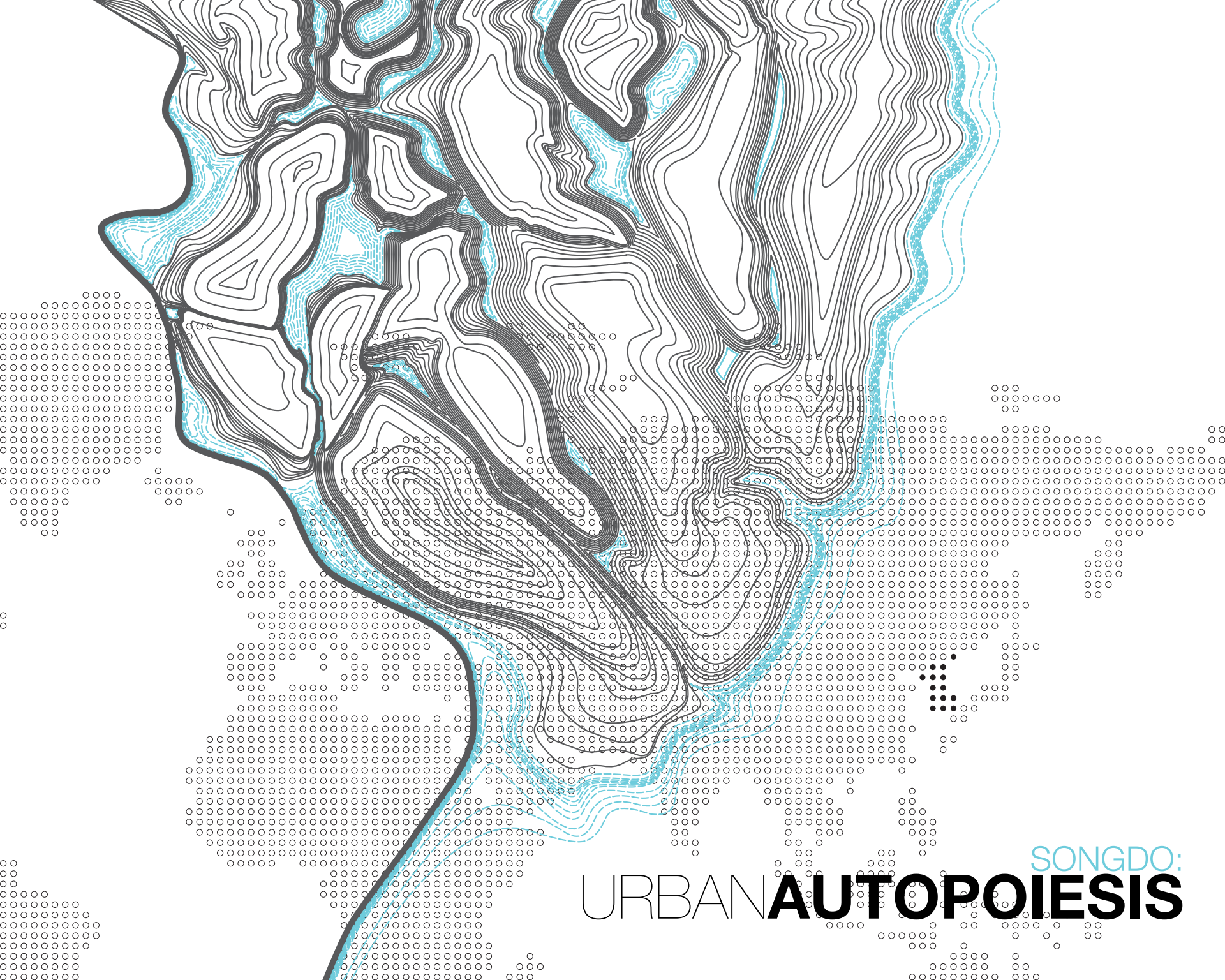

SONGDO:

URBAN**AUTOPOIESIS**

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SONGDO: URBAN**AUTOPOIESIS**

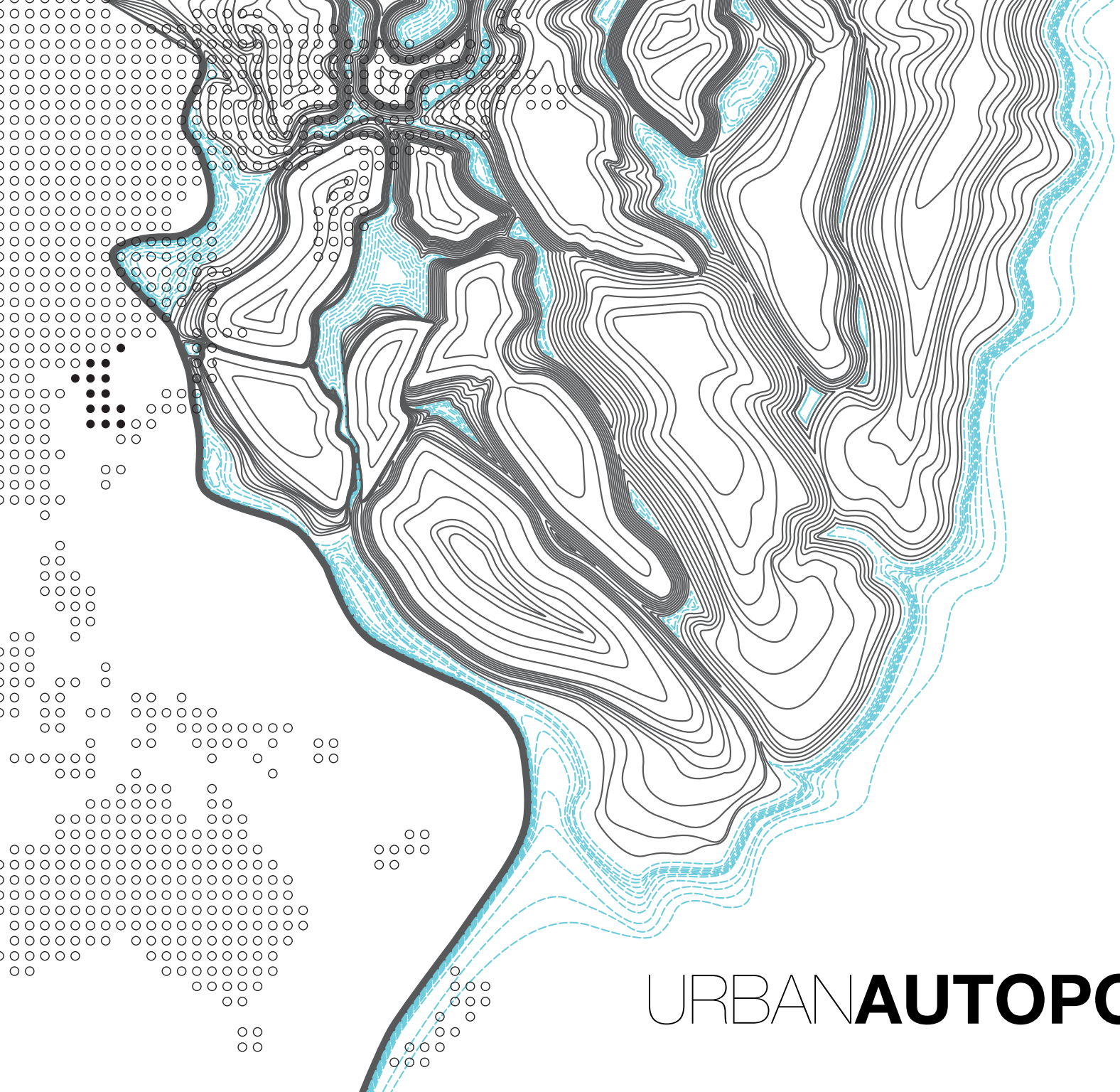
BY MEAGHAN HUNTER

a Practicum submitted to the Faculty of Graduate Studies
of the University of Manitoba

in partial fulfilment of the requirements of the degree of

Master of Landscape Architecture

Department of Landscape Architecture
Faculty of Architecture
University of Mantioba
Winnipeg



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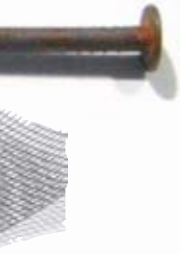


ABSTRACT

This project examines the term autopoiesis and contextualizes it into the realm of Landscape Architecture. Autopoiesis is defined as *self-generating*, *self-producing*, *self-maintaining* organization, used to describe the resilience of a living system. This practicum presents autopoiesis as a process condition that describes incidences of phenomena and the resulting emergent behaviors. Through illustration, photography, simulation and experimental studies, an understanding of autopoiesis through visual representations was attained.

This practicum creates a space that uses the dynamics of autopoiesis to both inform and form the design of an urban condition. Located along the coast of Incheon, South Korea, a 1.6km^2 site of reclaimed tidal-flat land was investigated. Autopoiesis was understood through phenomena and emergent behaviors that resulted by integrating the fluctuating tidal system into the creation, realization and functioning of the site.

The intention of this project is to articulate the notions of autopoiesis through the design of a flexible condition that responds, reacts and engages with contingencies and disturbances, allowing these types relationships to become integral component to the overall development and functioning of the designed site.

NARRATIVES 11

Theory • Intentions

All photographs & illustrations, unless otherwise stated, are the original work of the author.

NARRATIVES

A collection of literature, drawings and photographs that structure the investigation of this practicum.

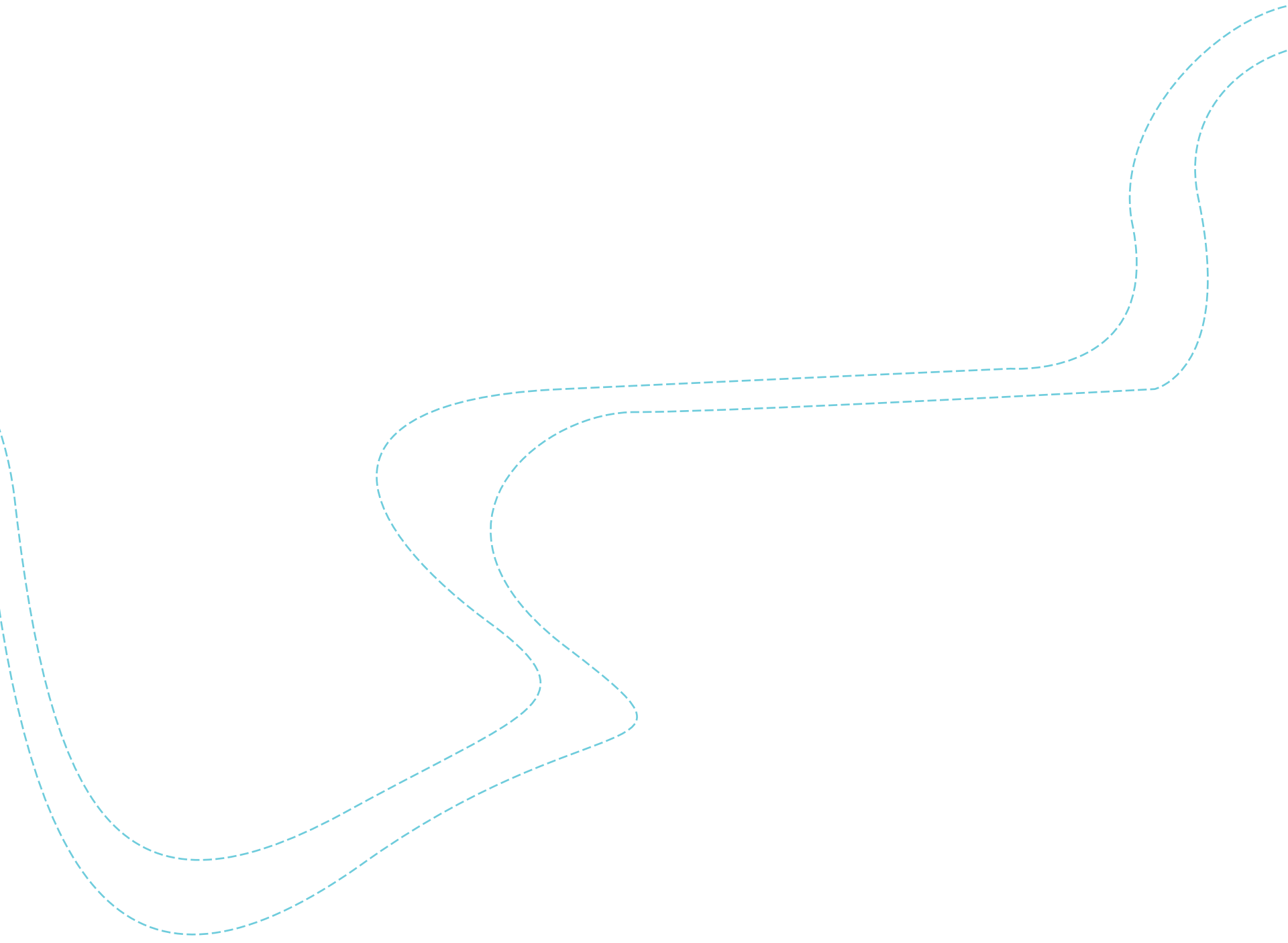


Figure 1.1: Emergent Conditions - Detroit 2010. Photograph

An abandoned industrial complex, whose original use is unknown, is left to deteriorate in the city of Detroit. Through time small ecological phenomena begin to arise and exist through the merging of independent systems.

