Planting Urban Health – Integrating Architecture and Productive Urban Greenspace into an Educational Health Facility

by

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The undersigned hereby certify that they have read and recommend to the Faculty of Graduate Studies for acceptance a thesis entitled “Planting Urban Health – Integrating Architecture and Productive Urban Greenspace into an Educational Health Facility” by Catherine E. Hefler in partial fulfilment of the requirements for the degree of Master of Architecture.

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Signature of Author

For my mother and father.

CONTENTS

ABSTRACT

Chronic health conditions such as obesity, cardiovascular disease, and diabetes are on the rise in Canada, and particularly in Nova Scotia. Lifestyle-related factors including stress level, exercise, and a healthy diet are crucial to preventing such illnesses. Research shows that access to greenspace can greatly effect physical and mental health in terms of stress-reduction, social cohesion and exercise promotion. Importantly, food-producing greenspace provides further mental and physical benefits; highlighting the importance of a healthy diet and a connection to the earth. Despite these findings, productive greenspace in our cities as a viable source of wellness is not optimized. This project, located in Halifax, Nova Scotia, examines how productive greenspace can be integrated with interactive learning spaces to encourage a preventative approach to lifestyle-based illnesses.

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CHAPTER 1: INTRODUCTION

Lifestyle-related chronic illnesses such as obesity, diabetes and cardiovascular disease are on the rise in Canada.[1] These illnesses are intrinsically related to preventable origins and effect our population across demographics of adults and children.[2] It is agreed that stress reduction, exercise, and a healthy diet are crucial lifestyle habits that must be addressed to achieve improvements in these chronic illnesses.[3] An extensive body of research indicates that exposure to greenery and open space also effects our physical and mental health.[4] This is visible in terms of the innate calming effect of nature and the associated increase in physical activity.[5] Despite this research and our obvious need for exercise and stress reduction, greenspace in our cities as a viable source of improving overall health is not optimized. Rather, health care in Canada continues to focus on a 'treating the symptoms' or allopathic approach, centred around medication and surgery.[6] In this model, the origins of health problems are rarely fully addressed and the patient often returns repeatedly to increase medication or undergo surgery. While an allopathic approach has its applications, against our most prevalent illnesses, a preventative and whole-body position towards health care would be more efficient as it would address the underlying cause of illness. Further, preventative forms of medicine focus on an educational approach to give the patient the information needed to make healthy lifestyle choices. As population numbers rise, our depleting natural resources makes densifying cities increasingly necessary. Within such urban environments, we need to explore the potential of urban greenspace to promote preventative health. How this greening can be incorporated into our cities is important from an environmental position and in the interest of enhancing quality of life.

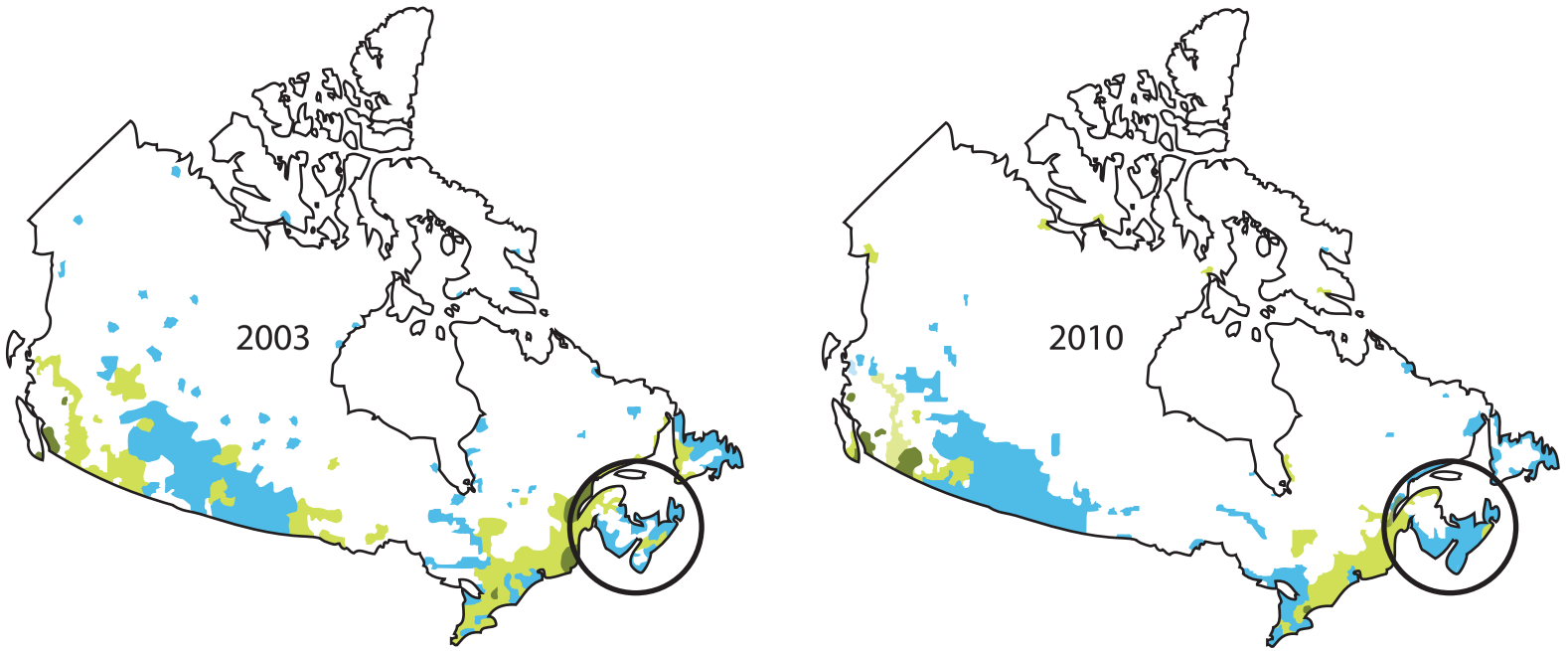
The key role of diet in Canada's prevailing chronic illnesses demonstrates that in conjunction with better urban greenspace, there is a need to change our food production and consumption. Our current food system is inherently unsustainable, as it is dependant upon cars and fossil fuels.[7] A report by Jennifer Scott and Marla MacLeod found that on average, the food consumed by Nova Scotians travels 8 000 km from production to plate[8]. This is relevant because food's nutritional value decreases the longer it is in transport, and because disengagement from production affects our knowledge of what constitutes a healthy diet. While a variety of factors contribute to lifestyle choices, sixty-two percent

of Nova Scotian adults are currently overweight or obese, a trend visible across many cohorts of the population.[9] This suggests that fewer Canadians understand the relationship between their food consumption and their overall health. Not surprisingly, Nova Scotians' consumption of fruits and vegetables has remained significantly lower than the National average for the last ten years; a trend visible across both rural areas and the urban centre of Halifax.[10] In response, studies have demonstrated that reintroducing food production to various populations through urban agriculture can foster education about healthy diet while promoting pleasurable interactions with nature.[11] Again, this type of proactive health education is not supported by our pervasive health care philosophy. By recognizing that the health of Canadians could be greatly affected by an understanding of nutrition, and acknowledging our inherent healing relationship with greenery, one might conceptualize these problems as an opportunity for productive greenspace to take a key role in a new approach to health care and urban living.

Thesis Question

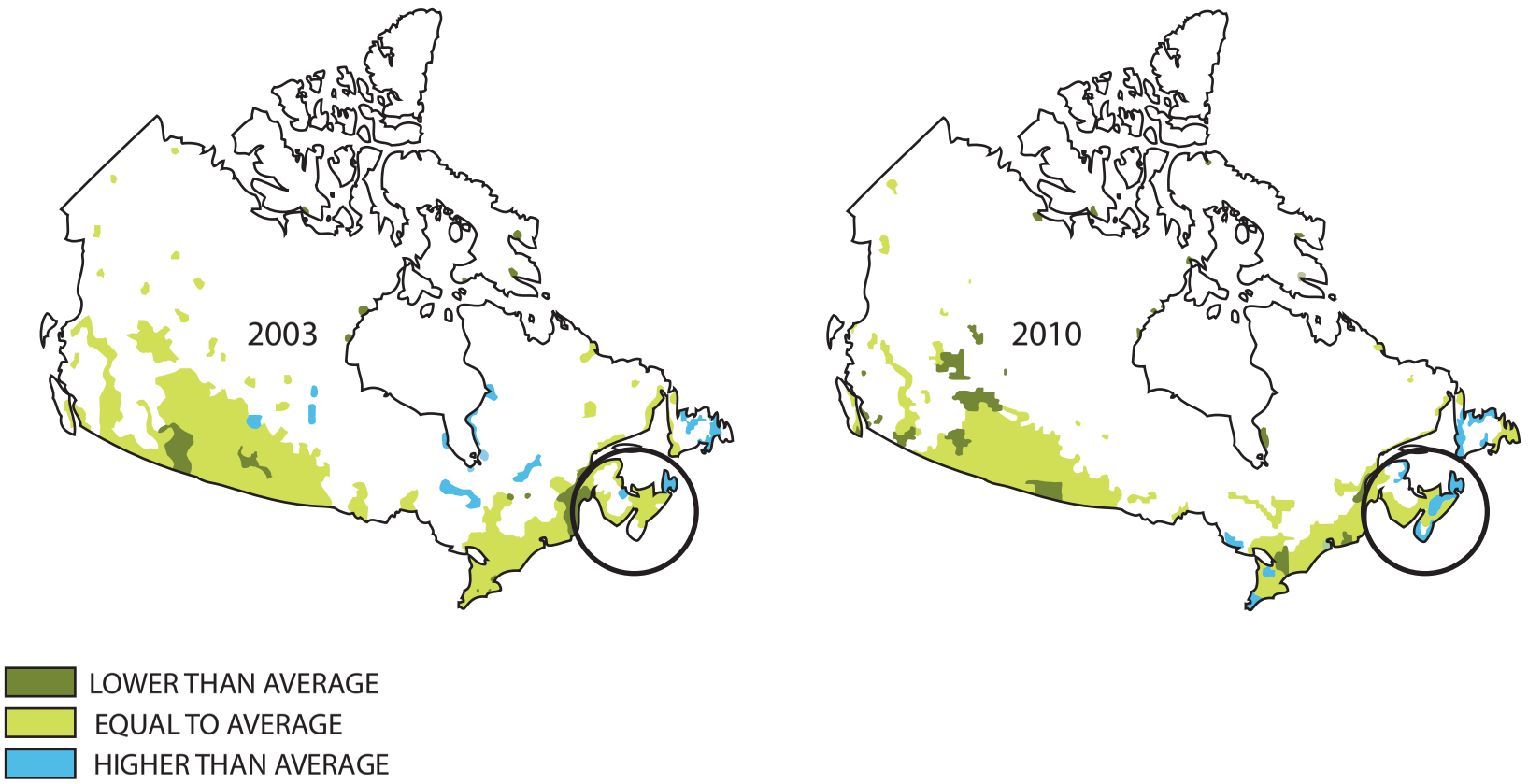
How might architecture integrate productive urban greenspace and interactive educational space to promote a preventative approach to health?

OBESITY



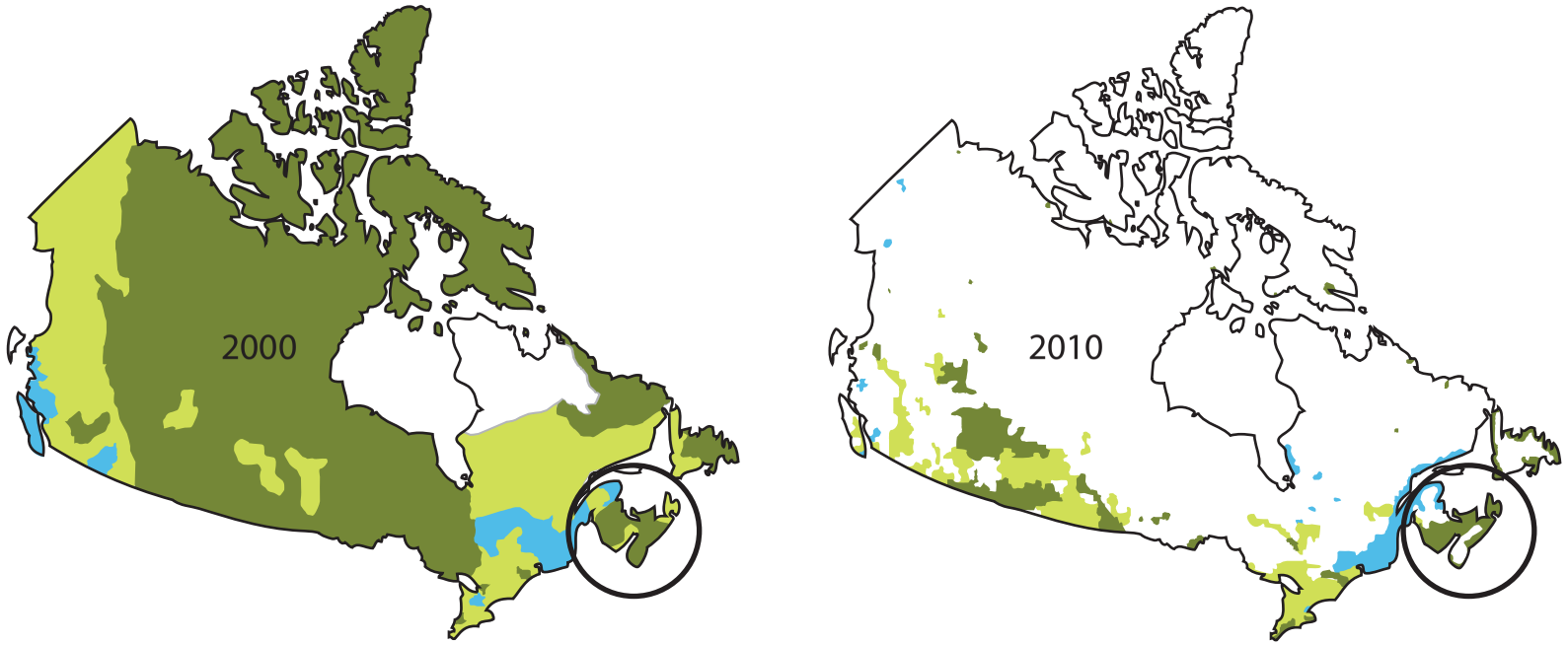
Comparative maps demonstrate the increase in Body Mass Index as an indication of obesity in adult Nova Scotians relative to the National Average of Canada. From Statistics Canada, Health Indicators Volume 2003/2004 and Canadian Community Health Survey 2009/2010.

DIABETES



Comparative maps demonstrate the increase in Diabetes in adult Nova Scotians relative to the National Average of Canada. From Statistics Canada, Health Indicators Volume 2003/2004 and Canadian Community Health Survey 2009/2010.

FRUIT & VEGETABLE CONSUMPTION



Comparative maps demonstrate the lack of Fruit and Vegetable consumption in adult Nova Scotians relative to the National Average of Canada. From Statistics Canada, Health Indicators Volume 2000/2001 and Canadian Community Health Survey 2009/2010.

Map showing of the distances of typical food items transported to Nova Scotia. From Scott and MacLeod, *Is Nova Scotia Eating Local? And if not, Where is Our Food Coming From?*

Greenspace and Cities

The value of greenspace in North American cities has been an ongoing discussion since the 1800s. Two influential writers in New York, Andrew Jackson Downing and William Cullen Bryant, advocated the responsibility of the city government to care for the growing working class by allocating natural open spaces for public recreation.[12] These initial voices helped lead to the development of Central Park, the first publicly owned greenspace, in 1851.[13] Before this, public open space did exist, but was not specifically designed for re-creation.[14] In, *A sense of Place, a Sense of Time*, J. B. Jackson says that the urban park has evolved from an important respite for the factory worker to a largely ignored space, a situation worsened by the automobile allowing the middle class to escape the city[15] The role of the park, he argues, is still evolving, from the romantic "country in the city" to an "ad hoc" space with many functions and many forms[16]. Future greenspace in dense cities may be increasingly productive in social, economical and agricultural ways. Further, as Western cities rediscover the value of distinct neighbourhoods that are self-sufficient in commercial and institutional amenities, urban greenspace may become more compact; integrated with architecture (i.e., roofs, facades) and reflect the cultural specifics of its neighbourhood. Excellent examples of greenspace integrated with architecture can be found in Copenhagen, Denmark; a city that has truly rediscovered the value of designing

Design shown in plan of Central Park in New York City by Frederick Olmsted. From Central Park, Greensward Parks Foundation.

urban space for the human scale. In particular, the Korsgadehallen Sports and Cultural Centre, designed by BBP Arkitekter is a neighbourhood scale multi-function building, providing direct amenity to the local residents. It is primarily a greenroof structure that is fully accessible and creates a green rolling park in the middle of a residential neighbourhood. The building contains one multi-use court and building services. This highly frequented space adds much to the community, and significant to its success, is the greenspace for people to read, picnic and relax.

Korsgadehallen Sports and Cultural Centre, designed by BBP Arkitekter, Copenhagen, Denmark.

Picnic on top of the Korsgadehallen green roof, Copenhagen, Denmark.

More recently, Douglas Farr put forth an idea of urbanization based on the inclusion of greenspace at different scales, from a small square to a large park, encompassing a variety of uses for the city.[17] These greenspaces would provide amenity to surrounding mixed-use development that would focus on public transit and pedestrian-friendly zones. In his proposition, every urban citizen should be able to walk to a greenspace in three minutes or less.[18] Taking this concept further, Viljoen and colleagues describe their vision for the future of urban greenspace in their work on CPULs – continuous productive urban landscapes.[19] The authors define CPULs as, "... city-traversing open spaces running continuously through the built urban environment, thereby connecting all kinds of existing inner-city open spaces and relating, finally to the surrounding rural area. [They] will not be about knocking down cities or erasing urban tissue; they do not seek a tabula rasa from which to grow. Instead, they will build on and over characteristics inherent to the city by overlaying and interweaving a multi-user landscape strategy to present and newly reclaimed open space".[20] In contrast to the idea of parks and spaces becoming more varied in size and activity, Viljoen proposes that the greenspace would be one expanse, flowing through the city and taking on different forms to allow varied activities to take place. This vision would allow for a long term planning of urban greenspaces. This type of landscape would be implemented over time as buildings and urban space become available for renewal and adaptation. If this is to be the case, my study of methods to integrate agriculturally productive greenspace with architecture would be essential. A recent successful example of this type of infrastructure adaptation is the High Line project in New York City. The park was built on an elevated and abandoned 1930s freight rail structure in the West Side of Manhattan. When the rail infrastructure was slated to be dismantled, a community group rose to save it and put the idea of an elevated park in motion. The adaptive reuse was designed by James Corner Field Operations, with Diller Scofidio+Renfro and provides park space for a variety of programs. It has been incredibly well received by the city and its users.[21]

In Halifax, the available greenspace does not coincide with Jackson's vision of ad hoc space with many functions and forms. While there is a semblance of a greenbelt, primarily in the 'South End' of the city, it is highly specialized in its use, often clearly programmed and targeted at a specific group. Historically, Halifax is a military town, and major aspects of the greenbelt are the historic Citadel Hill military fort, the Public Gardens, and the Com-

Image of the abandoned rail line in New York City before the High Line adaptive reuse. From Duran and Herrero, *The Sourcebook of Contemporary Green Architecture.*

The High Line, Diller Scofidio+Renfro and James Corner Field Operations, New York City, USA. From Duran and Herrero, *The Sourcebook of Contemporary Green Architecture.*

mons, a wide, open field originally used for common grazing of livestock. At the southern tip of the city is Point Pleasant Park, a ‘natural’ public greenspace with walking paths. All four of these major spaces are inflexible in their programming - historical preservation, formal English garden, sports field and green lung respectively. Along with these major urban greenspaces, a series of smaller sports-fields and public squares dot the city, used by dog-walkers and children. But, these spaces are rigid in their uses; they are highly regulated, lack dynamism in functionality, and are non-responsive to user’s needs and desires in natural space in an urban environment. Given this range of spaces, there is certainly the opportunity for current greenspaces of Halifax to evolve to allow for a range of activity that would be more engaging. In accordance with Farr and Viljoen’s proposals, an example of greenspace in Halifax that was productive socially, economically and agriculturally could potentially enrich the city’s current attitude toward its single-function, underutilized space, and could demonstrate methods to maximize this crucial urban resource.

Map showing the program of greenspace in Halifax, Nova Scotia.

Greenspace and Buildings

From a technological standpoint, the ability to integrate greenery on building roofs and facades has greatly expanded the possibility to integrate nature in the city. However, while these technological developments are well documented in their ability to benefit the natural environment, their potential for a positive effect on people is not yet demonstrated. As Leslie Hoffman, the Executive Director of Earth Pledge, states, “perhaps the most overlooked incentive for urban green roof development, and one that will likely take on greater significance in coming years, is the connection to the earth - to soil, plants, water, and nature - that green roofs offer to city dwellers - people who are often disconnected from the very source of their own survival”.[22] *Green Roofs in Sustainable Landscape Design* also advocates the exploration of accessible greenroofs as public greenspace as opposed to simply for environmental mitigation.[23] This is relevant because developers can easily meet current environmental standards of storm water runoff mitigation without ever considering benefits to the public realm. In a related volume, Nigel Dunnett and Noel Kingsbury describe a similar progression of facade greening in the Western built environment.[24] Stemming from natural facade greening where climbing vines attach directly to the building envelope, modern ideas of facade greening include steel or cable trellises, and prefabricated elements that support ‘green’ walls. Dunnett and Kingsbury note that living walls or interior greening can dramatically reduce temperature fluctuations in a building, aiding in reducing energy costs while improving air quality.[25] These are well-documented environmental benefits but there is little mention of the benefits of nature to mental health.

