

**The Metabolic Morphology Of Chora:
A Building Is An Organism On A Threshold**

by

Rebecca MacKenzie

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Supervisor: _____

Reader: _____

Reader: _____

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ABSTRACT

Expanding on the fields of bio-mimicry, morpho-ecologies, and dynamics and fluidity in architecture, this thesis proposes architecture as organism. It suggests that as organism, architecture is inherently responsive to the thresholds it exists on and within, thresholds which are composed not just of the physical but of the ephemeral; of time and of space. The existence, metabolism and morphology of an architectural organism becomes a function of the dynamic world into which it is born, inextricable from the ecology of the space it will inhabit. It is not forgotten that the architectural organism remains man-made, in itself a place of inhabitation, an object of sensory engagement. This thesis explores the architectural organism in the context of a visibly and significantly changing threshold, how connections are made between it and the world around it, and how it might engage those who are its inhabitants. The thesis is located in Nova Scotia's Bay of Fundy, at the mouth of the Gaspereau River.

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CHAPTER 1: INTRODUCTION

Chemicals are now found, at exponential rates each year, in the Great Lakes... The Great Lakes contain the last major supply of fresh water on the planet... The Pharmacist gives you a prescription, but says make sure you don't take it with the following ten things. But all those ten things are in the water. (WaterLife 2011)

At the core of the Mamas' understanding of the world is their belief that the mountain itself and its sacred sites are living and fully conscious, as are other key parts of the planet. They are now certain that if we cannot be brought to understand this, then everything is doomed as we shut down the life-energy of the world. (Tairona Heritage Trust 2011)

To shut ourselves off from these other voices, to continue by our lifestyles to condemn these other sensibilities to the oblivion of extinction, is to rob our own senses of their integrity, and to rob our minds of their coherence. We are human only in contact, and conviviality, with what is not human. (Ackerman 1990, 22)



The Gaspereau River at high tide, Gaspereau River, Nova Scotia

All living and non-living structures in nature are governed by a rhythm, a pattern...a pulse. Simultaneously resonating at infinitely small and large levels, it moves through systems, inanimate objects, simple and complex organisms alike. Increasingly man has become detached from this pulse, from the world around him, and arguably at great cost. At a time when technology has pushed connectivity between humans to unprecedented levels, we have significantly disconnected with what is not human. In our daily lives we fail to remember, or perhaps recognize, how fundamentally interwoven the world we inhabit is and the importance of our connection to it. Fresh air and sunshine are directly related to

our sense of well-being. Toxic chemicals, in spite of being banned in North America, make their way from China to the Great Lakes (Waterlife 2011). That the world of man and nature are in fact singular, and that we are defined by our existence within it, seems to have been forgotten. There does not appear to be a word which speaks to the two as inextricably linked, of man as one pulsing fragment resonating inside a much larger body.

For the largest part of our species' existence, humans have negotiated relationships with every aspect of the sensuous surroundings, exchanging possibilities with every flapping form, with each textured surface and shivering entity that we happened to focus upon... Today we participate almost exclusively with other humans and with our own human-made technologies. It is a precarious situation given our age-old reciprocity with the many-voiced landscape...(Ackerman 1990, ix)

If we are to change the patterns which seem to be unfolding, to reconnect with the 'many-voiced landscape', then perhaps we must shift our perception of having a relationship with nature, to one of a relationship *within* nature. If we are to reposition ourselves we must also reposition what, how, and why we make. As architects, as makers of the built environment, of place and inhabitable human space, what does this mean? This thesis explores the repositioning of ourselves and architecture by asking:

How can architecture be informed with the pulse of the world?

Precedents

There is a growing interest in the dynamics of fluidity, in networks and in the new topologies of surfaces and soft boundaries...a change [in the concept of 'nature'] from metaphor to model. (Weinstock 2008, 5)

In its understanding of man, his architecture, and nature, this thesis sits within the realm of human ecology as described by ecologists such as Frank Egler, as well as drawing from the likes of Diane Ackerman and David Abrams. Like Egler, both Ackerman and Abrams place humans within the natural world, but suggest also that our sensory experiences within

it, or lack thereof, are key to defining ourselves as humans. Not unlike Juhani Pallasmaa, Abrams expresses a concern with the disconnect between humans and the world around us, emphasizing that it is an awareness and engagement of the senses *in* the natural world, which we fundamentally need and are missing.

To some extent the thesis finds precedence in the world of Animal Architecture, in D'Arcy Thompson's On Growth and Form, and in texts such as Ian McHarg's Design With Nature. Each of these however represent only a component within the overall body of the thesis. Although explorations in biomimicry are related, to date these investigations as applied to architecture have tended to result in focused, singular metaphors, such as the bio-structural analogues explored by Joseph Lim (Lim 2009) or the work of Antonio Gaudi in the Sagrada Familia. More closely related is the world of morpho-ecologies, of dynamics and fluidity in architecture, and in particular the writings of Michael Weinstock (Weinstock 2008), who speaks specifically of the relationship of metabolism and morphology to the built environment.

Perhaps the closest built precedent comes in the form of Theo Jansen's Strandbeest; kinetic skeletons which hover at the edge of land and sea. Traversing the sands and skirting the tidal edge, these 'beests' are responsive to particular environmental conditions; changing motion with the direction of the wind, retreating when water becomes too deep. They play at memories of familiar, multi-legged creatures, and provoke the imagination with the context in which a beest of such size and morphology has been placed. Notably absent from the work as precedence is its ability to be inhabited and physically engaged by humans.



Example of Theo Jansen's Strandbeest. (An Irishman Abroad 2011)

CHAPTER 2: THINGS THAT PULSE

Chora: The Nature of Thresholds

The word chora...appears within the entrance of space above the inner doorway. In the Kariye Djami it indicates something like a field for the living, a field that links two realms; a threshold space between local and larger, global conditions... the word includes notions such as matrix, a kind of womb, the enfolding of an outside world into a specific body. A Greek word for city, chora came to indicate peripheral and liminal conditions. Peripheral spaces were portals to larger and different spaces where, in the early Greek period, sanctuaries were placed and rituals held. In this way, the mundane affairs of daily life were linked to larger spaces inhabited by gods with human propensities (they embodied forces otherwise too large to comprehend)...Portals generate spaces and events on the edge, on a cusp in time, almost not there, ephemeral like a dance, but influencing all that moves – vortices in a landscape of urban change. (Hoshino 2001, 7)

Despite all the mechanical artifacts that now surround us, the world in which we find ourselves before we set out to calculate and measure it is not an inert or mechanical object, but a living field, an open and dynamic landscape subject to its own moods and metamorphoses. (Ackerman 1990, 32)

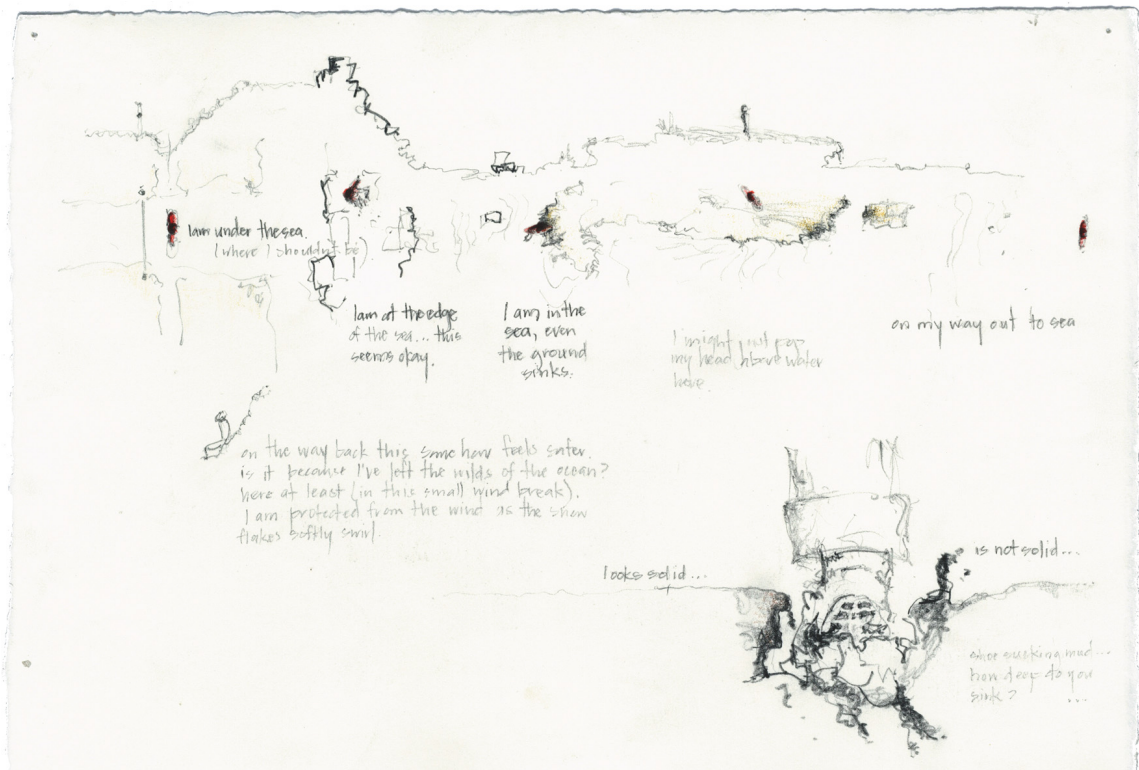


The Gaspereau River edge at high tide, Gaspereau River, Nova Scotia

In exploring the relative position of man and architecture within the world, our definition of that world must first be considered. Current understanding clings largely to ideas of permanency; tending towards a need to establish which lines and parameters are static, fixed, things. We are “a civilization obsessed with permanence and predictability, a civilization that believes its destiny is to dominate and possess an external reality transformed into

natural resources, while consciously or subconsciously concealing mortality and the ultimate ephemerality of all things human, from personal belongings to the powers of the mightiest empire” (Perez-Gomez 2006, 3).

To exist *within* nature, to dwell in the realm of the organism, is to recognize the mortality and ephemerality of *all things*, human and non; to inhabit a world which is in fact only dynamic. Static is a relative term, true only for, or in relationship to, a given period of time. If we assume that as an extension of man, architecture must also exist within nature, then to study the world of architecture is to study the dynamic; objects in motion, slippery edges, relationships of forces and organisms over time and space. It is a study of the chora of this world; the places in-between, the transitions, as one thing or condition bleeds into another. An exploration of the constantly shifting, tangible and ephemeral meshwork of zones, pathways, human and non-human lines, that make up our reality.



On My Way Out To Sea. Study of Oak Island land to sea transition.

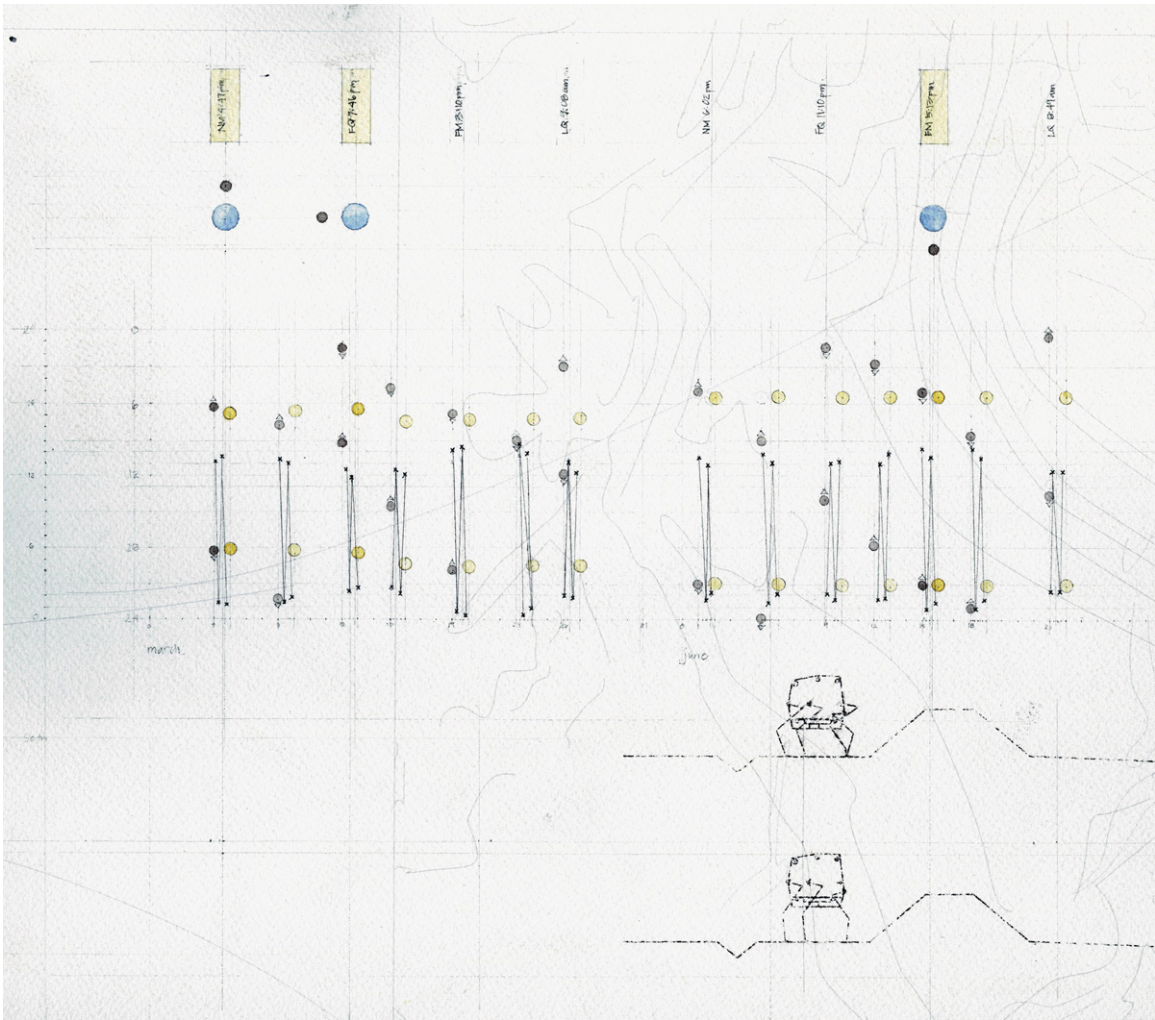
Man and Nature: Human Ecology and the Architectural Organism

For inhabitants...the environment does not consist of the surroundings of a bounded place but of a zone in which their several pathways are thoroughly entangled. In this zone of entanglement – this meshwork of interwoven lines – there are no insides or outsides, only openings and ways through. An ecology of life, in short, must be one of threads and traces, not of nodes and connectors. And its subject of inquiry must consist not of the relations between organisms and their external environments but of the relations along their severally enmeshed ways of life. Ecology, in short, is the study of the life of lines. (Ingold 2007, 103)

How do we place something in the context of a permanently dynamic environment? How do we place architecture so that like man, it is embedded within nature, able to respond to shifting space and time? If “stones and meandering rivers” have a voice, so too might the things we create (Ackerman 1990, 14). Let us imagine the architecture itself as a living, breathing, being; an organism, albeit of our creation.

Our architectural organism lives within a local ecology, connected to a greater regional ecology, which in turn is one of many within an even larger more complex system. Whether the organism exists or not is a function of its ecological niche; how much and what kind of resources are available, if and how many similar organisms exist, and what other kinds of organisms exist within the niche. Its metabolism, morphology, size, and lifespan, the scale of its permanence in time and space, are directly connected to such living variables, as well as to the rhythms of the inanimate objects and forces around it. As the organism is affected by the forces which work within its local niche, so too is it affected by the forces which flow through the system; forces which are connected to other niches, other systems, and ultimately the world at large. It neither exists nor is created at random, but as a function of its ecology. As a general rule, it does not consume more than it can safely disperse of, nor does it act in isolation. It is born, behaves, and dies, in relation to all of these things.

The inhabitant is rather one who participates from within in the very process of the world's continual coming into being and who, in laying a trail of life, contributes to its weave and texture. (Ingold 2007, 80)



Detail from the storyboard drawing series; annual lunar tidal patterns of the Southern Bight.

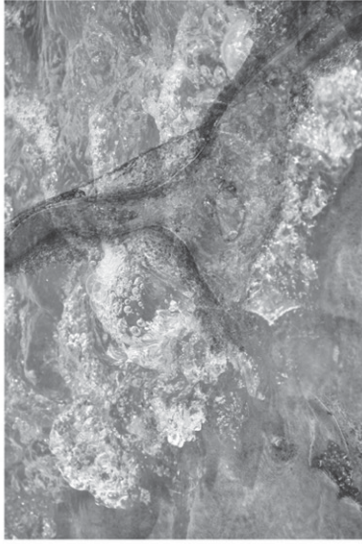
If we are to be responsible for the creation of such an organism, it follows that we must begin by understanding the ecology of the world we expect it to inhabit, the life of the lines that make up its anticipated context, before knowing or deciding quite what the organism is. Ecology, in this case, is as described by Egler; “a broadly integrated approach in which man, the physical environment, and all plants and animals are jointly considered parts of a single ‘organization’ in nature” (Egler 1977, 210). It does not separate but in fact includes, the “artificial” and “unnatural, placing importance on man-made and non-man-made as equally integrated parts of a system” (Egler 1977, 135). It recognizes that man and his objects, regardless of intent or outcome, operate not in relationship to nature, but inside of nature.

Man and Architecture: The Human Lens

Humans are tuned for relationship. The eyes, the skin, the tongue, ears, and nostrils – all are gates where our body receives the nourishment of otherness. This landscape of shadowed voices, these feathered bodies and antlers and tumbling streams – these breathing shapes are our family, the beings with whom we are engaged, with whom we struggle and suffer and celebrate. (Ackerman 1990, ix)

In imagining architecture as organism it should be remembered that the architectural organism remains an object of human making, a body to be inhabited. In addition to resonating within nature, it must engage and support the humans that create and dwell within it. As humans we fundamentally understand, interpret, and engage the world through sight, taste, touch, sound, muscle and bone (Perez-Gomez 2006, 24), through memory and imagination. If we are to be engaged by the architectural organism, it must intentionally encounter these senses.

If, as Juhani Pallasmaa says, “architecture is our primary instrument in relating us with space and time, and giving these dimensions a human measure” (Pallasmaa 2005, 17), then in addition to existing within chora, the architectural organism is itself a form of chora. As the means through which we humans interpret and interact with our world, architecture exists not only within, on, or about thresholds, but is in itself a powerful threshold, capable of connecting the individual with time and space, imagination, memory, and perhaps, the pulse of the world.



eye spy a mud pie and hear the salty sea

CHAPTER 3: METABOLISM, MORPHOLOGY, AND CHORA

Ebb and Flow

Curling through creeks deep and crooked,
Gliding o'er levels of green,
Hiding the rounded red rush banks
That sing to the currents and lean...
Flooding in power and silence,
Thrusting strong arms through the land,
Whirling the ships into harbor,
Lifting the keels from the sand...
As swiftly the waters enter,
So the tide shall return to the sea,
Ebbing again to the northward,
Southward again to the sea.