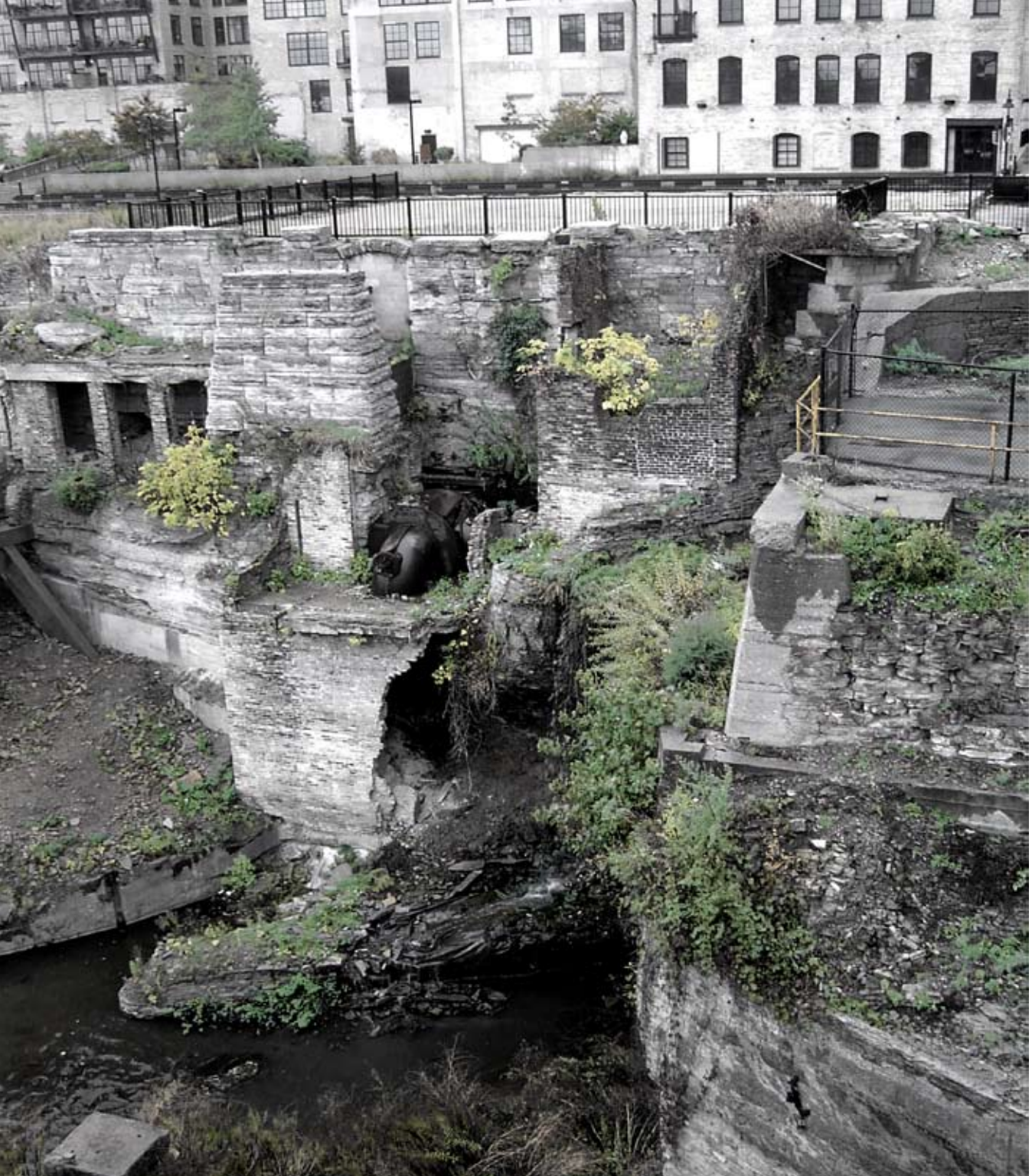


Figure 1.2: Mill Ruins Park. - Minneapolis 2005. Digitally enhance photograph.

An archaeological study reveals abandoned flourmills along the Mississippi River. The mill that once held an agricultural agenda is transformed into a city park. This shift in occupancy dramatically changes how the city of Minneapolis views, uses, and understands the district. The area still maintains all the parts and elements of a historical flourmill yet it's character has changed and evolved into a new condition to adapt to a maturing city.

Cities exist in a state of flux. They strive to maintain a degree of stability through law, order, morals, beliefs and routine. Yet when faced with unexpected events, whether catastrophic or minor, its ability to assimilate itself to change conditions exhibits its resilience over time. It is this dynamic nature that captivates my attention as a designer. To propose or plan an urban environment that exists in a state of equilibrium is to propose the impossible. Life can be erratic; it may shift in unpredictable ways at any given moment of time. It is the city's ability to adapt, change and alter itself to these unforeseeable events, permitting new conditions to emerge that create a city's individuality. This practicum explores the notions of phenomena and the resulting emergent behaviors through photography, illustration, simulation and experimentation, to comprise a design methodology to create a flexible urban condition.

> To be alive, an entity must first be *autopoietic* – that is, it must actively maintain itself against the mischief of the world (Fleischaker, 1990). Life responds to disturbance, using matter and energy to stay intact. An organism constantly exchanges its parts, replacing its component chemicals without ever losing its identity. This modulating, "holistic" phenomenon of autopoiesis, of active self-maintenance, is at the basis of all known life… (Margulis & Sagan, 1997, p.56).

Chris Reed, the founding principal of Stoss LU, brings attention to the concept of autopoiesis in his article *Performance Practices.* He discusses its meaning with respect to landscape architecture as a way of understanding the relationship between site and design. He contends that modern public practices are no longer concerned with the search for meaning, form or cultural ideas. Rather, the contemporary condition is characterized by "globalization, deregulation, privatization, and mobility" (Reed, 2005, p. 82). It is this shift in priority that demands a revision of traditional design strategies and the development of alternative

approaches and methodologies that better account for these changing values (Reed, 2005). Reed introduces the concept of autopoiesis as a metaphoric lens to visualize design. He refers to the biology of microorganisms. Reed discusses 'organisms' autopoietic nature, as they are not preprogrammed with the information needed for future encounters. Rather, they are equipped with the mechanisms to allow for "response and engagement" (Reed, 2005, p. 82). These are the 'mechanisms' contemporary designers need bring to their investigations. Design should be developed with a level of uncertainty, yet equipped with the ability to adapt and reshape itself when faced with the unexpected.

Understanding autopoiesis begins with the term's inception. Humberto Maturana and Francisco Varela, two Chilean biologists, conceived of the word to describe the nature of autonomic living systems. Linguistically, autopoiesis originated from the Greek language, *auto* being understood as 'self' and *poiesis* interpreted as 'creation', or 'production'. Maturana and Varela created this term as they felt that no true expression had existed at the time that could accurately describe the central feature of the organization of the living, which is autonomy. (Maturana & Varela, 1980, p. xvii).

To further understand autopoiesis Maturana and Verela use the analogy of a machine to describe autopoietic systems. The apparent understanding of a machine is that it is regarded as a unity. It is defined by the organization of

Figure 1.3 - 1.5: Autonomic Illustrations
Black ink on paper

The following images are a series of explorative illustrations that begin to contextualize the literary term autopoiesis into a visual representation. Realized through an autonomic drawing process, an assemblage of drawing utensils was collected during unplanned wanderings. This collection consisted of stones, flowers, disposed paper products, sticks, and grasses. Using India ink with the collected instruments, a series of markings were placed onto a sheet of paper revealing a primitive composition. The composition evolved by detailing and further accentuating features with a black pen. Through interpretation the illustrations were associated with autopoietic narratives.

CONTINGENCY

a future event or circumstance that is possible
but cannot be predicted with certainty

Figure 1.3:

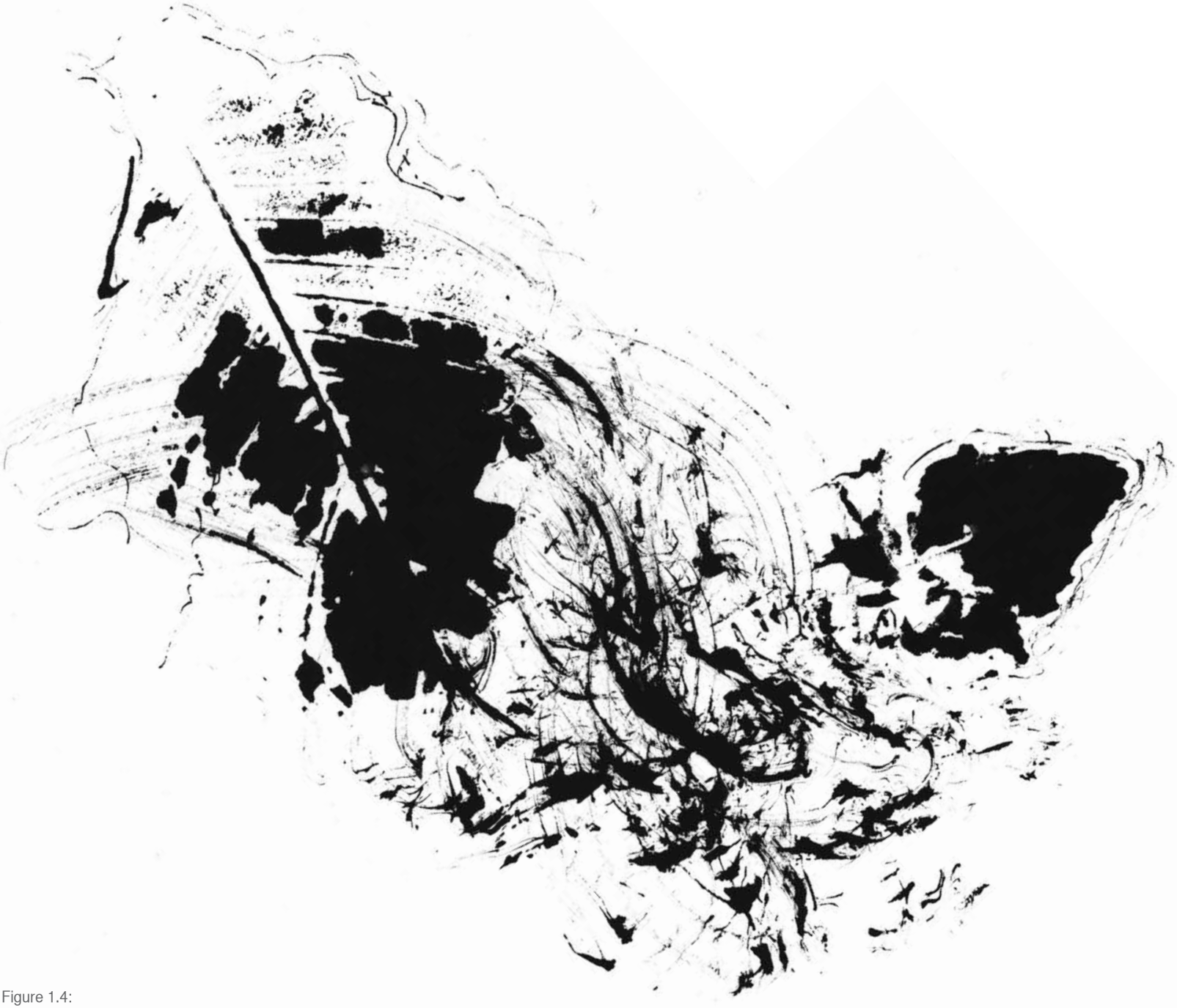
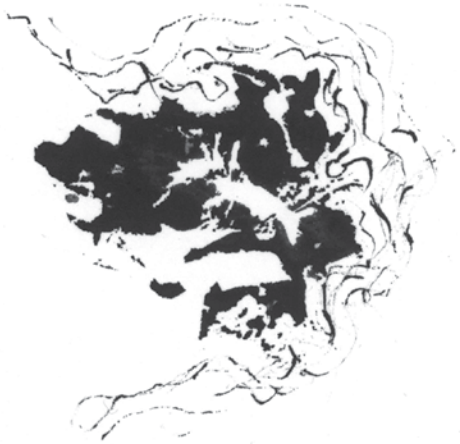


Figure 1.4:



DISTURBANCE

the interruption of a settled and peaceful condition

its components and by the purpose it fulfills in its operation (Maturana & Varela, 1980). What is not so perceptible is the "actual nature of the components and the particular properties that these may possess other than those participating in the interactions and transformations which constitute the system" (Maturana & Varela, 1980, 77). This understanding looks beyond the physical properties of the components and examines the "processes and relations between processes realized through the components", or more specifically, the phenomenological experience (Maturana & Varela, 1980, p. 75). Maturana and Verela claim the existence of these 'processes and relations', autopoiesis, is enough to characterize a system as a *living* system.

In the article *Origins of Life: An Operational Definition* by Fleischaker (1990), three properties are described that a system must embody to be classified as an autopoietic system.

1) Self-bounded: the boundary which the 'self' occupies is realized by the processes and interactions between components from which it is constituted.
2) Self-generating: the unity is produced by its own constituents and the processes and relations that are realized between them.
3) Self-perpetuating: the unity's existence is determined by the concatenation of the processes and relations realized through components. (p.130)

The most recognized autopoietic system is the cell. Fleischaker describes the cell as “a system that maintains its coherence in space and its duration over time by its integrity of organization - the product of its own activity.” (Fleischaker, 1990, p. 4). A cell exemplifies autopoiesis through its unitary organization. It combines bioenergetic and biosynthetic processes into a singular system that allows for the production of all of the cellular components including the ingredients for the construction of its membranous boundary (Fleischaker, 1990, p. 2). It is a self-bounded, self-generating, and self-perpetuating entity.

Maturana and Varela claimed that the presence of *“autopoiesis is necessary and sufficient to characterize the organization of living systems”* (Maturana & Varela, 1980, p. 82). They reject notions of teleology and teleonomy, theories that identify life from non-life through the embodiment of an inherent purpose, project or aim that has been built into its structural organization. This idea of a ‘purposeful organization’ does not have any explanatory value in the generation of system phenomena. It cannot describe or account for unforeseen or unexplainable contingencies that may result in mutation and or change. The idea that all life that exists, exists for a reason or final cause, belongs in the discourse of descriptions not in the phenomenological domain. (Maturana & Varela, 1980, p. 86).

