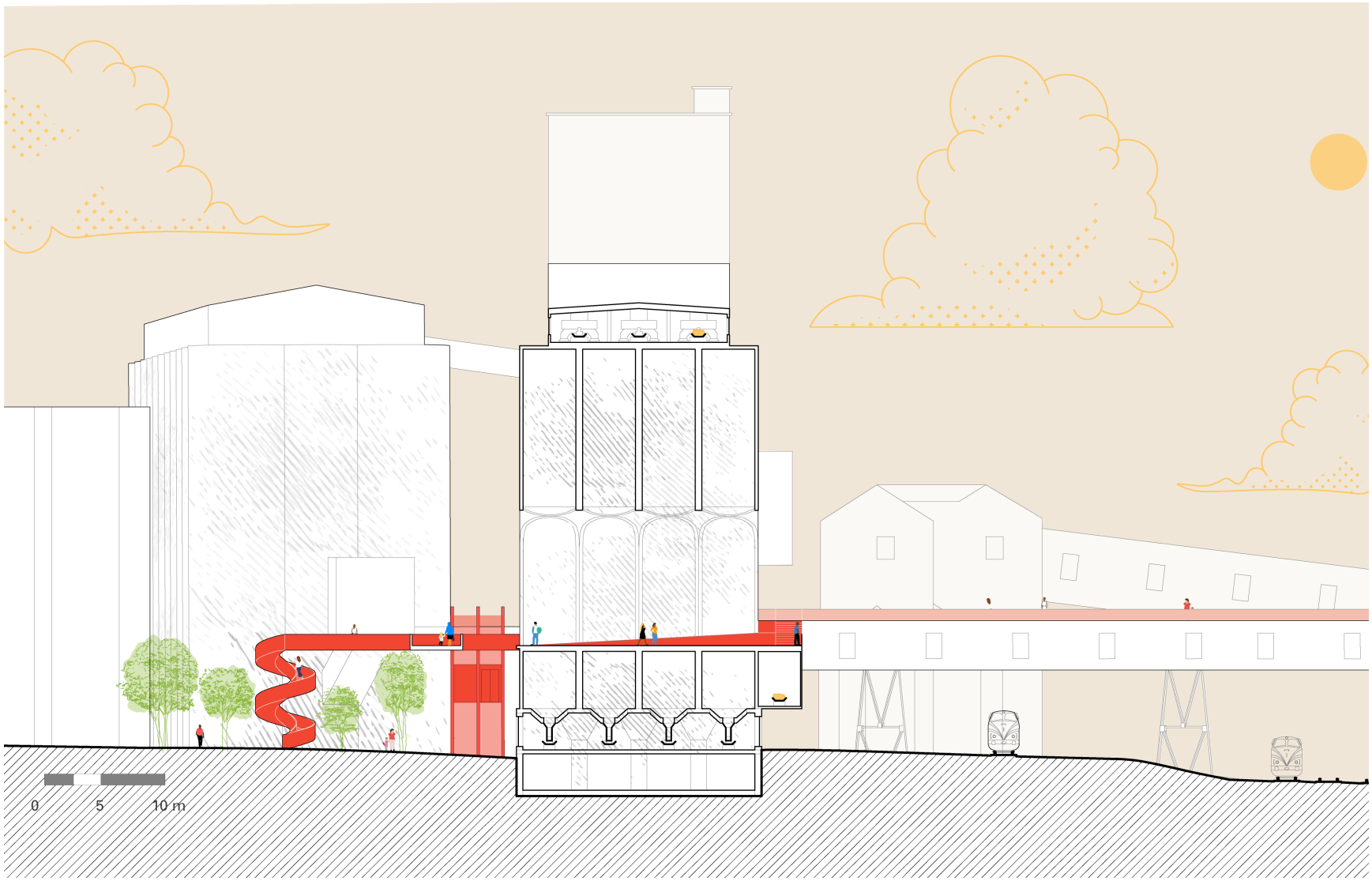
## Building-Scale Intervention

The program loops are a key element in the design, and were applied directly to the expendable 25% of silos at the south end of the building. The section reflects the program loop diagrams and incorporates additional program needed for the program loops to function.