J.F. Herbin, 1909, age 90

(Bleakney 2004, 46)



Gaspereau River Salt Marsh, Grand Pre, Nova Scotia

The Southern Bight and the Gaspereau River Estuary

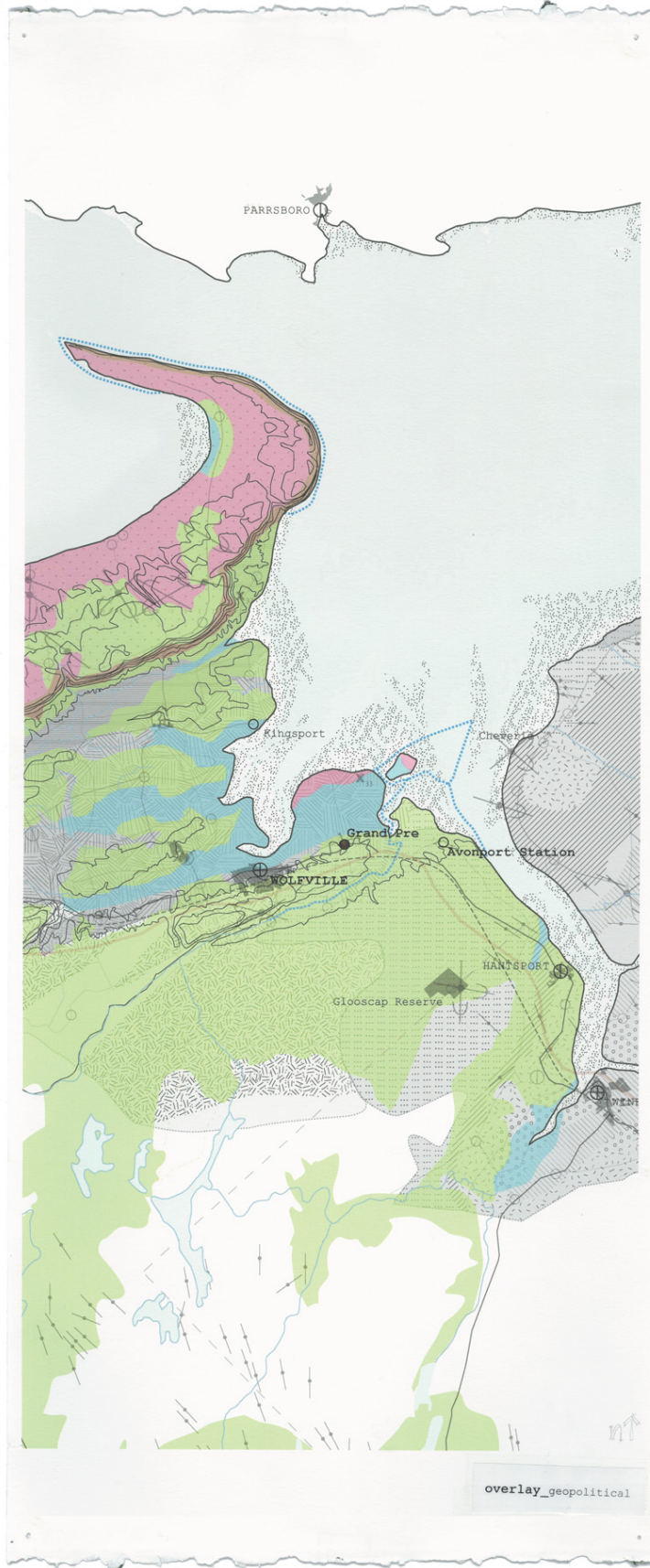
This special Bay of Fundy case of macro-amplification of tides is rare, and nowhere else has it transgressed the land to such an extent and laid down such deep marine soils. (Bleakney 2004, 9)



Define; sight, sound, muscle, bone. Sensory mapping; Minas Basin

In Nova Scotia's Bay of Fundy, the arrival of high tide is "an oceanic wave crest that progresses counter clockwise from Europe and sweeps down the North American coast from Greenland and Newfoundland, on to Florida, and back to Europe in just twelve hours" (Bleakney 2004, 13). Splitting in two at the tip of Cape Chignecto, the southern finger of the Bay runs along the cliffs of the Minas Geofracture, the result of an ancient collision between the broken plates of the super continent Pangea. Nova Scotia to the North of this line is part of the old North American plate. Everything to the south, sits atop remnants of Africa (Bleakney, 2004, 9).

Reaching inland, east towards Truro, the southern finger of the bay is known as the Minas Basin. Water rushes in and out at a speed of four meters per second (Percy 2001, 4) passing the triangle nose of Cape Chignecto and then rounding the curled tip of the North Mountain through one narrow gap. The inner basin then divides again, forming the Southern Bight and Cobequid Bay. Swirling down into the Bight the water bleeds into six rivers.



Geopolitical mapping; Southern Bight

Protected by the omnipresent shoulder of the mountain, all six of these rivers form tidal estuaries feeding significant marshlands. Four head back along the ridge of the North Mountain and down through the fertile farm communities of the Annapolis Valley. The largest of the six heads slightly to the east and south, carrying freighters to the world's fastest gypsum processing plant in the industrial town of Hantsport. The sixth, the Gaspereau River, sits nearly in the middle of the Bight, and heads south towards Gaspereau Lake.

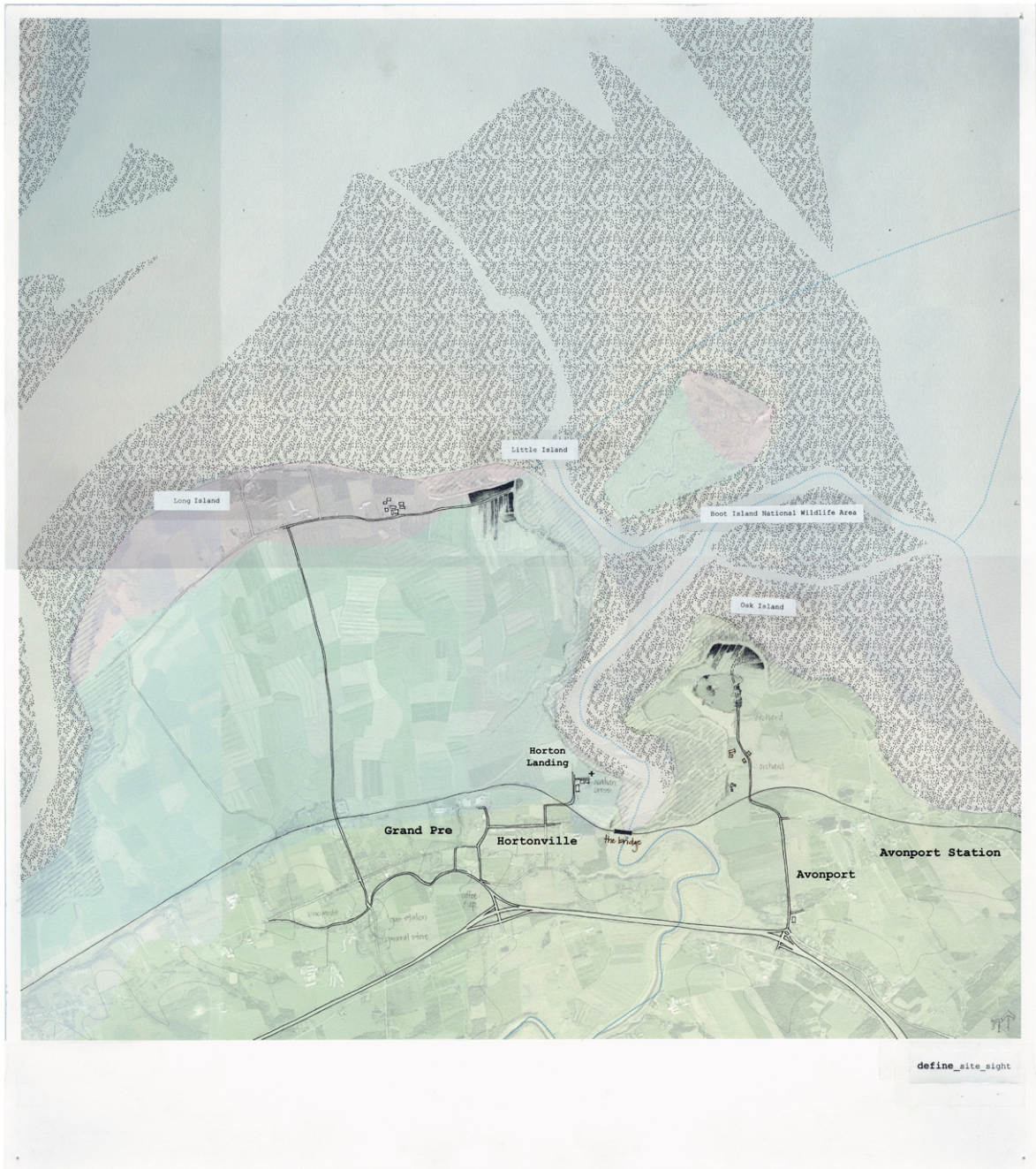
This is the land of Evangaline, the land of Glooscap, of the world's highest tides, of salt marshes and vast mudflats that seem to stretch across endless horizons. Tides here are diurnal, sweeping in and out twice daily. Their macro-amplification is a result of the "final geological act" in the Bay of Fundy; a tilting of the land down towards the Gulf of Maine which causes the bay to "resonate with the pulse of the moon's passage" (Bleakney 2004, 9) and at the mouth of the Gaspereau River, causing water to rise and lower an average of 13m with each tide. The idea of chora here is almost entirely tangible. For thousands of years, the edges and thresholds of this region have changed visibly and significantly, in cycles governed by the moon that span days, weeks, months, and years.



View to Oak Island, Grand Pre, Nova Scotia

The mouth of the Gaspereau River is marked by a small, increasingly eroding island known as Boot Island (Bleakney 2004, 139). It is a wildlife sanctuary, most visibly for birds, accessible even at low tide only with the aid of canoe or kayak. To the west of the island lies the farmlands and community of Grand Pre; "a rectangular block of 3000 acres of tidal

meadows” protected by the hard bedrock of the northern edge (Long Island) and lined on its east and west sides with the modern successors of 300 hundred year old Acadian dykes. It is the northern edge of Long Island, to which thousands of birds flock each year in the late summer months, stopping en route in a massive north to south migration. To the east of the island, lies a Grand Pre in miniature. Known as Oak Island, its protective dyke edge is much more recent than Grand Pre’s Acadian counterparts (Haliburton 1998, 129).



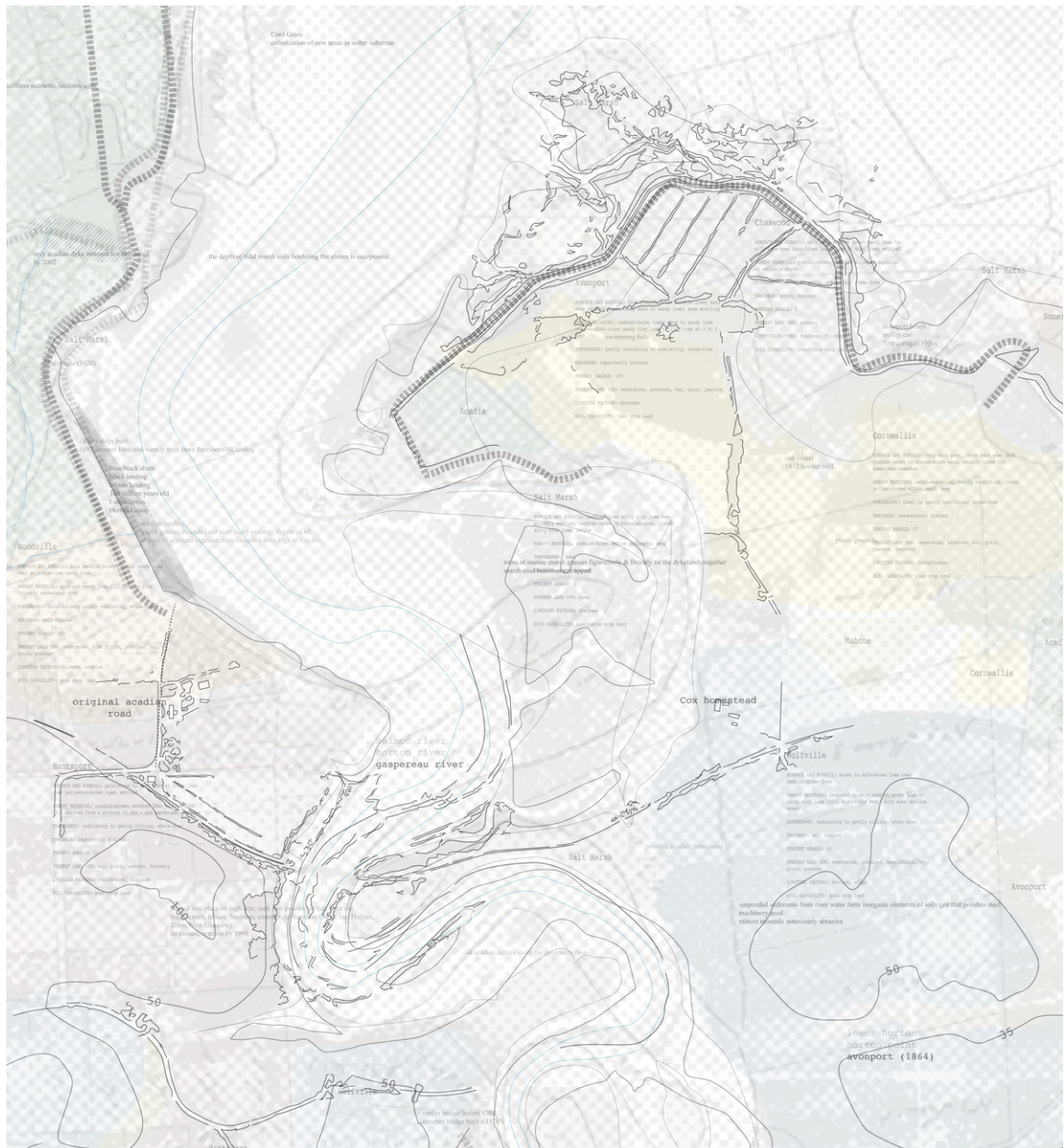
Gaspereau River Estuary, Grand Pre, Nova Scotia

Water in the Gaspereau Estuary is a lattice of pulsing arteries and veins. Even at low tide, capillaries flow around Boot Island, going to and from ocean and land, depending on the tides. As the Gaspereau begins to narrow, but still within its widest bends, a series of bridges and their remains describe the historic connection between the communities of Hortonville and Avonport, which straddle either side of the river's banks. Closest to the sea is the 1911 iron bridge, built as part of the 1870 Dominion Atlantic Railway. Furthest inland is the green frame of the modern bridge, which carries the only major highway in the region. Between the two, the remains of an old covered bridge, torn down when the road between Hortonville and Avonport was made redundant by a new road, long since replaced with the current highway (Haliburton 1998, 124). The bridges serve as markers of both human histories, and the constantly shifting lines of the Gaspereau River.

Modern human communities within the land of Evangaline stretch from Grand Pre down the length of the Annapolis Valley. They are a series of small interconnected organisms, the nearby university town of Wolfville being the largest, and are built on the backs of rich farmlands produced by Acadian dykelands and the naturally protected valley. Historically the fabric of the surrounding water, in its river and ocean forms, was both rich hunting ground and vital transportation network (Bleakney 2004, 6). For much of the region's history transport across water, even with the substantial challenges of the fast moving tides, was easier than transport across land. In a very real sense, the community included the southern portion of the Southern Bight as well as small settlements tucked into the cliffs of the Minas Geofracture. Daily ferries to Parrsboro have long stopped running from Horton Landing, and water traffic within the Minas Basin now consists primarily of the large gypsum freighters headed towards Hantsport, a handful of small fishing vessels from the few tiny remaining wharfs, and the occasional canoe and kayak traversing the Basin's edges.

CHAPTER 4: THE CHILD AND MORLEY

Life on the spot surely cannot yield an experience of place, of being somewhere. To be a place, every somewhere must lie on one or several paths of movement to and from places elsewhere. Life is lived... along paths, not just in places, and paths are lines of a sort. It is along paths, too, that people grow into a knowledge of the world around them, and describe this world in the stories they tell... (Ingold 2007, 2)



Detail from Storylines of the Gaspereau, Nova Scotia

The child blinked. Once. Twice. A moment of pause before the warm darkness of sleep ebbed into a dim awareness of early light and chilly toes gone uncovered. She stretched her arms, her legs, and tucked her feet back into the heat of the blankets before remembering. Quickly the child rolled out of bed and pulled her clothes on, shivering a bit at the cool of the morning. Slipping through the bedroom door she quietly tiptoed across wooden floor boards and out of the sleeping house, stopping only to clumsily tie shoelaces.

For a moment the child disappeared into the leafy fall foliage, re-emerging with a small, once-red bicycle. All summer she had been practicing. Watching and practicing. Waiting for the perfect opportunity and to be strong enough to go all the way out. It would take her the better part of the day she thought, and she had never been so far. Checking her box of provisions, she edged passed the farmhouse to the top of the road, where a small cluster of trees would hide her from any waking eyes.

The sun had begun to spread itself over the land and the child paused for a moment to survey her surroundings. From this point she could see just about everything. Over the corn and the cows and the orchards, past the shifting edges where the water rolled across the horizon, out to the deep red creases of the mountain thrown up by lava millions of years ago. Inhaling the crisp air and unharvested crops the child jumped on her bicycle, and with only a slight wobble, pushed off the gravel.

To her right was the sea. Though she knew things to be higher and lower, the vast expanses of field and water seemed to form nothing but flat lines, with small objects printed here and there. Curious things had been happening along the edges of these lines. She knew which objects were houses, barns, tractors, but the object that had caught her eye was not one of these. It was far too large for a dog or cow, yet too small, and had been there too long, to be mistaken for a wayward flock of birds from the far beach. At the sight of her school playground, the child was briefly pulled out of her reverie, swerving to narrowly avoiding missing her turn and the giant potholes in the road.

Heading towards the ocean, the child slipped back into her thoughts. For a time she lost sight of the water, pedalling past small houses and apple orchards. It was like no animal she could think of, and yet she was sure it moved...in and out with the tides, changing height with the water, location with the weather, and now color with the season. Slowing a

bit as she came down the hill and over the railway tracks, the child briefly caught a glimpse of the river to her left before continuing past the onion fields, where pavement became dirt path. Beside her, the fields had turned to trees. She carefully dismounted and settled on the bare trunk of an evergreen as resting spot for the once-red bicycle.

Pinecones and underbrush crunching underfoot, the child returned to the path and headed into the small patch of forest. At first the only noise she could hear was the distant hum of farm machinery and twittering of the occasional bird. Closing her eyes for a moment, and listening more closely, now came the sound of flocks being disturbed on the water side of the dyke. As she approached the end of the trees, the child looked over the few small fields that ran to the edges of the grass mounds that divided land from sea.

Whatever it was, from her bedroom window, she had seen it on both sides of the dykes. At the moment however, there was nothing in sight. Heading towards the mound, she continued to search for signs of something that may have gone before her. As the child stepped around the rusted gate marking the end of the farmers path, a curious pattern further down the dyke wall caught her eye. Turning towards it, the child made her way along the grassy shoulder which outlined the fields, careful not to get too close to the water quietly trickling out to sea.

Moving, the large, dark, circles, focused into patches of earth overturned, not unlike the machinery her father used to make holes in the farmhouse lawn. Unlike the lawn however, these holes were the size of her hand. More like a set of animal tracks, veering slightly diagonally as they climbed up over the dyke. The sounds of the birds were quite close now.

Inhaling deeply, the child began to quietly crawl her way up, moving slowly in anticipation of what might appear over the top. It was mid-morning and the tide would be making its first retreat of the day across endless muddy plains. A salty breeze rippling her hair, she crested the dyke and peered out across marshes and mudflats. Where the harder flat top of the mound dropped into massive boulders, the tracks suddenly disappeared. Scanning the horizon, the child spotted it, and quickly moved up against a boulder just large enough to hide her small frame. At the bottom of the rocky slope, the tracks began again. Deep, chocolatey, streaks of a footprint, followed the creature out to where it was, slowly, but most definitively, moving.