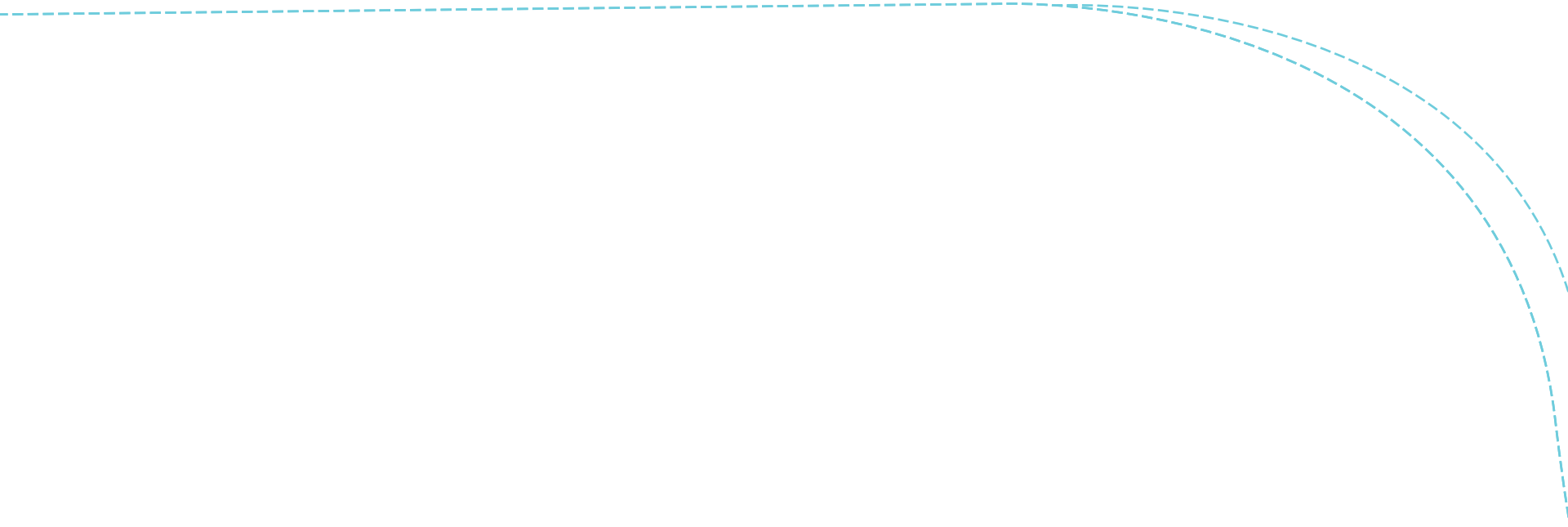
Living systems described by Maturana and Varela are ‘purposeless systems’ that react and adapt to contingences and disturbances only to maintain the integrity of their organization.

Autopoiesis is a process condition. It describes the nature of interactions and the emergent behaviors revealed through phenomena. Maturana and Varela negate the idea that living systems are programmed with instincts built into their physical structure. More precisely these ‘instincts’ are reactions to encountered stimulus and come secondary to the organization of the system itself. The philosophy of autopoiesis provides this practicum with a venue though which to explore, investigate and engage with design. This study focuses on the autopoietic nature of design and site. By embracing this school of thought throughout the design process attempts to create a flexible landscape that responds, transforms and mutates to adapt to future disturbances and contingencies without ever losing its inherent identity.

ADAPTATION

the process of becoming or adjusting to an instance or series of events.

Figure 1.5:



VISIONS

contextualizing an understanding of autopoiesis into physical manifestations through site, experimentations and revelations.

Figure 2.0: Parallels - Detroit 2010.
Photograph

Two distinct systems can coexist in the same circumstance creating a hybridized condition.

Figure 2.01: World map highlights the Korean peninsula, where the investigated practicum site is located.

The site of inquiry lies on the west side of the Korean peninsula. Located approximately 56 kilometers away from the capital city of Seoul, an audacious urban development is in the process of construction. In 2009, Incheon Urban Development Corporation released a design competition for student to engage and contribute to the development of the Songdo International Business District (Songdo IBD). The intention and theme of the competition was to be considerate of and consistent with the developing strategies of Songdo IBD by creating "A futuristic U-Eco Community where new technologies, the environment, and people are in harmony" (Incheon Urban Design Competition for Students, 2009).

Figure 2.2: location of the Incheon Free Economic Zone relative to the cities of Seoul and Incheon and the Yellow Sea.

Figure 2.3: A diagrammatic illustration that depicts the tidal range relative to a human scale.

Gale International, one of the largest private real estate developments and investment firms in the world, created the overall design of Songdo IBD. The district is being built on 53.25 square km of reclaimed tidal flats from the Yellow Sea along the coast of Incheon with a planned completion date of 2015. These tidal flats play an integral role in the biological diversity of the Yellow Sea by sustaining ecological health and processing environmental pollutants. They also hold a dramatic presence along the Korean coastline as it can rise and fall up to 9 meters across an intertidal expanse of 4 km, twice over the course of 24 hours (Frey et al., 1987). Songdo IBD is only one of three constructed islands that comprise the Incheon Free Economic Zone. The approximate total area of land required for this development is 210km2, of which 73% is reclaimed land from the tidal flats (Incheon Free Economic Zone Authority, 2008)

From its inception to its creation, Gale International has claimed Songdo IBD to be the city of the future. The architects from Kohn Peterson Fox (KPF) were chosen to create the master plan for Songdo IBD. The design intention was to build an unbiased, nonspecific, and sustainable city that acts as an international business hub. They aspire to achieve this by braiding ubiquitous computing technologies, where actions are tracked, recorded and all services are automated and personalized to the individual


YELLOW SEA
Investigated site
YELLOW SEA
N
0
100
200
5000m

into an assemblage of urban elements extracted from cities around the world (O'Connell, 2005). Gale international describes the vision of the community on the Songdo International Business Districts website (2010).

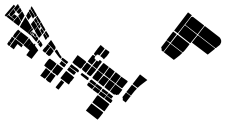
> Woven into the Songdo IBD master plan is a rich set of amenities inspired by some of the greatest cities of the world. Songdo IBD boasts the wide boulevards of Paris, a 100-acre Central Park reminiscent of New York City, a system of pocket parks similar to those in Savannah, a modern canal system inspired by Venice and convention center architecture redolent of the famed Sydney Opera House.

This pastiche city makes little, or no, reference to the environmental context in which it is situated. The master plan of Songdo IBD is reliant on building morphology as the method for spatial configuration. The thalassic context that Songdo IBD is situated within has had no active influence on the planning and design of the city. Rather, the erection of a seawall distinctly divides the urban context from the coastal condition prohibiting any informal interactions and emergent phenomena to transpire. The static nature of this master plan leaves no flexibility for change and mutation, objecting to notions of emergent conditions in terms of social, ecological and structural phenomena.

Figure 2.4: Vector plan of Gale International's proposed plan for The Songdo International Business District (Songdo IBD).

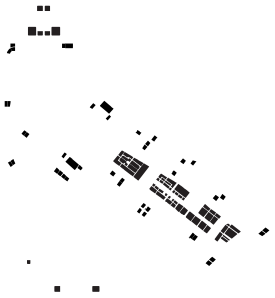

Investigated site
N

existing urban space

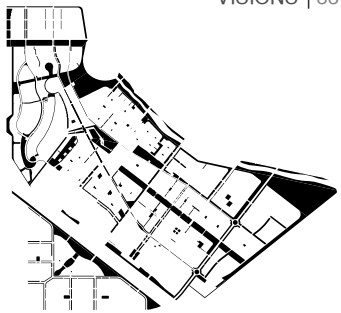


industrial space

commercial space



education/research space



green space

urban amenities

government

parking

mixed use

residential

Above Figure 2.6: Breakdown of programmatic elements that comprise the plan of Songdo IBD.

Opposite Page Figure 2.5: Vector plan of the Songdo IBD overlaid onto aerial photograph of tidal flats along the coast of Incheon. -

The site for the 2009 Incheon Urban Design Competition for Students provided a medium to explore how this developing urban condition can begin to engage and interact with the constituents of the sea. By removing the seawall, restores the fluid relationship between terrestrial and thalassic spaces. The fluctuating tides system offers a unique dynamic to investigate how disturbances can affect occupancy and whether these adaptations and compromises can inform the development of an urban condition.

To fully comprehend the complexities of this site, the design must respond to both its terrestrial existence and thalassic existence and the relationship that occurs between them.

Figure 2.7: Digitally altered image that identifies the location of the practicum site with respect to its terrestrial context.

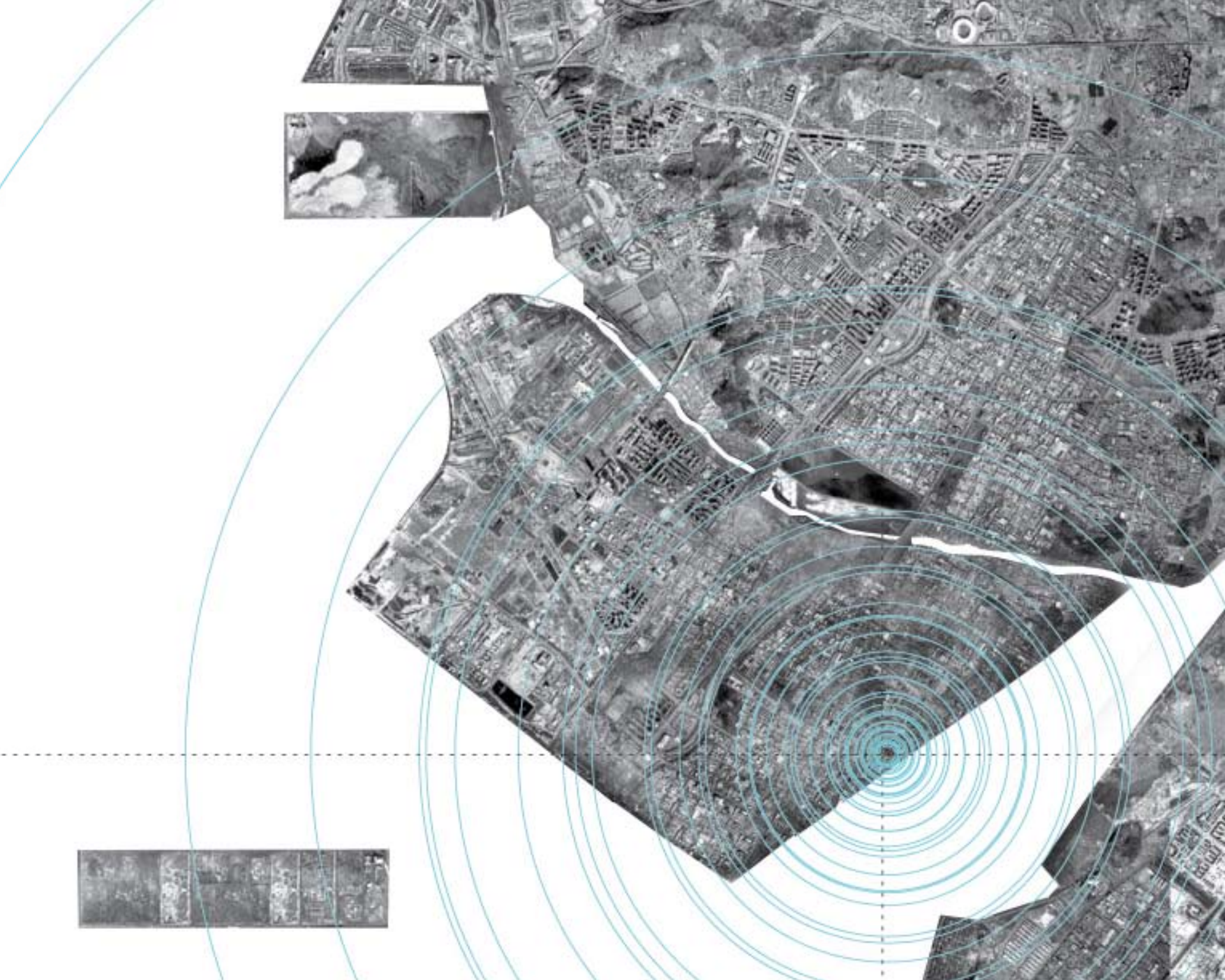


Figure 2.8: Photograph displaying a North West view of the site. In the foreground the Gyeonggi Bay tidal flat is revealed during low tide through a large expanse of land. In the distance the encroaching city of Incheon.

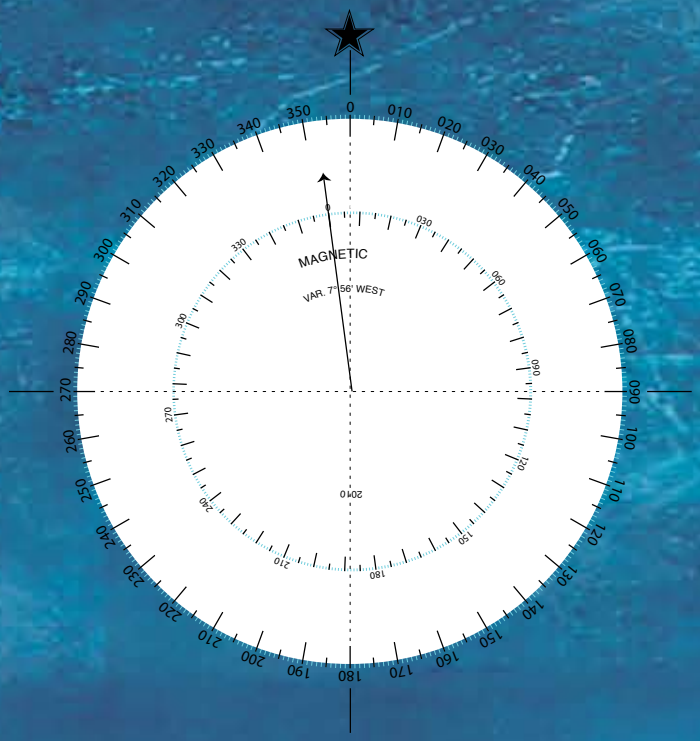


Figure 2.9: Digitally altered image that identifies the location of the practicum site with respect to its thalassic context. To understand and examine the site within its fluid context nautical navigation methods must be undertaken to comprehend the variability of the sea.

