

PRODUCTIVE SPOILS : RETOOLING DETROIT'S WATERFRONT

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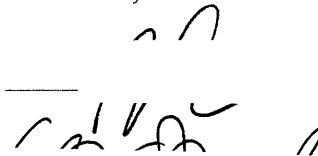
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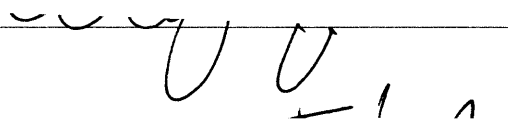
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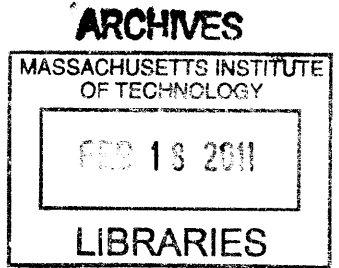


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5

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ABSTRACT

With the recent strain of environmental disasters associated with poor environmental planning and the crash of the economic system that had propped up this type of development, it is clear that architecture’s relationship to nature needs to be rethought.

The thesis uses the waterfront of Detroit as a test site for an integrated system based on ecological principles of interdependency, indeterminacy and time-based processes. The proposal situates itself in opposition to the urban development laid on top of the land and its application in current form to a new, so called “green” recreational riverwalk, which still relies on the hard engineering that has destroyed Detroit’s native wetlands. Instead, this thesis proposes a soft infrastructure which synthesizes solutions for water retention and environmental enrichment along the coastline, based on the natural patterns of drainage landforms, and with human development tightly integrated within the system. This system is modulated to balance different degrees of environmental, technical and economic priorities, layered throughout the waterfront to not only create a comprehensive storm defense system but also to provide new places for recreation, urban farming and urban development.

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INTRODUCTION: MANIFESTO & SITE ANALYSIS

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PRODUCTIVE SPOILS: RE-TOOLING DETROIT'S WATERFRONT

The recent strain of environmental disasters has highlighted the often hidden relationships between environmental systems and the cultural processes that have attempted to sustain indefinite economic progress despite depleting resources.

In Detroit, the authorities's attempt to transform the post-industrial waterfront for "green" recreational purposes, separate from environmental problems of the wastewater storm surge waters polluting the Detroit River is telling; it reveals a mode of thinking also prevalent in the design professions. Within the design disciplines, this oppositional system of thought, such as: architecture/landscape, object/space, culture/nature, work/site, has typically foregrounded the first term while naturalizing the second as backdrop. Even when landscape was privileged (Ebenezer Howard's Garden City, Frank Lloyd Wright's Broadacre City, Le Corbusier's Radiant City), it was designed as a respite from urban congestion and the pollution created by industrialization.

With the crash of the economic system that had propped up this type of development, it is clear that that architecture's relationship to nature needs to be rethought. Architecture (and urbanism) can no longer be organized solely around economic processes: it needs to be able to project an alternate future, one centered around ecological planning. If the infrastructure of the twenty-first century is to handle the resource crisis, a more symbiotic relationship between infrastructure, landscape and architecture must be adopted.

The thesis uses the waterfront of Detroit within the Great Lakes as a test site for an integrated system based on ecological principles of interdependency, indeterminacy and time-based processes. It seeks to resist typological classifications between built-up infrastructure and landscape by appropriating the tools of landscape design (time-based processes, repetitive cycles) with the

12 understanding that the built-up environment is not a finished object, but undergoes processes that extend through time (weathering, material life cycles, varying building components life-time).

SITE: DETROIT

Detroit, a major port city along the Detroit River connecting Lake St. Clair and Lake Eerie, was founded for commercial purposes, and later developed into the automobile center of the US. Its urban form is a good instance of an industrial economy driving a form of spatiality, allowing us to look at the story of large scale economic shifts and power. Over the past decades, Detroit has become a good case study for thinking about landscape urbanism in terms of urban shrinkage. Indeed the notion of shaping the city through buildings would not work in Detroit, because of its shrinkage. It is significant also because of the changing relationship of the city to its water's edge. The Detroit River is the most heavily industrialized connecting channel in the Great Lakes. Historically, visions for the water's edge have gone through significant shifts. Once viewed as primarily utilitarian, traditional industrial waterfronts have been redefined recently as a place for environmental rehabilitation, leisure, and entertainment.

WATER INFRASTRUCTURE

Like many of the Great Lake's aging coastal infrastructures, Detroit's industrial waterfront reflects its modernist legacy in its mono-functional approach to the design of infrastructure, segregating waste, water and transport into different unrelated categories.

As in many other urban and suburban environments, Detroit's landscape is engineered to convey water rapidly away from built structures to prevent interior flooding and to clear exterior circulation surfaces. Current design, planning and policy regard the dynamic of flows differently due to several major concerns. One concern is the conveyance of polluted surface runoff into water

bodies, which necessitates onsite retention and filtration systems. While many sites comply with 13 such municipal requirements, its landscape form is not always integrated as a design intent. With a majority of surfaces in the built environment are impervious, methods of small-scale, local water retention, and infiltration can be used to compensate for the depletion of the natural sponge structures (soil, wetlands) that were once widely dispersed to attenuate the volume of surges, as well as facilitate ground water recharge. To regain the sponge infrastructure in urban and suburban developments, the proposal seeks to integrate retention and infiltration into every lot. Consequently, new landscape typologies that were previously inconceivable arise.

PROPOSAL

The proposal situates itself in opposition to the industrial development laid on top of the land and its application in current form to a new recreational harborwalk which is touted as “green.” Yet by relying on existing hard engineering that has led to the destruction of most of the city’s native wetlands, current masterplans still do not take into consideration ecological processes.

Instead, this thesis proposes a soft infrastructure which aims to synthesize solutions for water retention and environmental enrichment along the coastline of the city. It proposes a new organizational system based on the natural patterns of drainage landforms, with human development tightly integrated within the system. As such, the proposal favors the operational logic of landscape over landscape which is primarily picturesque. The drainage landscape is wielded as infrastructure that underlies urban systems and is developed into a differentiated field, with different degrees and scales of drainage according to the program. Instead of the conventional response to waterfront development, i.e., hard engineering with seawalls and bulkheads that define a clear boundary between dry land and water, and which have led to the disappearance of native tidal wetlands along the river bed, this novel system is conceptualized as a littoral zone that extends from the city into the water.

14 As a post-industrial waterfront site targeted for redevelopment, the associated programmatic proposal takes into account not only the ecological conditions of the terrain, but the needs of the inhabitants as well. The proposal layers environmental priorities throughout the littoral zones to not only create a comprehensive drainage system but also to provide new places for recreation, agriculture, ecologies and urban development. The landscape's strategic pairing along transition zones with the public program will create a series of built spaces that can become a market generator, while activating the community.

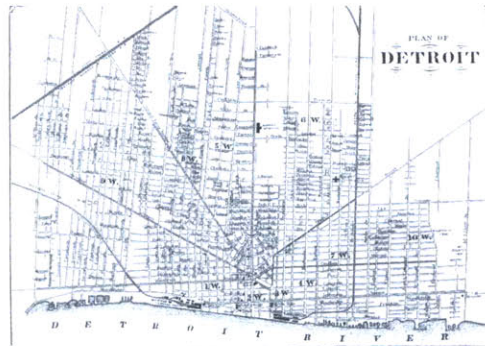
The book is organized in the following way. Chapter one lays the groundwork for an in-depth analysis of the site. The site is analyzed at different scales-as a region, as a landscape, as an urban site-and through various lens: historical, hydrological, and infrastructural. Chapter two deals with the reconceptualization of the relationship between land and water, rethinking them not as binaries, but as a composite system with novel formal and organizational relationships. Chapter three adapts the attributes of existing typologies (urban blocks, residential blocks, farming and recreational zones) to the landscape generated, thus redefining new typologies that optimize water retention. Chapter four finally proposes a new softly modulated terrain as a water based infrastructure that enfold cultural processes. Existing proposals for small-scale urban farming and new recreational routes are adapted, offering a utopian vision of an ecologically planned city.



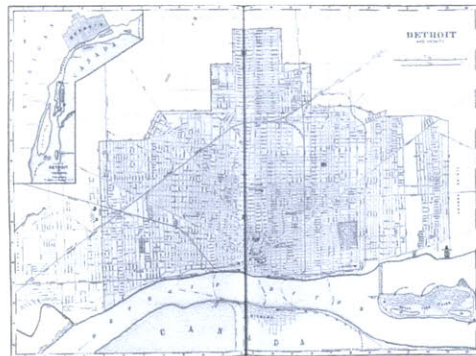
DETROIT WATERFRONT FROM THE DETROIT RIVER IN 1900

b) HISTORICAL ANALYSIS: MONO-FUNCTIONALISM'S IMPACT ON URBANISM 15

The following essay was originally written as analysis of the city of Detroit, for Julian Beinart's Theory of City Form course. It is re-purposed and adapted here in order to give a more thorough background on the site.



DETROIT IN 1880



DETROIT IN 1900

United States, Bureau of the Census, *Detroit, Michigan* [map]. 1:240,000. Washington, D.C. : The Bureau, 1975.

The site, located between a commercial port and a newly constructed riverfront walk, is analysed through the lens of the separation of industry and its by-products. To set the stage, the urban economic and historical development of Detroit since the 1990s is first traced, and a brief description of the site follows. Through further analysis of the site at various scales-economic, physical and environmental- this essay describes how the creation of the site, its performance and ultimately, its abandonment, is intimately linked to and inherently part of the modernist ideologies of mono-functionalism spatially, economically and ecologically.

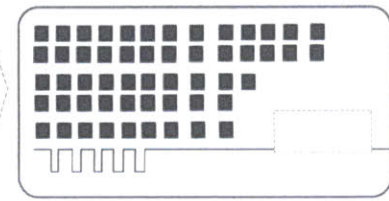
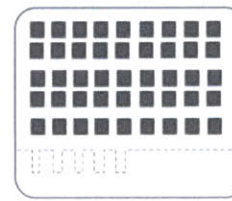
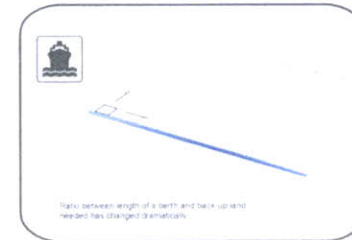
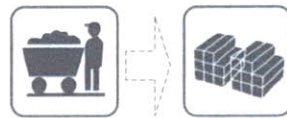
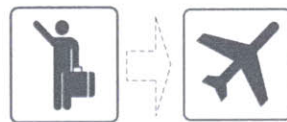
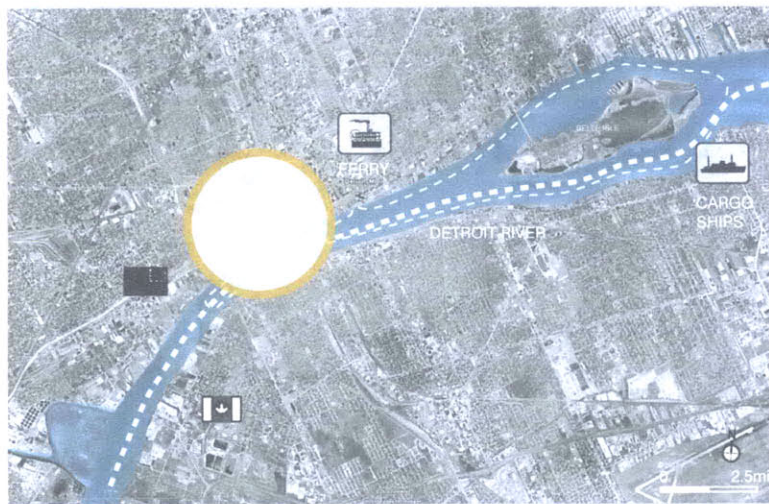
URBAN HISTORY OF DOWNTOWN DETROIT

Detroit was founded in 1701 because of its strategic location along the Detroit river, which proved to be advantageous for trading. The extents of the city were constantly expanding from the 1900s to the 1930s, mostly due to the development and expansion of its single major industry, car-making.¹ Since the financial crash of 1928 and the subsequent decline of the auto-industry, with the industry transitioning to tank-building during the Second World War, there has been a history of spectacular redevelopment proposals for Detroit and its downtown since the 1940's. In 1956, urban renewal was attempted through highway construction, where large areas of the city, including part of the area under scrutiny, were destroyed, to allow for a massive infrastructural highway system.² The construction of the highway led to the severance of the waterfront from the rest of the city. In 1987, plans for a regional transit catering to the less well-off population without car access were being developed, but the plans fell through eventually

16 due to lack of funding. The only project that was eventually built was the People Mover, an elevated train that follows a single 2.9 mile loop around the central business district. Ironically, due to its limited extents, its patrons are nowadays mostly pedestrian-bound tourists, who can completely bypass the deserted streets and instead stop directly at single point attractions such as the Renaissance Center and small urban activity pockets such as Greektown.³ A third try at reinvigorating the city occurred in the 1970s, with the construction of a series of major edifices, namely the above-mentioned Renais-

1. Vogel, Stephen. "Detroit [Re]Turns to Nature." *Handbook of Regenerative Landscape Design*. Robert L. France ed. (New York: CRC Press, 2008), 189-204.

2. New residential areas targeted toward upper middle class residents were planned at the same time, such as Mies Van der Rohe's Lafayette Park.



3. Its minimal coverage does not serve the population, a fact made obvious by the statistical figures: in 2006, only 10% of its capacity was utilized. See <http://www.detnews.com/apps/pbcs.dll/article?AID=/20061223/MET-RO/612230387/1003>. Some of the loop's 13 stations thus include the Cobo Hall, Grand Circus (the Detroit Opera) the Joe Louis Arena (games) the Renaissance Center, Greek town, a small street lined with Greek restaurants. <http://faculty.washington.edu/jbs/itrans/dpmhist.htm>.

4. Interboro Partners, "Interview." *Crisis, Verb Boogazine* (Barcelona: Actar, 2008), 258.

5. With the advent of standardization of cargo, ports no longer needed to maximize the linear extents to the water. Instead, more backup space was needed. Ports thus moved to bluecoasts sites-areas further inland. Meyer, Han. *City and Port: Urban Planning as a Cultural Venture* in London, Barcelona, New York, and Rotterdam. (Utrecht : International Books) 1999.

sance Center, a fortress-like building built in an attempt to prevent the exodus of the 17 middle-class population from the city.⁴ In the 1990s, three casinos (more single point attractions) were opened in the downtown area to stem the flow of cash away from Detroit into the nearby city of Windsor, Canada. The latest regeneration projects, started in 2006, are the revitalization of the commercial shipping port, and the construction of a new passenger terminal port and dock to serve what is hoped to be a thriving new industry, that of cruise-ship tourism.