It is crucial to include the public realm in our sustainability measures, as cities around the globe are increasingly implementing environmental by-laws and standards such as Leadership in Energy and Environmental Design (LEED) that influence urban greening. At this industry turning point, it is essential to teach the public the important benefits that sustainable design can make in people’s lives, alongside the clearly beneficial environmental impact so that regulations may reflect these concerns. As Alexander Garvin states in *Greening Cites: A Public Realm Approach*, “we need to place people at the centre of our thinking, making human activity and public participation important elements of the planning process”.[26] This type of public participation, and through it, the growing public understanding of our need to urban greenspace, can be presented in a variety of forms.

Exterior naturally occurring facade greening, Copenhagen, Denmark.

Interior green wall, Bella Sky Hotel by 3XN, Copenhagen, Denmark.

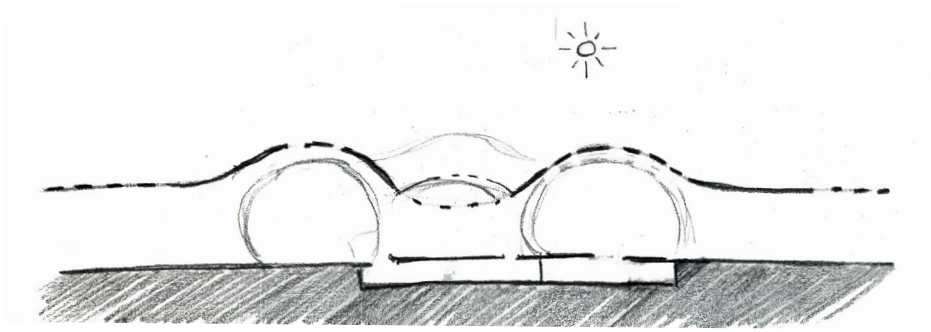
As research on education and learning indicates, instruction that makes use of multiple modes of presentation – visual, auditory and experiential (hands-on) – is more effective.[27] To this aim, buildings that highlight sustainability practices through their architecture help to educate the public from a 'seeing is understanding' perspective. This is key to my study, because to the public, green walls and roofs may sound pointless and costly, but experiencing this type of environment helps foster understanding of the associated benefits.

Many projects argue for the value of experiencing sustainability first hand. For example, the California Academy of Sciences by Renzo Piano showcases the importance of environmental protection. The Academy's focus on study and protection of the earth, sea, and space, not only for the researchers, but through education of the public through exhibits of plants and environment. A large part of this public education is the building itself, with an expansive green roof, natural ventilation systems, and surrounding parkland. It is however, on a very large scale, perhaps making it difficult for the public to apply the information to their daily lives.

The Institute for Forestry and Nature Research by Behnisch Architekten integrates green spaces with the built structure, allowing the building to display the programmatic goals through the building. This set of buildings in The Netherlands is intertwined with large glass-roofed courtyard spaces that provide excellent common space for the inhabitants. However, the buildings are not sited in an urban environment and it is not a public build-

California Academy of Sciences, by Renzo Piano, San Francisco, USA. From Duran and Herrero, *The Sourcebook of Contemporary Green Architecture.*

California Academy of Sciences, by Renzo Piano, San Francisco, USA. From “California Academy of Sciences,” ArchiCentral - Architecture News Daily.



Sketch of the longitudinal section of the California Academy of Sciences.

ing, thus limiting its reach to local inhabitants. In contrast, the Austenborg Botanical Roof Garden in Malmo, Sweden is fully open to the public and is located in an urban centre. It is a strong example of adaptive infrastructure as the research institute was built in 2001 on top of a cluster of abandoned industrial buildings. It is the primary green roof research and testing site in Sweden and trains architects, property owners, urban planners and other professionals, as well as students in conjunction with four universities. The centre’s strength in its public interaction is offset by its weakness in its overall architecture. As an adaptive reuse project, the buildings themselves are very plain and only the rooftop gardens highlight ideas of sustainability. Given these examples and the necessity to educate the public on sustainability and its effect on the human scale, buildings aimed at public

Interior glazed courtyard of the Institute for Forestry and Nature Research by Behnisch Architekten in Wageningen, The Netherlands. From Spirito, *Ecostructures: Forms of Sustainable Architecture.*

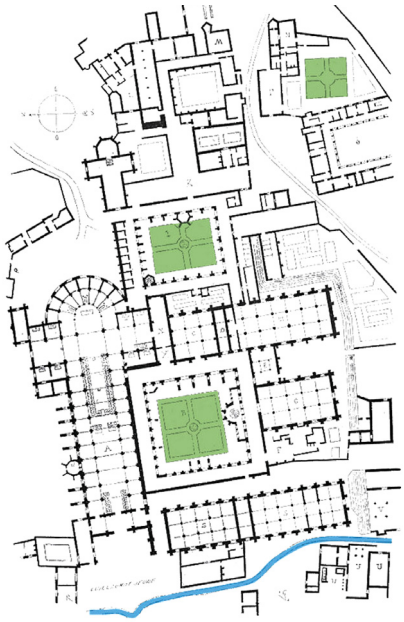
Austenborg Botanical Roof Garden, Malmo, Sweden.

benefit should attempt to address these issues through visual presentation, auditory instruction, and include participatory activities.

In Halifax, the majority of existing buildings would not be considered ‘green’ or meet LEED certification. However, several buildings constructed within the last five years have taken steps in the direction to expose the important relationship of sustainability to the public realm. The Halifax Seaport Market by Lydon Lynch promotes green ideas with architectural aspects such as a greenroof, wind turbines, daylighting and interior green walls. In Halifax, new architectural developments have an important role to play in encouraging sustainability and highlighting the contribution of green buildings to people’s mental and physical health.

Greenspace and Health

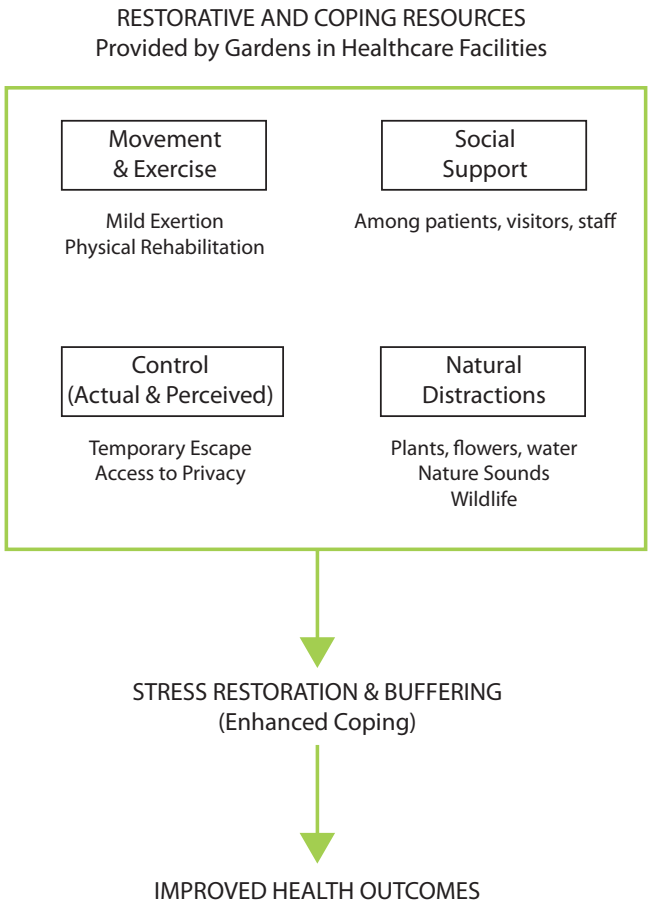
As Clare Cooper Marcus and Marni Barnes state, “the idea of a healing garden is both ancient and modern.”[28] Humans have often found sacred places in nature to heal; indeed the first hospitals in the Western world were located in monasteries where a cloistered garden filled with herbs was an essential aspect of health and recovery. In his 1918 book on western hospitals, Edward Stevens describes European case studies with extensive grounds and varied places to interact with the outdoors.[29] As western medicine has become increasingly technological, the healthful effect of nature – greenery, fresh air, sunlight – has become more of an afterthought. Hospitals caring for long-term chronic illness are the exception to this rule. After World War I, working in gardens became a part of rehabilitation hospitals and after World War II, Horticultural Therapy programs became integrated into care for veterans, the elderly and the mentally ill. This subset of hospitals acknowledged the therapeutic benefits of gardening but this did not translate to facilities treating the larger population.[30] In the 1981 volume, *Design for Health Care*, Cox and Groves describe hospitals only in terms of indoor space, and ignore the surrounding site entirely.[31] In contrast, Roger Ulrich simultaneously demonstrated healing benefits in patients recovering from surgery when they were given a view of vegetation.[32] This seminal research gave scientific evidence to the observations of many health practitioners and attempted to outline the aspects of a view that elicit positive and negative responses. [33] It was found that positive stimuli included complexity in the nature scene, water features and a perceived ability to easily move within the natural environment. More recently, the important work



Site plan of Clairvaux Abbey depicting gardens and surrounding cloisters. From “Clairvaux Abbey,” Garden Visit.

of Sociologist and theorist Cooper Marcus has greatly helped to develop the research on gardens as healing places. Biophilia – the theory of the innate human connection to nature is crucial to the design of a space to promote well-rounded health. In her work with Marni Barnes, Cooper Marcus outlines several key design elements of successful spaces that positively impact mental and physical health including all-season exposure to stimulating nature, settings for social support and gathering, places that promote exercise, gaining a feeling of control over daily activities, visibility, and accessibility.[34]

Aside from hospital grounds, Cooper Marcus also discusses parks and urban greenspace. In *People Places: Design Guidelines for Urban Open Space* with Carolyn Francis, Cooper Marcus describes how parks and urban greenspace provide a much-needed link to the natural world and the possibility of human contact - two concepts which are central to mental health.[35] Related Danish and Dutch studies also demonstrate a correlation between quality of life and greenspace in urban neighbourhoods.[36] In both cases, the researchers found lowered feelings of stress, and a better ability to cope to be positively associated with frequency of greenspace use.[37] An additional study questioned whether individuals who are healthier select greener urban areas, or if greener areas do indeed improve health. They tested health by three indicators: the number of symptoms a person had experienced in the last two weeks, a health questionnaire and the person’s perception



Conceptual diagram of the effects of gardens on health. From Cooper Marcus and Barnes, *Healing Gardens: Therapeutic Benefits and Design Recommendations.*

of their general health. By controlling for demographic variances, they found that people who happen to live within 3 km of urban greenspace display fewer health symptoms and perceive their general health to be better than those who live much further away from greenspace.[38]

Therefore, it is necessary to understand the greenspace accessible to the ill and vulnerable populations in Halifax. My project provides greenspace to both healthy and vulnerable populations in fact, given the extremely high rates of obesity, cardiovascular disease and diabetes in Nova Scotia, the majority of the population could be considered a vulnerable group. Serving this population is the aforementioned inflexible greenspace, which includes very little greenery on hospital grounds. The two unsatisfactory exceptions are the Halifax Children's hospital, which has a child-focused playground and a small space with benches and trees, and the Camp Hill Veteran's hospital, which has a memorial garden.

Neither of these spaces are specifically designed for health restoration, and the main public hospital, the Victoria General, has no greenspace at all. This is the location where the majority of the local population goes for treatment beyond the expertise of a family doctor.

A sea of parking lot with a small fringe of street trees surrounds the Victoria General Hospital, Halifax, Nova Scotia.

Agriculture and Cities

Intrinsically related to the evolution of greenspace in cities is the evolution of food production in the built environment. The concept of growing food in the city is actually a very old idea. Often stemming from food security, society's concern for cultivating food in the city has ebbed and waned through time. Growing food in the city can take many forms, from community gardens, which denote volunteers on individual plots, to national efforts such as the war gardens of WW1 and the victory gardens of WWII. As outlined by Laura Lawson, the broader title "urban garden" can encapsulate more varied structures including, "relief gardens, children's gardens, neighbourhood gardens, entrepreneurial job-training gardens, horticultural therapy gardens, company gardens, demonstration gardens" and more.[39] Since the late 1800s, people have organized to provide places for urban gardening in North American cities.[40] Many of the driving factors of urban gardens were the same as today: assist the unemployed with food and work, teach gardening and good work habits to children, and beautify the cityscape. Also, simply reintroducing 'nature' into the urban environment is a significant reoccurring theme. As described in the book *Square*

Foot Gardening, methods of companion planting, crop rotation, interplanting and succession planting can be achieved easily on a very small scale and are ways to improve the health of the plants and soil and utilize less water – all important aspects to strengthen the viability of urban growing.[41] Also, Mark Holland and Janine de la Salle describe the significant opportunity in rooftop growing. With the caveat that structural considerations of existing buildings are potentially limiting, there are many vegetables, fruit and herbs that can flourish in a rooftop environment.[42]

The Mobile Farm project is an excellent example in the United States of an urban garden that provides many of the above-mentioned benefits. This innovative group takes over abandoned city lots in the Chicago area that are awaiting development and creates a farm that supports the community's health and creates a greenspace. These farms provide agricultural training and jobs to homeless people who are then skilled to find work on related projects. The mobile aspect comes into play when the site begins construction – the support services and planters are loaded up and taken to the next site to start over. This type of innovative urban farm reintroduces 'nature' into an otherwise bleak urban space and provides cheap, healthy food and education to the surrounding community. By virtue of its mobility, it ensures that there is an excitement surrounding the project and it can reach out to many subsets of the population.[43] As Lawson described, there are many ways for food production to enter the city limits, and within the varied types of garden format, is a large variation of growing techniques. At the Edible Schoolyard project in California, these diverse types of growing techniques are taught to children as an integrated part of their curriculum. This project teaches children to grow fresh produce and to cook healthy food, along with important social and cultural aspects such as community cohesion, multiculturalism, public health and environmental responsibility.[44] At the core of these projects is the belief that individuals can take responsibility for their own health – a fundamental idea to preventative medicine. These projects are excellent examples of how an urban gardening project, coupled with a focus on education can create great modification in lifestyle habits. My design project is founded on the premise that this type of hands-on educational instruction empowers people to make difficult lifestyle changes when it would be so much easier to simply take medication.

Inhabitation of the Edible Schoolyard. From Cumberlidge and Musgrave, *Design and Landscape for People.*

Within Halifax, the vast majority of urban agriculture takes place in private backyards or in community gardens. While this type of innovative grassroots projects provide big benefits to the small group of people who use them, they do not promote an understanding of nutrition, lifestyle and overall health at the scale of the city. Further, as Lawson explains, a major problem with community gardens as an instigator of change is the volunteerism aspect and a general dwindling of interest overtime.[45] In Halifax, there are several urban gardens aimed at school children, which in accordance to the success found by the Edible Schoolyard project, could have potential to greatly impact how coming generations think about food and its relationship to health. This raises the question, if we can teach children the important relationship of food to health, why can we not teach ourselves? A partial answer for this is that food in Halifax is still relatively inexpensive and we do not need urban agriculture purely for food security. Nova Scotia does have plenty of agricultural land, as well as a respected Agricultural College in a rural part of the province. However, the vast majority of the money spent on food in the province is on imported options that are less healthy and disengage us from the act of growing. I propose that the role of urban agriculture in Halifax should be thought of as a means to public education on the relationship between health and food, rather than providing food security. In this way, urban agriculture could demonstrate of how to grow, prepare and consume healthy food options.

This map of Halifax's community gardens demonstrates that the vast majority of gardening activity in the city is in the North End. From "Halifax Community Gardens," Halifax Garden Network.

Agriculture and Health

At the macro scale, the work *Agricultural Urbanism* puts forth a comprehensive plan for including productive agriculture into cities.[46] The authors Janine de la Salle and Mark Holland, promote the inclusion of agriculture in the urban environment at different scales, from small community gardens and corner-store markets, up to sustainable farms within the city.[47] The work supports the inverse relationship between the distance to our food source and the level of healthy benefits it provides.[48] In conjunction with the physical benefits of local food production, are the notable mental health effects. In her study of the mental health benefits of gardening, Cooper Marcus demonstrated that therapeutic horticulture had positive effects on mental health including increased feelings of autonomy, feelings of control, and could also be beneficial in rehabilitation therapy.[49] Indeed, the field of Horticultural Therapy is becoming increasingly recognized for its immense beneficial contribution to healing with measurable clinical outcomes that may be integrated into a patient's overall therapy program.

Related findings by sociologist Sarah Wakefield and colleagues demonstrate through

participant surveys improved health among people who frequent community gardens in Toronto.[50] Involvement with the garden had improved their nutrition and increased their physical activity, as expected, but the study also highlighted important mental health improvements. This was attributed to feelings of satisfaction from producing something with your own hands, and that interaction with nature was relaxing and calming. The study also found improved 'community health' in participants, meaning improved feelings of group cohesion and cultural heritage.[51] In a designed community garden project, architects Amale Androas and Dan Woods of Work AC examined the benefits of their temporary urban agriculture display as both a productive landscape and an important gathering space in the city. Their work, *Above the Pavement, the Farm-Architecture and Agriculture at P.F.1* discusses how productive public space can be designed to promote culture and the health of the collective community through gathering and growing food for ethnic dishes.[52]

The inverse relationship between food miles and our health is also supported by Nova Scotia Capital Health's, most recent community health plan.[53] The plan names physical activity, healthy eating and healthy body weight as top priorities, and lists food security and accessible recreation space as key elements to a healthy lifestyle.[54] My design project is in direct response to these needs and investigates how architecture could create urban space that would promote the components of a healthy lifestyle through greenspace, gardening and educational programs to both professionals and the public at large.

The Common Roots Farm is a project currently underway in Halifax that will attempt to address the relationship between health and food. This project is focused on producing large yields of healthy food that will then be given away. There are elements of restorative gardens and community gathering, but the main goal is to teach farming practices and grow produce. My project has a similar goal of demonstrating healthy food production to the public but I have identified education and investigation of the urbanity of greenspace and agriculture, as the framework in which to approach these health problems.

Public Farm 1 installation by WORKac, New York City, USA. From Gorgolewski, Komisar and Nasr, *Carrot City - Creating Places for Urban Agriculture.*

Public Farm 1 installation by WORKac, New York City, USA. From Gorgolewski, Komisar and Nasr, *Carrot City - Creating Places for Urban Agriculture.*

Alternative Approaches to Health and Preventative Medicine

Prevention-based medicine has many precedents. Whereas Canadian health care philosophy is focused on allopathic methods, naturopathic or homeopathic health care is focused on achieving optimal mental and physical health from an all-encompassing standpoint. Naturopathic medicine (or homeopathy) gives back the responsibility for health back to the patient and, to this aim, conceptualizes the doctor as a teacher. With the aim of preventing illness, it utilizes a patient-centred approach.[55] Nutrition and lifestyle choices for each individual are a central focus. In a related vein, Horticultural therapy improves mental and physical health attributes through greenspace and urban agriculture. These outcomes align closely with the six principles of Naturopathic medicine, which are 1) a focus on prevention and overall wellness, 2) trust of the healing power of nature, 3) practitioner as teacher – educate patients to achieve and maintain health, 4) view the body as an integrated whole in its physical and spiritual dimensions, 5) identify and treat the underlying cause, and 6) utilize the most natural therapies. To this, the current project has added 7) practitioner as student – make a lifelong commitment to experiential learning.

There are currently six universities in North America that boast accredited programs in Naturopathic Medicine. The Canadian schools are found in Toronto and Vancouver and while both of these programs utilize nutrition and herbs as key components of preventative medicine, neither school has successful gardens onsite or incorporates programs to support this production. Importantly, the programs of the buildings do not translate into the architecture in any of the programs, a visual representation of a lack of public outreach. One of the six, Bastyr University in Seattle, Washington is a school of preventative medicine that combines Naturopathic Medicine with Acupuncture, Nutrition, Midwifery, Health

Bastyr University, Seattle, USA. From Bastyr University.

Psychology, Herbal Sciences, Exercise and Wellness, and Integrated Human Biology.[56] The school is sited in a natural setting, about 25 kilometres from the city and its student clinic, thus removing it from the public realm and does not display health in its architecture. The distance creates a disconnect between the education of the professionals and the education of the public and removes a key opportunity to showcase the importance of lifestyle habits to the patients of the clinic.

Thesis Position

I propose that many of Nova Scotia's prevailing chronic illnesses can be combated with lifestyle practices, and that lifestyle can be positively effected by one's spaces of inhabitation. Architecture can play an important role in this shift by providing a series of spaces that push the integration of productive landscape into the urban environment as a means to emphasize a prevention-based ideology of health care.

My program development and site selection are intrinsic to the success of the project. The program is a facility of preventative medicine encompassing educational spaces that encourage interaction with productive landscape. The location supports the programmatic goals of reaching the public and challenging our current ideology of healthcare and urban greenspace. Currently, the site is a parking lot on the corner of South Park Street, South Street and University Avenue. It is adjacent to the existing Victoria General Hospital and the campus of Dalhousie University.

Initial concept collage of greening the Victoria General parking lot.

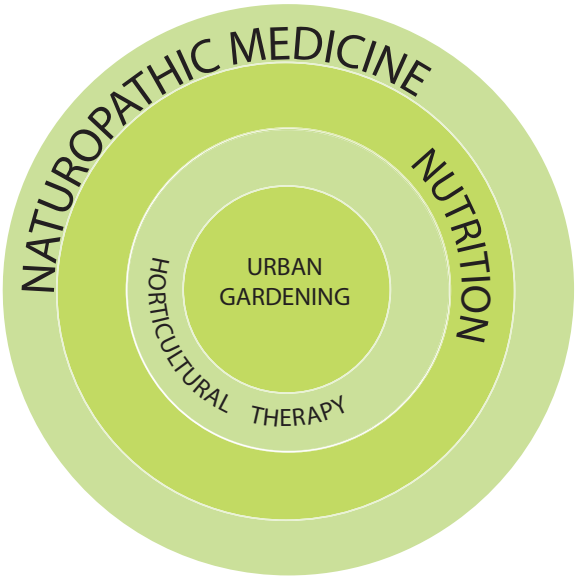
Program Development

My program is a Centre of Preventative Medicine and would bring Naturopathic medicine and Horticultural Therapy programs to Halifax for the first time as a preventative approach to health care. By combining these professional university streams of education with an Urban Gardening course and a Nutrition course, there is a synergy between these disciplines that would be valuable to students and the public alike. The educational framework is an attempt to propel the thesis vision of utilizing architecture to investigate how agriculture and greenspace can infiltrate cities. The combination of programs ensures that the support and services needed by a large-scale urban agriculture project are available on site, while highlighting the interaction between architecture and growing. The problems associated with volunteerism in urban gardening are thereby eliminated and the food produced will serve all other aspects of the program. For example, the Naturopathic students can use herbs grown onsite for tinctures and teas.