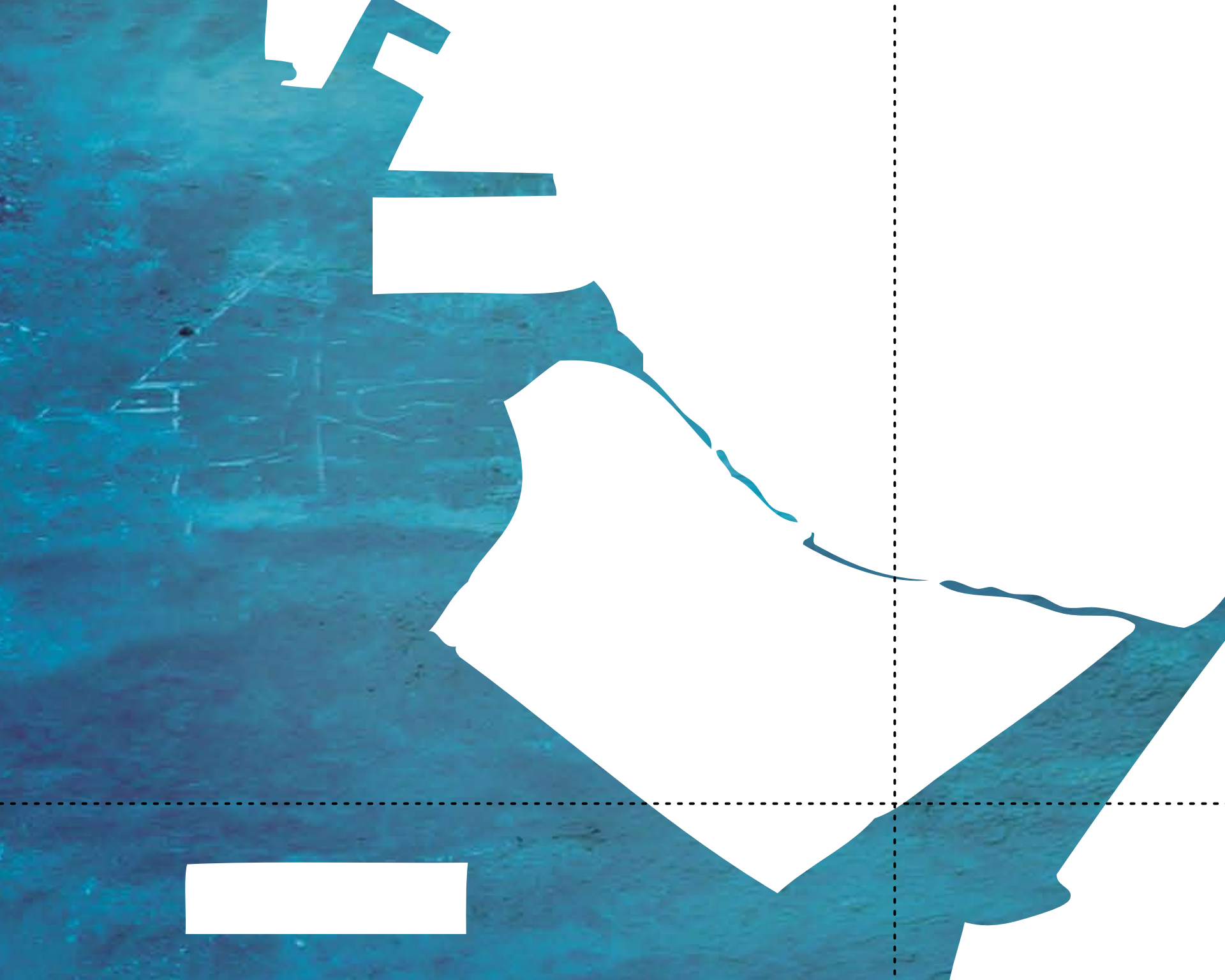


Figure 2.10: Photograph displaying a South East view of the site. As the tide recedes, the seawater traces unique patterns into the sandy mud. These marking exist only temporary, as they are washed away and reinterpreted during the next tidal sequence.

To understand this fluid relationship, the investigation began by consulting with imagery and photographs of shorelines. As water moves onto the land, it brings with it an uncertainty, regardless if it's flotsam, jettison or biological matter, its introduction into the terrestrial system can precipitate a concatenation of social and/or ecological events. Particularly interesting were the physical traces and carvings left in the sand by the rhythm of the water. These patterns exist temporarily. As quickly as they emerge they disappear with a swift motion of the sea.

Autopoiesis describes a flexible system that shifts, moves, changes and mutates without ever losing its identity to persist through temperamental conditions. The relationship between sand and water revealed a literal representation of these relationships. Each entity has its own set of components and properties. When placed into a context that allows a relationship to occur between them, the entities responds to each other through changing water currents and sedimentation patterns. During this interaction where

Figure 2.11: *Traces* – Ucluelet 2009
(Photograph)
Debris, deposits and sand patterns are left on the land when the ocean draws away.

Figure 2.12: Flume – University of Manitoba
Photograph
Experiments were conducted in the flume to investigate dynamic relationships that arise when static objects are placed into a fluid environment.

realities are shifting, the entities still maintain their essential characteristics that are used to define them.

To further understand through the acquisition and interpretation of physical data of the relationship existing between sand and water, a series of empirical studies were conducted in the University of Manitoba Engineering Hydraulics lab. The intention was to understand how one entity (i.e. sand or water) could affect the other, as well as what types of implications and or phenomena resulted when additional entities were introduced into system.

Using a 15-meter long (1 meter wide) variable slope hydraulic flume, a succession of experiments was performed involving sand and water. By controlling flow rate, volume of water and slope, a shoreline was attempted to be simulated. To create a more dynamic environment, objects were introduced into

the tested system. The positioning of these objects began to change how the water and sand interacted with each other. These arrangements began to indicate possible structural organizations and techniques to inform how the sand and water moved. The following describes the series of studies that were taken.

The first examination involved introducing a permanent landmass into a tidal region and observing the affects it had on water currents and sedimentation patterns. By creating a mass representative of the Songdo

Figure 2.13: a cutout of the proposed plan for Songdo IBD with sand.

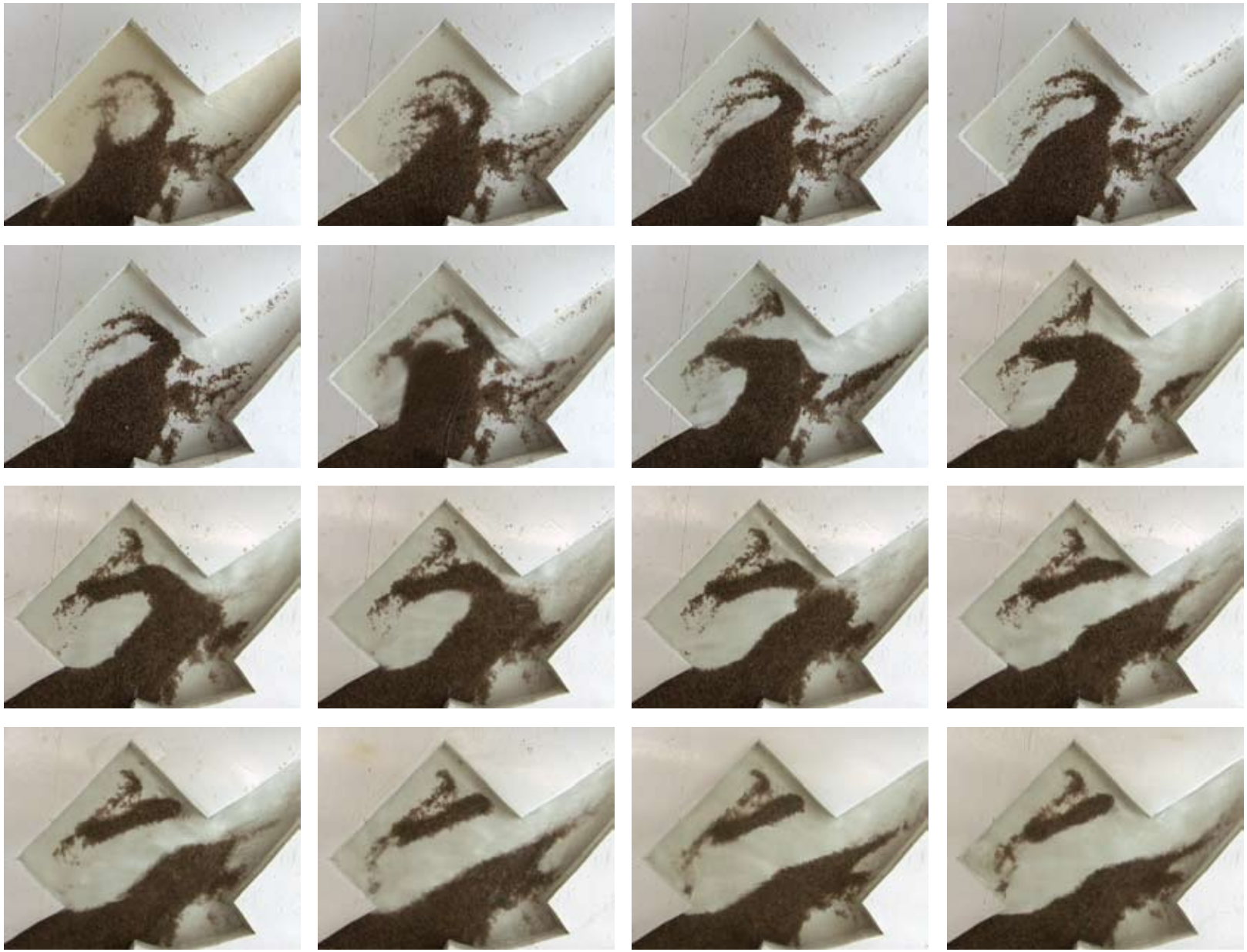


Figure 2.14: Observational photographs over the course of approximately 1 hour showing the shifts in sand when interacting with inconsistent flow of water.

development and then inserting it into the flume simulated this. Initially, without the model, the water intervened at a constant rate and was relatively inactive. However, the insertion of the model caused the water to become turbulent, shifting and moving the sediment in different directions. These findings led to questioning whether it was possible to capture the sediment with the intent of catalyzing a land building process.

In order to contextualize how the tidal flats would respond to structures other than the Songdo project a second experiment was preformed. Objects were inserted into the water and sand to see what types of reactive properties materialized. It began by introducing simple piles. These stanchions had a little to no effect on the system. To see if it was possible to catch sand, netting and partitions were placed into the tested area. The initial placement was configured too tightly and the water

Figure 2.15: Tools used in flume experiments.

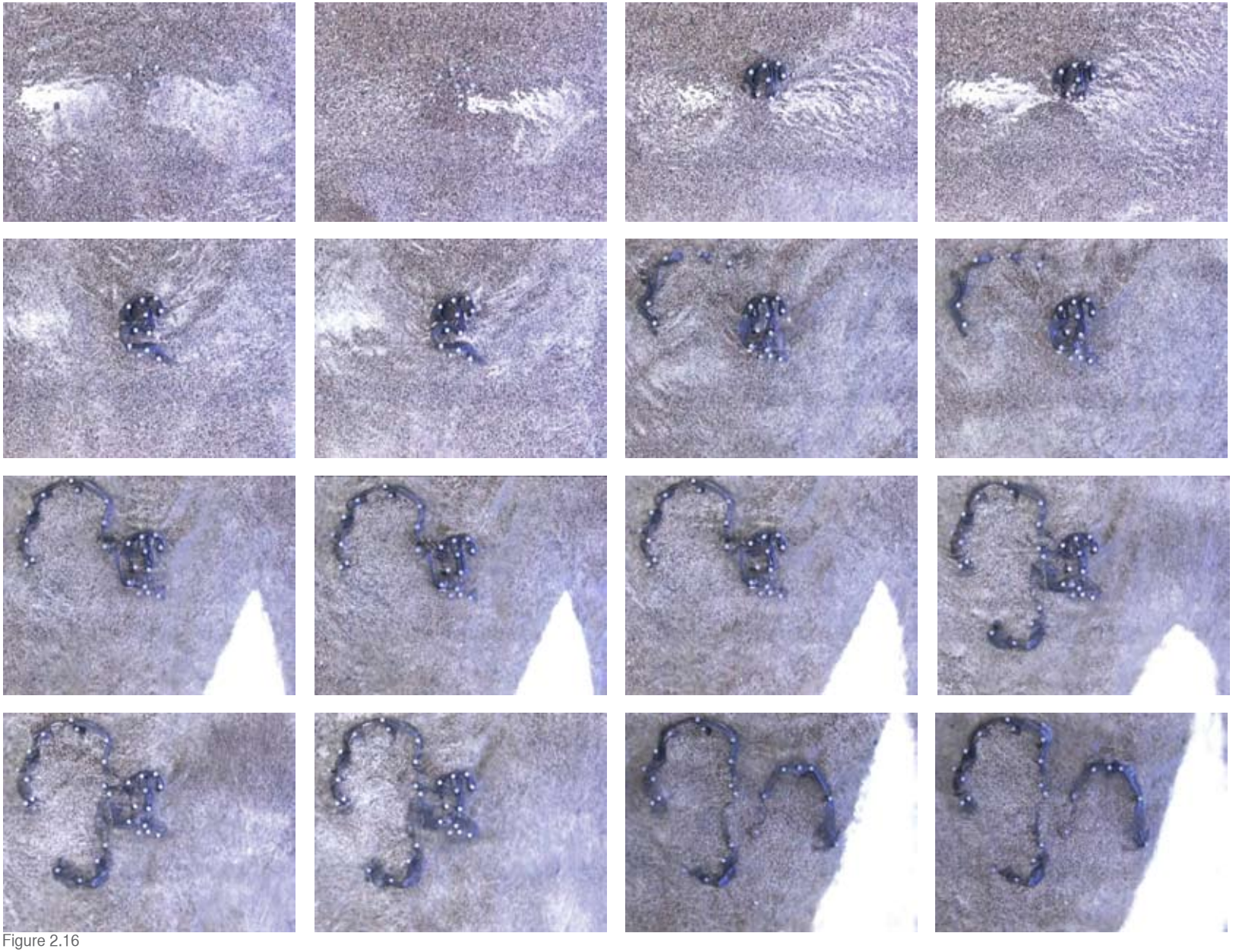


Figure 2.16

Figure 2.16 – 2.17: Observational photographs exhibiting the reactions that result by moving the static objects in the fluid context.