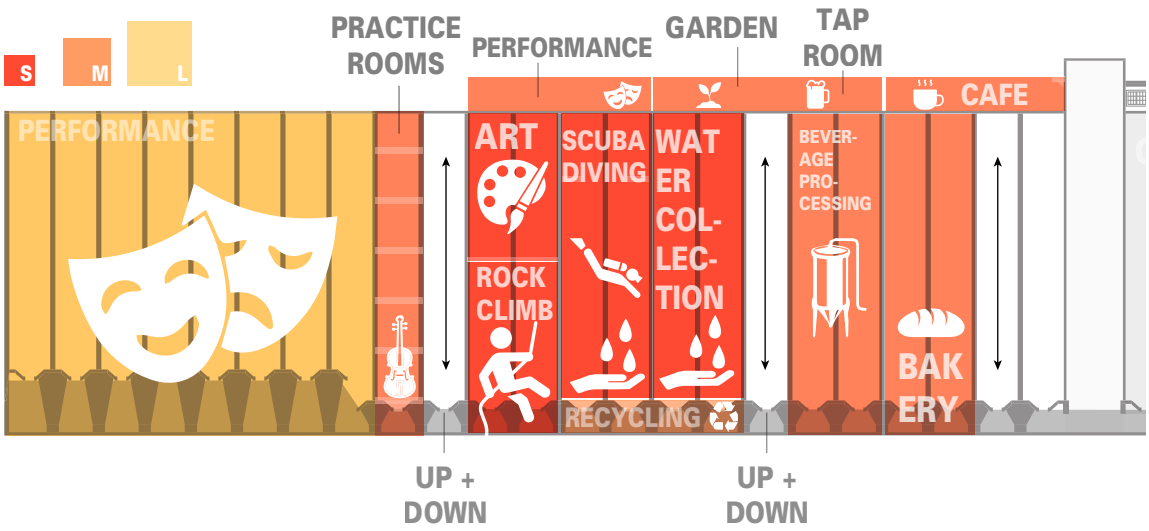
The 25% of silos on the south end used for the intervention (base map from Halifax Open Data 2019).

With the theory of the horizontal skyscraper in mind, the top and bottom floors host crucial moments where programs begin to mix. Many programs exist inside the silos, and the top and bottom floors are used to enter them. This is why these floors are so important for the mixing of programs and moments of social interaction that may not happen otherwise. For example, from the top floor, someone who is on their way to an event at the small theater may get a




Section through the “cut”.

The “cut” from South Bland Street.