The Child and Morley

Forgetting that she was hiding, the child clambered on top of the boulder to get a better look. Its legs were a bit like the small birds that flickered across the flats in the thousands during late summer and early fall. Though the mass flocks had already been gone a few weeks, larger birds and a number of small ones still fluttered along the edge of the far beach, towards the island, and into the mouth of the river.

It was out towards the island that the organism appeared to be heading. Although it looked big enough to contain a man, there was no door, no window, no way that the child could see of entering the way you would a building. And it moved. Picking up two legs at a time, it mostly seemed to be follow the water, hovering at the edges of waves pushing against the

slick earth. Now and again, it seemed to change its mind, turning slightly to look at the island, then shifting course to suit.

After a time, it paused. The child held her breath as she watch it quickly sink into the depths of the mud. Mud slippery, fine, and deep enough, to swallow a child she thought. But just as she was sure it would sink forever, it stopped. The creature seemed to settle now, and she could hear a faint clicking as it turned its head quietly towards the island. The child sat for some time more, waiting to see if it would move again. But as the birds began to flutter back around the long, stick like legs of the organism, the faint rumbling of her stomach reminded the child that it was now mid-day, and her store of summer apples and slightly messy peanut butter sandwich were safely stored with her bicycle, against the bare trunk of an evergreen tree.



The Inhabitant

Looking towards the creature the child's eyes moved out past the island, across the river, and she remembered the other curious case of summer. Out on the tip of the far beach, where the birds flew back and forth with the tides, people seemed to disappear. Harder to see than the dyke-land organism, and difficult to be sure as she had not seen it so often, whole families, out for a walk across the tops of the grassy walls, seemed to suddenly disappear into the earth. The child's eyes drifted back to the creature, still still, and with a sigh and the now much louder rattle of an empty stomach, the child turned away from the mudflats and headed back towards the forest.

Having paused at the edge of the forest to eat, the child now made her way to her second destination, on the other side of the banks, where the rivers mouth bled into sea. From the chatter of the older kids, the child knew that the old railway tracks led to the bridge, and the bridge would take her to the other side of the river. From there, she thought, she could follow the tops of the dykes out to the tip of the far beach. Arriving back at the railway, she turned at the old Cox house, and headed towards the bridge.

The child had never pedalled along the old tracks before, and had never really looked towards the bridge. She was now further than the farthest she had ever gone. Eyes squinting as the bicycle rolled rhythmically along wooden planks, her pedals slowed as she realised things appeared to be hanging from the bridge, almost cocoon-like around the old iron skeleton. They had something of the creature of the mud flats about them. Heart beating fast, the soft clunking of wheels stopped with the child, unsure whether or not she should continue.

Suddenly, the sound of laughter floated across from the other side of the bridge. Squinting harder, the child could see a couple approaching from the tracks across the river. Like her parents she thought. Seemingly un-concerned about the thing on the bridge. Comforted slightly, she resumed her pedalling. Unlike the object on the mud flats, whatever had attached itself to the bridge did not seem to be moving. Still not entirely convinced however, the child hurried across, not daring to look up or take a second look at the adults. Instead, veering off the tracks, back on top of the dykes, and out towards the tip of the far beach.

The mid-afternoon sun warmed the child as she followed the sinuous line of the dyke wall, separating the deep gouges of a now nearly empty riverbed to her right, and the stretches of

field and pasture to her left. Past the small white farm, past the old cross. Along-side her, at the base of the rock boulders and the edge of the green marshy mounds, the last of the small plovers danced delicately across the muddy banks of the river. Her thoughts briefly went back to the long legged organism she had watched this morning, and looking out across the river banks she could now see it clearly. It had moved again, and to her disappointment remained facing away from her, looking down. Perhaps at its own small group of plovers weaving across the top of the mud, digging for the nearly invisible worms that were their supper.

The island was much clearer, she was nearly at the tip of the the far beach. Yet still she could not see anything. Where were the people disappearing to? Getting off the bicycle, the child began to walk the remaining bit. And then the sound came...quiet but distinct. A trickling noise, echoing a bit almost as if it were coming from a cave. For a moment she thought it must be the water of the fields emptying out to the ocean. But that did not make sense. The water from the fields had emptied, the tide having turned its course. The sea was now steadily beginning its run back up the river, water having never fully left the deepest crevices of the muddy beds.

Following the delicate echoes, the child slid down the grassy slope, steeper here in an attempt to battle edges which were more exposed. Ahead of her was another farmer's gate, and just past she saw it; boulders stacked the way they were on the sea side. Great masses of them. That seemed odd. The boulders never stacked on the grassy side. Heading towards what seemed to be the center, the child noticed a few stones set slightly in front of the rest.

The trickling water was less delicate, more distinct as the child approached the boulders. Rounding the first stack, the child discovered a wide gap; wide enough for a whole family to disappear into. Salty, damp, earth flooded her senses as she entered a small cavern. Eyes adjusting, she could now make out a set of stone stairs leading directly to the top of the dyke. The child sat on a small stone bench and pulled out the other half of her sandwich. Crossing her feet she noticed the gravel beneath her feet; smooth and easy to walk on. This was a purposeful place. Not quite a building, but definitely built by people.



The Listening Cave

There didn't seem to be an entrance or exit to the sea. She supposed if there were, the sea would get in, rushing quickly over the fields she had pedalled by. Now that she listened, the trickling was quite loud. She couldn't quite tell where it was coming from. Listening closer, she thought she could hear the steady heartbeat of the waves, pulsing back in from the bay. Almost as if the sea was breathing. In spite of the massive stones around her, the mound of boulders suddenly didn't seem quite as solid as they felt. If the sea had not gotten into the fields, then surely it must not come into the cave. And yet the child thought perhaps it was time to leave. Her parents would have started to worry about her by now. She thought it was maybe a longer ride than she had realised, all the way back to the farmhouse. Leaving the cave she headed back to the grassy slopes, back to the once-red bicycle which she had leaned against a boulder at the top.

By the time the child reached the small farm and the old cross, the light had begun to fade, the sound of the river rolling along beside her as ocean moved its way back up against the

land. The child could now see the face of the bridge, and in the early evening light, alone and a bit tired, the cocoon like structures had become quite comforting. Emitting a soft glow, the silhouette of a person moved within one, giving it a nest like appearance and reminding her of the warm bed waiting at home. As she drew nearer, the child could hear the sounds of small groups chattering and laughing, and the smell of a well-cooked meal wafted over the tops of the dykes.

The child now noticed what she had hurried by earlier in the day. The hanging structures seemed to spin and stretch back into the land. Further down the old railway tracks, tucked into the base of the hill, was another, larger, object. Almost as though it had been extracted from the first. Through its filmy body she could see people eating and talking, unconcerned with their presence in this larger yet somehow still animal-like organism. It did not move like the creature on the dyke-lands, but as the child slowed and stopped at the edge of the bridge she looked between the two. She couldn't be sure, but something about these organisms didn't seem quite permanent, the way a building normally was. Something about the way they sat, stretched out and hovering over the deep crease of the muddy river, clawing slightly into the more stable crease of the hill. The larger one especially, seemed prepared to move. Very slowly perhaps, but creeping backwards into the fields none the less, as the river continued its job of smudging at the edges of the banks.

A slight chill came over the child as evening began to settle in, the sun having drawn much of its light, back across the land, out across the bay, and over the protective shoulder and deep red creases of the north mountain. Her parents would be quite worried now. And her stomach was once again grumbling. Climbing back on to her bicycle and taking one last look up into the cocoons, the soft thumping of wooden planks echoed into the river bed as the child rode under the hanging structures, over the bridge, and back towards the farmhouse.



Epilogue

It was wintertime. The ice and mud cracking together in big, hefty chunks over the darkness of the riverbed and the marshlands. The child was much older now. She stood at the top of the hill looking down at the constellation which made up the summers of her childhood. Looking across to the other side of the river she could just make out the top of the hill where the farmhouse still stood. In the moonlight, the edges of the dyke-lands Morley had once moved across glittered as the water lapped against frozen marsh grass.

Of course the edges were not the same edges exactly. When the sea had finally crept in, breaking at the boulders of the listening cave, the water had rushed over the fields. The humans in this area at least, had finally let the edges go. On both sides of the river, the fields were eventually returned to marshlands, as they had been almost 600 years ago. The edges would continue to shift, as all lines and edges do.

Morley did not live very long. Being a small, quick moving organism, he was, of course, not designed to live very long. Made of the extra bits and pieces of the land and man-made structures around him, he lasted ten summers, before being retired and replaced by another Morley. Slightly different, but much the same. The summer after her discovery, the child had realized Morley was in fact made by humans, as were the cocoon like structures and pathways which wrapped in and around the bones of the old Dominion Atlantic Railway. As she grew older, she spent many summer days herself, inside the dykeland organisms, wandering out towards the disappearing edges of Boot Island and watching the birds gather at the far beach.

The river now made a smooth, broad path, more or less through the old bridge. As the edges had been smudged away, year after year, the tavern had slowly crept further into the land, and with a bit of help, slightly up the hill. Having reached the end of their life, the cocoons had been let go. Also to return to the sea. Going out the way the old iron bridge had once been brought in. The smell of a well cooked dinner, fresh from the nearby farms that still lived further down the valley, crept upon her in the crisp evening air. Blinking lights outlined the ridge of the North Mountain, which still offered its protective shoulder to this inlet of the sea. Inhaling deeply she turned to the flickering lights of the tavern, and headed up the hill.

CHAPTER 5: MORLEY AND THE COCOONS OF HORTONVILLE



Storylines of the Gaspereau, Nova Scotia

If architecture is to be informed by the pulse of the world, and life is lived along paths, then no architecture can exist, or should be viewed, in isolation. Rather, it must be looked at through the lens of a constellation, as a series of architectures and organisms, even when it is just a single architectural organism under consideration. The constellation of this thesis has three foci; the dykeland organism(s) of Oak Island, the cocoons of Hortonville, and the listening cave of Little Island. The first two are home to architectural organisms as understood and explored by this thesis. The third, the listening cave, serves as counterpoint to the architectures imagined as organisms.



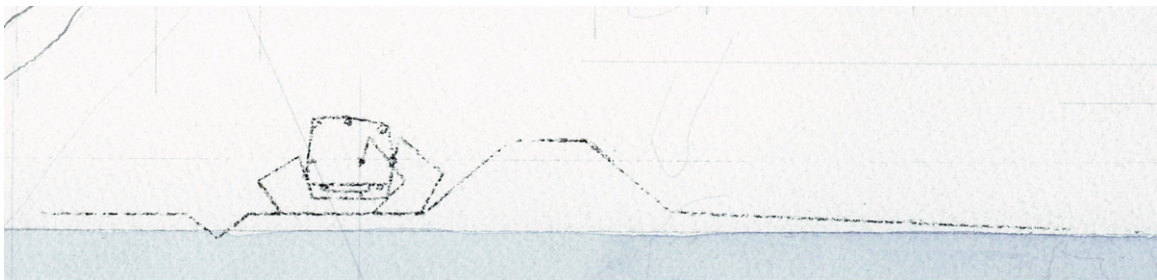
Early program mapping.



The three foci; from left to right, Little Island, Oak Island, and the Dominion Atlantic Railway bridge.

Morley: The Bird Watcher's Hut

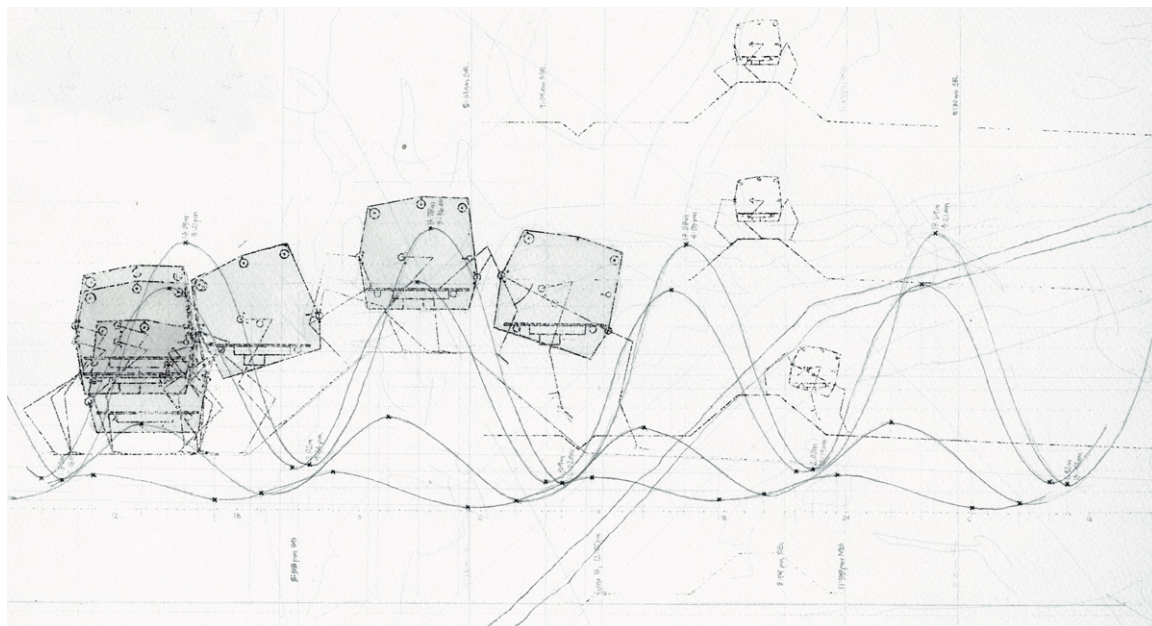
Oak Island, with its dykeland organism, is the smallest of the three sites. Here, the scale of the land, the fields, the thresholds, is slightly more human. Not really an island but a peninsula, Oak Island faces Boot Island and the eastern banks of Grand Pre. It marks the edge of the tiny communities of Avonport and Avonport Station, which consist primarily of small farming homesteads. Though located immediately off a major highway, the humble size of Avonport and the position of the land between the Gaspereau and Avon rivers lends a sense of isolation to the peninsula. In spite of this, sunny days always seem to find someone walking the edges of the dykes or the road from Oak Island to the highway. For the moment, the edges here are protected by both the dykes and Boot Island. As such, the modern version of heavily bouldered dykes is slightly less heavy and foreboding than other parts of the Acadian shoreline.



Detail of Morley of the Mudflats; Morley at rest.

In response to both the scale of the land and communities around it the scale of the architecture imagined here is small. Inhabited by a single individual it has the highest metabolism; it is the quickest moving, most nimble of the three architectural organisms, and has the shortest lifespan. Existing only for periods of about ten years, it rests on the wide shoulders which run the lengths of the land side of the dykes. When inhabited by humans, it is a vessel for exploration, observation, and reflection of the mud flats. Its movement through the mud flats is both controlled by the human occupant as well as influenced by the tides and thresholds of marsh grasses; avoiding water that it is too deep or a proximity that is not safe for the sensitive marshlands. Much like a spider, or the birds that run across the slick surfaces of the mud flats, its weight is distributed amongst multiple legs, and as such damage inflicted by its feet is temporary in the palimpsest of the sea floor, and minimal to the grassy side of the dykes.

As an inhabited, human space, the organism encourages large periods of reflection, regardless of the particular activity of the occupant. Perhaps used by a visiting writer, artist, or local bird watcher, the framed view determined by size and (user controlled) orientation of the architectural eye acts to both emphasize and restrict the sense of sight. When in motion, the resulting series of visual frames heightens the feeling of a horizon which moves both horizontally and vertically. When at rest, the sounds and smells of the empty sea filter in more distinctly.

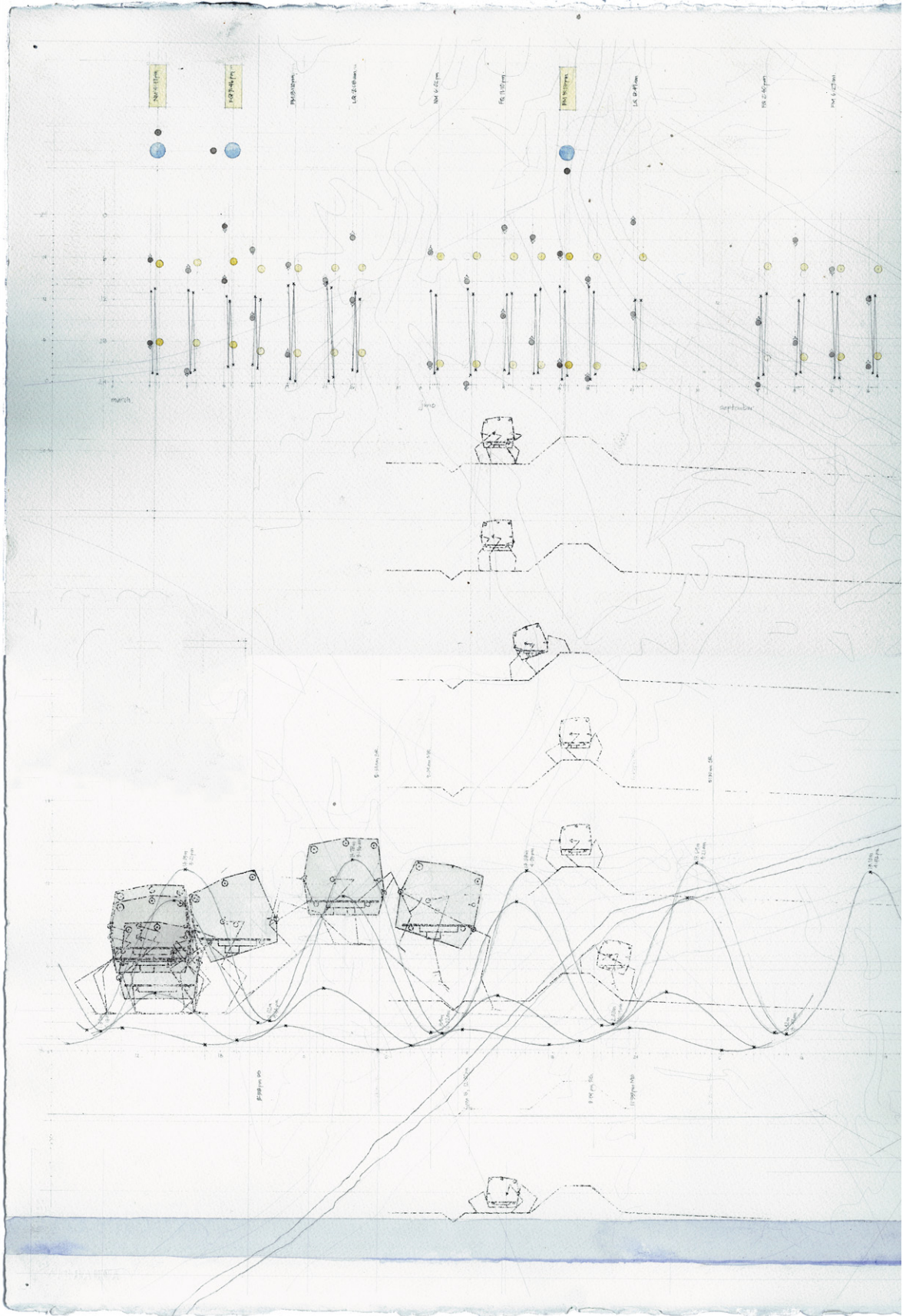


Detail of Morley of the Mudflats; Morley in motion.