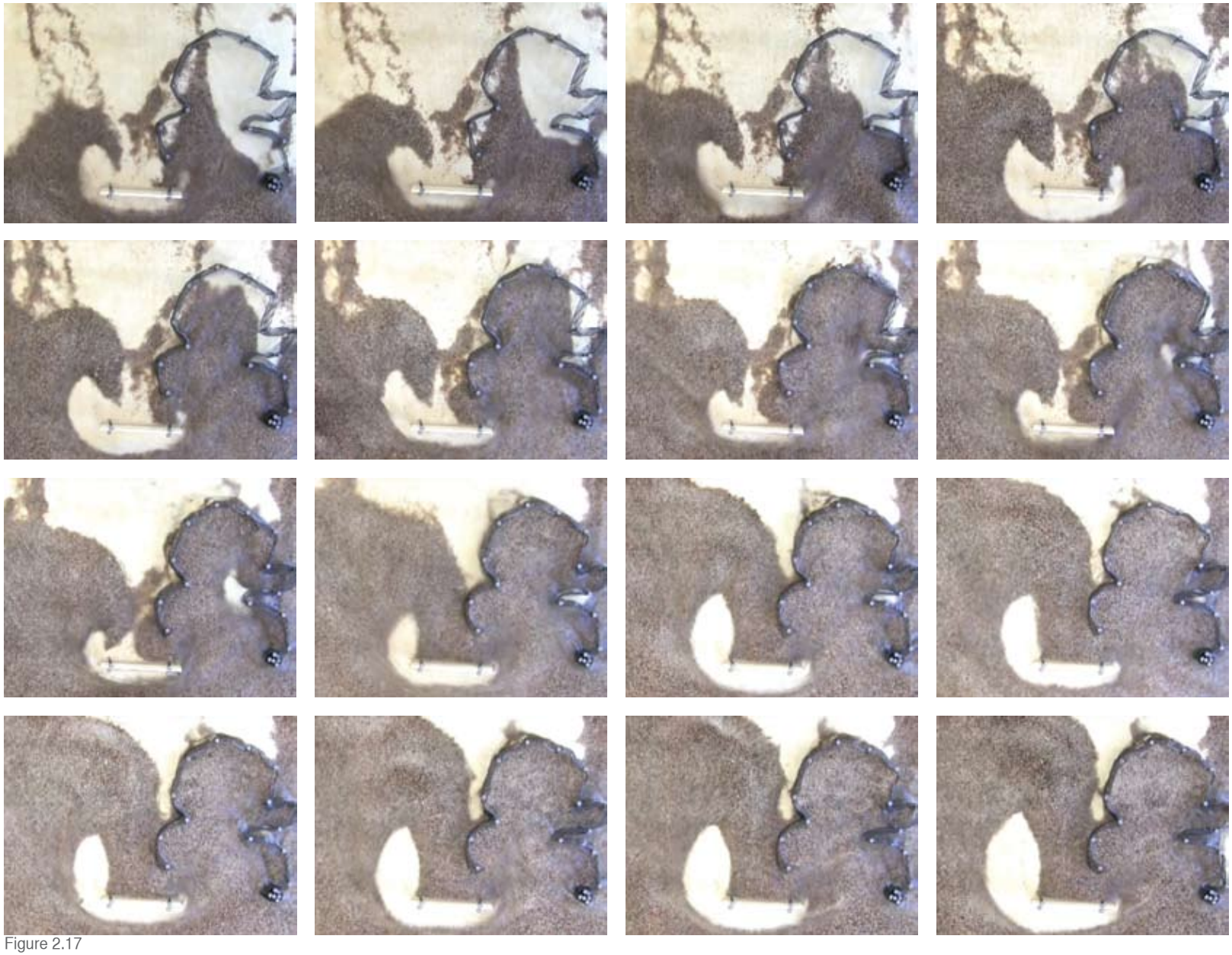


Figure 2.17


Figure 2.18


Figure 2.19


Figure 2.20

Figure 2.18 – 2.21: Tidal conditions attempted to be simulated by changing water levels in the flume. The fluctuating levels allowed for the sand to shift, gather, and pile onsite during multiple high/low water level cycles.

Figure 2.21

Figure 2.22 – 2.23: When the flow of water had stopped the infrastructure was removed to understand how well the captured sand would maintain its form. Without the frameworkthe defined edges softened to muted form.

Figure 2.23

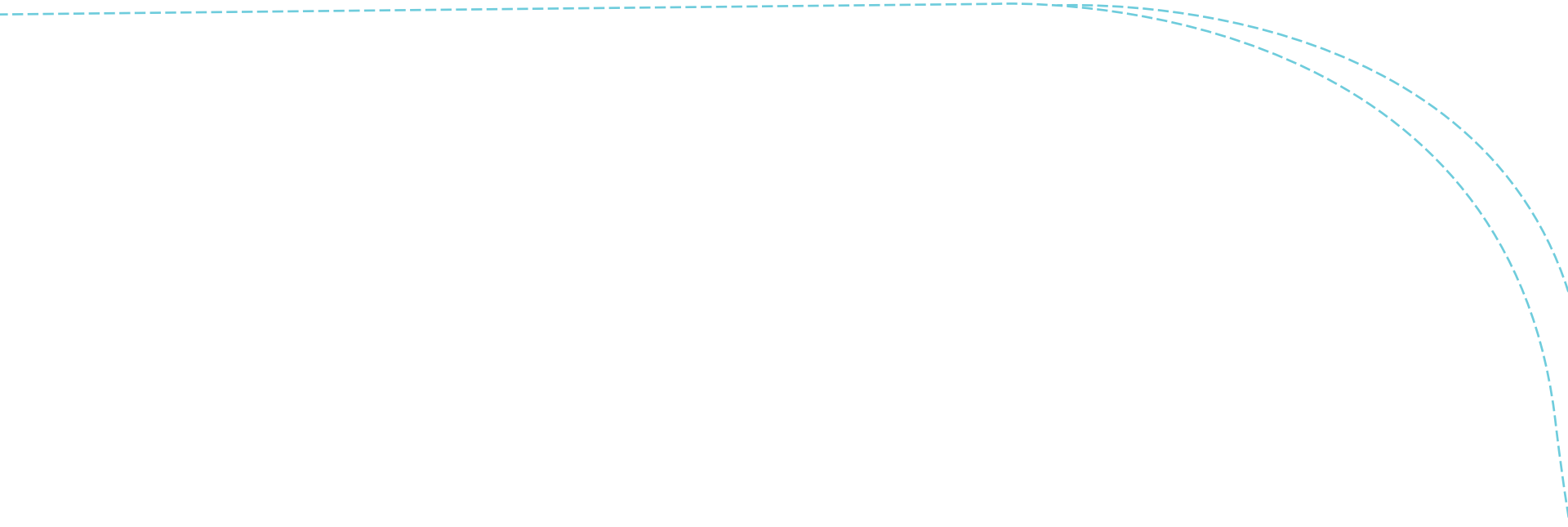
and sand avoided the intervention by moving past it. Once the mass and netted barrior were loosened and opened up, a relationship between the system and foreign parts began to emerge. The experiment then proceeded onto exploring a series of configurations to see what arrangements produced specific results. The findings showed that certain layouts resulted in excelled water currents causing the sand to wash out of the nets and be deposited behind them. Other designs would navigate the sand into the interior of the form and allow it to pile on itself.

In terms of creating an effective land building framework, the most successful device incorporated all the components: piles, netting, and partitions. Incorporating partitions created alternative water currents subtle enough to direct the sediment into the nets without being so forceful as to wash it away. With this particular configured method, specific shapes were able to be staked out and successfully fill with sediment through water currents creating small sand masses.

Figure 2.24: When drained water is captured in sand enclosures that were created during the shifting water levels. This photograph begins draw connections to grandeur scale by understanding how sand and sediment can be captured to create complex landforms.

While these small-scaled studies cannot mimic complex systems occurring in the natural world, they did provide an understanding for a potential framework that could initiate a land building process. For the purpose of this practicum a preliminary landform plan was devised that could lead to a possible landform. The realization of this form begins by inserting a land building framework into the tidal flats of my investigated site. The processes and relations existing between the fluctuating tidal system, sedimentation and this infrastructure would potentially allow a landscape to slowly emerge through time. Once this landform reaches a tangible existence it can begin to fully interact and build relationships with the surrounding context.

Figure 2.25: This rendering emerged by overlaying the observational photographs taken during experimentations onto a context photograph. The abstracted photograph begins to create visual relationships between the understandings of autopoiesis through experimentation and grounds these notions into a physical context.



SCENARIOS

The unfolding of a story, an incidental design that responds too and engages with the preceding theoretical and design explorations.

Figure 3.0: Detroit 2010
Photograph.
A space that was intended for a specific purpose shifts interpretations when abandoned by occupants. The environment changes and adapts to deteriorating surroundings allowing new conditions to emerge. This scene presents all the components necessary to identify the space as once being understood as a factory. Yet the phenomenon of a growing tree insinuates the environments ability to modulate itself when faced with contingencies.

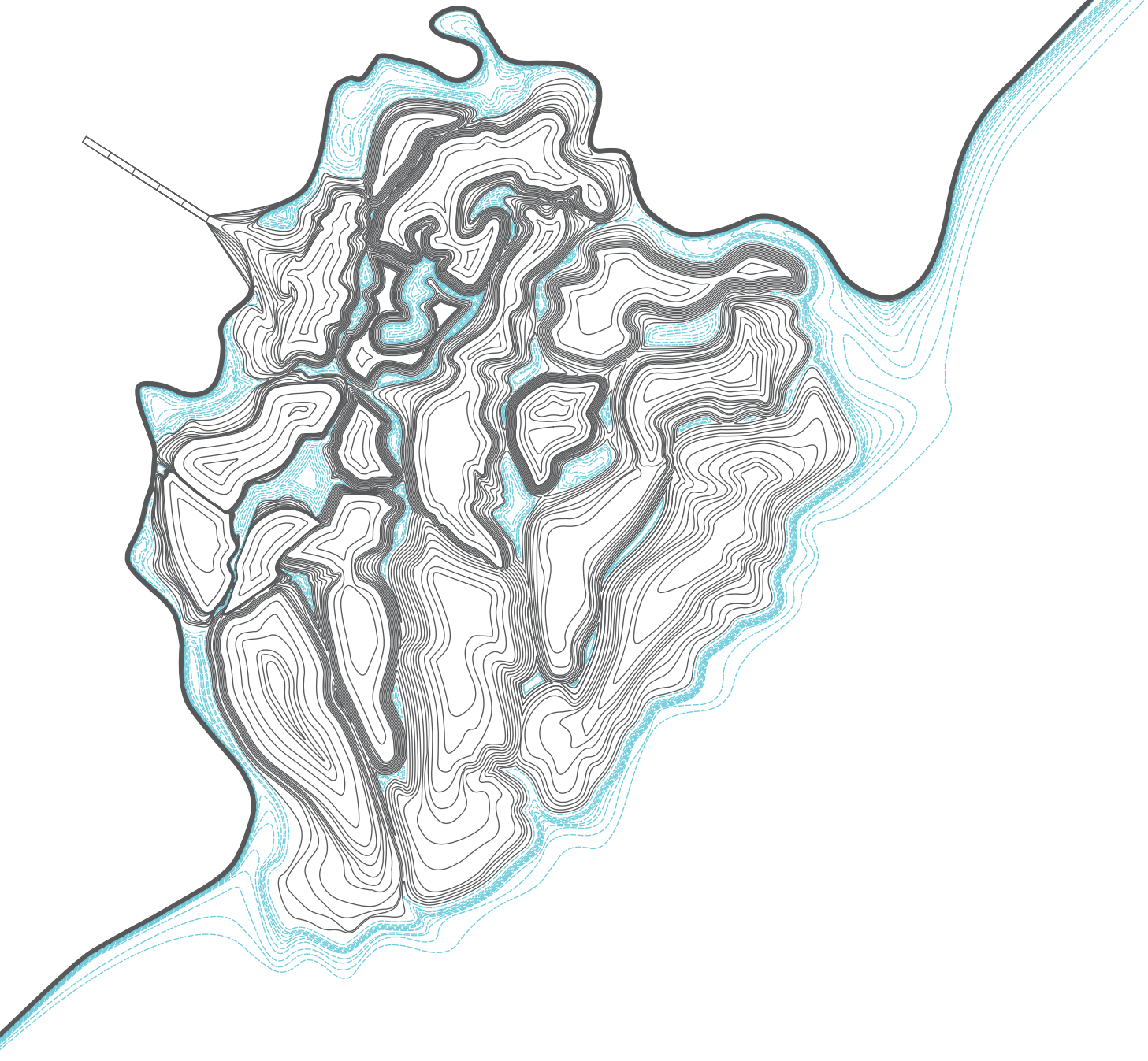
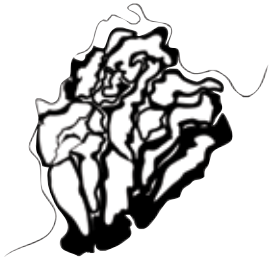


Figure 3.1: To explore the notions of autopoiesis within an urban development a speculative topographical plan based on land building visions was created to play out conceivable scenarios.

Surrounding Context



Intertidal Zone

Dry Land

Sea

Figure 3.2: Interacting components examined in the site

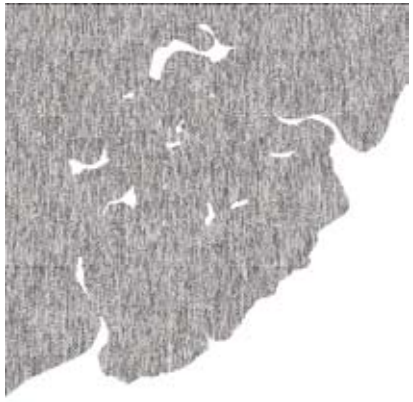
To fully engage with the capacity of autopoietic landscapes, a scene was devised to play out possible events. The topographic plan on the opposite page is an abstraction of the land-building process. It provides a basic framework to begin to explore the relationship between the notions of autopoiesis and urban development.