SITE ANALYSIS: DESCRIPTION

The site is two-mile long linear stretch two blocks wide, situated along the Detroit river, and located between the commercial port and a new Riverfront Detroit Walk, two areas that have undergone major changes during the last two centuries, with the containerization of cargo, the separation of port functions into commercial and public activities, and the relocation of commercial ports (see diagrams on opposite page).⁵ The current construction of the harbor walk reflects contemporary ideas about the renewal of waterfronts to host public recreational activities. Tucked between the two planned locus of activity, the site sits as a number of blocks of vacant infill lot, a result of uneven development activities and failed attempts to reinvigorate the economy.

SITE ANALYSIS-REGIONAL SCALE

On a regional scale, the whole city of Dtetroit can be conceptualized as a site that reflects the mono-functional aspect of the modernization process, through the process of capital accumulation in the US, notably the growth, development and decline of the economic system brought about by Fordism. The process of development and decay can be understood in an analysis of the development of the city from the late 1900s onwards as a testing ground for Fordism. Though the downtown area urban blocks had

18 been designed in 1818-as spokes radiating out, based on the plan of Washington D.C., the development of the outlying areas in the form of a grid was only enabled through the development of a car culture. By 1920 Detroit had become one of the largest cities in America not only in population terms but also in spatial terms: the borders of the city were 130 miles apart, extending from the Detroit River to what is known as the 8 mile road. In fact, the utmost lack of public transport, even in the contemporary period, that caters to the indigent local population reflects the city's single-headed focus on the car. In his car manufacture, Ford took up existing methods of mass industrial production through assembly line work and coupled these methods with the idea of mass consumption.⁷ Ford's pledge was to "enable each worker to have a car."⁸ The supply of cars (production) would balance the demand of cars by its own workers. Spatially, the production line flows and assembly parts were dispersed in single story sheds across large swathes of property.⁹ This assembly line concept based on notions of functionality and efficiency was applied to the overall urban complex, creating a highly regularized grid designed to enable and optimize the use of the automobile. The road infrastructural system was designed as a mono-functional structure intended only for vehicular movement from one place to the other.¹⁰ As a result, beyond the downtown, the city became defined by single family worker housing sitting on their own plot, accessible only by car.

In the late 1960s, with the collapse of the US economic system, the era of flexible accumulation began, resulting in urban dispersal, geographical mobility, and flexible responses in labor markets, labor processes, and consumer markets.¹¹ The population whittled down to just below 900,000 from the 2 million during the 1950s. Having developed as a mono-functional economy relying on a single major industry which had migrated away to cheaper regions, the city became an emblematic residue of the economic processes it had undergone. Thus with the movement of its main industry away

6. For more on the economic and urban system created by the application of Fordism, see works by David Harvey: Harvey, David. "Fordism" in *The Condition of Postmodernity* (Oxford: Blackwell, 1989), 125-140.

Harvey, David. "From Fordism to Flexible Accumulation." *The Condition of Postmodernity*, (Oxford: Blackwell, 1989), 141-172.

7. A number of attempts were made eventually to introduce public transit, but these all failed, as later described in the paper.

8. Harvey, David. "Fordism." *The Condition of Postmodernity* (Oxford: Blackwell, 1989), 125-140.

9. Hoffman, "Detroit, Capital of the 20th Century." *Praxis* 5(2005), 113-1120.

10. Grahame, Shane. "The Emergence of Landscape Urbanism." *The Landscape Urbanism Reader*, ed. Charles Waldheim. (New York: Princeton Architectural Press, 2006). 57-67

11. Schumacher, Partrick and Rogner, Christian. "After Ford." *Stalking Detroit*. Daskalakis, Georgia, Waldheim, Charles, Young, Jason., ed. 2005, 48-56.

12. Zaera-Polo, Alejandro. "Order out of Chaos: the material order of advanced capitalism" *AD* vol.3 (1994), 25-29.

13. Its modernist roots are reflected in the mono-functionalism of the city.

14. In 1970, a committee called Detroit Renaissance was founded by a number of business leaders including Henry Ford II, to prevent white flight to the suburbs through a series of urban development proposals along the waterfront in Detroit, including the building of the Renaissance Center in 1977. In the 1990s, the Detroit Riverfront Conservancy was incorporated to develop and manage Detroit's riverfront, from the Ambassador Bridge to Belle Isle. Many attempts to revitalize the city and boost tourism through large scale developments during the same decade, such as a \$100 million Autoworld theme Park, a \$13 million Hyatt Regency Hotel, has failed.

15. Hill, Eric and Gallagher, John. *American Institute of Architects Guide to Detroit Architecture*. (Michigan: Wayne State University Press) 2002.

from the city, the exodus of more than half of its population and plight of its remaining 19 population, the city of Detroit itself has become a residual site, a reminder of its historical growth through innovative production and economic processes, and its repudiation when these economic processes became outdated.¹³

Monofunctionalism is reflected further in the site's physical location at the urban scale. Located between two major areas of activity, very different in form and scale from each other, the area acts as a buffer zone between the two. Facing the Detroit River, the site is bounded by the Detroit Commercial Port to its west. Typical of 20th century ports, the Detroit Commercial Port is a mono-functional enclave protected by wire fences with a large backup space for shipping containers. To the west of the site is the Detroit riverfront walkway, currently under development, to the east and adjacent to which are to be found the series of 1970s development projects.¹⁴ These mostly public and commercial buildings located behind the harbor walk were designed as large urban fortresses. Many of these buildings, such as the massive Cobo Hall and Convention Center (600,000 square foot), are wholly internalized edifices, lacking a coherent urban connection to the streets and to the grid.¹⁵ Moreover, the Renaissance Center, a block of 4 towers, and since 1999 home to General Motors, a Marriott hotel as well as various offices and boutique shops, is so large that it has its own zip code. Even as a buffer zone, the area does not allow a transition from commercial to public street scope, but merely acts as empty space with no connection between the two.

The area is also a residual site in that it is physically cut off from the rest of the city and lacks any internal coherence.¹⁶ Large infrastructures, notably the 1956 highway to the north, cuts off the riverfront and its adjoining two blocks wide linear stretch from the city and its residential neighborhoods. A commercial rail track runs within the boundaries

20 of the site, further limiting the internal coherence of the site. Both transportation infrastructures thus create morphological divisions, the first isolating the site into an urban island, and the second creating a divide within the site itself. Despite the fact that small sections of the site have been stated for development as public recreational areas such as riverfront park designed to accommodate fishing and recreational boating activities, their development was put on permanent hold as public money for investments withered away.¹⁷

This notion of residual is moreover made clear through the attitude to building and rebuilding at an urban scale, where blighted areas were and still are abandoned or razed while new buildings prop up elsewhere. The building of roads extending outwards from the city during the 1940s and the highway construction of 1956 was an act of rebuilding by leaving parts of the city behind. Thus the highway paved the way for the suburbanization of the periphery, by providing commuters a means to escape from the city.¹⁸ In fact it was only in the 1990s that any attempts at restoring historical buildings were started. Though the rebuilding of “pockets” of Detroit as a strategy to cope with a shrinking population is put to questioning in this paper, the fact is that the site is an area outlying those pockets, and is thus meant to remain as residual landscape, outside of revitalization efforts given to the downtown.¹⁹

The site, seen as part of the historical development of the industrial waterfront in the great lakes region, also reflects the modern attitude to the division of production from its waste, through the organization of production without accounting for the inevitable waste products of their industries. Yet waste is a natural process and inherently part of production: according to Alan Berger, the city is the “manifestation of industrial processes that naturally produce waste.”²⁰ Despite this fact, coastal industrialization in the

16. In this essay, the notion of “terrain vague” is not explored. Ignasi de Solà-Morales Rubio. “Terrain Vague,” *Anyplace*. Cynthia Davidson ed. (Cambridge: MIT Press, 1995), 119-123.

17. Pierce, Jeannette. Inside Detroit Co-founder. Conversation, January 22, 2010.

18. Hoffman, “Detroit Capital of the 20th century.”

19. See for instance, the “Shrinking Cities” project—a publication of the Federal Cultural Foundation under the direction of Phillip Oswald. Oswald, Philipp, ed. *Shrinking cities* (New York: Distributed Art Publishers) 2005.

See also Richard Ingersoll *Sprawltown: Looking for the City*.

20. Berger, Alan. "Drossscape." *The Landscape Urbanism Reader*, ed. Charles Waldheim, (New York: Princeton Architectural Press, 2006). 199-217 on its Edges (Princeton Architectural Press, New York) 2006. Mark Wigley, "Resisting the City." *TransUrbanism*. Joke Brouwer, Arjen Mulder and Laura Martz ed., (NAI Publishers, Rotterdam) 2002.

21. Belanger, Pierre. "Synthetic Surfaces." *The Landscape Urbanism Reader*, ed. Charles Waldheim. (New York: Princeton Architectural Press, 2006), 240-265

22. Belanger, Pierre. "Landscape as Infrastructure." *Landscape Journal*, Vol. 28 (January 2009) 79-95.

Great Lakes during the modern period, and even today does not properly account for 21 its waste products such as sludge or dredged materials. It locates one site as a production enclave, another as a consumption enclave and yet another as a back-water site for waste products. In the Great Lakes waterfront area of which the site forms part, dredgeate material, the most common byproduct of the shipping industry, is disposed of in offshore sites, historically first in the open water, and later in the confined dredging disposal facilities, off-site, off-view and off-mind.²¹ Within the Great Lakes water has been both exploited as a resource and used as a dumping site. Despite the 1977 Federal Clean Water Act that had the goal of eliminating all wastewater discharges into the nation's waters by 1985, a number of significant incidents in the Great Lakes, reflect the high levels of pollution in its waters. Thus Lake Erie was declared as a dead zone, lake ontario became over-fertilized as a result of sewage and detergent discharges, and mercury contaminations led to the closure of fisheries on Lake Superior, Lake Michigan and Lake Huron.²²

Thus the site reflects its modernist legacy, in an era where optimization and efficiency were the foremost goals, achieved through the separation of functions in the design of industrial production sites as well as major infrastructure. At a smaller scale, enclavic projects don't work, as the 1970s attempts (Renaissance Center, Cobo Hall) to revitalize an urban neighborhood. Moreover, the development of detroit based on a single industry, its subsequent abandonment and its successive attempts at renewal through single major draws (casinos, high way infrastructure, etc.) has shown that a single idea approach to city development does not work.

Current proposals by the Federal Government to clean up the environmental problems of the Great Lakes without taking into account its ageing coastal infrastructure

22 sidesteps the larger issue underlying the lakes' environmental degradation: the fact that human activities on the land and its ecology have always been treated as being separate from each other, most often to the detriment of the landscape. The most recent clean-up attempt reflects the persistent division of functions still prevalent in contemporary thinking and design. This approach to the design of infrastructures has resulted in the segregation of water, waste and transport taken care of by separate departments, resulting in what Pierre Belanger has described as the "suppression of the bio-physical landscape."²³ Waste and pollution is a natural by-product of production processes and it should be taken into account with the design of man-made infrastructures, especially ones that are physically tied to natural systems.²⁴

Within the design profession, a new type of relationship between infrastructure and ecological processes should be developed, one that not only takes into account the cyclical processes inherent within natural ecosystems but also with building both at an architectural scale (weathering processes, material life cycles, building life-time) and an urban scale. Design should not separate, but rather take the processes of landscape and infrastructure as interdependent. An expanded definition of infrastructure is necessary, one that supports industrial production without forgetting its by products, one that attends to increasing human-induced ecological problems while recognizing that economic progress is not indefinite; one which incorporates a higher degree of natural and cultural mediation.

23. The term "bio-physical" landscape is borrowed from Pierre Belanger in "Landscape as Infrastructure." *Landscape Journal*, Vol. 28 (January 2009) 79-95

24. Berger, Alan. "Drossscape." *The Landscape Urbanism Reader*, ed. Charles Waldheim. (New York: Princeton Architectural Press, 2006) 199-217.

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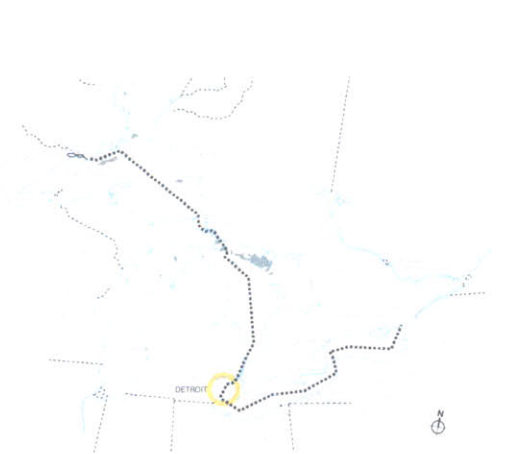
24 c] HYDROLOGICAL ANALYSIS : GREAT LAKES



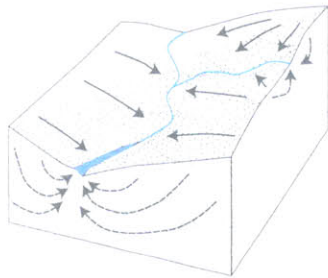
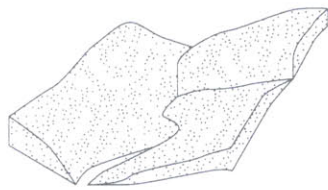
Regional Site: the Great Lakes



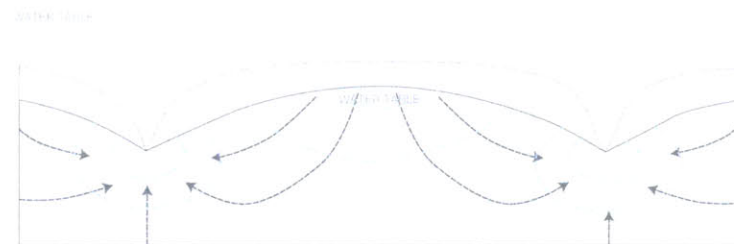
Great Lakes: Zones of Environmental Concern