At the Centre for Preventative Medicine, students will investigate the relationship of food, health and the urban environment through study, community outreach and hands-on examples. In keeping with the three modes of education, the students will present information to the public in the form of auditory lectures, interesting visual demonstrations and hands-on participation. Community groups and individuals will interact with the building and its displays of food production, visit the student Naturopathic clinic, attend public lectures, or simply relax in the garden. The building itself highlights passive sustainability through its indoor and outdoor spaces and will provide much needed greenspace to the patients and employees at the Victoria General hospital block. By demonstrating the importance of healthy lifestyle choices (food, exercise, greenspace) in an inviting urban park setting, it has potential to reach a broader community.

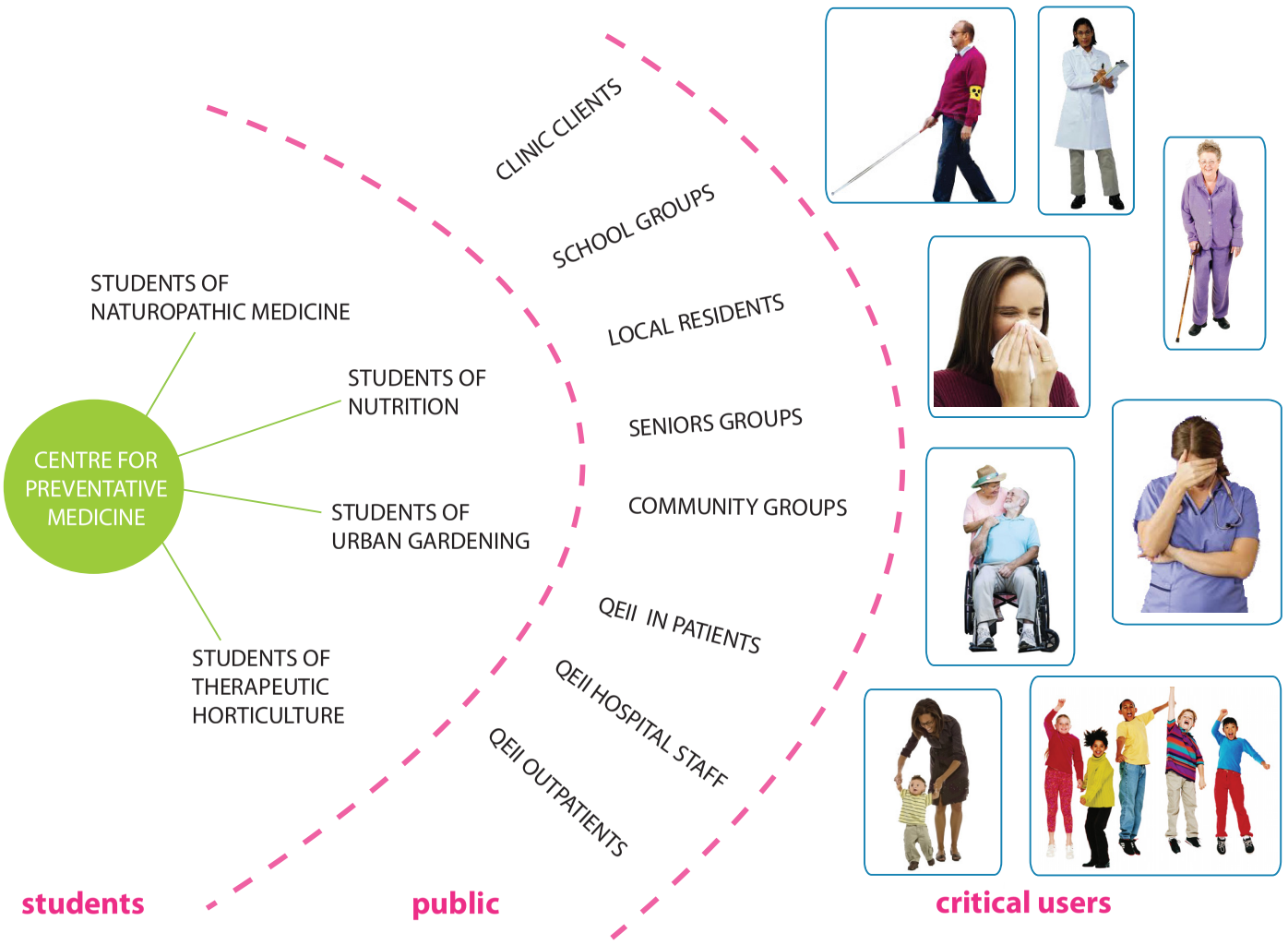
User Groups

The user groups are in two types, the students and the public. Everyone onsite is considered a ‘learner’ but the act of learning is both formal and informal. Whether by practising professional clinical skills in the student health clinic, studying in a classroom, or by participating in a garden seminar, the user groups will learn by doing, and will be able to apply this knowledge to positively effect their own lifestyle habits. Within the public user



Initial Program Diagram depicting the four streams of education. Naturopathic Medicine is the largest stream, followed by Nutrition, and Horticultural Therapy. These three streams interrelate through the Urban Gardening stream.

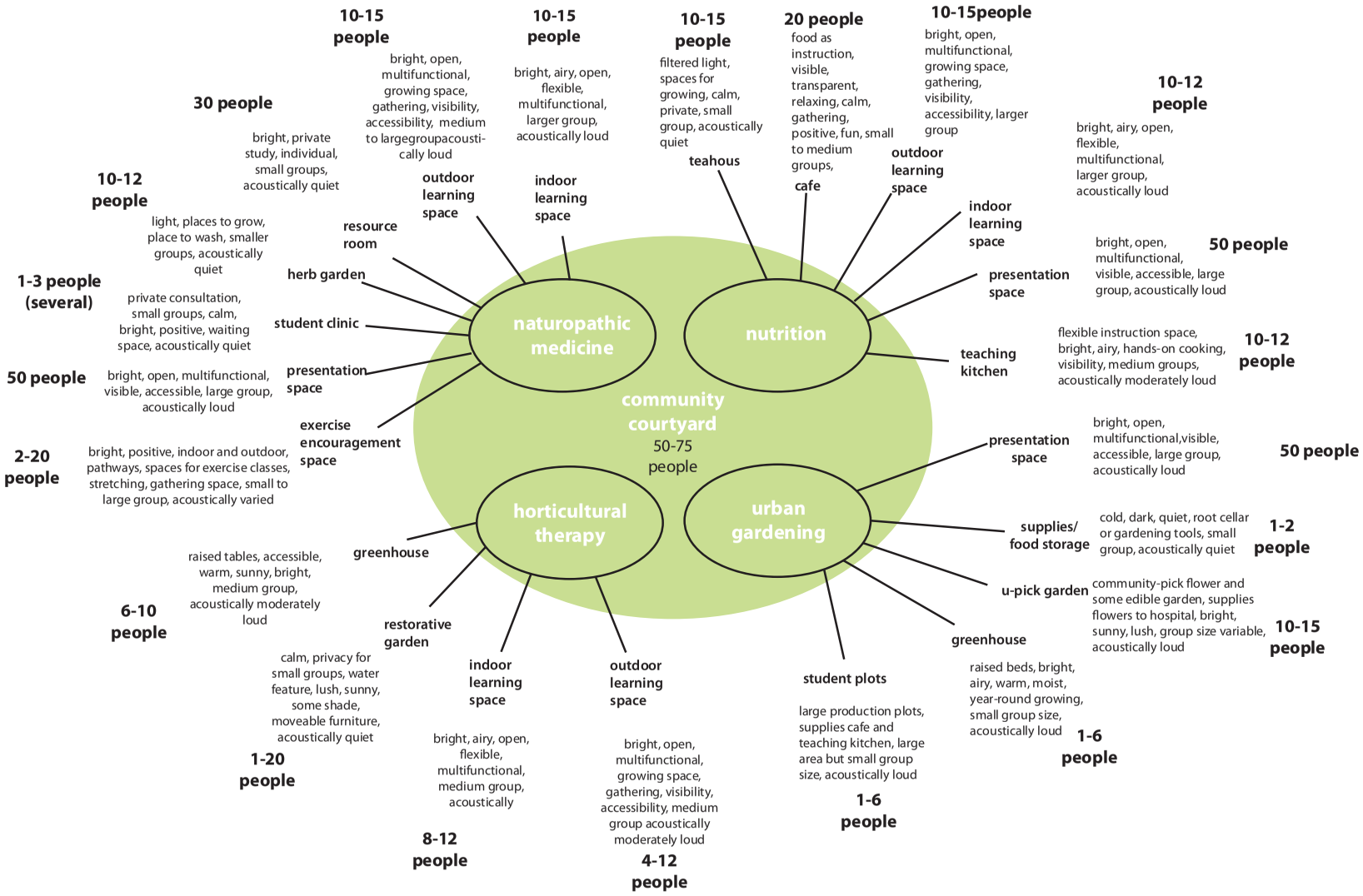
group, there would be people who come to the site for a specific event such as a visit to the clinic, or an evening class at a teaching kitchen. There would also be visitors from the adjacent hospitals or the surrounding community who would use the site informally by enjoying the teahouse, walking paths and viewing gardens simply for restoration and pleasure. There are several types of user groups who are considered ‘critical’ or who would require special consideration. Because it is a public setting devoted to health care, people of varying degrees of health would be present, and could have mobility concerns. For example, gentle sloped, accessible paths with clear way finding is a part of the design consideration.



User diagram depicting the direction of learning in the program. Professionals teach students who, as a part of their curriculum perform practical work to educate the community through presentations, clinic visits, and demonstrations.

Programmatic Spaces

I developed a list of spatial requirements by researching public greenspace, naturopathic medicine programs, nutrition programs, community centre programs and agriculture or horticulture programs. These spaces were driven by the numbers of people who might use particular spaces at a time, and then I estimated required areas by cross referencing with precedents. This process lead to a list of spaces that could be shared between the students and the public. To develop an architectural language to envision these spaces, I developed essential haptic and structural collages of photographs from the site and idea images. From these, I constructed a chart to outline the program requirements and an architectural language.



Initial diagram brainstorming programmatic needs, required spaces, predicted numbers of users, and essential characteristics of the learning spaces.

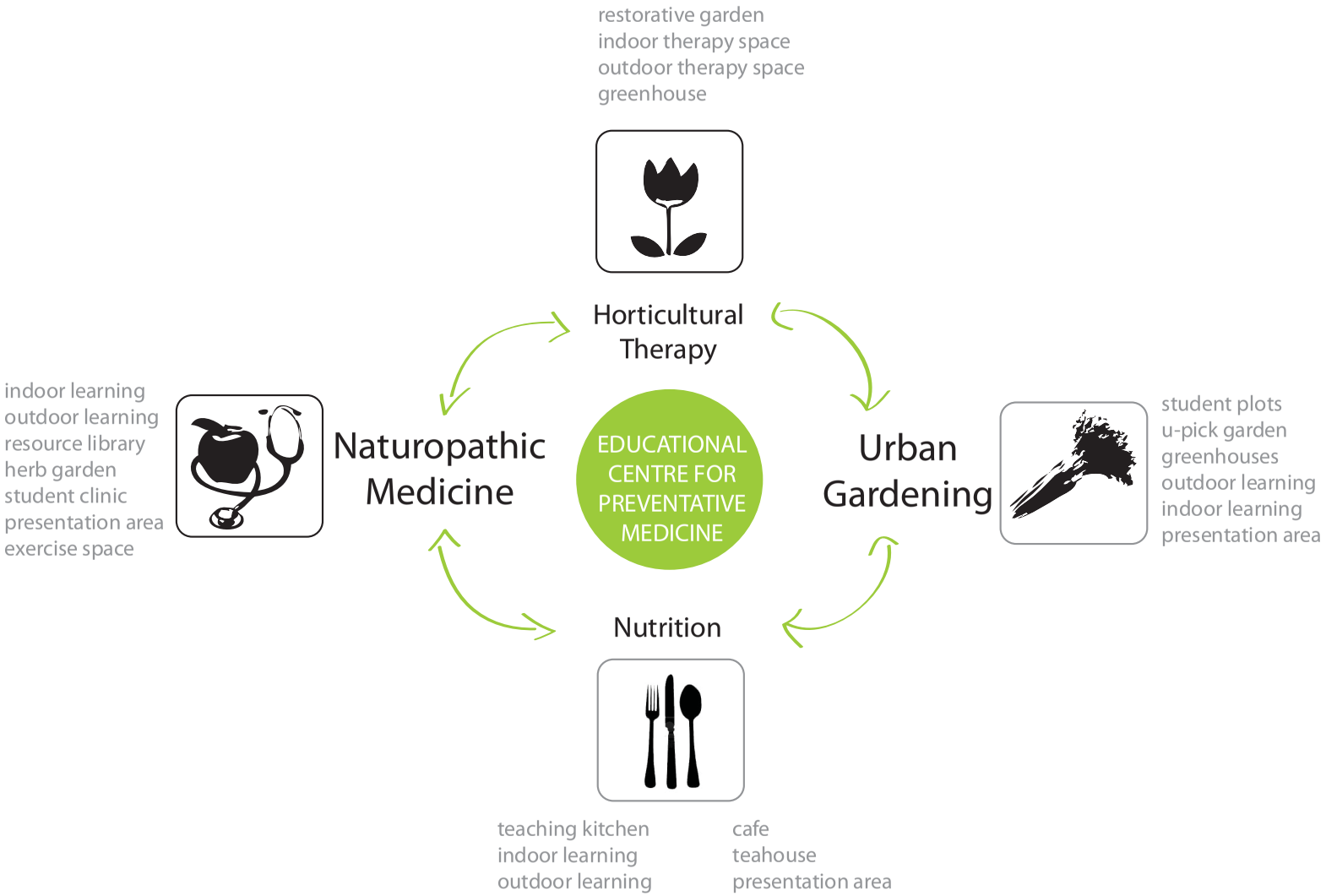


Diagram demonstrating necessary programmatic spaces in accordance with the educational streams.

learning type
instructor led,
personal discovery

light
bright, filtered,
dim,
time/use dependent

acoustics
public,
private,
time/use dependent

privacy
loud,
moderate,
quiet,
time/use dependent

atmosphere
fresh air,
controlled,
fresh/control mix air

ambiance
exciting,
relaxing,
time/use dependent

sensory
Visibility,
Auditory,
Tactility,
Olfactory,
Gustatory

					ARCHITECTURAL QUALITIES					ARCHITECTURAL PRIORITIES	
space	people	quantity	area	learning type	light	acoustics	atmosphere	privacy	ambiance	sensory	structure
outdoor experiential	15-20	2-3	75 (225)	instructor led personal discovery	bright	moderately loud	fresh air	time/ use	exciting	V, A,T	
indoor experiential	15-20	4	75 (300)	instructor led personal discovery	bright	moderately loud	fresh/ controlled	time/ use	exciting	V, A, T	
resource library	20-30	1	90	personal discovery	filtered	quiet	fresh/ controlled	public	time/ use	A, V	
herb garden	10-12	1	60	instructor led personal discovery	bright/ filtered	quiet	fresh/ controlled	private-school	relaxing	O, G, A, T	
student clinic (consult)	1-4	10	6 (200)	instructor led	filtered	quiet	fresh/ controlled	private and public	relaxing	A, V, T	acoustic privacy
presentation/ exhibition	50	2	125 (250)	instructor led personal discovery	time/ use	time/ use	fresh air	public	exciting	A, V	visibility
exercise activities	2-25	2	90 (180)	instructor led personal discovery	time/ use	time/ use	controlled - cool	public	time/ use	A, V	high ceiling, air flow
therapeutic hort. delivery	6-10	1	75	instructor led	bright/ filtered	moderately loud	controlled - warm/humid	time/ use	time/ use	T, V, A, O	accessibility
restorative garden	1-30	1	250	personal discovery	bright/ filtered	quiet	fresh air	public	relaxing	A, V, O, T	privacy without
student garden plots	1-8	2	140 (280)	instructor led personal discovery	bright	loud	fresh air	private-school	exciting	V, A, T	ability to produce
greenhouse	1-8	2	40 (80)	instructor led personal discovery	bright/ filtered	moderately loud	controlled - warm/humid	private and public	time/ use	V, O, T	
u-pick garden	10-15	1	100	personal discovery	bright	loud	fresh air	public	relaxing	O, V, T	
teaching kitchen	10-15	2	75 (150)	instructor led	bright	moderately loud	controlled- highly vent.	public	exciting	G, O, V, T, A	transparency
cafe	25	1	100	personal discovery	filtered	moderately loud	fresh/ controlled	public	exciting	G, O, V, T	transparency
teahouse	15-20	1	75	personal discovery	filtered /dim	quiet	fresh/ controlled	public	relaxing	G, O, A, V	proximity to herbs

Chart depicting the programmatic required spaces organized into an idea of architectural requirements. Every space is considered in the framework of learning.

Concept rendering of a planted herb wall in the proposed teahouse.

Concept collage of an outdoor learning space.

Site Analysis

This site is a hub of health and education in the city. By developing the south-facing, 3.5 acre parking lot on the corner of South Park Street, South Street, and University Avenue, the project is located at the centre of where many Halifax Regional Municipality residents come for education and health care. The project enhances the existing Victoria General hospital by providing restorative greenspace and green views for the staff, patients and support groups. A key goal of the project is community outreach, therefore, reintroducing productive ‘nature’ into a very dense area of the city is crucial. This is in terms of the continued evolution of greenspace in the city, and to highlight the health benefits - both mental and physical - of nature in our daily lives. The site is one block from Spring Garden Road, which is a very busy street of offices and retail. Also, it is a density of residences in the area is high with a mix of high rise, multi-residential and single family dwellings in the immediate surroundings.

Three Scales of Site Assessment - The Region, The City, The Site

An understanding of the site was developed at three scales:

The Region

At the scale of Halifax Regional Municipality (HRM), the site will attract users who will drive by the site everyday on their way to work, or who will be exposed the site when seeking traditional healthcare nearby.

The Region: Map depicting the site as a Hub of education and healthcare in the Halifax Regional Municipality.

The City

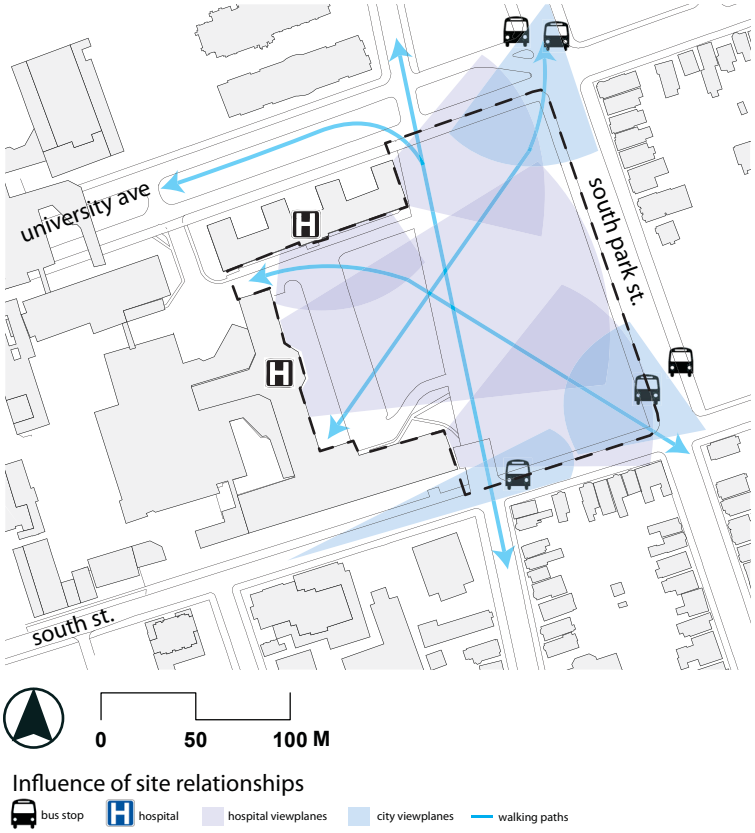
At the scale of the Peninsula, I examined the site's important relationship to existing health and education services, and as an addition to the existing greenbelt of Halifax. The surrounding health and educational facilities were outlined for possible interactions between the user groups. Many of the surrounding services would draw people who would benefit greatly from the current project such as the elderly, rehabilitation patients, and students of various faculties. The project can make a great impact on the greenbelt of Halifax, as an example of productive and multi-functional urban landscape. Its close proximity to the Commons, Point Pleasant Park, and its relationship to the Dalhousie campus green median could also allow for such a productive greenspace to spread beyond the boundaries of the existing site.

The City: Map of Contextual Relationships - Demonstrating the site's relationship as a part of the greater Halifax Greenbelt and in relation to important local healthcare and educational services.