Referring to the Maturana and Verela analogy of an autopoietic machine, the interpretation of this site is understood to be a device composed of interacting components. Each constituent maintains its own operation while simultaneously contributing to the overall machine (i.e. site). These components have been identified as sea, dry land, intertidal zone and the surrounding urban context. To narrow this exploration and understand the effects of disturbances on the 'machine' the focus will be on tidewater as an imposing force. The following design delivers a potential scenario of a flexible urban condition that responds and engages with contingencies and disturbances allowing them to play an active role in the development of the urban condition.

To understand the relationships between constituents relative to this site, the topographical design was analyzed throughout the seasons looking at the most extreme tidal conditions that occur during the months of January, April, July, and October. On average the area experiences four tidal shifts over a 24-hour period. According to the Korea Hydrographic and Oceanographic Administration's 2010 Tidal Forecast, it predicted on Wednesday July 14th 2010, that area would experience the most dramatic water level of the year during a 24-hour period. Beginning at 00:19 hours the sea level will be at its lowest point of approximately -1 meter below sea level. At 06:31 hours the high tide peaks at +9.51m followed by the second low tide of the day, 12:57 hours, at +.77m. The last tide is experienced at 18:47 hours reaching +8.49 meters above sea level.

JANUARY 31

▲TIME: 05:30 LEVEL:+8.32 m.a.s.l



▼TIME: 11:47 LEVEL:-.67 m.b.s.l

▲TIME: 17:57 LEVEL:+9.31 m.a.s.l

▼TIME: 23:59 LEVEL:+.10 m.a.s.l

APRIL 1

▼TIME: 00:04 LEVEL:-.27 m.b.s.l

▲TIME: 06:11 LEVEL:+9.20 m.a.s.l

▼TIME: 12:31 LEVEL:+.26 m.a.s.l

▲TIME: 18:21 LEVEL:+8.50 m.a.s.l

Figure 3.3: Based on the Korea Hydrographic and Oceanographic Administrations website's 2010 tidal forecast, speculative illustrations are created to simulate the interacting relationship between the terrestrial and thalassic systems. The fluctuating tide levels are analyzed over the course of twenty-four hours creating four illustrations that depict the tide's ebb and flow. Considerable changes in water levels occur approximately every six hours resulting in dramatic alterations on the landscape. Each illustration indicates time of day and the measurement of meters above sea level (masl) or meters below sea level (mbsl).

JULY 14

▼TIME: 00:19 LEVEL:-.10 m.b.s.l

▲TIME: 06:31 LEVEL:+9.51 m.a.s.l

▼TIME: 12:57 LEVEL:+.03 m.a.s.l

▲TIME: 18:47 LEVEL:+8.49 m.a.s.l

OCTOBER 8

▲TIME: 04:41 LEVEL:+9.17 m.a.s.l

▼TIME: 11:01 LEVEL:-.22 m.b.s.l

▲TIME: 17:06 LEVEL:+9.17 m.a.s.l

▼TIME: 18:21 LEVEL:+8.50 m.a.s.l

Figure 3.4: July 14, TIME: 06:31, LEVEL: +9.51 masl.
Within a period of a pproximately six hours the tide flow's nine meters creating a fragmented landform. Navigation of the space is understood by deciphering movement within a fluid context. Land development depends on the occupants' adaptability to shifting conditions that will ultimately determine what areas are developed for urban usage and what are left as residual spaces.

Tidewaters maintain a degree of uncertainty. Tidal forecasts and water levels are only predictions and never accurate measurements. One can never anticipate what the sea flows in or what it washes away. This shifting variable allows for emergent conditions to transpire as land is revealed and concealed relative to the ebb and flow of the tide. Occupancy must maintain resiliency to thrive within these changing realities.

These two images model the landform during the first cycle of tides on July 14th, 2010. At this scale during high tide site navigation becomes the most prevalent condition that will occur. As the water rises, land begins to submerge, what once was one solid mass becomes a series of pieces. Land based connections disappear and give rise to alternative methods of transport. The idea that you arrive at a destination by sea and in a few hours you would need to leave by land would be a daily reality. The emergence and submersion of land will play an integral role in the overall occupancy of the area. The materialization of commercial and residential programs will co-exist with the daily tidal schedule as it dictates the accessibility of land. Areas that experience limited availability will

July 14, TIME: 00:19, LEVEL: -.10 mbsl.
significant amounts of land are temporarily revealed allowing the
e of fortuities to transpire.

likely be less than ideal for high traffic urban occupancy and large development schemes. These sites then become residual spaces increasing opportunities for ecological and social phenomena to transpire.

When low tide begins to set in and water recedes, navigation within the site shifts from sea to land. As the intertidal zone is revealed, land bridges surface creating barriers and obstructions to sea travel, yet increasing ground connectivity within the site. The site that was once navigable through a network of fluid connections transforms into a terrestrial space with landlocked salt lakes. The intertidal zone offers a temporary landscape that may begin to embody emergent behaviors as occupants move from dry land onto the muddy landscape. The informal programs that will emerge in these temporal spaces will result from the active programs inhabiting the surrounding dry land.

Using the programmatic scheme development by Gale International for the surrounding urban context, one can begin to speculate what urban programs may arise based on proximity and daily access needs in terms of land based connections.

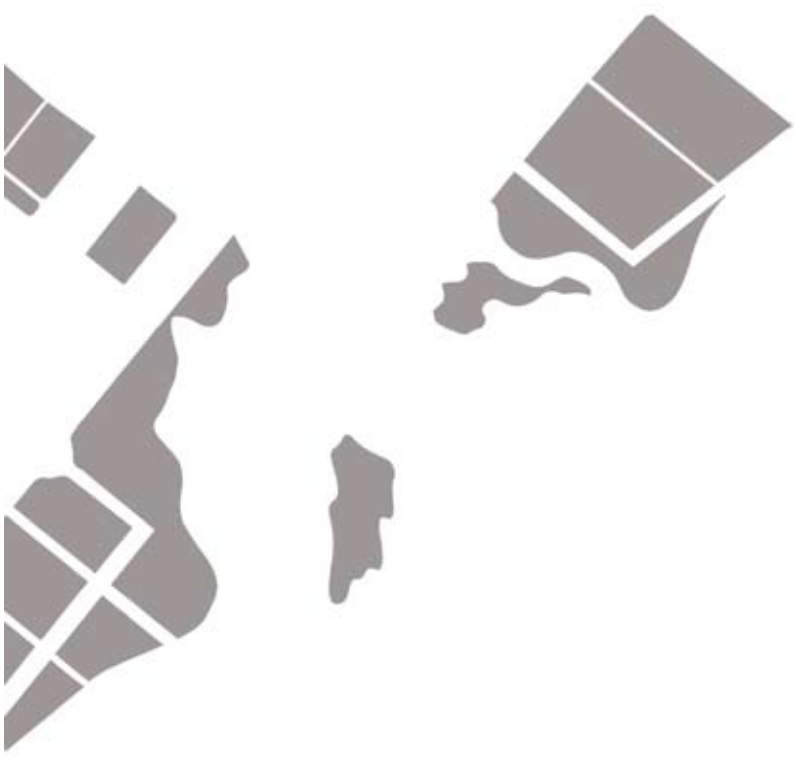
PARK/ OPEN SPACE

Bridging off the linear park that extends across the Songdo IBD, the ‘green’ zone is drawn into the landform to continue the linear corridor and maintain a connection with the coastline.

MIXED

Mixed use is comprised of commercial, leisure, and residential facilities. This zone feeds off the park corridor and is situated in land parcels closest to the mainland. Its proximity to the surrounding context ensures a certain degree of activity through land access and its visibility to the surrounding context.

Figure 3.6: A breakdown of the programmatic elements that comprise the site. The programs emergence is relative to the tidal cycle and the occupancy of the surrounding context.



RESIDENTIAL

Due to high tidewaters these parcels of land become less accessible by convention transport methods and will call upon people who prefer to reside in remote destinations that are less active. Occupants will have to adapt to the fluctuating water levels and integrate it into their daily transportation methods.

INDUSTRIAL

Presence of industry will be minimum in this design scenario as transportation plays an integral role in the survival of these types of businesses. Therefore the Industrial zone is limited to the periphery of the investigated site.

