

FIELD GUIDE TO AN URBAN NATURE:  
DESIGNING FOR ECOLOGICAL DEMOCRACY ON McNABS ISLAND

by

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Submitted in partial fulfilment of the requirements  
for the degree of Master of Architecture

at

Dalhousie University  
Halifax, Nova Scotia  
November 2016

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## ABSTRACT

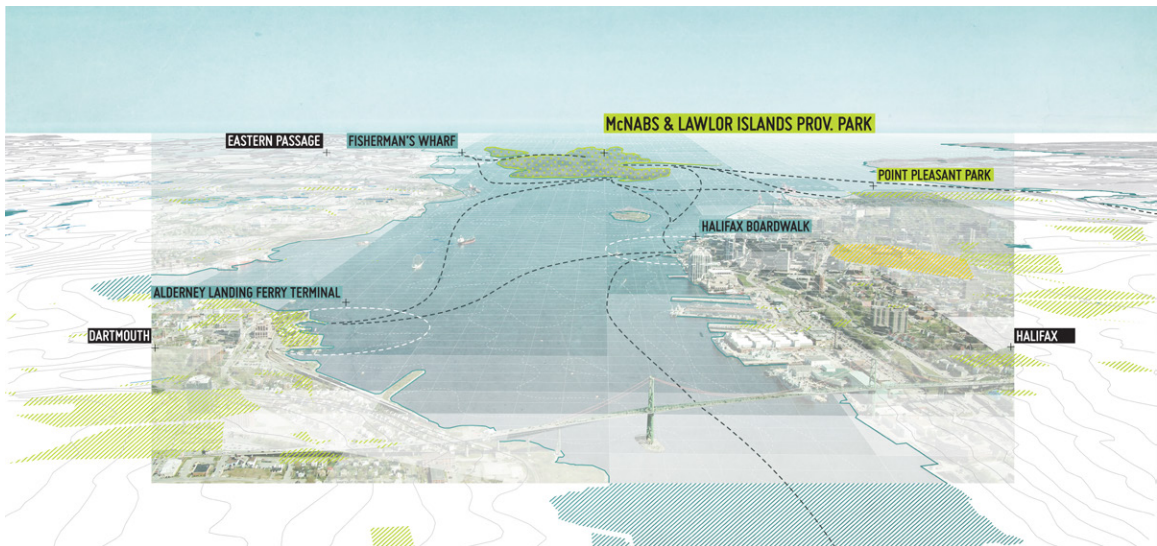
In the middle of the city and on the edge of the ocean, McNabs and Lawlor Islands Provincial Park is an expansive protected area in Halifax, Nova Scotia, Atlantic Canada's largest metropolitan area. Given its location at the mouth of the Halifax Harbour, the park is in a strategically important position to inform Halifax's adaptation to the changing climate and the associated rise in sea level. This thesis considers the capacity of architecture to adapt to and teach us about changing natural and cultural conditions of the landscape in the face of climate change and sea level rise. The project proposes a network of prefabricated and autonomous 'field stations' that encourage active engagement with the changing landscape. The network of small scale buildings demonstrate an array of strategies for coastal adaptation, each with a site specific connection to the water/land and local ecology/history.

## CHAPTER 1: INTRODUCTION

### VIEWING THE ISLANDS FROM THE CITY

Looking out from the shores of Point Pleasant Park, the docks of the Alderney Ferry Terminal, and the wharves of Eastern Passage, McNabs and Lawlor Islands have a captivating presence at the mouth of the Halifax Harbour. They are at once close and yet remote. A swathe of tall trees on the cusp of the ocean, the islands seem like a far off wilderness, a world apart from the city that surrounds them. The islands inspire our curiosity and appeal to our desire to retreat from the city into nature. Seen from the shores of the city, McNabs and Lawlor Islands Provincial Park is a vast expanse of forested land encompassed by sandy beaches, salt marshes, and steep cliffs. Carved by receding glaciers

and eroded by unrelenting waves, the undulating outline of McNabs and Lawlor Islands is interwoven with the ocean. Comprising a series of drumlins, hills of glacial sediment deposits, McNabs Island gently rises 48 meters above sea level before falling back into the horizon of the Atlantic Ocean, like a turtle's back breaching the water. At a distance, the islands give the impression of a pristine nature, "the green gem of the harbour," removed from the forces of urbanization and sprawl. Even on a clear day, the islands' few buildings can scarcely be seen from the city's shore. Held out into the entrance of the harbour by the outstretched arm of the breakwater, the Maugher Beach Lighthouse stands as a beacon and a landmark visible from vantage points throughout the city.



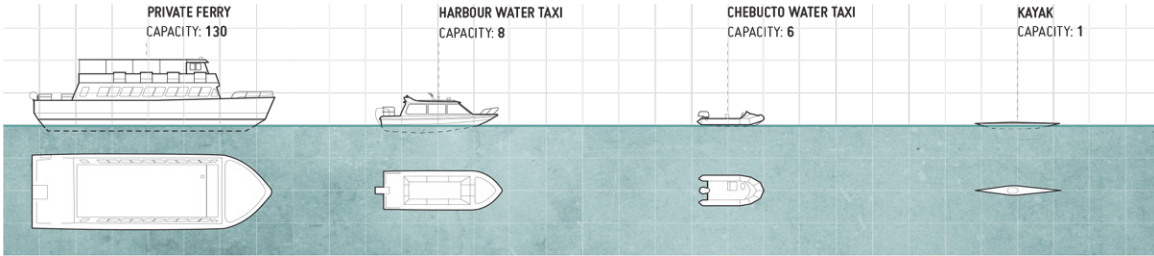
Aerial view of the Halifax Harbour (data from HRM GIS Database, base image from Spacing Magazine 2014)

### CROSSING THE HARBOUR

Leaving the boardwalks and historic ships on the Halifax waterfront in the wake of a water taxi, visitors are instantly immersed in the activity of the harbour. Cargo ships, cruise ships, research vessels, ferries, fishing boats, sailboats, zodiacs and kayaks can be seen zig zagging across the harbour or following the main channel out into the ocean. Approaching McNabs Island is a transitional experience. In the open waters of the harbour, visitors gain a different perspective on the city and the lives within it. On the starboard side of a McNabs-bound boat, the high-rises of downtown Halifax, the cruise ships of Pier 22, and the containers of the Halifax Seaport are perceived from a new vantage point. On the port side, as the boat slips past the lighthouse and military fortifications of Georges Island, the industrial skyline of Dartmouth’s oil refineries can be seen in the distance. Nearing McNabs Island, historical estates and crumbling concrete gun emplacements dot the hills and peer through the trees. The steep cliffs on the north west of the island stand as evidence of coastal erosion, which constantly pulls the edge of the island into the ocean. As the boat bends its path into the shelter of McNabs Cove on the island’s



Kayaking to McNabs Island



Various types of boats used access to McNabs Island



McNabs Island forward



Georges Island off the port bow



Pier 22 Seaport off the starboard bow



South End Container Terminal abeam to the starboard

western shore, Garrison Pier juts out from the sandy beach, bridging a pathway across the shallow waters to the island and offering a sturdy place to dock lines.

More than just a pleasant backdrop for the lives of Haligonians, McNabs and Lawlor Islands have historically been an integral part of the region’s coastal infrastructure. By virtue of being in the Halifax Harbour, the islands are in a critical area of transition between land and sea, with complex overlaps between dynamic ecosystems and an ever-changing built infrastructure. Despite their pristine appearance from the mainland, the islands have been profoundly affected by coastal industries, transportation and defence infrastructure, and residential development.

In close proximity to hundreds of thousands of residents, from the density of downtown Halifax and the charm of communities like Eastern Passage, the park is readily accessible, but rarely visited. Public access and use of the island has decreased by as much as 50% since a private ferry service was canceled and a small privately run teahouse shut down on the island in the mid-1990s (Austin 2014). Compared to its once prominent place in the life of the city, few Haligonians visit the islands let alone know how to cross the harbour to their shores. As we will see, McNabs and Lawlor Islands Provincial Park has the potential to integrate into the existing infrastructure of the city and regain its relevance as a vital resource in the urban context.



## DISCOVERING THE ISLANDS

Hiking along the network of multi-use trails, visitors develop a deep understanding of the island's contours. The park unfolds before the visitor at their own pace, whether by foot, bike, cross-country skis, or kayak. By meandering the trails and following the shores, visitors can define a unique and personal experience with the landscape. With a range of trajectories over the island, the visitor's perception is mediated through their active engagement with the landscape. Every journey to McNabs is different and offers unforeseen insights into the history of the place. With a keen eye and a sense of curiosity, enigmatic fragments of buildings suddenly appear, partially submerged in the ground and shrouded in foliage. Traces of temporary camps, fishing traps, wood lots, farms, cottages, homes, pleasure grounds, cemeteries, and military forts can still be found scattered throughout the island or embedded into the landscape, revealing and concealing layers of the city's history. At the intersection of Teahouse Lane and Jenkins Hill Trail, for instance, the remnants of the stone foundation of the former Hugonin-Perrin Estate encloses a patch of the forest floor. At Back Cove, steel skeletons of wrecked ships appear and disappear with the rise and fall of the tide, which is why it is also aptly known as Wreck Cove. At the end of Searchlight Trail, sturdy concrete gun emplacements, once the front line of the Halifax Defence Complex, provide temporary shelter from strong leeward winds.



View from the porch at the Davis-Conrad House



View inside an abandoned gun emplacement at Ives Point

McNabs and Lawlor Islands Provincial Park is an ideal site to explore the threads that tie natural and cultural landscapes together. The islands' coastal ecologies are intimately interconnected with human activity and are in a constant state of change in response to the surrounding urban conditions. On unceded Mi'kmaq land, McNabs and Lawlor Islands have been used for centuries for their abundant forests, fertile soils, and strategic position in the harbour. Through centuries of continued use, inhabitation, and transformation, McNabs and Lawlor Islands constitute an urban nature. The idea of an urban nature recognizes that our cities and the land upon which they are built comprise our habitat, with its own distinct ecologies. It reminds us that at its more essential level, architecture is a vitally important mode of human adaptation to the landscape. The unique qualities of McNabs and Lawlor Islands have provided opportunities for various peoples throughout history to adapt to the landscape, leaving behind buildings in stages of ruin and altering

the islands' ecological composition. The structures that remain, more than physical artifacts, disclose the lasting implications of our relationship to the landscapes we inhabit and the values we place in them. As our relationship to the landscape has changed and our appreciation of the urban nature has evolved, so too must our conception of the corresponding built infrastructure.

How can an infrastructural network on McNabs and Lawlor Islands Provincial Park tie into the existing networks of the city and provide visitors with an understanding of its urban nature? An infrastructural network on McNabs Island has the potential to connect the park to the city. Furthermore, an architecture that is expressive of the socio-ecological conditions has the capacity to adapt to and teach us about our ever-changing natural and cultural landscapes. By turning the visitor's attention towards the landscape, the infrastructure can invite visitors to discover the urban nature of McNabs and Lawlor Islands Provincial Park.



Looking out at the Halifax skyline from Ives Point

VIEWING THE CITY FROM THE ISLANDS

Emerging from the shaded forest of Fraser Farm Trail and out onto the northern tip of the island’s coastline, the skyline of the city frames the harbour. Towering cranes seemingly rise from the forests of Point Pleasant Park, waiting to pluck containers off of ships from distant shores. In the late summer, immense cruise ships dominate Halifax’s seaport, contrasting with the tall ships and sailboats that sway with the waves. The city’s tallest buildings surround the Halifax Citadel, which sits atop the peninsula’s only drumlin. Arching across the Narrows, the Mackay Bridge provides passage for the commutes of the city’s citizens. On downtown Halifax’s opposite shore, the Dartmouth Refinery hearkens back to the city’s industrial heritage. The now defunct and recently decommissioned refinery stands as a testament to the shifting economic and environmental concerns affecting our coasts. Fisherman’s Wharf, the closest access point to the islands, is within eyesight from Indian Point on McNabs’ north eastern shore. The low-lying fishing community of Eastern Passage, which is considered to be the “gateway to the islands,” is a reminder of the ongoing importance of the fishery to the area’s residents.

At a distance from the activity of urban life, but close enough to observe its many manifestations, the shores of McNabs offer a chance for visitors to contemplate their connection to the city. Stretching across the mouth of the harbour, McNabs and Lawlor Islands separate and shelter the inner harbour and mainland from the open Atlantic Ocean. In the face of climate change and an unprecedented rise in sea level, how can we collectively take on the challenge to adapt to the changing landscape? As a possible test site for coastal adaptation and adaptive reuse strategies, a network of infrastructural installations will help visitors learn about the implications of climate change on the local landscape and conceptualize the notion of adaptation in the broader context of the city. At the regional scale, there is the potential for McNabs and Lawlor Island Provincial Park to integrate into the existing infrastructural networks of the city and play a role in mitigating the effects of sea level rise in the urban context. Furthermore, McNabs and Lawlor Islands Provincial Park could serve as a keystone park that would help define an overall adaptation strategy for urban parks and protected areas in Nova Scotia.



Discovering the breach at Maugher Beach

## THE VIEW AHEAD

In addition to the introductory *FIELD of VIEW*, the project will unfold in four chapters. The *FIELD of RESEARCH* will explore the concept of the urban nature and our role in the stewardship of the changing landscape. The *FIELD CONDITIONS* of McNabs and Lawlor Islands will situate the park within its broader socio-ecological context and give an historical account of the various interrelationships between the human uses and ecological changes that have taken place on the island. Through the development of a *FIELD KIT*, a series of light-on-the-land design strategies will provide the basis for the development of an adaptive infrastructure and a series of small-scale buildings. Finally, by taking a *FIELD TRIP* to McNabs and Lawlor Provincial Park, we will see the ways in which design strategies can be implemented to form an adaptive network of field stations, paths, and platforms that allow for visitors to discover the urban nature of the park.



Trail sign for the thesis trek

## CHAPTER 2: FIELD OF RESEARCH

On the day of our arrival we met an old man who explained the basic geography: “The ocean,” he told us, “goes all around the island.” We let the remark direct our rambles on that brief holiday, and found indeed that the ocean encircles Aran like the rim of a magnifying glass, focusing attention to the point of obsession (Robinson 2008, 16–17).

In the middle of the Halifax Harbour, McNabs and Lawlor Islands Provincial Park is in a strategically important position to influence public perceptions concerning the interconnectedness of social and ecological systems. Not only is the park encompassed by the city, it has historically been a vital amenity within the city. On the precipice of the ocean, the fragile island ecosystem and the city that surrounds it face increasing threats from climate change and the associated rise in sea level. As the landscape changes, how will we adapt? The social role of the park is vital in fostering a new ethic of stewardship of the landscape, one that could regenerate the ecological and social conditions of the city simultaneously. The objective of *FIELD of RESEARCH* is to come to an understanding of the relationship between natural and cultural aspects of landscapes, and ultimately, the role of design in fostering engagement with and stewardship of the urban nature.

### THE NATURE / CULTURE OF THE LANDSCAPE

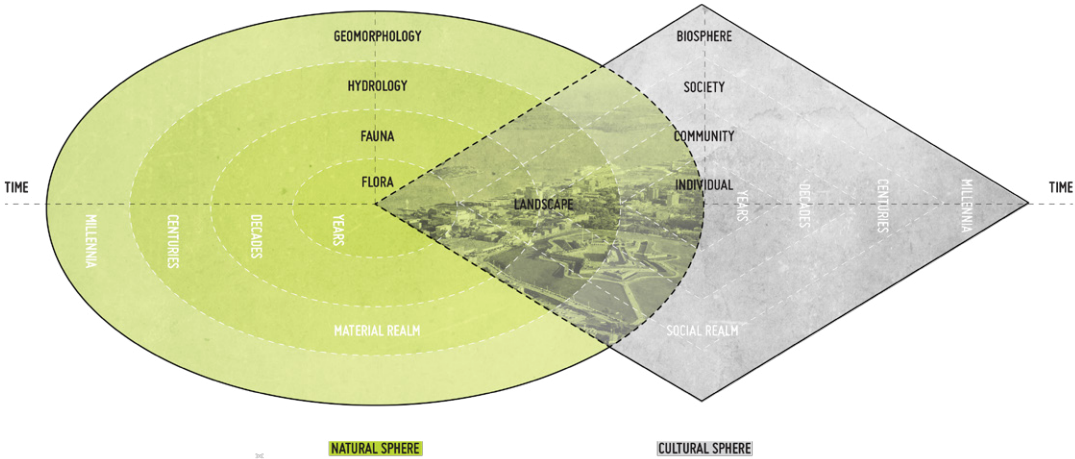
#### The Culture of Nature

At once an integral part of the city and yet seemingly at a remove from it, McNabs and Lawlor Islands Provincial Park is an ideal site to explore the tensions, both conceptual and physical, that exist in the urban nature. The expectation that McNabs Island is composed of a pristine nature is immediately disrupted upon setting foot on the island’s shores as traces of previous peoples are scattered amongst its many hills. When we are on the island, how do we make sense of the apparent disconnect between McNabs Pond, rich with life, and the used car tires found on its banks? Or the line of electricity poles along the shore, home to the largest population of nesting Osprey in North America?

The common conception of the relationship between nature and culture is that they are mutually exclusive, that a cultural presence in nature unavoidably renders it less natural. In his article “The Trouble with Wilderness, or, Getting Back to the Wrong Nature,” William Cronon aims to collapse the widely held distinction between wilderness and civilization

or nature and culture. He upsets the familiar idea that nature is pristine and entirely removed from a human intervention, rarely touched or interfered with. Not only has nature been profoundly changed by various human purposes, he argues, the concept of nature itself is a human creation. Somewhat counter-intuitively, he claims that, “wilderness is not quite what it seems. Far from being the one place on earth that stands apart from humanity, it is quite profoundly a human creation—indeed, the creation of very particular human cultures at very particular moments in human history” (Cronon 1996, 7). By recounting the development of various conceptions of nature, Cronon shows that our relationship to nature and the idea of nature itself are conditioned by the beliefs and practices our time and place, our culture. In bringing our attention to the cultural rootedness of the concept of nature, Cronon subverts the commonly held belief that we stand in contrast to nature and, in turn, invites us to consider alternative conceptions of the relationship.

Rather than viewing nature and culture as separate and distinct entities, they can be thought of as the intertwined threads that make up the fabric of the landscape. The concept of landscape represents the synthesis of natural and cultural spheres, the area of intersection that we experience. Encompassing the natural processes of geomorphology, hydrology, and biology, as well as the social systems of the individual, community, society, and biosphere, landscape is the result of the dynamic interrelationships that unfold on a range of time scales. The influential American geographer Carl Sauer advocates for broadening the study of geography beyond environmental determinism to include the way that cultures use and change the landscape over time. His formulation of the relationship between nature and culture is that, “the cultural landscape is fashioned from a natural landscape by a cultural group. Culture is the agent, the natural area the medium, the cultural landscape the result” (Sauer 1925, 16). Landscapes evolve continually in time, in



Landscape at the intersection of natural and cultural spheres

predictable and unpredictable ways and in response to changing natural processes and cultural purposes. What we see on the surface of the landscape is a sum of all these processes and what we think about the landscape is a reflection of ourselves.

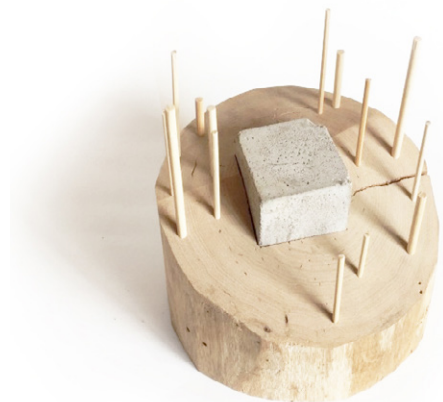
### The Reflection of Nature

The many ruins that dot McNabs Island, more than simply wood, concrete, and steel, are imbued with past and present cultural values and communicate the lasting consequences of our relationship to the landscape we inhabit. From the crumbling concrete gun emplacements that look out into the ocean to the fishing gear that washes up onto shore, the value that we place in the landscape can be found in the most unlikely places, hiding in plain sight. The cultures that preceded our own, each having made their fading mark on the landscape, serve as a point of comparison to examine the relationship between nature and culture on McNabs Island.

If the concept of nature is deeply informed by our attitudes and takes the forms that we give it, nature is a reflection of ourselves. “As we gaze into the mirror it holds up for us,” Cronon remarks, “we too easily imagine that what we behold is nature when in fact we see the reflection of our own unexamined longings and desires” (Cronon 1996, 7). Nature takes on the forms that we give it, accepting and rejecting our attempts at understanding and overcoming it. The



Found object model: residential artifact



Found object model: military artifact



Found object model: fishery artifact



Found object model: industrial artifact

artifacts of these attempts, the ruins in the landscape, teach us about our past and present attitudes to nature. They serve as a starting point in analyzing the cultural rootedness of nature as well as how cultures adapt to the vagaries of nature. Idealizing nature as remote and untouched often means ignoring the landscape in which we live. By failing grasp to the full range of our influence on the landscape, we fail to see how we can better adapt to its changes.

### The Politics of Nature

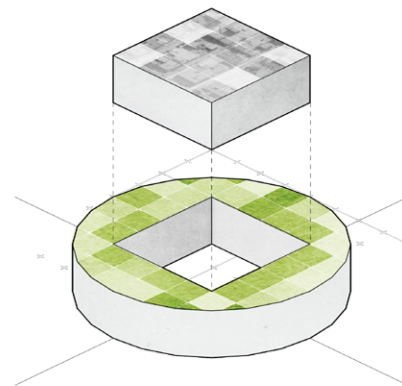
As quickly as McNabs Island has changed as a result of various human uses throughout the past century, it has been changing at an increasingly fast pace in recent years. Hurricane Juan, which made landfall on McNabs Island in September of 2003, ravaged the island and dramatically altered its physical composition. Although storms occur on an annual basis, the city was largely unprepared for such a disastrous event. As adverse weather is on the rise as a result of climate change, how can citizens become involved in adaptation strategies? It is difficult to actively engage with the most pressing issues of climate change given the sheer scale of the phenomenon, but it is becoming increasingly necessary find ways to implement changes at a local scale. Rather than relying on a top-down approach through public policy, our collective action must be informed by a shared understanding of and engagement with the changing landscape.



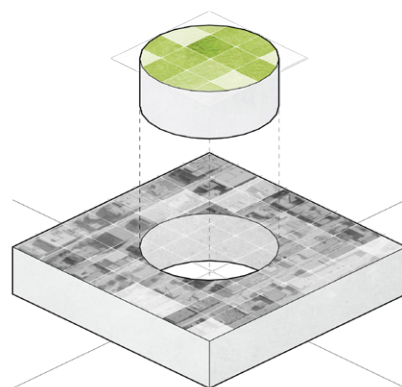
By directly attributing cultural values and practices in the creation of the concept of nature, Cronon shows us that nature is inherently an inherently political concept. Defining wilderness as non-human territory, he claims, allows people to overlook their role in contributing to the present environmental destruction. Separating humanity from nature ignores our entire human history of adapting to the landscape to survive while changing the landscape to suit our needs. If our presence in nature inevitably leads to its downfall, then we are fated to degrade the landscape without an alternative path. As political theorist Murray Bookchin argues in *Ecology and Revolutionary Thought*, we must acknowledge how much social values and natural processes are inextricably intertwined. A truly democratic ecology must reject the misanthropic view that humans are inherent “environmental degraders” and assert our potential as creative stewards. (Bookchin 1966, 18). If we act on the supposition that we are supposedly separate from nature and our presence is inherently destructive, then we fail to make the first steps on the path towards discovering what an “ethical, sustainable, honorable human place in nature might actually look like” (Cronon 1996, 17).

### An Urban Nature

McNabs and Lawlor Islands are surrounded by the ever-expanding city. Once a secluded outpost of the British military, Halifax is now the sprawling metropolitan



An isolated island of development in sea of nature



An vestige of nature in encroaching development

hub of Atlantic Canada. As such, McNabs and Lawlor Islands Provincial Park is part of the complex urban infrastructural network, based simply on its position in the city. How can the park participate in the sustainable development of the city and serve as an infrastructural asset to the city and region's citizens?

Historically, parks were thought of as isolated islands of development in a sea of nature. In the Canadian context, this model was used in the creation of Banff National Park. As the Canadian Pacific Railway forged westward in the 1880s, CPR executives sought to provide access to the wilderness with a lavish mountain resort, part of a series of hotels connected by the railway. This gave potential railway users an incentive to make the cross-country voyage beyond the practical purposes of inter-provincial trade. As illustrated, this development model gave rise to the conception of parks as islands of civilization in a vast and unforgiving wilderness.

In the contemporary Canadian context, the inverse of the initial island theory has come to dominate the way that parks are created and maintained. In contrast to the early conception, development is now seen to be the threat to be kept at bay by an attempt to protect parks as pristine wilderness areas. Parks are now seen as islands of nature in an ever-encroaching pattern of development and environmental exploitation. Within this view, the two aspects of the landscape are held in contradistinction to one another. The human use of the landscape is ostensibly limited or, in worse

cases, ignored completely in order to promote the idea that small vestiges of nature are preserved for our occasional use and enjoyment. Both conceptions are disingenuous and reinforce the "garrison mentality" that Northrop Frye attributed to Canadian literature more than half a century ago. What exactly are we attempting to protect or protect ourselves from?

As Anne Whiston Spirn remarks in her influential book *The Granite Garden: Urban Nature and Human Design*, "as human habitat, cities are part of the natural world and constitute ecosystems that are dynamic and interconnected" (Spirn 1984, 35). Every city has a deep, enduring context connected as much to the long range processes of geomorphology as the social systems of citizens that make it up at any given time. In her view, urban design is a tool of human adaptation, vital to the creation of truly sustainable living environments. Recognition of the fact that we are reliant upon the responsible use of resources for our own survival has powerful implications for how the city is designed, built, and maintained, and for the health, safety, and welfare of its citizens. According to Spirn, "the common belief that the urban realm is apart from, and even antithetical to, nature has dominated the way in which the city is perceived and continues to affect how it is built" (Spirn 1984, 26). The design of our cities could, she argues, be based on an understanding of the natural and social history of the region as well as the needs of its current and future residents. In this way, cities must be viewed in their broader context.

The natural sphere has a social value to be cultivated through the tools of design. If one embraces this idea, then the false oppositions between city and nature, the given and the built, fall away. This realization leads to the question: how can we engage with the changing landscape in a way that strengthens the natural and cultural aspects of the landscape simultaneously?

### ENGAGING WITH THE LANDSCAPE

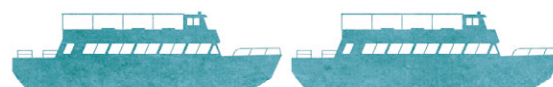
McNabs Island sees thousands of visitors annually, each with their own reason for coming to the island. Some come to the island as scientists, learning about the coastal processes that shape the island, others come as photographers, documenting the beauty of the urban nature, some come as athletes, experiencing the trails while training their bodies, and some come as trail blazers, shaping the land with their hands. Each of these user groups has a different way of engaging with the landscape and, in turn, a different way of understanding what the landscape is. How can McNabs and Lawlor Island Provincial Park accommodate these various use groups while staying true to the values of the park?

#### Learning From the Landscape

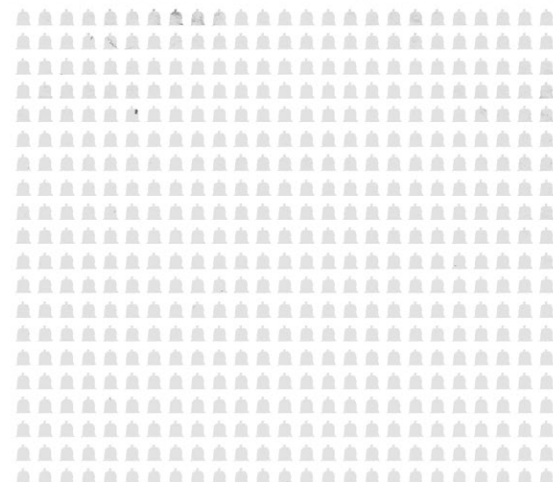
Every spring, the Friends of McNabs Island Society organizes a beach cleanup after a winter's worth of flotsam has drifted ashore. Hundreds of volunteers



TWO HUNDRED AND FIFTY VOLUNTEERS



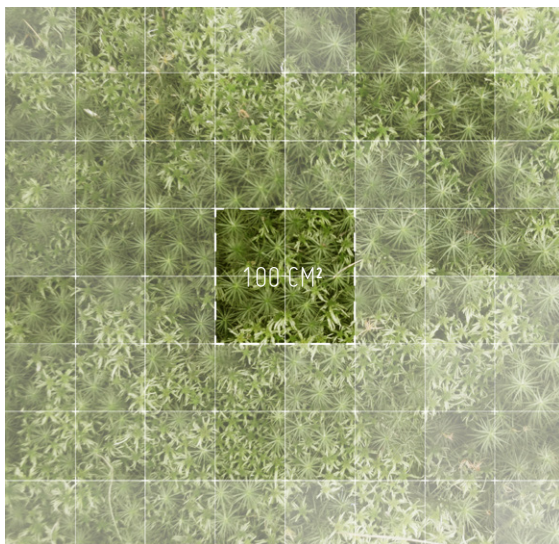
TWO CHARTERED FERRY TRIPS



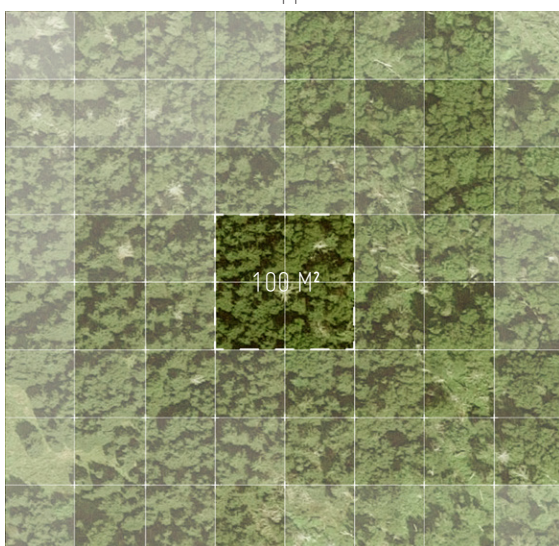
FIVE HUNDRED GARBAGE BAGS



NINE BOATLOADS OF GARBAGE



Close-up photo of the forest floor on Jenkins Hill



Aerial photo of the forest canopy on Jenkins Hill (from Google)

attend the event, spending their day walking the coast with a garbage bag in-hand, picking up the trash that the city's citizens have discarded and left to float in the wind and water. In addition to being a practical and purposeful way of wandering the trails of McNabs, the event gives volunteers a special insight into the ways in which we can engage with the social and ecological aspects of the landscape. This annual tradition points to a potential solution to the problems that a lack of recognition and engagement with the urban nature brings about.