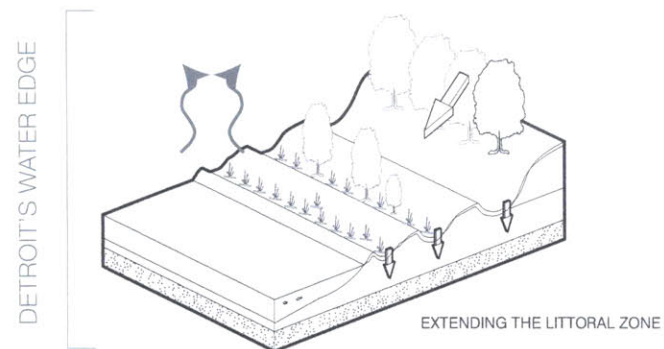
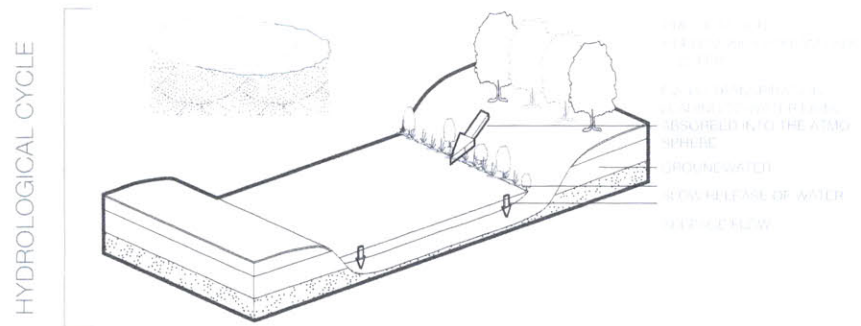
Location of the Detroit Channel along the shipping route from the Atlantic Ocean into North America



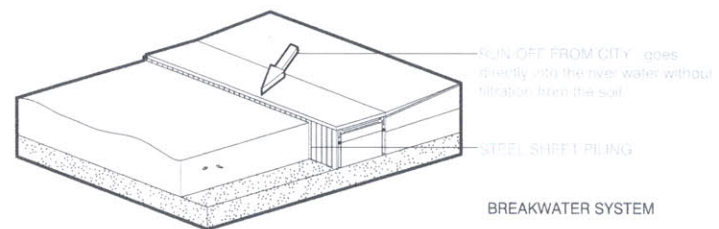
INDICATES DIRECTION OF WATER FLOW



CROSS-SECTION OF LAND SURFACE

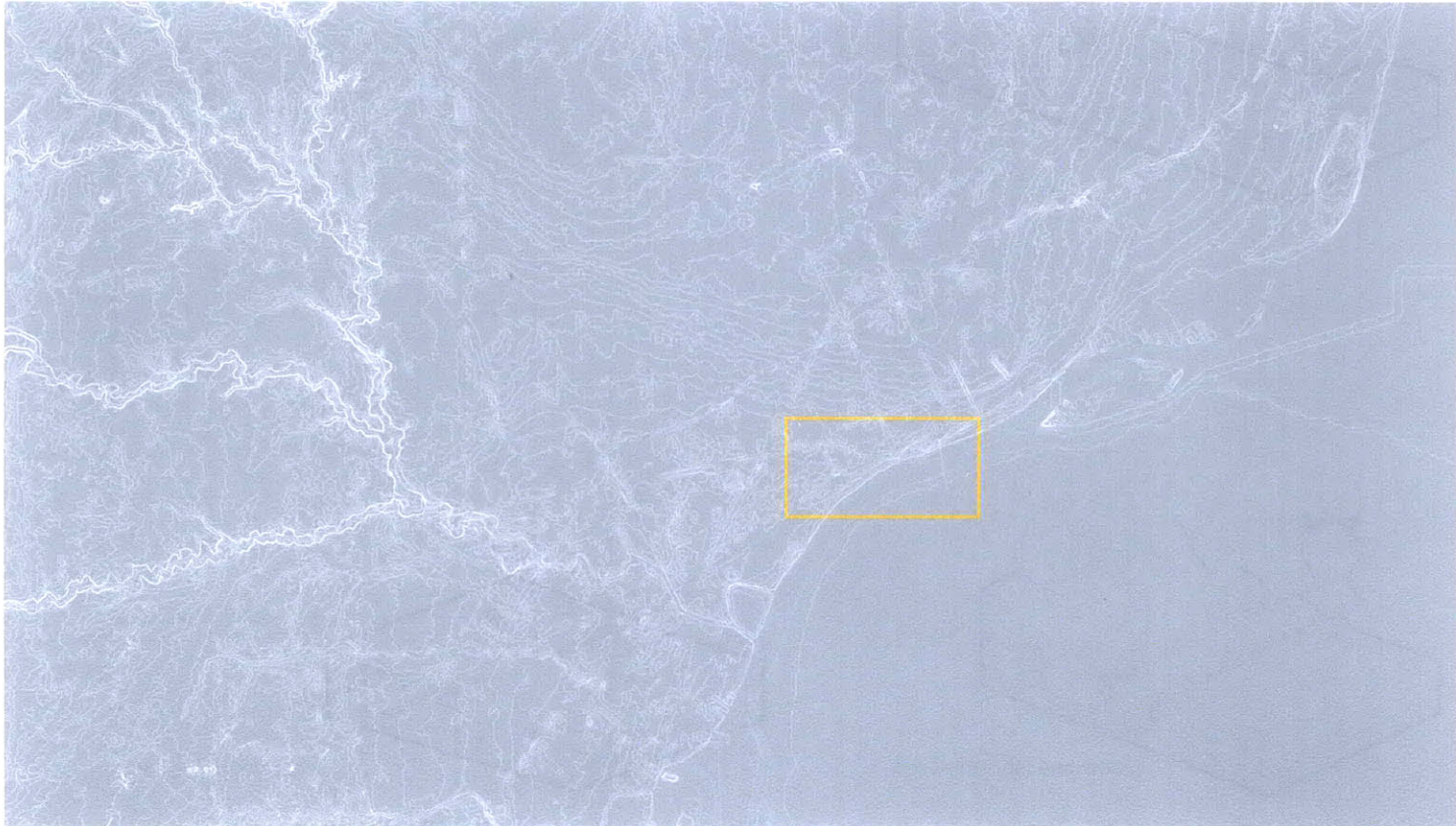


Detroit's former water edge : 1890. The littoral zone allows for maximum absorption and filtration of water runoff

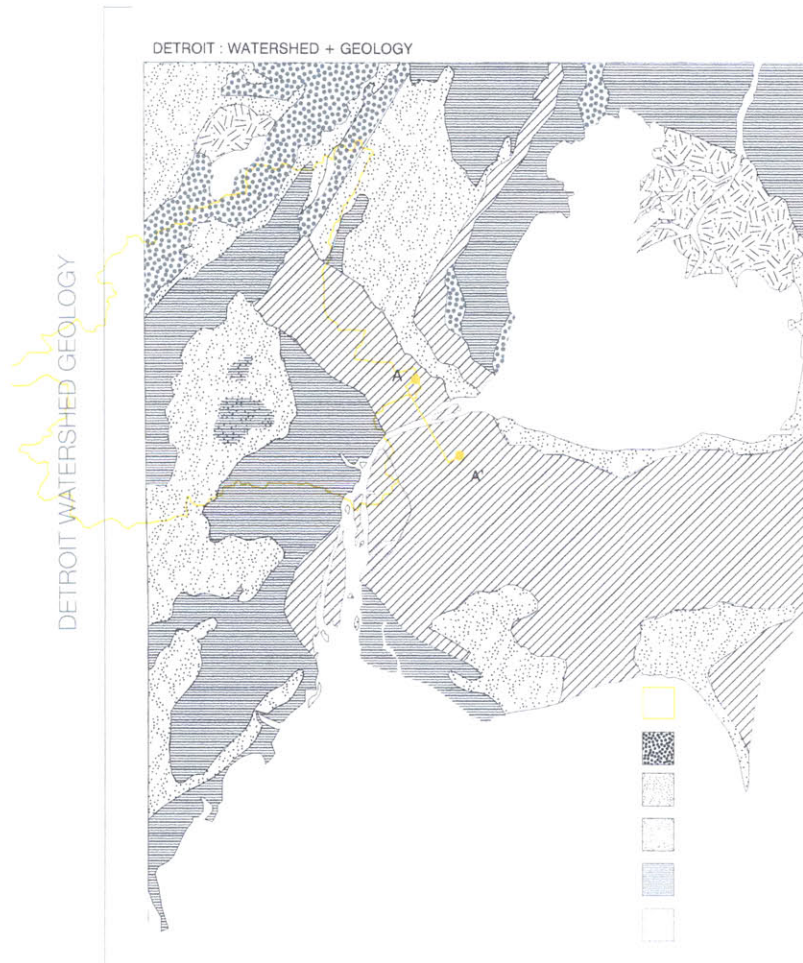


Detroit's current water edge 2010. Hard engineering leads to minimal water absorption

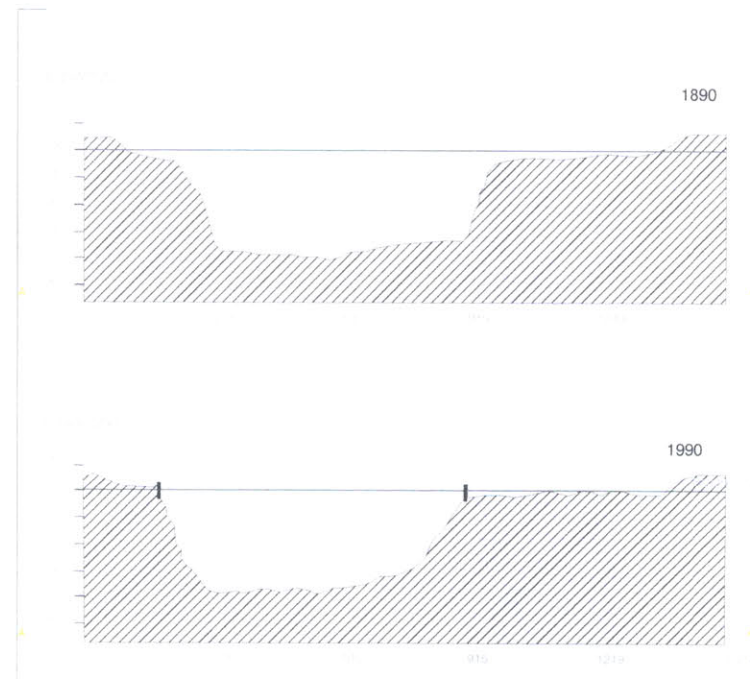
DETROIT TOPOGRAPHY



The Great Lakes' topography is mostly flat, broken by the valleys of River Rouge and a few lesser tributaries. Low glacial morrains and beach ridges of ancestral lake Erie provide slight relief. Detroit is flat, with little relief that promote absorption of water runoff.



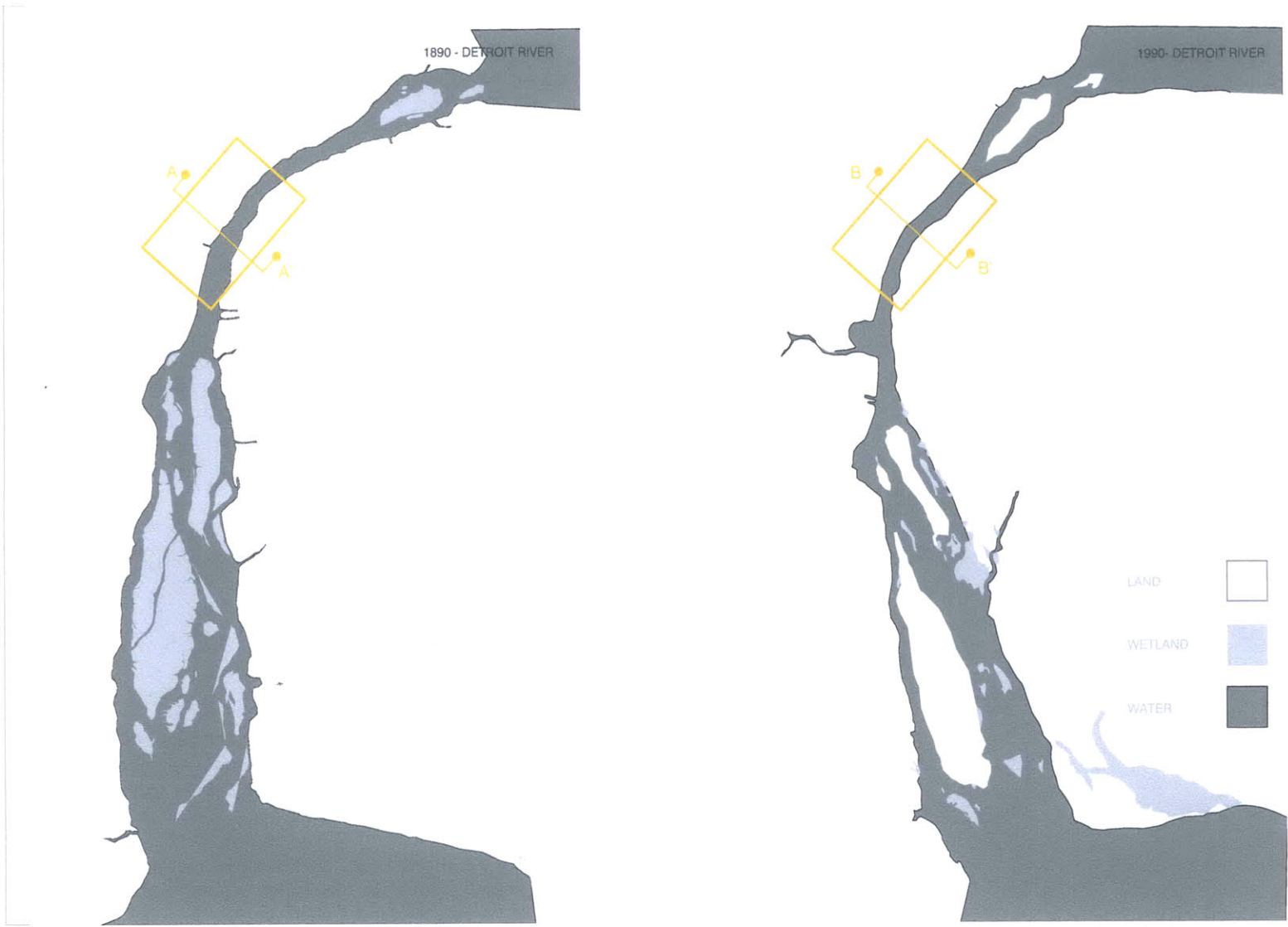
DETROIT RIVER CROSS-SECTIONAL CHANGES



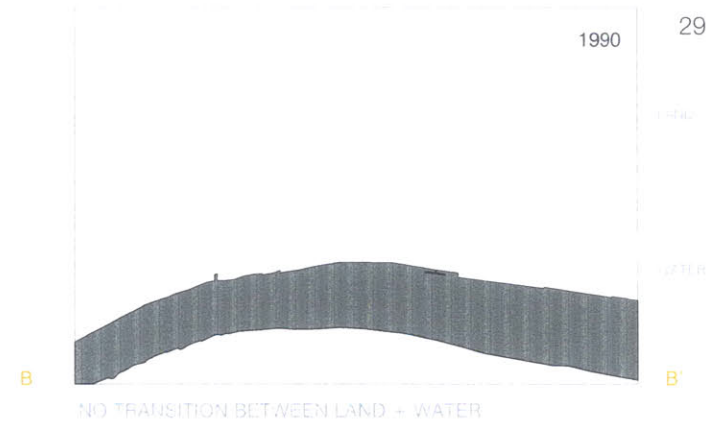
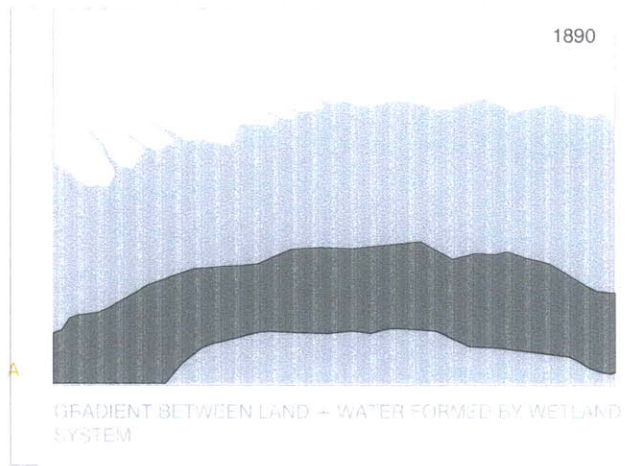
Moreover, the soil on the lake plain consists of level poorly drained loams that developed on former Lake bottoms or clay sediments. In Detroit, the permeability of the soils is low, with a high surface runoff coefficient.