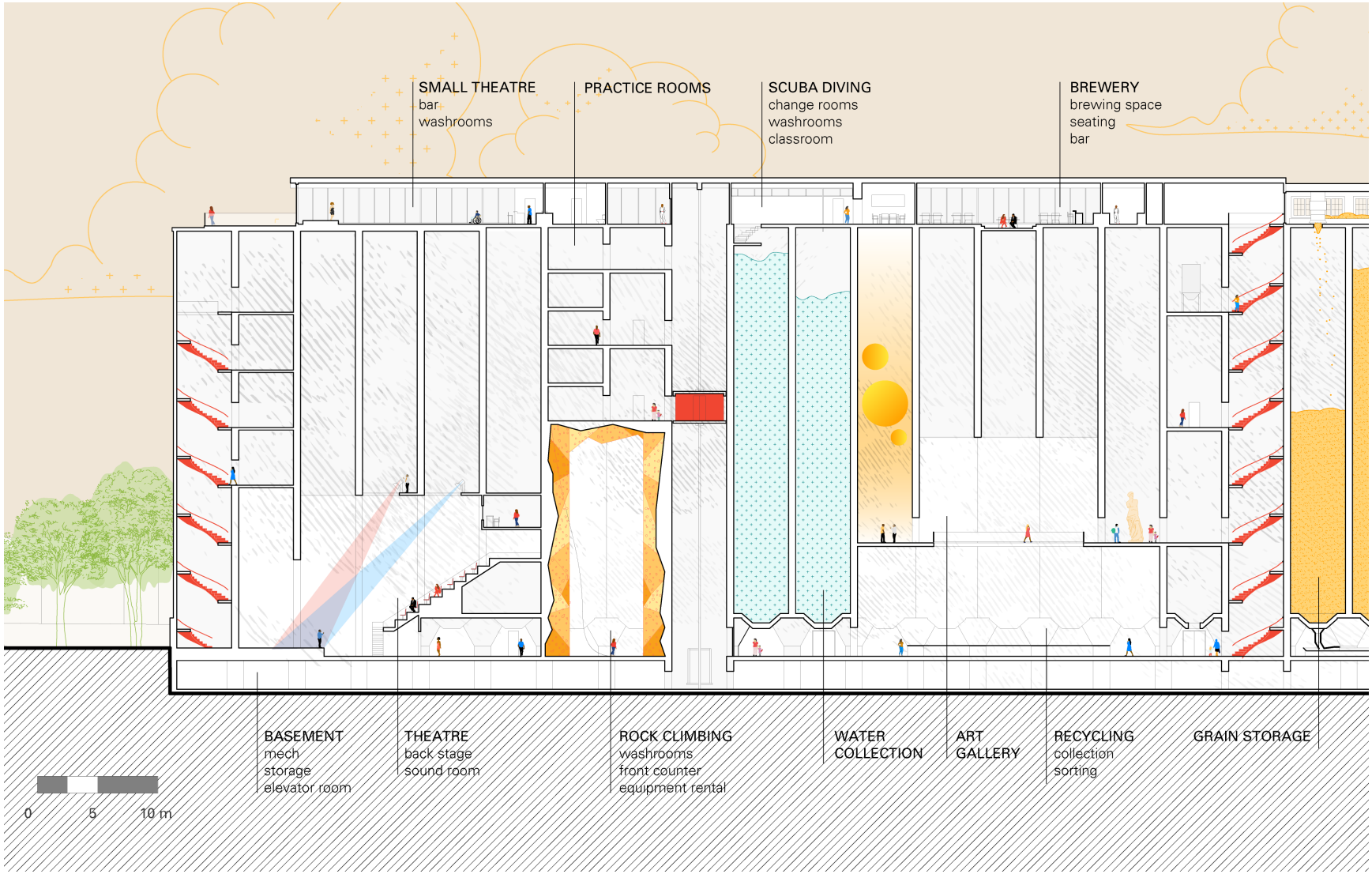

Preliminary section demonstrating application of program loops colour coded by size.

glimpse of someone about to dive in the scuba tank. Smaller moments inside the silos occur with cuts that link views of different programs.

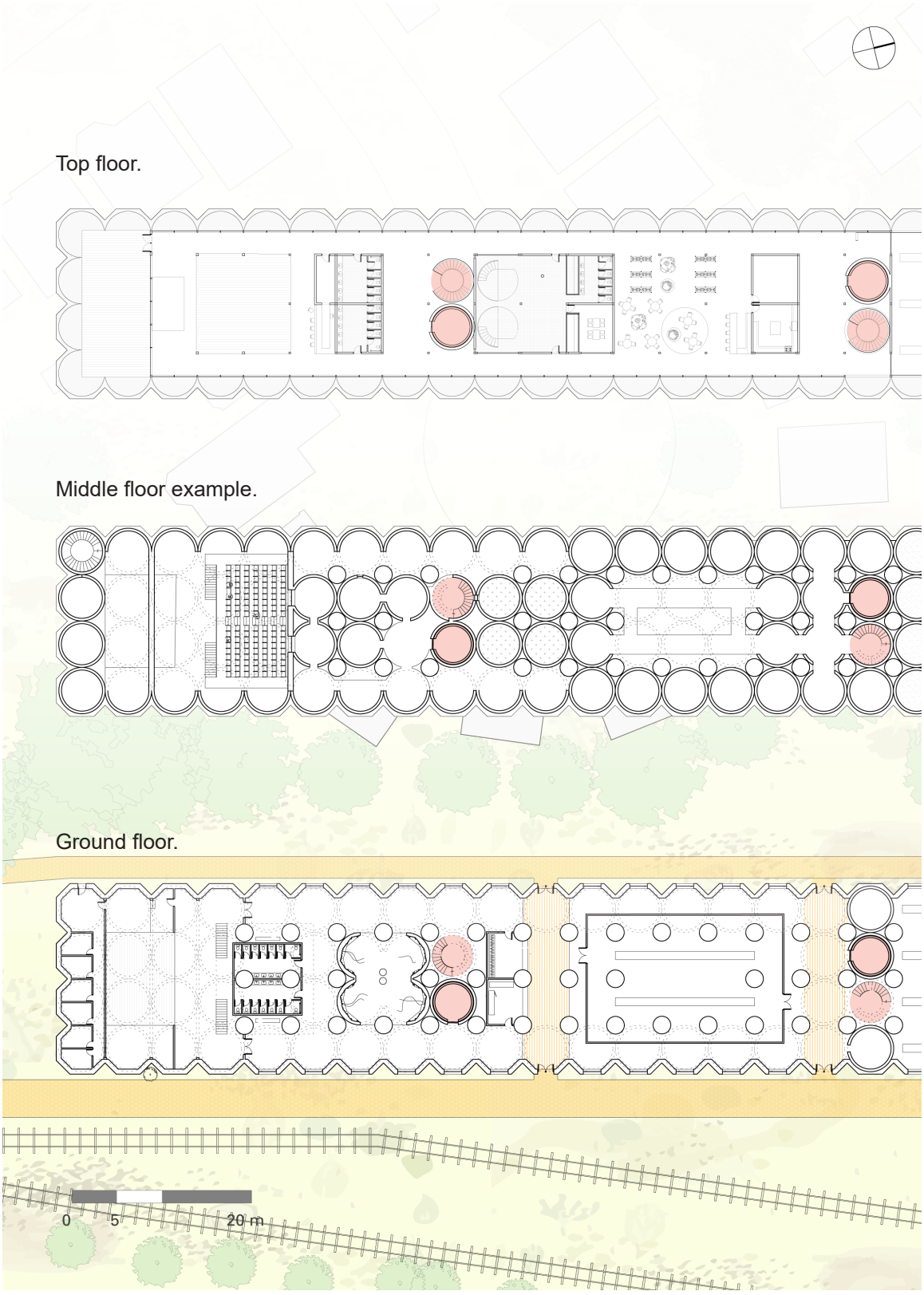
### Ground Floor

On the ground floor, multiple entrances along the building link the two sides of the site as an extension of the pathways that run along the building and connect the south end intervention with the “cut”.