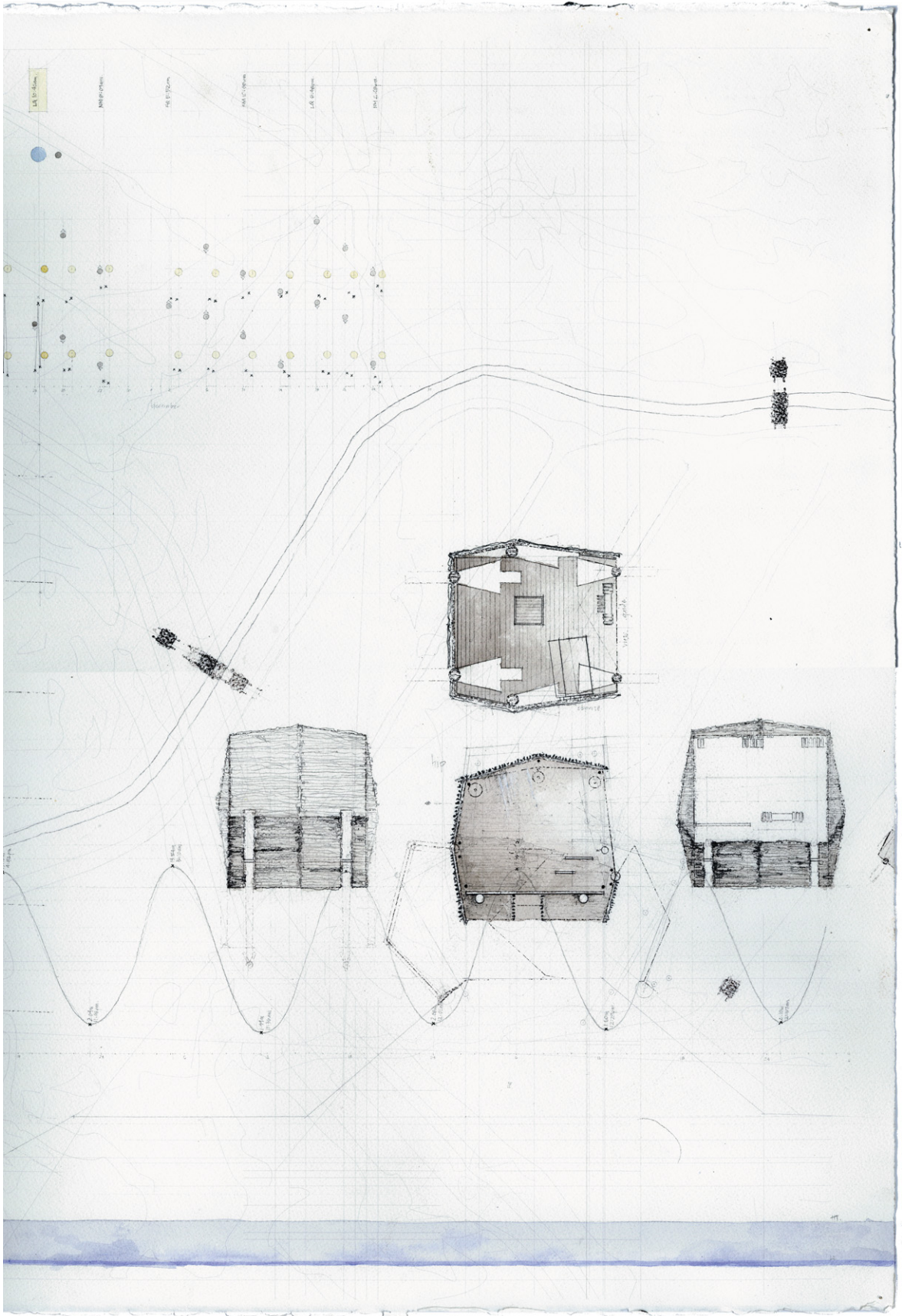
This is an organism whose use in inclement weather is intentionally restricted. Primarily it acts as a buffer of sun and to some extent wind. Excessive amounts of rain would quickly find its way through, making for a wet occupant. It is an organism that depends intimately on the community that inhabits it. Though the skeleton frame and key intricate joints exist from one generation to the next, the various skins, connective tissues, and appendages, are replaced in a hierarchy of cycles. During the course of its life, the skin is replaced on a seasonal to annual basis, pattern and texture shifting with available materials and the transfer of knowledge from one weaver to the next. Appendages and connective tissues last roughly the length of a single generation, ten years. Over time, their precise form, construction, and material composition may also change in response to changes in the landscape or the use of the organism by its inhabitants. At the end of its lifespan, the organism is left sitting in its compressed resting position on the land-side of the dyke. Any components worth keeping having been re-purposed as part of the next generation, the rest are left exposed, fading into the hill side with the passing of one or two seasons.



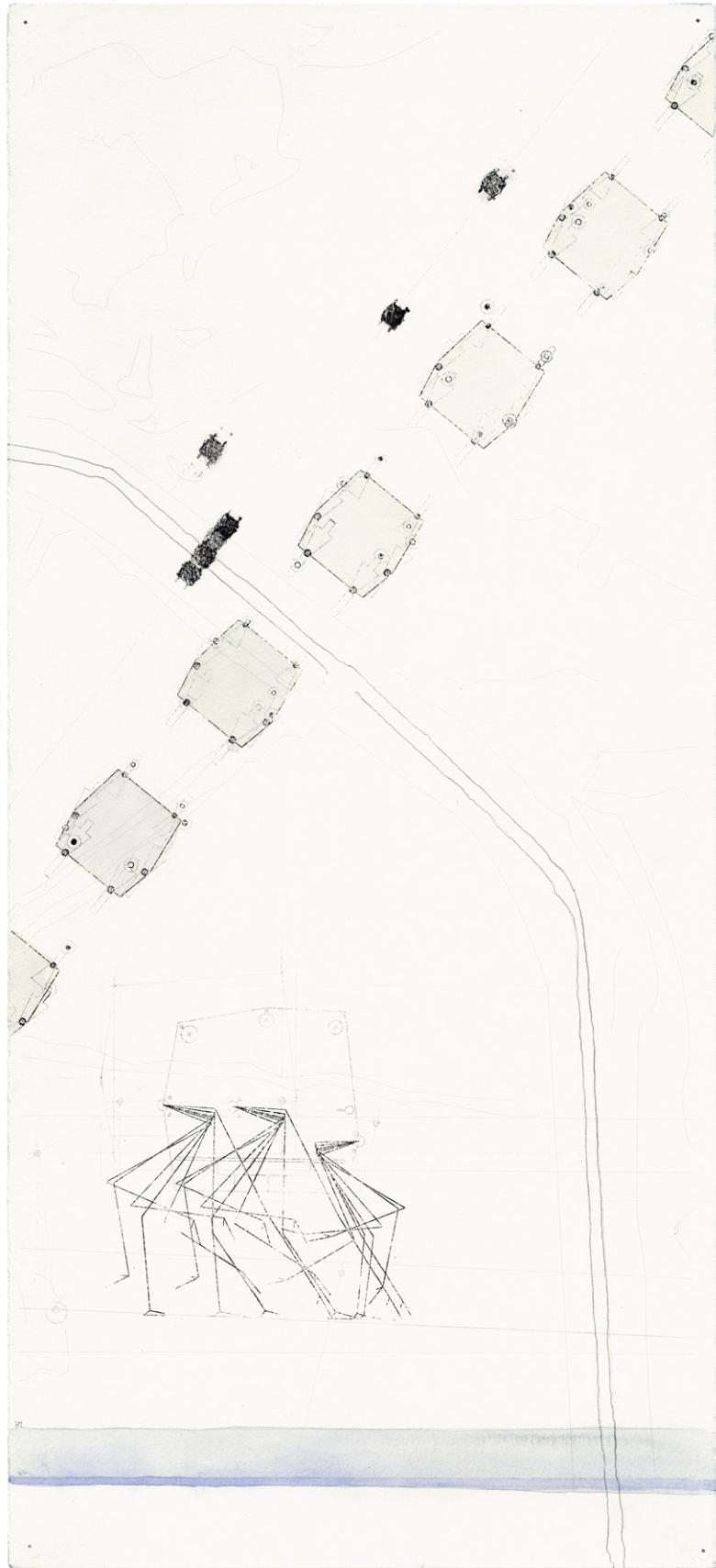
Morley of the Mudflats; ankle/toe appendages and sketch model of skeleton frame.



Detail of Morley of the Mudflats; part two storyboard drawing series, left side.



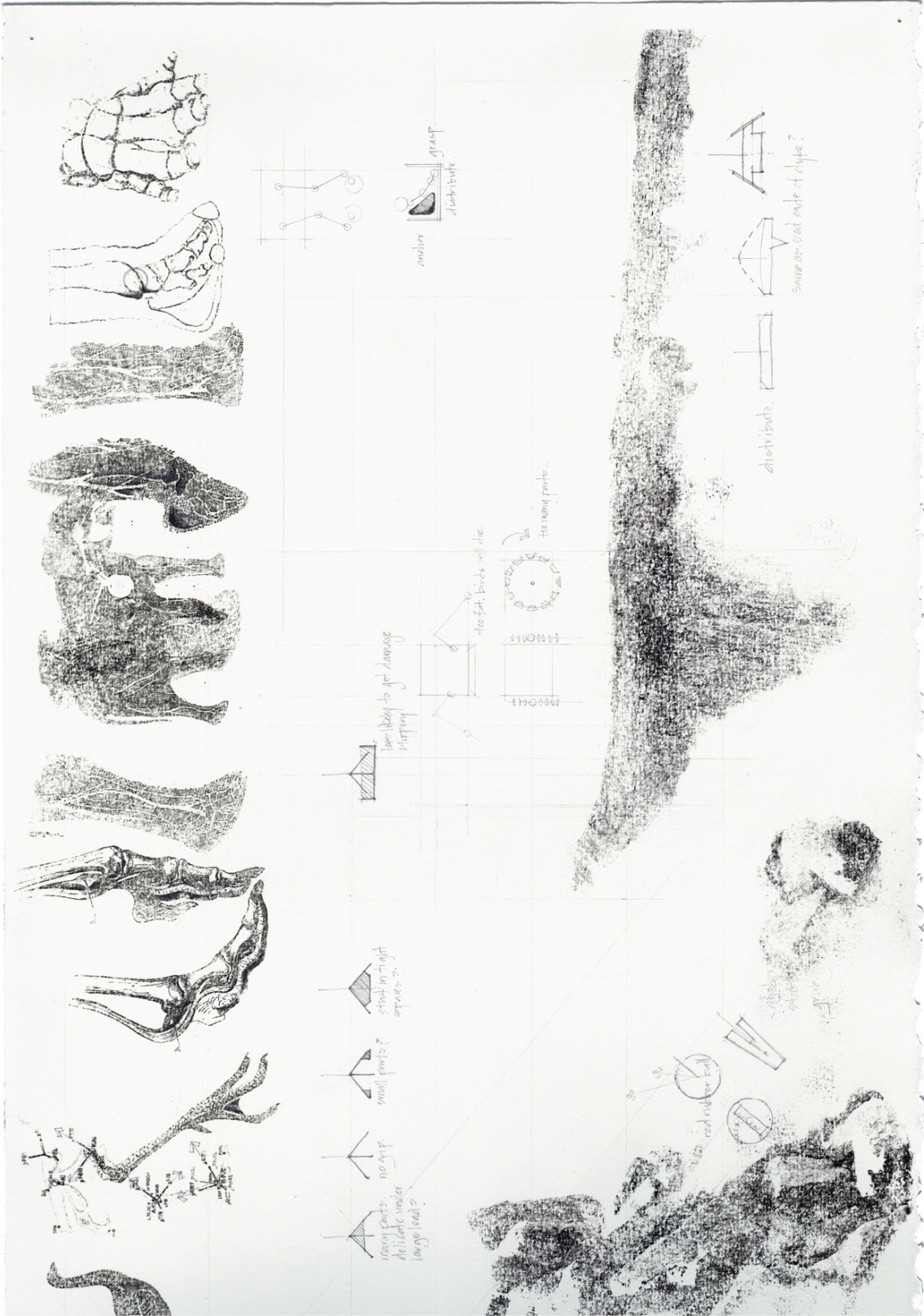
Detail of Morley of the Mudflats; part two storyboard drawing series, right side.

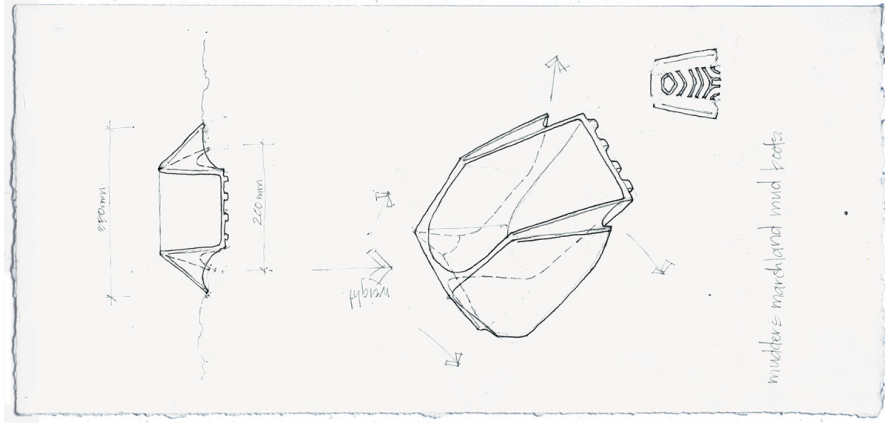
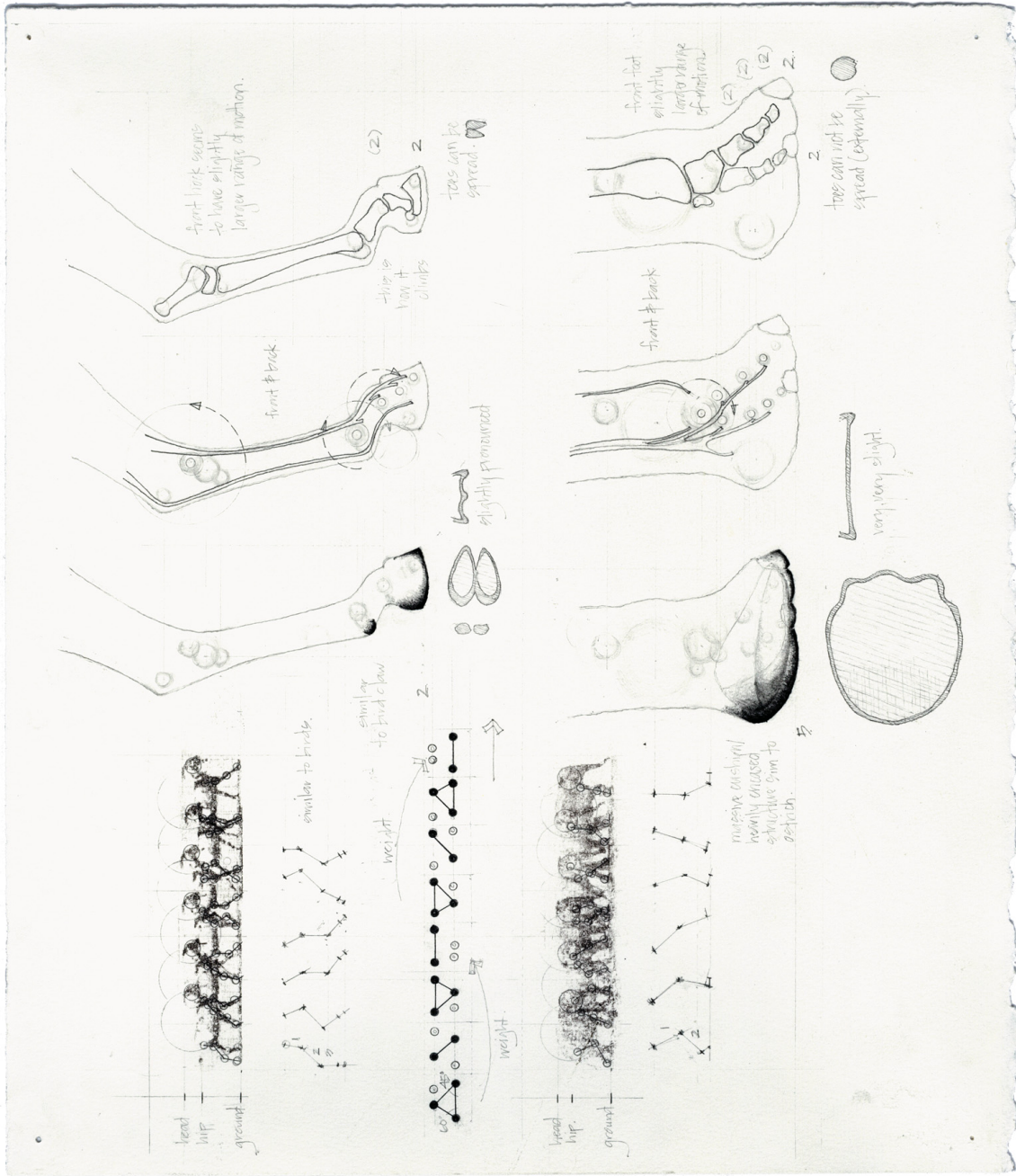


Detail of Morley of the Mudflats; part three storyboard drawing series.