In his book *Design for Ecological Democracy*, *Randolf Hester* lays the groundwork for a form of government by the people emphasizing direct, hands-on engagement with the landscape. Within an ecological democratic framework, actions are guided by understanding natural processes and social relationships within a specific locality and the larger socio-ecological context. The simultaneous focus on both large and small scale processes allows communities to continually and creatively reassess individual needs and long-term community goods in shaping the places we inhabit. Setting a lofty goal, Hester claims that, "Ecological democracy can change the form that our cities take, creating a new urban ecology" (Hester 2010, 4). Rather than focusing exclusively on what 'natural' land to conserve and where not to build, urban ecological design first attempts to form a comprehensive understanding of organisms, habitats, and events — both social and ecological. A city will be

transformed and will compel us towards preserving it only if we comprehend and truly understand it, know our place in it, and know how to be meaningfully engaged in the decisions that create it (Hester 2010, 325).

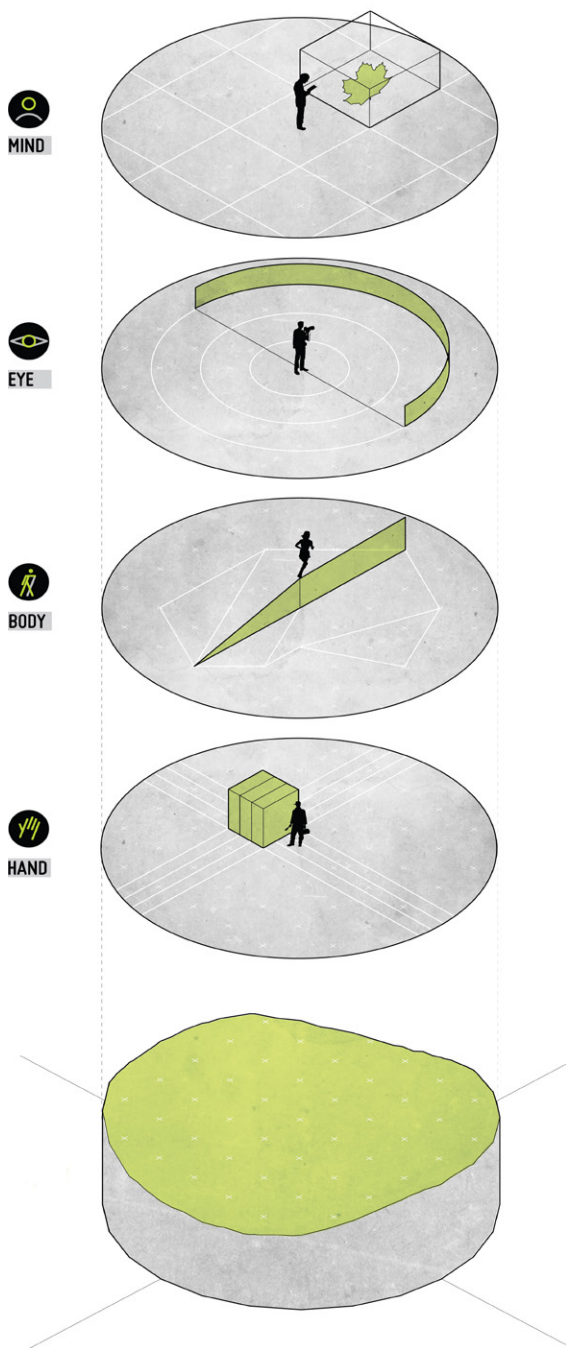
At the core of Hester's argument is the necessity of developing a more engaged and active citizenry, one that is involved in shaping the landscape for the social and ecological well-being of the community. How do we make this crucial step in creating a more socially and ecologically just city? As previously stated, the Friends of McNabs Island Society Annual Beach Cleanup points towards the answer. Simultaneous experience and education usually produces a greater appreciation for and attention to ecological processes, urban and natural, and, perhaps most importantly, changes in personal lifestyles and leads to more informed actions. Environmental education emphasizes the role of the citizen in working, both individually and collectively, toward the solutions to the problems that affect the social and ecological well-being of our communities. Environmental education is aimed at producing a citizenry that is knowledgeable concerning the socio-ecological conditions of the landscape and its associated problems, aware of how to help solve these problems, and motivated to work towards their resolution. How can we better understand and engage people looking to make changes to the socio-ecological conditions of the urban nature at a local level?



Discarded chair on the shore of Wreck Cove

### Understanding the Landscape

As Simon Swaffield notes in his article “Landscape as a Way of Knowing the World,” the “ability of landscape to generate powerful feelings of belonging, of aesthetic pleasure, and of wonder at the complexity of ecology, while also expressing the relations within and between societies, is perhaps its greatest strength” (Swaffield 2005, 6). The concept of landscape provides a systematic basis for understanding the specific patterns and processes we see around us. Landscape is therefore a multivalent form of knowledge that does not fall squarely into any single discipline, nor does it offer only one perspective upon the world (Swaffield 2005, 7). Rooted in the specificity of a place and encompassing social and ecological processes, understanding the landscape complements and provides an important counterpoint to other ways of knowing the world. On the one hand, an understanding of the landscape is an integral part of science, related to conventional knowledge about the natural realm. On the other hand, landscape knowledge, firmly based in the locality of a place, can be used as the basis for understanding and critiquing of aspects of the social realm. The landscape takes on different values and meanings depending on the way that one engages with it. In this way, it is a multivalent concept with continually evolving interpretations. According to Swaffield, landscape knowledge is grounded in different dimensions of human existence: mind, eye,



Landscape knowledge grounded in four dimensions of human existence

body, and hand, each representing a different approach to understanding the landscape (Swaffield 2005, 13). The outline of these approaches will form a foundation for the design of ecological democracy on McNabs Island.

'Landscapes of the mind' are a synthesis of conceptual knowledge of the landscape, empirically tested through firsthand experience. They represent how we understand the character of the land in a scientific sense. Systematically recorded, mapped, measured, abstracted, and classified, the features of the landscape are made intelligible through rigorous study and investigation. The scientist is at home in landscapes of the mind, documenting and analyzing the biology, geomorphology, and hydrology of the landscape.

'Landscapes of the eye' are composed of what we see in the landscape. The term landscape itself comes from the 16th century Dutch word *landschap*, meaning "land" + "condition." The word was coined during the Dutch Renaissance to refer to paintings representing an extensive view of natural scenery (OED 2017). The powerful association of the term with artistic practice persists to this day. Indeed, the most common conception of landscape is the landscape of the eye, the idea that landscape is a beautiful natural scene to look at. In particular, the application of this sensibility led to a dramatic re-evaluation of nature during the Romantic period, when poets and artists ventured out into the wilderness in an attempt



Landscape of the eye concept model



Landscape of the mind concept model



Landscape of the body concept model



Landscape of the hand concept model

to behold the sublime. This aesthetic approach to landscape underpins much tourism, conservation and recreation to this day (Swaffield 2005, 10).

'Landscapes of the body' are a way of knowing the world through grounded experience, the way people inhabit and move through the landscape with their bodies. Features and patterns in the landscape make sense to us because we experience them through our own physical exertion. The cyclist understands the landscape in a different way than the motorist, developing a physical and sometimes painful relationship to the topography through the ascent of a hill, for instance. As Danish-Icelandic artist Ólafur Elíasson remarks, "We often think that we see everything, but our eyes are only one small part of our sensory apparatus... When we walk, we generate space and make time physical. If I walk up a mountain, for example, it becomes more real" (Elíasson, 2016, 24).

'Landscapes of the hand' are made through the everyday practices of people living in communities by shaping the land. The concept expresses the way knowledge is embedded within everyday social practices, shaping place through the repeated application of the local vernacular and the material culture. Landscapes of the hand are the territory of the builder, constructing the buildings, roads, and farms that make human inhabitation of the landscape possible. Perhaps the most fundamental to architecture, landscapes of the body constitute the built form of a place, the way that cultures are expressed through their environments.



## MAPPING THE LANDSCAPE

With a history dating back millennia, McNabs Island has been extensively documented. Although no written or visual documentation exists from the Mi'kmaq, early European settlers made maps of the area for navigational and military purposes. As they planned their settlements, they charted the height of the area's hills and the depths of the harbour. McNabs Island features prominently in the early maps, recognizable even though its outline has been dramatically altered by coastal processes. Being in such close proximity to many of the regions universities, research communities, and government agencies, the documentation of the island has continued unabated since the early days of settlement. How do we make sense of the myriad projections of this space while planning for future development?

### Layering the Landscape

In his book *Design with Nature*, ecologist and landscape architect, Ian McHarg argues that design is an evolutionary strategy, a means of adaptation to the landscape as well as an end in itself. Published in 1969, McHarg's prescient part-memoir, part-manifesto is a first-hand account of the beginnings of the environmental movement and an essential resource for sustainable land-use planning. Advocating for an ecologically and socially informed view of land-use

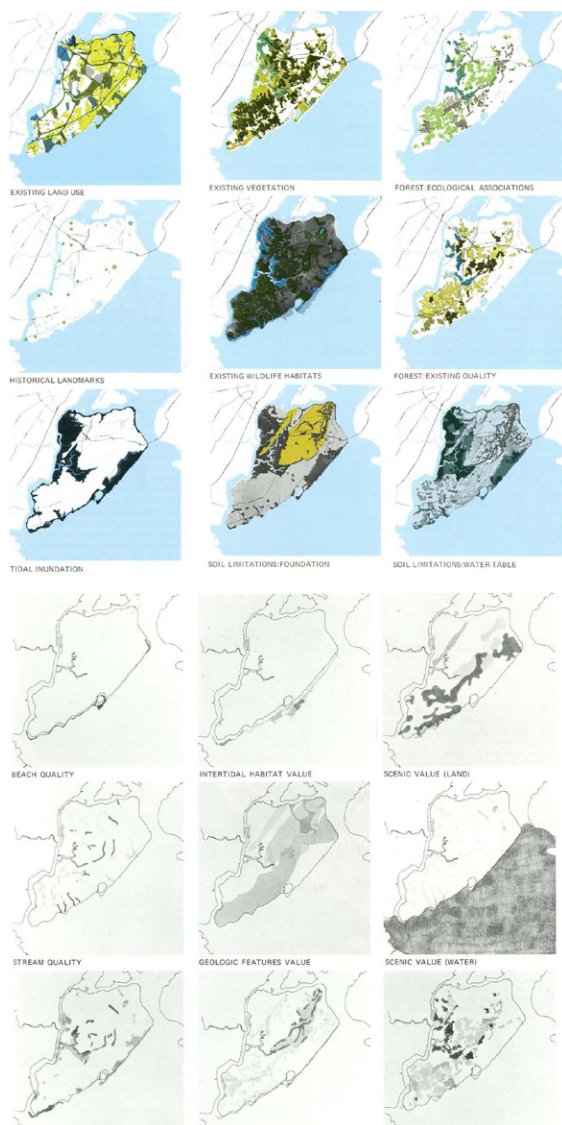


Harbour of Chebucto and Town of Halifax (Harris 1750)

planning, McHarg sees the role of the designer as an interpreter and, in turn, creator of urban systems that harmonize with natural and cultural aspects of the landscape.

McHarg's method is to assess ecosystems as fit for certain prospective land-uses according to a multi-layered understanding of landscape. A hierarchy of information is developed by conducting a thorough, layered analysis of nature's and society's morphologies to the particularities of a region or a given site. Just as we can read a map to get us from point A to point B, we can interpret a path for development that follows the trajectory that the natural aspects of the landscape has laid before us. As a prerequisite for planning and design, he advocated for the development of a survey of all biophysical processes and human aspirations, the "ecological inventory" (McHarg 1969, 12). McHarg's ecological inventory is an itemized list of interrelated systems, useful not only to understand how a place came to be, but also as a diagnostic tool used to identify problems and opportunities in the landscape.

Ian McHarg's approach to understanding landscape has been widely influential as a methodology in the sciences (he is credited with developing the theoretical underpinnings of Geographic Information Systems mapping, also known as GIS) and has been adopted by urban planners sensitive to the myriad natural and social forces that affect life in the city. Although influential in land-use planning, McHarg's systematic methodology has been criticized for its



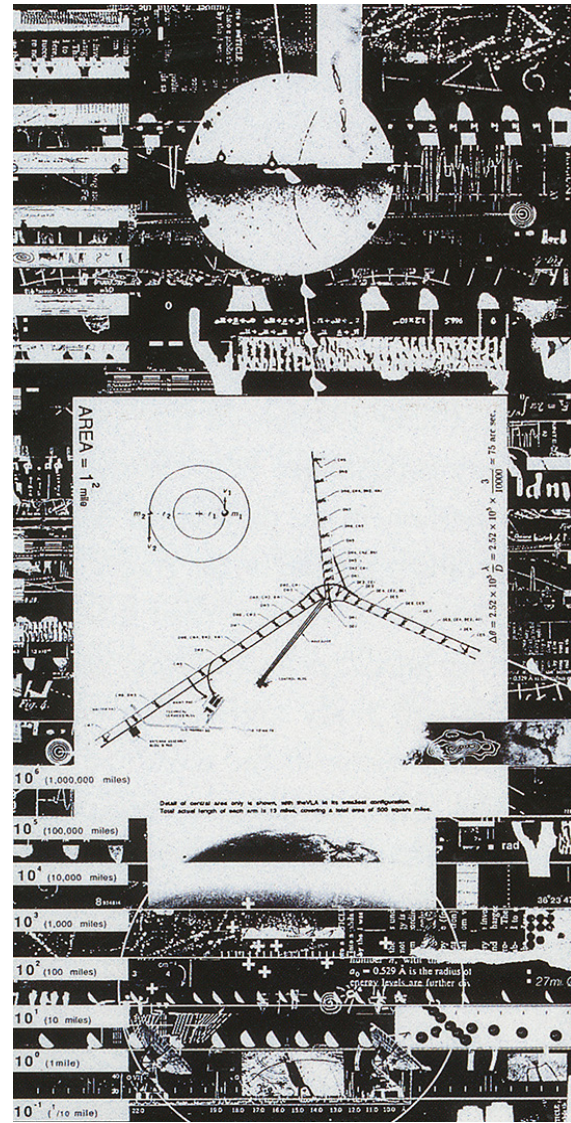
Mapping study of Staten Island (McHarg 1969)

perceived determinism. The notion that we can deduce the best possible use for a particular landscape by analyzing nature's morphologies and human settlement patterns leaves little room for the agency of the designer to address factors beyond the social and ecological inventory.

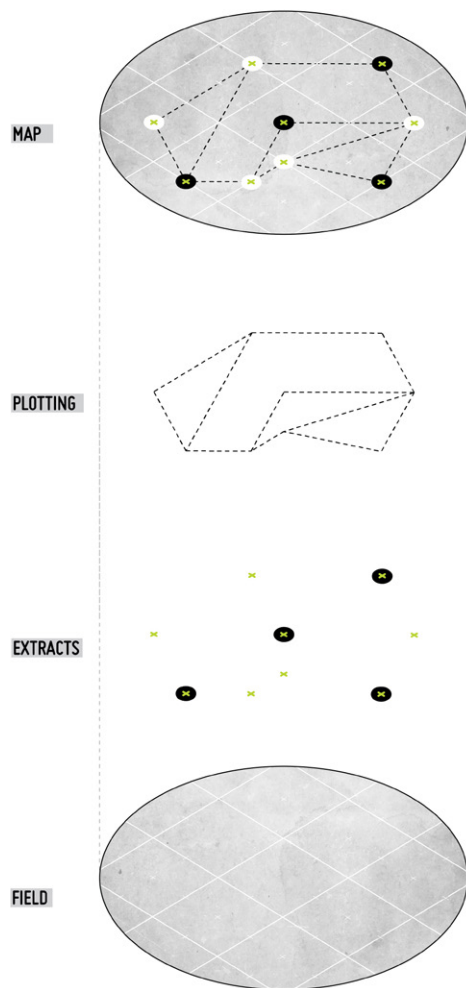
### Abstracting the Landscape

Landscape architect and theorist James Corner points us in the direction of a new methodology for mapping which takes a phenomenological approach to the documentation of the landscape. Rather than the layered analysis of Ian McHarg, Corner's mapping process is open-ended to dynamics of the site, with a new process unfolding according to the ever-changing 'field conditions.' By doing away with the ecological inventory, Corner captures the phenomenological aspects of the site, which are conveyed through abstraction. These useful abstractions are meant to provide insight as much as they are to incite design. He writes in his essay, "The Agency of Mapping: Speculation, critique, and invention," that:

the capacity to reformulate what already exists, is the important step, and what already exists is more than just the physical attributes of terrain (topography, rivers, roads, buildings, but includes also the various hidden forces that underlie the workings of a given place... Through rendering visible multiple and sometimes disparate field conditions, mapping allows for



J.G. Ballard (Corner 1996)



Anatomy of a map (concept from Corner 1999)

an understanding of terrain as only the surface expression of a complex and dynamic imbroglio of social and natural processes. In visualizing these interrelationships and interactions, mapping itself participates in any future unfolding (Corner 1999, 214).

As Corner elucidates, the mapping process begins with determining the 'field', that is, the organizational logic of the map. The extents, scale, and representational methods are all included within the 'field' of the map. The data of the map, what Corner calls the 'extracts' are then identified, isolated, and de-territorialized. Through 'plotting' the map, the extracts are then re-territorialized by showing the network of relationships that exist between them. The map is the resulting projection of the plotted extracts on the predetermined field (Corner 1999, 231).

In Corner's view, the map itself is derived more from cultural invention than from a preexisting natural conditions. The cartographer, rather than attempting to document the world through the accurate rendering of its physical features, is an agent within the map itself, determining, through the iterative process of design, which aspects of the site take priority over others. The map, therefore, is a kind of projection, putting forward "new urban and regional futures," derived "less from a utopia of form and more from a *utopia of process*" (Corner 1999, 228). By taking this approach, the interpretation of the social and ecological features of a site become the starting point for design.

## DESIGNING THE LANDSCAPE

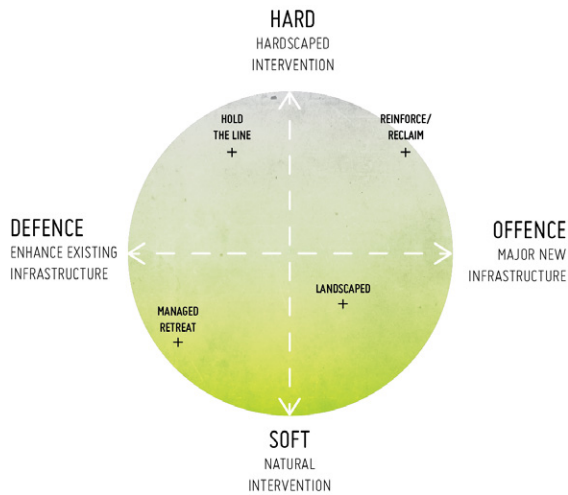
As we have seen, McNabs and Lawlor Islands Provincial Park possesses the unique conditions of the urban nature, where the tensions between nature and culture are palpable and readily apparent at every fork in the trail. Visitors to the park have their own way of engaging with the landscape, each of which need to be considered while designing park infrastructure to suit their needs and provide new experiences of the urban nature. The many layers of social and ecological change on the island also need to be taken into account while designing an infrastructure that is sustainable and adaptive to various types of cultural and natural change. The design of *infrastructure* for McNabs Island requires particular attention to two main parameters: the existing transportation networks in the Halifax Harbour and the anticipated effects of climate change and sea level rise. The process of *building* on McNabs Island has two major limiting factors: the remoteness of the site and its disconnection from the grid of the surrounding city.

### Adapting (to) the Landscape

McNabs and Lawlor Islands Provincial Park is in the middle of the city and yet it remains inaccessible to many Haligonians. The greatest obstacle to increasing the use of the park is overcoming the lack of awareness of how to cross the harbour to the shores of McNabs

Island. In the late nineteenth and early twentieth-centuries, the harbour was regularly used as a means of transportation. With the advent of the automobile, many Haligonians lost touch with the once vital amenity in the city. Today, the ferry serves a greater number of people, but has a significantly diminished network of transportation nodes. For instance, McNabs Island used to be one of the many stops that the Mic Mac ferry would make at various wharves and docks throughout the harbour. Ferry service to the island has been sporadic since the Mic Mac ferry shut down in the 1920s. With the island cut off from the most heavily used public water transportation infrastructure, private companies have filled the void with differing levels of success. The question of how to get more visitors to McNabs is therefore an infrastructural issue. In order to connect the city to the island and integrate into the socio-ecological conditions of the landscape, how should this key piece of infrastructure be designed?

The attempt to preserve the socio-ecological integrity of the landscape is directly linked to the integrated management of its infrastructural assets, both in terms of hard infrastructure such as seaports and water management systems and soft infrastructure such as research and knowledge networks. The city is what theorist Stanford Kwinter calls a “soft system” – adaptive, flexible, and evolving through its capacity to absorb and exchange information with its surroundings (Kwinter 1993, 207). An infrastructure network that allows for the active adaptive management of the



Types of infrastructural interventions in the landscape (concept from Hill 2014)

landscape is of paramount importance. Active adaptive management is an iterative process, where deliberate experimentation and carefully designed monitoring informs decisions that improve the effectiveness of management strategies. The process of simultaneously managing and learning is particularly useful given the uncertainties associated climate change and sea level rise. To achieve this, the infrastructure must be finely attuned to the social and ecological conditions of the landscape.

Good design resonates with the natural and cultural rhythms of a place; it echoes, amplifies, clarifies, and contributes to a sense of rootedness in space and time. According to Anne Whiston Spirn:

Design that makes visible the operation of natural processes and their temporal cycles contributes to the experience of being connected to rather than separate from the past and the future...The urban landscape affords abundant opportunities to celebrate these cycles, to make legible and tangible the connections they forge" (Spirn 1988, 74).

Such an approach on McNabs Island must be based specifically on the socio-ecological conditions of the coastal landscape. In "The New Age of Coasts: A design typology," Kristina Hill outlines an approach to design for coastal areas that combines cultural values, economic benefits, and ecological goals while increasing urban resilience to sea level rise. In order to protect cities and enhance ecosystems, infrastructure must be re-conceived as symbiotic with dynamic,

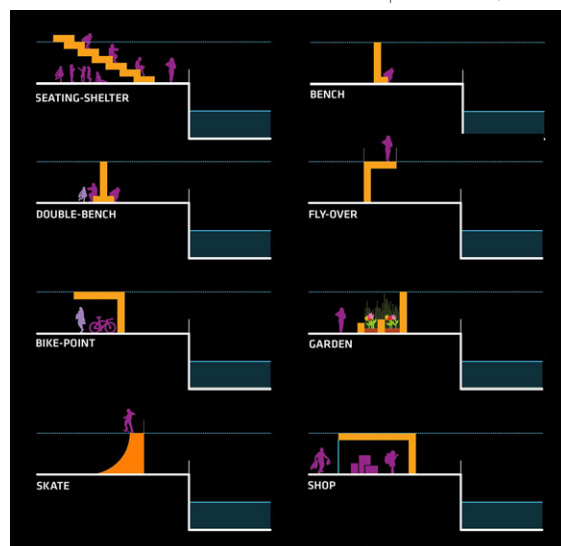
living systems, she argues. These interventions can be designed to interact with complex biological systems and cultural behaviours to create more benefits for society. Hill coined the term “adaptive infrastructure” to identify a new approach to infrastructure design and planning, an approach that specifically emphasizes the urgency of adaptation to climate change.

In the wake of Hurricane Sandy, the U.S. Department of Housing and Urban Development invited leading international architecture firms to participate in Rebuild by Design, a \$930 million competition that hoped to inspire plans to rebuild New York. The winning proposal by Bjarke Ingels Group, named BIG U, addresses New York City’s vulnerability to coastal flooding with an undulating, protective ribbon of public recreation infrastructure on the southern tip of Manhattan. The 12 kilometre long barrier incorporates public space with a high-water barrier that doubles as parks, seating, bicycle shelters, and skateboard ramps. New embankments or berms add green spaces to the dense urban environment and the existing infrastructure of elevated roadways house pavilions for public use. The city is protected from the water by the berms which are underlaid with steel and concrete, which are in turn covered in landscaping and decorated with art. In this way, disaster-proofing becomes an urban amenity, manifesting Professor Hill’s concept of adaptive infrastructure.

The BIG U, is rooted in Bjarke Ingels Group’s signature concepts of social infrastructure and



Aerial view of the southern tip of Manhattan (BIG 2014)



Sections of the proposed infrastructure (BIG 2014)

hedonistic sustainability. According to this design approach, not only should infrastructure protect us from the threats of climate change and sea level rise, we should have fun with it as well. If people enjoy themselves, the rewards of the design will extend beyond prosaic purpose of the infrastructure and contribute to the public realm. They envision an infrastructural intervention that protects the city from floods and storm water while simultaneously providing public realms specific to the needs of the city's diverse communities. Bjarke Ingels states:

We asked ourselves: What if we could envision the resilient infrastructure for Lower Manhattan in a way that wouldn't be like a wall between the city and the water, but rather a string of pearls of social and environmental amenities tailored to their specific neighbourhoods, that also happens to shield their various communities from flooding. Social infrastructure understood as a big overall strategy rooted in the local communities (BIG 2016).

The Big U not only shields the city against the disastrous effects of climate change and sea level rise; it provides social and environmental benefits to the community and contributes to the public realm.

### **Building the Landscape**

McNabs Island is in a unique position; it is at once a part of the city, surrounded by the harbour and development on three sides, and yet it is disconnected from the

region's critical infrastructure. Its remote condition as an island, paired with the fact that it is disconnected from the municipal service grid, means that it requires a building solution tailored to the constraints of the site. Any development of park facilities must have a strategy for building with the appropriate planning and logistics. Furthermore, it must be able to function without the aid of municipal infrastructure such as electrical, water, and sewage services. A two pronged approach to building on McNabs Island, one that incorporates modular prefabricated construction and autonomous systems, could serve as a basis for improving the visitor experience of the island and create a living laboratory for the uncertain conditions of the future.

Prefabrication is often associated with the terms "modular," "off-site," or "assembly." For centuries, buildings have been built *in-situ*, that is, directly on-site. Once associated with the nineteenth-century obsession with standardization and twentieth-century modernism, prefabrication has begun to reemerge, however slowly, as a result of shifts in the environmental ethic of the architecture and construction industries. If nothing else, prefabrication is an answer to the fact that on-site construction has been estimated to waste up to 40% of all new products brought to the site (Smith 2001, ix). A prefabricated solution would be advantageous on McNabs Island for two main reasons: improved logistics on the remote island site and less site disturbance.



The process of prefabricating a building, particularly for remote locations, can drastically improve the logistics with off-site construction and on-site assembly. The construction of a building in-situ requires months of transporting materials and workers to and from site. This is especially true of island sites, where there is often the added logistical issue of transporting materials and workers by boat. Less back-and-forth means less stress on the environment and less wasted time.

In the late 1960s, mid-century furniture designer Jens Risom helped raise the profile of prefabricated construction methods. Risom sourced the design for his family retreat from a catalog and had it delivered in pieces to the remote island site off the coast of Rhode Island. At the time, “prefabricated buildings suffered from poor public perception after the post World War II housing boom and the subsequent need for quickly produced, kit-assembly buildings” (Dameron 2012). Risom’s structure, with its use of natural materials and expansive open spaces, set into its rustic location, created a new standard for what prefabricated buildings could look like. The kit of parts were trucked to mainland Rhode Island and then sent by tugboat to Block Island, about 20 kilometres from the mainland. Flatbed trucks then picked up the pieces and drove them up a winding dirt road to the site. Remote but well placed, the plot has an elevated position, overlooking the ocean yet sealed off from view (Dameron 2012).