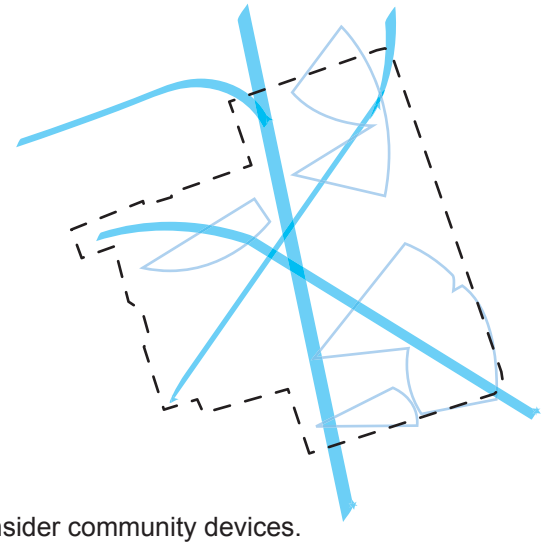
The Site

At the scale of the site itself, the influence of natural forces and conditions were examined in great detail. This was completed through research, site modeling and layering of information. My site strategy determined the existing zones of potential for food production in terms of sunlight, surface water runoff, acoustic influences, and wind. While these influences were examined throughout a calendar year, they were graphically mapped as an average of the growing season in Nova Scotia. Once these site influences were overlayed, zones of potential were determined. The next step was to overlay the surrounding community context, which depicted key viewplanes from the surrounding city and hospitals, and essential pedestrian paths. Once this mapping was complete, the program was zoned to the site, as an initial move of adjacencies.

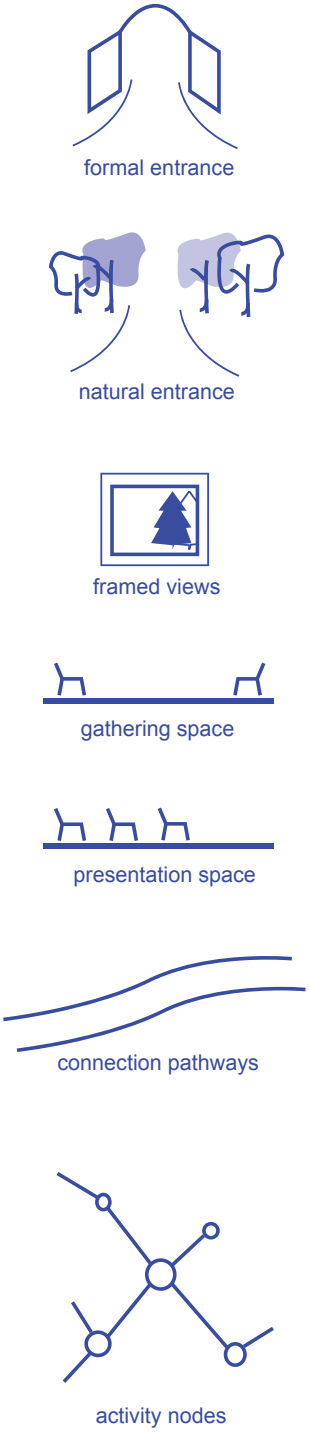
Overlaying the site influences created zones of potential for various programs, but also, determined border conditions between these zones. From this, I developed architectural interventions to maximize the sites' inherent ability to support productive landscape. I constructed this 'Kit of Parts' of architectural devices to influence/counteract/maximize/minimize the effects of sun and shade, water runoff, wind, and sound pollution.



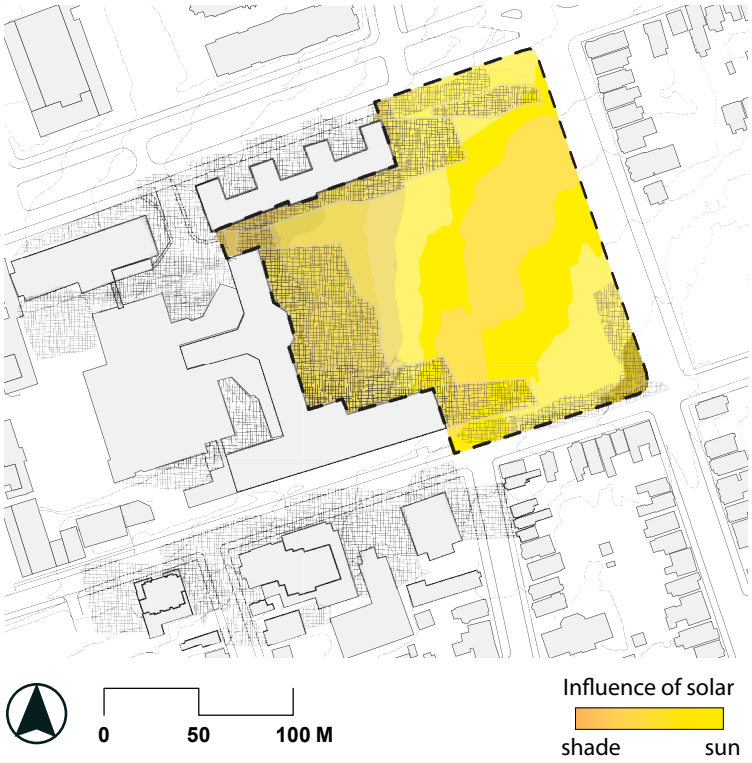
Influence of surrounding site context.



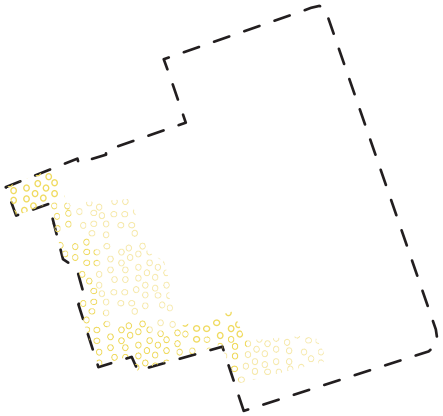
Areas to consider community devices.



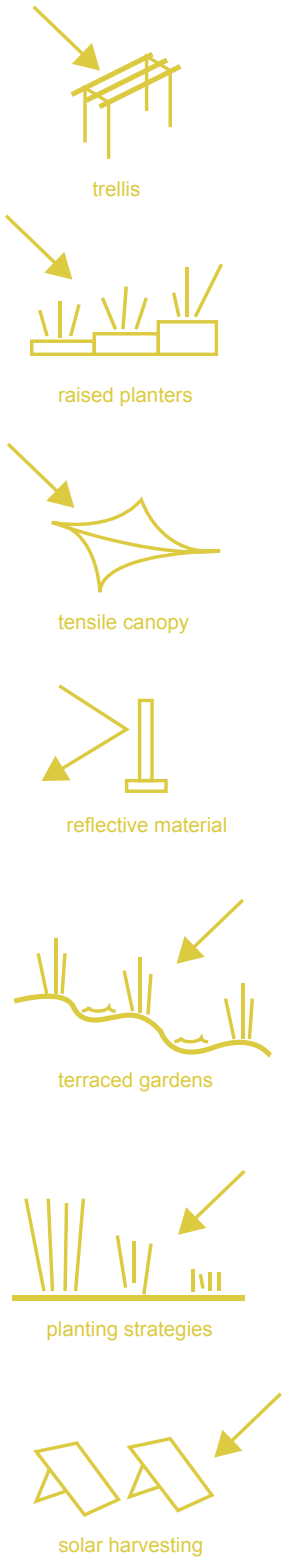
Architectural devices.



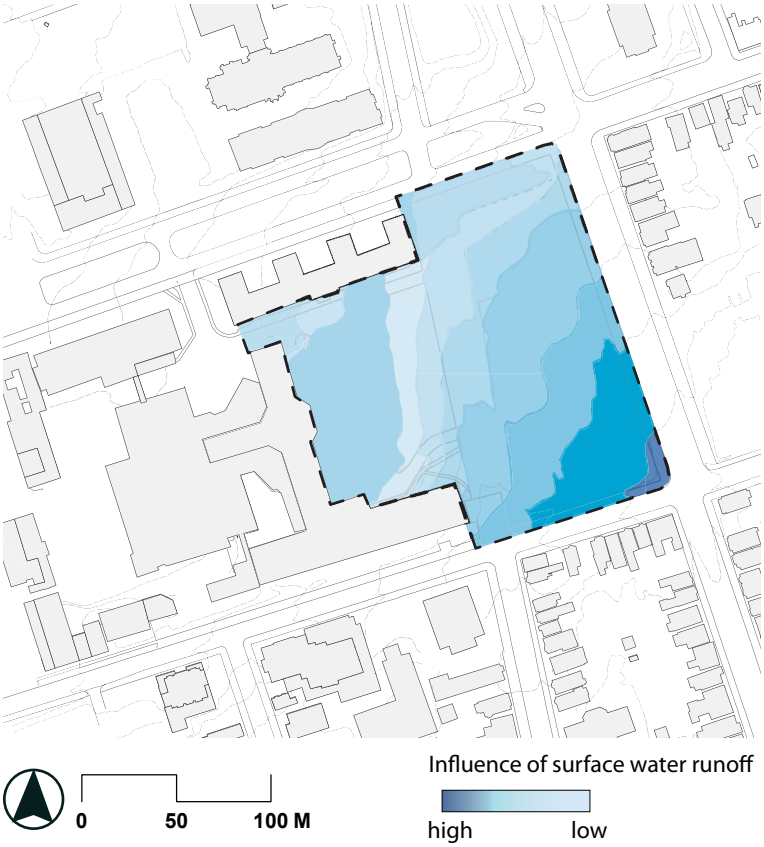
Influence of sun and shadows on the site.



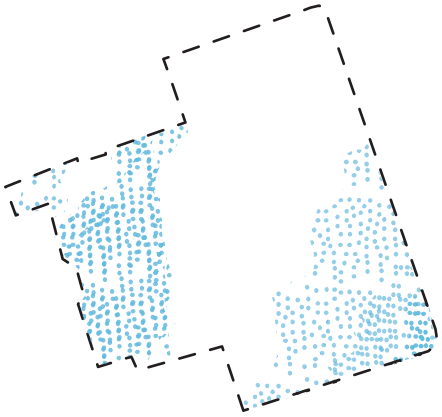
Areas to consider solar devices.



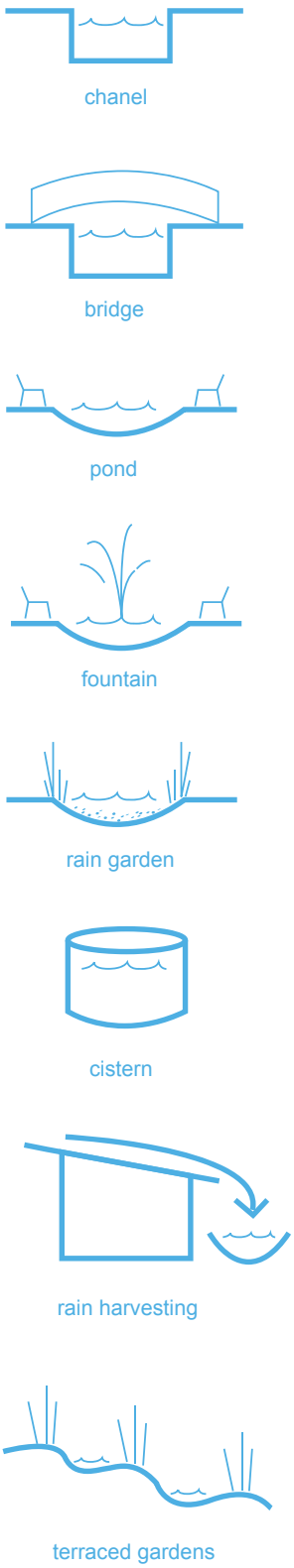
Architectural devices.



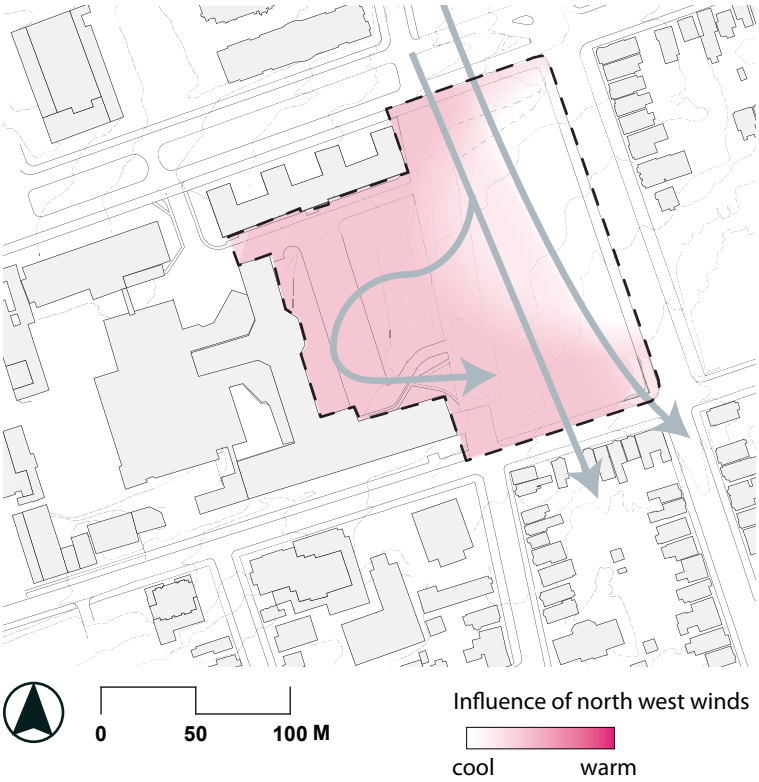
Influence of surface water on the site.



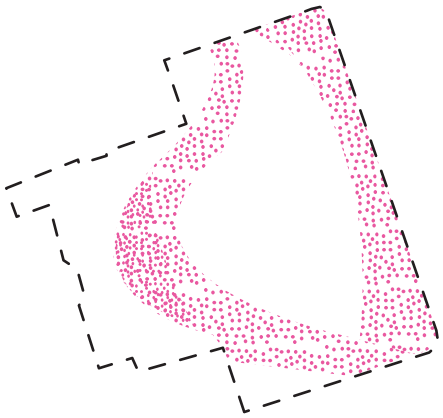
Areas to consider water devices.



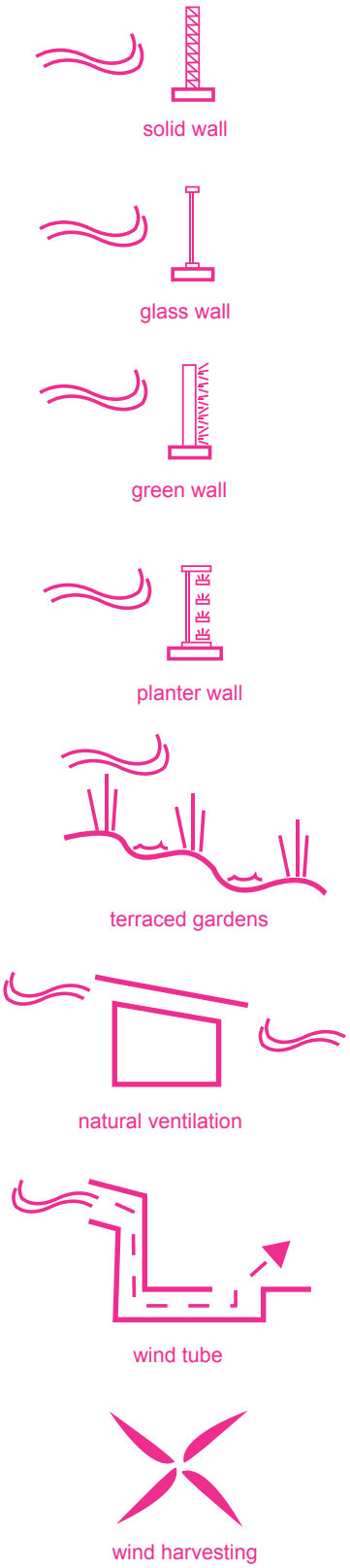
Architectural devices.



Influence of north west wind on the site.

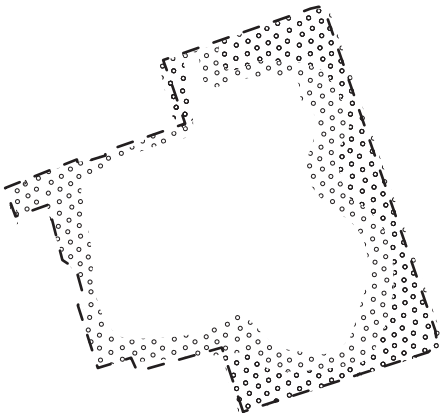


Areas to consider wind devices.

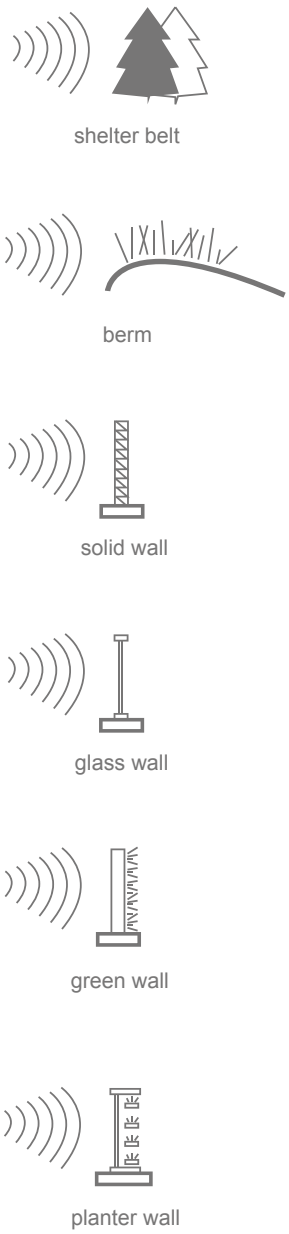


Architectural devices.

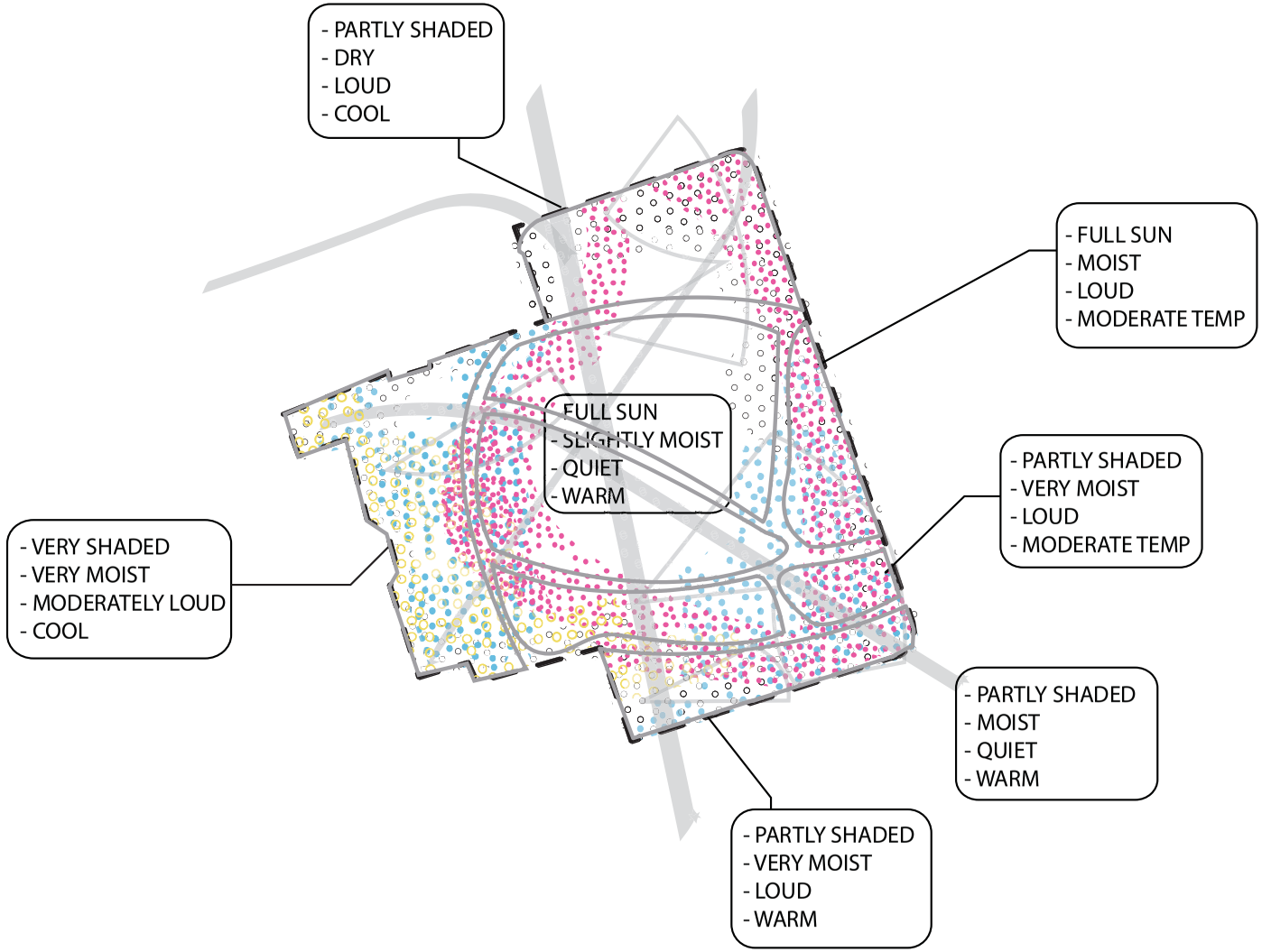
Influence of acoustics on the site.



Areas to consider acoustic devices.



Architectural devices.



Areas in need of architectural devices were layered to determine the site's inherent zones of potential production.

Program was assigned to the determined Zones of Potential according to program requirements and in response to surrounding community influences.

CHAPTER 2: DESIGN

My vision for the site is an inviting urban complex where urban agriculture and park-land combine with structure to create health-focused learning environments. A variety of spaces are required to support the types of learning that would take place, which ranges form formal to informal, and visual to experiential. Key factors in the success of the design are its ability to engage with the surrounding context, and to balance the need for an inter-active greenpace with exellent learning spaces for students.