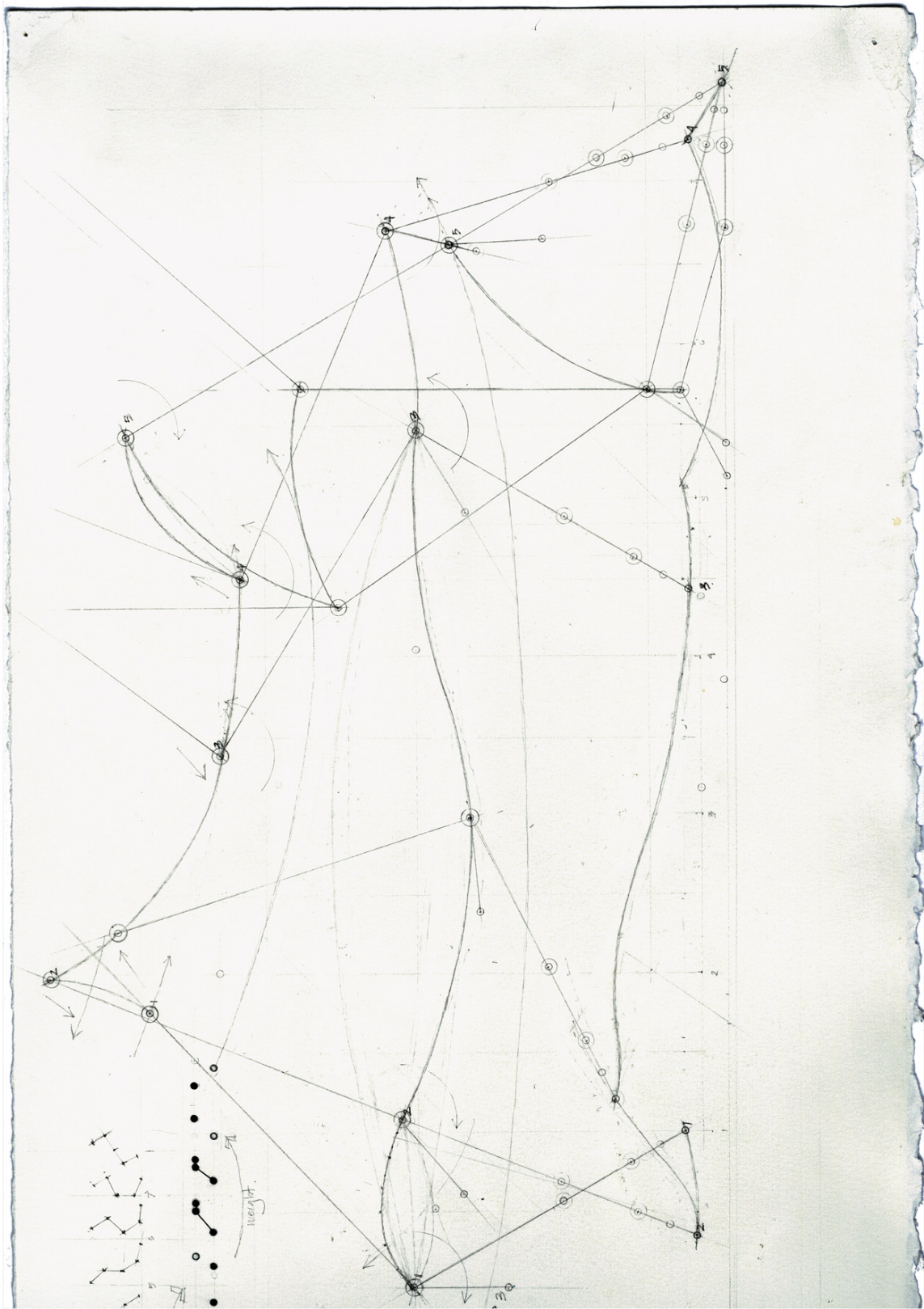


The Motion of Morley Part I; Navigating the Dykelands, terrain and homologous organism investigations, left side





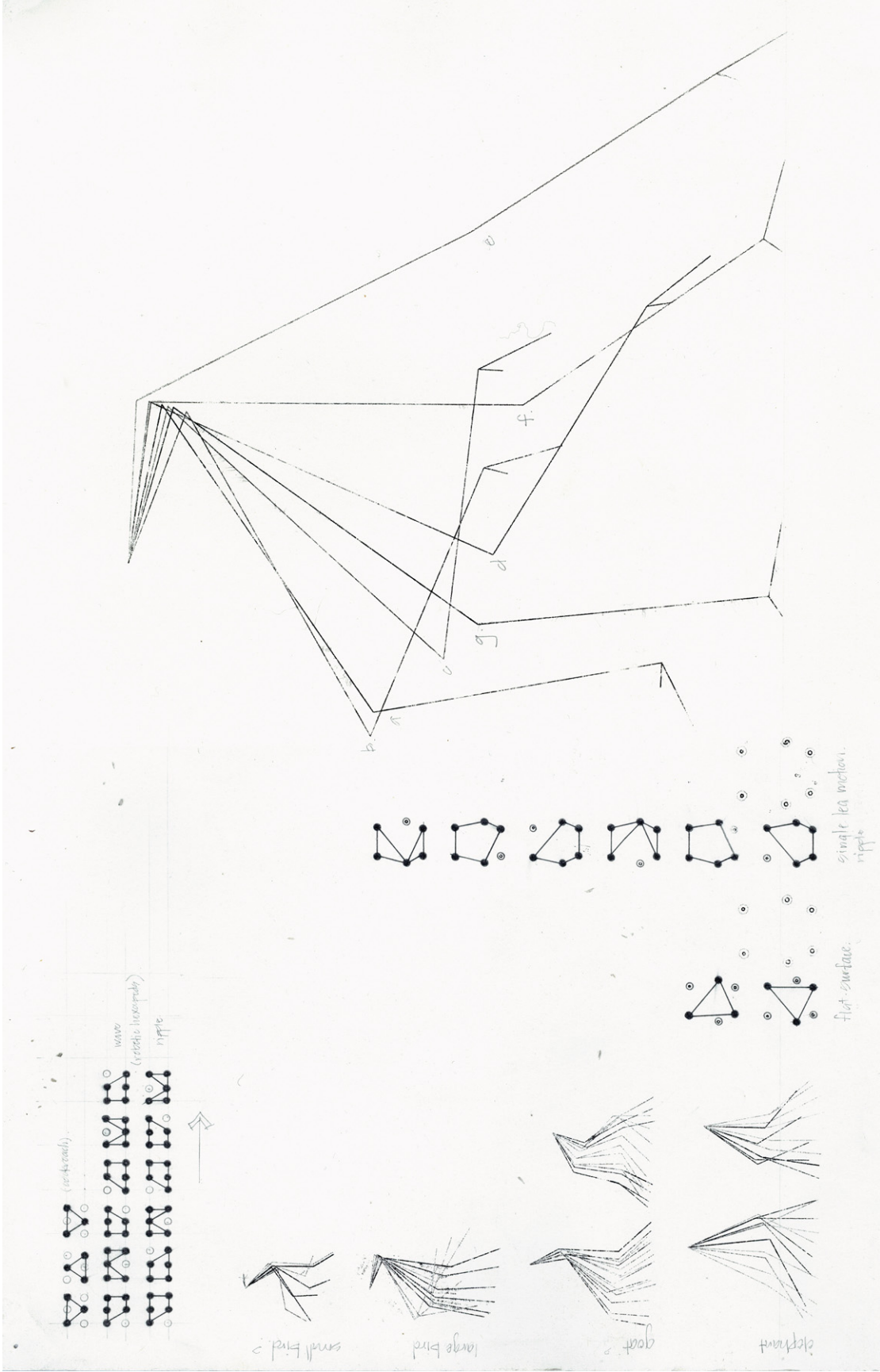




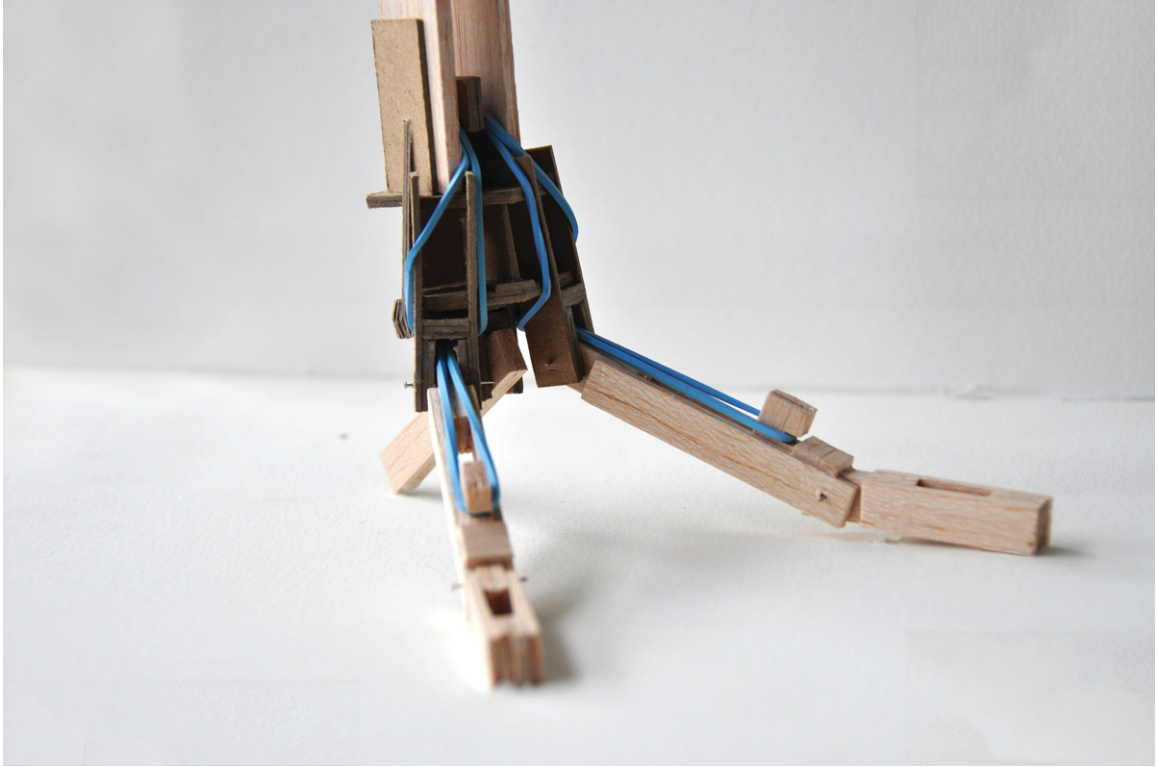
The Motion of Morley Part II; Understanding Motion, homologous organism investigations, right side.



The Motion of Morley Part II; Understanding Motion, lower leg (below hip) motion study model, homologous organism.



The Motion of Morley Part III; Morley in Motion, homologous walking patterns of multi-legged organisms and final translation showing the motion of Morley.



Morley of the Mudflats; detail model of ankle/toe appendages, joints, and connective tissues.



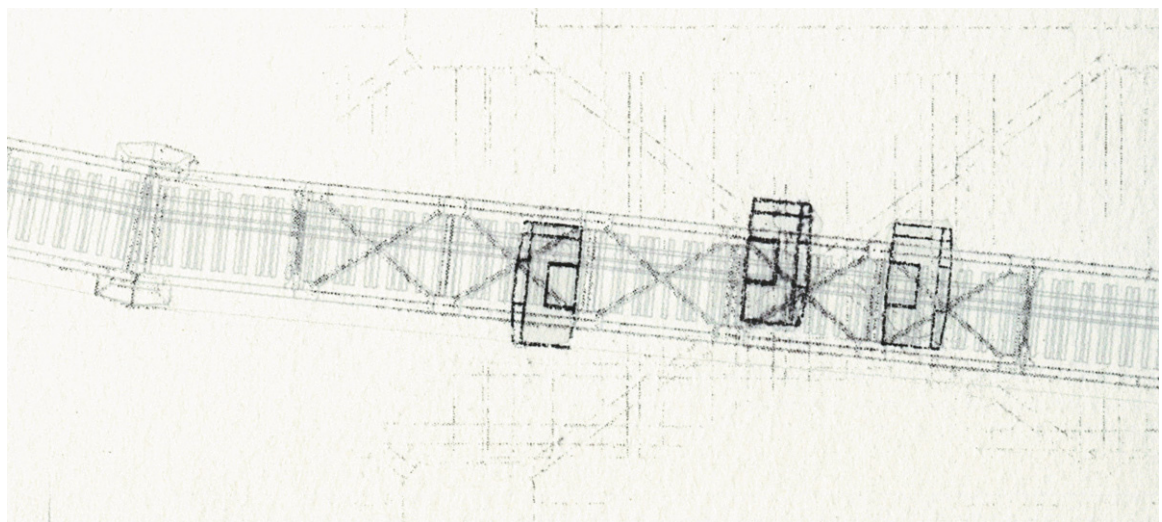
Morley Remains; brown card component indicates multi-generational key-joint.

The Cocoons of Hortonville: Witters Inn and Tavern

Straddling the Gaspereau River the iron bridge sits at the foot of a hill, atop which rests the town of Hortonville. Through the bridge runs the remains of the Dominion Atlantic railway, once the primary connector for communities from the southern tip of the Annapolis Valley to Halifax. The sinuous rails sneak out through the marshlands on the Avonport side of the river then runs along the crease of the hill and the Acadian tidal meadows, continuing through the vineyards of Grand Pre and on towards the university town of Wolfville.

Suspended from the bridge and tethered to the hill, the cocoons of Hortonville form an anchor of sorts to the constellation. Of the three sites it is here where humans are likely to spend the most time, in small groups or as individuals. The cocoons are the most enclosed of the architectures, offering protection and resting points in all seasons.

The sleeping cocoons (Witters Inn) hang quietly from the rafters of the skeleton of the iron bridge. Sitting between the banks of the Gaspereau, they occupy a space which for most of its history has been passed through. For visitors they are the beginning and ending points of a day, offering a private vantage point to ponder the emptying and filling of the muddy banks below. For the community, they are a marker in the landscape reminiscent of the old covered bridge, offering a bit of shade under which to perhaps find a moment's pause while passing through on foot or by bicycle.



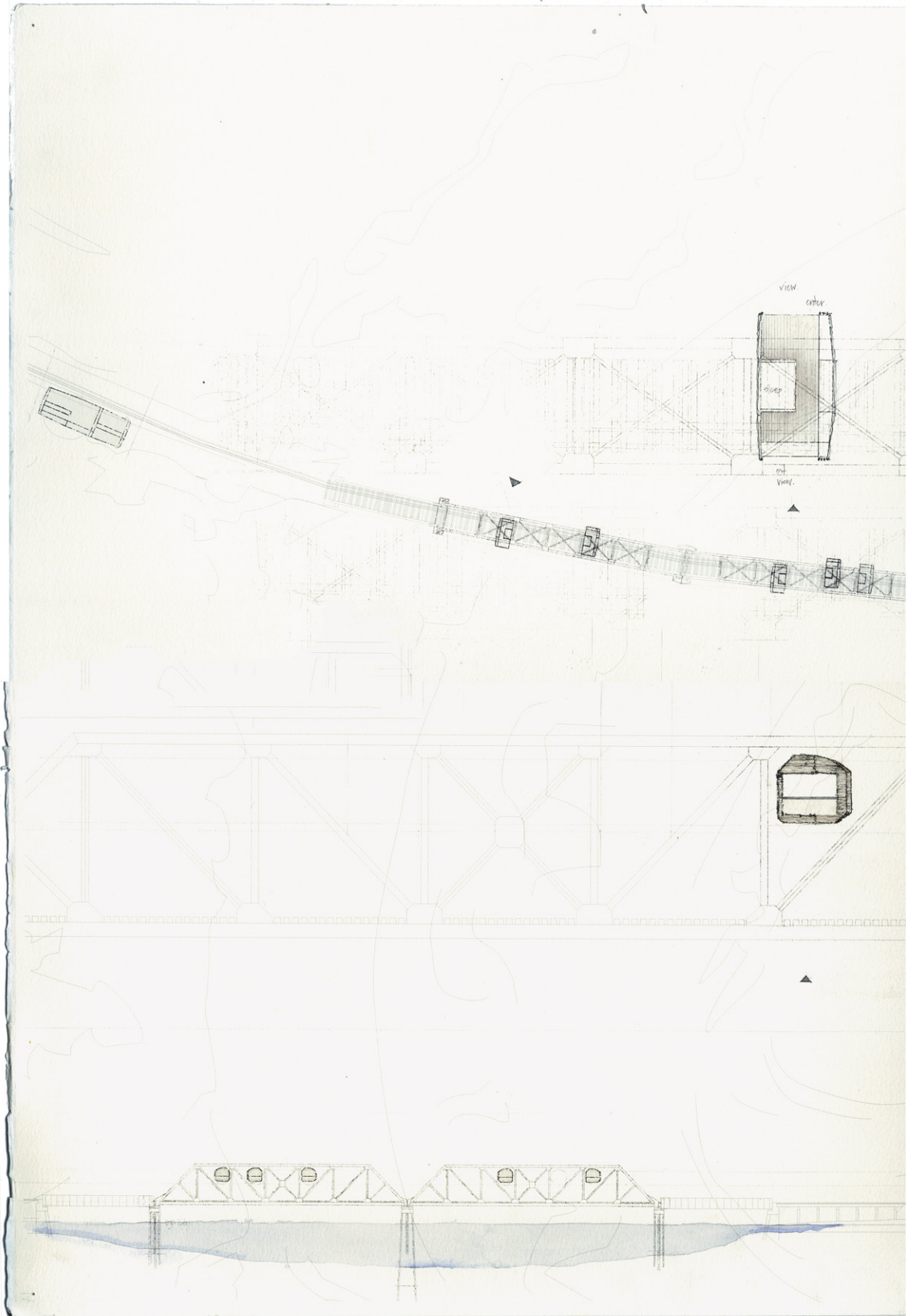
Detail of the Cocoons of Hortonville; cocoons site plan.

Knowing that the daily movement of water in and out of this tidal estuary will continue to significantly change the edges, the sleeping cocoons are less permanent than their land based counterpart. Anticipating a time when the banks of the river will no longer support the structure of the old bridge, they have a shorter life span of approximately 50 years. At the end of that lifespan smaller pieces which may continue to have a use, such as interior furnishings or remnants of the exterior skin, are dismantled and re-used. Perhaps in a new generation of land-based cocoons, perhaps in a new generation of dykeland organisms. The remaining fabric and structure is left to disintegrate, eventually taken out on the high tide, as fragments to the sea.

The main cocoon, is a gathering place for both visitors and community, in keeping with the tradition of small rural taverns. Providing bathing, dining, and general support services for guests of the inn, it is also a living room for the local community, and a destination point for the extended community of Annapolis Valley to Halifax. For much of its 100 year lifespan it sits along the edge of the railway lines, nestled into the crease of the hillside, slowly moving towards Grand Pre and then up the hill towards Hortonville as water shifts the edges of the land. Larger than the sleeping cocoons, it acts similar to the nearby farm buildings, offering a point of relief in a landscape which seems to be composed of endless horizons.



Detail of the Cocoons of Hortonville



The Cocoons of Hortonville; part one storyboard drawing series.

The Listening Cave

The listening cave marks the anti-thesis to ‘Morley’. It holds the potential for the largest gathering of human inhabitants, perhaps groups of visitors observing the yearly migration of sandpipers, or a final stop point for children on an excursion from the local school. It is the most massive of the architectural interventions and is intentionally developed only as an idea within the narrative, offering a point of reflection on the implications of ‘permanent’ structure on a threshold, under an exaggerated lens. Located along the outer edge of Grand Pre, a view from the top of its steps would stretch out towards the North Mountain, across to Boot and Oak Island, and back towards the cocoons of Hortonville. It is representative of how we often think of architecture today, digging down and piling up with great force, in an effort to hold a line deemed fixed.

CHAPTER 6: CONCLUSION

What is the pulse of the world? It is the rhythm of the cycles of the animate and in-animate; the passing of the seasons, the phases of the moon, the life of mud worm, the history of a human community, a cold winter-wind from the north-west. It is a difficult and tenuous thing to take complete register of, full of juxtapositions, physical and ephemeral, broad and yet very specific.

In architecture we find the paradox of a thing we affect and which affects us, and not just us. We form our own environments while simultaneously and significantly altering the space and lives, human and non, around us. And yet it is the things we do not form or produce, that emphasize, clarify, remind us that we are human. It is as much to our benefit as to the world we are a part of, to be in sync with that world. Perhaps the most important realization in this thesis is that connecting to the pulse of the world means re-thinking our understanding of permanence. To register such a pulse means to take stock of the beginnings and endings of life in a particular place, understanding that the boundaries of that place bleed in time and space.

It is, arguably, easier to understand and imagine an architectural translation of pulse in a place where the scale of communities, the rhythm of the land, the history of the edges, suggest and support small, singular, somewhat isolated objects. What happens when we attempt to take the pulse in more densely human populated areas? What would suburbs with articulated life-spans look like?

We have become linear thinkers, and perhaps need to return to the idea of the cyclical, or maybe, introduce the idea of the shifting cyclical, as no cycle is ever exactly the same. In architecture we spend vast amounts of time considering the beginning of a space, and the physical elements that will form that beginning, but spend much less time considering the end of a lifespan. To inform architecture with a pulse means we must also fully take stock of its beginnings and endings. To understand what those beginnings and endings might be, we must understand the pulse of the place the architecture will inhabit. Informing architecture with the pulse of the world is a question of permanence, of scale, of waste and re-use, of a connection that is on-going and dynamic. Where we are as important as thing we create, and the thing we create as important as the place in which it exists, the lives it encounters.