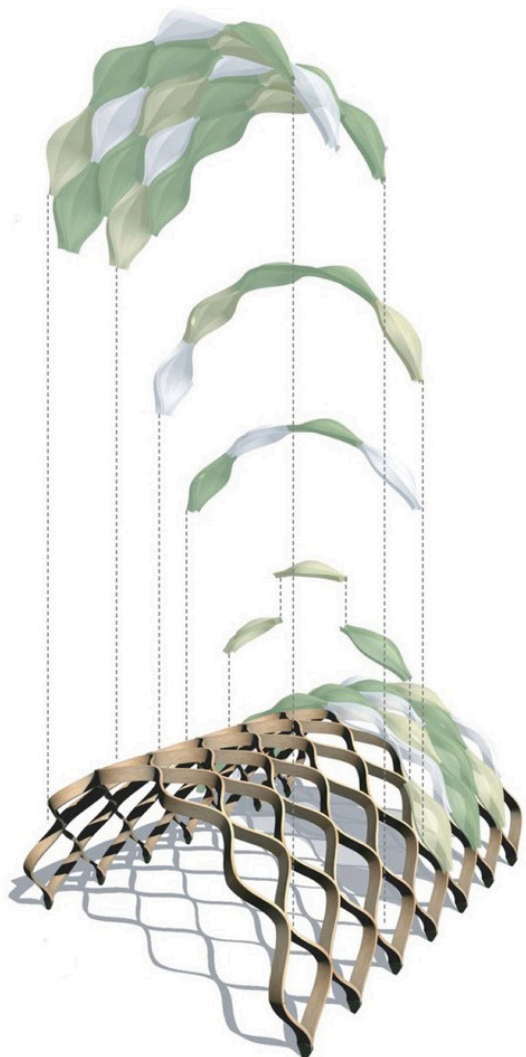
Components of Jens Risom's A-framed prefab family retreat (Life Magazine 1967)



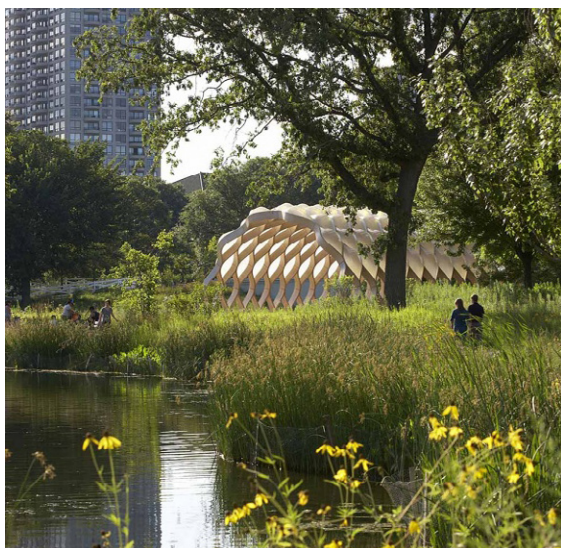
Jens Risom's prefab family retreat (Dameron 2012)

The second major benefit to prefabricated buildings is that on-site traffic is greatly minimized from builders and heavy equipment leading to impact on the local environment. Depending on the construction, prefabricated buildings can also be disassembled and the modules relocated or refurbished for new use at a different site, reducing the demand for raw materials and minimizing the amount of energy expended to create a building to meet the new need in another location.

The Chicago-based architecture firm Studio Gang is known for its focus on sustainability, material experimentation, and collaboration in the construction process. Their Lincoln Zoo Pavilion transforms a picturesque pond in downtown Chicago into an urban ecological laboratory. In conjunction with the site improvements to hydrology, landscape, and accessibility, the pavilion is able to function as an outdoor classroom, where the natural and urban surroundings are harmonized by the elegant structure. Inspired by the tortoise shell, its structure consists of prefabricated, bent-wood members and a series of interconnected fiberglass pods. The prefabricated glulam wood ribs and fiberglass domes were designed to be light enough for workers to lift and install by hand (Gang 2010). The carefully thought out fabrication and assembly process allows the site to flourish with minimal site disturbance, proving that prefabrication is not only a viable, but a desirable solution when dealing with sensitive ecosystems.



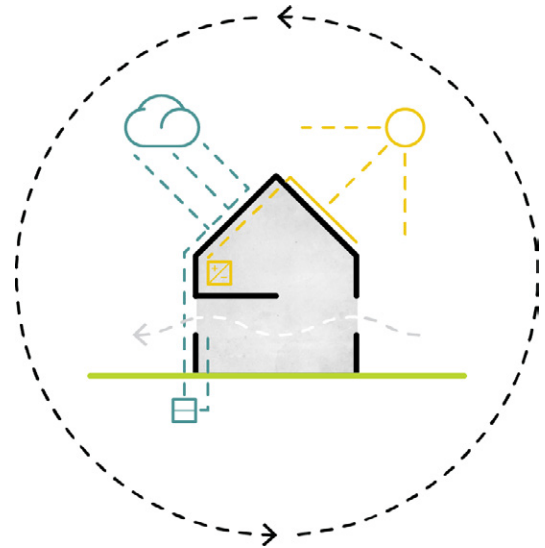
Lincoln Zoo Pavilion exploded axo (Studio Gang 2010)



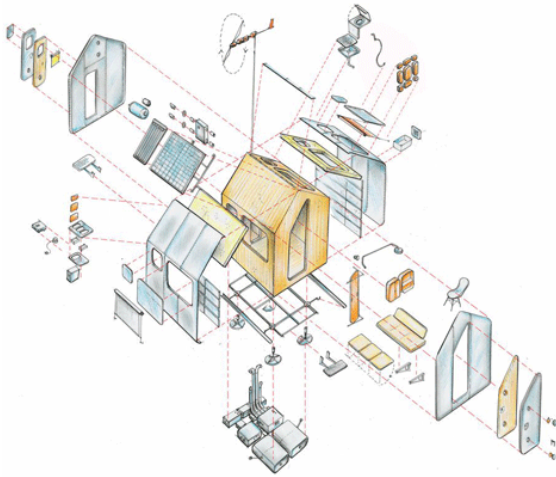
Lincoln Zoo Pavilion in its urban habitat (Studio Gang 2010)

An autonomous building is a building designed to be operated independently from infrastructural support services such as the electric power grid, gas grid, municipal water systems, sewage treatment systems, storm drains, and in some cases, public roads. As architects become more concerned with the disadvantages of our collective dependence on distant resources and transportation networks, designs tend to include more autonomous elements. The historic tendency towards building autonomous buildings was a result of the necessity of self sufficiency. Without reliable sources of heat, power, and water, buildings needed to be as independent from distant resources as possible, focused instead on the local material culture.

In today's climate, a parallel but distinct path toward autonomy has just begun to be explored as designers are becoming increasingly concerned with the environmental impacts of the construction industry and the long term maintenance costs of buildings. Not only are autonomous buildings becoming progressively necessary with the uncertainty related to climate change, they are becoming desirable in their own right, as public perception concerning the environmental impacts of buildings changes. Autonomous buildings can increase security and reduce environmental impacts by using on-site resources such as sunlight, rainwater, and wind. Autonomy also dramatically reduces the costs and impacts of networks that serve the building, since autonomy eliminates the inefficiencies of collecting and transporting resources.



Autonomous building with rainwater collection, active solar and passive ventilation



Diogene Hut exploded axo (Renzo Piano Building Workshop 2013)



Diogene Hut on the Vitra Campus (Renzo Piano Building Workshop 2013)

With the Diogene Hut, renowned Italian architect Renzo Piano completed his career-long dream of building a micro house measuring only 7.5 square metres. Piano's cabin for one has been added to the gardens of the Vitra Campus in Weil am Rhein, Germany. "This little house is the final result of a long, long journey partially driven by desires and dreams, but also by technicality and a scientific approach," says Piano (Frearson 2013). Named 'Diogene' in honor of the Greek philosopher Diogenes of Sinope, who was said to have abandoned all worldly luxuries and conventions for the simplicity of living in a large ceramic jar (Frearson 2013).

From the exterior of the building, nearly all of the autonomous elements Piano decided to employ are visible. While the hut's exterior corresponds to the image of a simple house with 12:12 pitch gabled roof, it is in actuality a highly complex and compact technical structure, equipped with various installations and systems that guarantee its self-sufficiency and independence from the local infrastructure. The hut includes amongst its many features photovoltaic panels, evacuated solar tubes, exterior mounted hot water tank, rainwater collection cisterns, and a composting toilet. The micro home also boasts a recessed skylight that provides ample natural lighting and ventilation. Its exterior is clad with aluminium panels to protect it from the elements and allows it to function in various climactic conditions. Its incredibly modest size allows it to be loaded onto the bed of a pick up truck and be

freely transported. The Diogene Hut proudly displays its many autonomous features as if to announce its status as an off-grid building.

Todd Saunders, a native Newfoundlander, is responsible for the iconic architecture of the Fogo Island Arts Studios. Situated at various locations on the remote island, each of the four artist studios is distinctly designed, relating to the specific program of the building and artists they are meant to house. Anchored into the landscape of volcanic rock by steel piers, the structures are completely autonomous, equipped with photovoltaic panels, wood burning stoves, composting toilets, and thick, well insulated walls. In addition to the implementation of autonomous building systems, the environmental impact of the construction was minimized by the use of local materials, which were largely transported to the remote building sites by local workers.

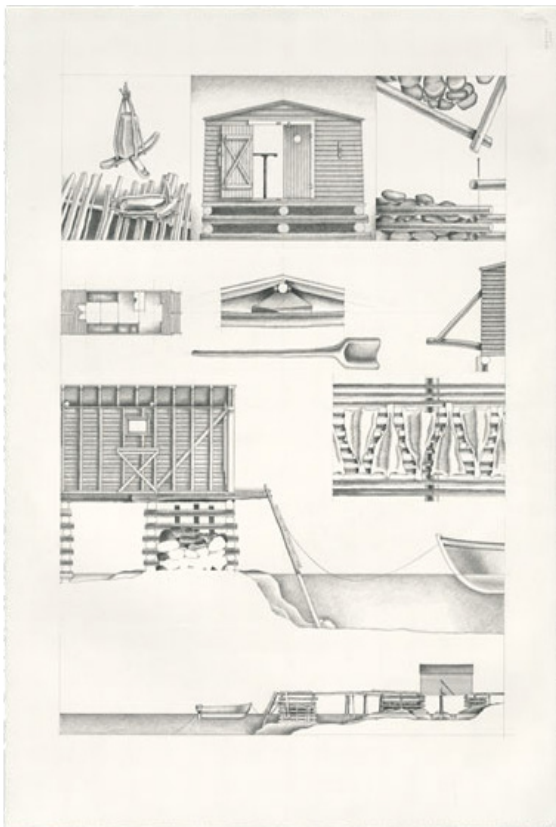
While the studios were built using materials intended to evoke vernacular building traditions in the region, the forms are strikingly contemporary. The structures directly reference the fishing stages used for the salting and drying of cod that are seen throughout the outport communities of Newfoundland. Scattered over the island, the modern forms are at once jarring and yet discreetly placed in the landscape, perched seemingly precariously over the water. While radically different in appearance from Fogo's weather-beaten clapboard houses, in subtle, abstract ways they have a relationship with them. Both are built on stilts



Fogo Island, Squish Studio (Saunders Architecture 2012)



Fogo Island, Tower Studio (Saunders Architecture 2012)



Fishery outbuildings in Tilting, Newfoundland (Mellin 2012)

over the water and seem to cling to the shore. With the studios, Saunders uses architecture to express an essential fact about life in the region, “in which dwellings create a strong bulwark and safe haven against constantly changing weather conditions” (Fogo Island Arts 2016). In contrast to the Diogene Hut, the studios on Fogo Island take a different approach to displaying their autonomous elements. While they are completely autonomous, one would never know from their outward appearance alone. Preferring instead to hide the typically auspicious photovoltaic panels, for instance, the buildings are meant to conjure associations with the self-sufficiency of the local vernacular. This allows the buildings to tell a different narrative, one that distinguishes between the technological nature of contemporary autonomous buildings with the poetics of the vernacular building traditions. The studios are as much at home amongst the glowing images of architecture blogs as they are amongst the fishery outbuildings in Tilting, Newfoundland elegantly illustrated by Roger Mellin.

## CHAPTER 3: FIELD CONDITIONS

There is an atmosphere that shrouds islands in mystery and ignites the imagination. Nova Scotia would be an island, disconnected from the mainland, if not for a narrow isthmus linking the province to New Brunswick. The ocean waters surrounding Nova Scotia have proportionally more islands than anywhere else on the Atlantic. There are more than 3 800 islands that lie scattered like the pieces of a jigsaw puzzle along nearly 13 300 kilometers of jagged coastline (BC Ministry of Environment 2013, 17). Understanding the importance of these islands to the social and ecological conditions of Nova Scotia, Atlantic Canadians have a fascination with islands which is reflected in the cultural traditions of the region.

The *FIELD CONDITIONS* of McNabs and Lawlor Islands will situate the park within its broader socio-ecological context and give a historical account of the interrelationships between the human uses and ecological changes that have taken place in the region, city, and island. Through a layered mapping process, we will see that different aspects of inhabitation have been shaped by the landscape and, in turn, how the landscape has been altered by a variety of human uses.

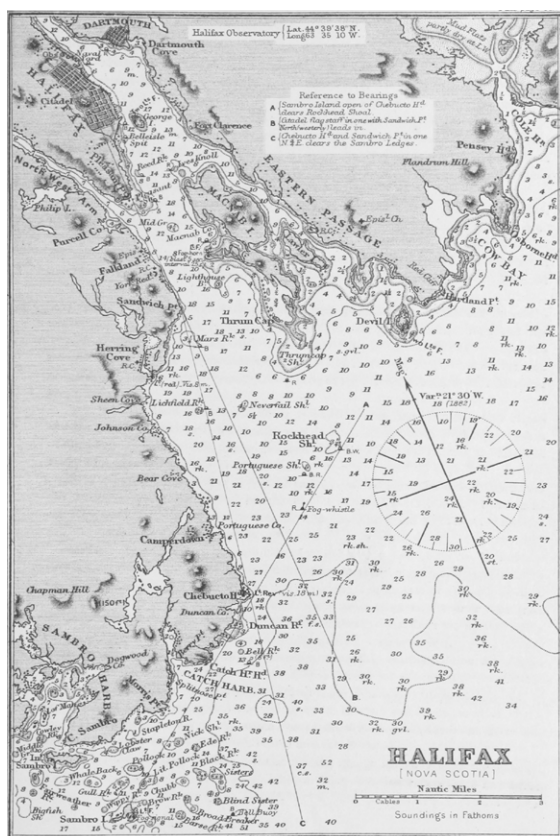


Double exposure photo at Point Pleasant Park (Sinje Westerhaus 2015)

## A CITY ON THE COAST

Halifax, Nova Scotia is a city shaped by its prominent placement on the Atlantic coast. From the temporary fishing encampments of the Mi'kmaq to the concrete military fortifications of the British, the various peoples that have inhabited the region, have done so for its strategic location on the edge of the ocean. Halifax is the hub of Atlantic Canada in large part because it is the first inbound and last outbound major port on mainland North America. For a relatively small city, Halifax boasts a proportionally high concentration of coastal infrastructure, with many of the region's main industries on the Halifax Harbour.

The province's parks and protected areas, ecoregions, major storm events, anticipated sea level rise, transportation infrastructure, maritime trade routes, development, and historic sites have all been determined by their close relationship to the Atlantic Ocean. The socio-ecological conditions of the city are in many ways in direct response to its oceanside location. The ocean has left an indelible mark on the culture of the people and ever-changing nature of the landscape.



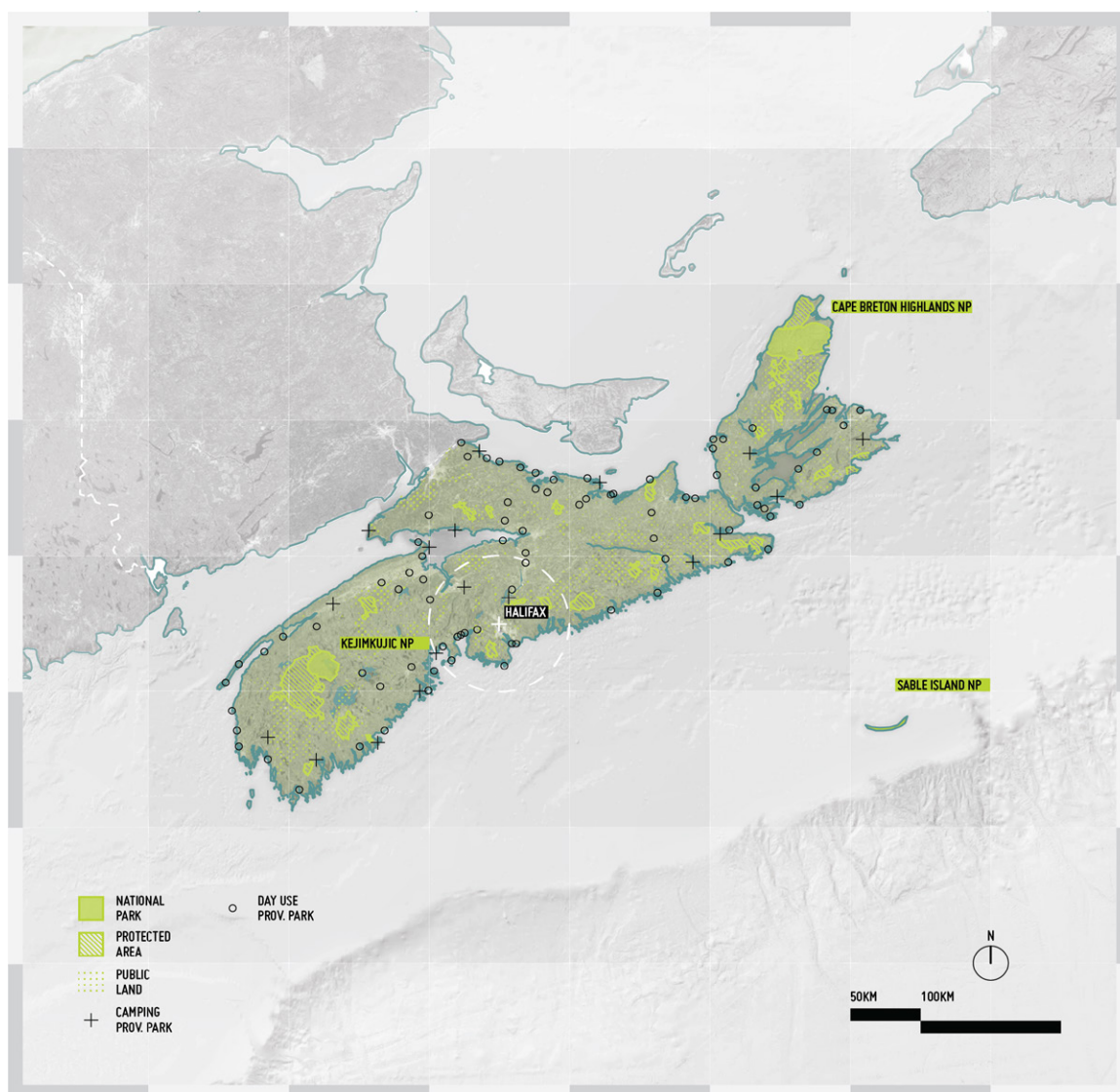
Map of the Halifax Harbour (Imray 1883)



## Parks and Protected Areas

In 1972 after years of planning, a federal memorandum was signed by the National Parks to establish Ship Harbour National Park, just fifty kilometres from Halifax. At the time, the park would have been in closer proximity to a major city than any other national park in the system. Public opinion quickly deteriorated, however, due to resentment that local residents were going to be expropriated for the benefit of tourists

'from away' (Froese-Stoddard 2012). As a result, Nova Scotia Department of Natural Resources stepped in to fill the void in the park system. Today, Nova Scotia has one of the most extensive networks of provincial parks in the country. Its many day-use and camping parks are distributed throughout the province to meet the needs of local residents, including a concentration close to the regional hub of Halifax. Both National Parks in Nova Scotia, Kejimikujik and Cape Breton Highlands, are in relatively unpopulated areas of the province.

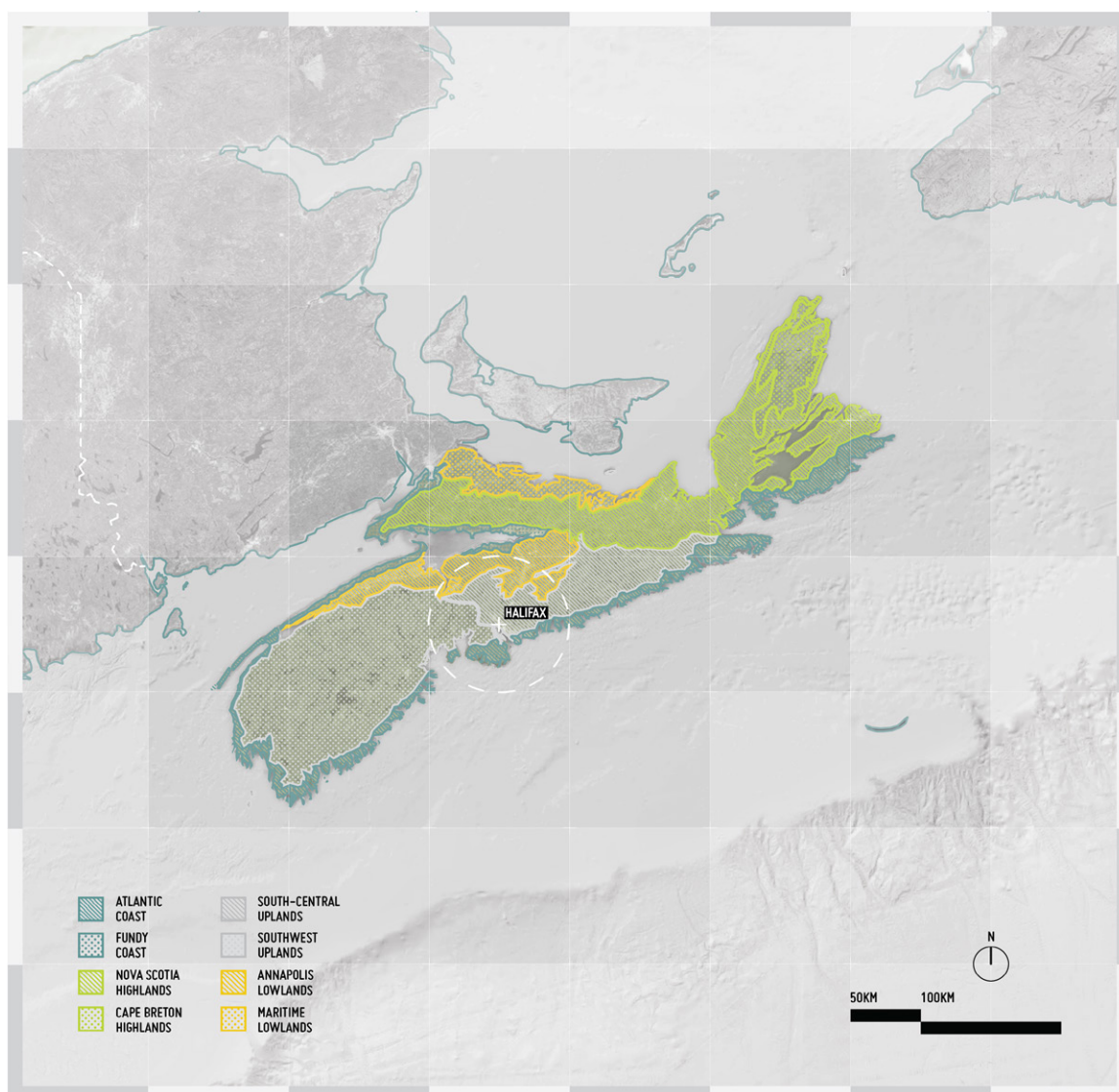


Parks and protected areas in Nova Scotia (data from Nova Scotia Department of Natural Resources, base image from Google)

## Terrestrial Ecoregions

A terrestrial ecoregion is characterized by its distinctive regional landforms, macro and meso-climates, vegetation, soils, water, and regional scale human activity patterns. Nova Scotia has eight identified terrestrial ecoregions, with each being a subset of the Atlantic Maritime Ecozone. Halifax is on the cusp of three ecoregions: the South-central and South-west Nova Scotia Uplands ecoregions and the Atlantic Coast

ecoregion. The ecoregion that covers entire length of Nova Scotia's Atlantic coast, between Yarmouth to the south and Scatarie Island on the tip of Cape Breton, has gradually been submerged with rising sea levels over the last 10 000 years. This slow sinking has resulted in a highly irregular coastline with in an indented coast, fringed with islands (Webb 1999, 18).

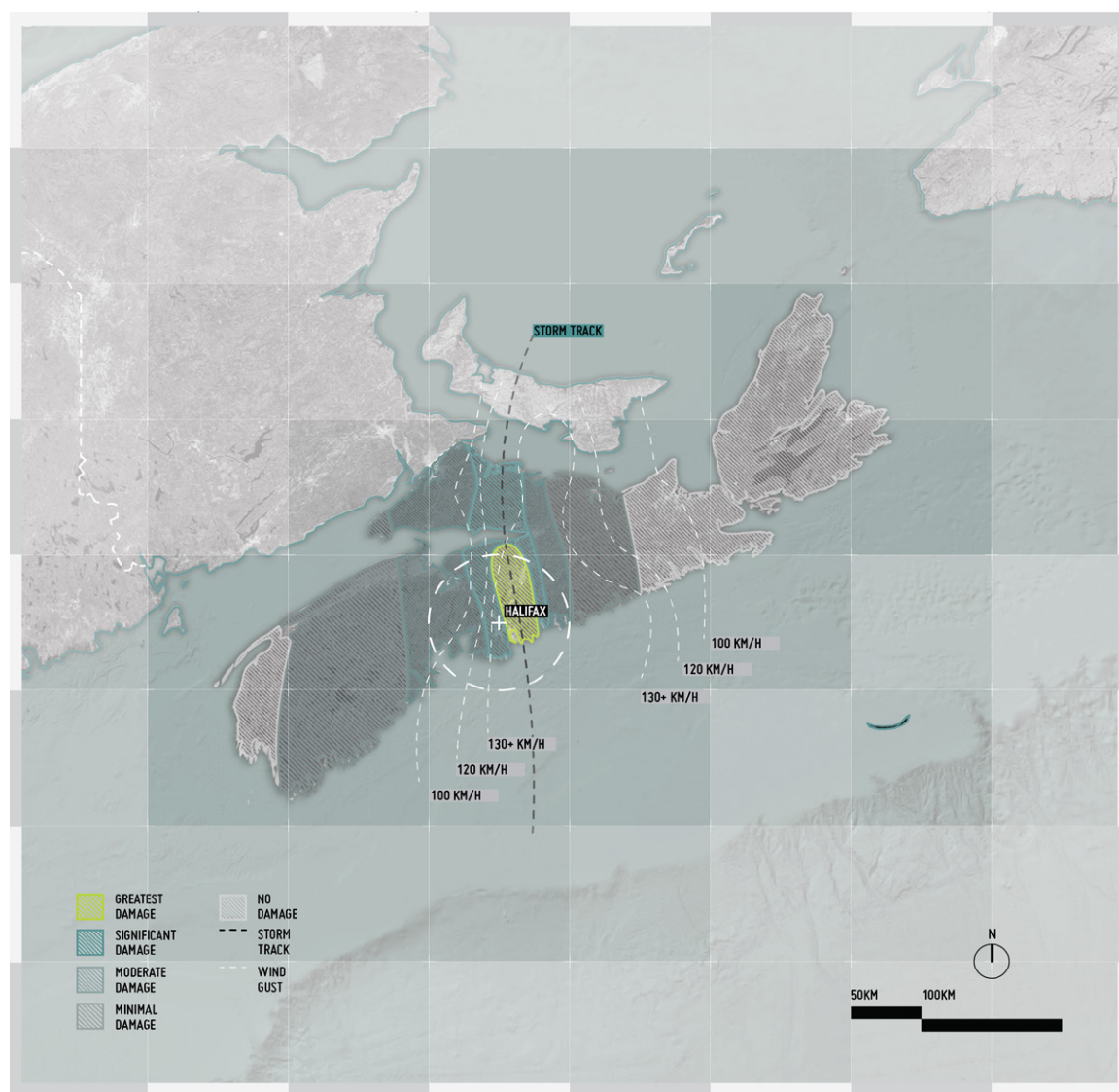


Terrestrial ecoregions in Nova Scotia (data from Environment and Climate Change Canada, base image from Google)

## Hurricane Juan Storm Damage

Hurricane Juan was a devastating storm that heavily damaged parts of Atlantic Canada in September 2003. Juan made landfall between Shad Bay and Prospect, directly hitting Halifax early on September 29 with wind speeds upwards of 160 km/h. Juan retained its strength while crossing Nova Scotia from south to north, eventually dissipating as it reached Anticosti Island in the northern Gulf of Saint Lawrence. The hurricane left

a trail of damage along Nova Scotia's most populated regions, with the eye of the storm crossing over an area home to nearly half of the province's population. The effects of the storm are still apparent, especially along the Atlantic coast (Lixion 2012, 1).