Design Framework

I outlined four points of departure to develop an architectural concept for the Centre of Preventative Medicine:

1. The design of our environment can foster learning, influence a positive change in physical behaviour and support mental health.

2. Greenspace can be productive environmentally, agriculturally, and socially.

3. Productive greenspaces can be integrated with architecture at various scales as a synergistic approach to urban healthy living.

4. Productive urban greenspace can be a convergence point between health and education.

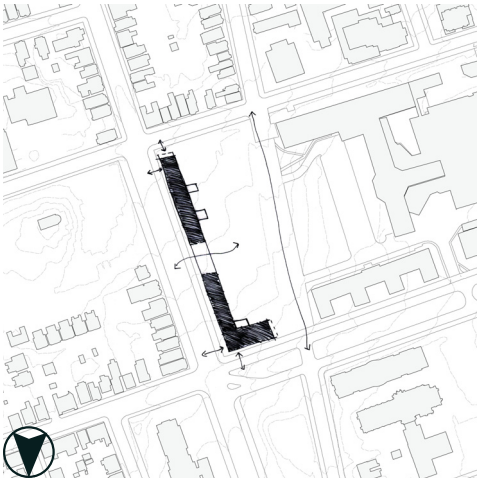
Together, these four points propose that productive greening can be an integral part of architecture. From envelope, to building systems, to inhabitation, greenspace interwoven with architecture can create spaces of learning and activity.

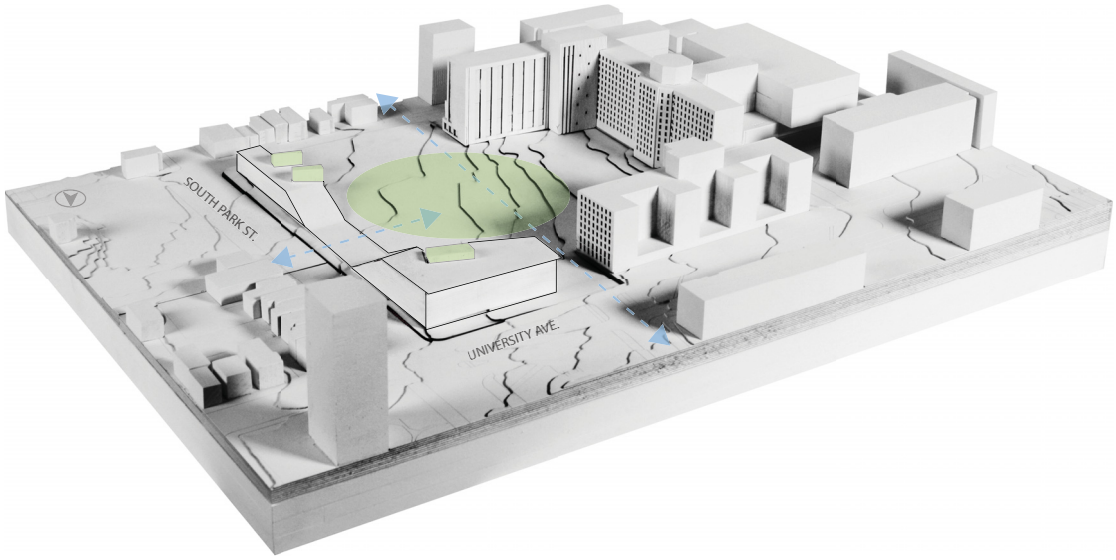
Site Strategy Investigation

The two diagrams depicting the Zones of Potential and the Initial Program overlay were assessed in accordance with the four points of departure. From this rationale, several urban site schemes were investigated.

Site Strategy 1 - Urban Wall

Concept - A bar building defines the boundaries adjacent to the streets and maintains the maximum available open space for agriculture. The main architectural feature is a green roof that slopes to create an entry into a public courtyard.



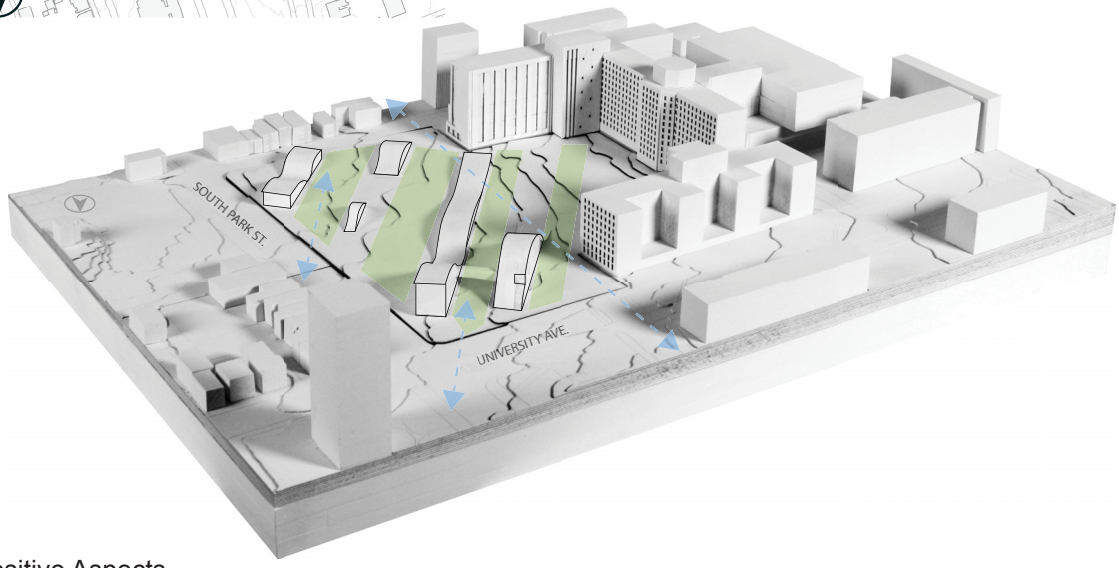


Positive Aspects
- A strong urban facade helps create a street wall
- Green roof is productive and provides sloped access from the street
- Sloped area of roof creates a public court and formal entry to the landscaped area
- Accessible green roof is gesture of integrating building and landscape
- The vast majority of the site is kept free for agriculture
- Maintains pedestrian ‘Tower Road’ walk

Negative Aspects
- Does not push the idea of integrating building and landscape because the building is too seperate
- Strong urban wall hurts visibility to parkland from the street and does not invite the public inside
- Creates a private garden for students but does not balance students and the public

Site Strategy 2 - Ribbons Gestured to City

Concept - Blanketing the site in a series of green ribbons of agriculture. Inspired by an idea of laying traditional garden rows across the site. These ribbons are pulled into the undulating roof to cover programmatic elements when required.

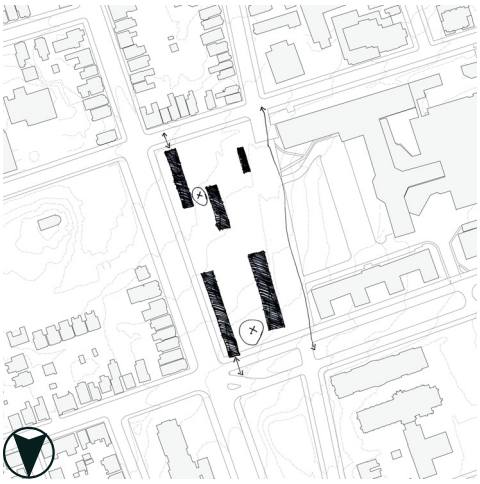


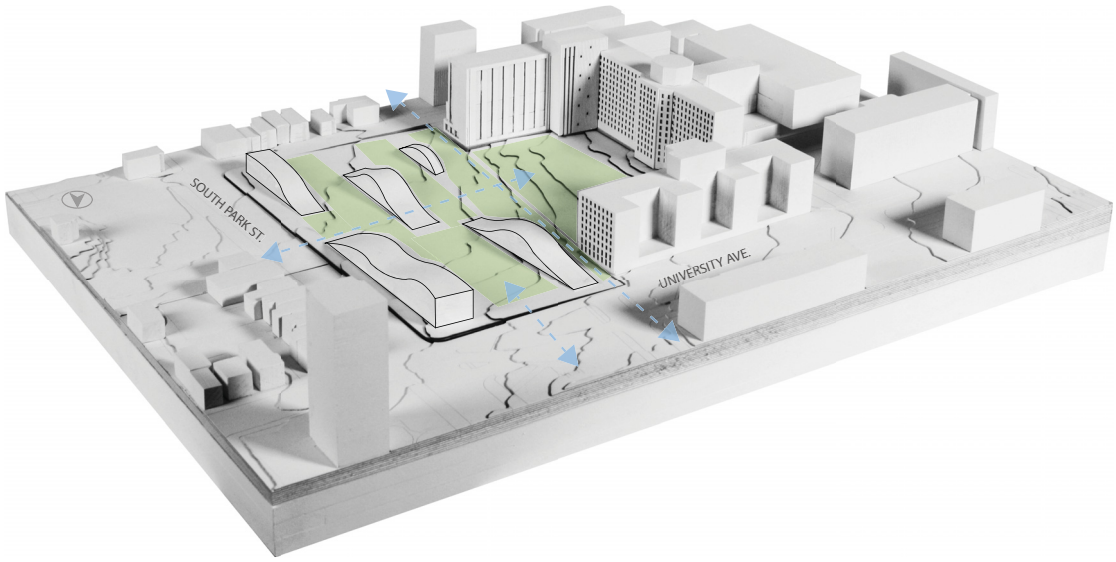
Positive Aspects
- Highlights integrating building architecture with landscape
- Roof of the program is the green ribbons and therefore, productive
- People in the hospital would soley have a view of gardens, people on street would see a building facade
- The direction of the ribbons gestures toward downtown
- The hills and their placement create gathering spaces
- Inviting to the public because of its open green “ribbons” of agriculture, its novelty and playfulness
- Maintains pedestrian ‘Tower Road’ walk
- Creates sheltered spaces from the cold North-West winds

Negative Aspects
- Does not create a strong urban street facade on University, South Park or South
- Not in line with urban grid, and therefore does not make clear entrances
- Productive roofs receive full daylight, but interior of buildings are in darkness for much of day

Site Strategy 3 - Ribbons to create Urban Wall

Concept - Second variation of the Ribbon Concept of blanketing the site in a series of green ribbons of agriculture. These ribbons are again pulled up to cover programmatic elements when required. The buildings are oriented to create an urban facade and define the edges of the site.



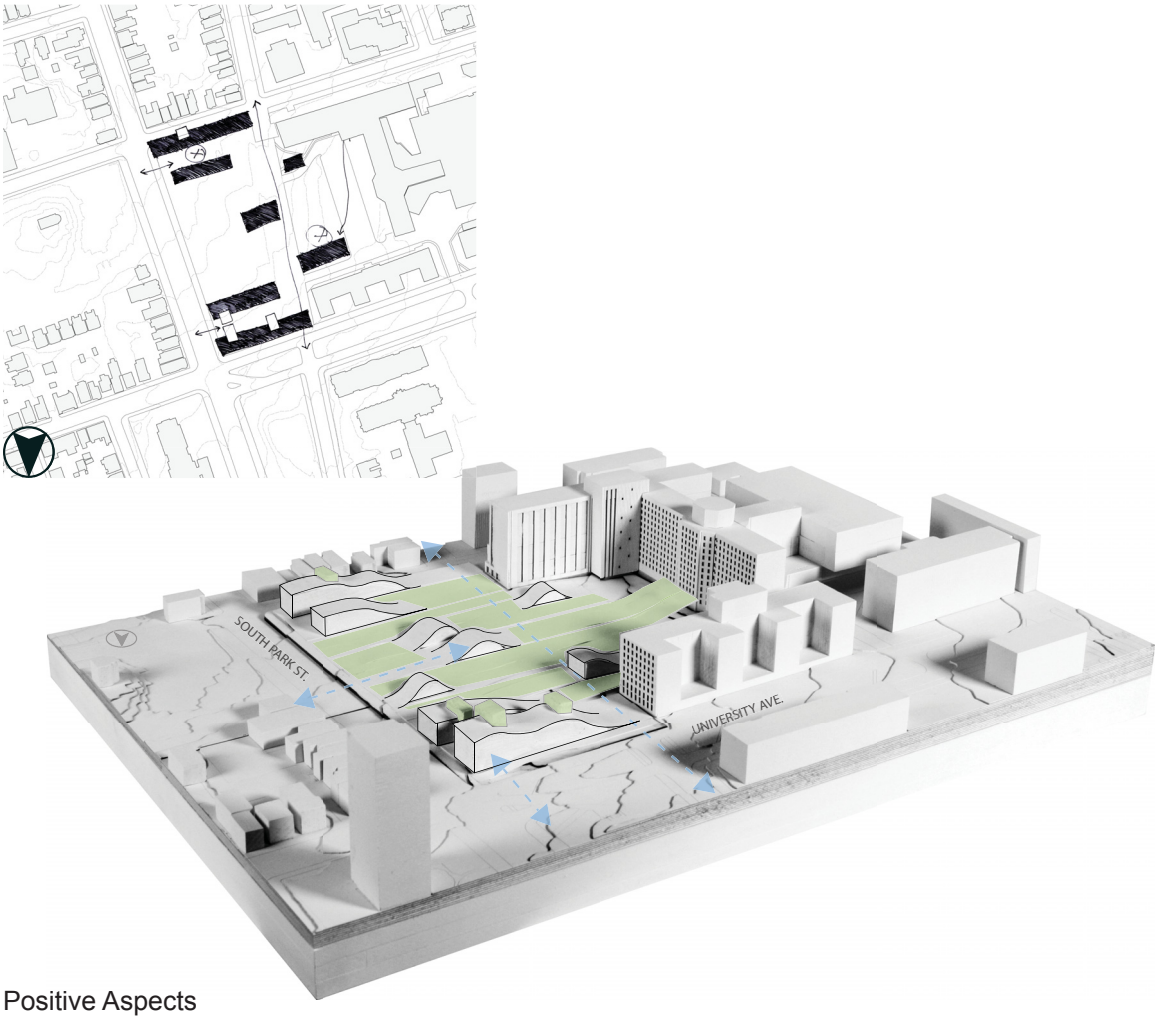


Positive Aspects
- Inviting to the public because green “ribbons” open toward University Avenue and South Street
- creates an urban facade on South Street, University Avenue and South Park Street
- Maintains pedestrian ‘Tower Road’ walk

Negative Aspects
- People in the hospital would now view much more building instead of greenspace
- Roofs still have considerable sunlight but interior buildings would be in darkness for a large portion of the afternoon
- Does not block the cool North-West winds

Site Strategy 4 - Woven Ribbons to create Urban Facade

Concept - Third variation of the Ribbon Concept of blanketing the site in a series of green ribbons of agriculture. The buildings are oriented to create an urban facade and define the corners of the site. Buildings are oriented to gain sunlight and respond to urban grid.

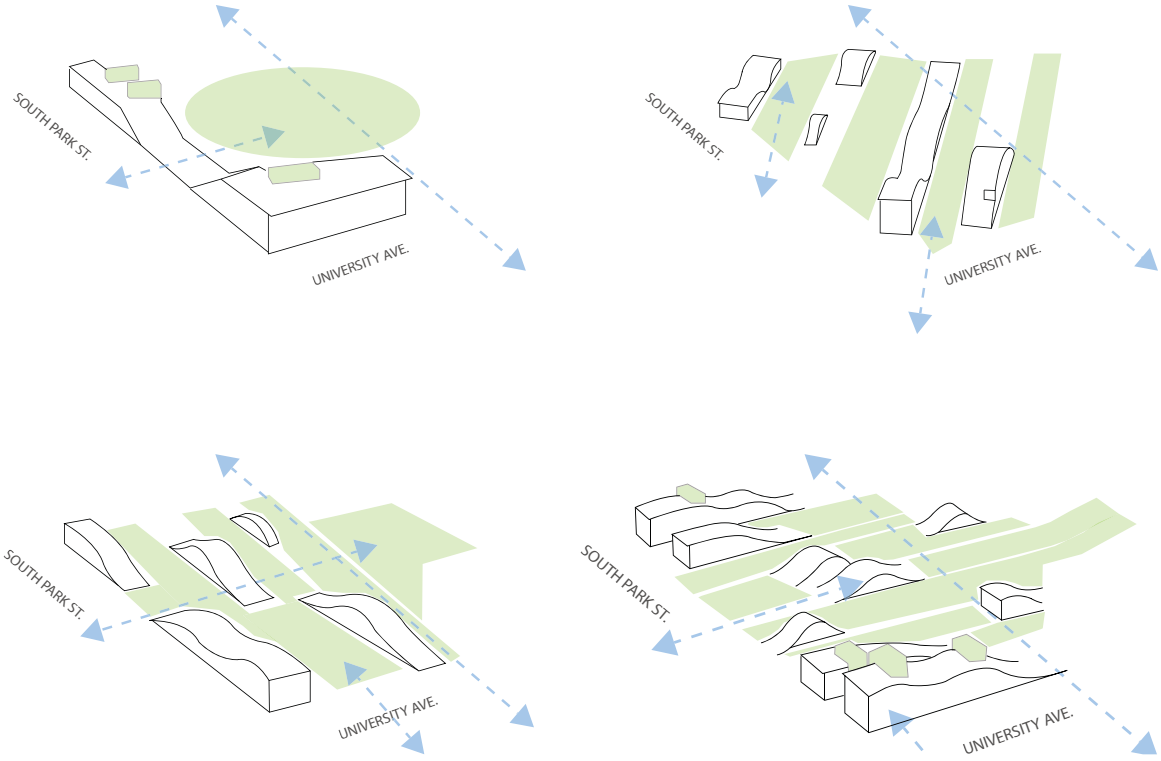


Positive Aspects
- Highlights integrating building architecture with landscape
- The buildings are oriented to get maximum daytime South and morning Eastern light
- Cool North-West winds are blocked by largest building, sheltering majority of gardens
- The people in the hospital have views soley of gardens, and people on the street catch glimpses of gardens between urban facades.
- The public is invited in through the green “ribbons” that stretch to the sidewalks
- Maintains pedestrian ‘Tower Road’ walk
- Buildings are arranged according to height in a similar way as garden rows - tallest to the North
- Allows for agricultural ribbons to negociate slope of site

Negative Aspects
- Does not create a strong urban street facade across all of South St. so entrances should be more clearly defined
- Courtyards between buildings appear too narrow and might be dark
- Agricultural ribbons flow in the direction of the contours so may present water drainage issues allowing water to flow away too quickly to irrigate properly

Site Strategy Comparative Analysis

After assessing the four site strategies, I chose to develop Option Four. It is crucial to ensure the buildings' interiors maintain maximum daylight, while optimizing daylight on the productive roof gardens. Placing the largest building to the North-West corner will help create a wind shelter and is in keeping with the concept of garden rows. Further, it places the building that is at an instituional scale on the corner of University Avenue, adjacent to other large public buildings, thus gesturing to the city. Providing green views to the hospital patients and staff while providing an urban facade to South Street, University Avenue and South Park Street is a strong balance of purpose. To move forward, I need to develop a balance between creating an urban facade, and ensuring the park is inviting to the public through clear entries. Investigations of plantings would help clarify water flow for irrigation. I need to examine how places of inhabitation are created by the undulating buildings and how their placement throughout the site helps develop the relationship between public space and formal learning classrooms.

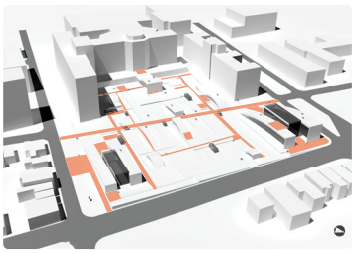


Comparative diagrams of the four site strategy options.

Formal Translation - Weaving the Layers of Program

As I layered the many aspects required to make a large-scale urban park and urban garden project function, I began to conceptualize the project as a weaving of these layers. The first layer, or the warp of the weave, was the most crucial to orient. Based on my Site Strategy Comparative Analysis, I had decided its strongest orientation was to run East-West with an urban facade to the street. The second layer of the weave, or the weft, was the layer of agriculture. It runs south to north and responds to sunlight and the flow of water across the site, which is gathered and absorbed through a series of channels and aerated ponds.

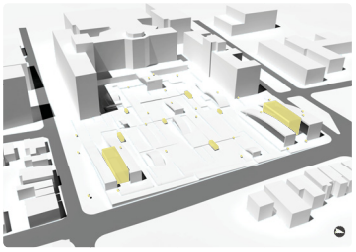
The other two layers of the weave I termed light boxes and interaction. They are the atriums and greenhouses and the courtyards and paths, respectively. These spaces work together to create year round inhabitable gardens for the public and students to enjoy while promoting movement and gathering through the site.



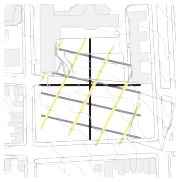
INTERACTION

Layer Direction - responds to flow of people on and around the site

Major existing pedestrian pathways are enhanced and crossed with new paths and courtyards to promote movement, learning and gathering

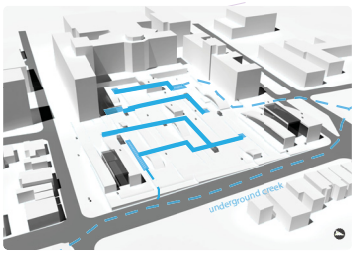


LIGHT BOXES

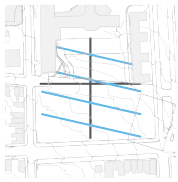


Layer Direction - responds to the sun

Second architectural language onsite, act of placing 'glass boxes' to create enclosed gardens for year-round display and inhabitation - atriumss, greenhouse, rest pavilions, lightwells

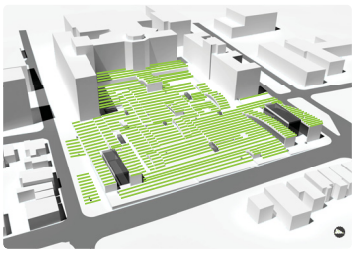


WATER



Layer Direction - responds perpendicularly to the natural flow of surface water

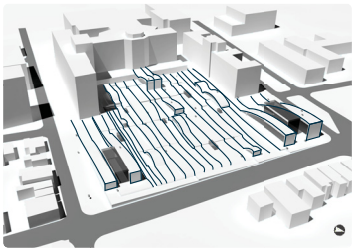
Aerated ponds and chanels collect, filter and absorb surface runoff for irrigation. System is connected to underground creek at key intake and overflow points.