Upon entering, the red ribbon of circulation seen in the urban intervention is continued in the staircase and elevators. Programs on the top and bottom floors that enter the silo (such as elevators, the rock climbing wall, and stairs) are evident in plan because they comply with the cylindrical shape of the silo. This is because as it currently exists, the silo does not reach the ground floor. Programs that enter the silo from the bottom therefore need to be connected to the ground floor in order for people to be able to enter. All other




Building section showing program.




Top floor, middle floor, and ground floor plans shown with site context.

programs that exist on the top floor or the ground floor follow a grid pattern.

On the top and bottom floors, program and vertical circulation such as stairs and elevators are pushed into the centre and horizontal circulation occurs around the perimeter. This is so activities can be seen when circulating on the top and bottom floors and the views and natural light can reach the corridors and the program areas in the middle.

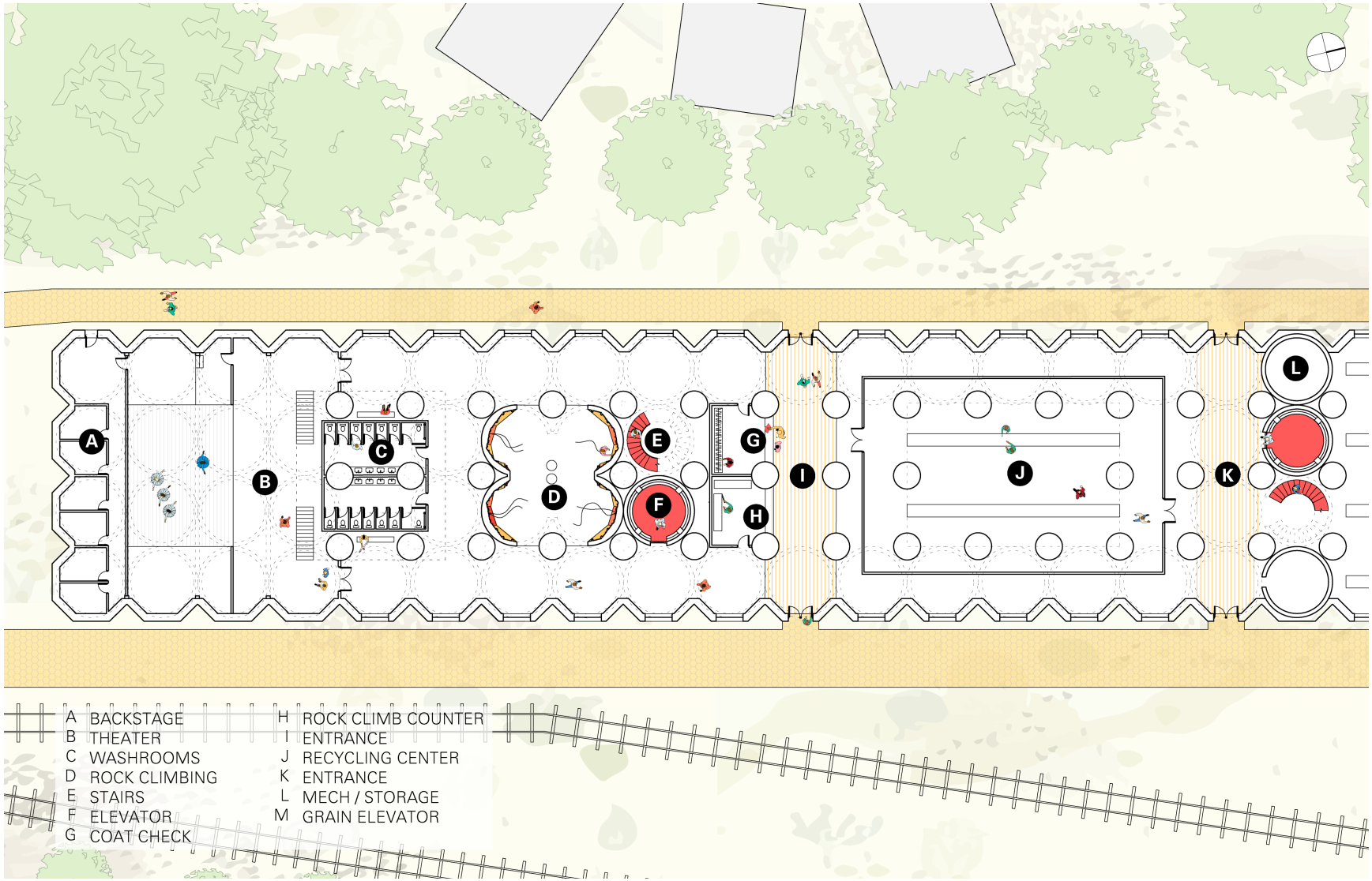