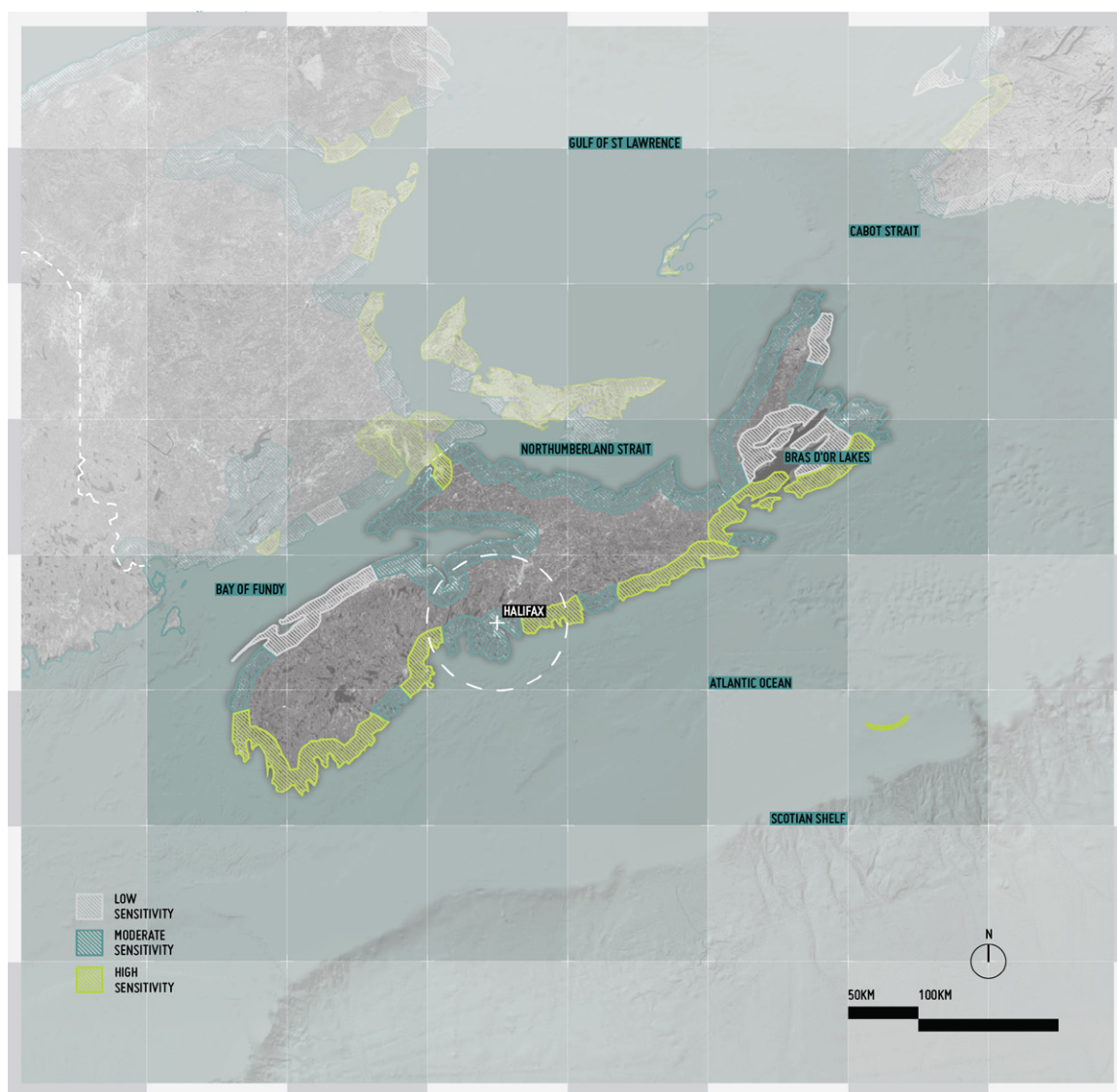


Hurricane Juan Storm Track (data from Meteorological Service of Canada, base image from Google)

## Sensitivity to Sea Level Rise

During the twentieth century, the sea level surrounding Nova Scotia rose approximately 30 centimetres. Researchers expect an additional increase from 70 to 140 cm over the next century (Gov't of NS 2009). As with coasts around the world, the sea level surrounding Nova Scotia is rising at an accelerated rate due to climate change. Relative to the global averages, however, Nova Scotia is more dramatically affected.

The increased rate is caused by two factors: thermal expansion of cold water flowing south from the Arctic Ocean and regional land subsidence, the sinking of land relative to sea level. These factors, and the fact that many of the provinces citizens live on the 13000 kilometres of coastline, means more risks of damage to people, property, infrastructure, wildlife, and ecosystems (Gov't of NS 2009).

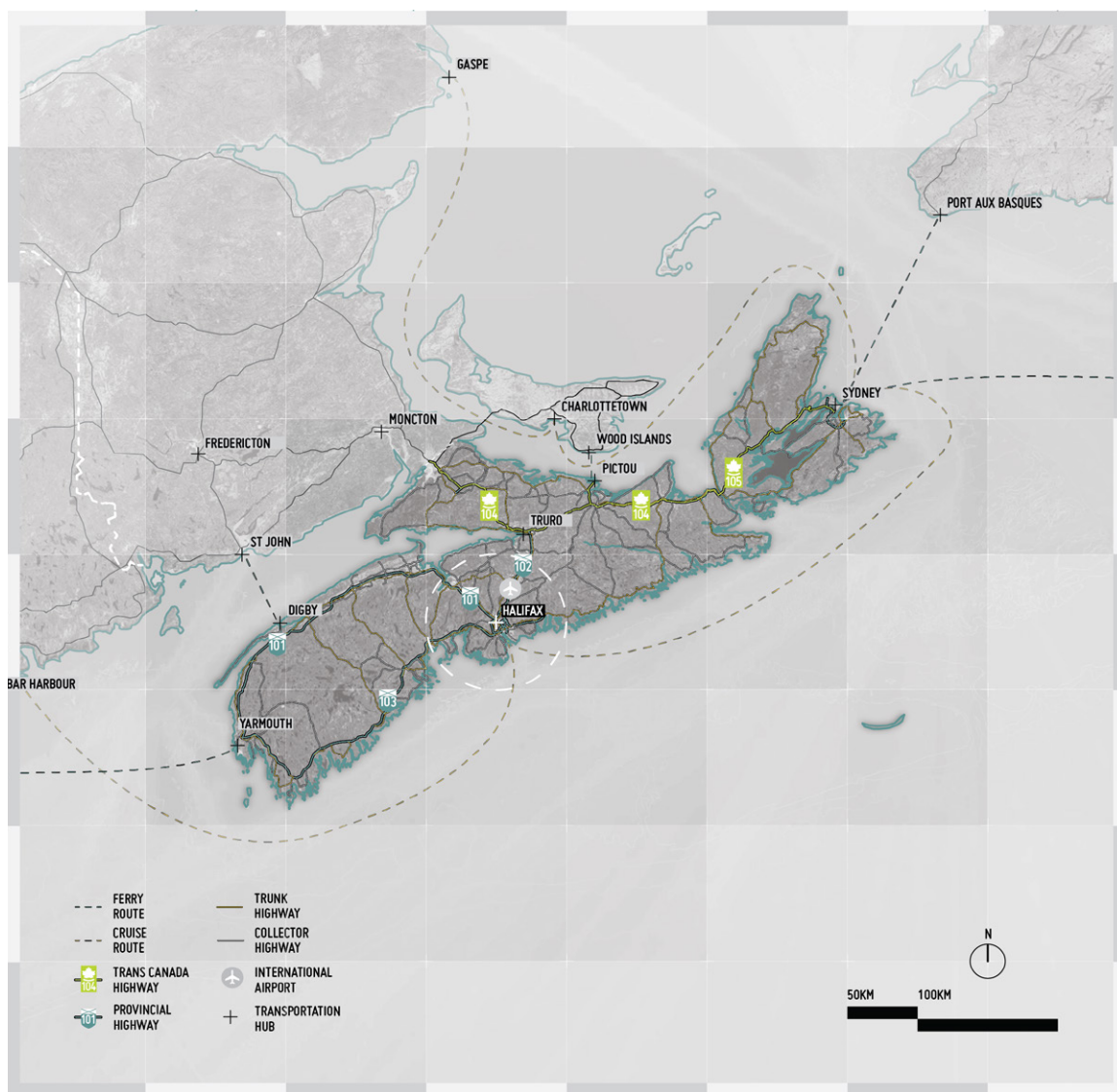


Sensitivity to sea level rise in Nova Scotia (data from Geological Survey of Canada, base image from Google)

## Transportation Network

As the largest metropolitan area east of Montreal, Halifax is the regional hub of Atlantic Canada’s Maritime provinces of Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland and Labrador. The greatest number of people arrive to the province by air at Halifax’s Stanfield International Airport, home base for all domestic, regional, and international flights. As has been the case for centuries, thousands of people arrive

every year by sea by ferry, cruise ship, and in some instances, sailboat. Halifax and Sydney are the main ports of call for more than 20 major cruise ship lines. The Trans Canada Highway, linked to the province by a ferry from Port-aux-Basques, Newfoundland, passes through Truro before heading west to New Brunswick, notably missing Halifax. Nevertheless, the city is well connected by provincial highways that follow the coast and regional highways that cut across land.

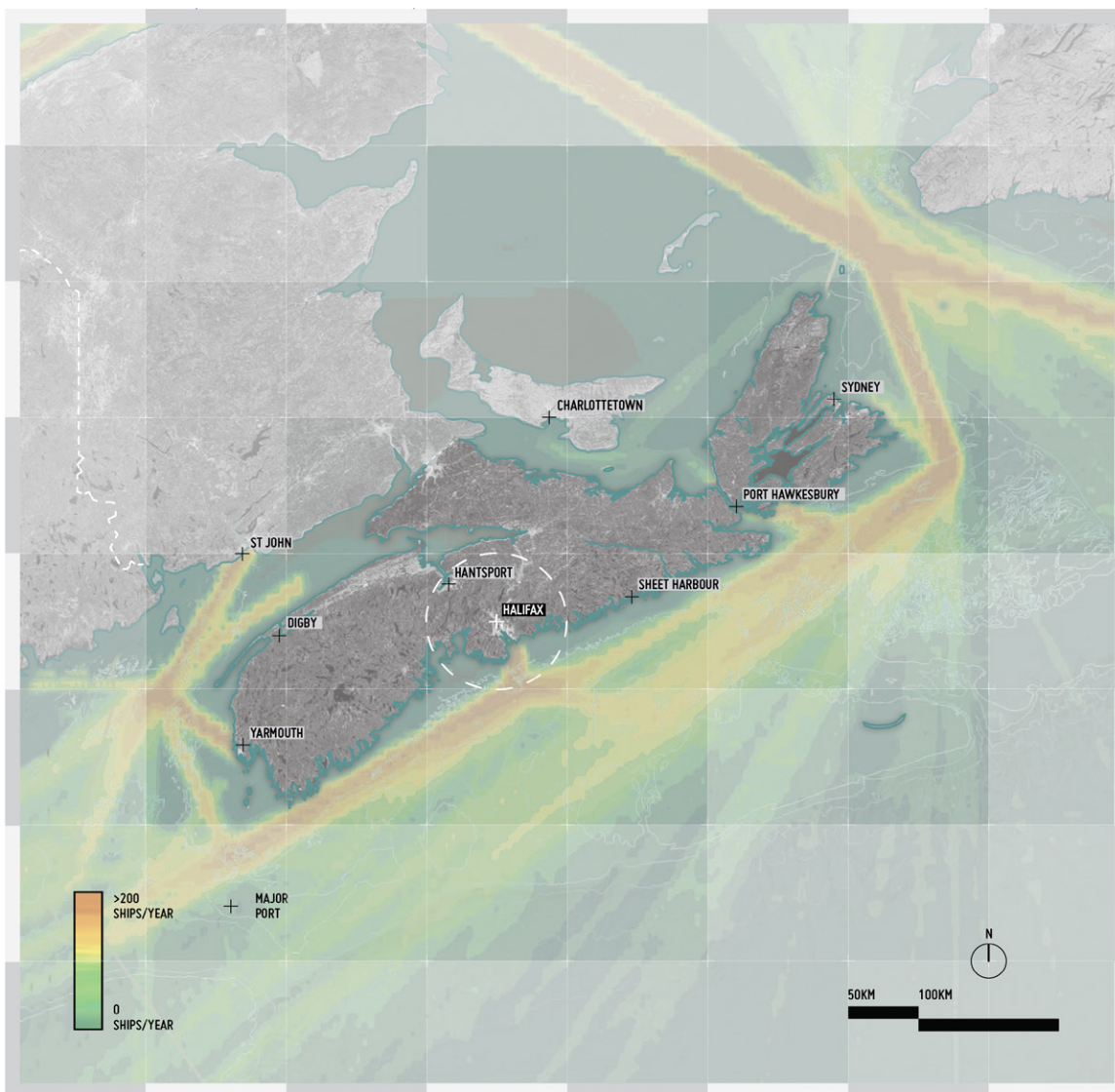


Transportation network in Nova Scotia (data from Tourism Nova Scotia, base image from Google)

### Shipping Traffic Density and Major Ports

Nova Scotia's economy is inextricably linked to the Atlantic Ocean. With major ports in Yarmouth, Digby, Halifax, Port Hawkesbury, and Sydney, the province is well connected to intercontinental trade routes. The Halifax Harbour is strategically located approximately one hour's sailing time north of the Great Circle Route that arcs between the eastern seaboard of the USA and the distant shores of Europe. As such, the harbour is the

first inbound and last outbound port of call in eastern North America with transcontinental rail connections. Its strategic location makes the it one of the largest commercial ports in Canada, with more than 13 million metric tonnes of cargo passing by McNabs Island and into the sheltered harbour every year (Port of Halifax 2016).

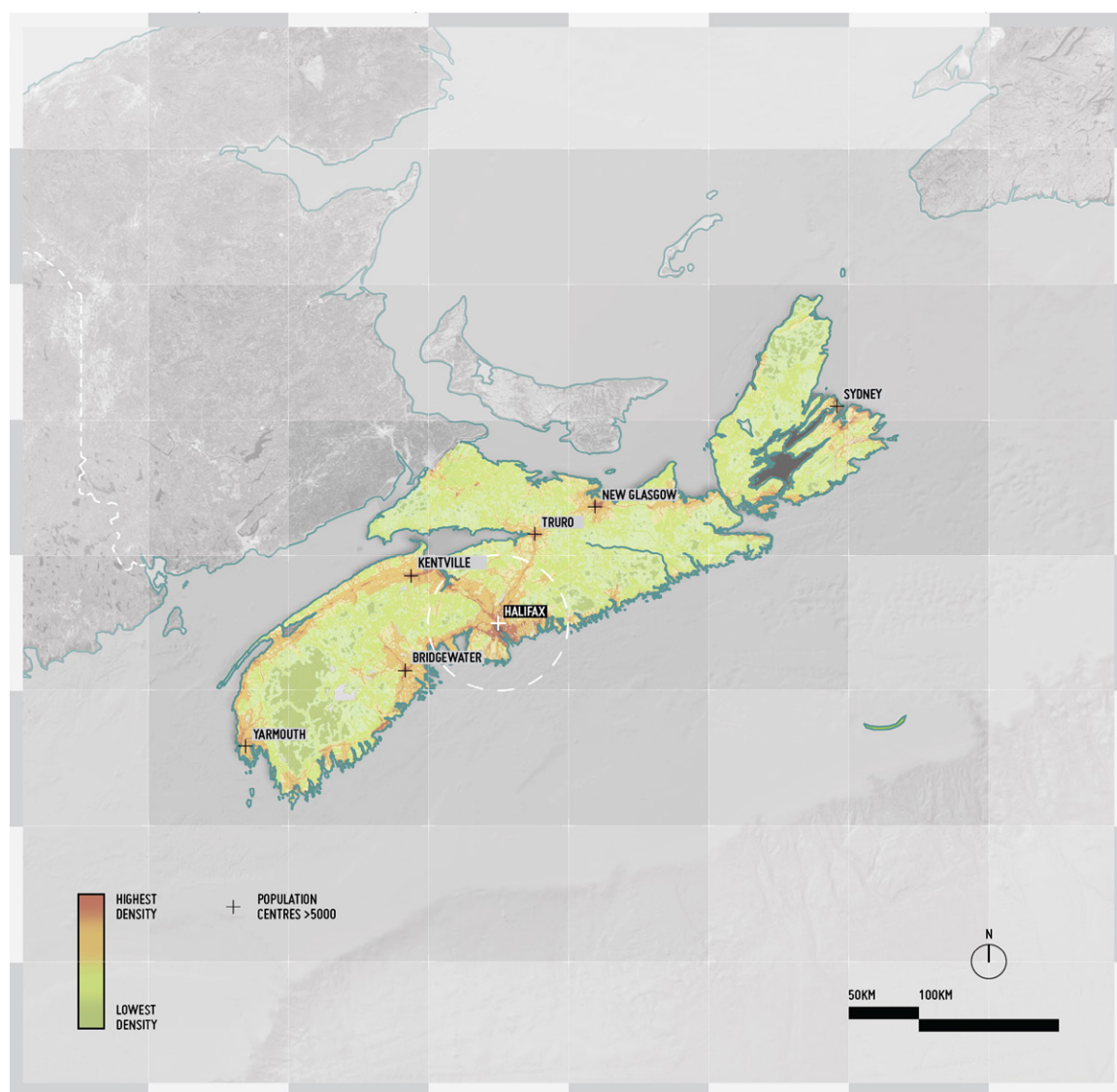


Shipping traffic density and major ports in Nova Scotia (data from Fisheries and Oceans Canada, base image from Google)

## Population and Infrastructure Density

Nova Scotia is both one of Canada's most rural and dense provinces. Based on the traditional fishing and shipping industries, the most development occurs along the coast. With Nova Scotians spread out in towns across the province, 43% of the population resided in rural communities. That being said, the Halifax Regional Municipality is home to 41% of the province's total population. Nova Scotia is experiencing

a shift in settlement patterns, the further the distance away from the provincial capital and central region of the province, the greater the population loss. As a result, rural Nova Scotia is encountering substantial infrastructural deficits and concerns regarding the quality of essential amenities such as roads and access to water (Markey 2015, 67).



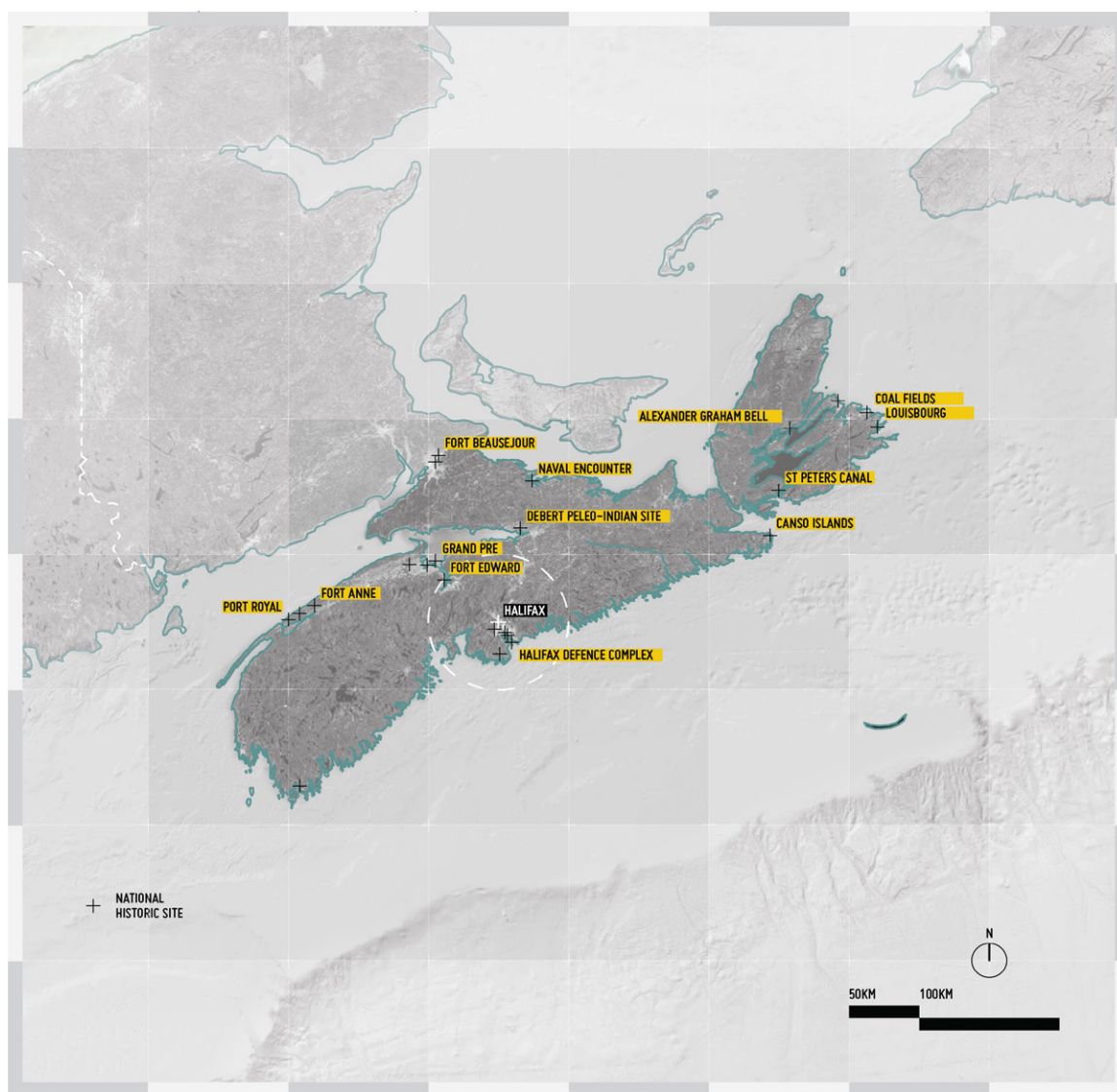
Population and infrastructure density in Nova Scotia (data from Two Countries and One Forest, base image from Google)

## National Historic Sites

The indigenous peoples called it Mi'kma'ki, the French called it Acadie, and the British called it New Scotland, Nova Scotia has a rich history dating back millennia. The Mi'kmaq were the area's first inhabitants, with their traditional lands encompassing Nova Scotia and stretching to Gaspé in current day Quebec. The first permanent settlement, Port Royal, was established by the French on the eastern shore in 1605. Claimed by

the British by Royal Charter in 1621, they eventually settled the mainland, leaving Cape Breton to the French.

Halifax, which has been the capital of the province since it was founded, boasts many National Historic Sites that tell the stories of the province's many peoples. The Halifax Defence Complex, a series of military sites surrounding the harbour, constitute a network of National Historic Sites, including Fort McNab on McNabs Island.



National historic sites in Nova Scotia (data from Tourism Nova Scotia, base image from Google)



## AN ISLAND IN THE CITY

McNabs and Lawlor Islands are in a critical area of transition between the city and the ocean, the Halifax Harbour. For navigational purposes, the official harbour limit is delineated by a line running from Herring Cove across the main channel to the northern side of McNabs Island, then from McNabs Island across Drake's Gut and past Lawlor Island to the community of Eastern Passage on the east side of the harbour.

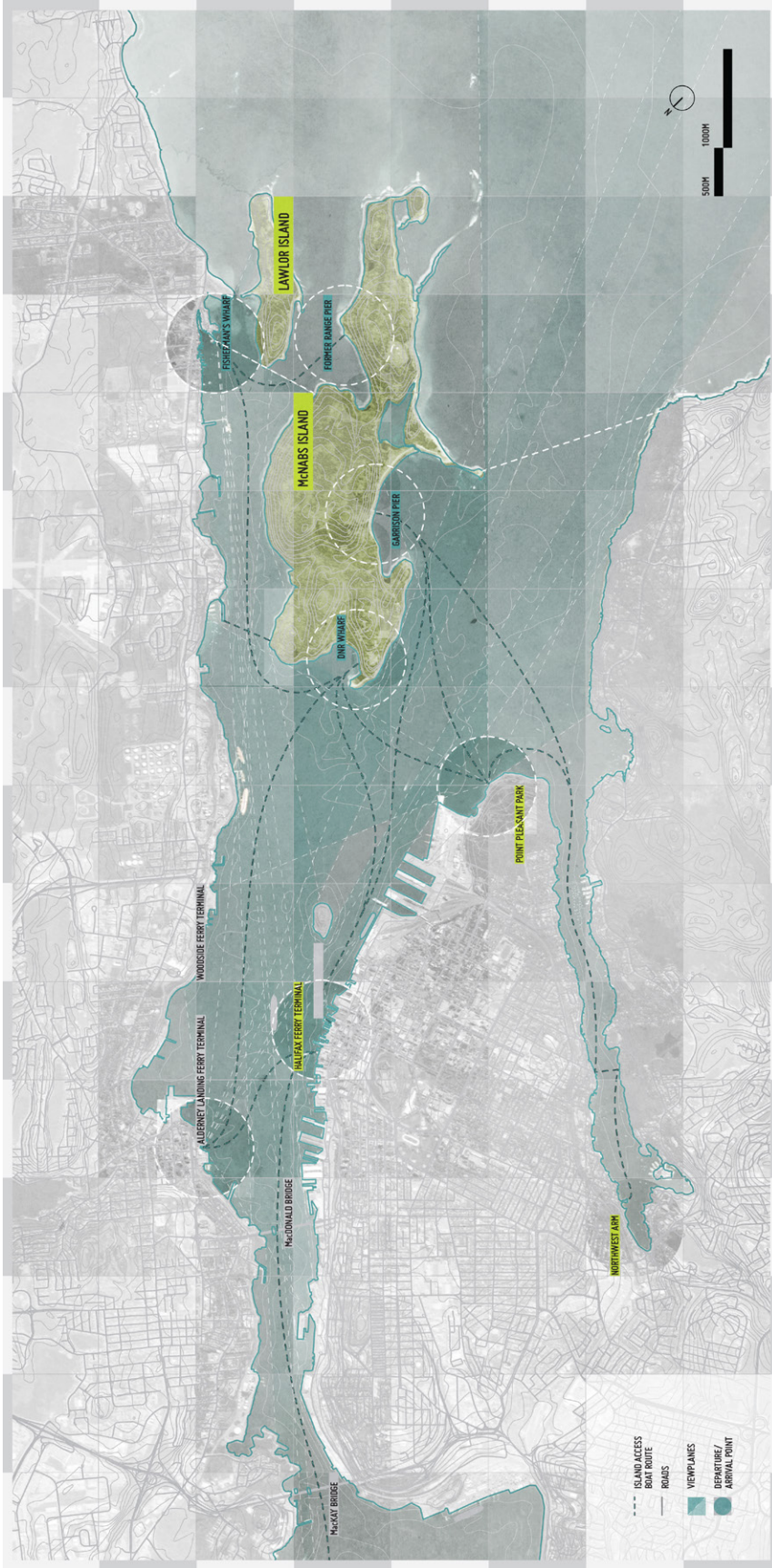
The coastal processes that shape the landscape are a layering of dynamic ecosystems and an ever-changing built infrastructure. The islands, initially formed by receding glaciers at the end of the last ice age, have recently been dramatically altered by surrounding resource based industries, transportation and defence infrastructure, and residential development. By mapping the harbour views, island access, coastal development, public waterfront access, parks, historic sites, and vulnerability to sea level rise, we will come to an understanding of the social conditions of McNabs Island in relation to the infrastructure of the city.

### Island Access and Harbour Views

Looking out from the shores of Point Pleasant Park, the docks of the Alderney Ferry Terminal, and the wharves of Eastern Passage, McNabs and Lawlor Islands can be seen stretching across the horizon. From various vantage points throughout the city, the gentle drumlins

of McNabs and Lawlor islands seem remote and inaccessible, far from the city that surrounds them. Despite the relative ease of accessing the islands, few Haligonians, let alone visitors, know how to cross the harbour to McNabs and Lawlor Island Provincial Park.

Accessible only by boat, the islands are rarely visited compared to other provincial parks in the region accessible by car. From the docks along the Halifax boardwalk, Dartmouth ferry terminal, and Fishemans's wharf, private ferries, commercial water taxis, and chartered zodiaks pick up passengers en-route to McNabs. Depending on pick-up and drop-off locations, the trip takes between 20-30 minutes from downtown Halifax or Dartmouth and 10 minutes from nearby Eastern Passage. For the adventurous, the island is accessible by kayak, especially from the closest points of Fisherman's Wharf in the community of Eastern Passage and the southern tip of Point Pleasant Park.



Island access and harbour views in the Halifax Harbour (data from HRM GIS Database, base image from Google)

## Parks and Historic Sites

Given its relatively small size, Halifax has an array of public parks, walking trails, and beaches to experience. That being said, McNabs and Lawlor Islands Provincial Park could contribute significantly to meet the demands for outdoor recreation in the Halifax metropolitan area. As an island, it represents a unique recreational and educational space, an opportunity that has yet to be fully realized.

In 1991 an estimated 30 000 people visited McNabs Island. By 2001, the number of visitors dropped by approximately 50% to 15 000. Today, estimates for annual visitation rates range from 6 000 to 10 000 people. For comparison, Point Pleasant Park, which is 20% the size of McNabs, sees about 1.2 million visits annually, 200 times that of McNabs (Austin 2014). For two parks only 1.5 kilometres apart at the closest point, the difference in use is dramatic.

The low visitation of McNabs and Lawlor Islands Provincial Park currently sees has not always been the case. Historically, McNabs Island has played a major role in providing recreational opportunities for Haligonians. In the latter part of the 19th century and early 20th century, several pleasure grounds were located on the island. During the halcyon days of the park, 4 000 to 6 000 revelers attended the 1845 summer picnic held by the Mechanics' Institute of Dartmouth, just one of the many major one-day events held on the island during this period . McNabs Island

was also the birthplace of the Bill Lynch Midway Show during the 1920's, still one of the largest carnivals in Atlantic Canada.

McNabs Island, perched atop the glacial drumlins was once a strategically important location for the British military to look out over the ocean against potential threats. Fort McNab, a national historic site, as well as Fort Ives, the Strawberry Battery, and Searchlight gun emplacements, were once an integral part of the Halifax Defence Complex. Today, the complex consists of five national historic sites. As one of four principal overseas naval stations of the British Empire during the 18th and 19th centuries, the Halifax Defence Complex includes the full range of shore defences from the 18th century to the Second World War. The Halifax Defence Complex is a valued and vital part of the fabric of Halifax, telling the stories of the city's former military significance.