AGRICULTURE

Layer Direction - responds to sunlight and the natural drainage of surface water.

Gestures in the direction to the city greenbelt. A variety of garden types are planted according to microclimate.



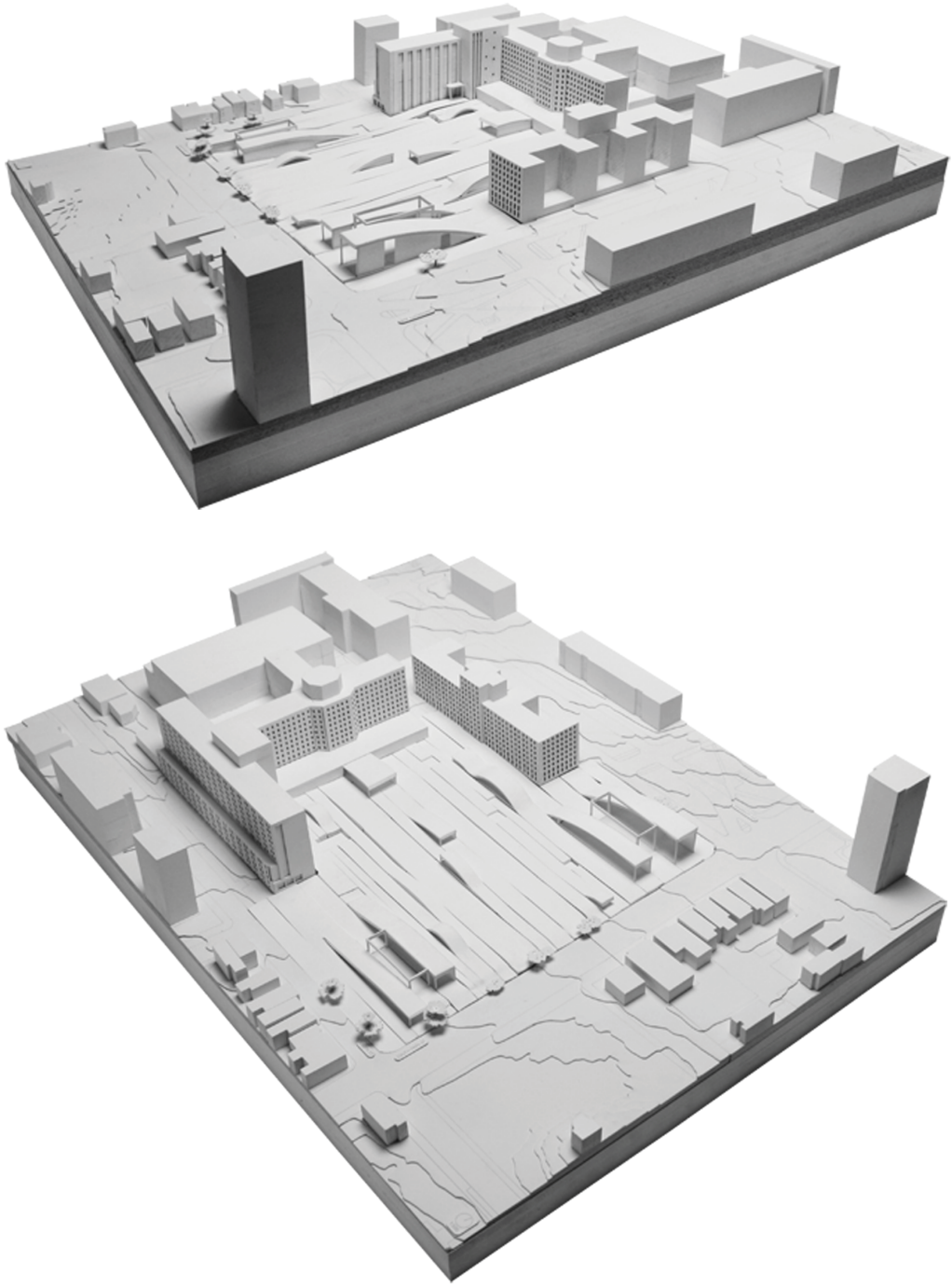
BUILDING PROGRAM

Layer Direction - responds to sunlight and urban fabric while sheltering the site from the North-West wind

Buildings are 'planted' as garden rows - shortest to tallest N-S

This image outlines the layers of the program in the order in which they were applied to the site.

Site Model



Final formal translation of the conceptual design. The model highlights the importance of the building program and illustrates how the designed changes in grade meet the surrounding street grid. Twenty-six longitudinal sections were cut through the site to ensure that key pathways have a gradual slope of 1:12. Outside of these paths, the changes in elevations flow freely, creating gardens, buildings and outdoor learning spaces that can change from year to year.

It was important for the design to be a contrast to the existing hospitals, in order to question and challenge our current approach to health programmatically and architecturally.

Site Design

Summer Site Plan

Based on my site analysis and program drawings, I developed a master plan of buildings and adjacent gardens on site, considering the native plants in Halifax's hardiness zone of 5b-6a. I located the largest building, the university (school) building on the corner of University Avenue and South Park Street, to continue the line of educational buildings, gesture to the downtown and create a north wind block. On the corner of South Park and South Street is the community focused building which includes the student clinic, the teaching kitchens and the group exercise space. In the centre of the productive garden area, I've located the urban gardening classroom and the garden shed with prep space and storage of equipment.

The most quiet part of the site is next to the hospital, which I've zoned as the restorative area. There is a teahouse and a new entrance into the hospital cafeteria, so that patients and hospital staff can sit in a garden space and eat, and also can gain access to the underground parking.

The buildings on site are designed so that the tallest buildings are to the north and the shortest are to the south. This, combined with the changing grade of the design allows for full sun exposure to the majority of the site. The buildings and the gardens interact closely, to support the idea of interweaving the greenspace and the architecture. For example, to the south side of the buildings, the reflected sun and blocked wind could allow speciality gardens that would typically be in the higher hardiness zone of 6b. This is opposed to the north side of buildings that has been designed as medicinal shade gardens. A diagram outlining the garden types in more detail follows.

Winter Site Plan

During the Winter months, the majority of the production gardens would go dormant, however the main pathways and courtyards would remain pleasant and active by the planting of winter gardens. Evergreens, semi-evergreens and perennial plants that become brilliant reds and yellows in the Autumn and Winter would be used to promote outdoor activity and gathering throughout the year. These spaces could be used for bonfires, and the

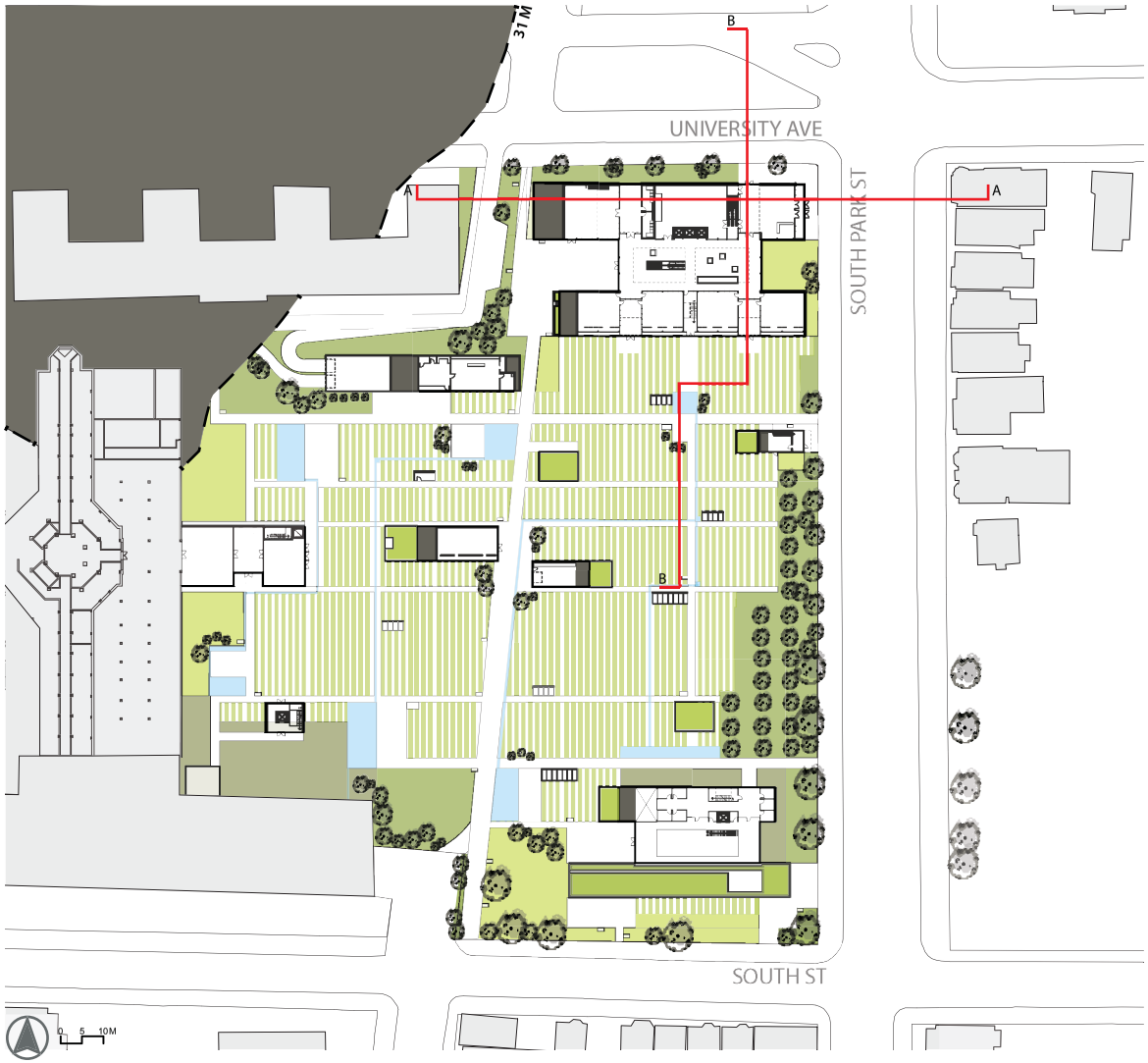
adjacent ponds could be used for skating.

Roof Site Plan

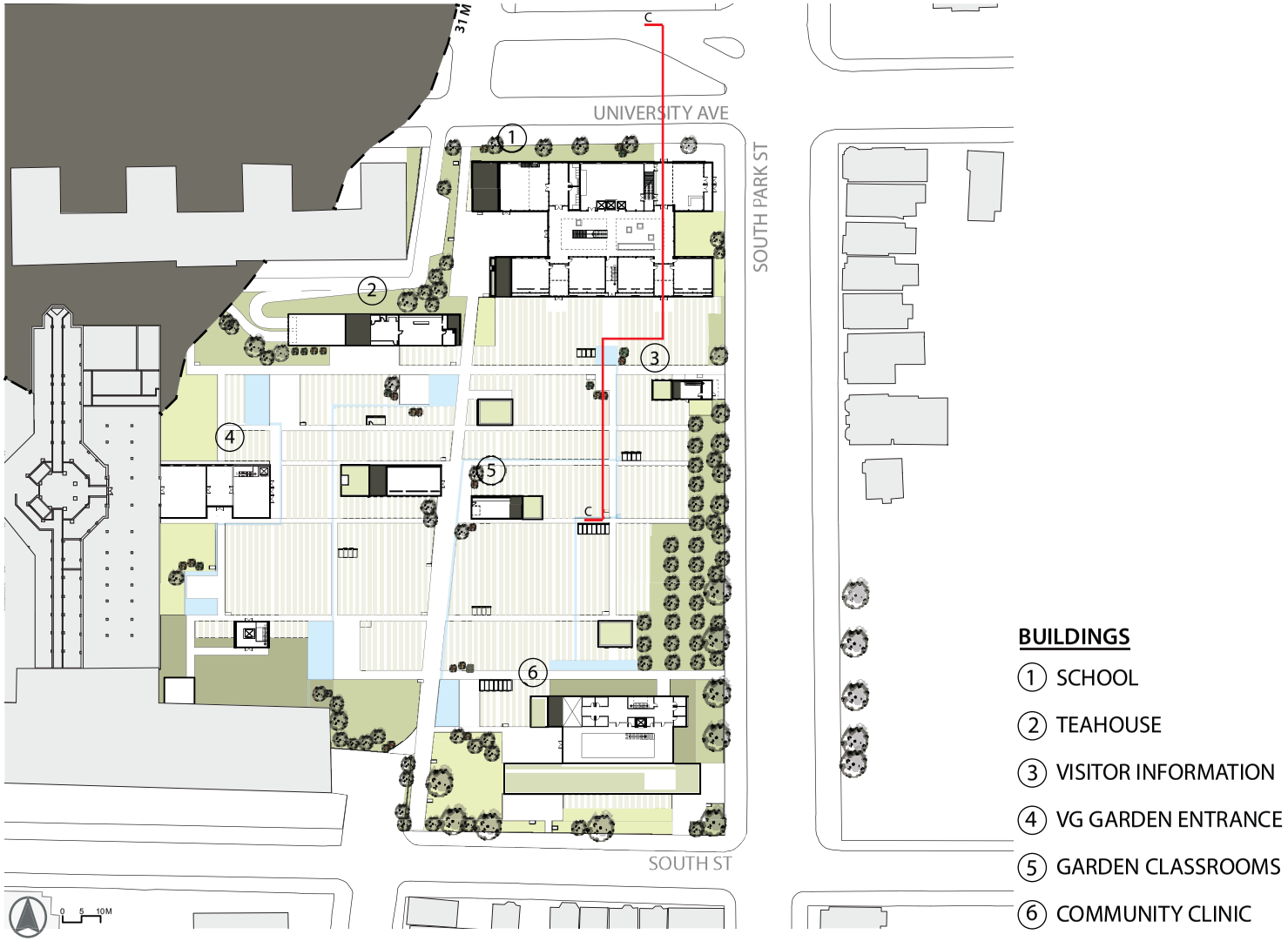
The productive roofscape is a key aspect of the design. It is an intensive greenroof assembly. I decided that it was important to demonstrate how the ‘interaction’ layer of the design continued onto the roof through paths and courtyards. Each roof was designed at a slope that allowed built-in steps and pathways to encourage exercise and movement through the greenspace. Adjacent to the hospital, the existing elevated parking platform has also been covered in an intensive greenroof assembly. The diversity of plants, shrubs and flowers would be specifically chosen to be restorative, meaning diverse and exciting to view, smell and touch. This rooftop allows inpatients in the hospital to enjoy a garden experience without moving far away from the building.

Site Planting Strategy

Based on the original assessment of the site’s inherent potential to produce food, a variety of garden types were organized on the site with the input of a permaculturist. These gardens relate directly to the adjacent buildings and create a diverse landscape for students and the public.



Site Plan for the summer season, cut 31 M above sea level.



Site Plan for the winter season, cut 31 M above sea level.

Roof Plan for the summer season, cut 46 M above sea level.

Garden Legend

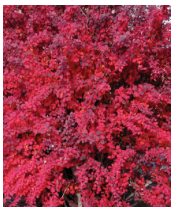
PRODUCTION

The majority of the site is for food production. The agriculture runs in 3′ rows, N-S. Low root vegetables are planted to the South. Taller, stalk vegetables to the North.

HERB

A portion of the production area will be devoted to herbs. Herbs will also be grown in interior planter walls. They are used in cooking, in herbal teas and in naturopathic tinctures.

WINTER


red lady


calamagrostis

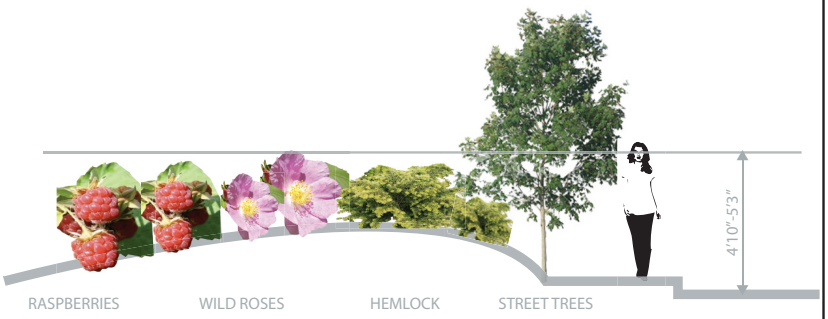

pittosporum


cotoneaster

Bushes and plants that remain green or turn vibrant colours through the Fall and Winter will line the paths and courts open year round.

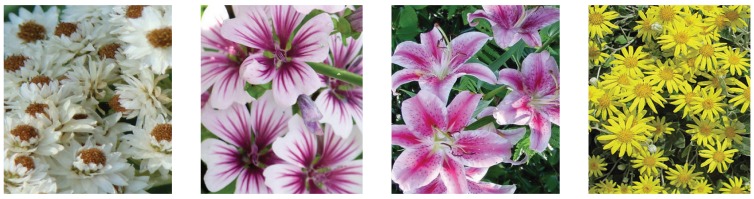
This diagram explains each type of garden that has been zoned on the Summer Site Plan and how it would relate to the people and programmatic spaces on site. Continued on next page.

BIOFILTER



The parts of the site closest to the street will have berms of biofilters to mitigate pollution and noise. This will create a natural fence and highight the entrances.

INEDIBLES



anaphalis margarit | malvasylvestris | lillium | brachyglottis

Inedibles for beauty and cutting are located in high-traffic areas unsuitable for food. These gardens are mainly perennials to help maintain soil health.

RAIN

A key part of the on site water system of filtration pools are the rain gardens. These plants help break down pollutants and filter the water for irrigation. Also, they enhance biodiversity.

SHADE

Several areas on site are in shade for part of the day due to the height of the hospitals. Shade gardens grow a variety of medicinal plants and beautiful woodland ferns and flowers.

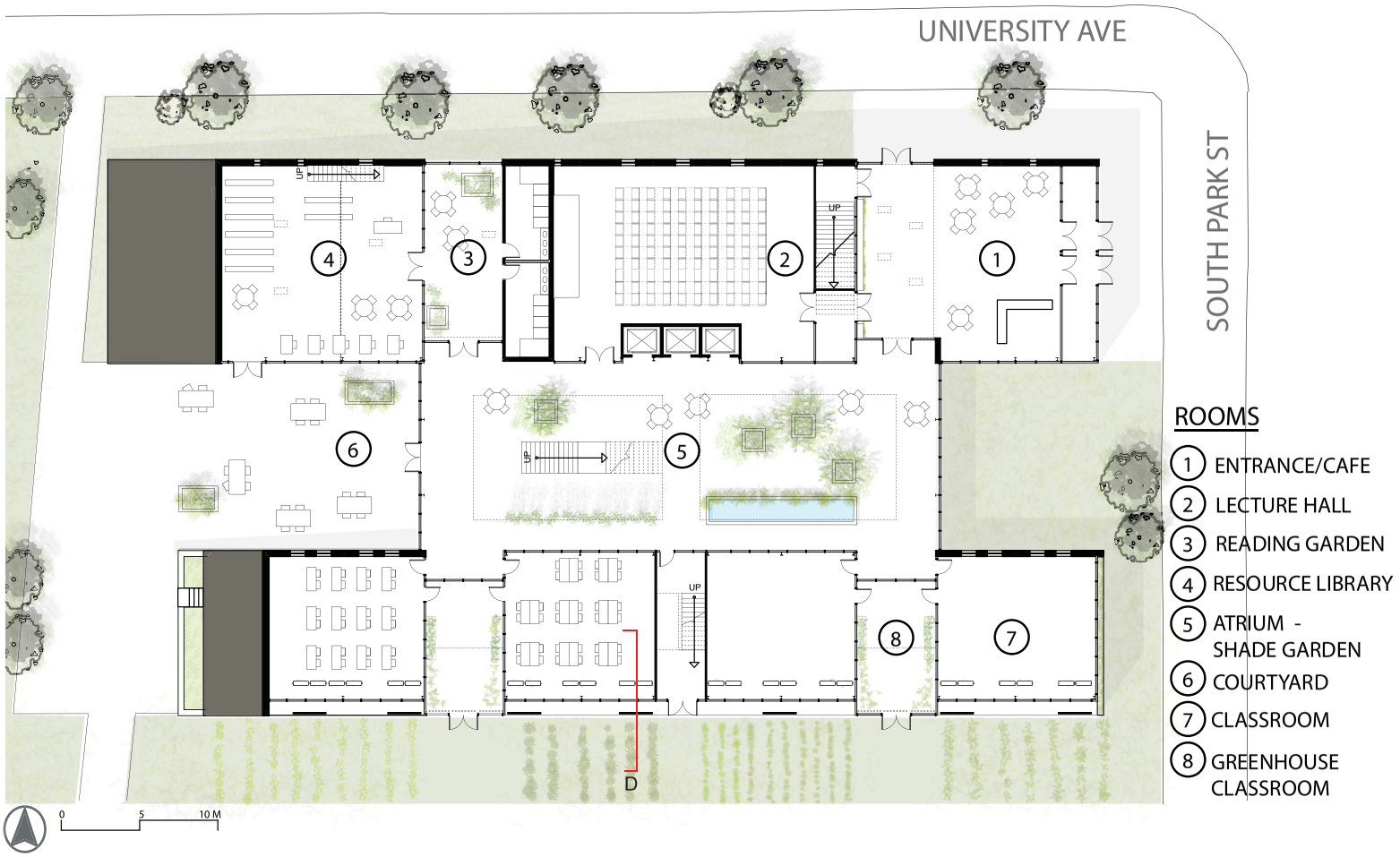
Building Design

I chose to develop the school building in greater detail as a test building for architectural aspects that could be repeated and adapted through all of the buildings on site. The school and the community centre buildings on site consist of two ‘garden rows’ lifted for program, joined by an atrium space. The atriums vary in dimension and are programmed with different garden activities allow the idea of interwoven landscape to continue through and up into the building. It was important to the design for every inhabitable space be connected directly or visually to a garden area.