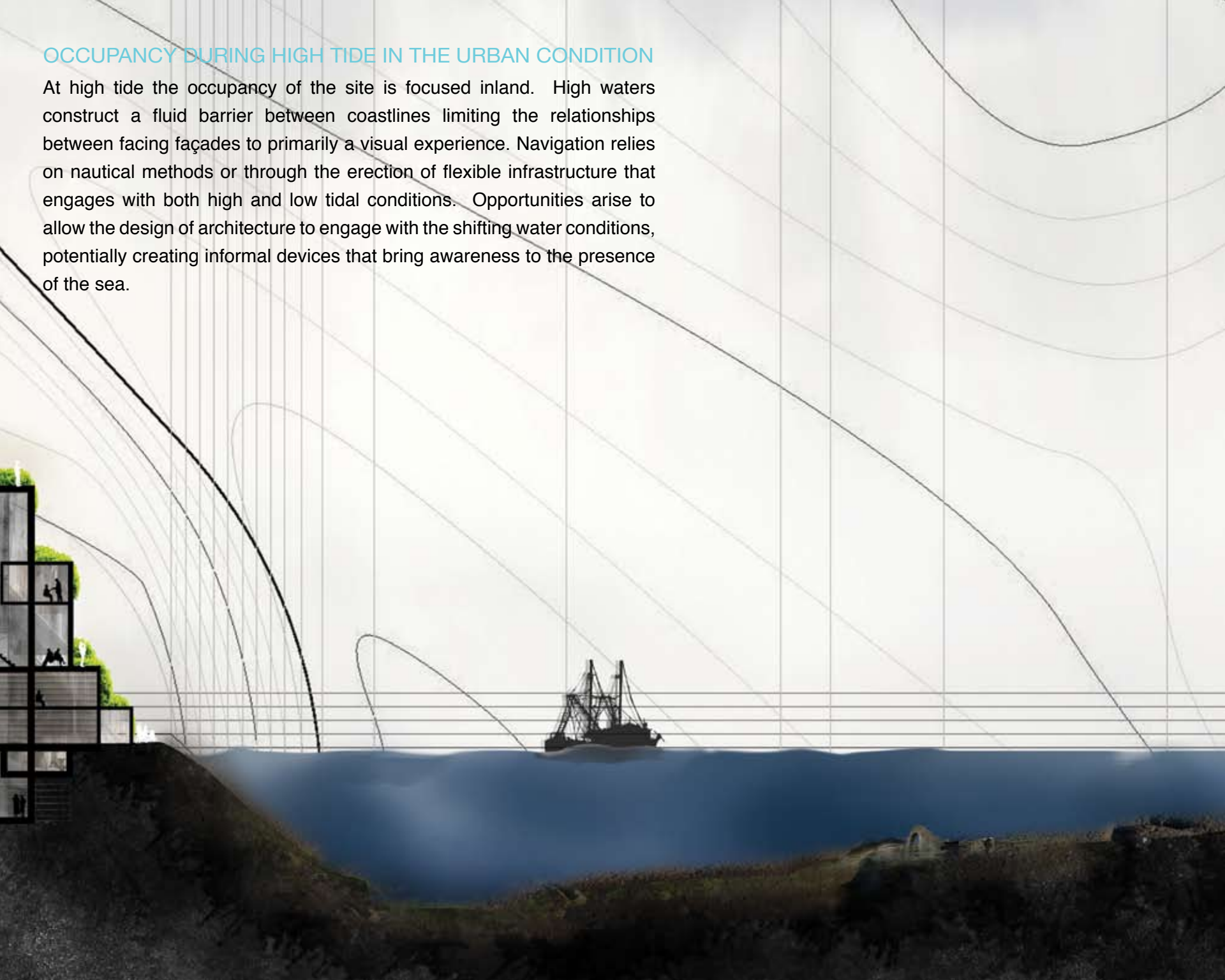

SEA
RESIDENTIAL
INDUSTRIAL
RESEARCH
PARK/ OPEN SPACE
ROADS
INTERTIDAL
MIXED

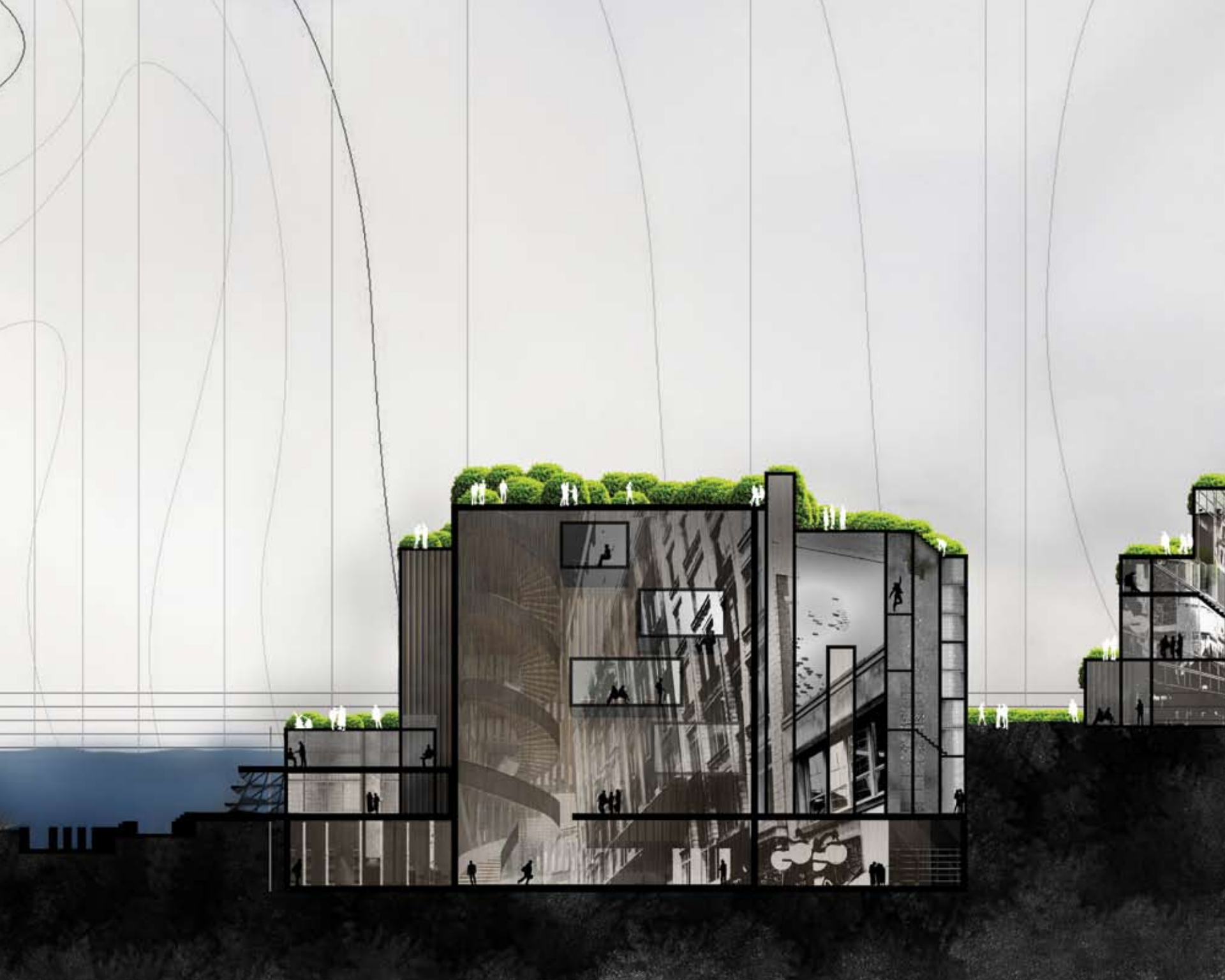
As the urban condition evolves into a mature component within the system, phenomena become less observable on this scale unless faced with a catastrophic event. The presence of autopoiesis can then be observed and examined by shifting downwards in scale. The following rendered sections reveal scenarios that could unravel. The first scene depicts a developed urban context engaging and reacting to the fluctuating tidal condition. The latter demonstrates this relationship but in a residual context, a space found in a remote area of the site that has had less exposure to urban development.

Figure 3.7: A composite plan of all the related programmatic elements

OCCUPANCY DURING HIGH TIDE IN THE URBAN CONDITION

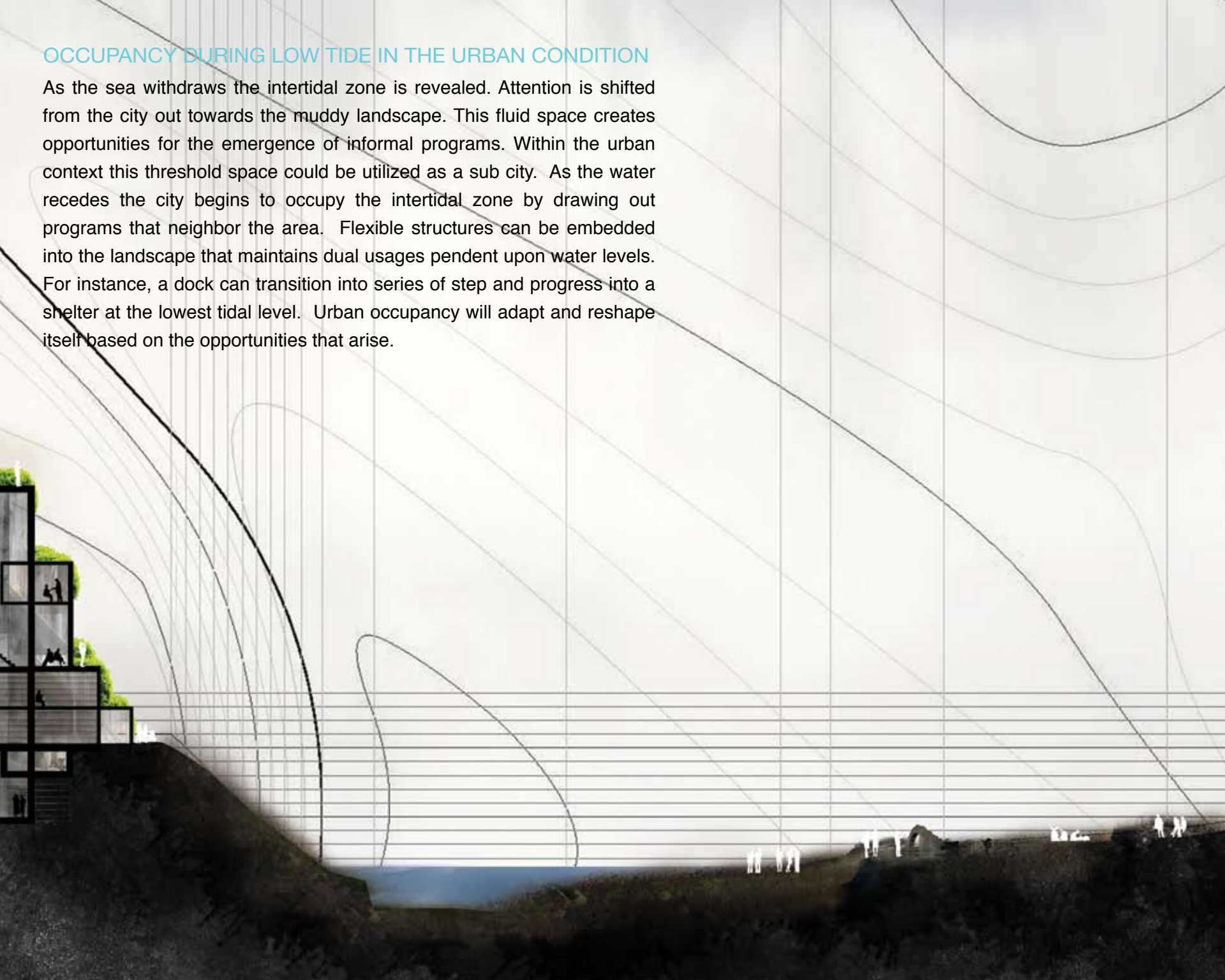
At high tide the occupancy of the site is focused inland. High waters construct a fluid barrier between coastlines limiting the relationships between facing façades to primarily a visual experience. Navigation relies on nautical methods or through the erection of flexible infrastructure that engages with both high and low tidal conditions. Opportunities arise to allow the design of architecture to engage with the shifting water conditions, potentially creating informal devices that bring awareness to the presence of the sea.

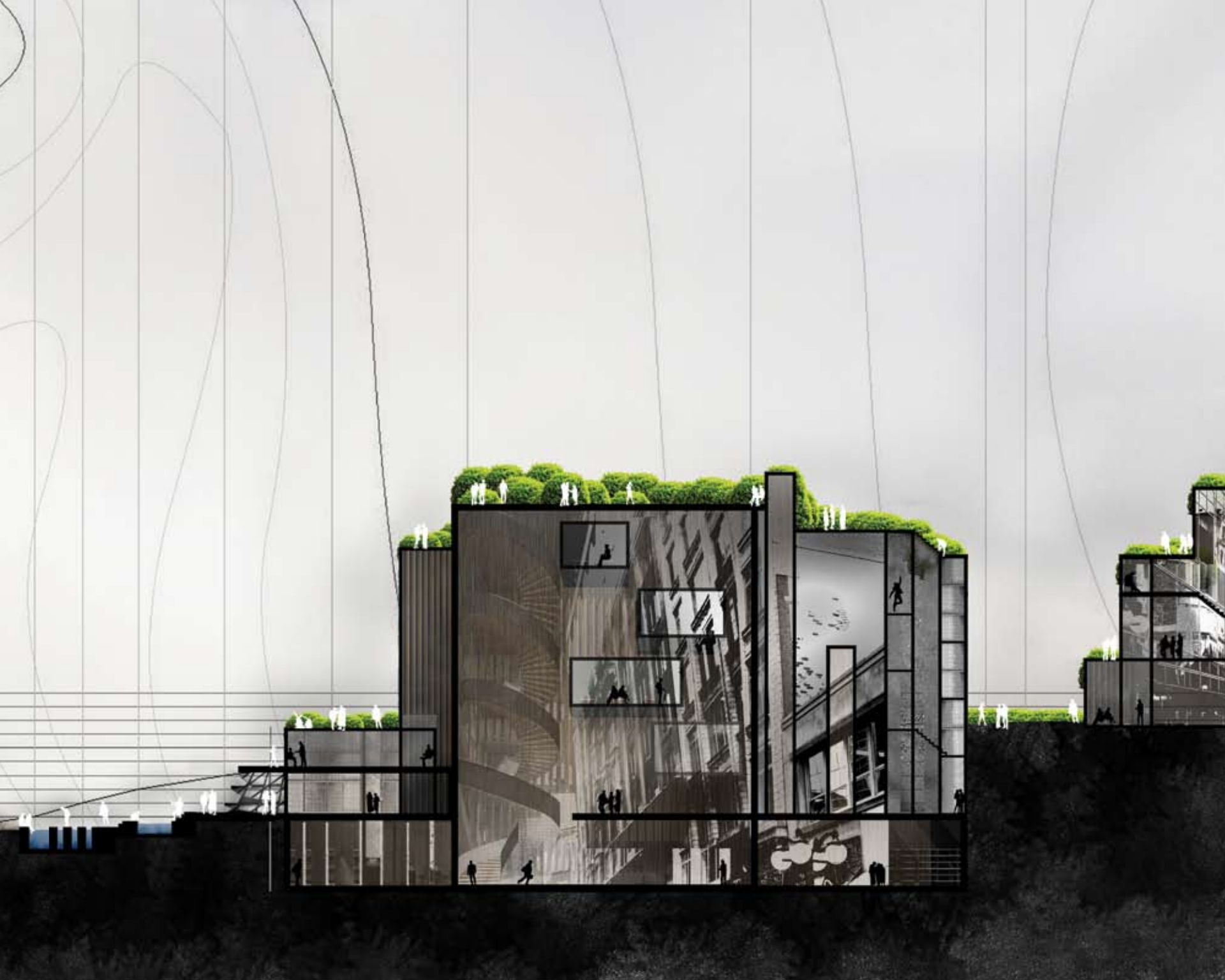




OCCUPANCY DURING LOW TIDE IN THE URBAN CONDITION

As the sea withdraws the intertidal zone is revealed. Attention is shifted from the city out towards the muddy landscape. This fluid space creates opportunities for the emergence of informal programs. Within the urban context this threshold space could be utilized as a sub city. As the water recedes the city begins to occupy the intertidal zone by drawing out programs that neighbor the area. Flexible structures can be embedded into the landscape that maintains dual usages pendent upon water levels. For instance, a dock can transition into series of step and progress into a shelter at the lowest tidal level. Urban occupancy will adapt and reshape itself based on the opportunities that arise.



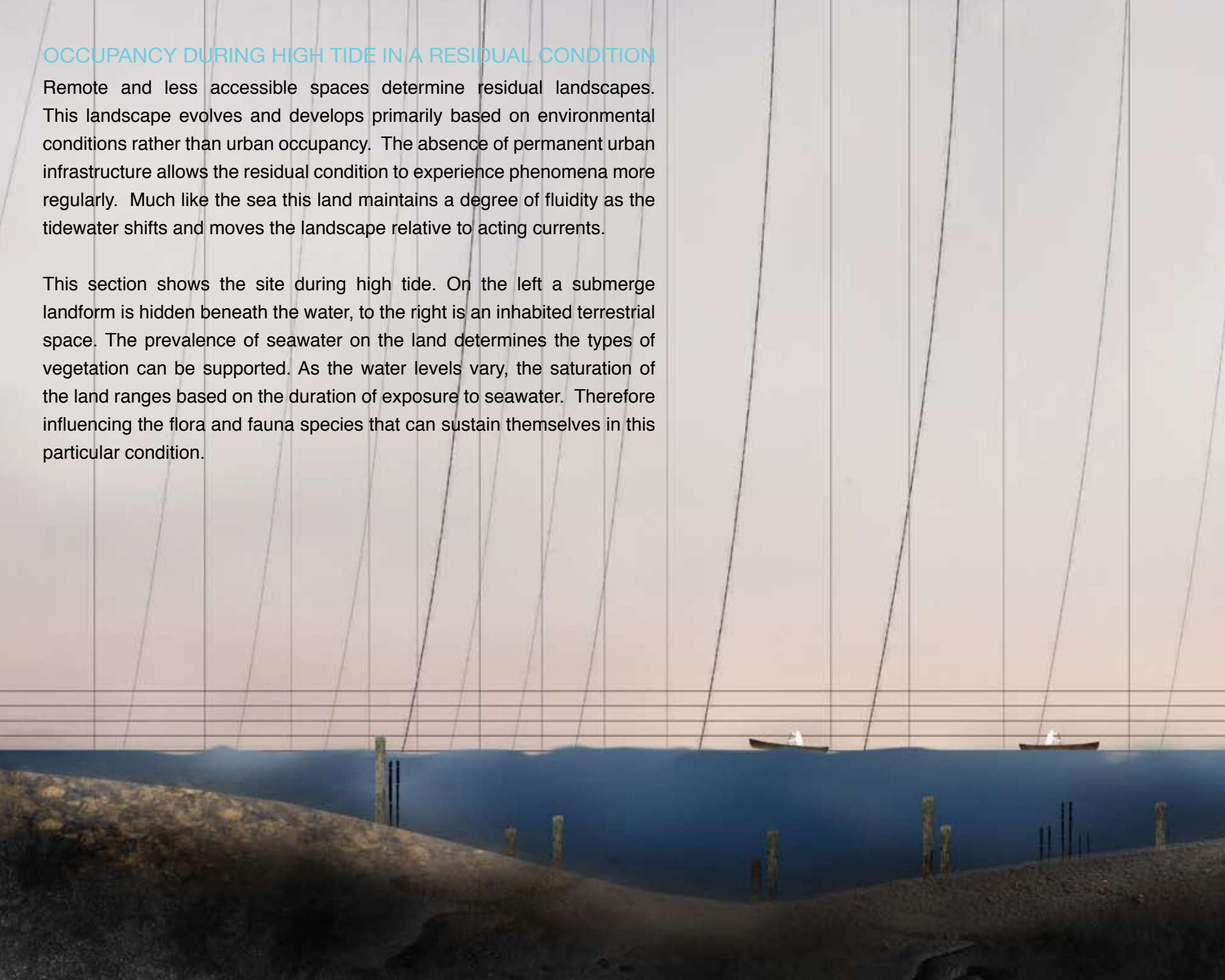


Interventions can be placed into the intertidal zone to accentuate the temporal nature of the space. In this perspective an individual looks into a reservoir that captured seawater when it was submersed during high tide. This tidal basin provides an opportunity for phenomena to take place. Each tidal cycle may bring particles, organic matter, sediment, organisms, debris or the unknown. The reservoir captures and contains entities in a temporal environment allowing the emergent conditions and relationships to be revealed.