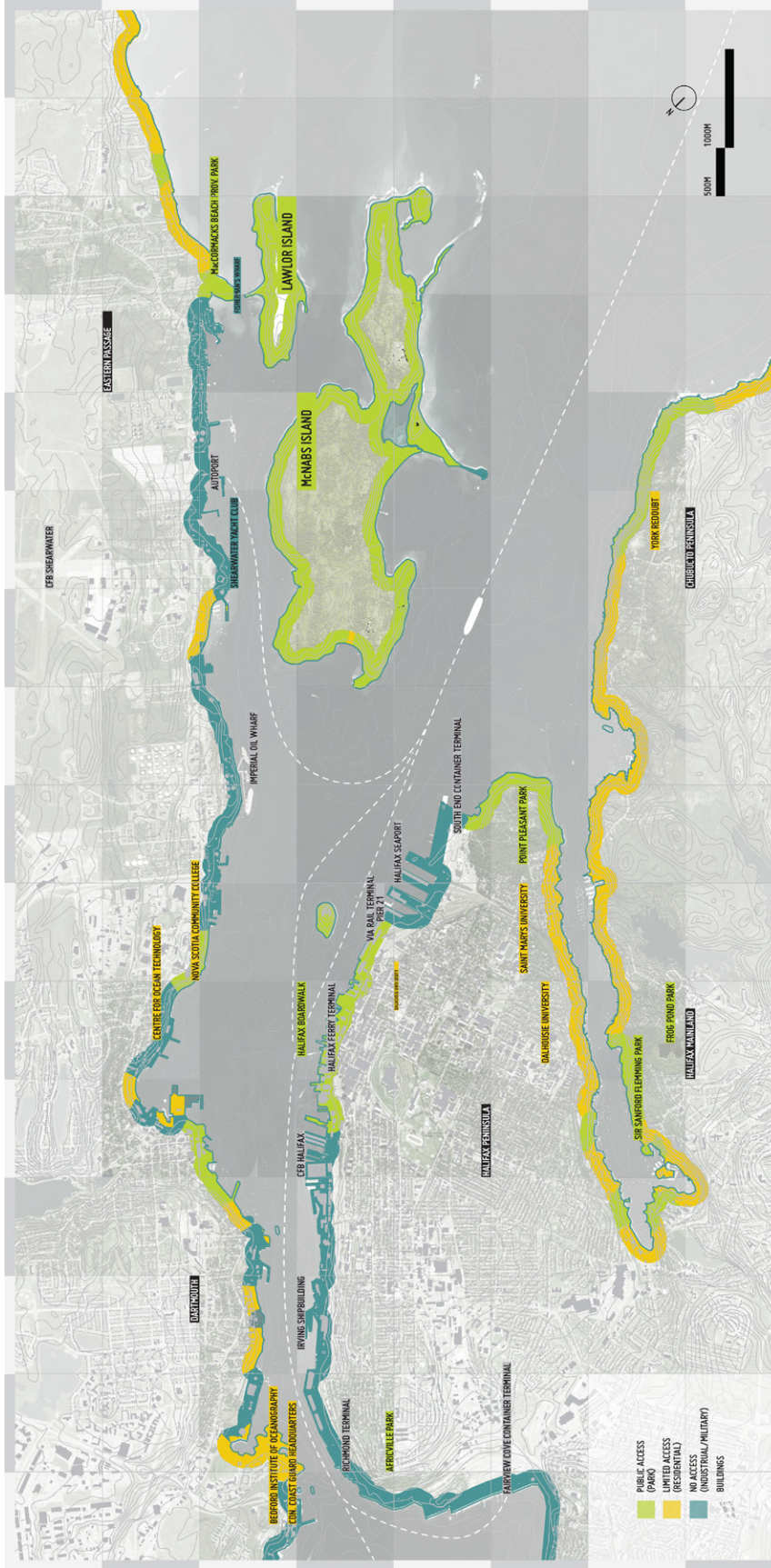


## Coastal Access and Development

The shoreline of McNabs Island is the longest stretch of uninterrupted coast accessible to the public in the Halifax Harbour. From the vantage point of McNabs Island, situated in the middle of the harbour, the city and the ocean come into full view. The island is an ideal location to experience the deep connection that Halifax has to the ocean. Having once been an important part of the regional infrastructure, the island's ruins relate to the current activity on the city's shoreline. With many of the city's main industries historically establishing their ports on the shoreline, however, public access to the waterfront is limited. The boardwalk brings Haligonians down to the water's edge, as does Point Pleasant Park, on the tip of the Halifax peninsula. With the exception of these two prominent locations, the majority of the harbour is zoned for industrial, military, or residential use.

The piers of the South End Container Terminal, Ocean Terminals, Seaport, Cruise Ship Pavilion, and Halifax Grain Elevator are the connected to the mainland by the Atlantic terminus of the CN rail line. The dockyards of the Canadian Forces Base, home to the Atlantic fleet, and the recently expanded Irving Shipbuilding headquarters dominate the Halifax side of the Narrows. On the north side of the peninsula, the Richmond Terminal and Fairview Cove Container Terminal were built in the 1980's to accommodate a transportation route that avoids the

congestion of Downtown Halifax. The Bedford Institute of Oceanography, at the channel leading to the Bedford Basin, is a federal oceans research centre that brings scientists from around the country and the world to the Halifax Harbour. On the Dartmouth side of the middle harbour, the Imperial Oil Refinery has recently been fully decommissioned, but will require decades of remediation before its soils will be safe for human use. The quaint fishing village of Eastern Passage and MacCormack's Beach Provincial Park provide access to the coast and McNabs Island across Drake's Gut.



Coastal access and development in Halifax Harbour (data from HRM GIS Database, base image from Google)

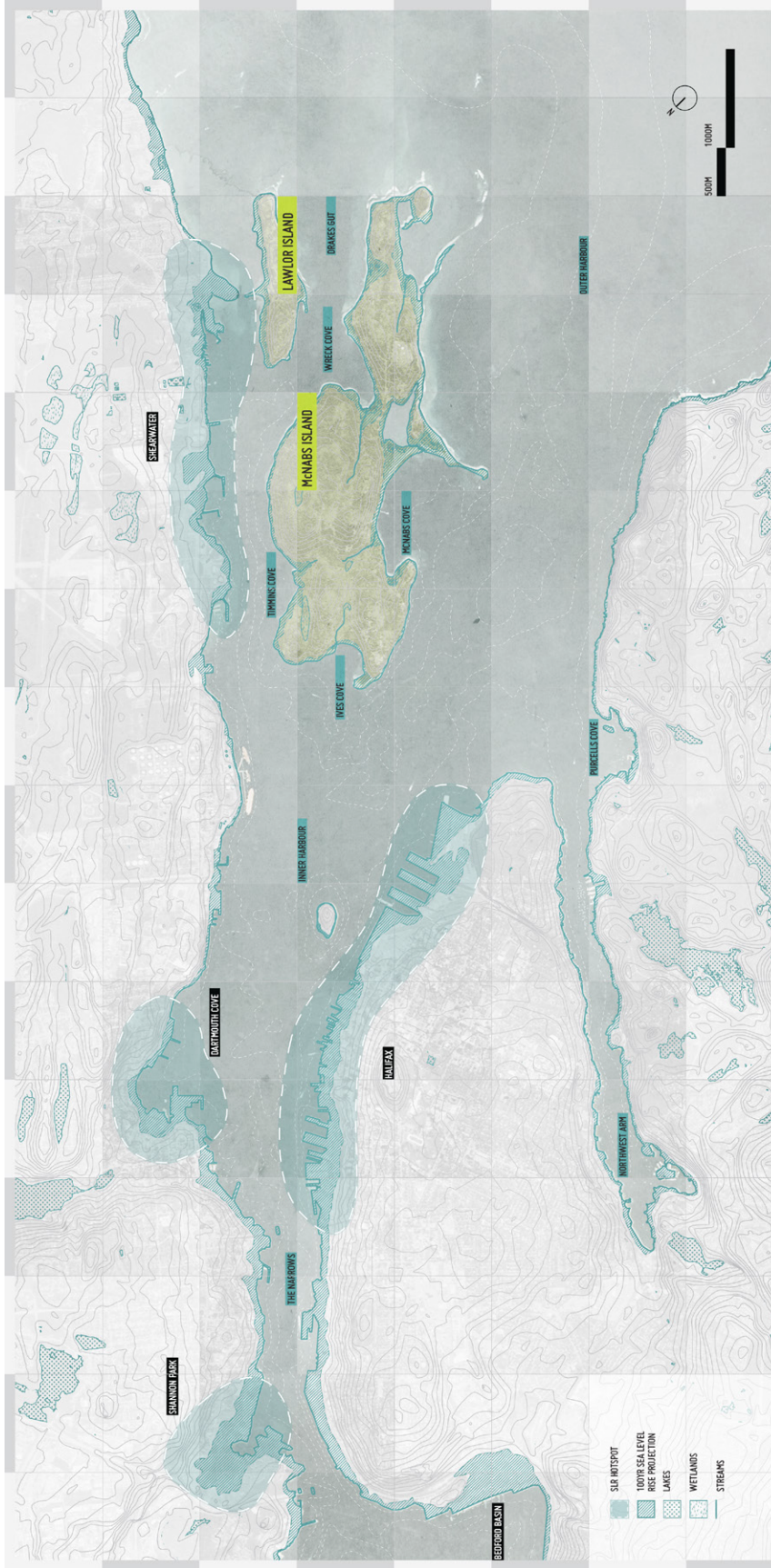
## Sensitivity to Sea Level Rise and Hydrology

Stretching across the mouth of the harbour, McNabs Island shelters the city from the rough Atlantic Ocean. McNabs and Lawlor Islands provide Halifax with critical natural defences against hurricanes and other natural disasters by absorbing wave energy and limiting storm surge. This trend is expected to continue, if not increase, as a result of climate change and sea level rise. After more than a century of ongoing tide-gauge measurements in the Halifax Harbour, the mean sea level has been rising continuously (Forbes et al. 2009, 2). There is now wide consensus that the global climate is warming and that this warming will result in accelerated sea level rise and other consequences such as changes in storm intensity and frequency, with serious implications for coastal residents (IPCC 2007). It is necessary to gather appropriate scientific data on the harbour shoreline, future sea levels, flooding hazards and vulnerability in order to anticipate the effects of climate-change and incorporate adaptation measures.

Not only is 80 percent of Halifax's population situated within 5 kilometres of the ocean, The Government of Canada's sea level rise sensitivity index places Halifax Harbour at the higher end of the spectrum (Forbes et al. 2009, 2). Based on the one hundred year sea level rise scenarios produced by the Bedford Institute of Oceanography, five areas around the Halifax Harbour have been identified as particularly

vulnerable. The selection of each location is based on a combination of factors, including global sea level rise, land subsidence, storm surge events and tidal fluctuations. The resulting areas are places with high human, social and economic activity that are vulnerable to the effects of sea level rise. They include Shearwater, Dartmouth Cove, Halifax waterfront, Shannon Park, and Bedford Basin.

McNabs Island is especially vulnerable to the effects of sea level rise relative to the rest of the harbour since its soil composition and bedrock geology is dramatically different from the coastline of most of the region. Composed of glacial till, the island is more susceptible to coastal erosion than the granite and slate coasts that surround. Furthermore, the island shelters the city from the open Atlantic Ocean by absorbing wave energy and, in extreme conditions, storm surge before it reaches the inner harbour.



Sensitivity to sealevel rise and hydrology in the Halifax Harbour (data from HRM GIS Database, base image from Google)



## A PARK ON AN ISLAND

At 400 hectares, nearly a quarter the area of the Halifax peninsula, McNabs and Lawlor Islands Provincial Park is an expansive protected area in Halifax, Nova Scotia, Atlantic Canada’s largest metropolitan area. With the greatest urban density centred around the Halifax Harbour, the greater region of the HRM has a population of 414 400 residents. McNabs and Lawlor Island Provincial Park is in an undeniably urban setting.

Just 1.5 kilometres from the Halifax peninsula at its closest point, the park is accessible only by boat. More than 5 kilometres long and 1.5 kilometres wide, McNabs Island is the larger island of the two islands. Lawlor Island is 55 hectares and located opposite MacCormicks Beach in Eastern Passage.

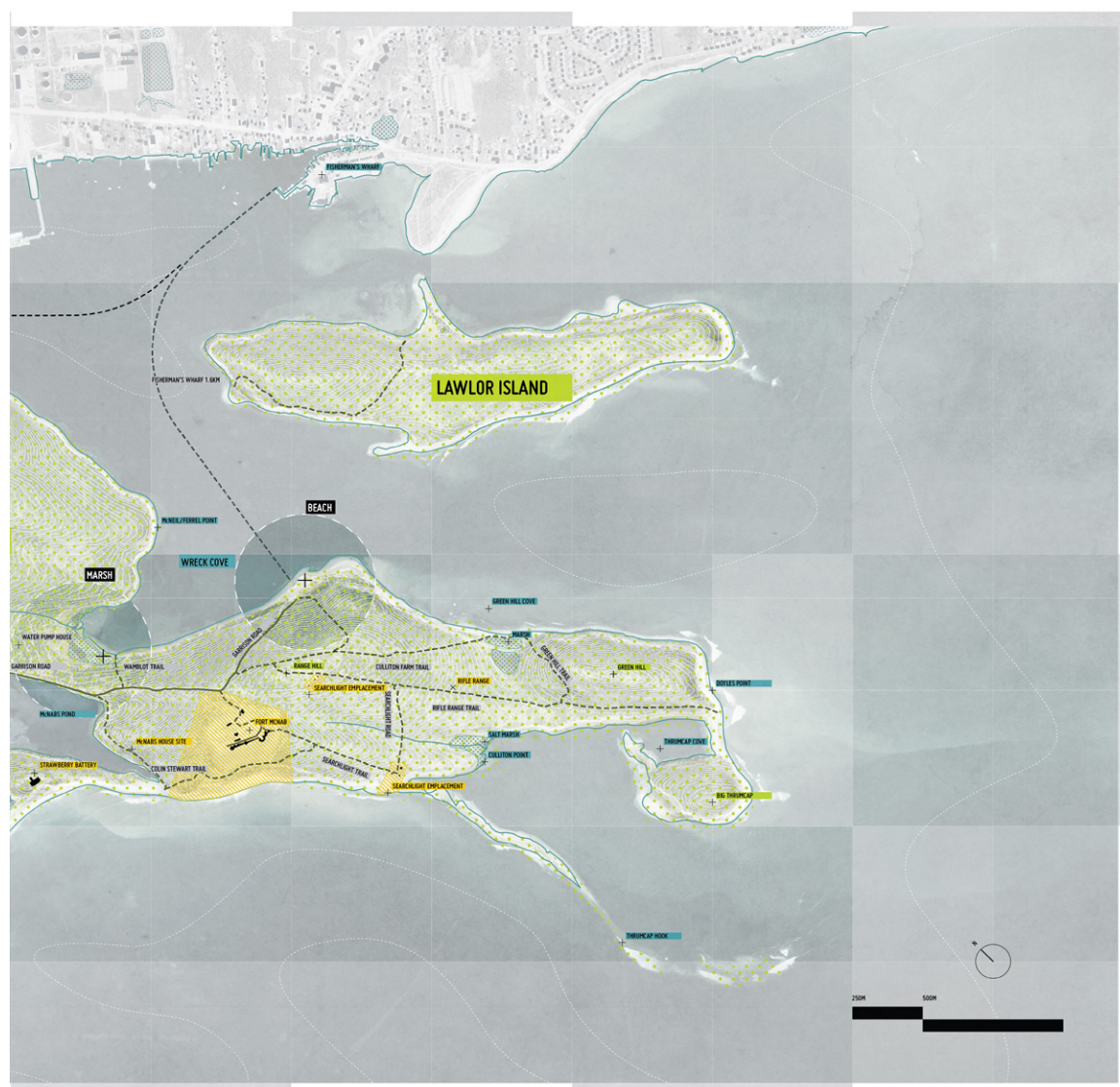
The park, which was established in 2002 by a volunteer advocacy group called Friends of McNabs Island Society (FOMIS), is almost entirely owned by the Province of Nova Scotia and maintained by the



Department of Natural Resources. Parks Canada manages Fort McNab National Historical Site and its immediate surroundings. A few small plots on the island are still privately owned.

By investigating the forest cover, Hurricane Juan storm damage, park zoning, trails, ruins, slope, soils, hydrology, and sensitivity to sea level rise, we will come to a comprehensive understanding of the socio-ecological conditions on McNabs Island. Four sites in particular have been identified based on their unique

coastal processes and their susceptibility sea level rise. The four sites of focus are: the cliff at Hugonin Point, the dune at Maugher Beach, the marsh at Wreck Cove, and the beach at Wreck Cove. These four sites will provide a basis for further design as test sites for coastal adaptation strategies explored during the *FIELD TRIP*.



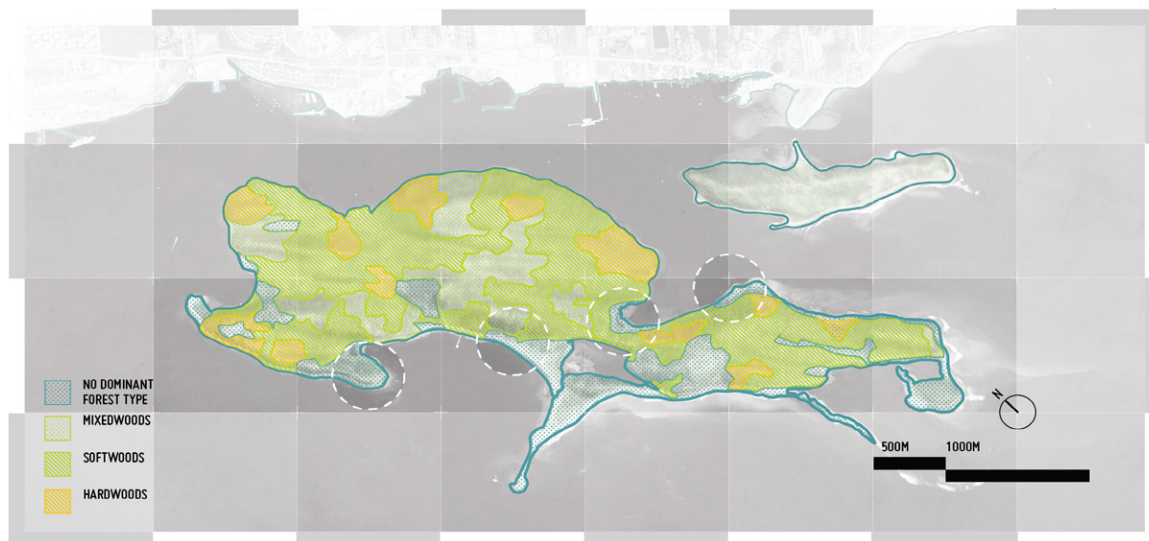
McNabs Island (data from Friends of McNabs Island Society and HRM GIS Database, base image from Google)

## Forest Cover

The vegetation on McNabs and Lawlor Islands has been heavily modified by various human uses over the past two hundred years. Most of McNabs Island and all of Lawlor Island were cleared at one time for agriculture, military fortifications, or lumber harvesting. As such, much of the island has been colonized by first successional species as formerly cleared areas revert to forest. The usual successional forest on abandoned fields is dominated by white spruce.

The drumlins that constitute the islands support a mosaic of forest types dominated by climax species of tolerant hardwoods and red spruce, with varying amounts of the early successional species of white spruce, balsam fir, white birch, red maple, and aspen. The lower slopes of the drumlins that immediately border the coastline support a salt and wind tolerant white spruce/white birch forest type (NS Dept. of Natural Resources 2005, 14).

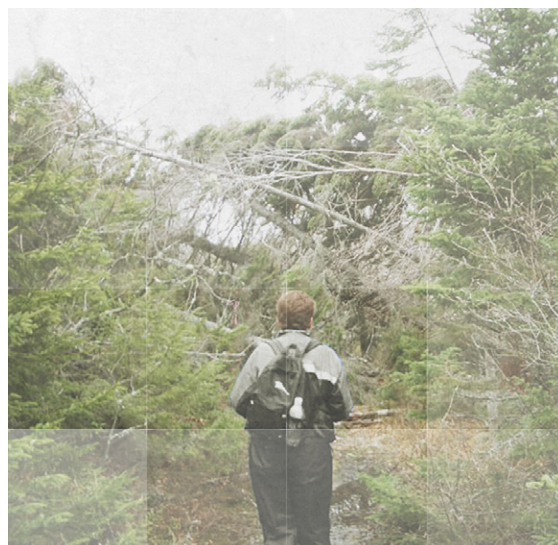
Low areas between the drumlins, and the southern part of the island, support the well- to imperfectly drained undulating terrain ecosystem. This ecosystem type is dominated by the climatic climax red spruce, with varying amounts of early successional coniferous and deciduous tree species, including balsam fir, black spruce, white spruce and red maple (NS Dept. of Natural Resources 2005, 14).



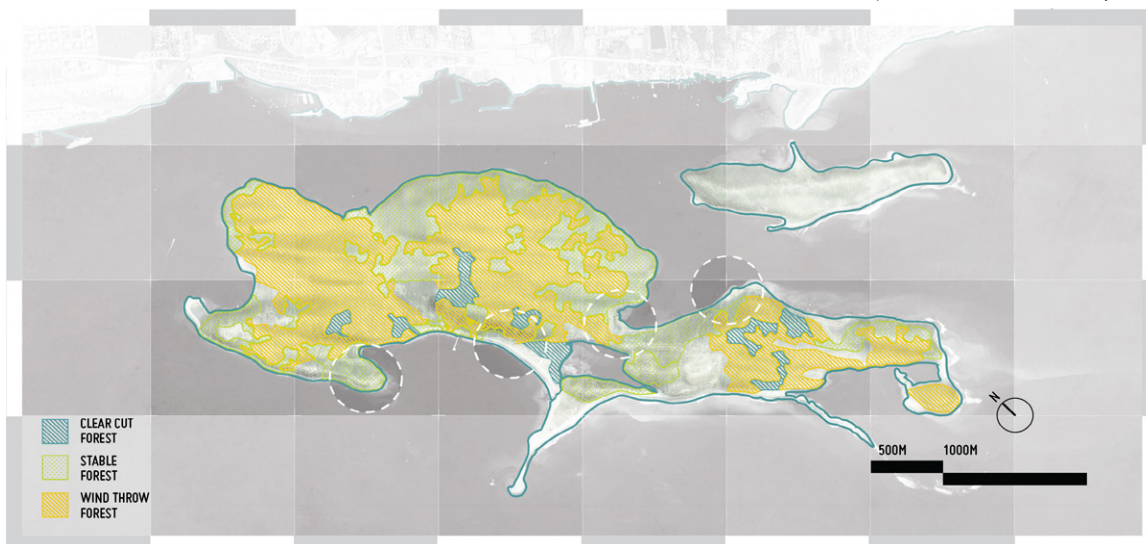
Forest cover on McNabs Island (data from McNabs Island Trail System Plan, base image from Google)

## Hurricane Juan Forest Damage

In September of 2003, Hurricane Juan caused extensive damage on McNabs Island, with some of the highest wind speeds in Nova Scotia recorded on the island's south western tip of Big Thrumcap. The highest points on the Island, drumlins composed of relatively loose glacial till, were the most affected by windthrow, trees uprooted or broken by the wind. As much as 75 percent of the forest cover on the northern half of McNabs Island was damaged. (Management Plan, 2005). The network of trails, especially those on the interior of the island, were made impassable. In 2004, an extensive clean-up of the trails was completed and the island was re-opened to the public. The effects of the storm can still be seen on the island as the hundreds of spruce trees felled during the storm now provide habitat for the Brown Spruce Long-horn Beetle, an exotic pest discovered on the island in 2000 (NS Dept. of Natural Resources 2005, 5).



Hurricane Juan trail cleanup (Friends of McNabs Island Society 2004)

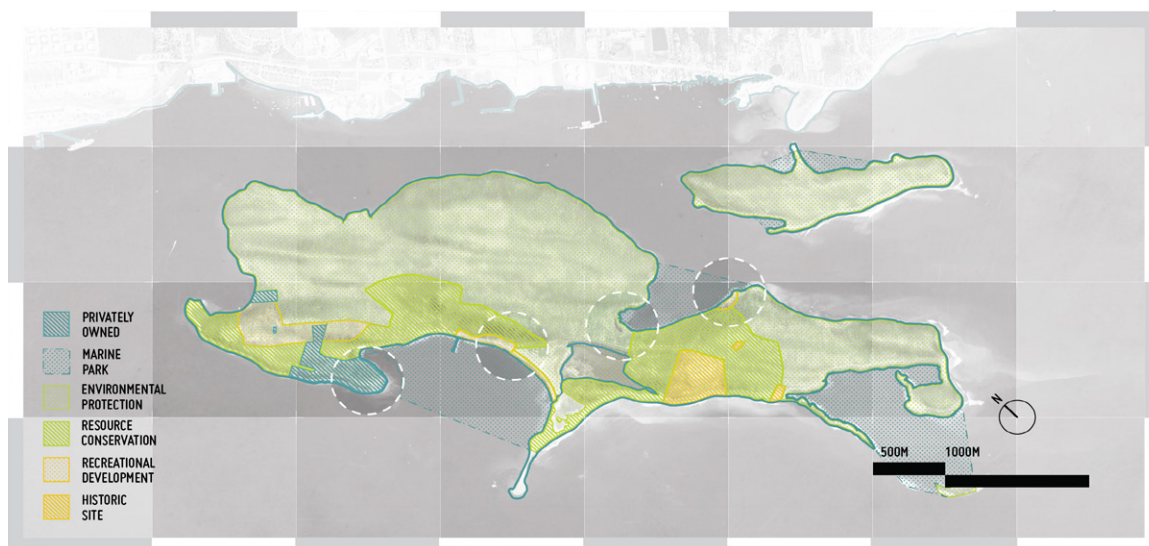


Hurricane Juan forest damage on McNabs Island (data from McNabs Island Trail System Plan, base image from Google)

## Park Zoning

Park zoning defines the degree of protection, conservation, and development that may occur within respective park areas. There are three main zoning classifications on the island: environmental protection, resource conservation, and recreational development. According to the McNabs and Lawlor Islands Provincial Park Management Plan, published by the Nova Scotia Department of Natural Resources, zoning allocates park lands and waters on the basis of the importance attached to their protection as heritage resources and to their capability and suitability for recreational use and associated facility and service development. The first two zoning types are protection oriented, while the third allows for more intensive development and use. Environmental Protection Zones are areas of the park that are highly sensitive or contain significant natural heritage values that require protection. Interpretive, educational, and scientific activities are permitted

if they do not compromise protection objectives. Resource Conservation Zones are areas of the park that contain significant natural and cultural features that require a high standard of conservation. These areas include a number of trails, scenic viewpoints, beaches, fortifications and numerous archaeological sites. Recreational Development Zones are areas of a park that is capable of supporting the development of facilities and services associated with outdoor recreation activities and more intensive visitor use. This zone is used to focus park facilities and services, as well as public use, within the most appropriate park areas without compromising protection-oriented values of the park. Finally, there are more than 200 hectares of marine area located within the park. Much of McNabs Cove, Wreck Cove, and the area surrounding Big Thrumcap have been identified as Marine Park (NS Dept. of Natural Resources 2005, 24).



Park zoning on McNabs Island (data from NS Dept of Natural Resources, base image from Google)

Trails

The current trail system on McNabs Island consists of a mix of old roads and trails that provide access to most of the island. Some are historical connections originally developed for military purposes or as trails accessing various tenant farms once scattered throughout the island. The more recently constructed trails were developed for recreational use. The trail network is linear, consisting of a central north-south corridor, Garrison Road. There are north end loop, a series of spur trails leading to coastal points, former farm sites or decommissioned utility points.

Some of the trails are former roads that have fallen into disrepair. In a few cases, road surfaces appear to have settled and they are now saturated with water. Notwithstanding the current state of the roads and trails, the island could offer an outstanding trail experience and become a valuable tourism asset in the region (NS Dept. of Natural Resources 2014, 3).



North island long loop (data from Friends of McNabs Island Society 2008)



Mid island short loop (data from Friends of McNabs Island Society 2008)



Mid island long loop (data from Friends of McNabs Island Society 2008)



South island long loop (data from Friends of McNabs Island Society 2008)



Trails on McNabs Island (data from McNabs Island Trail System Plan, base image from Google)

## Ruins and Abandoned Buildings

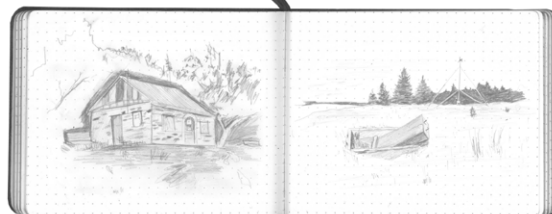
From the shell middens found on the southern tip of the island, to the military fortifications on the hilltops, McNabs Island is filled with ruins and abandoned buildings that tell the story of the island's and peoples' history. There are buildings that relate to all phases of the island's past including the Mi'kmaq fishing encampments, early British military settlements, residential houses and cabins, recreational grounds, and even artifacts remaining from when there was a bottling factory on the island. The most visited ruins are Fort McNab, recently given safety upgrades by Parks Canada, and Fort Ives. These two sites also constitute the largest collection of abandoned buildings on the island. For safety reasons, many of the ruins and abandoned buildings are inaccessible. Some of the dilapidated residential buildings have been condemned, such as the Davis-Conrad House, and some of them have been burned down to prevent visitors

from injuring themselves.