### Middle Floors

The floors within the silos have different considerations, because they must be altered more to make inhabitable space. The top and ground floors are already suitable for human use while the silos are not. They currently facilitate the vertical movement of grain, and may be altered to facilitate the horizontal movement of people. Additions of floors, openings to move from silo to silo, and groupings of silos for program and for circulation accomplish this. The middle floors follow the layout on the top and ground floors where vertical circulation occurs in the central silos, but may not use the perimeter strictly for circulation.

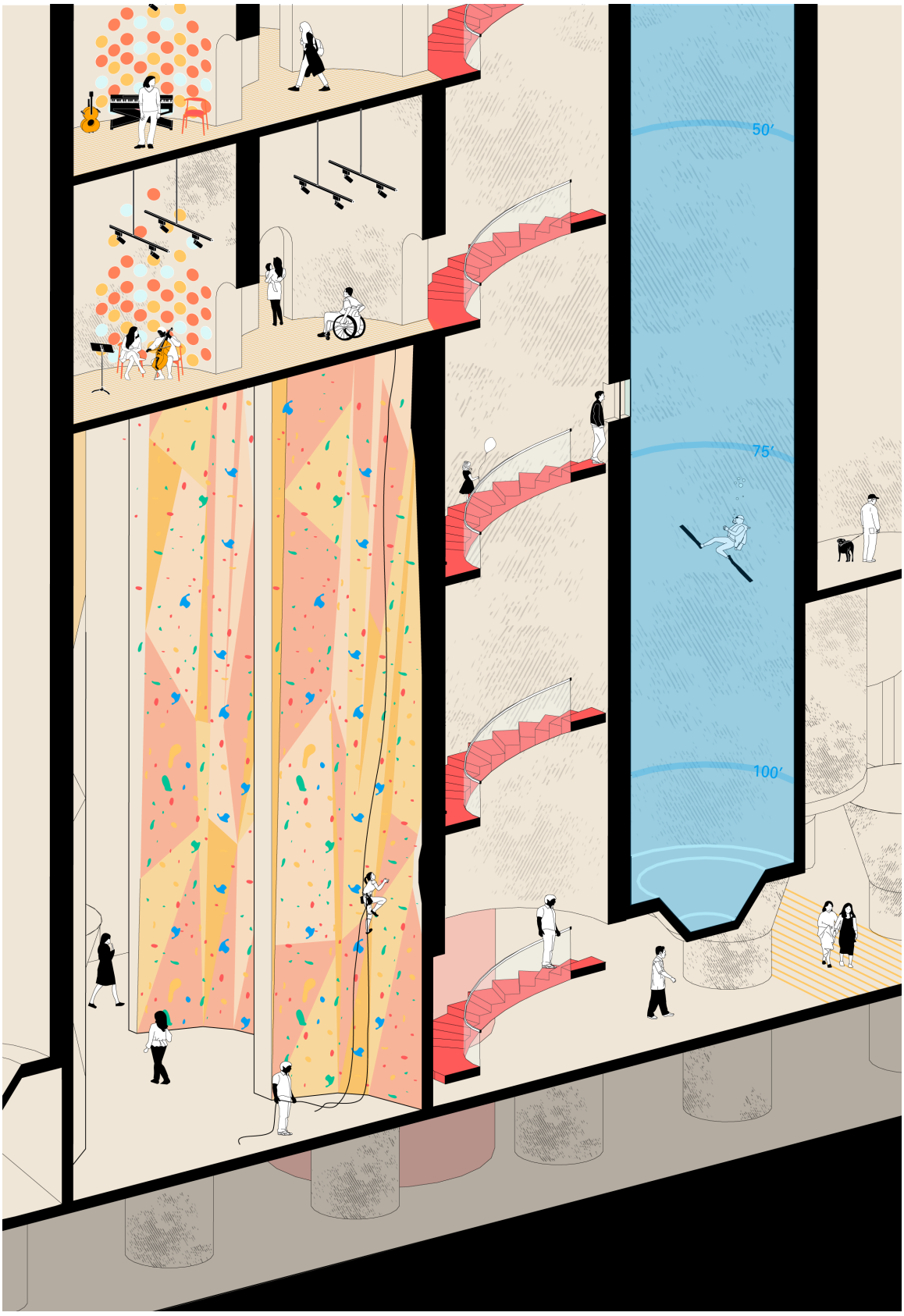
### Top Floor

Because the top floor takes advantage of views and sunlight the east and west, it hosts more social based programs such as a small theater and a brewery. The garden takes advantage of unobstructed sunlight from both directions and bleeds into the brewery. The top floor is also where natural light may enter certain silos through skylights. These silos host programs that allow some silos to be open to the top floor and therefore able to take in natural light from above. Programs that take advantage of being naturally lit