78% of the shoreline on the US border is now bulkheaded. The seaway is artificially maintained at a depth of 8.23m-27 ft, to allow a vessel draft of 7.77m.

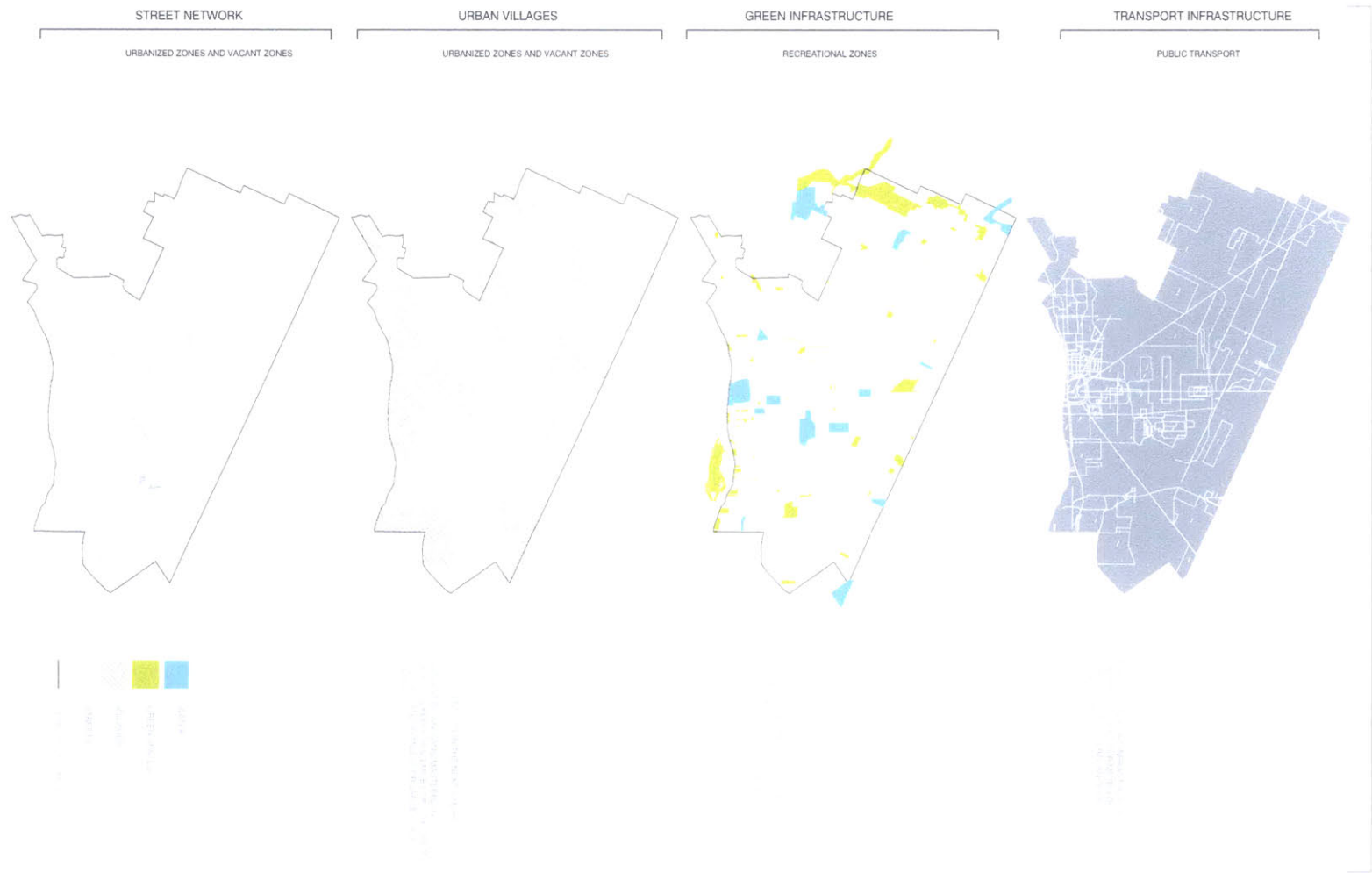
DETROIT RIVER : (TEMPORAL) TOPOGRAPHICAL CHANGES



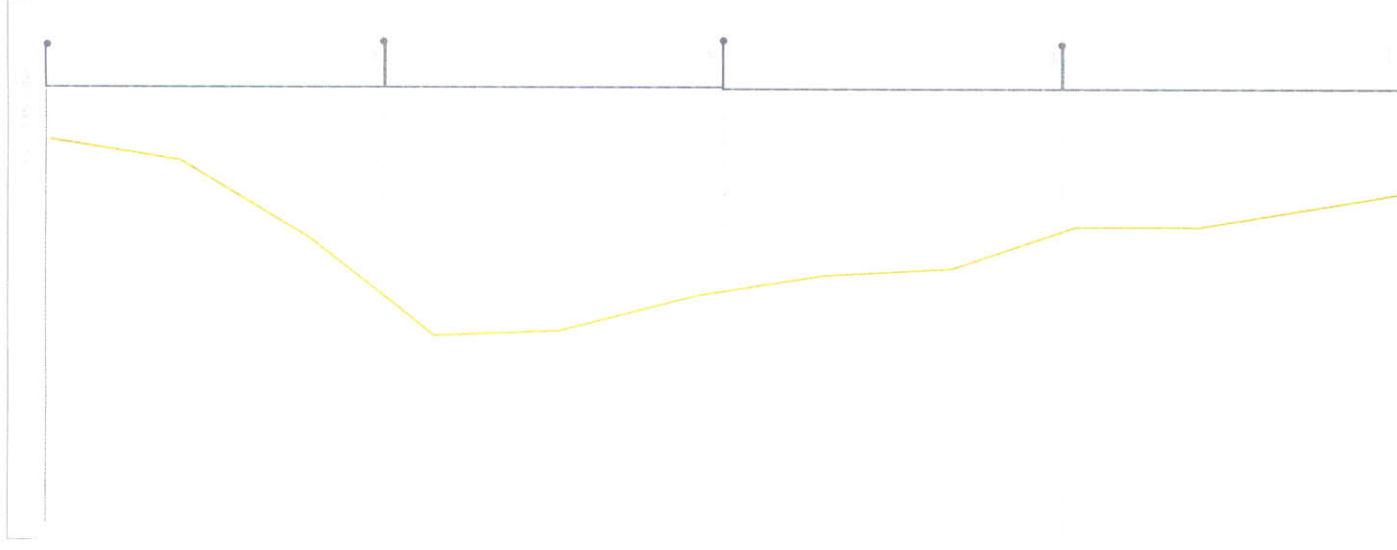
DETROIT RIVER: SECTIONAL CHANGES



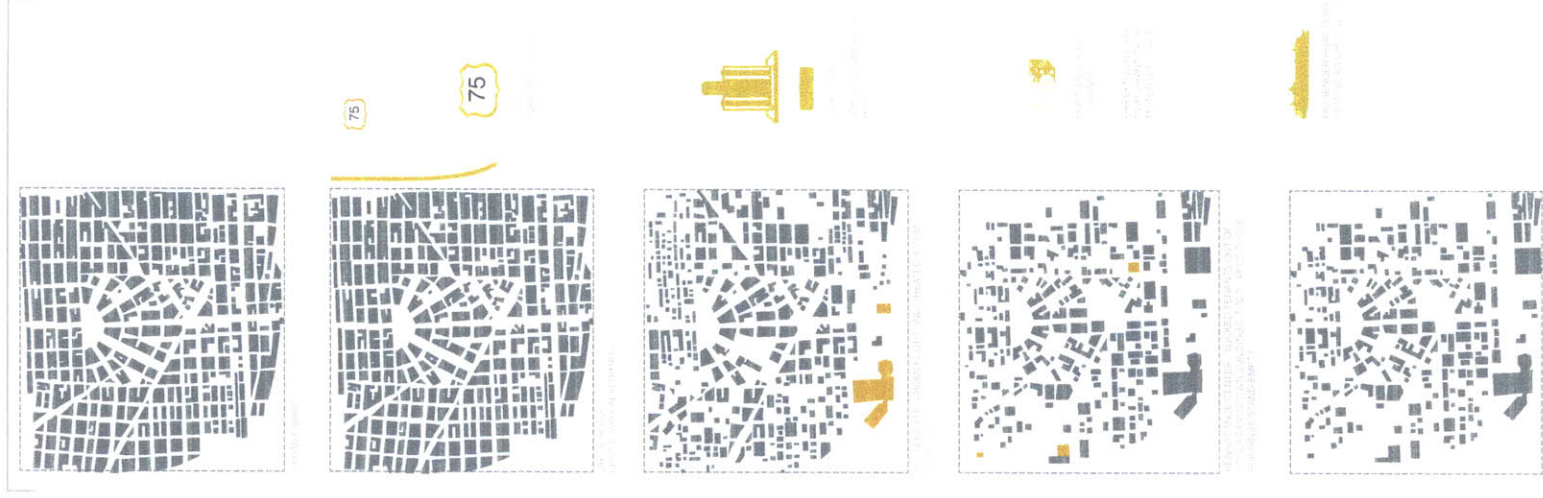
With mass industrialization, Detroit has lost its natural sponge structures (soil and wetlands) that historically were widely dispersed to attenuate the volume of storm water surges, and that facilitated ground water recharge.



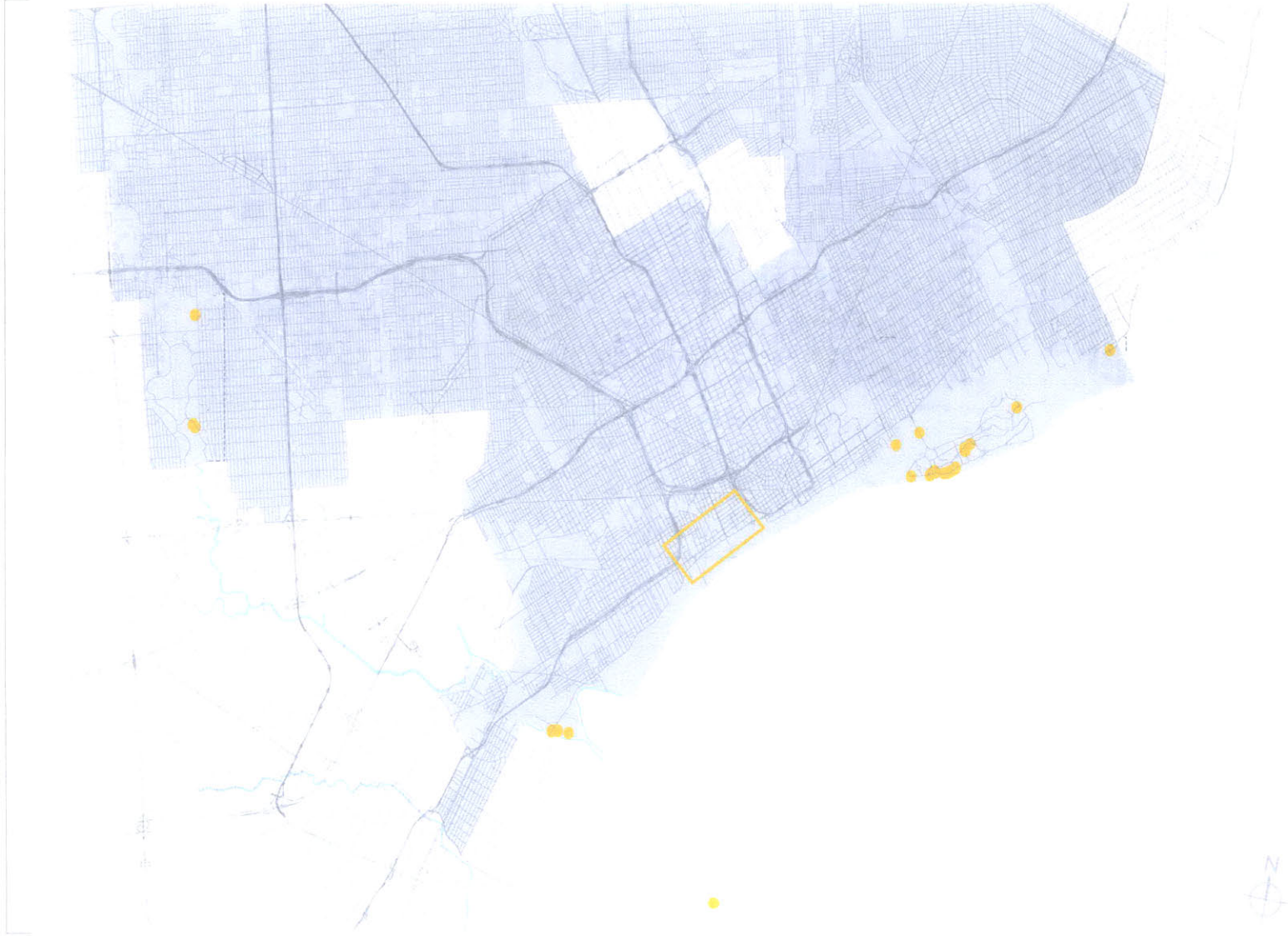
DETROIT DENSITY CHANGES OVER TIME



DETROIT DOWNTOWN OVER TIME

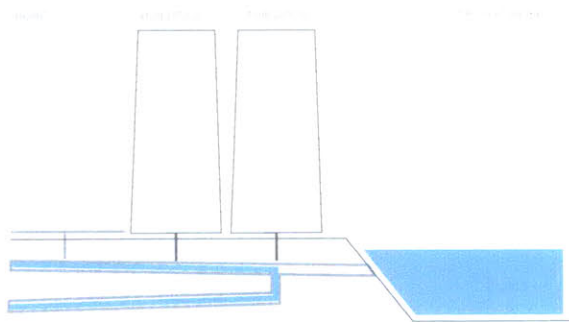


DETROIT STORM WATER SEWER OUTFALLS

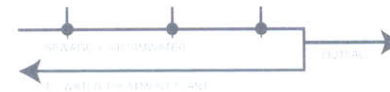
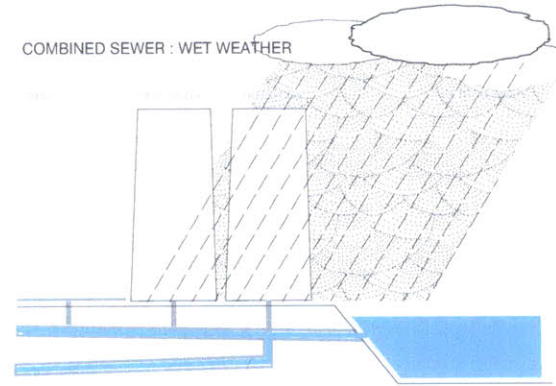