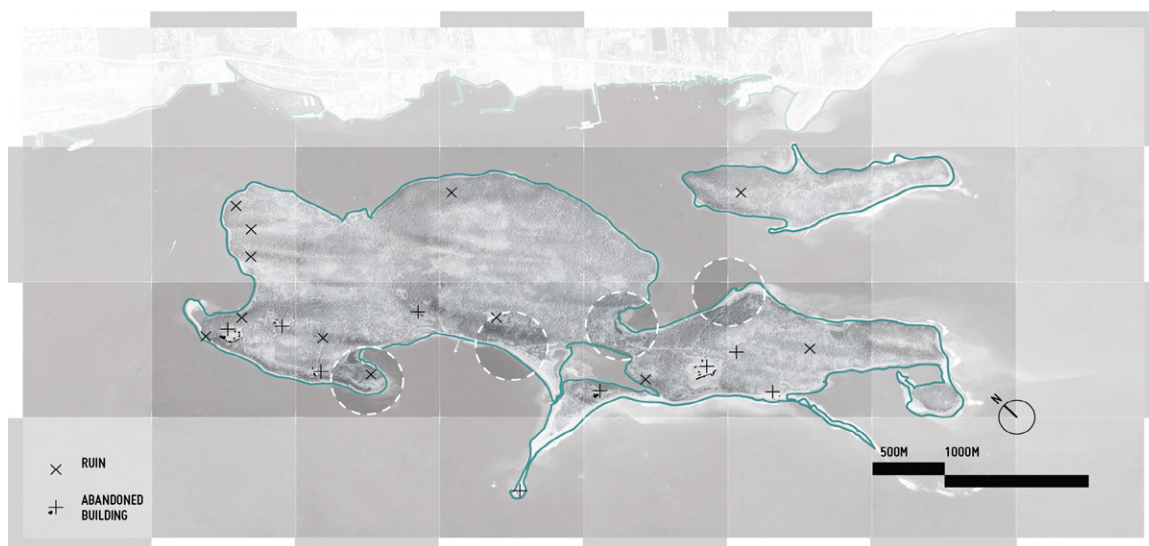
In addition to the beauty of the coastal landscape, the ruins are a major draw and attraction to the island. There is an innate fascination that people have with ruins. Perhaps it is the notion that, when we see the failures of previous people to adapt to the landscape, we see our own fragility and consider what will become our way of life. Frozen in time and overtaken by nature, the buildings give us insight into the way things change.



Site sketches from 10/09/15



Site sketches from 04/06/16

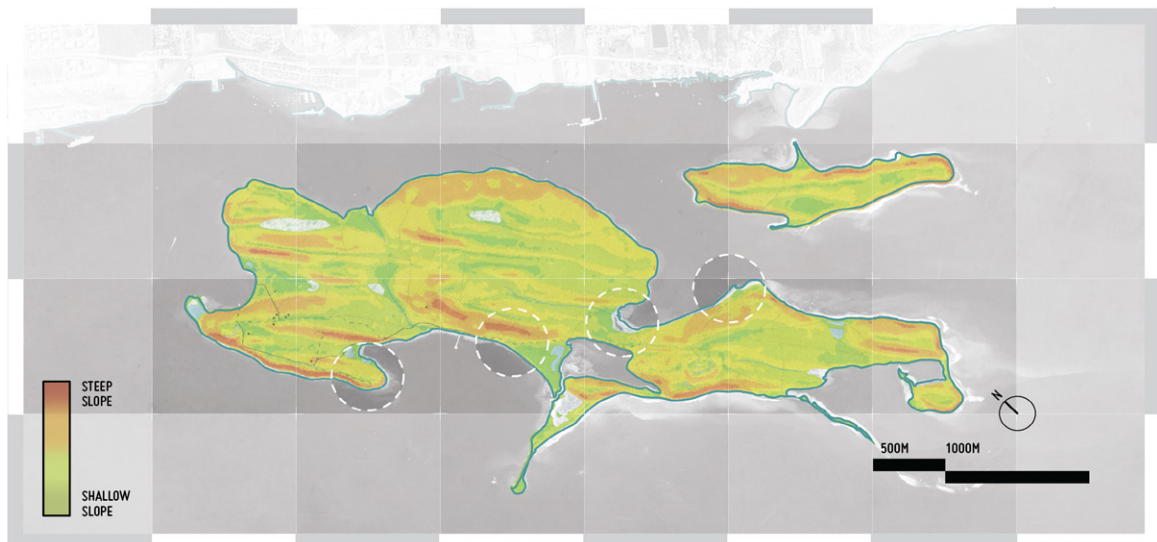


Ruins and abandoned buildings on McNabs Island (data from HRM GIS Database, base image from Google)

## Slope

McNabs Island essentially comprises a complex of drumlins oriented roughly from northwest to southeast. These drumlins provide a gently to steeply rolling topography. Elevations range from sea level to 48 metres on McNabs Island and 27 metres on Lawlor Island. The drumlins are formed from glacial deposits. On McNabs Island the glacial till is actively eroding at several locations where wave action is cutting steep banks in exposed drumlin material. In general, the highest rates of erosion occur along coasts facing the Atlantic Ocean, creating steep cliffs.

Many of the islands trails run parallel to the orientation of the drumlins. This allows for a more gentle ascent and descent along the most actively used trails of Garrison Road, the main connector and central axis on the island. Areas where coastal erosion has taken into the ocean have been made inaccessible for safety reasons.



Slope on McNabs Island (data from HRM GIS Database, base image from Google)

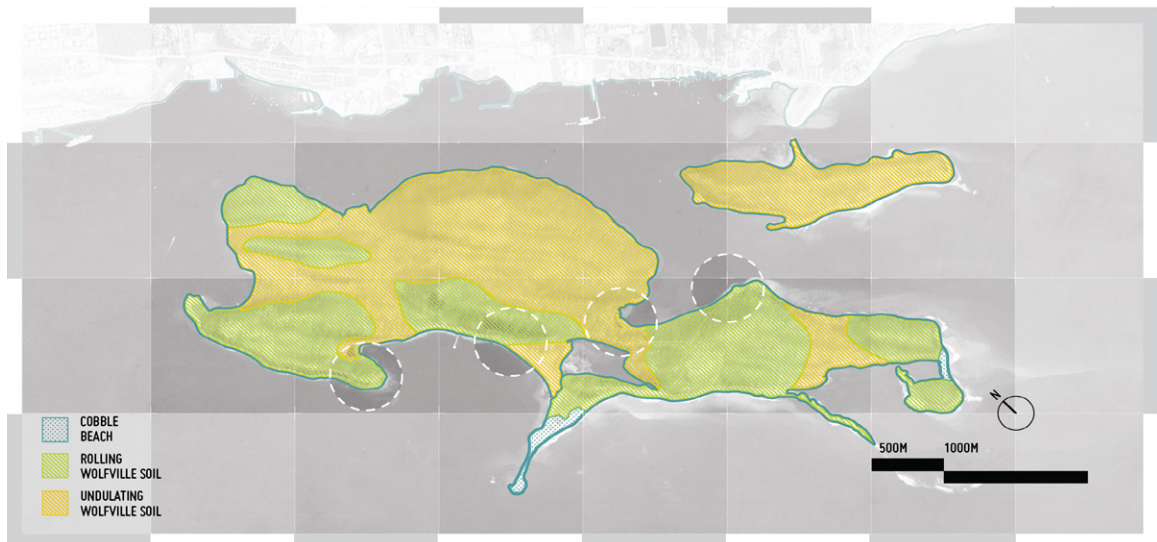


## Soils

McNabs Island is composed of a complex of drumlins oriented from northwest to southeast. The drumlins provide a gently to steeply rolling topography with several small waterways and bogs found between them. Lawlor Island contains a single drumlin with no significant exposures of surface water. Elevations range from sea level to 48 metres on McNabs Island and 27 metres on Lawlor Island. (Dept. of Natural Resources 2005, 13). The drumlins are formed of glacial deposits of reddish-brown till. The relatively loose till makes the islands distinct in the region and more susceptible to erosion than the surrounding coasts.



Exposed cliff face at Hangman's Beach



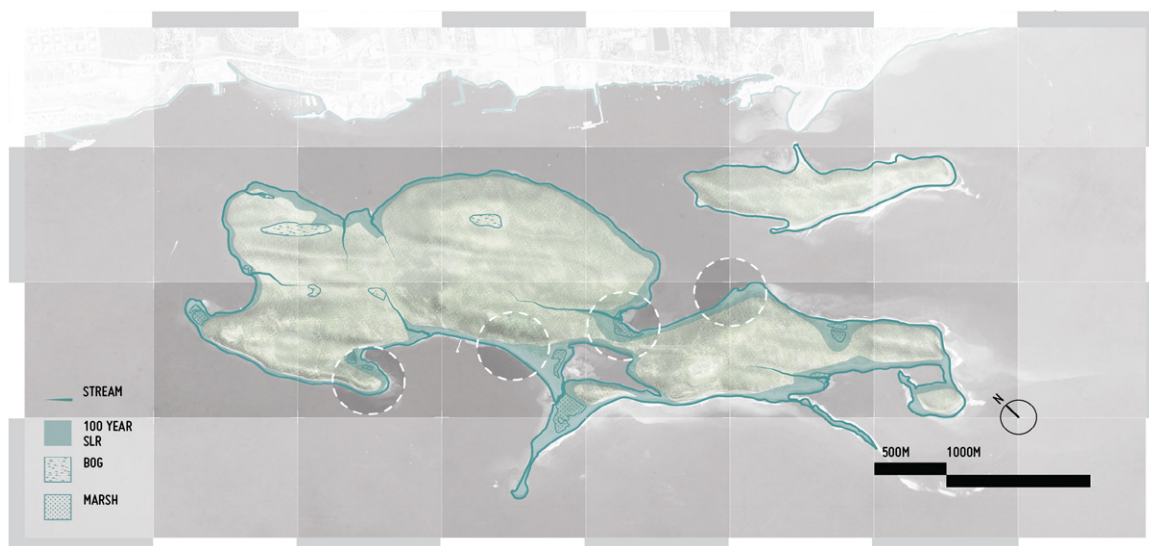
Soils on McNabs Island (data from McNabs Island Trail System Plan, base image from Google)

## Sensitivity to Sea Level Rise and Hydrology

McNabs and Lawlor Island Provincial Park is at risk from the effects of sea level rise. With an uncertain future, several sites along the coast of the island are rapidly changing. Although not all of these effects are attributable to climate change, the trend is that, it will put key features of the park's infrastructure at risk as sea level continues to rise.

A variety of coastal processes combine to constantly reshape the islands. On McNabs Island the glacial till is actively eroding at several locations where wave action is cutting steep banks in exposed drumlin material. On Lawlor Island erosion is occurring primarily at the exposed southern end of the island. In general, the highest rates of erosion occur along beaches facing the Atlantic Ocean. (Dept. of Natural Resources 2005, 13). Human activity has also helped to shape McNabs Island. Large-scale removal of rock from cobble beaches at the southern end of the island

has accelerated erosion, especially of Little Thrumcap. A causeway that was constructed to provide access to the lighthouse had prevented the natural flushing of McNabs Cove, enabling Maugher Beach to develop and McNabs Cove to become a freshwater pond.



Sensitivity to sea level rise and hydrology (data from HRM GIS Database, base image from Google)

## User Groups

McNabs and Lawlor Islands Provincial Park has the potential to provide opportunities for environmental education, recreation, and tourism to a wide range of user groups. Among the thousands that visit the park annually, visitors include those interested in the natural and cultural history, outdoor recreation amenities, and self-directed environmental education tours. With few visitors taking the opportunity to camp, the majority of visitors make their return trip to the mainland on the same day they arrive. The park has variety of outdoor recreational opportunities including, hiking, cycling, swimming, bird watching, and kayaking. In addition, there are an array of interpretive programs for schools, universities, and special interest groups such as youth groups, naturalist groups, and historical societies provided by seasonal park employees. The interpretive program features several levels of field interpretation.

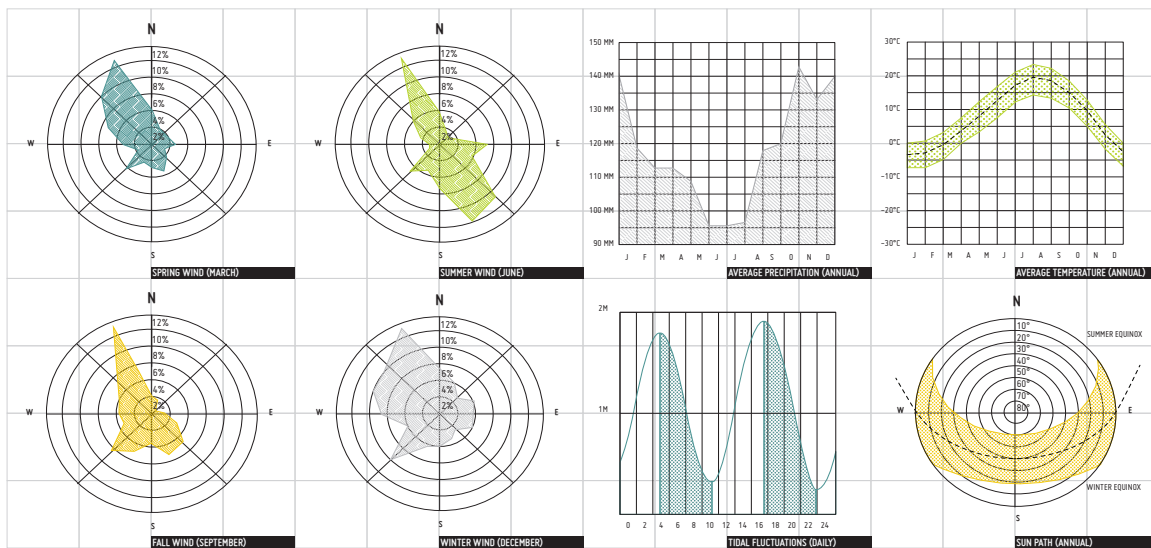
With an expanded infrastructure, these programs can be further developed. Providing additional facilities would mean expanding upon the services currently offered by the park. With a permanent field station, for instance, park management could have an ongoing presence on the island, resulting in more finely attuned active adaptive management strategies. With particular attention given to changes in the landscape as climate change and sea level rise take their toll on the natural and cultural conditions of the landscape, visitors can become more engaged in monitoring and, in turn, managing the park.



User Groups

### Climatic Conditions

McNabs and Lawlor Islands are situated within the maritime-temperate climatic zone, strongly influenced by their proximity to the Atlantic Ocean. For most of the year, the prevailing winds come from the northwest, parallel to the length of the island. The average precipitation during the dryer spring and summer months from May to September is 100 millimetres, compared with 124 millimetres during the fall and winter. June and July are by far the driest months of the year on the islands. The average annual snowfall is 190 centimetres, with accumulations varying greatly from year to year. The average annual temperature is 7°C and the mean July temperature is 18°C. The islands receive, on average, 209 hours of sunshine monthly between May and September, and 129 hours from October to April.



Climatic Condition

## A SOCIO-ECOLOGICAL HISTORY OF THE ISLAND

### The M'ikmaq

The Mi'kmaq were the islands' first inhabitants nearly 1500 years ago. For more than a millennium, they established seasonal camps on the island's shores. With no permanent settlement, the Mi'kmaq participated in an annual cycle of seasonal migration between living in dispersed inland encampments during the fall and winter and larger coastal communities during the spring and summer. Archaeological research has shown the Mi'kmaq hunted and fished on the McNabs Island, setting up their temporary villages on the shores of sheltered coves.

As evidence of their inhabitation, shell middens can be found hidden in the forests of McNabs Island. Shell middens are places where the debris from eating shellfish and other food has accumulated over time. They can contain shellfish remains, bones of fish,

birds, and land and sea mammals used for food. These remains give insight into where the Mi'kmaq set up residency on the island.

The Mi'kmaq were aware of their place in the broader context of the region and drew a connection between their settlement patterns and the carrying capacity of the landscape. By shifting their places of dwelling between land and sea, they expanded their resource base while minimizing their impact on the landscape. Since they were able to successfully repeat this cycle for centuries, their seasonal inhabitation of McNabs Island shows us a deep understanding of the cyclical nature of ecological processes.



Seasonal fishing encampment at Indian Point

## The Europeans

The French established a fishing station on McNabs in the 1690s when it was known as Isle de Chibouquetou. In 1711 French military engineers went as far as to draw up plans for a prospective town and fortifications on the island. Those plans came never came to fruition, however, since the French ceded mainland Nova Scotia to the British while claiming Cape Breton with the signing of the Treaty of Utrecht in 1713.

The French fishing port, similar to many found dotted along the coasts of Canada, were a resource based infrastructure in that allowed for large quantities of fish to be processed and distributed. At the time, it was that was a central part of the regional food network, with seasoned fish making their way as far away as Europe.

Due to their positioning in the context of the region, they were able to exploit the resource to suit their use in an efficient and far-reaching way. The

island, then, became an interface between the culture and the resources needed to sustain life. The French use of McNabs represents the beginning of seeing nature's bounty as an exploitable resource with benefits that reached far beyond the region, an outlook that has had the greatest effect in ecology of the island over time.



Lighthouse and breakwater at Maugher Beach

## The Colonizers

Isle de Chibouquetou became Cornwallis Island in 1749 to honour Edward Cornwallis, a British military officer and founder of Halifax. During British colonization of the area, the early settlers used the island for a variety of purposes, including drying fish on its banks, harvesting lumber from its forests, and grazing livestock on its newly cleared hills. Almost the entirety of both McNabs and Lawlor Islands were clear cut for lumber, when much of the province's prosperity came from wooden ships and the lumber they carried overseas. Once the land was cleared, it was used for livestock to graze. A small number of tenant farmers established homesteads on the island. In 1752, the island was granted to Edward Cornwallis's three nephews, Henry, James, and William, a patronage gift that upset many who thought the prime piece of real estate should be made available to the settlers "instead of cooping them up on a small isthmus," the current day Halifax Peninsula (Fisher

1996, 71).

The island has since been colonized by white spruce. White spruce is a first successional species also known as field spruce for its ability to become the dominant species on abandoned farm fields. The forests that make up McNabs Island are to this day a direct result of the silvicultural and agricultural past of the early settlers.



Tenant farming and first successional forests at Finlay Farm

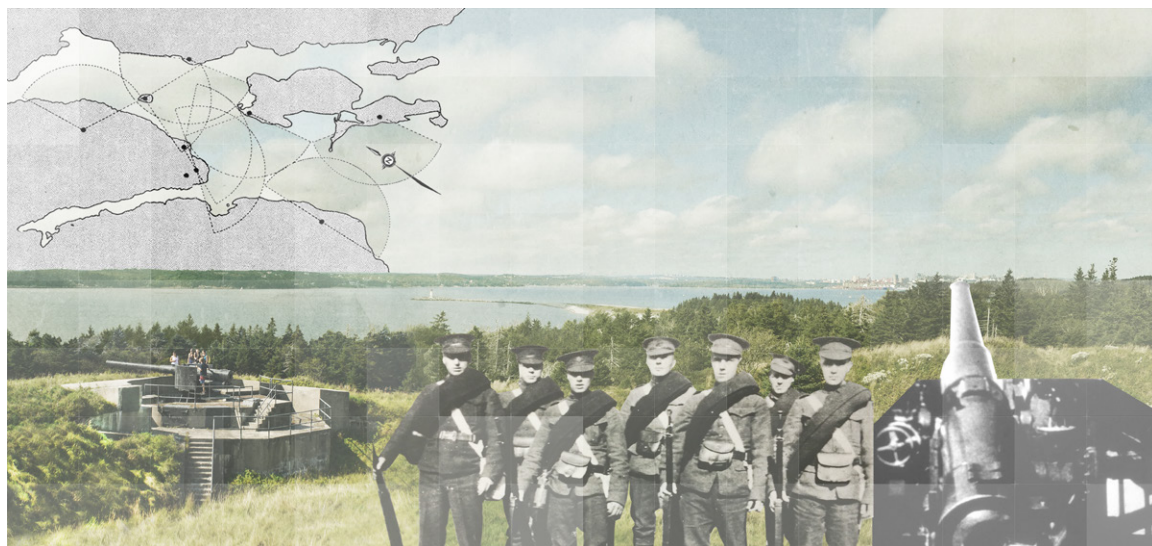
## The Halifax Defence Complex

Taking advantage of the island's vantage point above the ocean, the British established military fortifications on the highest hills of McNabs. Like the Citadel on the Halifax peninsula and later Georges Island, the drumlins on McNabs provided a strategic position for the military to look out over the ocean against potential military threats. These sites and the low lying areas along the coast for the basis of the Halifax Defence Complex.

Steps to fortify McNabs Island were initially undertaken in 1762 during the Seven Years' War, but it was not until a century later—at the time of the American Civil War when fears grew of being attacked from south of the border — that an effort was made to better the island defences. In the 1860s, the Imperial Government purchased portions of the island from the McNab family to erect fortifications to strengthen Halifax's defences. Fort Ives was “the linchpin that knitted together the inner and outer harbour defences.” Completed in 1870,

it is the oldest existing fortification on the island (NS Dept. Of Natural Resources 2005, 4). Fort McNab was constructed between 1888–1892 at the seaward end of the island to serve as the “gatekeeper of Halifax Harbour,” protecting the outer approaches from attack and providing port security during the two world wars.

The strategic location on top of the drumlins that the British military exploited are, to this day, important aspects of the visitor experience of the island. The best views of the harbour are from the elevated and cleared hills of Fort McNab. Perhaps, as we move into an uncertain future, the drumlins of McNabs will be used by visitors to look out over the ocean for a new kind of threat: climate change and sea level rise.



Soldiers and gun emplacements at Fort McNab



## The Quarantine

As settlement patterns evolved on mainland Nova Scotia, islands such as McNabs and Lawlors often served as military sites, prisons, or quarantine outposts. The ruins of a quarantine hospital, which helped protect Halifax and Dartmouth against outbreaks of potentially deadly disease from the mid-19th century to the early 20th century has been decaying in the forests of Lawlor Island since the building was abandoned.

Following the threat of cholera in 1866, the Government of Nova Scotia acquired the use of Lawlor Island as a quarantine station. With the threat of another cholera epidemic in 1871, three quarantine hospitals capable of accommodating at least 500 people were constructed on the island. In 1899, over 2,000 Doukhobor immigrants from Russia were quarantined there (NS Dept. of Natural Resources 2005). With the exception of World War II, the quarantine station was used sparingly in the 20th century. Today only scattered

foundations and a small cemetery remain.

Interim management of the quarantine station will include undertaking an inventory of historical remnants associated with the station. Access to the site, like access to all of Lawlor Island, is limited.



Graveyard for cholera victims on Hugonin Point

## The Estate

Since it was settled by the McNab family that gives the island its name, McNabs Island has been an exclusive residential location. The McNab's family home was built at the sheltered south-end of McNabs Pond, which was once open to the ocean. As title to the land was passed on through the generations, more homes were built on the island, each reflecting the exclusivity of the land with large estates. The estates contrasted with the humble homes of the tenant farmers who worked the land.

One such estate, located off Garrison Road immediately northeast of Garrison Pier, is the Hugonin-Perrin estate which dates from the 1850s. In its heyday, the estate featured an elaborate Victorian garden, which were said to rival the Public Gardens at the time. The gardens were designed by Englishman Frederick Perrin of the Lea & Perrins Worcestershire Sauce family, who bought the property on the island in Halifax Harbour in

1885. His home overlooked a terraced lawn surrounded by exotic and native plants, including purple-leaf European beech, several large horse chestnuts and a group of English hawthorns. The garden also included Japanese maples, hemlocks, cedars, lilacs, roses, mock orange, and Japanese barberry (NS Dept. of Natural Resources 2005, 16).

The foundation of the estate is now filled with trees that have colonized the footprint of the home. Although some of the large trees remain, the gardens have been repopulated by native plants. Stones from the foundations were used to construct a small teahouse immediately adjacent to the former home. Built in 1986, the tea house was a privately run space where visitors would start and end their tour of the island.



The teahouse, built from the foundations of the Hugonin-Perin Estate

## The Ferry

During the halcyon days of the McNabs Island as a recreational in the late 19th and early 20th-century, Haligonians would travel across the harbour in the Mic Mac Ferry to the island's shores. Before the advent and popularization of the automobile, the transportation infrastructure allowed for easy access to the islands since many of the trips around the area were made by boat in the Halifax Harbour. At its height, thousands of people would visit the island by ferry on a single day, making use of the transportation infrastructure and McNabs Island as a recreational space. The decline started when Dartmouth Ferry Commission cancelled its ferry service to McNabs in 1928. A regular boat connection has been missing ever since. Private ferries and chartered boats have been in operation, but have failed to maintain the level of service offered by the Mic Mac ferry. Currently, visitors can reach McNabs by kayak, zodiak, water taxi, or chartered ferry. The

main points of arrival are the Garrison Pier and the former Department of National Defence Wharf. Range Pier, which once provided access to the Island from nearby Eastern Passage has been demolished. The transportation infrastructure of the city could better serve the park by reestablishing the ferry service, opening up McNabs to a new generation.



Boats at Garrison Pier

## The Pleasure Grounds

Locals have been retreating from Halifax to the quiet of McNabs Island for centuries. In the early days of the park as a recreational space, it was common for people to visit the island for a stroll through the gardens, enjoy seaside picnics, or partake in a game of quoits. As it became more of a draw for residents of the area, the infrastructure for hosting various events and activities grew. The first publicly organized outing to McNabs occurred in 1845 and saw 3 000 to 4 000 picnickers travel to the island for a charity function. The population of Halifax and Dartmouth at the time was only around 23 000, meaning that over 10% of the towns' combined population was there on the same day (Austin 2014). Woolnough's Pleasure Grounds opened on the north of the island in 1873 with two large pavilions for dancing and dining. Bill Lynch, who operated a successful carnival that toured Atlantic Canada for decades, got his start on McNabs Island, by putting on one of his first

shows on the pleasure grounds. Others soon followed, and McNabs Island became a destination for Haligonians looking to escape the congestion of military town life. For over 150 years, McNabs Island has been used a recreational space, but it has never been less visited than it is today.



The former Finlay Fairgrounds

## CHAPTER 4: FIELD KIT

### ISLAND SCALE

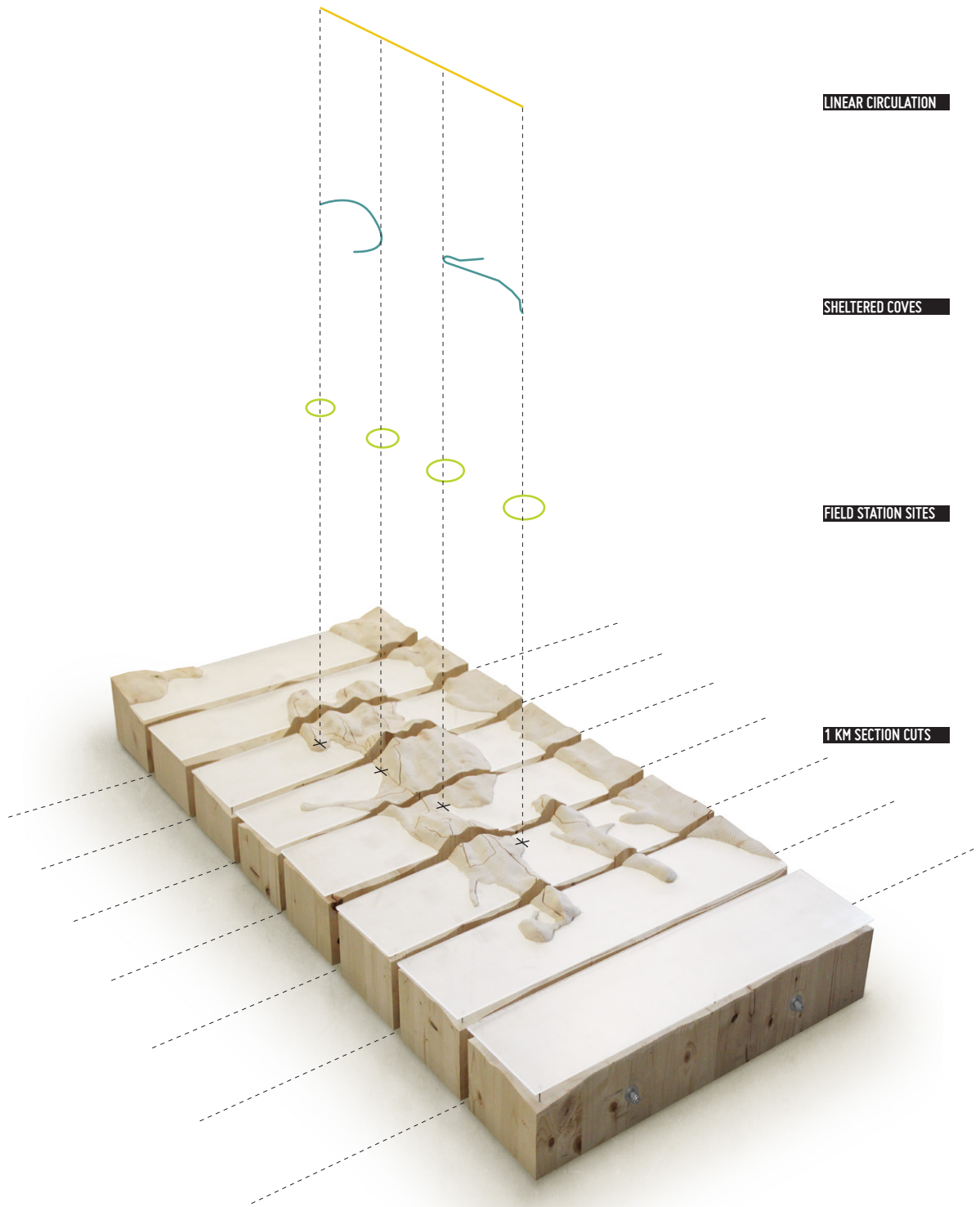
Designing within a dynamic socio-ecological conditions of the landscape requires transforming the information about natural and cultural processes into architectural knowledge. Reinterpreting site dynamics to create design guidelines provides the basis for introducing elements of architecture into these dynamic systems. At the island scale, the ambition is to reintroduce the ecologies of the island into the broader context of the city by providing increased access. As previously explored, the main challenge is to integrate the infrastructure into both the urban and ecological dynamics of the site.