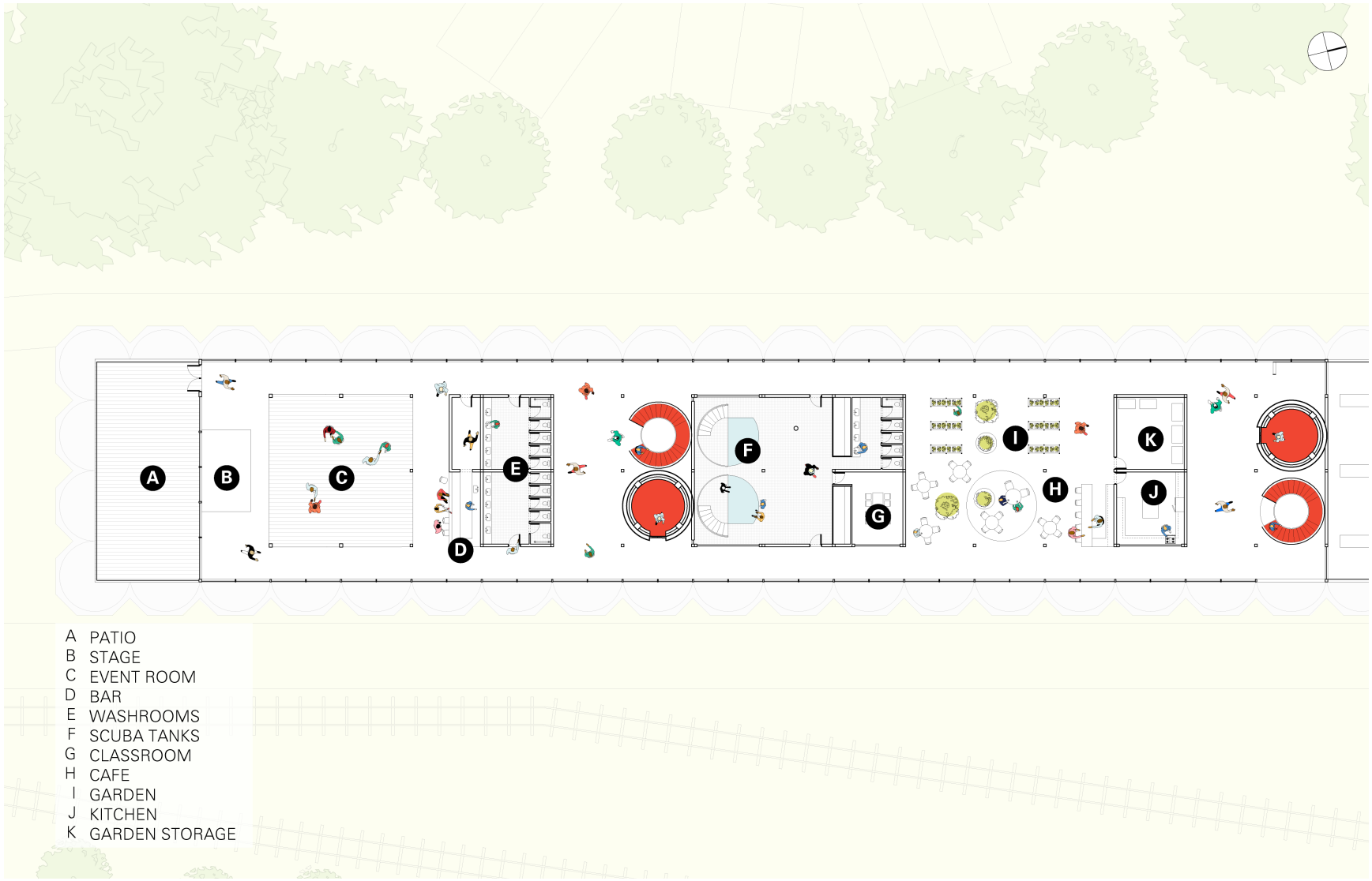
from above include the scuba tank and the staircase. Other programs that are sealed on the top may be artificially lit or be punctured to take advantage of natural light coming in from the sides of the building, or other silos.