OCCUPANCY DURING HIGH TIDE IN A RESIDUAL CONDITION

Remote and less accessible spaces determine residual landscapes. This landscape evolves and develops primarily based on environmental conditions rather than urban occupancy. The absence of permanent urban infrastructure allows the residual condition to experience phenomena more regularly. Much like the sea this land maintains a degree of fluidity as the tidewater shifts and moves the landscape relative to acting currents.

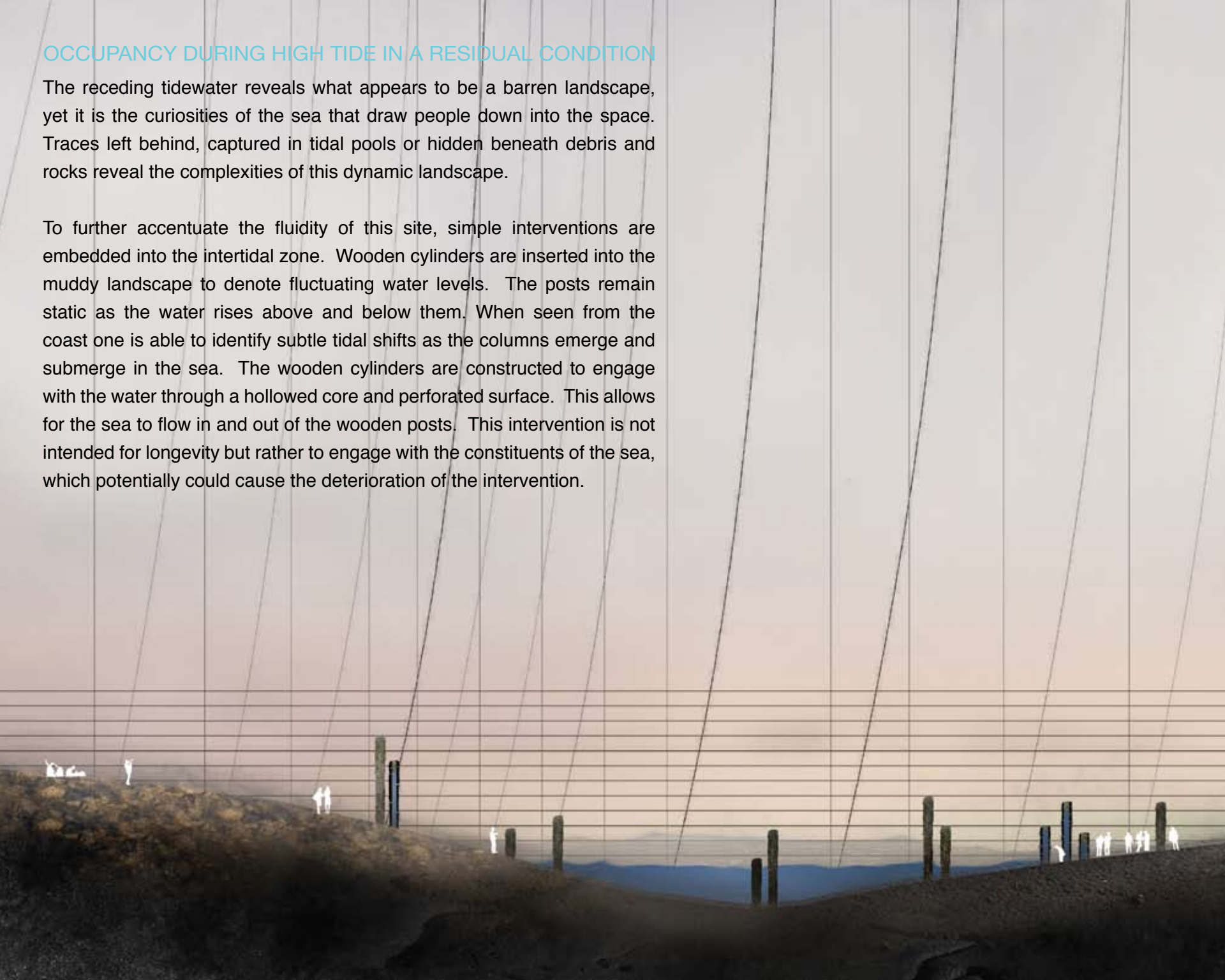
This section shows the site during high tide. On the left a submerge landform is hidden beneath the water, to the right is an inhabited terrestrial space. The prevalence of seawater on the land determines the types of vegetation can be supported. As the water levels vary, the saturation of the land ranges based on the duration of exposure to seawater. Therefore influencing the flora and fauna species that can sustain themselves in this particular condition.



OCCUPANCY DURING HIGH TIDE IN A RESIDUAL CONDITION

The receding tidewater reveals what appears to be a barren landscape, yet it is the curiosities of the sea that draw people down into the space. Traces left behind, captured in tidal pools or hidden beneath debris and rocks reveal the complexities of this dynamic landscape.

To further accentuate the fluidity of this site, simple interventions are embedded into the intertidal zone. Wooden cylinders are inserted into the muddy landscape to denote fluctuating water levels. The posts remain static as the water rises above and below them. When seen from the coast one is able to identify subtle tidal shifts as the columns emerge and submerge in the sea. The wooden cylinders are constructed to engage with the water through a hollowed core and perforated surface. This allows for the sea to flow in and out of the wooden posts. This intervention is not intended for longevity but rather to engage with the constituents of the sea, which potentially could cause the deterioration of the intervention.



In summary it is important to reiterate that the presented landform is not at fixed or final state. It is a shifting condition that will change and adapt itself when confronted with outside disturbances. The sea acts as the most profound disturbance; its behavior can be erratic and at times unpredictable. It can erode, deposit and carve the landscape, significantly transforming the terrestrial space. Ultimately it will be the interactions and disturbances by plants, animals, and humans that will provide the additional framework necessary for this system to achieve a degree of resilience and adaptability.

IN CONCLUSION

In this practicum I sought to understand the relationship between autopoiesis and landscape architecture. Maturan and Verera discuss autopoiesis in terms of autonomic processes; that organisms involuntary adapt to presented phenomena in order to survive. They later go on to say that living systems are 'purposeless systems', that they have no inherent preprogrammed qualities. A challenge of this practicum was in its attempts to understand the act of autonomic processes within the context of design, as design is never without purpose. Through this practicum study it was revealed that at times design can be autonomic, such as the autonomic illustrations found in the first chapter of this document. They began with no finite form and through their autonomic beginnings a basic framework was revealed that lead to an analytical end.

Autopoiesis, as understood through this practicum, is a process condition. It describes the survival of life through the exhibition of resilience. To design autopoietically, is to design with a flexible framework where an unexpected phenomenon can become an integral component in the design process. These phenomena present alternatives causing deviations from the set design path. These deviations can be seen as opportunities, revealing and uncovering alternate methods and ideas to follow in the pursuit of a design composition.

This practicum looks beyond conventional methods of design by understanding the term of autopoiesis in the context of landscape architecture. It challenges perceptions of design by encouraging the embrace of unforeseeable events as an active tool in a design knowledge set. The design presented in this practicum emerged through processes of exploration and experimentation.

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To my Family and Friends. Thank you for your support and patience throughout this educational endeavor.

To Team Thesis. For making this process a little easier and far more fun. Thank you for your motivation, support, inspiration and momentum!

REFERENCE LIST

Author Unknown. (5th ed.). (2001). Publication Manual of the American Psychological Association. American Psychological Association: Washington DC.

Balmori, Lee, U. (Ed.). (2007). Balmori. Seoul, Korea: C3 Publishing Co.

Berrizbeitia, A. (2009) Michael Van Valkenburgh Associates : reconstructing urban landscapes: New Haven: Yale University Press.

Betsky, A. (Ed.). (2009). Uneternal city: Urbanism Beyond Rome : Section of the 11th International Architecture Exhibition. Venice, Italy: Marsilio.

Corner, J., Desvigne, M. A., & Tiberghien, G. A., (2009). Intermediate Natures: The Landscape of Micheal Desvigne (Kugler, E. Trans.). Berlin, Germany: Birkhauser.

Cisco Systems Inc. (2010). Cisco Website. Retrieved from: <http://www.cisco.com/en/US/hmpgs/index.html>.

DeOliveira, A. R., Bahamon, A. (2000). Eco-techture : Bioclimatic Trends and Landscape Architecture in The Year 2001 (R. Rees, Trans.). Barcelona, Spain: Loft Publications

Fleischaker, G. R. (1990). Origins of Life: An Operational Definition. Origins of Life and Evolution of the Biosphere, 20, 127-137.

Forman, R. T. T & Godron, M. (1986). Landscape Ecology. New York: John Wiley.

Forman, R. T. T. (1995). Land Mosaics: The Ecology of Landscapes and Regions. United Kingdom: Cambridge University Press.

Forman, R. T. T. (2008). Urban Regions: Ecology and Planning Beyond the City. United Kingdom: Cambridge University Press.

Frey, R.W., Howard, J. D., Hong, J. (1987). Prevalent Lebensspuren on a Modern Macrotidal Flat, Inchon, Korea: Ethological and Environmental Significance [Electronic version]. Palaios, 2(6), 571-593.

Gale International, LLC. (2010). Gale International. Retrieved from: <http://www.galeintl.com/#>.

Gale International, LLC. (2010). Songdo International Business District. Retrieved from: <http://www.songdo.com/#>.

Hong, S., Koh, C., Harris, R.R., Kim, J., Lee, J., Ihm, B. (2007). Land Use in Korean Tidal Wetlands: Impacts and Management Strategies [Electronic version]. Environmental Management, 45(5), 1014-1026.

Incheon Free Economic Zone Authority (2008). IFEZ website. Retrieved from: <http://eng.ifex.go.kr/>.

Incheon Urban Design Competition for Students. (2009). Retrieved from: http://www.iudc.or.kr/e02/e02_4.php.

Isobe, A. (2008). Recent Advances in Ocean-Circulation Research on the Yellow Sea and East China Sea Shelves [Electronic version]. Journal of Oceanography, 64(4), 569-584.

Kalcher, S. (2009). System Landschaft : zeitgenössische deutsche Landschaftsarchitektur/ Landscape as a System : Contemporary German Landscape Architecture. Berlin, Germany: Birkhauser.

Kohn Pedersen Fox Associates. (2009). Kohn Pedersen Fox Associates Website. Retrieved from: <www.kpf.com>.

Korea Hydrographic and Oceanographic Administration (KHOA). (2004). Retrieved from: <http://www.nori.go.kr/english/tide/INCHEON/200911.htm>.

Le Corbusier. (1971). Looking at City Planning (E. Levieux, Trans.). New York, Grossman Publishers.

Longhurst, A. (1998). Ecological Geography of the Sea. San Diego, California: Academic Press.

Margulis, L. & Sagan, D. (1997). Microcosmos: Four Billion Years of Microbial Evolution. Los Angeles, California: University of California Press.

Maturana, H. & Varela, F. (1980). Autopoiesis and Cognition: The Realization of the Living. Boston, U.S.A.: D. Reidel Publishing Company.

O'Connell, P. L. (2005, October 5). Korea's High-Tech Utopia, Where Everything Is Observed. *The New York Times.* Retrieved from: <http://www.nytimes.com/2005/10/05/technology/techspecial/05oconnell.html?pagewanted=1&ei=5070&en=7faa973d42e14c44&ex=1159675200>

Paloscia, R. (Ed.). (2004). The Contested Metropolis: Six Cities at The Beginning of The 21st Century. Boston, USA: Birkhauser.

Pieterse, E. A. (2008). City Futures: Confronting The Crisis of Urban Development. New York, NY: Zed Books.

Reed, C. (2005). Performance Practices. 306090 Architecture Journal, August 2005, 09, 82-91.

Reh, W., Steenbergen, C., Aten, D. (2007). Sea of Land : The Polder As An Experimental Atlas of Dutch Landscape Architecture. Wormer : Stichting Uitgeverij Noord-Holland.

Shane, D. G. (2005). Recombinant Urbanism: Conceptual Modeling in Architecture, Urban Design, and City Theory. Hoboken, NJ: Wiley.

Stewart, I. (2001). What Shape is a Snowflake? Magical Numbers in Nature. London, England: Weidenfeld & Nicolson.

Stoss LU. Lee, U. (Ed.). (2007). Stoss LU. Seoul, Korea: C3 Publishing Co.

Zonneveld, I. S. (Ed.), Forman, R. T. T. (Ed.). (1989). Changing Landscapes: An Ecological Perspective. New York : Springer-Verlag.

IMAGE REFERENCE

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Figure 2.01: World vector dot map, 2010. Coutesy of Sim Jun Han. http://www.jay-han.com/about/

Figure 2.4: Vector plan of Songdo International Business District, 2009. Courtesy of Incheon Urban Design Competition for Students. http://www.iudc.or.kr/e02/e02_4.php.

Figure 2.8: Photograph displaying a North West view of the site, 2009. Courtesy of Incheon Urban Design Competition for Students. http://www.iudc.or.kr/e02/e02_4.php.

Figure 2.10: Photograph displaying a South East view of the site, 2009. Courtesy of Incheon Urban Design Competition for Students. http://www.iudc.or.kr/e02/e02_4.php.

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