A clear, legible solution has been developed in which the main circulation follows the length of the island, parallel to the coast and along the most subtle slope of the site. Garisson Road is the longest trail on the island and connects the north west tip of the island, with views of the city, to the south east side, with views of the open Atlantic Ocean. In this way, the circulation provides visitors with a way to experience the two most salient aspects of the site. The linear path links together the sheltered coves of the island: McNabs Cove and Wreck Cove. Within these sheltered

coves, the field stations have been located. The field stations perform two main tasks: allowing visitors greater access to the island with piers, wharves, and bridges, and providing a permanent location in which visitors can become more actively engaged in the adaptive management of the sites. In addition to being in locations that are easily accessible and roughly equidistant (1km as the crow flies), the field stations have been placed in the areas of the island that are most susceptible to sea level rise: the cliff at Hugonin Point, the dune at Maugher Beach, the marsh at Wreck Cove, and the beach at Wreck Cove. These four sites will provide a basis for the design as test sites for the field kit and coastal adaptation strategies.



Aerial View of McNabs Island (Friends of McNabs Island Society 2005)



LINEAR CIRCULATION

SHELTERED COVES

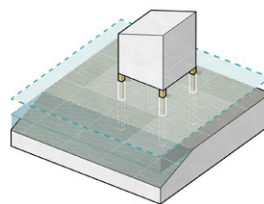
FIELD STATION SITES

1 KM SECTION CUTS

## SITE SCALE

Four main strategies for adaptive infrastructure have been developed, each with a unique relationship to the water/land. As sea level rise occurs, the adaptation strategies of the infrastructure will allow visitors to experience the coastal changes in different ways. In addition to providing various experiences, each of the installations will increase access to the island.

The four strategies are: stabilize, protect, float, and lift. Stabilization occurs in locations susceptible to coastal erosion, such as cliffs. By installing a matrix of wooden piers into the glacial till, the installation will act as the root system of a stand of trees, retaining the soils in place. Sites that are prone to storm surge will be protected by heavier elements such as stone gabion walls. The gabion walls will form new paths where others have washed away. Floating infrastructural installations such as docks will rise with the sea level, all the while providing access to visitors. The floating installations will act as the vegetation in a marsh would, changing with the tide and providing a buffer between land and ocean. Finally, in areas where littoral drift occur such as beaches, the infrastructure will be lifted high above to allow the migration of sand along the coast. Rather than blocking the sand as is typically done with more invasive infrastructure, the lifting of the infrastructure will allow the natural process of littoral drift to occur.



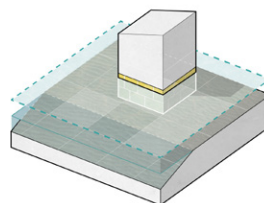
**Adaptation strategy:** *STABILIZE*

**Component:**

- wooden piers

**Application:**

- sites experiencing high levels of coastal erosion



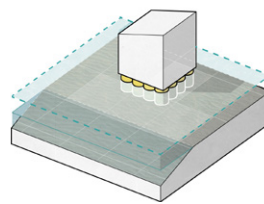
**Adaptation strategy:** *PROTECT*

**Component:**

- gabions

**Application:**

- sites prone to storm surge



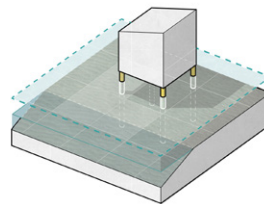
**Adaptation strategy:** *FLOAT*

**Component:**

- floating rain barrels

**Application:**

- sites prone to marsh erosion



**Adaptation strategy:** *LIFT*

**Component:**

- helical piles

**Application:**

- sites prone to littoral drift

## BUILDING SCALE

At the building scale, various threshold conditions have been developed to mediate between the interior and exterior space. The overall objective is to “let the landscape do the talking,” by providing visitors with different vantage points and degrees of interiority, allowing them to be both inside and outside simultaneously. Even when visitors are within the building, different levels of enclosure emphasize the experience of the surrounding landscape. Programatically, interconnected but distinct zones of the small scale building address the ways in which various groups learn from and engage with the landscape.

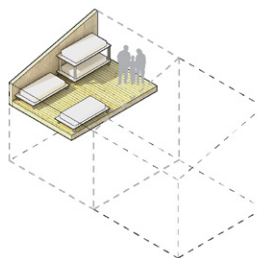
The most enclosed space is the loft, elevated above the rest of the space by a ladder. The loft is a place of refuge, where visitors to the island can stay overnight.

The lab houses the equipment of the field station, where visitors would document the landscape is also an interior space. The mechanical millwork wall houses the solar battery, a wifi router, and a fold-out desk for digital documentation. The lab also features the ‘island table,’ a large table and saltwater sink, where groups can gather around to carry out experiments. On the tall wall of the field station, a stone hearth radiates heat throughout the interior space.

The 5m by 5 m greenhouse is an expansive open area where large outdoor classrooms can gaze out

of large folding windows to experience the surrounding landscape. The greenhouse, clad in polycarbonate, is an entirely passively heated space, meaning that it can be used comfortably throughout the year. Gabion benches on the perimeter the greenhouse retain heat and act as the ‘knee wall’ of the building.

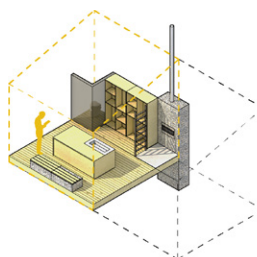
Finally, on the exterior of the field station, between the spruce beams of the building, kayaks and rainwater collection cisterns are conveniently located to easy access.



**Program:** REFUGE

**Components:**

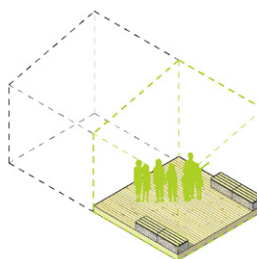
- sleeping loft
- access ladder



**Program:** REFLECTION

**Components:**

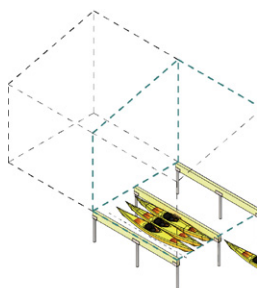
- island table
- hearth
- mechanical millwork wall
- water access
- compost toilet



**Program:** PROSPECT

**Components:**

- open gathering space
- folding windows
- gabion benches



**Program:** ACTION

**Components:**

- kayak storage
- rainwater cisterns



## DETAIL SCALE

### Prefabricated Modules

Addressing the remote location of the island and the sensitive ecological conditions, the field stations are modular and prefabricated, ensuring ease of transportation and installation. As a limiting factor, all of the prefabricated components of the building need to be transported to site by boat and carried by a small crew to the remote sites. As such, none of the structural members, are larger than 5m long with the majority of the prefabricated panels being 1.2m by 2.5m.

A field of helical piles placed on 2.5m by 2.5 m grid form foundations of the field station. In contrast to other concrete based foundation types, helical piles are minimally invasive. Erected by a light weight machine or by hand-crank, the piles can be installed without disturbing the surrounding landscape. Helical piles are also ideally suited for glacial till. The steel columns of the piles also allow the building to be lifted off of the landscape, meaning that vegetation can still grow on the space beneath.

The timber structure of the building, also on a 2.5 by 2.5 m structural grid, allows the building to be erected as a kit of parts by a small crew. The 14cm by 14cm (6"x6") spruce members are held together by lightweight and durable aluminum sleeves and gusset plates. The connections are made from aluminum to ensure that they do not corrode from the salty air since

they perform better than steel and do not require any treatment prior to use. Tension cables connected to the gusset plates provide shear for the building and, through structural redundancy, ensure that the building will stay up even in the high winds on the coast.

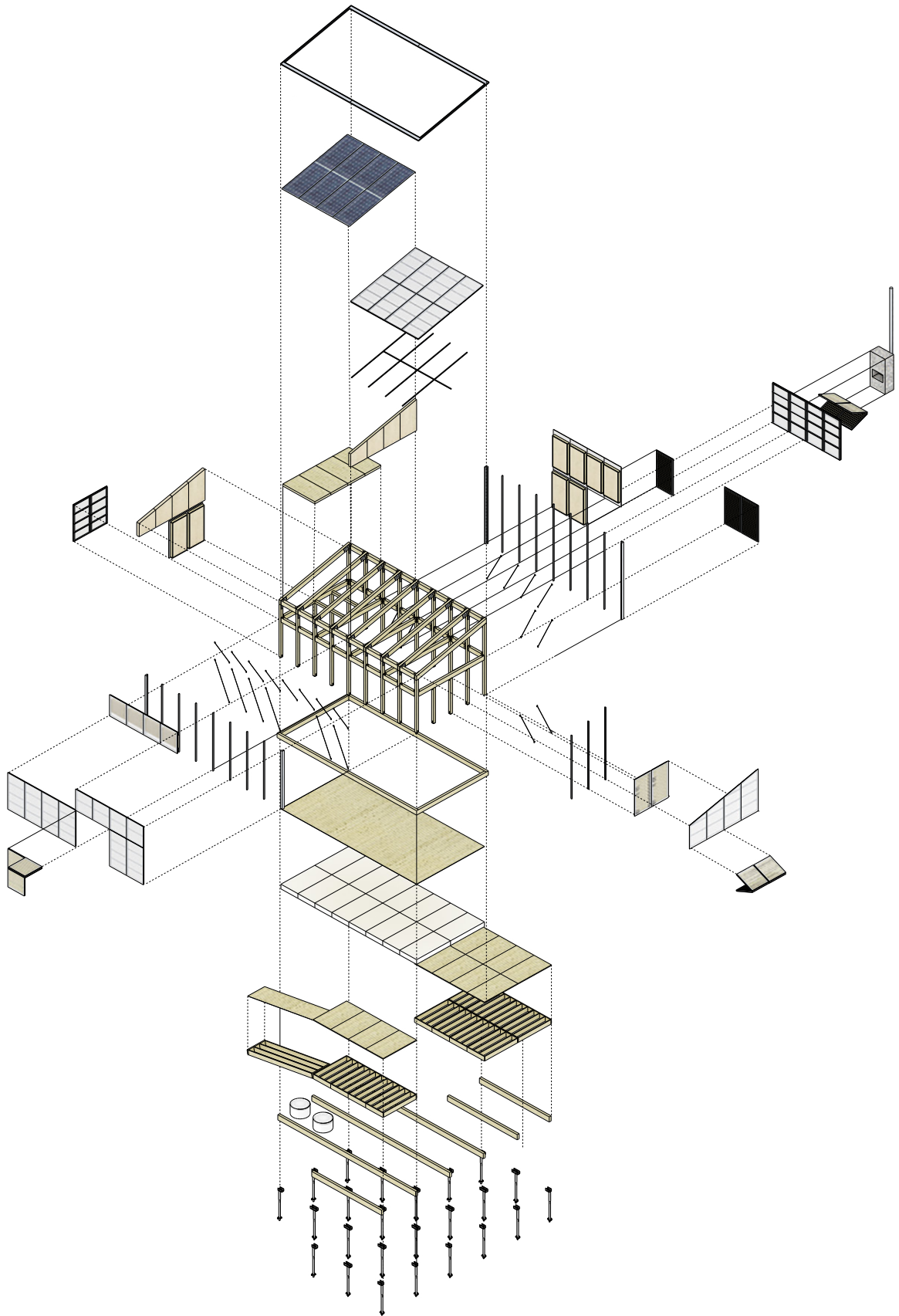
The cladding panels are of prefabricated cassette construction. Some of the panels, such as those that clad the greenhouse are made of polycarbonate, an aluminum frame for strapping, and h-clips for air tightness. Other panels are insulated



1:50 Building model - west elevation



1:50 Building model - south elevation



Exploded axo of prefabricated building components

with rigid foam, sandwiched between plywood sheets, and clad in spruce. These structurally insulated panels also made up the floor construction. The modularity of the panels means that they can be easily substituted with other materials or rearranged depending on the site conditions. The panels can be carried by a small crew and installed to the wood structure with ease.

There are two types of doors on the building, folding windows/doors and sliding barn doors. These can also be substituted for one another depending on

the site conditions. On the interior of the building, sliding doors separate the greenhouse from the lab and loft spaces.

The ramps, platforms, and decks that provide access to the building are built from nominal dimensional lumber. The standard construction allows the infrastructural installations to be easily replaced once they have been exposed to the elements or affected by adverse storm conditions.



1:50 Building model

## Autonomous Systems

Although McNabs Island is in an undeniably urban setting, it is an island, cut off from the grid of the surrounding city. It is at once connected and yet remote. Recognizing the logistical issues of visiting the island without the amenities of the city, the field stations have been designed to be entirely autonomous.

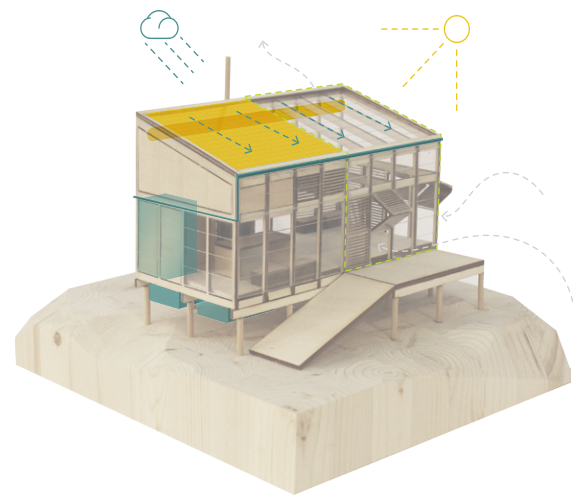
The buildings are heated through a combination of passive solar heating and evacuated solar tubes. Polycarbonate cladding on the south and west building facades allows for light to fill the space and, in turn, heat the interior. The buildings effectively operates as a greenhouse, ensuring that the building can be heated throughout the year, including the cold winter months. A minimal mechanical system circulates the warm air through the building and also performs heat recovery by warming the incoming fresh air entering the building with the warm air exiting the building. The evacuated solar tubes mounted to the roof of the building circulate warm glycol through radiant lines embedded into the structurally insulated panels that make up the floor. During the spring and summer months, the building also can be passively ventilated through the large folding windows on either side of the greenhouse.

A rainwater collection trough along the lower side of the shed roof directs water to insulated storage cisterns between the beams under the building. In this way, the buildings' entire roof area is used to harvest

rainwater.

Facing south to ensure maximum exposure, half of the roof area is devoted towards actively collecting solar energy. Photovoltaic panels clad half of the roof, which was designed in order to accommodate the typical size of the panels. The power converter and solar battery are stored in the mechanical millwork wall inside of the building.

A composting toilet inside of the building on the north west corner is accessed from a panel outside of the building.



1:50 Building systems model

## CHAPTER 5: FIELD TRIP

### TEST SITES

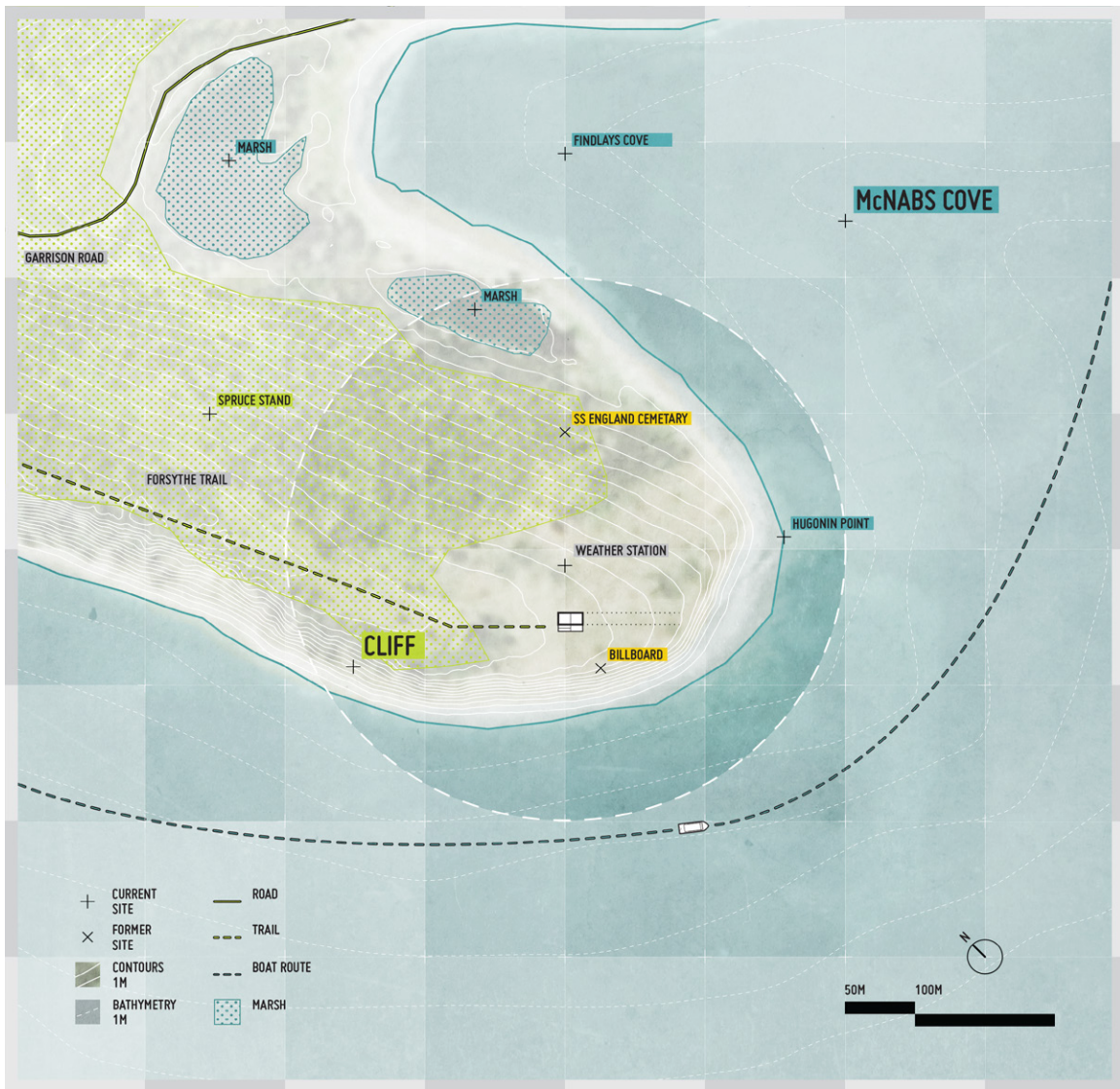
Field stations are living libraries and outdoor laboratories for students, researchers, and the general public interested in the urban nature of McNabs and Lawlor Islands Provincial Park. In the *FIELD TRIP*, we will see how the modular, prefabricated structures developed in the *FIELD KIT* will stand up to various coastal site conditions. Each building has been reoriented and reconfigured for maximum exposure to the sun, views, coastal access, and shelter from the high winds coming off of the Atlantic Ocean. Also, as test sites for coastal adaptation strategies, each field station will have a different infrastructural connection to the water/land depending on its unique site conditions and coastal processes. The infrastructure is meant to give visitors an experience of coastal change over time while also increasing access to the islands.

### THE CLIFF

Backed by a deciduous forest, the cliff site is accessed by Forsythe Trail. As hikers reach the site, they emerge from the forest onto the barren cliff top. From the edge of Hugonin Point, visitors can take in the dramatic view of McNabs Cove, the lighthouse at the tip of the Maugher's Beach breakwater, and the Atlantic Ocean beyond. From the cliff face, visitors can hear the crashing of the waves below.



Cliff site model



Cliff site plan (data from HRM GIS Database, base image from Google)

## Coastal Process

Cliff erosion is the gradual wearing away of land and the removal of beach or dune sediments by wave action, tidal currents, wave currents, drainage, or high winds (US Geological Survey 2016). Exposed to the open ocean, the cliff site at Hugonin Point is one of the most dramatically affected by coastal erosion on McNabs Island. Although further in the harbour than other sites, the cliff site juts out into McNabs Cove and is left unprotected by the Maughers Beach breakwater. Direct wave action coming off of the ocean has battered this stretch of coastline and resulted in a steep cliff face of exposed glacial till. The original cliff face after glaciation would have been significantly further out into the harbour, this has led to a gradual bathymetric slope as the till from the hill has washed away into the water. As such, the wave cut platform, the flat area at the base of a cliff affected by wave action, is relatively long.

## Site Strategy

To mitigate further coastal erosion on the cliff face, a stabilizing field of piles are driven into the glacial till.

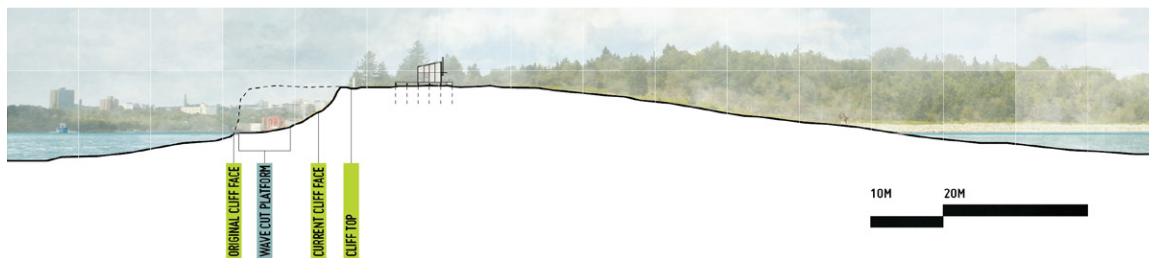
The piles, acting like the root system of the forest, prevent the cliff from falling into the ocean by retaining the soil in place. That being said, the piles are meant to be sacrificial; as erosion inevitably occurs, the piles will gradually fall away into the ocean, in this way, they function as markers of the coastal process over time.

Located on the cliff top, the field station is oriented north east to south west to ensure maximum solar gain for the greenhouse and solar panels. With the solid face of the building blocking the north wind, the ramp and deck of the field station are in a micro climate created by the building mass. The gathering space is meant to project out over the cliff and provide views to the Maugher Beach Lighthouse in the distance.

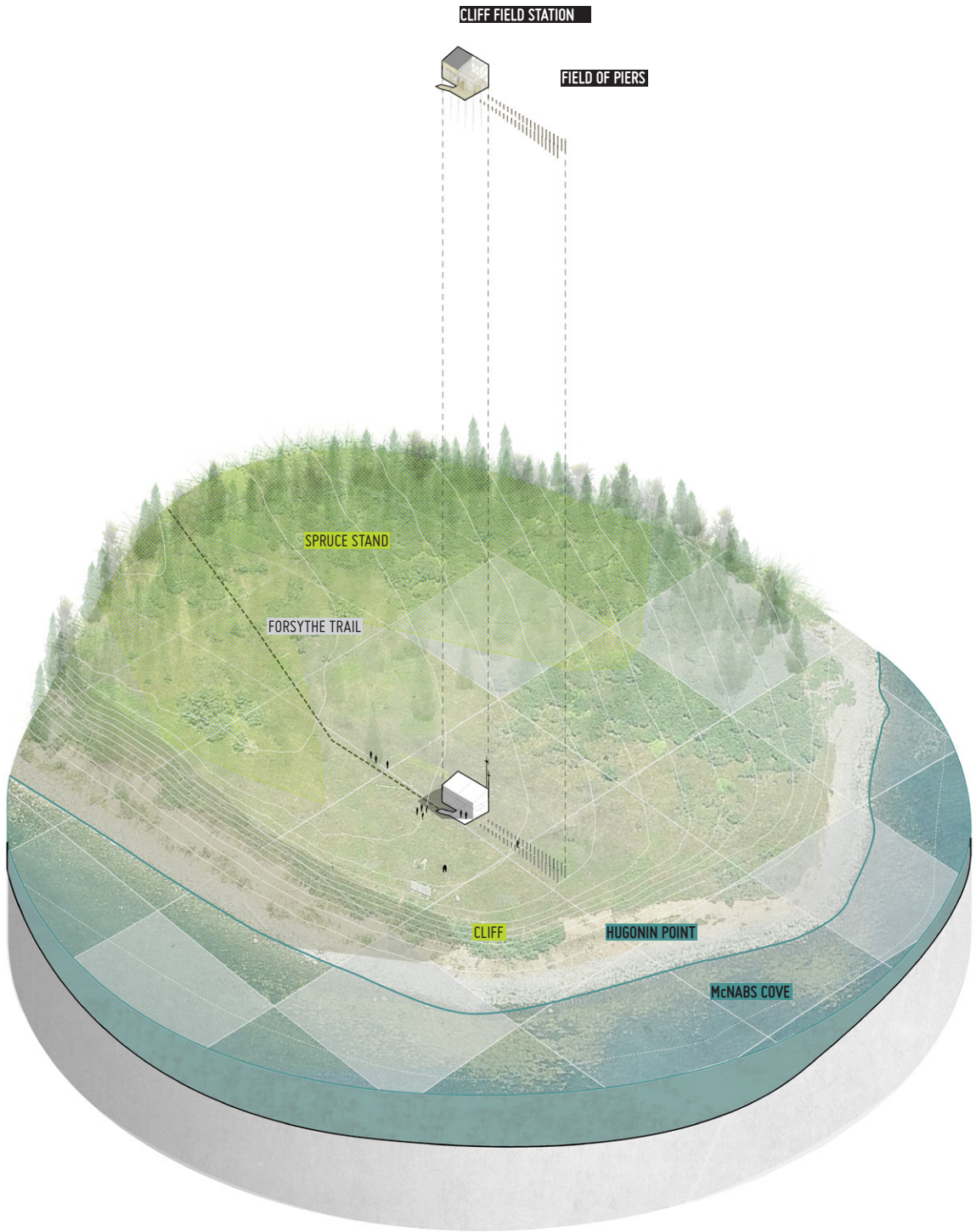
The cliff site is accessible on the north island long loop. This path leads visitors to some of the most culturally rich areas of the island, with the majority of the residential development being on the north portion of the island.



Cliff site accessible on the north island long loop

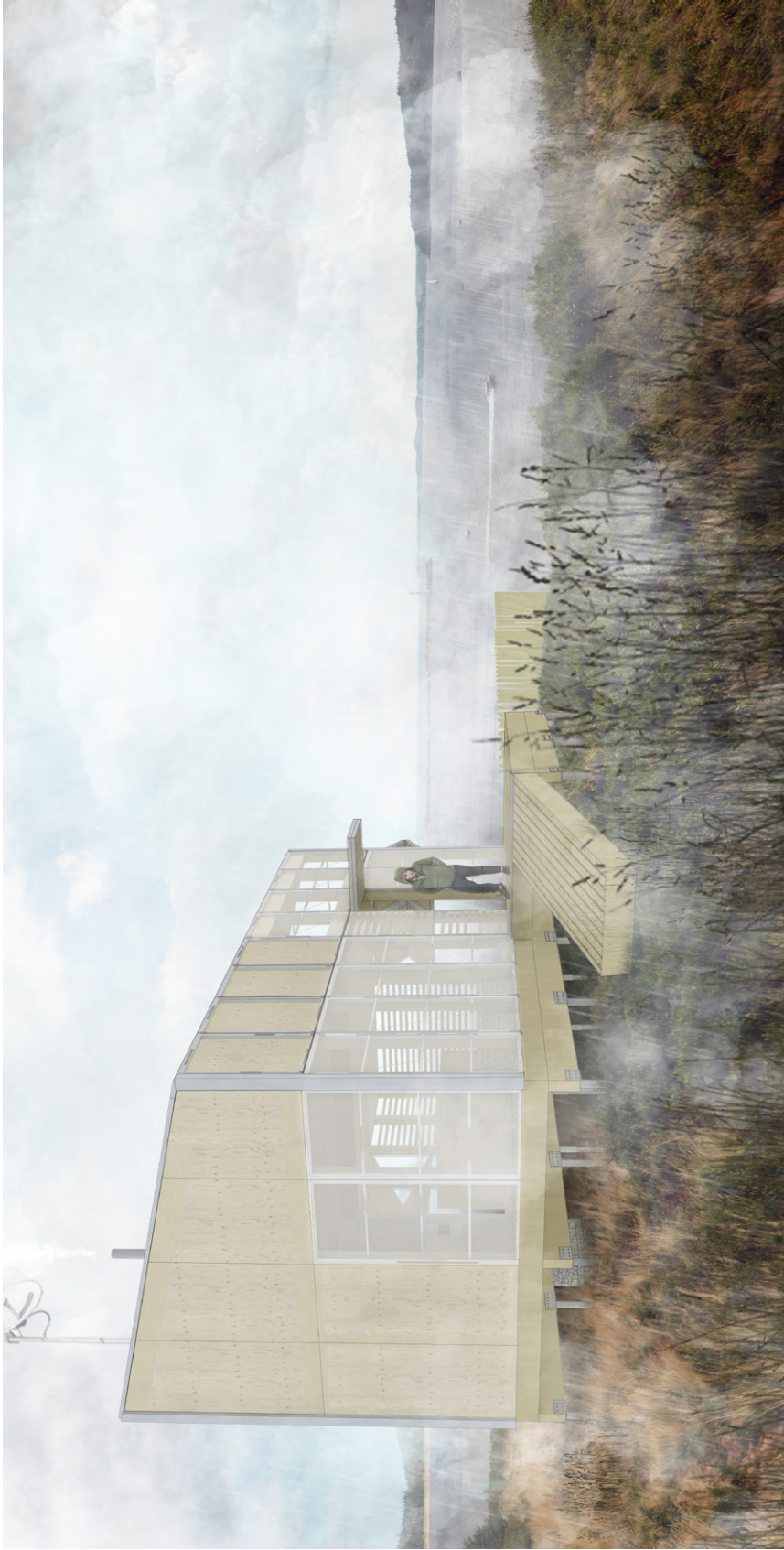


Cliff site section



Cliff site axo (data from HRM GIS Database, base image from Bing)





The cliff field station on a stormy spring day

## THE DUNE

The dune site is located at a fork in Garrison Road, where visitors coming from Garrison Pier can either take the main trail to the southern part of the island or enjoy the sandy shores of Maugher Beach. At present, the sensitive dunes must be crossed to access the beach. Backed by the steep incline of the hill, the building site sits on the rolling topography between the water and the most elevated location on the island.