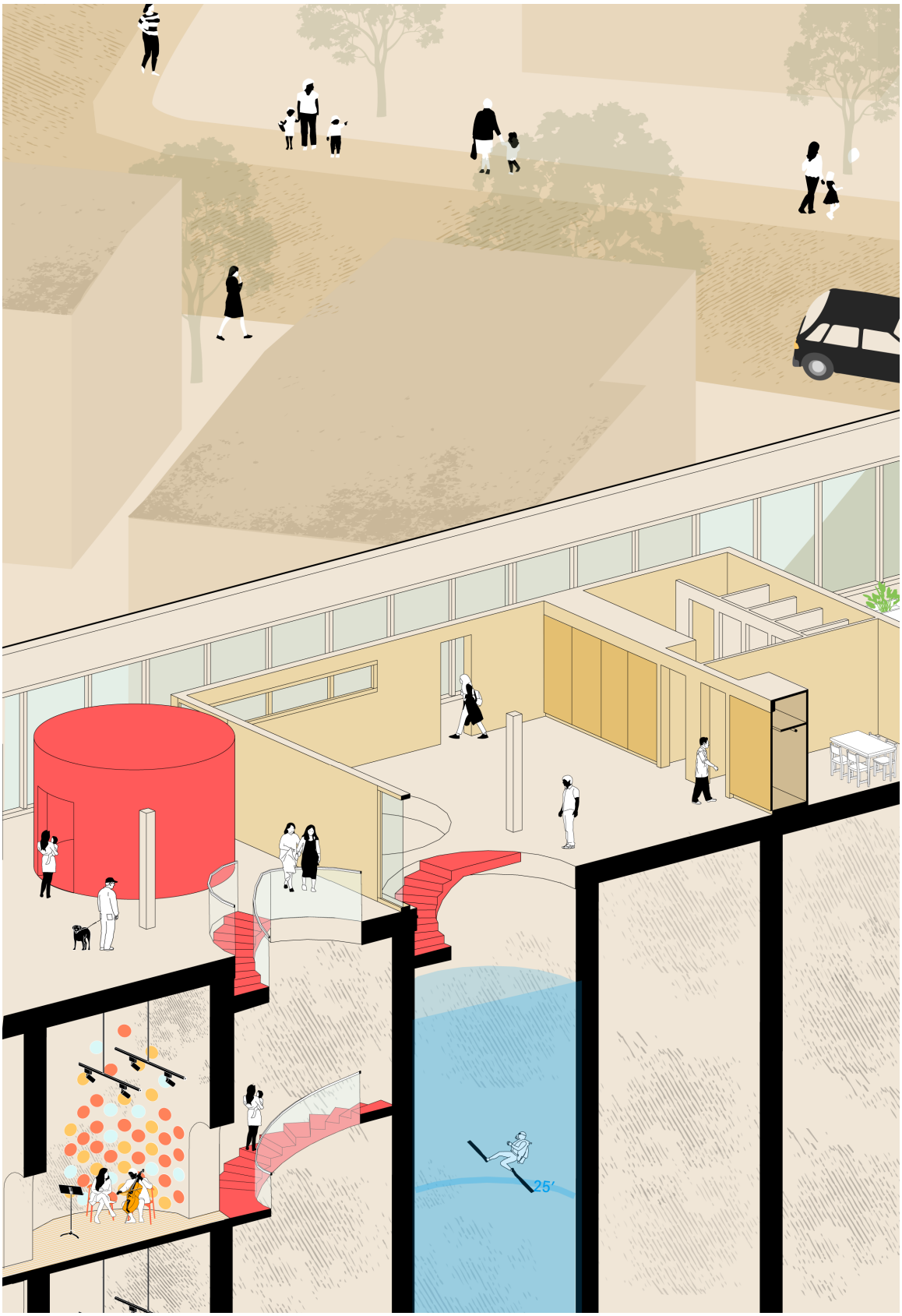

Ground floor programs (base map from Halifax Open Data 2019).