DETROIT SEWER OUTFALLS

COMBINED SEWER : DRY WEATHER



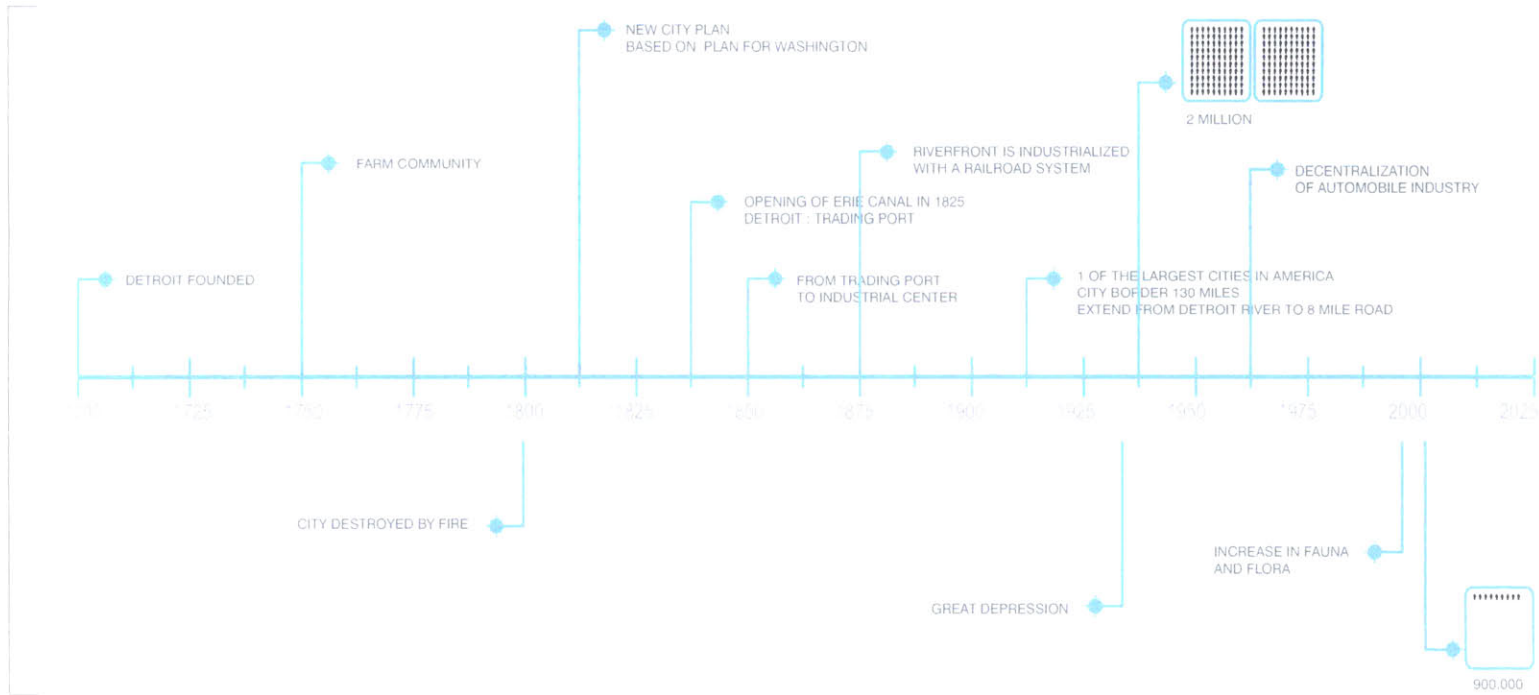
COMBINED SEWER : WET WEATHER



Most of Detroit city's built surface is impervious, and is engineered to convey water rapidly away, in only a few sewer outfalls, located along the Detroit River. This leads to serious consequences:

1. The depletion of its natural sponge structures that facilitated groundwater recharge
2. Inevitably, urban runoff is discharged directly into the Detroit River, leading to pollution
3. In wet conditions, because Detroit's stormwater system is a combined system, excess rainwater is mixed with sewage and is discharged untreated into the river, worsening the pollution problems

DETROIT HISTORIC TIMELINE



RECONCEPTUALIZING ARCHITECTURE & LANDSCAPE RELATIONSHIPS:
FROM BINARIES TO A COMPOSITE SYSTEM

- a) DEVELOPMENT OF A COMPOSITE SYSTEM
- b) LANDSCAPE SYSTEM

COMPOSITE SYSTEM

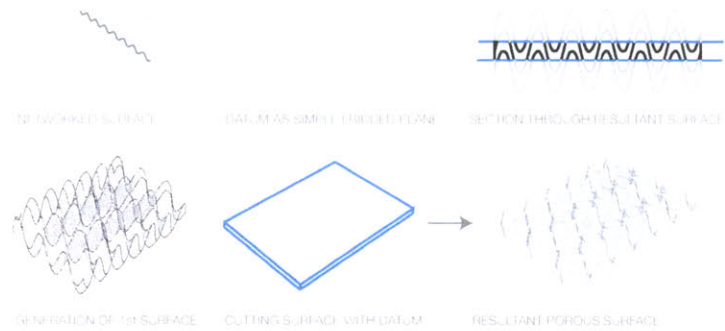
To re-think the relationships between architecture, landscape and infrastructure, the thesis necessitated a novel way of conceptualizing the relationship between architecture (typically viewed as a static system) and landscape (typically viewed as a dynamic system). Here they are defined not as singular systems with different attributes, but as two interacting systems. To develop the project, the following exercise was carried out to develop a logic of integration between two interrelated abstract systems with characteristic geometric, organizational, physical and formal attributes, to ultimately produce a composite of the two. Instead of treating a building and its site as binaries, a composite of the two systems would privilege interconnectivity and reciprocity, while acknowledging the singular characteristics and differences between the two systems.

LANDSCAPE SYSTEM

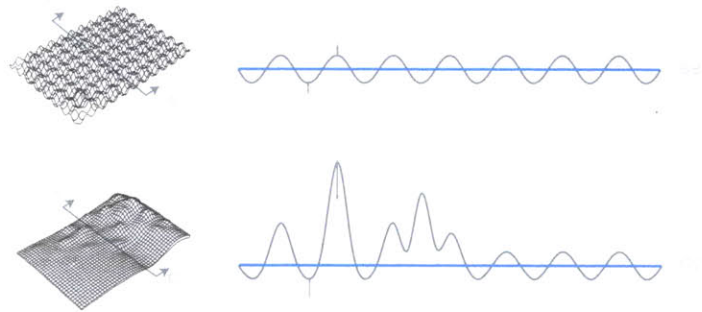
The initial models exploring a synthesis of the two systems were considered to only be samples from a larger field. Ultimately, a larger surface was developed, first by uncovering the underlying order of the composite system, and then generating a flexible organizational framework based on said order that could be manipulated to modulate the attributes of the composite system over a large field.

38 a) DEVELOPMENT OF A COMPOSITE SYSTEM

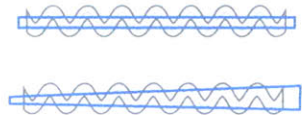
TESTING UNIFORMITY OF 1st SURFACE



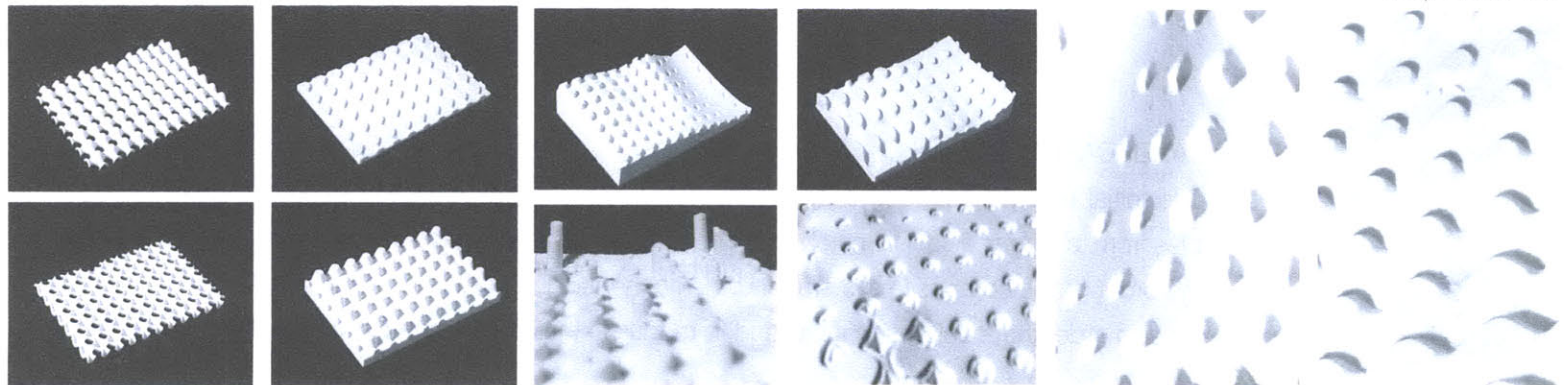
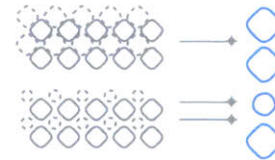
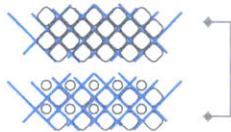
TESTING UNIFORMITY OF 1st SURFACE



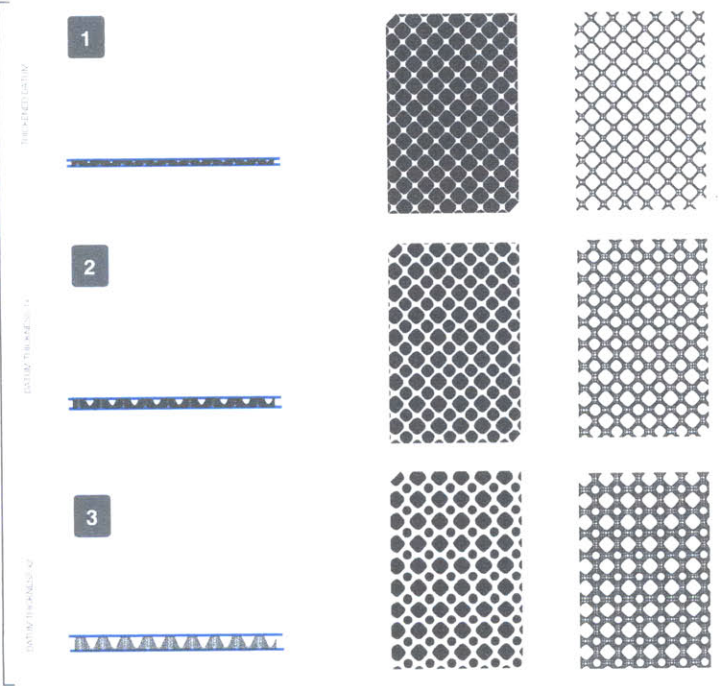
TESTING DATUM THICKNESS



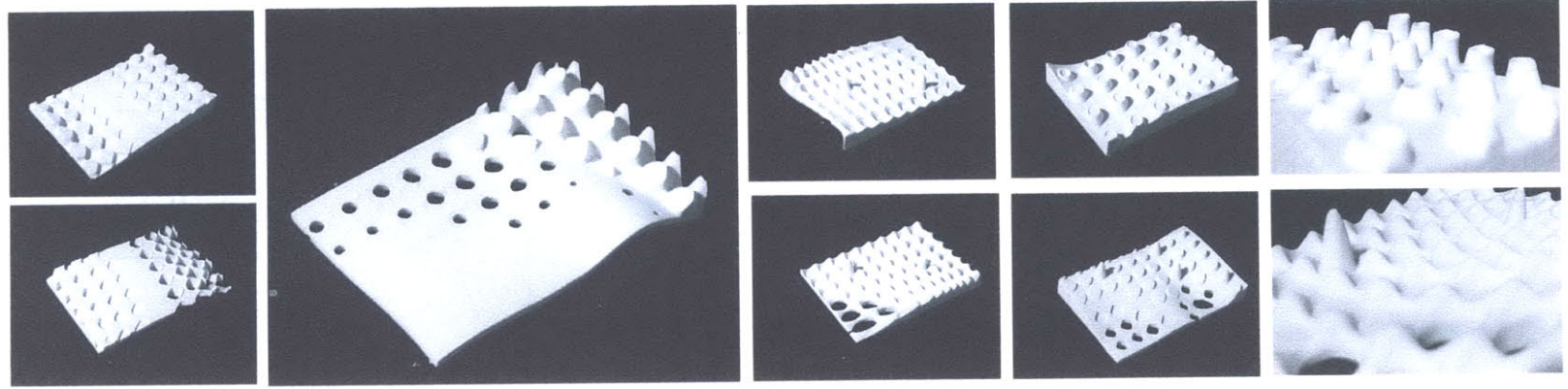
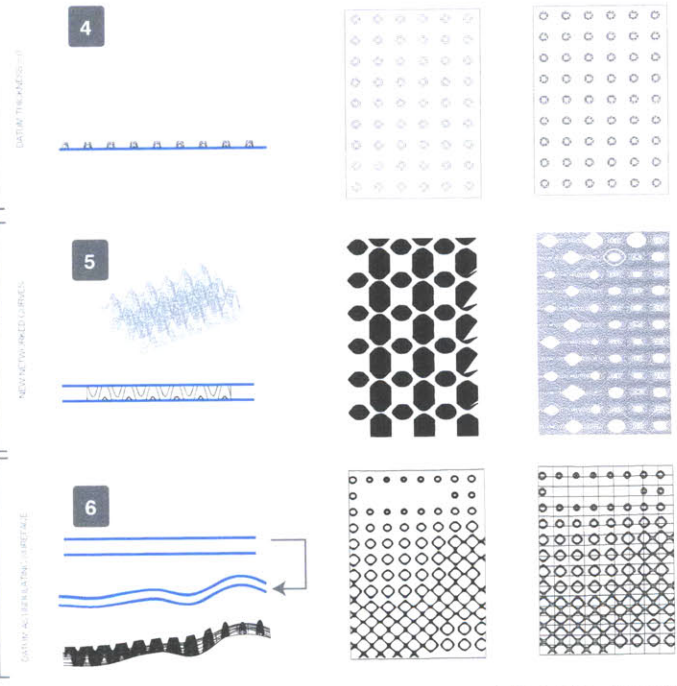
DISCOVERIES