APPENDICES

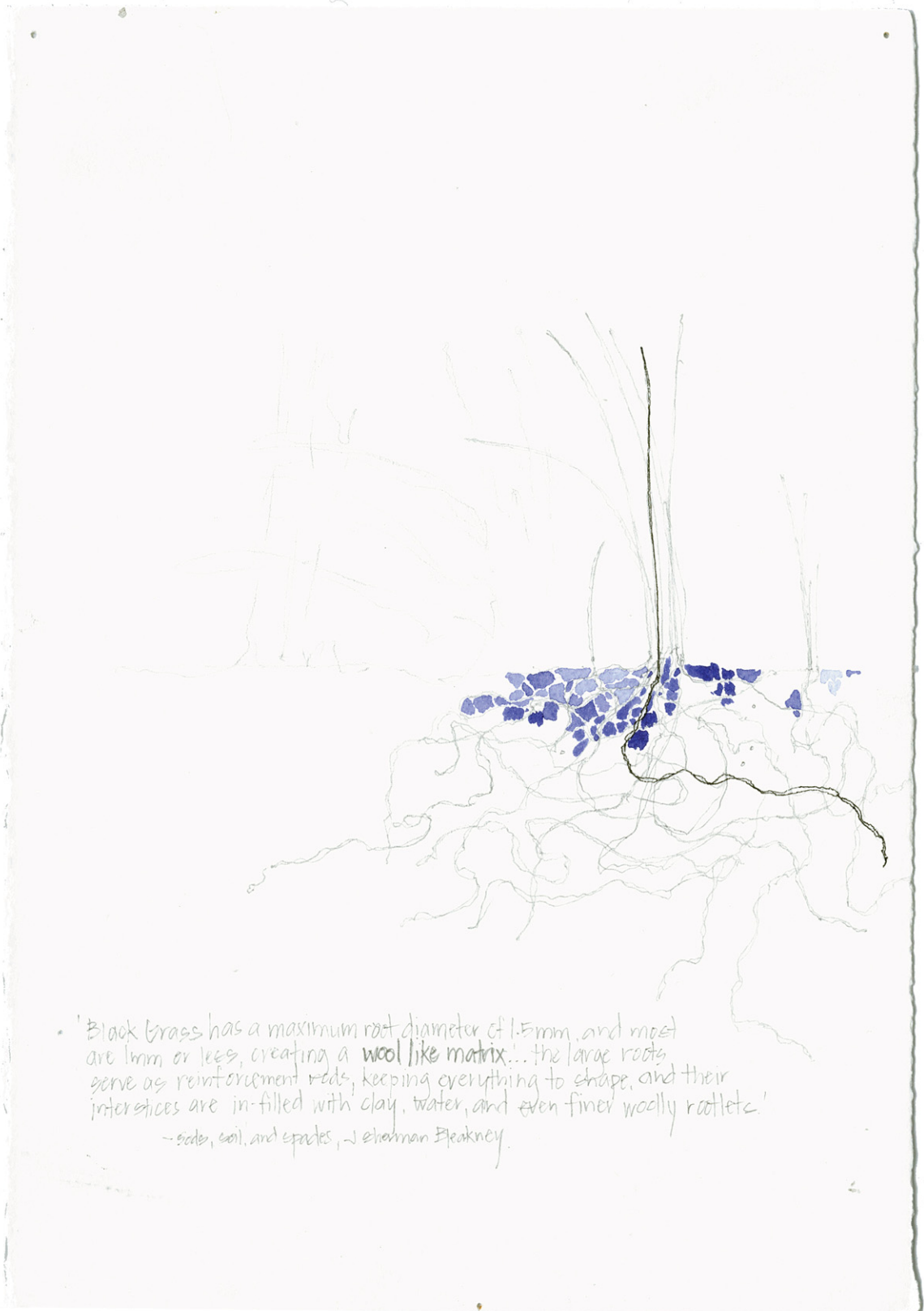
Catalogue: Inhabitants



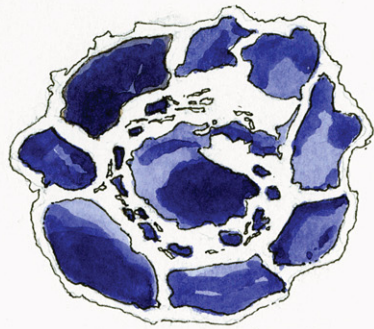
salt marsh hay ?
roots look like
they could easily
be 1m ± long
— weave in/out of
mud... hard to
see stop/start

occur every
so often. growth
bands = coincide
with inundation/noon ?

study_salt marsh grasses



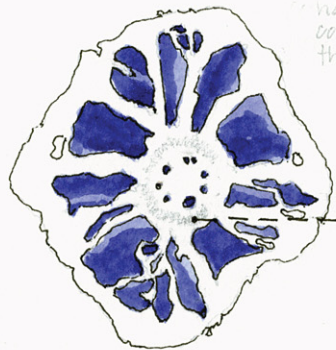
- 'Black Grass has a maximum root diameter of 1.5mm, and most are 1mm or less, creating a wool like matrix... the large roots serve as reinforcement rods, keeping everything to shape, and their interstices are in-filled with clay, water, and even finer woolly rootlets.'
- sods, soil, and epodes, - Sherman Beakney.



root cross section

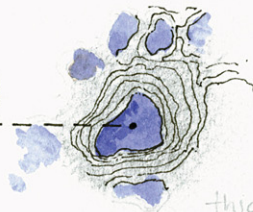
large central cavity
outer cortex long rounded tubes.
non-facing dyke scd
true grass.

salt meadow hay



root cross section

narrow tubes in outer cortex
core cluster of small tubes
thickwalled cells around central vascular tissue



thick walled cells.
resist decay.

roots form wool like mesh.
traps moisture (w/ clay)
↳ to survive high tide locations
(weeks w/out inundation)
spring growth 6 wks earlier than others
facing dyke scd.
member of rush family

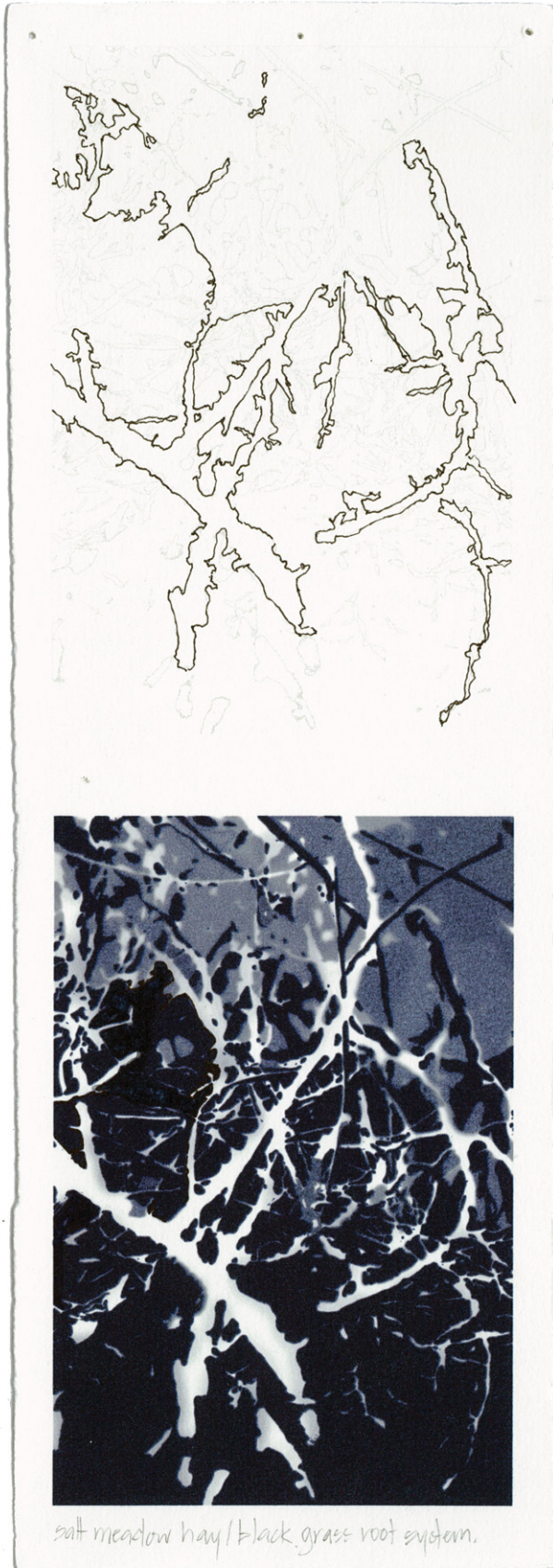
black grass

roots up to (at least 1m); impossibly entangled = matrix for scd bricks.
roots + fine tidal silt = anoxic soil.
↳ grasses/rushes bring oxygen to roots via air transport tubes
(from leaves to roots)

notations from seeds, soil, & spades. J sherman bleakney. 2004. p 27-32.

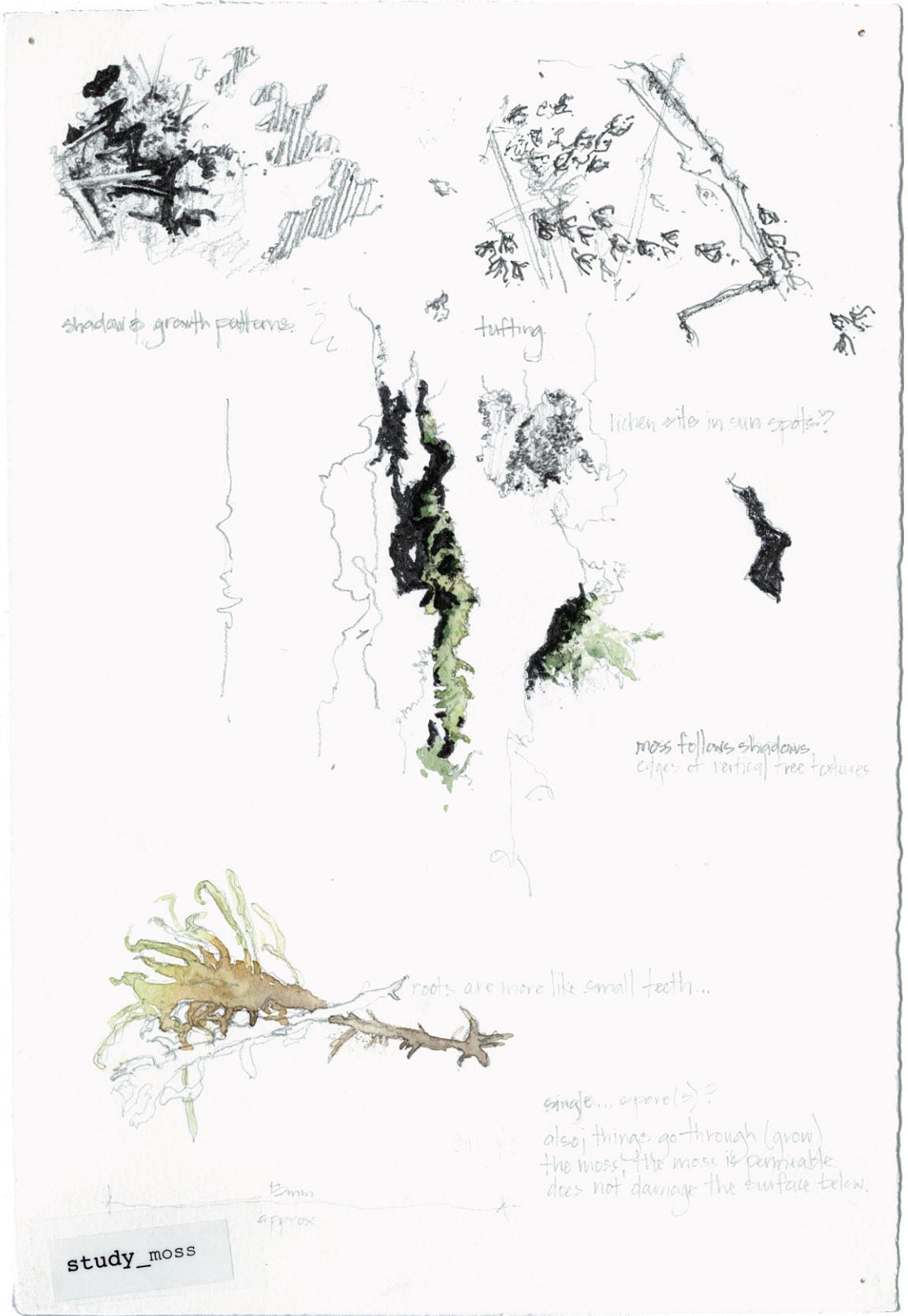


Oak Island lower marsh study_marsh grass root details

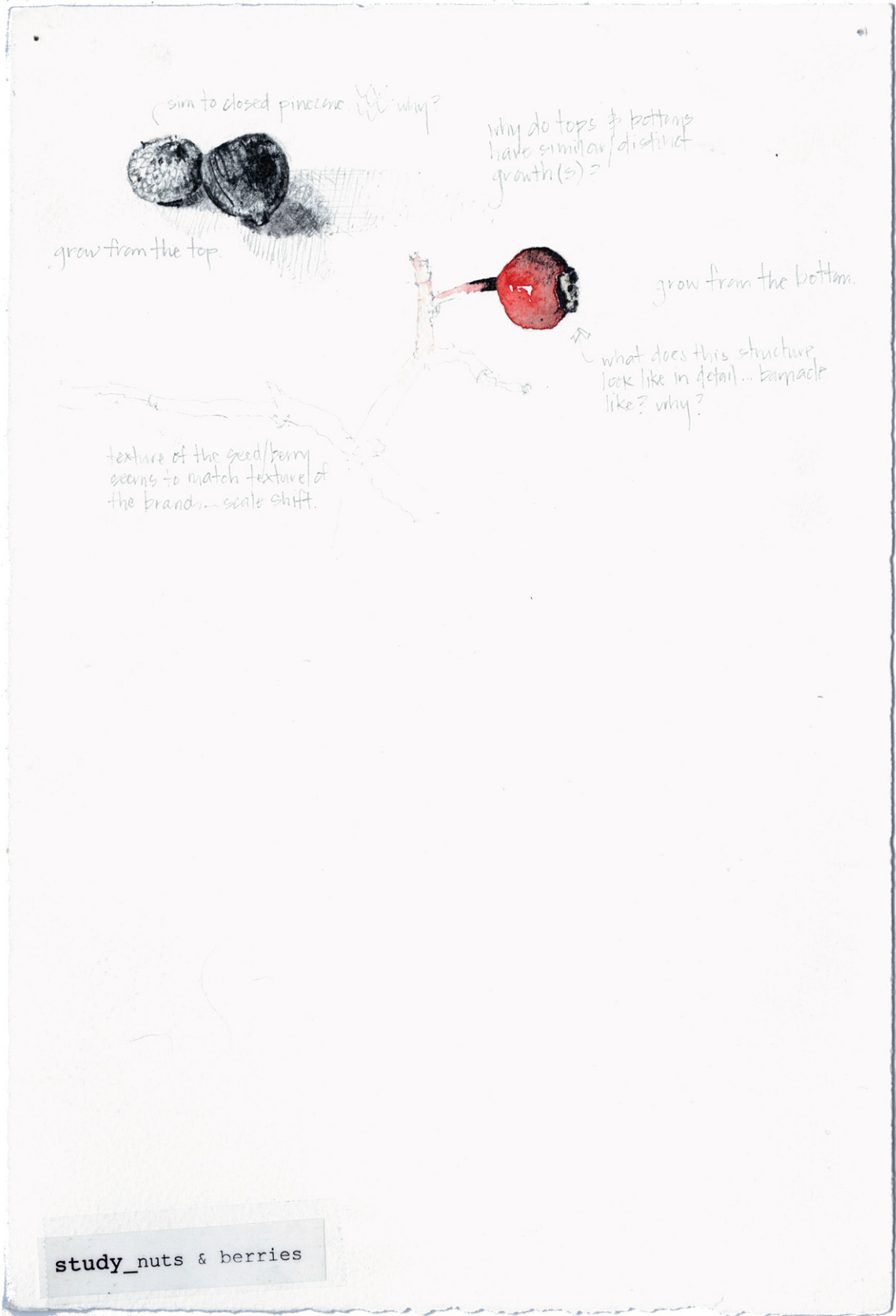


salt meadow hay/black grass root system.

Oak Island lower marsh study_marsh grass root details

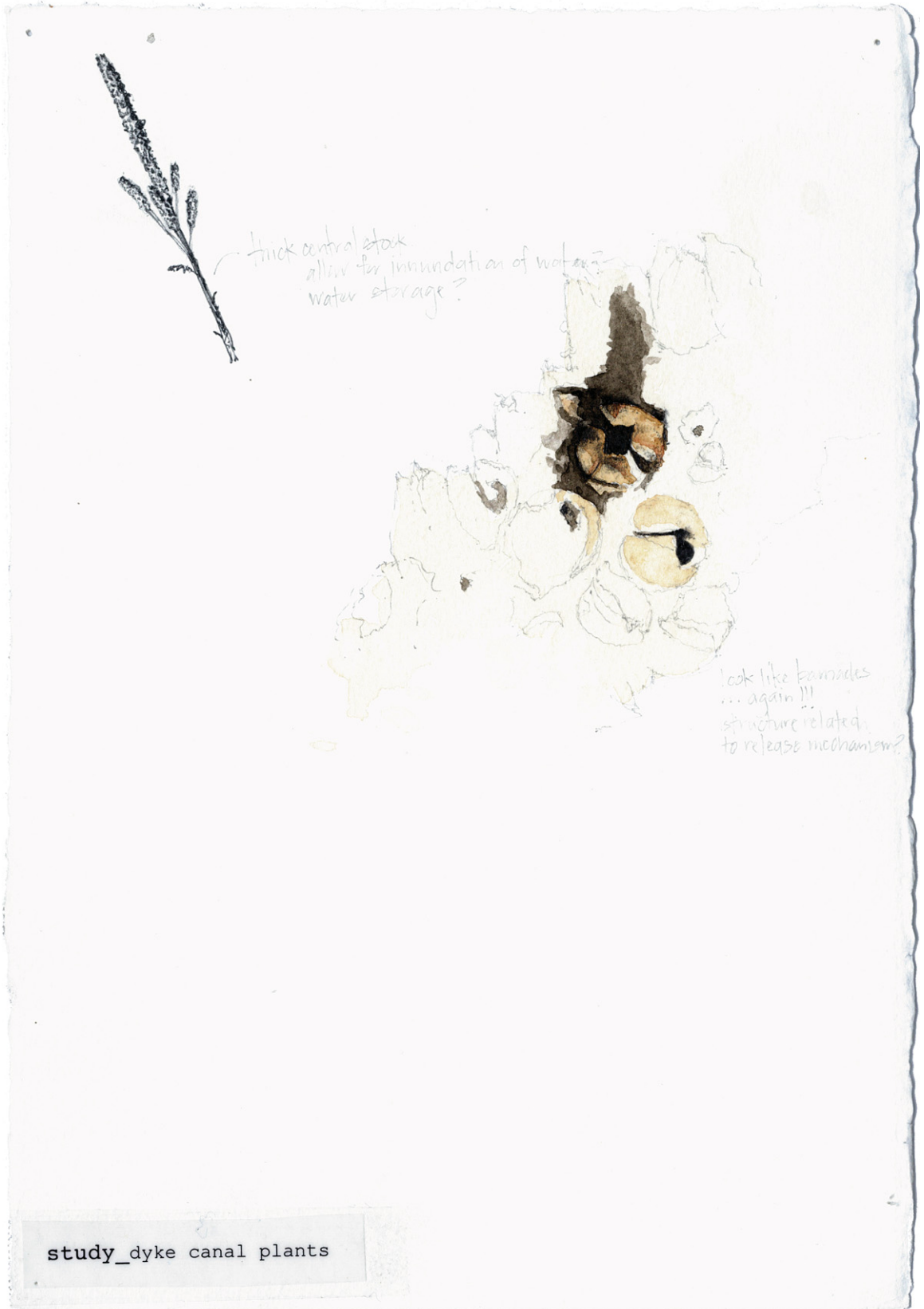


Oak Island forest study_moss details



Oak Island forest study_nuts and berries

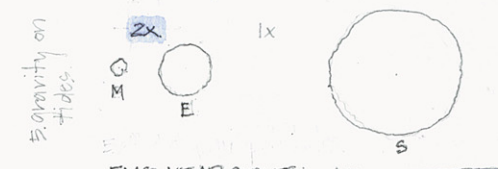
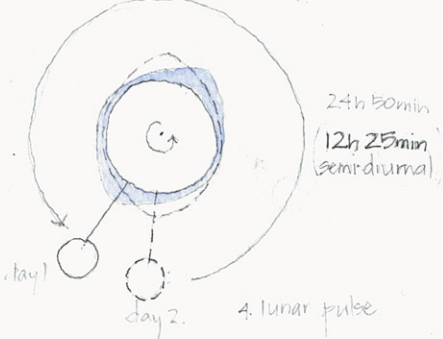
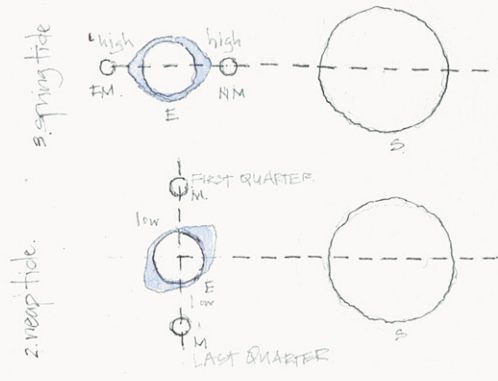
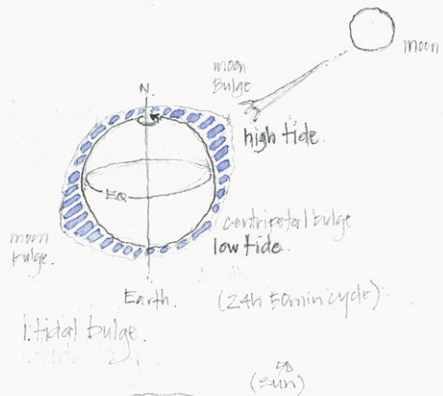




Oak Island forest study_canal plant details

Catalogue: Forces



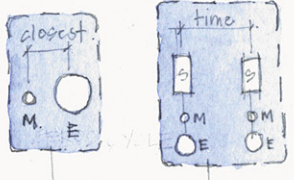


EMO YEAR CYCLES: $\frac{45}{18.03}$
 $\frac{1600.00}{26000.00}$
 particularly large every 18 years in 20F/minutes.
 1975, 1993, 2011

What happens then?