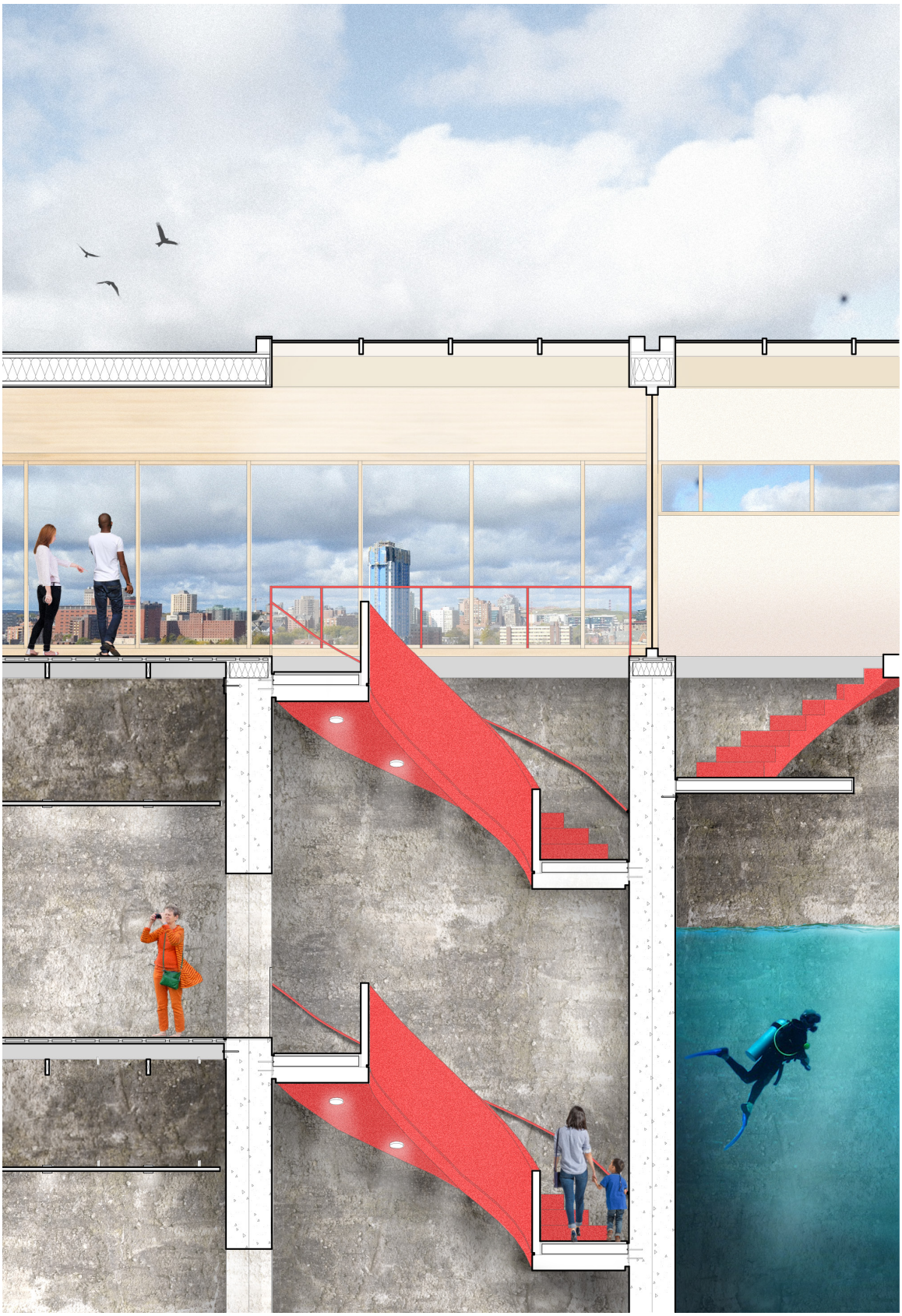

Vignette of the ground floor.




Top floor programs (base map from Halifax Open Data 2019).




Vignette of the top floor.



Section showing attachments to the silo (such as floors and stairs).

# Chapter 7: Conclusion

Deindustrialization is an economic shift that presents an architectural opportunity. The industrial infrastructure that was once the economic driver of industrial cities has become obsolete. The lingering and intertwined nature of industry make industrial buildings hard to deal with, while demolition of these structures presents social and environmental dilemmas.

This thesis begins to question the role of industrial buildings in our cities in a post-industrial age. In the decline of industry, industrial infrastructure presents architectural, social, and economic opportunities for human landscapes. Because industrial buildings exist in such close proximity with human landscapes, there are often multiple attitudes towards them, and these landscapes are highly layered. The Halifax grain elevator occupies an important part of the city, and its decline over a number of years has resulted in an unproductive building on a site with high potential. This is a common thread amongst industrial sites in general, and is addressed in this thesis through adaptive reuse.

The Halifax grain elevator and surrounding site are used to test a proactive approach in the form of multiple scales of interventions. This takes advantage of opportunities to intervene while industry is still phasing out, rather than waiting for the infrastructure to fall completely into ruin.

Program is a key driver for industrial reuse, and programs that take advantage of the latent qualities of the silos are a way to address the disconnect between human and industrial landscapes. Further, programs are explored that work with the architectural opportunities of the building

with the hopes of revealing solutions that address the layers of significance of the structure, moving past mono-programmatic art galleries or condominiums.

Allowing people to permeate traditionally private buildings with non-human users opens possibilities for a new urban form to take shape. In this light, adaptive reuse of industrial infrastructure has the ability to address the sustainability of our built environment and the resiliency of our buildings.

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