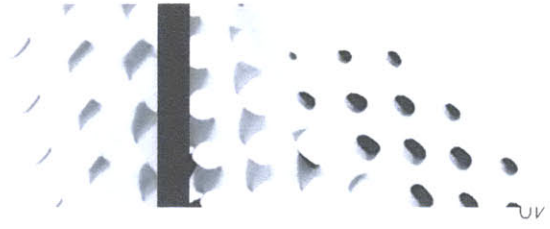
DATUM THICKNESS



DATUM PLANE



3D prints, 6" x 8"



100

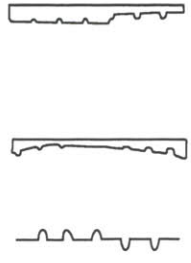
GLOBAL MANIPULATIONS

1 FLOWS

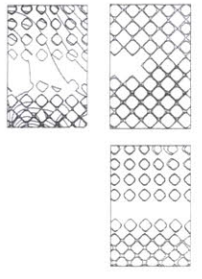


GLOBAL MANIPULATION OF POROSITY
 LOCAL MANIPULATION OF THE SYSTEM BECOMES A LOCAL MANIPULATION OF THE NEXT LEVEL, IT BECOMES OVERMANIPULATION AND HAS DIFFERENTIALITY

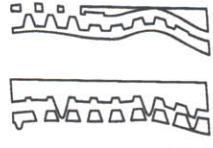
2 FLIPPING THE SURFACE



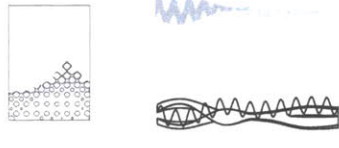
INVERTING THE SURFACE FROM THE PEAK TO A DEEP
 EXTERNAL SURFACE ENTERS TO THE INTERIOR
 DIFFERENTIATION WITHIN THE EXISTING GRID



3 DOUBLE SIDENESS | INTERIORITY

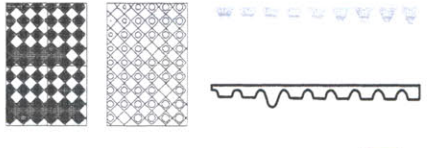


FORMING SURFACE THROUGHOUT THE WHOLE THAT BECOMES EXTENSIVE
 IN THE MIDDLE AS A TOP SURFACE, INTERNAL POINT IS BOTTOM SURFACE
 CAN BE A TOP SURFACE, INTERNAL POINT IS BOTTOM SURFACE
 CAN BE A BOTTOM SURFACE, INTERNAL POINT IS TOP SURFACE
 ALL AT ONCE, FROM TOP TO BOTTOM, INTERIOR, OR RELATES TO A POROUS
 SPACE, OR RELATES TO A BOTTOM SURFACE, OR RELATES TO A BOTTOM



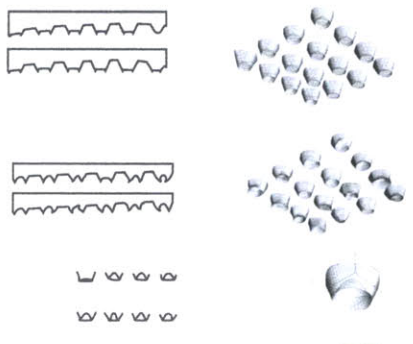
LOCAL MANIPULATIONS

4 REGULAR POROUS DATUM



DATUM BECOMES POROUS, AND A LOCAL MANIPULATION TO BECOME
 THE SURFACE, SINCE THAT THE UNIFORMITY OF THE ORGANIZATION, CLUSTER
 ELEMENTS ARE DIFFERENTIATED IN A NON UNIFORM WAY

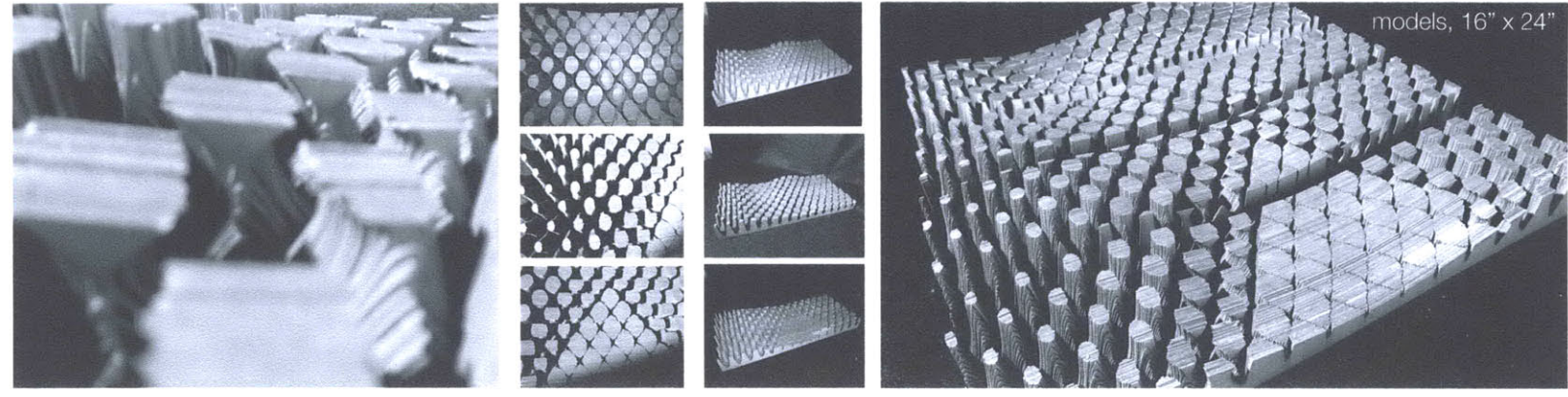
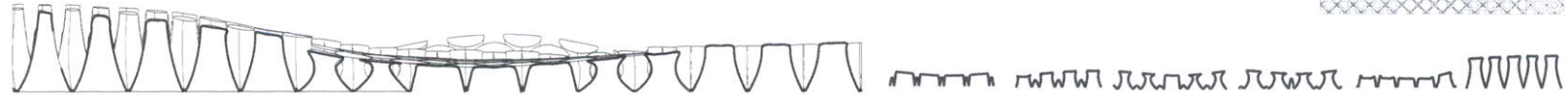
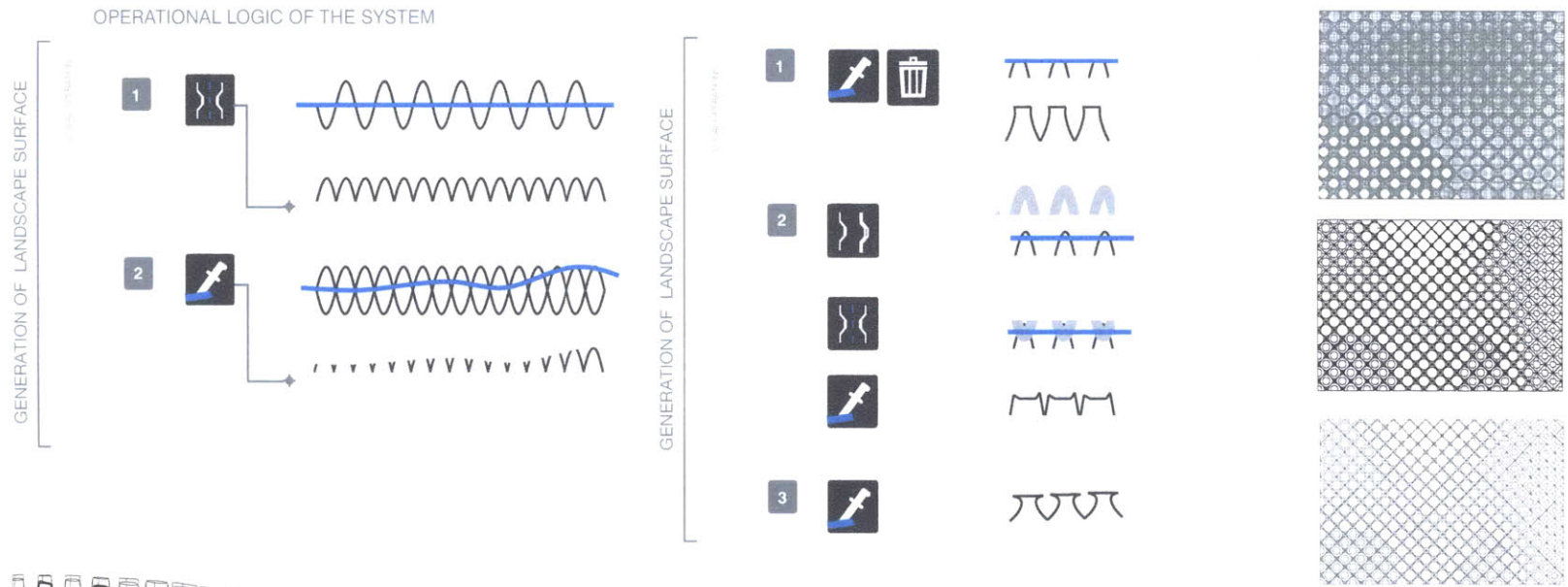
5 INDIVIDUAL MANIPULATION OF CONES

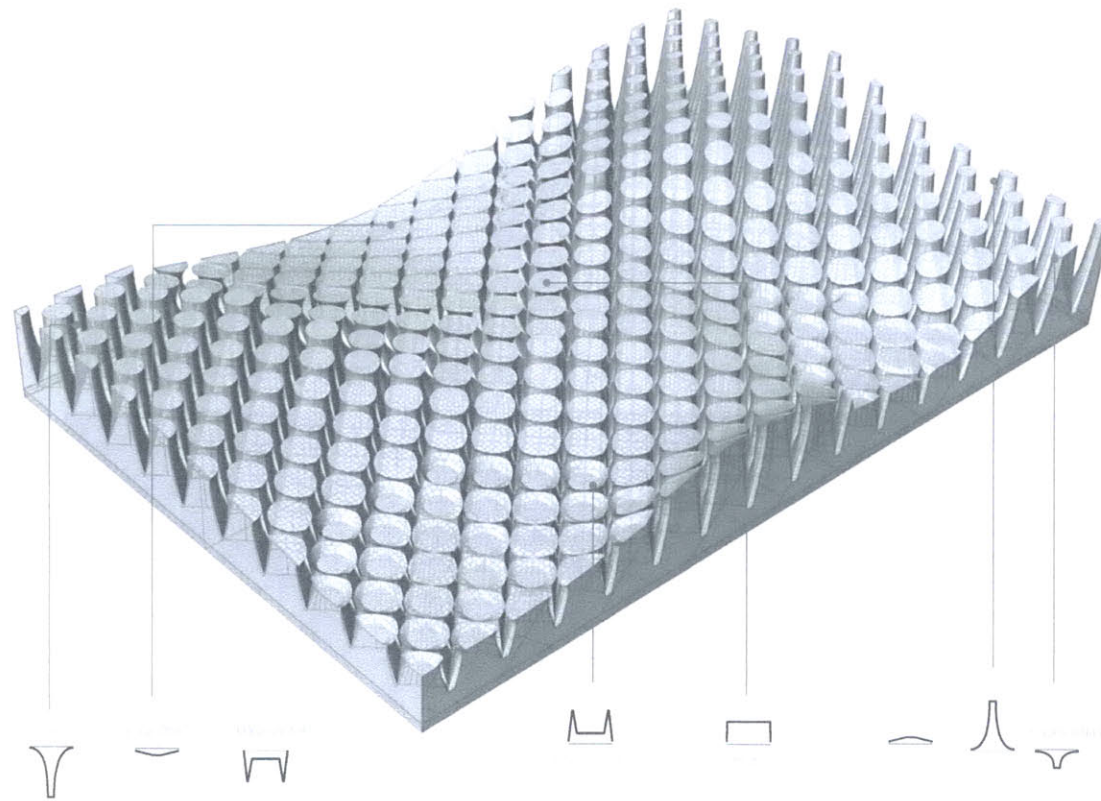


LOCAL MANIPULATION INDIVIDUAL UNITS (CONES) ARE MANIPULATED, CHANGING A
 LOCAL MANIPULATION WITHIN THE SAME SYSTEM



b) LANDSCAPE SYSTEM





TYOLOGICAL REDEFINITIONS

- a) RETENTION POND CALCULATIONS
- b) MATRIX OF EXISTING TYPES - URBAN, RESIDENTIAL, AGRICULTURAL, RECREATIONAL
- c) DEVELOPMENT OF NEW TYPOLOGIES
- d) WATER RETENTION STRATEGIES

The previous exercise (chapter two) generated a formal definition of a new composite architecture and landscape system to optimize water retention and drainage. This landscape had a variety of physical attributes: mounds, depressions, peaks, valleys, etc. This chapter uses the varied attributes, whether formal and/or organizational strategies of the designed composite landscape to redefine existing typologies so as to maximize water drainage and groundwater absorption.