EXTREME HIGH TIDES

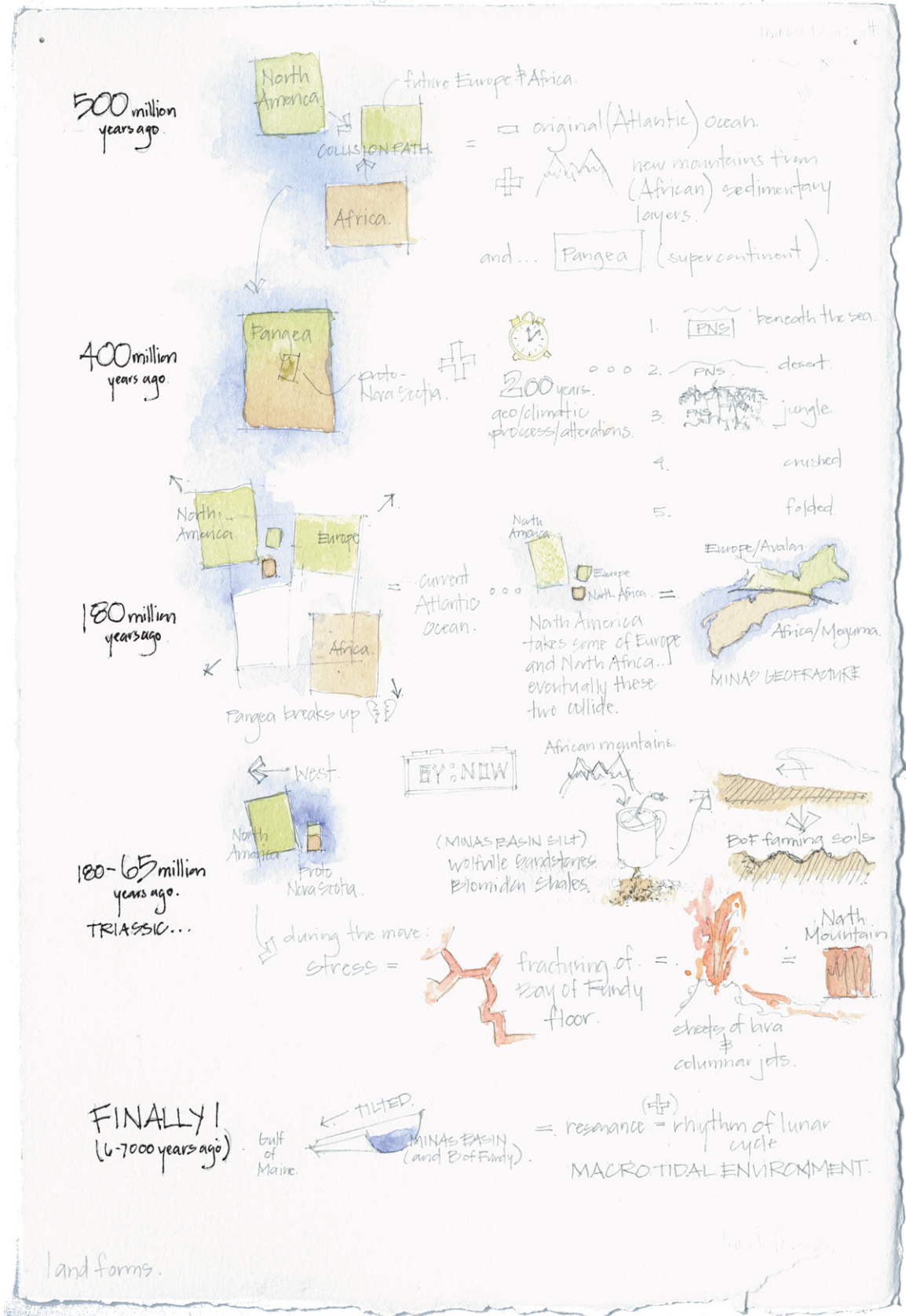
hours	12.4
days	24.8
days	14.8
years	207.0
years	4.52
	18.03



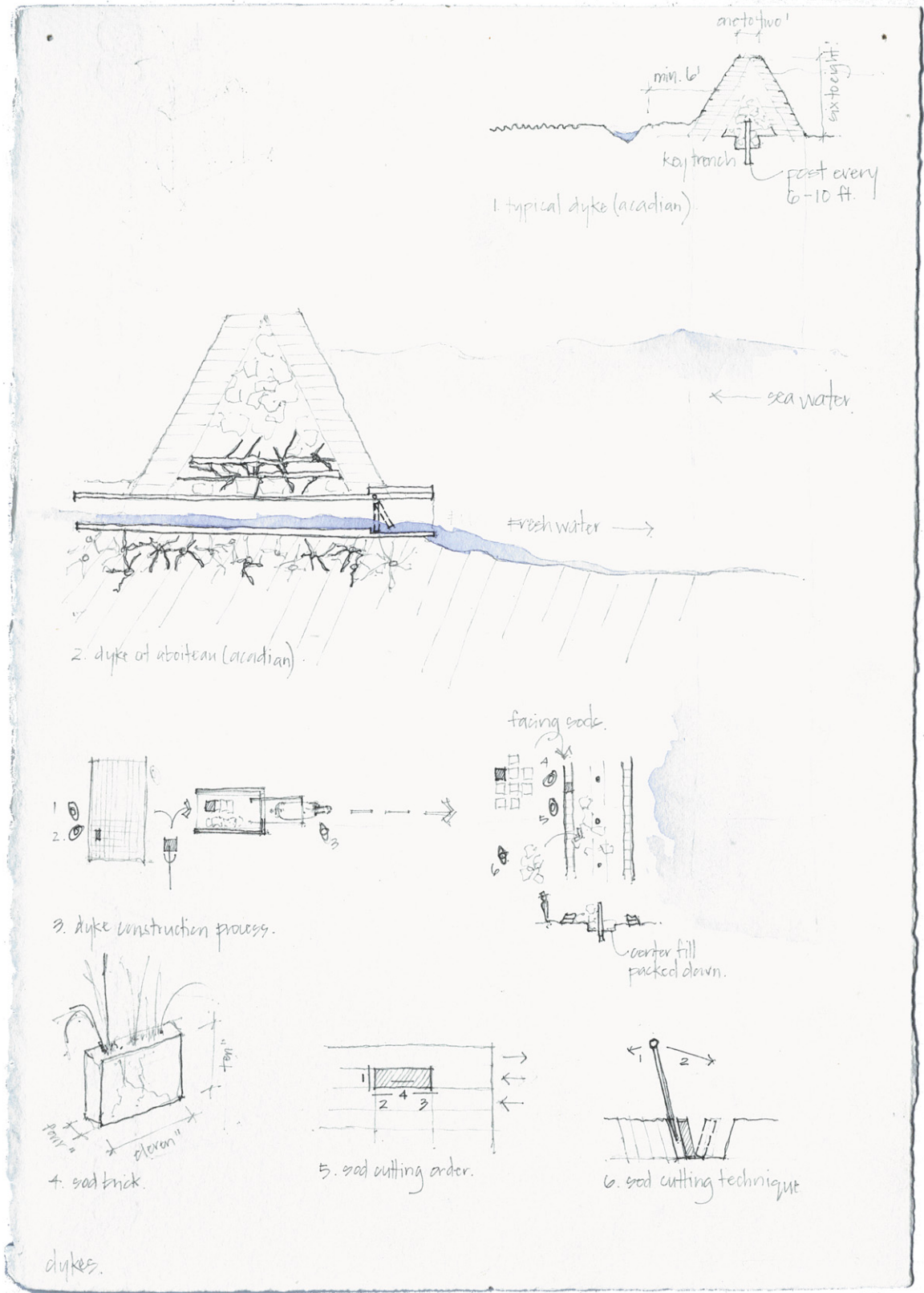
SEROS CYCLE = Perigean Cycle + Synodic Cycle.

= greater likely hood of dyke destruction.

moon/sun.



Forces_geological history and formation



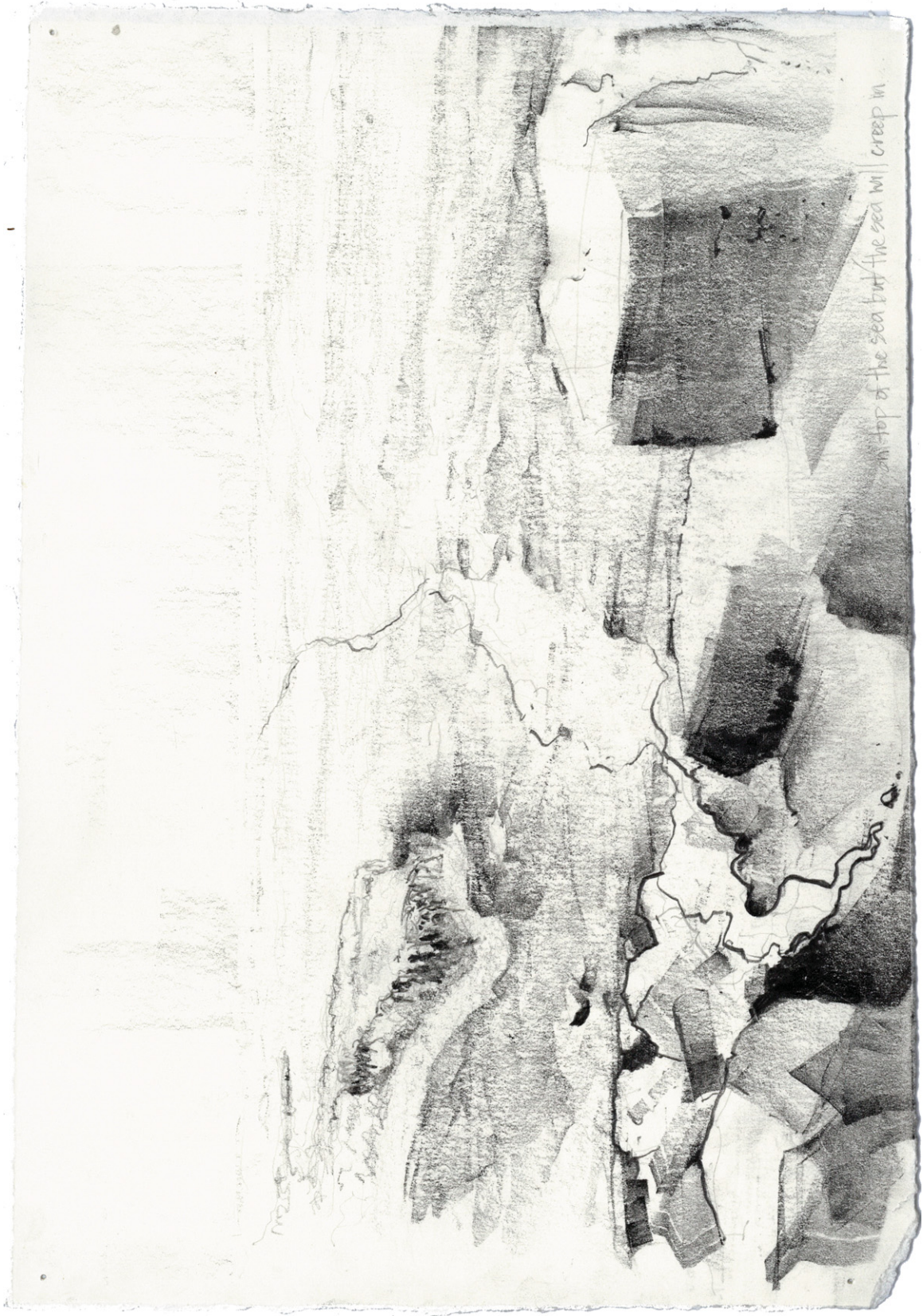
Forces_Acadian dyke structures and building methods

Catalogue: Memories and Imaginations



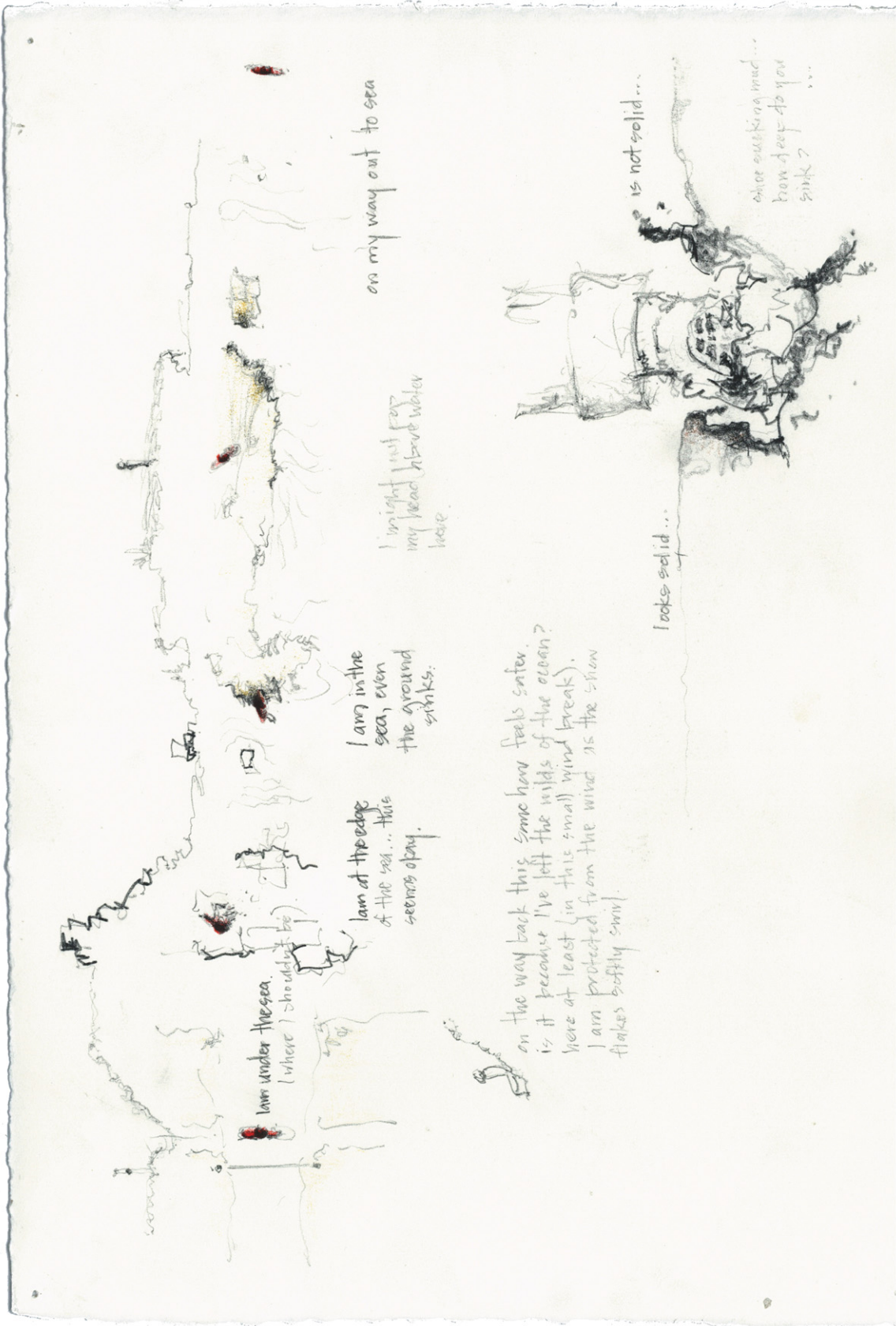
But when do the waves crash over?

But when will the waves crash over?_sensory sketch from base of dyke, land side, Oak Island



on top of the sea but the sea will creep in

On top of the sea, but the sea will creep in _sensory sketch from top of dyke, Oak Island



I am under the sea.
(where I shouldn't be)

I am at the edge
of the sea... this
seems okay.

I am in the
sea, even
the ground
sinks.

I might not lose
my head above water
here.