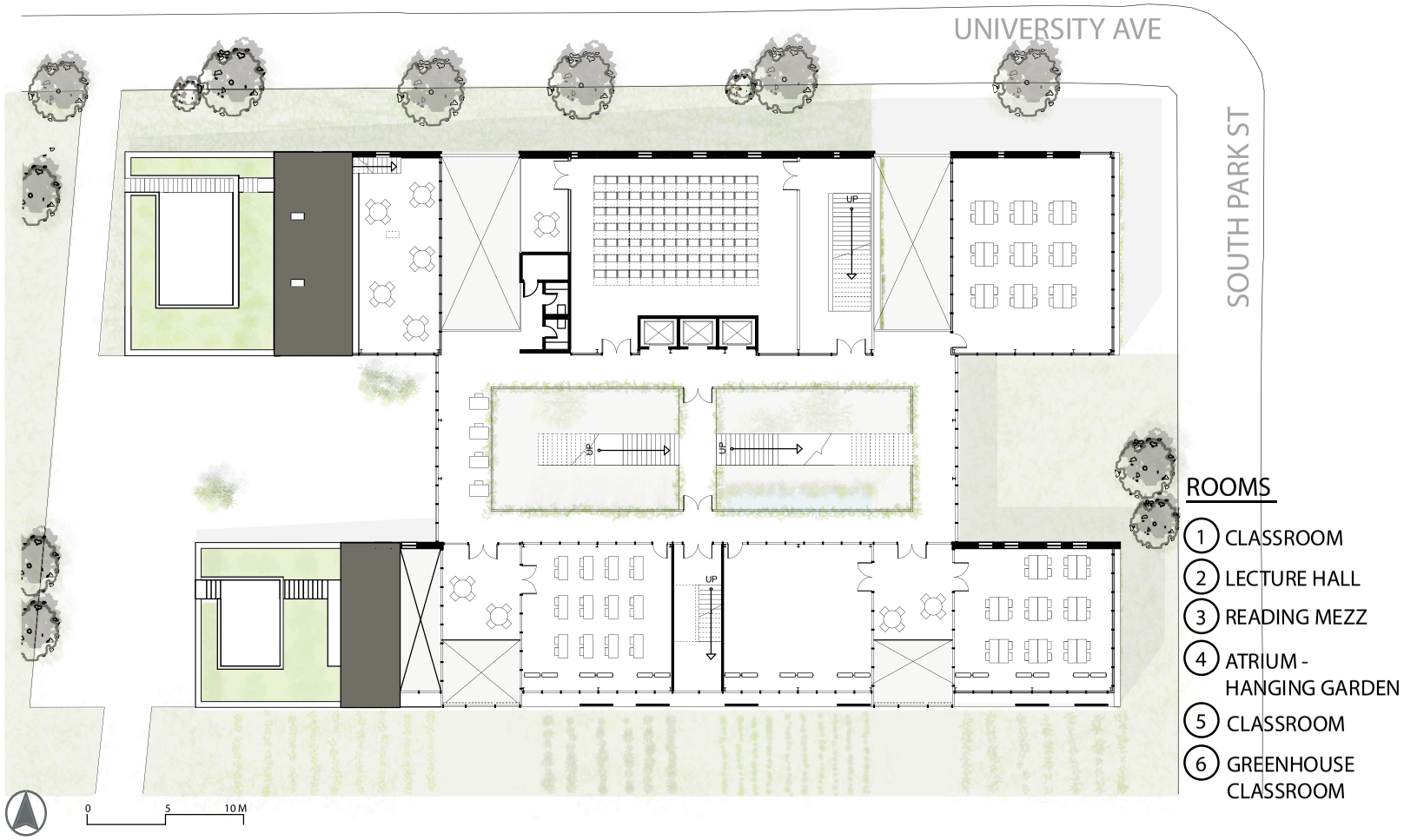
In the school building, the larger ‘garden row’ building is located to the street and includes large assembly halls for students that could be used at night for public lectures and events. It also includes an entrance lobby with a health-food cafe, a resource library, and a classroom that opens onto a rooftop terrace. The smaller ‘garden row’ building faces south and opens onto the adjacent gardens. It includes classrooms and greenhouse atriums.

These two garden row buildings are joined by a large productive atrium. This space allows the gardens to be enjoyed year-round, and creates informal learning spaces for seminars, small groups and individual study.

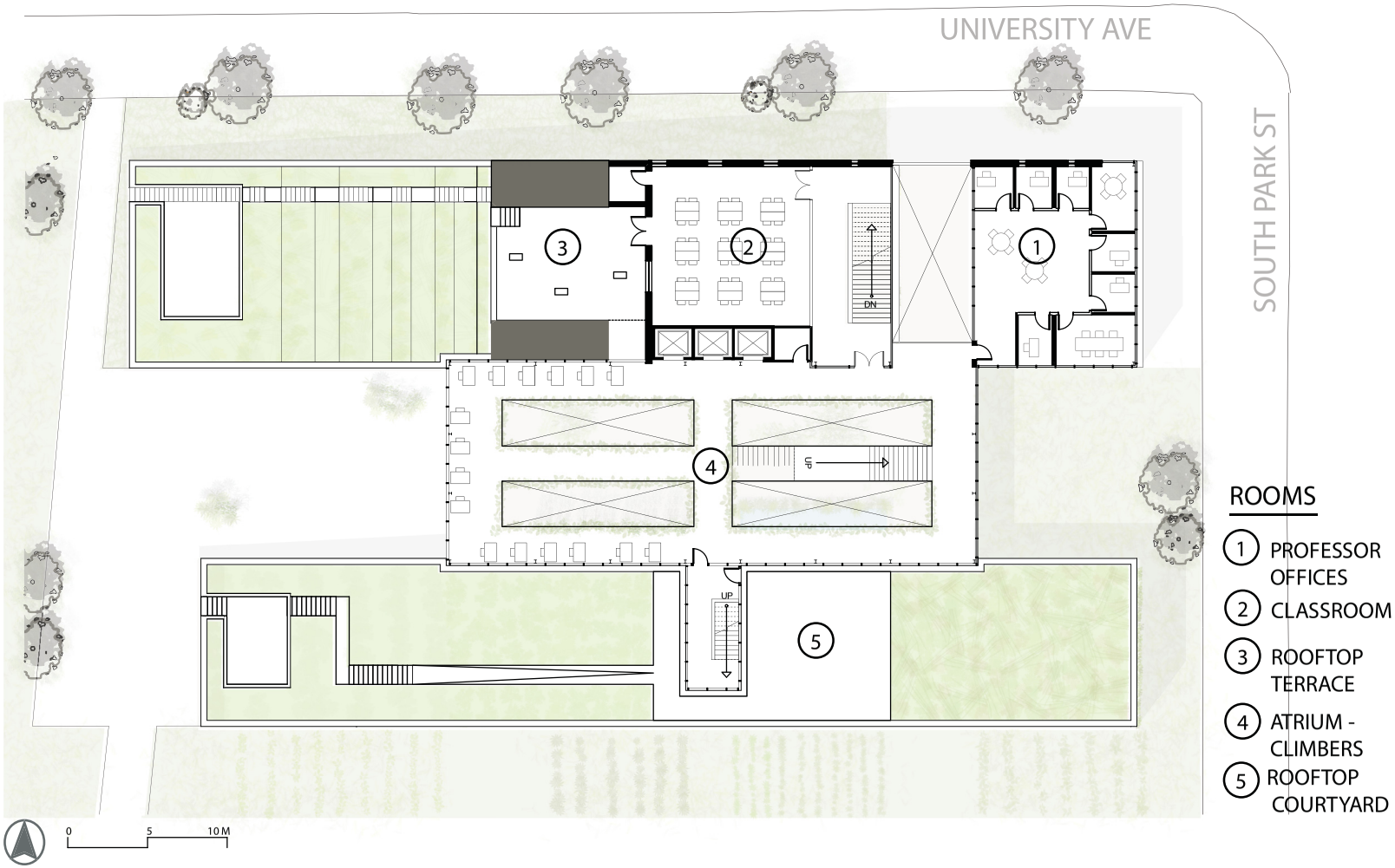
Plans



Level 1 floor plan of the school building.

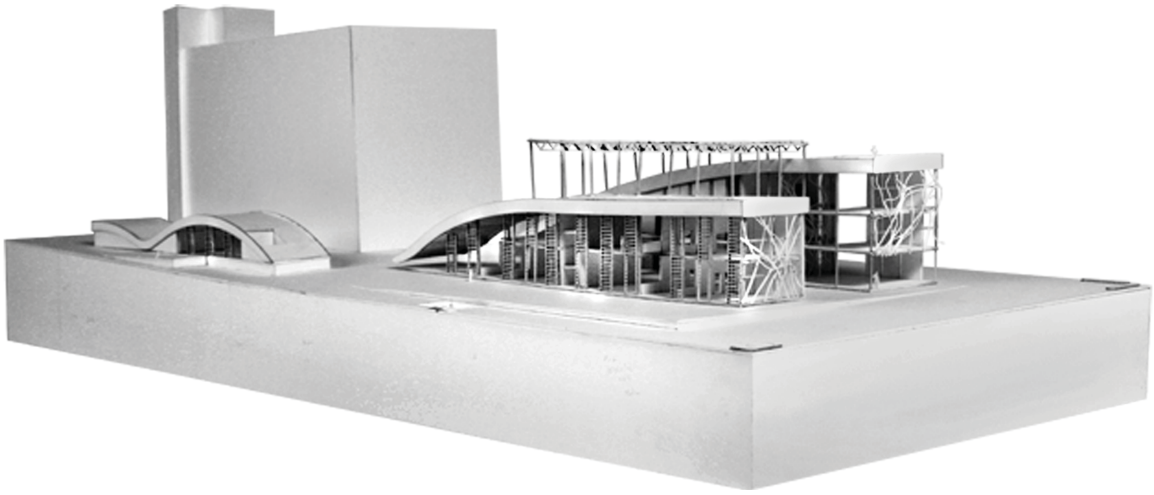


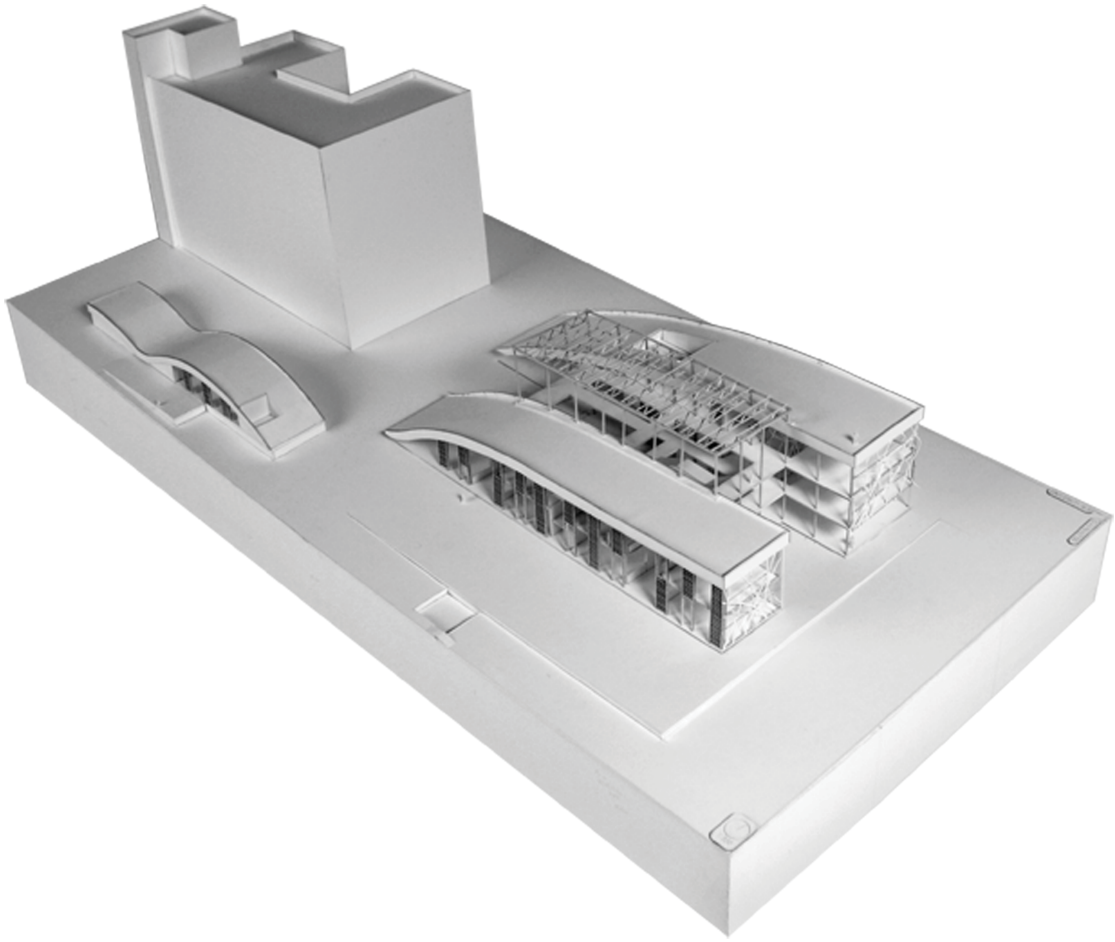
Level 2 floor plan of the school building.



Level 3 floor plan of the school building.

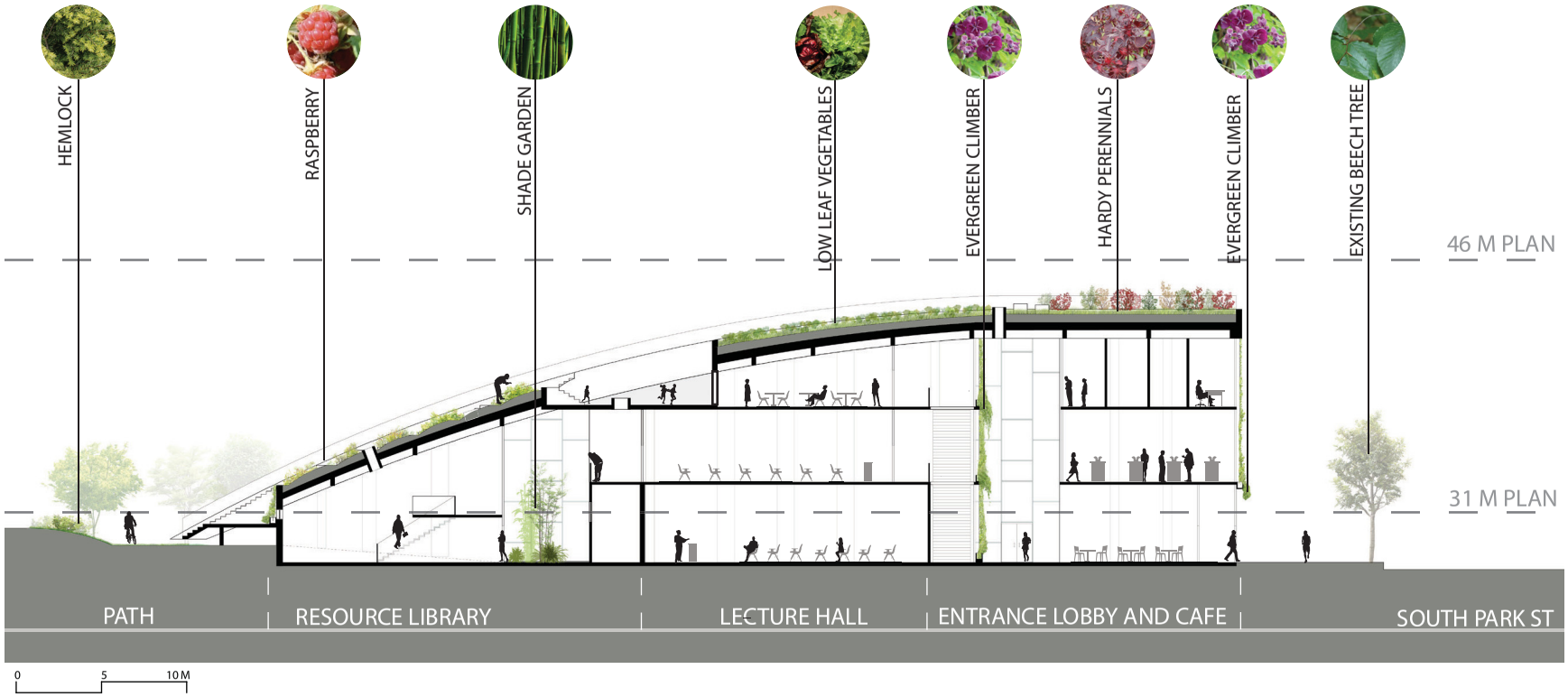
Building Model



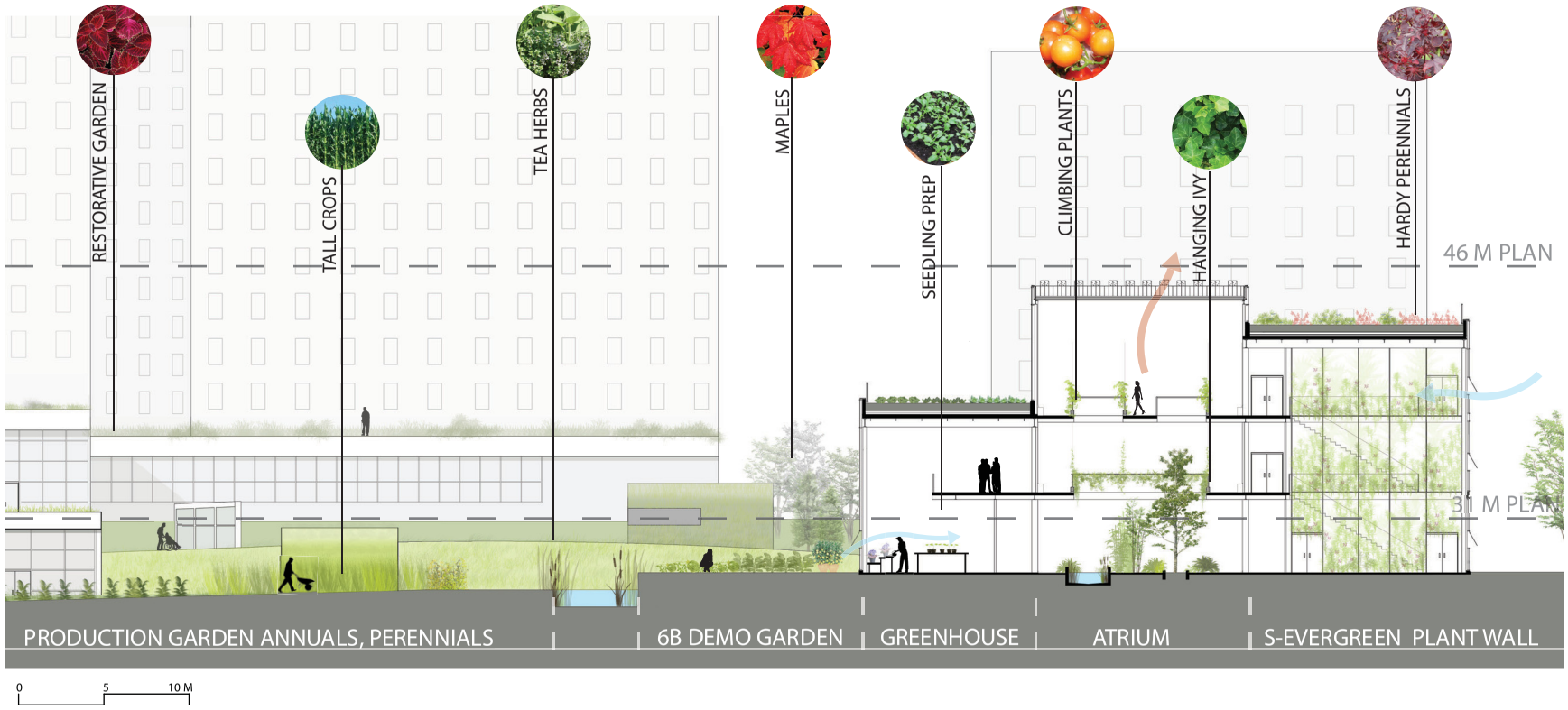


The model depicts the large and small garden row buildings that are joined by the large central atrium space. The teahouse building is modelled to illustrate the formal relationship between the buildings, and the in-between spaces of gardens and courtyards.