The amount of land surface optimal for the drainage and retention of water in the site was first calculated. Then the significant attributes of existing urban, residential, and farming block typologies, were strategically selected, translated and adapted on the composite landscape, ultimately transforming each into a new type more integrated with hydrological systems. Thus the farming zone, whose amount of optimal water retention having been taken into account, is mostly flat with gentle slopes and specifically sized channels to transport water for irrigation.

While the urban blocks store water underneath new porous streets, the residential block has a number of retention ponds that can serve doubly as community centers around small greenhouses while the farming block has water stored for irrigation, instead of purely mechanical irrigation systems. Large scale greenhouses have a water catchment area integrated to distribute to greenhouses.

46 a] RETENTION POND CALCULATIONS: SURFACE AREA NECESSARY TO MAXIMIZE WATER INFILTRATION IN THE SITE

RUNOFF RATE_RATIONAL METHOD

$Q = CIA$

Q = PEAK RUNOFF RATE (FT³/S)

C= RUNOFF COEFFICIENT (RURAL: .25,
CITY: .65, PARKS, .35)

I = RAINFALL INTENSITY P/ HOUR

A = WATERSHED AREA (ACRES)

RUNOFF VOLUME

$Q VOL = 60 QT$

T= TIME OF CONCENTRATION, MIN

$Q VOL = RUNOFF VOLUME, FT^3$

SIZE OF DETENTION PONDS

1. WET DETENTION POND

$Q VOL = D (A PERM + A HIGH)/2$

D = DEPTH OF WATER BETWEEN
HIGH AND PERMANENT LEVELS

A PERM = AREA OF PERMANENT LEVELS

A HIGH = AREA OF HIGH LEVELS

2. DRY DETENTION POND

$V = 1/3 AREA X DEPTH$

LENGTH OF SPREADER

Q VOL (FT ³ /S)	LENGTH (FT)
< 10	15
11-20	20
21-30	26
31-40	36
41-50	44

GRADIENT OF INCREASING RUNOFF

Duration of storm	1h		24 h
Intensity of Storm	2y	10y	24y
Soil Texture	sand	silt	clay
Topography	flat	Rolling	Hilly
Land use	Zero	Medium	High
	density	density	density

- * 10 YEAR DAILY = APPROX 3.0" OF RAIN PER DAY IN DETROIT.
- * 25 YEAR DAILY = APPROX 3.7" OF RAIN PER DAY IN DETROIT (SEE REFERENCE SITE HERE)
- * 100 YEAR DAILY = APPROX 4.7" OF RAIN PER DAY IN DETROIT. (SEE REFERENCE SITE HERE)
- * 100 YEAR HOURLY = 2.48" OF RAIN PER HOUR IN DETROIT. (PER MICHIGAN DEPT OF TRANSPORTATION)

URBAN RUNOFF RATE_

$$Q = 0.65 \times 2.48 \times 1$$

$$= 1.61 \text{ (FT}^3\text{/S)}$$

RUNOFF VOLUME

$$Q \text{ VOL} = 60 \times 1.61 \times 60 \times 24$$

$$= 5796$$

SIZE OF DETENTION POND

$$139104 = 1/3 \text{ AREA} \times 10'$$

$$\text{AREA} = 41731$$

$$\text{AREA} = L \times W \text{ (} W = 1/3 L \text{)}$$

$$= L \times 1/3 L = 1/3 L^2$$

$$L = 350'$$

$$W = 100'$$

RURAL RUNOFF RATE_

$$Q = 0.25 \times 2.48 \times 1$$

$$= 0.62 \text{ (FT}^3\text{/S)}$$

RUNOFF VOLUME

$$Q \text{ VOL} = 60 \times 0.62 \times 60 \times 24$$

$$= 53568$$

SIZE OF DETENTION PONDS

$$53568 = 1/3 \text{ AREA} \times 10'$$

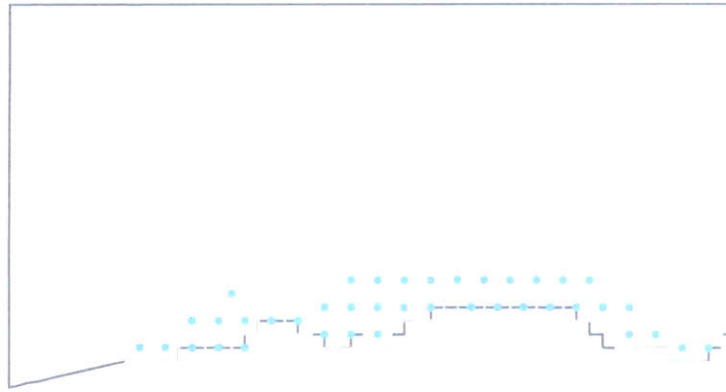
$$\text{AREA} = 16070$$

$$L = 220'$$

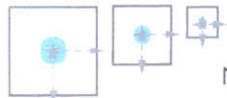
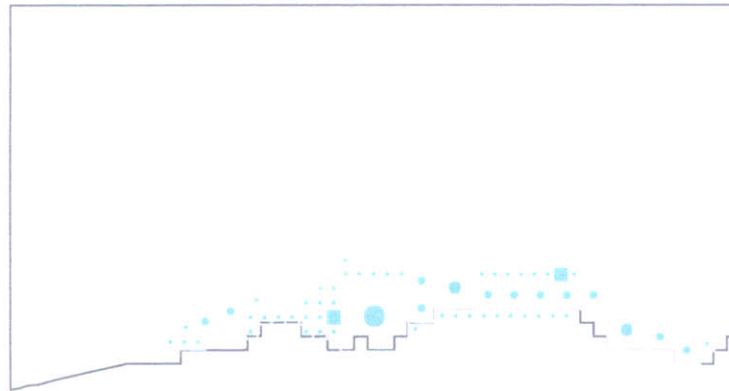
$$W = 75'$$

48

DISTRIBUTION OF WATER RETENTION PONDS

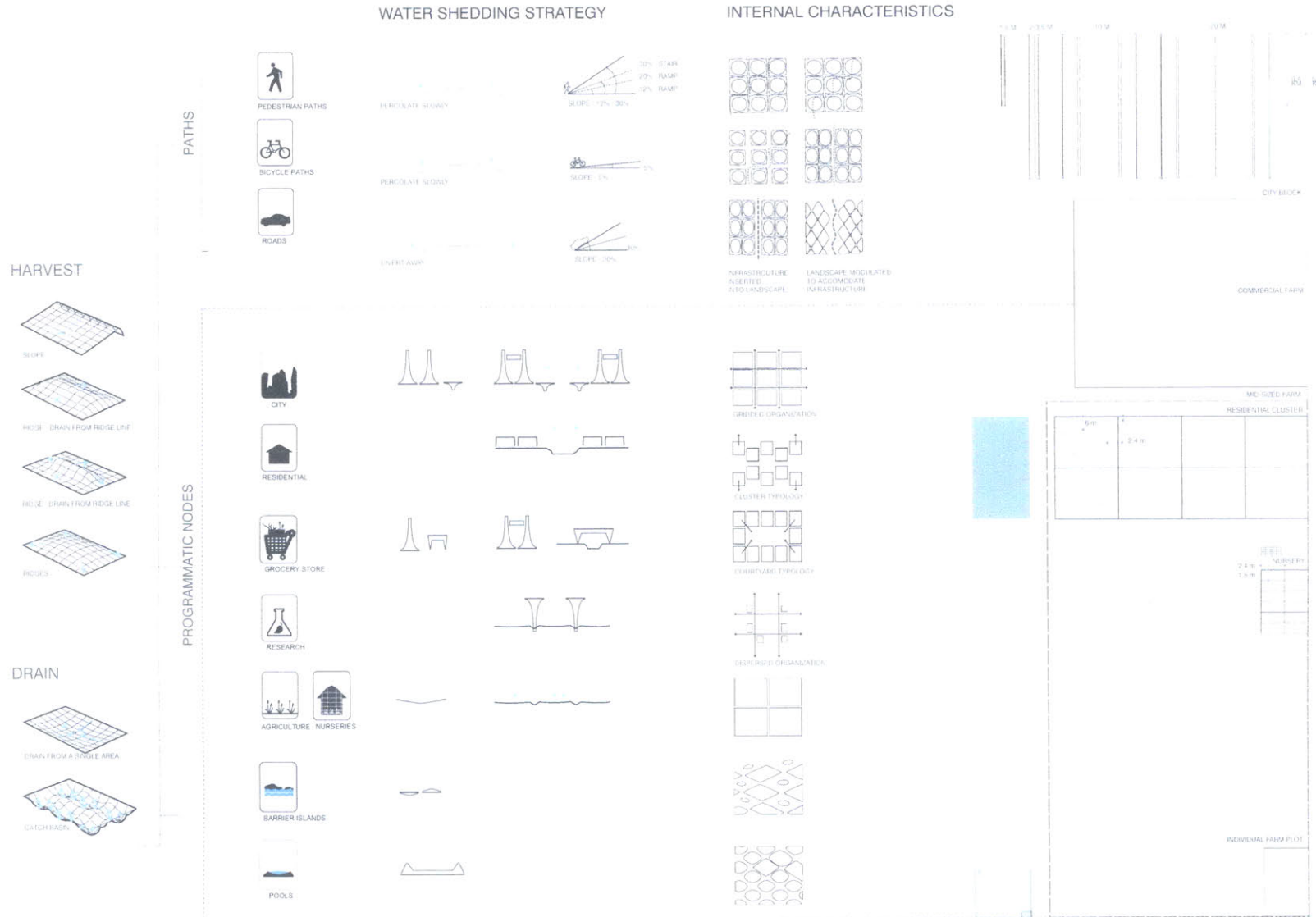


UNIFORM DISTRIBUTION ACROSS SITE

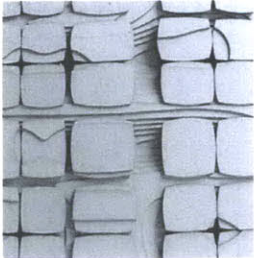
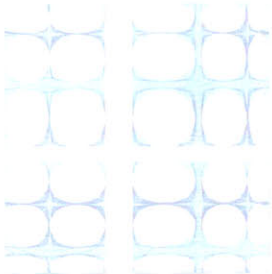
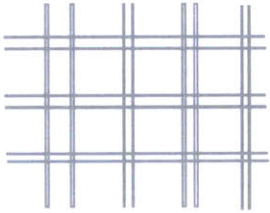
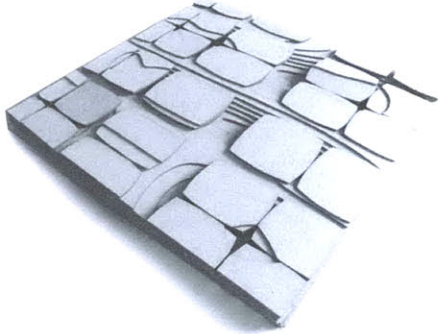
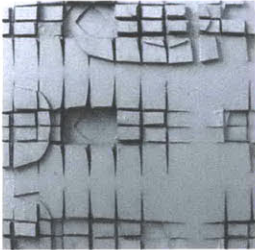

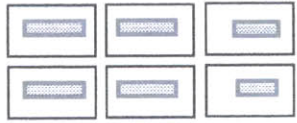
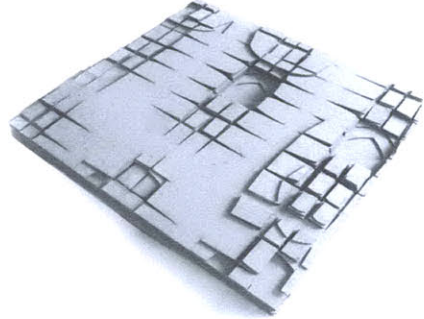
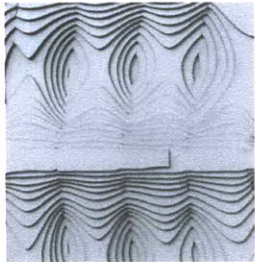
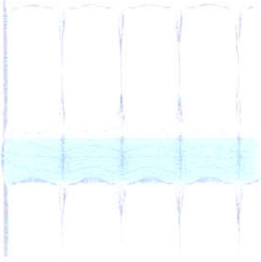
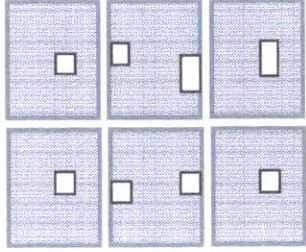
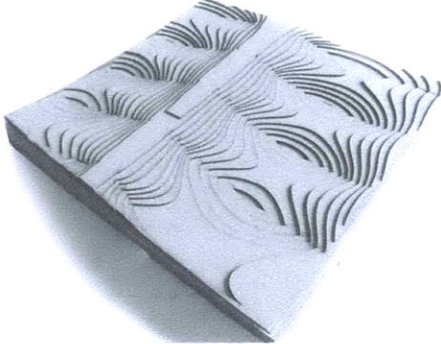


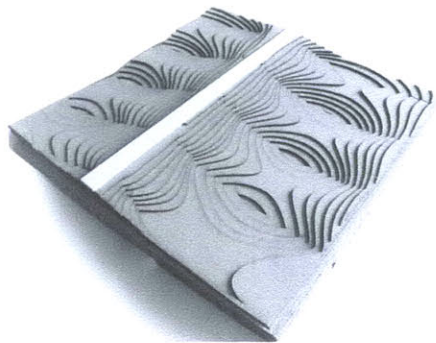
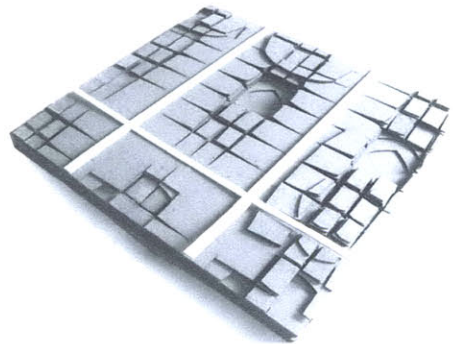
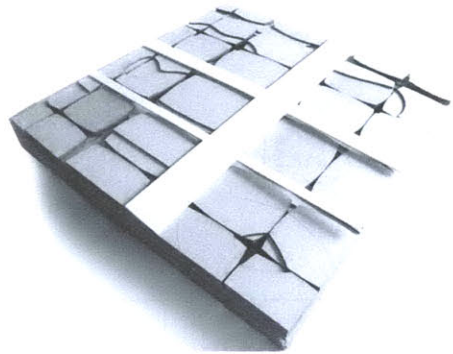
NON-UNIFORM DISTRIBUTION ACROSS SITE

b) MATRIX OF EXISTING TYPES: URBAN, RESIDENTIAL, AGRICULTURAL, RECREATIONAL



50 DEVELOPMENT OF NEW TYPOLOGIES: URBAN, RESIDENTIAL, FARMING, RECREATIONAL

	PLAN	WATER	ORGANIZING PATTERNS	
BUILDING-ORIENTED		 <p>URBAN CORES WITH POROUS STREETS</p>		
		 <p>RESIDENTIAL BLOCKS WITH INFILTRATION ISLANDS</p>		
LANDSCAPE-ORIENTED		 <p>WATER HARVESTING FOR IRRIGATION</p>		