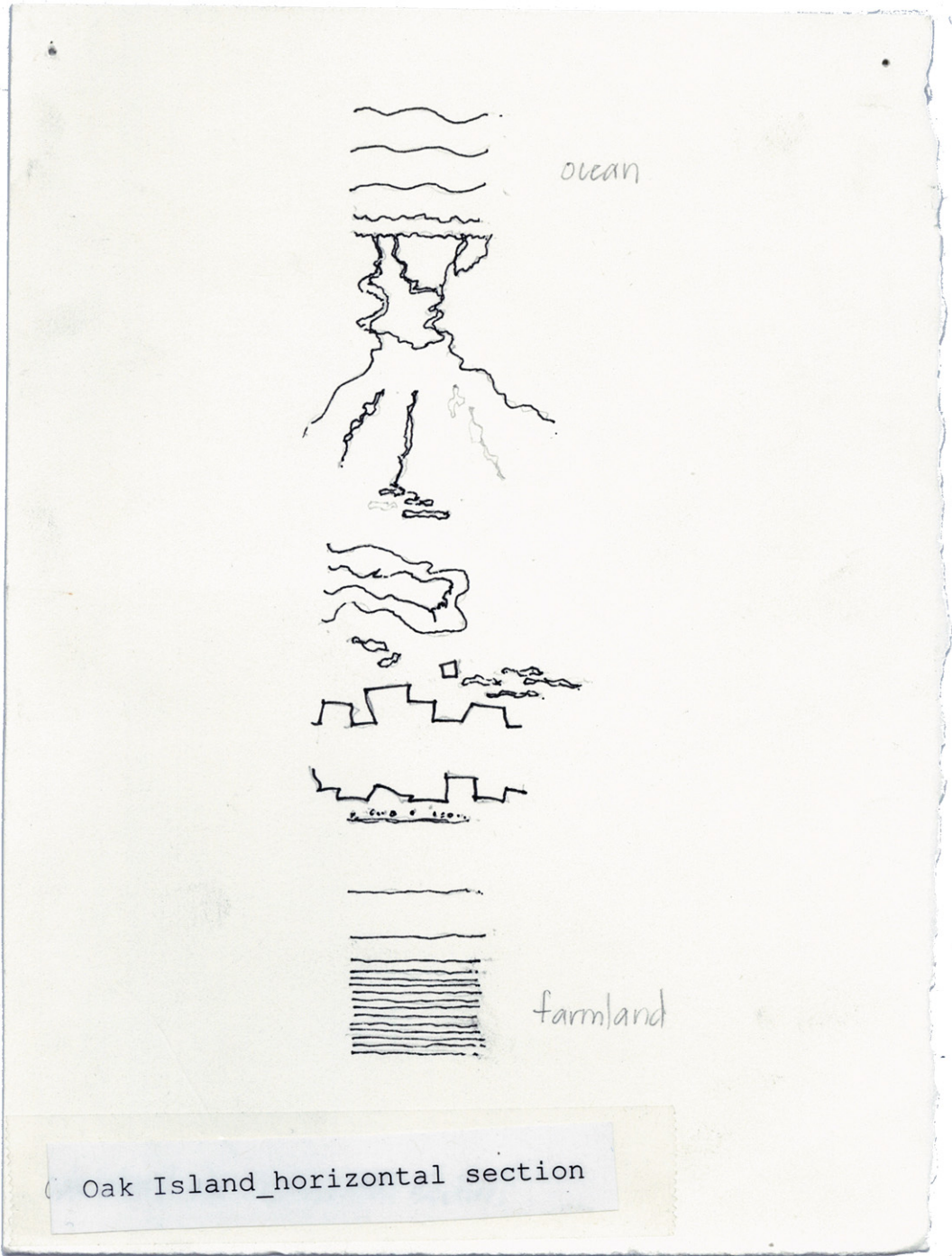
on my way out to sea

on the way back this somehow feels safer.
is it because I've left the wilds of the ocean?
here at least (in this small wind break).
I am protected from the wind as the snow
flakes softly swirl.

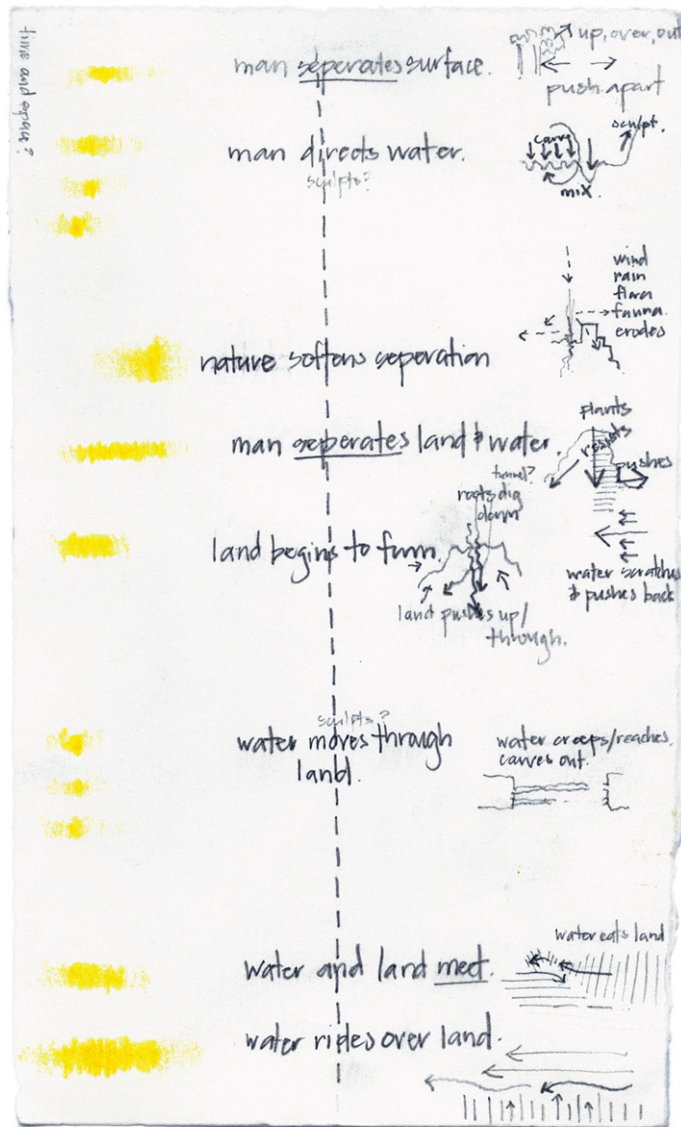
looks solid...

is not solid...

what's sucking me...
from deep? do you
sink? ...



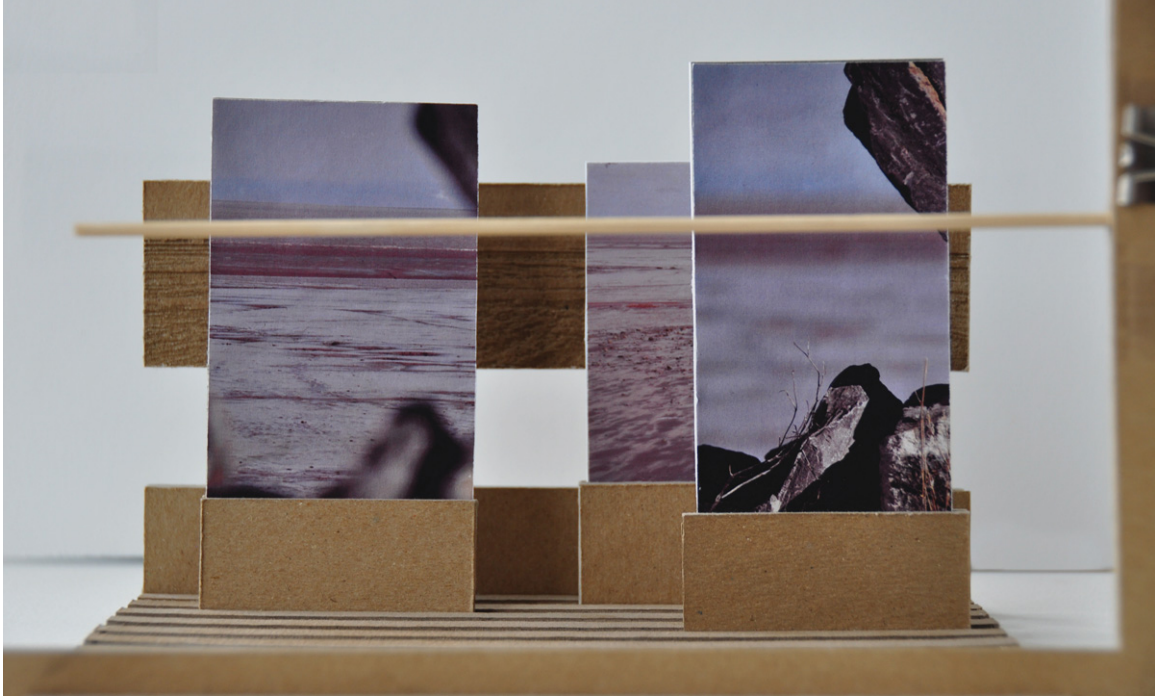
Imaginations_Oak Island in section



Imaginations_the force thresholds of Oak Island



Model Study_The Fundy Scale



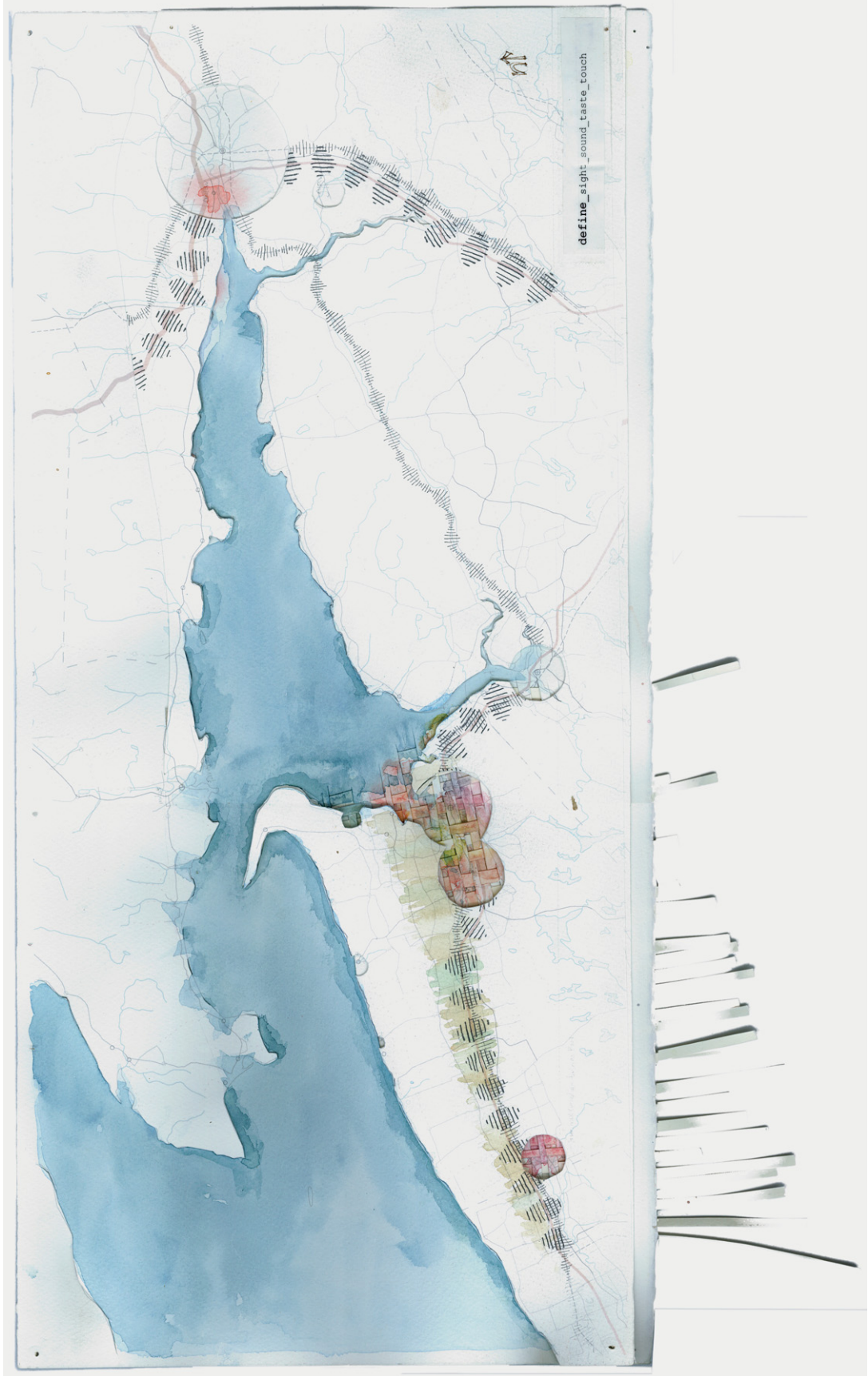
Model Study_Shifting Horizon Lines

Further: Additions and Subtractions

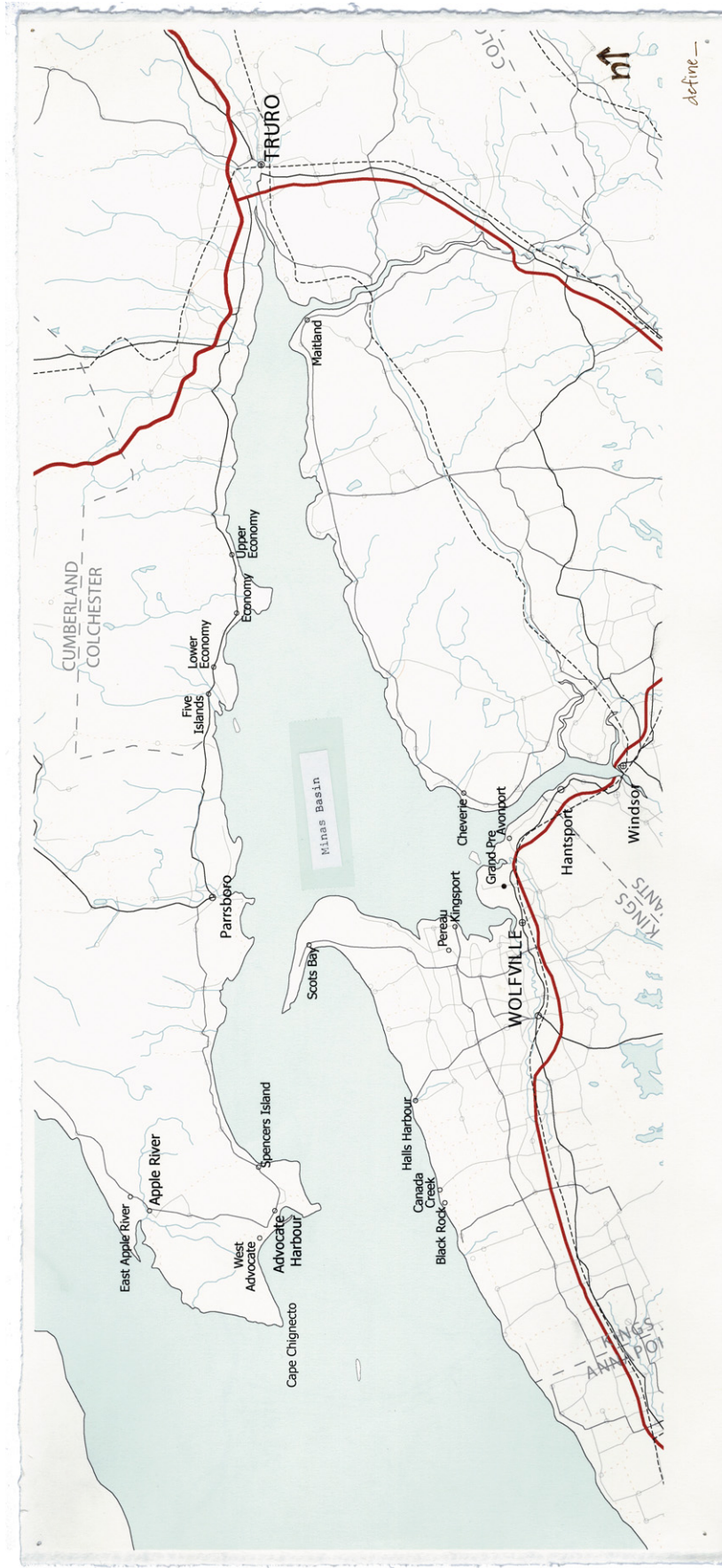


Joint Exploration_preliminary studies of foot structure





Define_sight, sight, sound, taste, touch. Sensory mapping, Minas Basin.





Geopolitical mapping; Southern Bight expanded

1. political

dashed lines_

Kings/Hants county border line

2. urban pathways

blue dashed_

Trails Nova Scotia sea kayak trails

red_

primary highway; highway 101

black_

secondary highway; old primary highway, highway 1

black dashed_

railway

3. geological_structure

darkest_

oldest; mesozoic

middle_

permo-carboniferous

lightest_

youngest; devonian

4. geological_surficial

brown_

Colluvial Deposits A complex mixture of glacial deposits, weathered and frost-shattered rock and soils. Forms a blanket of material over steep valley walls; a talus cone or rotational slump.

blue_

Marine Deposits Gravel, sand, silt, clay, locally overlain by peat (salt marsh). Beaches, spits and bars; intertidal saltmarsh and mud flats

green_

Ground Moraine and Streamlined Drift Till (gravel sand and mud of direct glacial origin) often sandy and stony; loose, inclusions of water sediment. Irregular rough topography, local ridges (ribbed moraine) depressions or pits (kettles).

pink_

Bedrock Bedrock of various types and ages; glacially scoured basins and knobs; overlain by thin, discontinuous veneer of till, shaped by glacial erosion. Flat to strongly rolling; ridges of hard rock exposed in thin till areas; rock with stoss and lee form rouches moutonnee

5. geological_glacial

X32 Blomidon_

Base to top (3m): clay; peat monolith; deformed sandy-silt

X33 Grand Pre_

Tree stumps rooted in till - 8m, below MSL overlain by estuarine silt; oysters in silt -13.5m

dot and line_

drumlins; ridges and elliptical hills parallel to ice flow

barbed lines_

glacial striae; linear grooves on rock; single barb indicates known ice flow direction, double barb indicates unknown flow direction; barb points in direction of ice flow

6. geological_soil

T1nm_

North Mountain formation; basalt

11b_

Blomidon formation; siltstone, shale, claystone

11w_

Wolfville formation; red conglomerate, arkose, sandstone, shale

Geopolitical mapping; Southern Bight expanded, legend a.

steep valley walls, a series cone of rotational slump.

blue

Marine Deposits Gravel, sand, silt, clay, locally overlain by peat (salt marsh). Beaches, spits and bars; intertidal saltmarsh and mud flats

green

Ground Moraine and Streamlined Drift Till (gravel sand and mud of direct glacial origin) often sandy and stony; loose, inclusions of water sediment. Irregular rough topography, local ridges (ribbed moraine) depressions or pits (kettles).

pink

Bedrock Bedrock of various types and ages; glacially scoured basins and knobs, overlain by thin, discontinuous veneer of till, shaped by glacial erosion. Flat to strongly rolling; ridges of hard rock exposed in thin till areas; rock with stoss and lee form rouches moutonnees

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X32 Blomidon

Base to top (3m): clay; peat monolith; deformed sandy-silt

X33 Grand Pre

Tree stumps rooted in till - 8m, below MSL overlain by estuarine silt; oysters in silt -13.5m

dot and line

drumlins; ridges and elliptical hills parallel to ice flow

barbed lines

glacial striae; linear grooves on rock; single barb indicates known ice flow direction, double barb indicates unknown flow direction; barb points in direction of ice flow

6. geological_soil

Tnm

North Mountain formation; basalt

nb

Blomidon formation; siltstone, shale, claystone

ITw

Wolfville formation; red conglomerate, arkose, sandstone, shale

COh

North Mountain formation; basalt

eChb

Horton Bluff formation; sandstone, shale, dolomite, conglomerate

eCc

Cheverie formation; sandstone, siltstone, shale, arkose, conglomerate

eCw

Windsor group; sandstone, siltstone, limestone, dolostone, anhydrite, gypsum

eCwa

Windsor sub-group; siltstone, limestone, dolostone

eCwb

Windsor sub-group; anhydrite, gypsum, halite, siltstone, limestone, dolostone, shale

7. land_aerial

8. water_aerial

9. land_topography

10. water_low tide

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