Dune site model



Dune site plan (data from HRM GIS Database, base image from Google)

### Coastal Process

Dune erosion occurs when storm surge elevates waves higher on the beach, allowing them to erode the coastal dune. As sand is removed from the dune, the front face becomes steep. The overall volume and elevation of the dune is gradually reduced due to the erosion process. Dune erosion makes properties behind the dune more vulnerable to future storms and the potential for overwash. The eroded sediment is carried offshore and stored in large sandbars, in this case Maughers Beach. The sand dune can recover over a period of years, gaining in elevation and volume through deposits of wind-blown sand (US Geological Survey 2016).

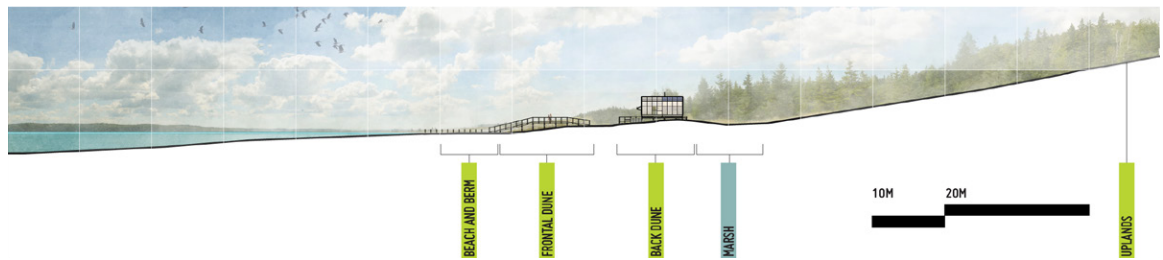
behind. The field station is set back into the dune, protecting the most sensitive areas from development. Its location also give visitors a view into the marsh between the elevated areas of the back dune and the uplands of Jenkins Hill.

### Site Strategy

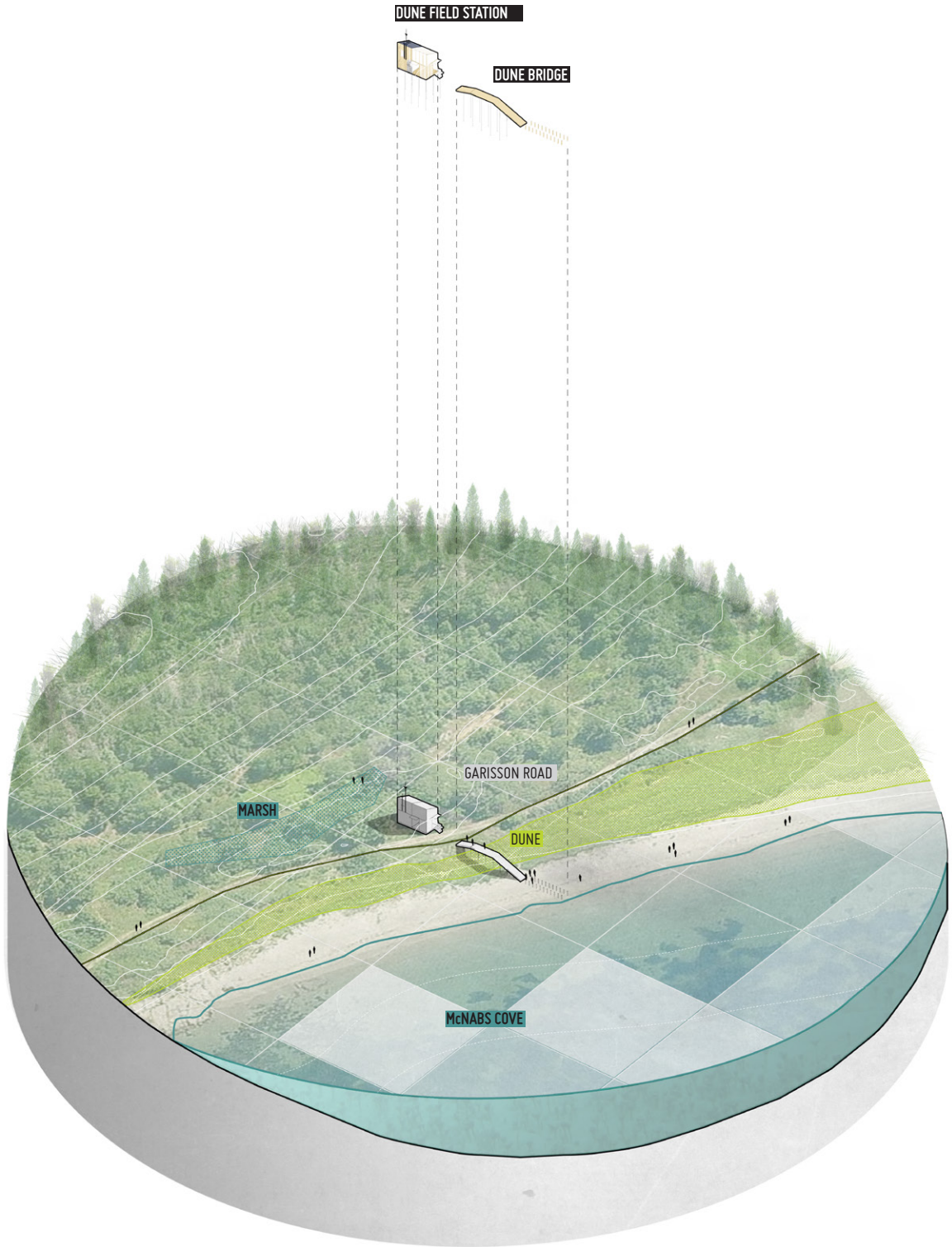
Set back from the dune, the field station is connected to the coast by a bridge that spans the dune. The bridge allows for access, while protecting the sensitive dune ecosystem. Ensuring a healthy dune ecosystem also means that the field station will be protected. To mitigate the effects of storm surge, a path of protective gabion walls leads to the field station, gradually ascending to the back dune and the marsh



Dune site accessible on the mid island long loop



Dune site section



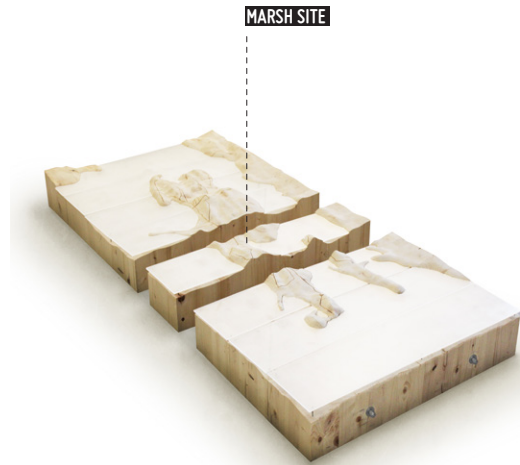
Dune site axo (data from HRM GIS Database, base image from Bing)



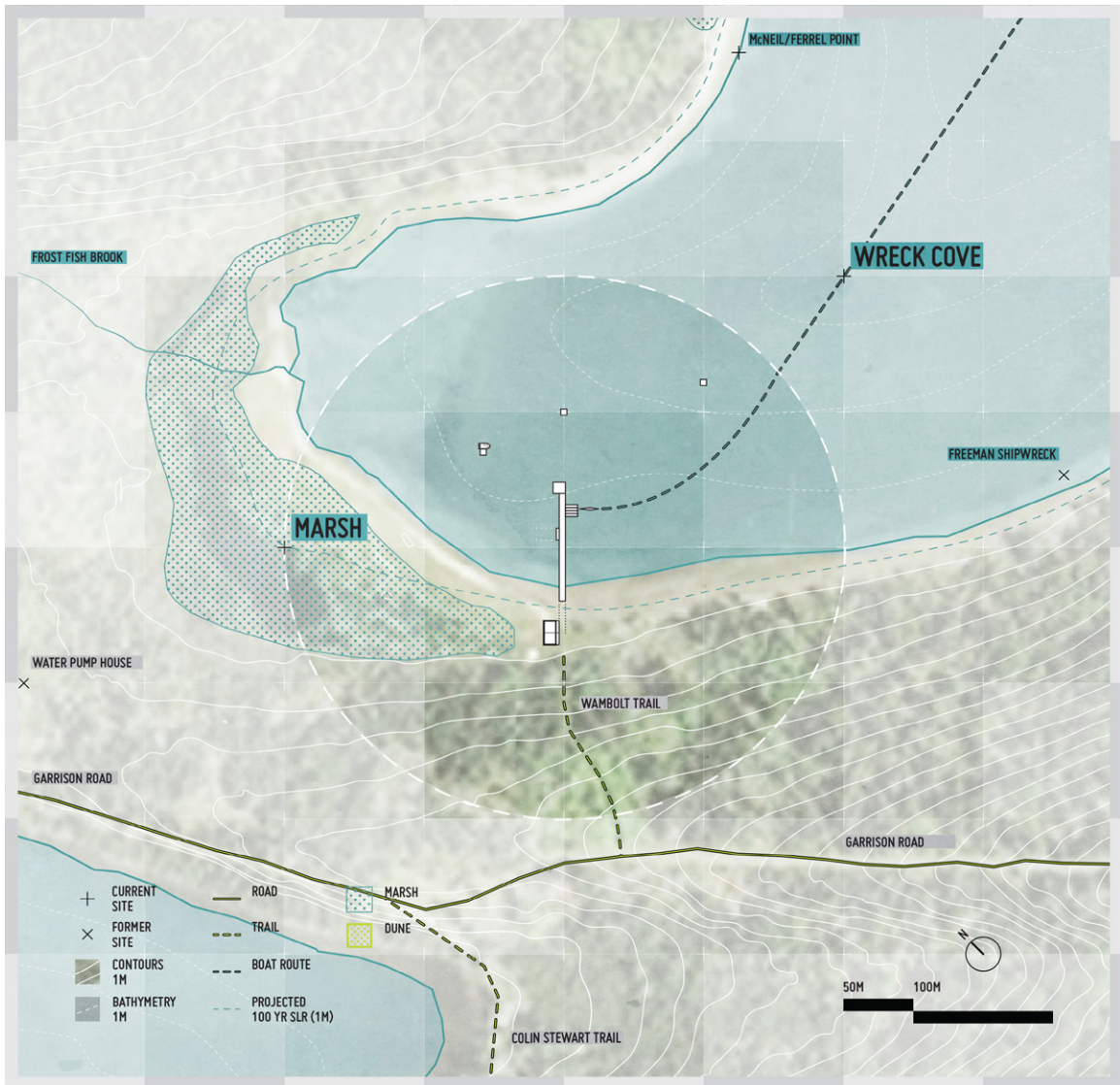
Gathering around the 'island table' at sunset

## THE MARSH

The marsh at Wreck Cove is accessed from Wambolt Trail, a narrow path between in the upland buffer. The sheltered cove is the site of a large saltwater marsh that has been reducing in size with storms such as Hurricane Juan. With sediment washing down the drumlins along Frost Fish Brook, the marsh has a very gradual slope and the water remains shallow far out into the cove. The marsh one of the most quiet spots along the coast.



Marsh site model



Beach site plan (data from HRM GIS Database, base image from Google)

### Coastal Process

Marsh erosion occurs along coastlines that are exposed to the open ocean and wide bays. Storm-induced waves and currents erode the muddy wetlands soil, causing these fragile coastlines to erode significantly, often transforming land area into open water (US Geological Survey 2016). One recent example of marsh erosion is the loss of land during Hurricanes Juan in 2003. Although seemingly secluded and peaceful, the marsh is one of the most biologically rich areas of the island. The brackish water, where fresh and salt waters converge and mix, provides a habitat to hundreds of species. From the aquatic bed and deep marsh, where larger fish feed, to the shrub wetland, a breeding ground for waterfowl, a salt marsh fulfills many critical ecosystem functions.

### Site Strategy

A floating dock stretches out into Wreck cove, providing a spot for visitors to arrive to the island by kayak or jump off into the deeper water farther away from the shore. The dock sits on re-purposed rain barrels that absorb the wave energy. On several locations along the

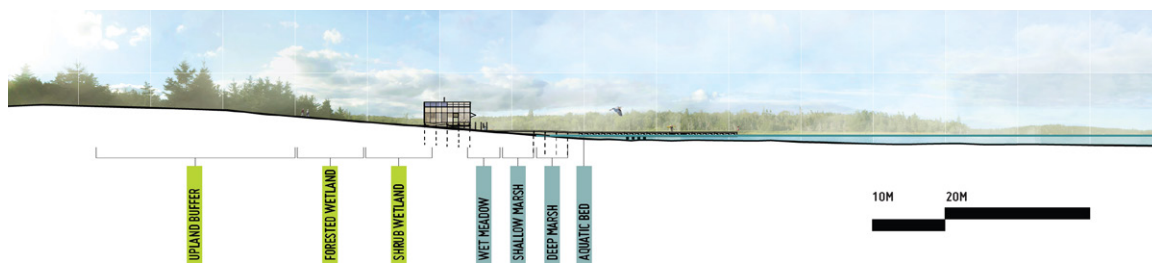
dock, the rain barrels are substituted for oyster farms that create more biological diversity and contribute to the health of the marsh. The field station is perched above the marsh, eliminating site disturbance of the sensitive habitat below while providing excellent views of the surrounding landscape.

The field station itself sits on the critical area of transition between the forested uplands and the wetlands, where fresh and salt water meet. This gives visitors a look into the coastal processes that shape this part of the island and a view over the dynamic ecosystem that sits below.

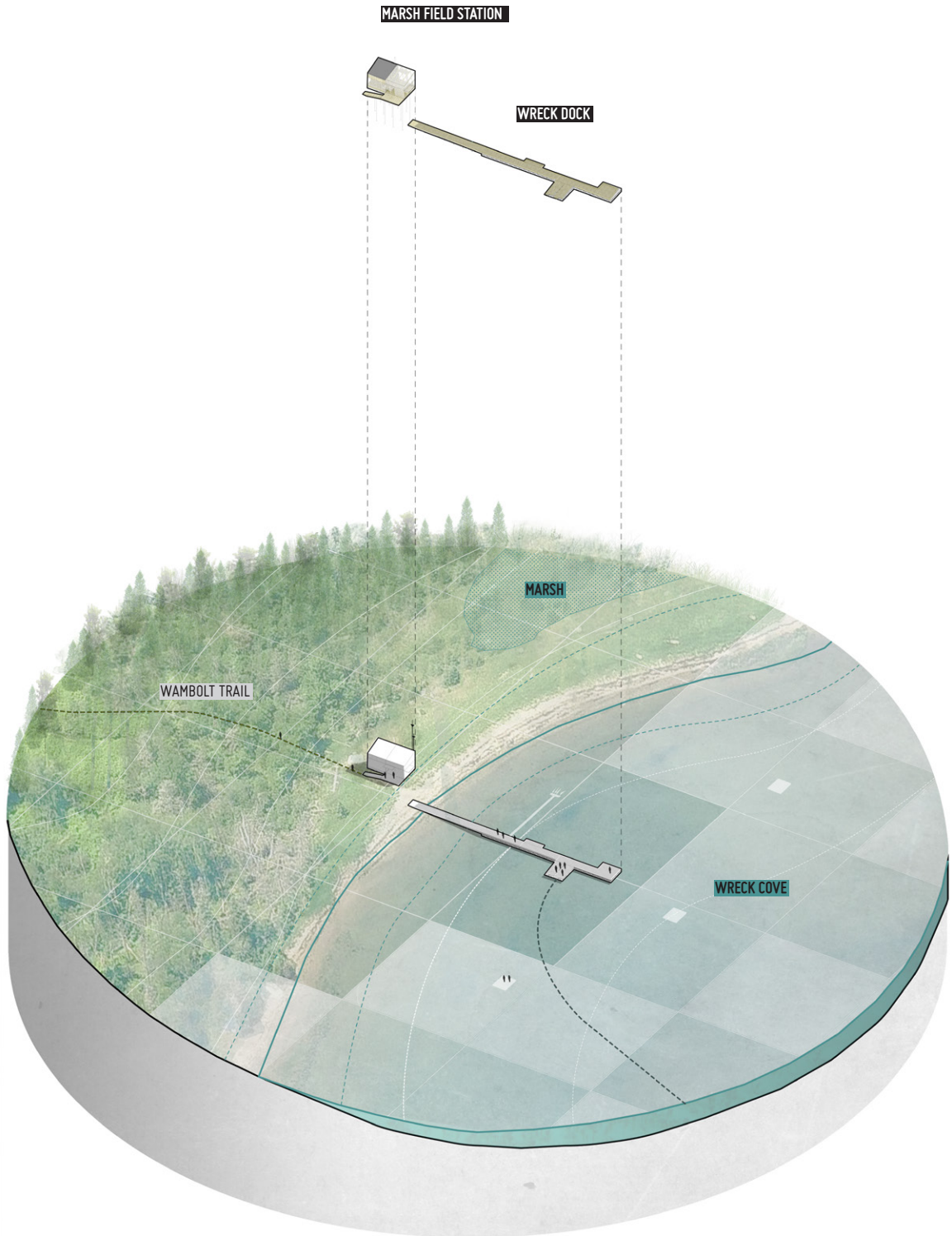
The marsh site is accessible on the mid island short loop, on the spur trail of Wambolt Trail that comes off of Garrison Road. This loop gives visitors an experience of the low lying area between the elevated areas of the north and south portions of the island, where sea level rise is eventually expected to split McNabs Island into two separate islands.



Marsh site accessible on the mid island short loop



Marsh site section



Marsh site axo (data from HRM GIS Database, base image from BING)

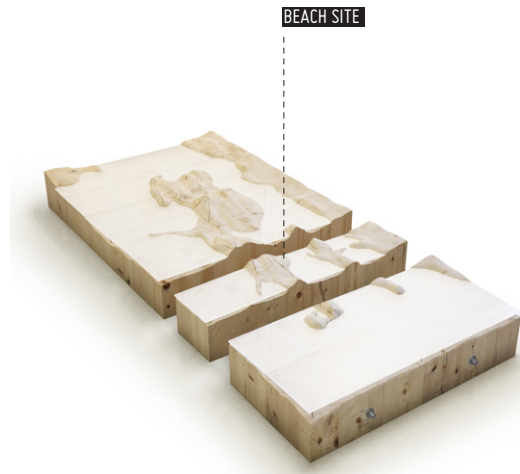




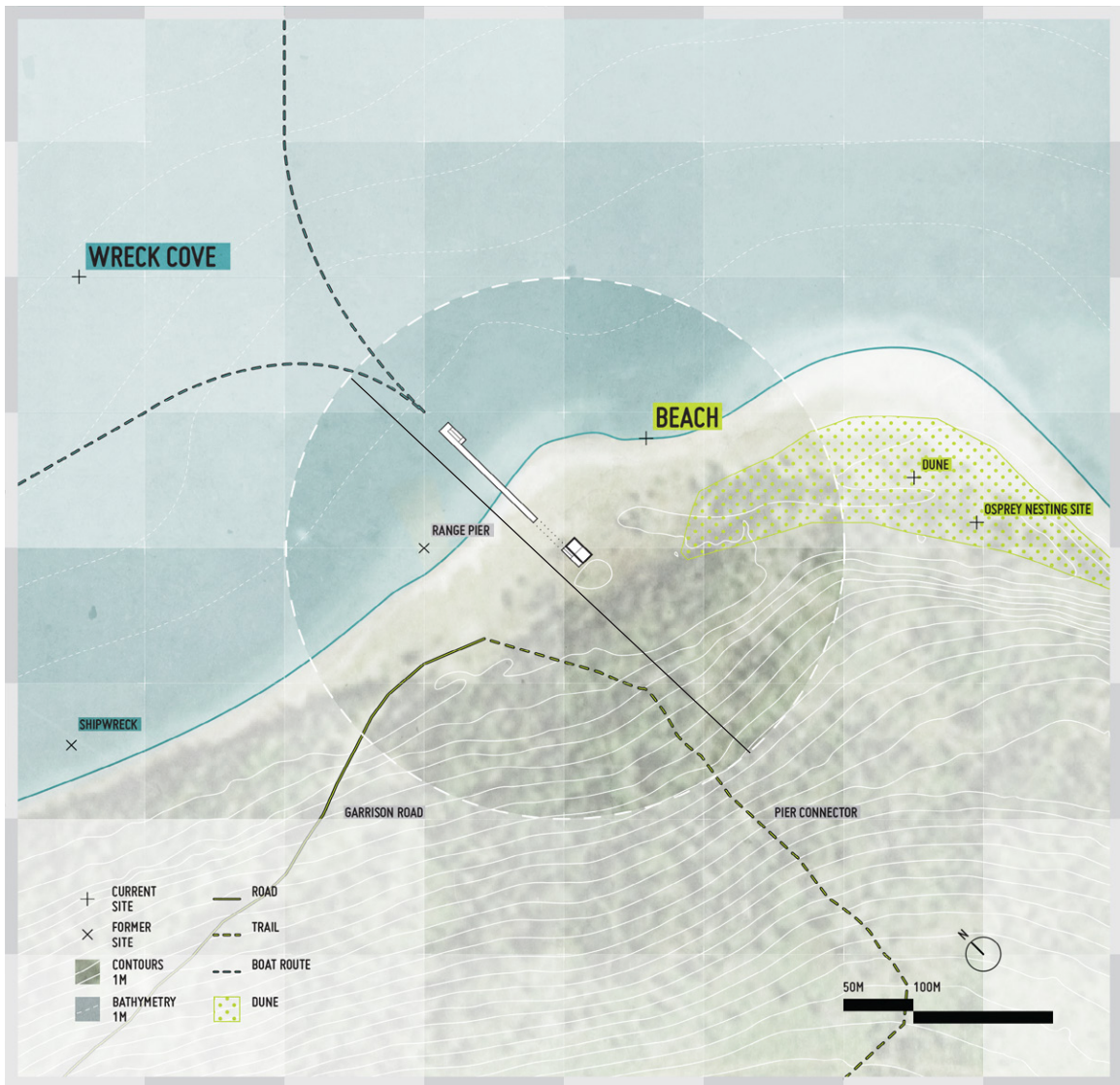
A school group approaching the marsh field station on a summer morning

## THE BEACH

The exposed tip of Wreck Cove, with a view of Dartmouth to the north west and a view of the open Atlantic Ocean to the north east. The beach extends from the salt marsh, all the way along the coast to the rockier shores more exposed to wave action. The site is located immediately adjacent to the demolished Range Pier.



Beach site model



Beach site plan (data from HRM GIS Database, base image from Google)

### Coastal Process

Beach erosion occurs when waves and currents remove sand from the beach system in a process known as littoral drift. With waves running at an oblique angle to the shoreline, sand migrates along the beach and is eventually transported out to sea. The loss of sand causes the beach to become narrower and lower in elevation. Storm waves in particular carry the sand offshore, depositing and storing the sediment in large sandbars. The

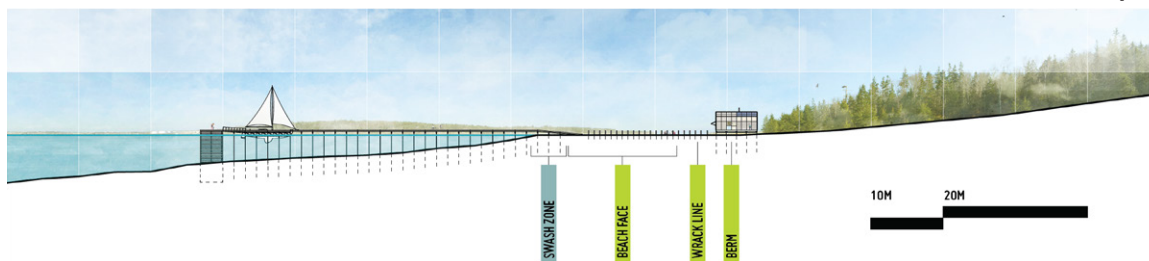
The beach field station is positioned at the foot of green hill, in an area of transition between the forested uplands and the dune of the beach. The greenhouse of the field station acts as a welcoming point for visitors of the park. As they arrive by boat, they can either ascend the steps to the field station or travel the length of the beach. The more private quarters of the field station are set back into the forested area which provides shelter in the trees. Solar gain is maximized with the roof slope directed towards the south.

### Site Strategy

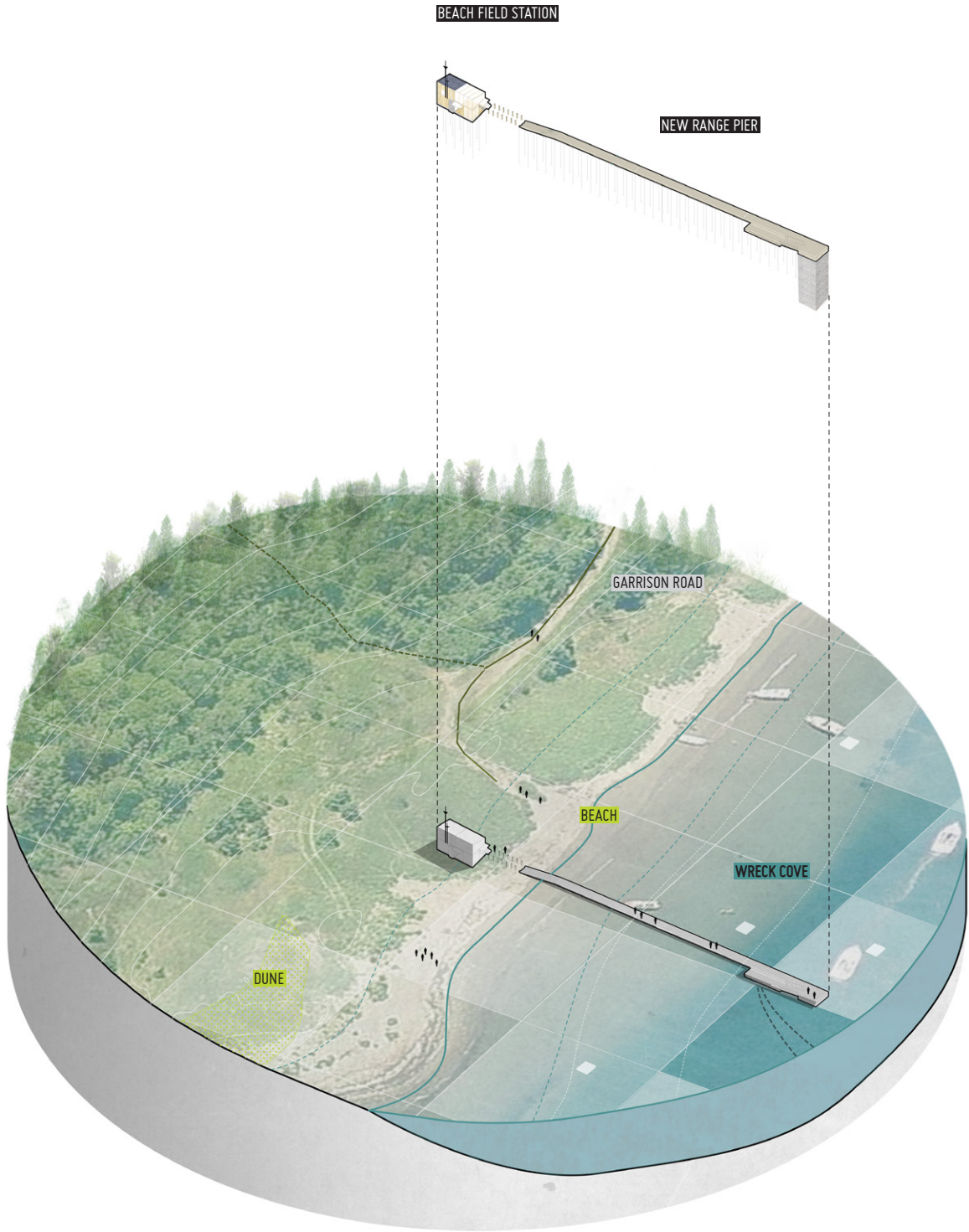
In contrast to more invasive infrastructure, the process of littoral drift on the beach site is not prevented. Instead, the pier that provides access to the nearby Fisherman’s Wharf in Eastern Passage is elevated above the swash of the waves and the shifting sand by helical piles. The New Range Pier provides a place for visitors to arrive to the island and dock larger boats on the pier. Gradually, the process of littoral drift will push sand out into Drakes Gut, so the pier has been extended out into the deep waters to ensure that access to the island will be maintained for years to come.



Beach site accessible on the south island long loop



Beach site section



Beach site axo (data from HRM GIS Database, base image from Bing)



Sketching in the beach field station on a fall morning

## CHAPTER 6: CONCLUSION

This thesis began by narrating the experience of looking out McNabs Island from the shores of the city in the *FIELD of VIEW*. Through the process of traveling to the island and discovering the unique socio-ecological conditions of the landscape, a new understanding of the urban nature has hopefully been reached. By giving an account of the various interrelationships between the human uses and ecological changes that have taken place on the island, we have seen how the islands have always been an important resource within the region, but as it is today, McNabs and Lawlor Islands Provincial Park has not reached its full potential as a unique urban amenity for citizens of Halifax. The ambition of this thesis was to prove that our role in the stewardship of the changing landscape could also foster a greater impact on the urban landscape of Halifax. Through the development of a *FIELD KIT*, a series of light-on-the-land design strategies provided the basis for the development of an adaptive infrastructure and a series of small-scale buildings on the island. The intention was to create an adaptive network that would not only allow for greater access to the islands, but would encourage active engagement with the changing landscape and have an impact much larger than the buildings' small footprints. By taking a *FIELD TRIP* to

McNabs and Lawlor Provincial Park, we saw the ways in which design strategies can be implemented to form an adaptive network of field stations that allow for visitors to discover the urban nature of the park. As hypothetical buildings, the outcome of the project can never fully be seen, but hopefully the idea at the heart of this thesis will encourage new ways of considering our role in adapting to a landscape rapidly changing as a result of climate change and sea level rise.

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