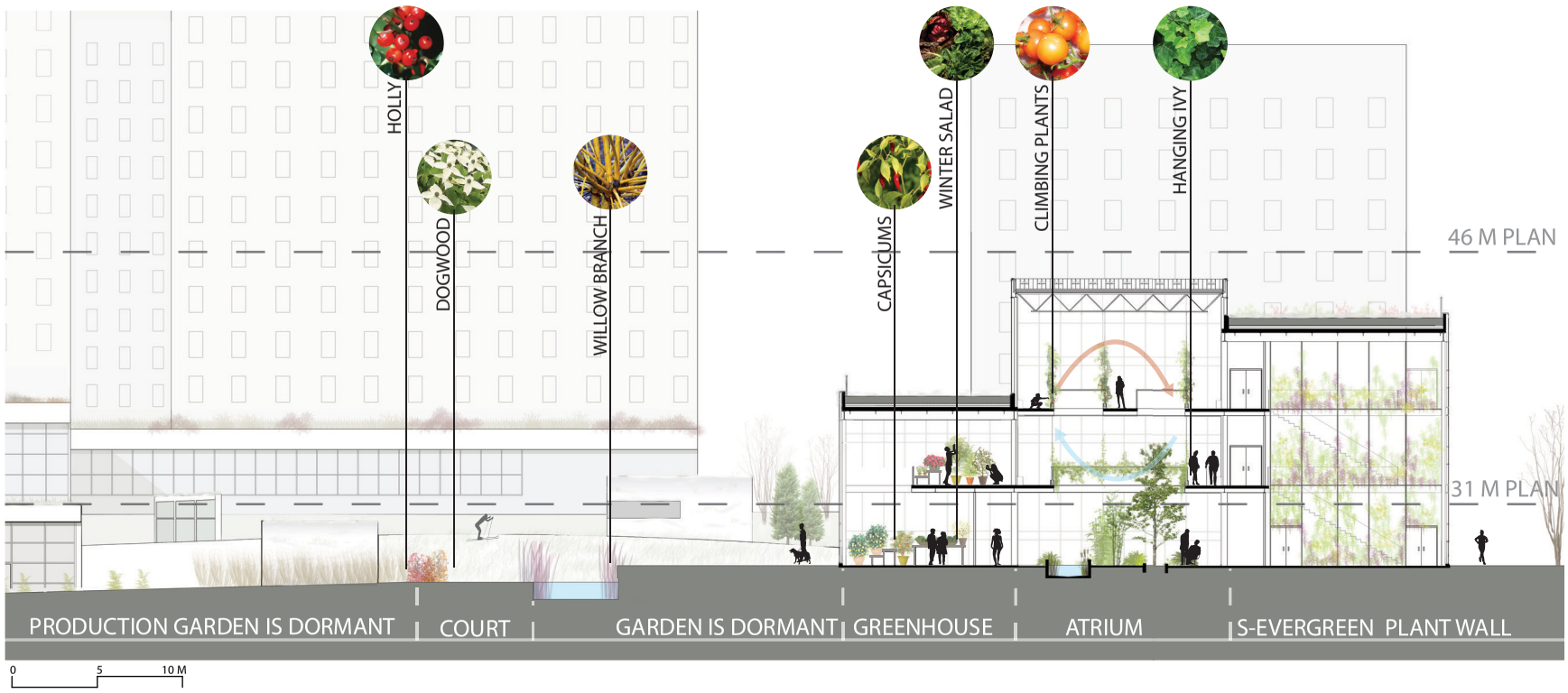
Sections



Section AA highlights the way the landscape is interwoven through the building in two aspects. First, the interior atriums play with height to create vertical space filled with greenery as a contrast to the horizontal nature of the classrooms. Second, the moment where the building roof meets the ground has been detailed to lift the roof plane and allow the landscape to flow underneath.



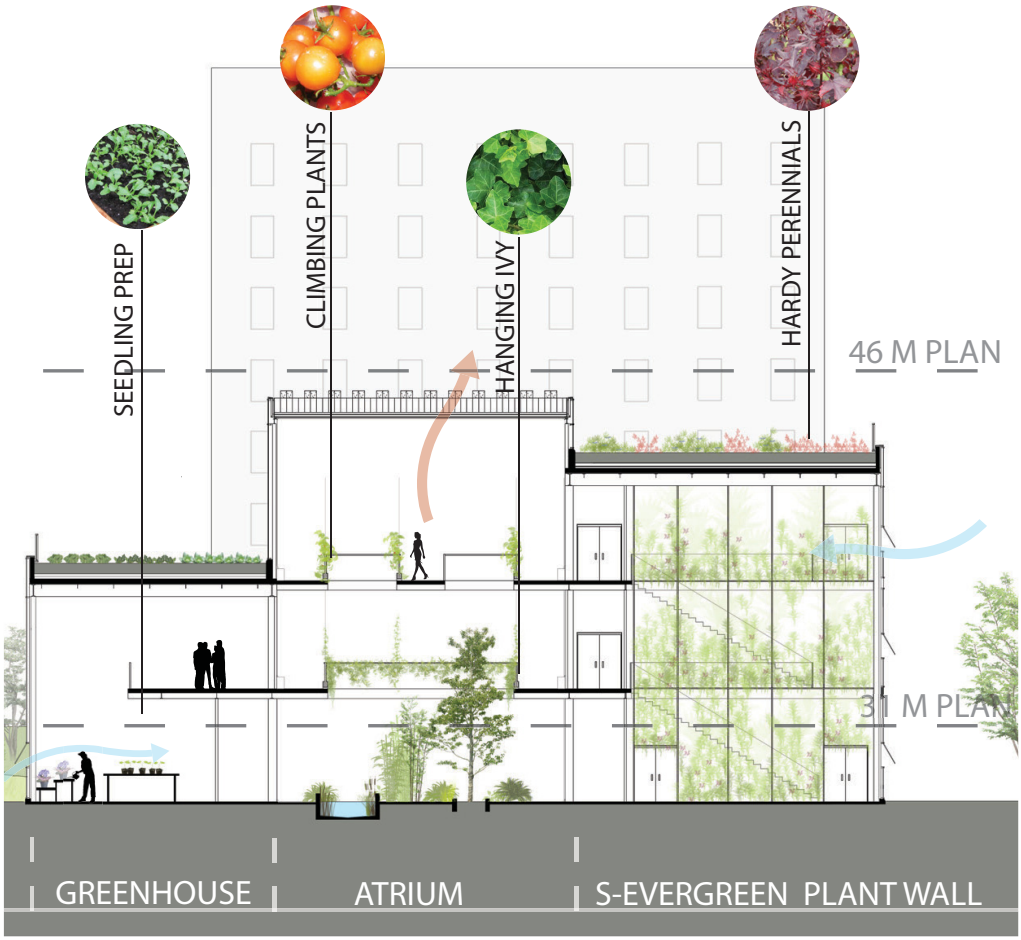
Section BB illustrates the relationship of the building to the landscape. During the summer months, the building's atrium spaces are calm areas for study and relaxation. The building is used to support the adjacent gardens through preparation of plants. The interior atrium creates a stack effect, allowing hot air to escape through operable louvres in the glazed roof.



Section CC illustrates that during the winter months, much of the site becomes dormant, with the exception of the rain gardens and adjacent courtyards for gathering. The building's atrium spaces come alive with production and the building becomes more inward-focused. The interior atrium creates a greenhouse effect, allowing hot air to rise and fall, maintaining warmth and humidity.

Building Planting Strategy

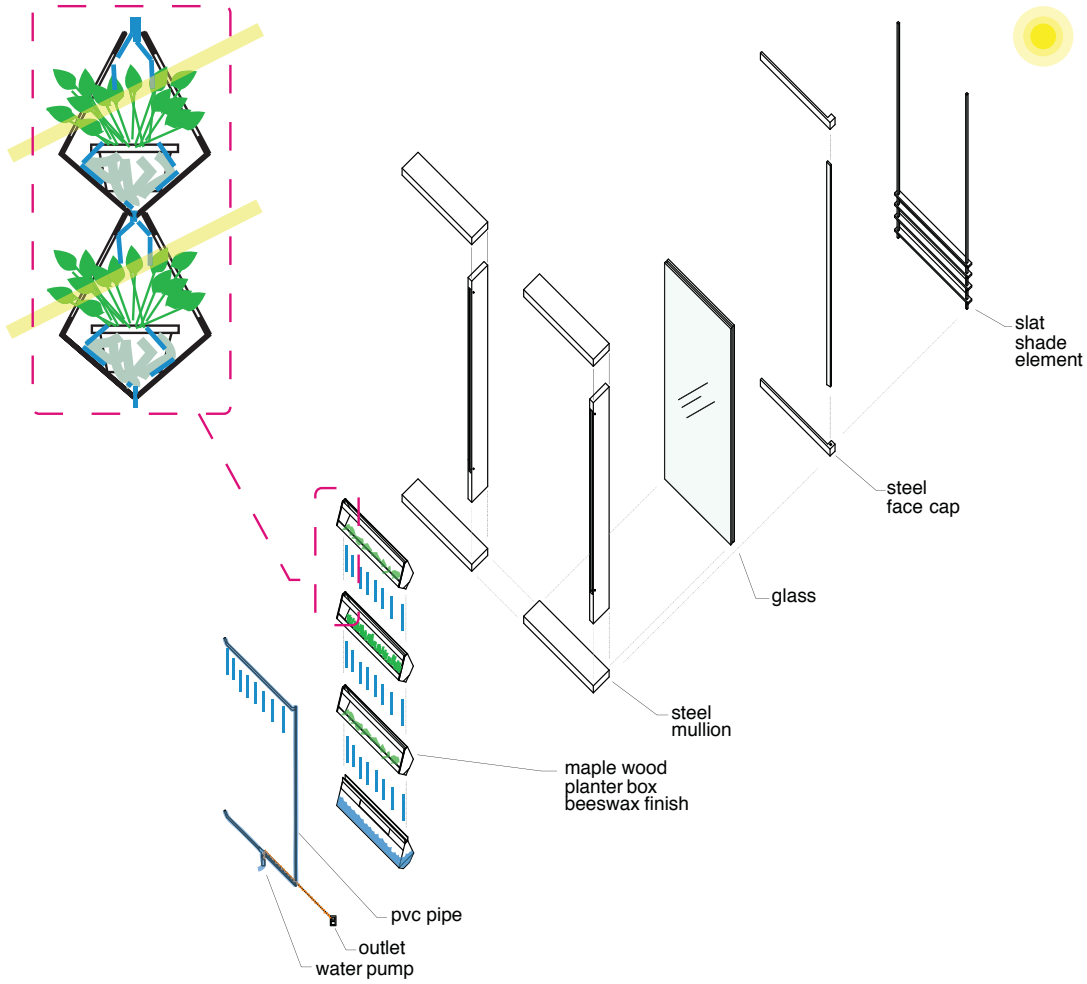
There are four main areas where productive greenspace has been interwoven into the building. The roof is an intensive greenroof assembly with 400 mm of substrate to allow a varied growing surface. The south facade contains planter walls in every classroom and shared greenhouse learning spaces. The east facade is a semi-evergreen climbing plant wall to enhance the verticality of the space and filter light. The central atrium has three distinct growing conditions based on light and humidity: Level 1 is a shade garden because of low light and more humidity. It creates a relaxing space for reading, and studying filled with ferns, bamboo, and white birch. Level 2 is a hanging garden because of partial sun levels through the day. Hanging ivy lines the circulation spaces. Level 3 is a climbing garden because of high sun and heat levels. The verticality of the space allows climbing plants like tomatoes, peppers and cucumbers to thrive.



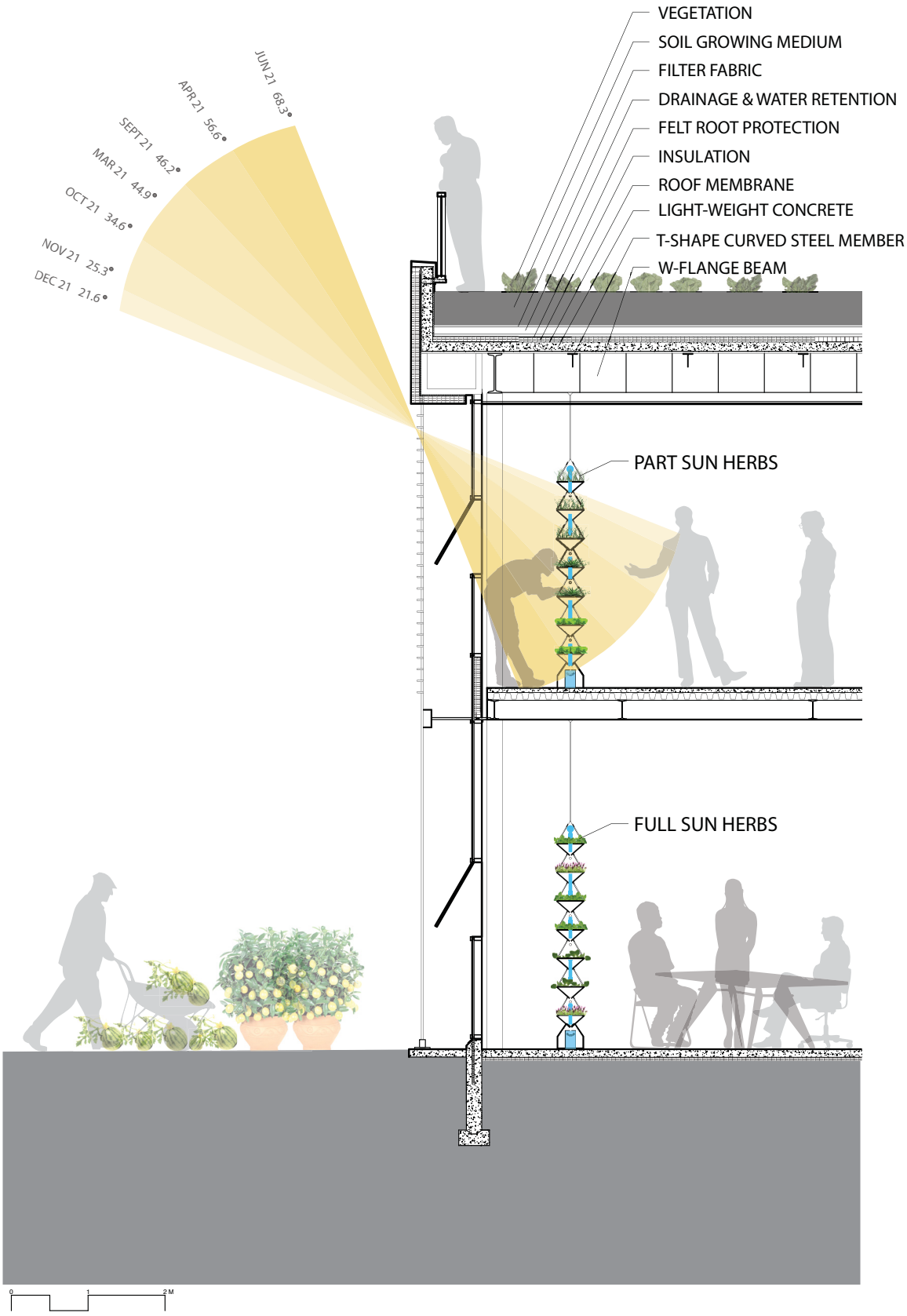
Enlarged portion of Section BB, outlining key growing areas.

Planter Wall Detail

At the scale of the detail and with the intention of examining how to bring productive greenery into the traditional classroom, I designed a hydroponic planter wall for the south facade. The wall of planters were designed to function on a closed-loop system, where a small timer activates a pump to send water and nutrients to the top most planter. The designed shape of the planters then allows the water to drain from one to the next, down to the reservoir. The reservoir had to be kept to the bottom of the system to allow for frequent tending of nutrient levels. The design was focused on growing herbs in the classroom because naturopathic students use a variety of herbs in tinctures and teas, and this would foster an interactive learning environment. The planters could easily be adapted to grow a variety of plants.



Exploded axonometric - Hydroponic herb wall sequence of construction.



Section DD illustrates the south facade hydroponic herb wall in the classrooms.

1:2 prototype model of planter wall detail.

1:2 prototype model was built to examine how water would pump from the reservoir to the planters to explore the hydroponic capabilities of the system.

Perspective Renderings

This rendering was created from the South Park Street entrance into the park. It showcases the rolling landscape of inhabitable, productive gardens and depicts students and visitors enjoying the space through study, exercise, relaxation and gardening.

This rendering is of a typical south-facing classroom on site. Four metre floor to ceiling heights and the interior hydroponic planter wall create an active, bright and positive learning environment.

This rendering depicts the entrance lobby and cafe and reinforces how students and the public would be immediately exposed to healthy food preparation and consumption upon entering the building. The green wall in the background highlights the verticality of the atriums.

This rendering of the central atrium illustrates the different types of growing environments and the visual connection between the classrooms and the garden spaces.

CHAPTER 3: CONCLUSIONS AND FUTURE CONSIDERATIONS

Through this study I investigated the ways in which urban greenspace can be productive agriculturally and socially. Further, I examined a variety of architectural methods to interweave productive greenspace into our urban landscape at the scale of the city, the building and the detail.

My aim was to carry the idea of interwoven landscape and architecture through the entire process to develop a conceptual design comprised of many dynamic layers. This conceptual design was achieved, however, in order to consider this idea at the scale of the site, the building and the detail, and due to the site's large area and the number of proposed buildings, there are several aspects of the design that could be explored in greater depth. If this project were to continue to the stage of design development, with the added input of landscape and structural professionals, these ideas could be developed into a rich urban landscape.

As the primary focus of the MArch thesis is to design a building, the landscape design is schematic and was developed to the extent to which I could confidently locate buildings to enhance the inherent site conditions. The site was developed to a sufficiently appropriate level to which an architect could collaborate with a landscape team. It would require revision and consultation to fully understand the construction of the garden rows. Structurally, the landscape is an intensive greenroof assembly as it is partially placed on top of an underground parking garage for the hospital. The parking was designed to the extent of entrances and exits for cars and people, and its connection to the existing hospital. It would require further development in terms of ramps, slopes and structure.

In regards to the buildings containing specific program elements, the architectural ideas that were developed in the main school building could be applied and adapted in greater detail to the remaining buildings. For this conceptual design, I examined the detailing of the buildings at two key junctures – the assembly of the south facade and where the roof meets the ground. These two details were selected as they are crucial moments where the building, the landscape and the inhabitants come together. To take this design into the stage of design development, other details of the buildings would be examined, such

as the atrium louvres and shading devices. Working with Mechanical and Environmental engineers, these aspects could be refined to reflect a more informed understanding of the gardens' influence on the buildings systems.

While this project examined how greenspace can be productive agriculturally and socially, it did not examine the potential of economic productivity. An economic argument was not examined because costing of the design was outside of the scope of the project. It is however a valid argument for this project, as estimates suggest that millions of dollars can be saved on health care through the promotion of preventative health, which could far exceed the project's cost of construction and maintenance. Fees from students could also offset the cost of maintaining the landscape. Also, the productive aspects of the landscape create opportunity of income by selling the produce. For this specific project, my discussions with a horticulturalist suggested that the food produced would be used on site in the cafes and teaching spaces. Similar projects however could propose to sell the fruit and vegetables as a way to offset the costs of maintenance.

At its broadest scale, this project examines how architecture can positively influence people's mood, affect and behaviour - namely their mental and physical health. From this standpoint, there are several overarching ideas of the design that are worthy of further exploration. This project demonstrates that an urban park can be mixed-use and targeted to a wide range of users. It also demonstrates that intensive greenroofs on top of parking garages are a plausible way to increase the number of urban parks. Further, it highlights the growing potential of South and East facades as ways to increase greenery and access to vegetation. These design ideas do not necessarily have to be integrated into the urban landscape at the scale of at 3.5 acre park. While my project's goal of acting as an urban hub led to a large scale approach to this issue, modest adaptations of these design moves could be integrated at the scale of a planter wall inside of an office building, or a green wall on the eastern facade of a school. Both of these explorations are examples of relatively economical architectural interventions that would instantly bring productive greenery into urban buildings. These features are simply a part of the greater exploration of my thesis of the many valid ways in which architecture can make a positive impact on our lifestyle and health.

NOTES

1. Statistics Canada, Canadian Community Health Survey, 2000/2001, http://www40.statcan.gc.ca/cbin/ze/w40re.cgi/l01/cst01/health90a-eng.htm (accessed November 18, 2011); Statistics Canada, Health Indicators Volume 2003/2004, http://www40.statcan.gc.ca/cbin/ze/w40re.cgi/l01/cst01/health90a-eng.htm (accessed November 18, 2011); Statistics Canada, Canadian Community Health Survey, 2009/2010, http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/health90a-eng.htm (accessed November 18, 2011); Capital Health's Community Health Boards, *Our Healthy Future...Realizing our Promise* (Halifax: Community Health Boards, 2010), 12.

2. Ibid.

3. Capital Health's Community Health Boards, ed., *Our Healthy Future...Realizing our Promise* (Halifax: Community Health Boards, 2010), 13.

4. Roger S. Ulrich, "Effects of Gardens on Health Outcomes: Theory and Research," in *Healing Gardens: Therapeutic Benefits and Design Recommendations,* ed. Clare Cooper Marcus and Marni Barnes (Toronto: John Wiley & Sons, Inc., 1999), 27.

5. Ulrika K. Stigsdotter, Ola Ekholm, Jasper Schipperijn, Mette Toftager, Finn Kamper-Jorgensen, and Thomas B. Randrup, "Health promoting outdoor environments – Associations between green space, and health, health-related quality of life and stress based on a Danish national representative survey," *Scandinavian Journal of Public Health* 38, no. 4 (2010): 411-417., Agnes van den Berg, Jolanda Maas, Robert Verheij and Peter Groenewegen, "Green Space as a buffer between stressful life events and health," *Social Science & Medicine* 70, no. 8 (2010): 1203-1210.

6. Pat Armstrong and Hugh Armstrong, *About Canada: Health Care* (Halifax: Hignell Book Printing, 2008), 72.

7. Janine de la Salle and Mark Holland, *Agricultural Urbanism: Handbook for Building Sustainable Food & Agriculture Systems in 21st Century Cities* (Winnipeg: HB Lanarc Consultants Ltd., 2010), 22.

8. Jennifer Scott and Marla MacLeod, *Is Nova Scotia Eating Local? And if not, Where is Our Food Coming From?* (Halifax: Agri-Futures Nova Scotia, 2010), 2.

9. Capital Health's Community Health Boards, *Our Healthy Future,* 13.

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