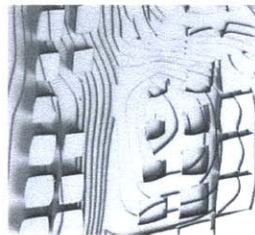


LANDSCAPE ORIENTED

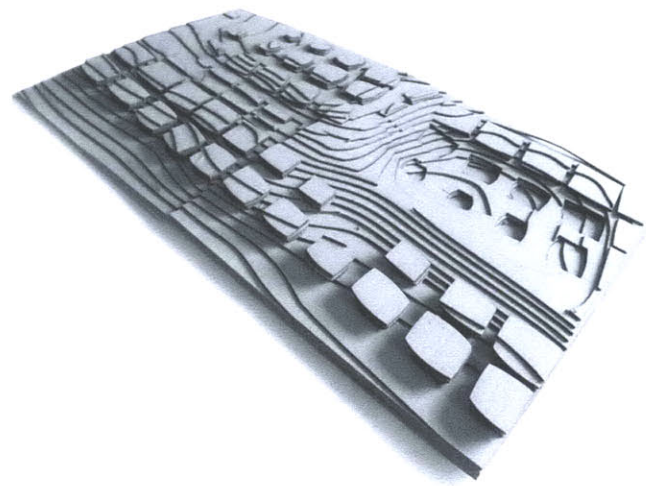
MULTIPLAS KURUSHI PAZIS

URPHEDICAL ANKARA DUTLU

PLAN

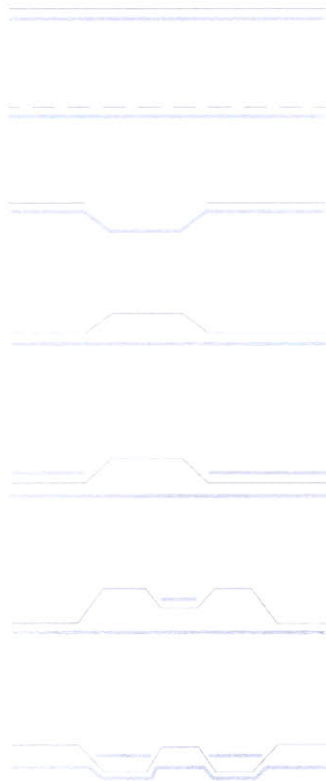


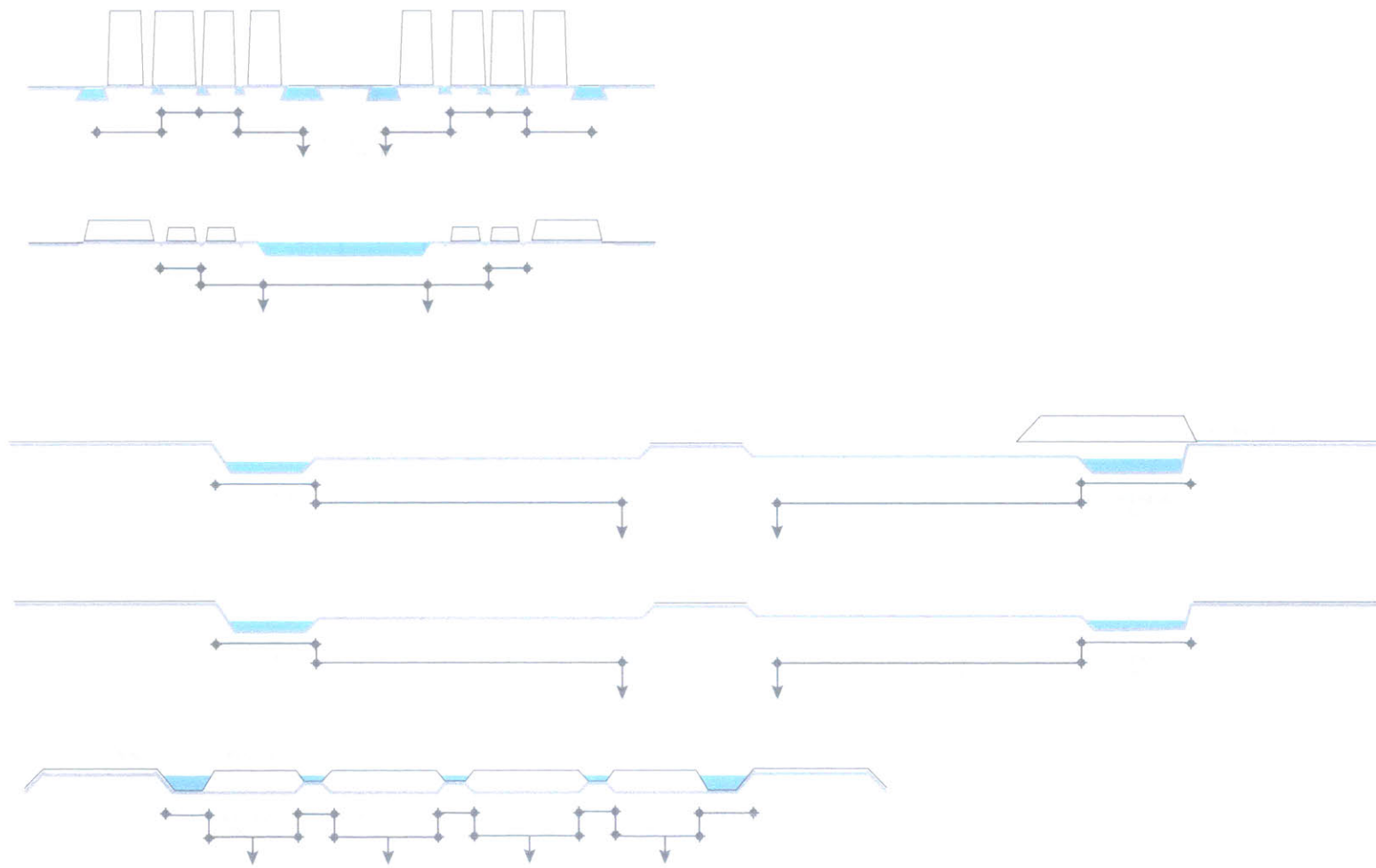
LANDSCAPE TYPOLOGY



CATALOGUE

ARCHITECTURE | LANDSCAPE
RELATIONSHIPS



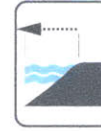


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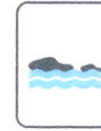
ARCHITECTURE | LANDSCAPE
RELATIONSHIPS



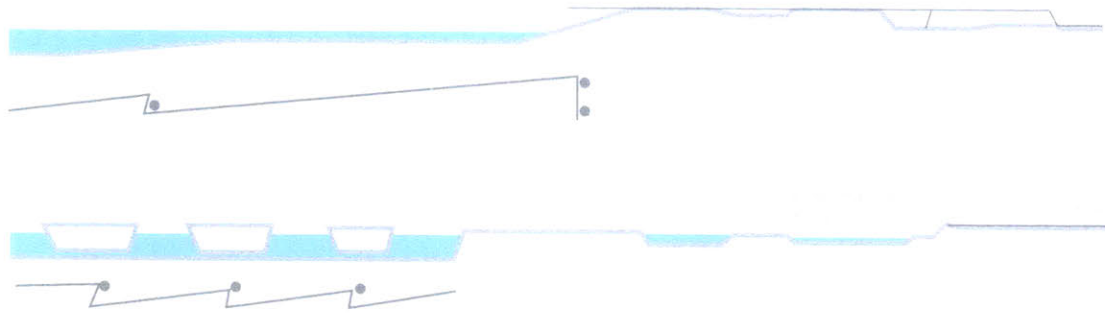
PROTECTION
PARK LANDSCAPE



EXTENDED
COASTLINE



BARRIER
ISLANDS

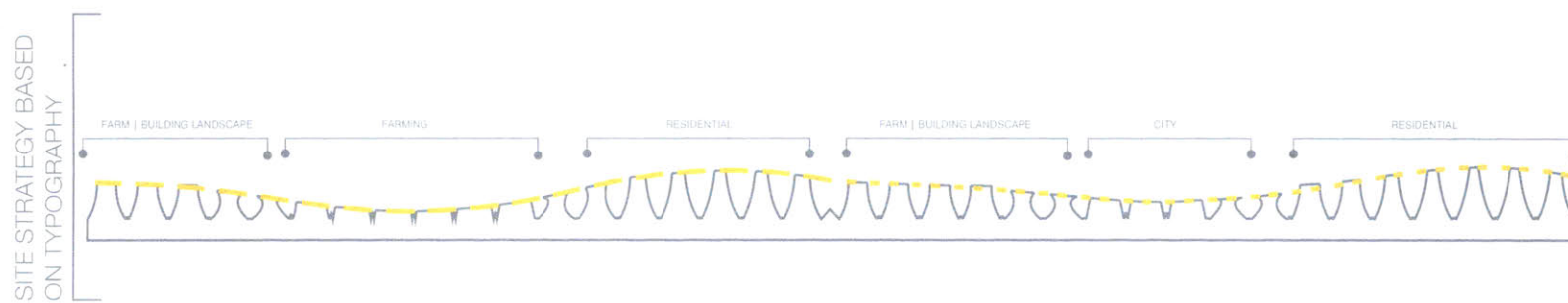


PROJECT

- a] SITE DEVELOPMENT STRATEGY: DIAGRAMS
- b] PLAN
- c] SECTIONS
- d] DETAIL SECTIONS
- e] RENDERS

After redefining typologies to optimize drainage and water retention (chapter three), a new landscape terrain was designed for the site.

The project takes the form of a soft infrastructure which synthesizes solutions for water drainage inland and storm defense along the coast. The proposal adapts the existing highly rational street grid of Detroit into a softly modulated landscape where the location of different programmatic blocks are based not only on a pedestrianized (New Urbanism) system, but also on the topographical attributes of the different typologies. Thus, after establishing that each urban zone are located within 1/4 miles of each other for walkability, each urban block is placed adjacent to a residential block, which requires a more elevated topography. Hybrid urban farming labs and hotels act as transition blocks between peaks (residential zones) and depressions (urban blocks).



60 This terrain thus adjusts to varying climatic conditions and urban demands by balancing environmental, technical and economic priorities. These priorities are layered throughout the harbor zones to not only create a comprehensive storm defense system but also to provide new places for recreation, agriculture, ecologies and urban development.

URBAN ZONES

This system includes existing services (water, sewer, gas and electric) relocated in accessible waterproof vaults beneath the sidewalk. The roadbed is rebuilt as a network of porous green streets that work like a sponge, absorb water and use it to irrigate the new placement in the street bed. With reduced traffic because of urban shrinkage, much of the width of the roadbed is transformed into green space, pedestrian walkways and bike paths. The waterproof vaults are divided into two parts: private utilities (dry systems), such as electric and telecommunications, and public utilities (wet systems), such as water, gas and sewers.

RESIDENTIAL ZONES

Each residential block is marked by channels that subdivide the block and lead rain water to drain into a common retention pool at the center of the block, setting up a potential gathering space for the block's residents.

FARMING ZONES-OUTSIDE OF THE URBAN CORES

Because of the marginal benefits associated with large scale agriculture, larger farming blocks are located outside of the city cores (and outside of the site). Thus higher density zones (urban and residential) and the rural or agricultural zones are conceptualized as intensifying inwards. Within the site, urban farming is only associated with residential blocks, where each individual plot has a mound with a greenhouse, the latter supplied with the block's retention pond.

RESEARCH | FARMING LABS

61

Bridging the topographical gap between the flat urban cores and the elevated residential zones, as well as between the urban cores and the waterfront's edge are the research labs, a new type. This hybrid building epitomizes the novel symbiotic architectural and landscape relationships.

LANDSCAPE : A NEW GRADUATED EDGE

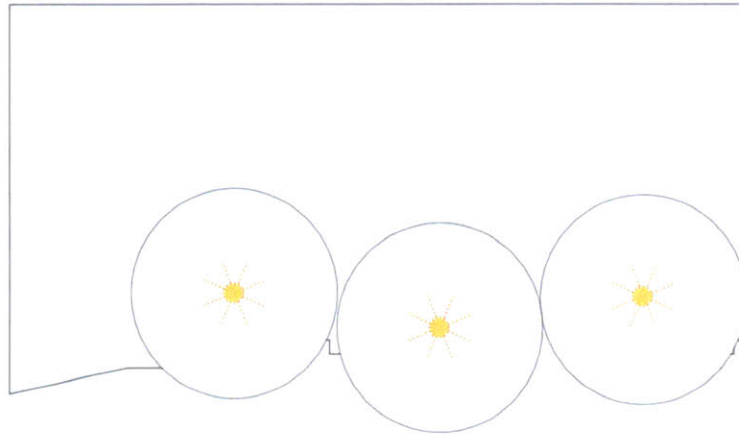
.A new coastal profile is created, adapted from the modulated terrain, softening the edge of the site to absorb storm surge. The resulting change in topography creates a mix of higher ground and water channels. An alternating pattern of landscape and new development creates a balance between ecological and economic sustainability. Thus the shallow, protected water around the islands allows for new recreational activities while, for the new marina, the steep bathymetry underwater topography is maintained to provide draught for boats.

PHASING

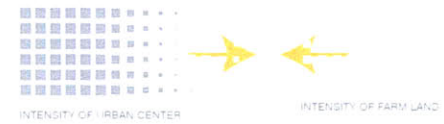
The coast becomes tied into the cycles of landscape, recreation and tourism flows, recapturing the historic role of Detroit as a point of cultural as well as ecological exchange. Over time, currents, tides, and storms cause an evolution of the shape of the coastline and the local fauna that it supports eventually creating a rich varying ecological succession.

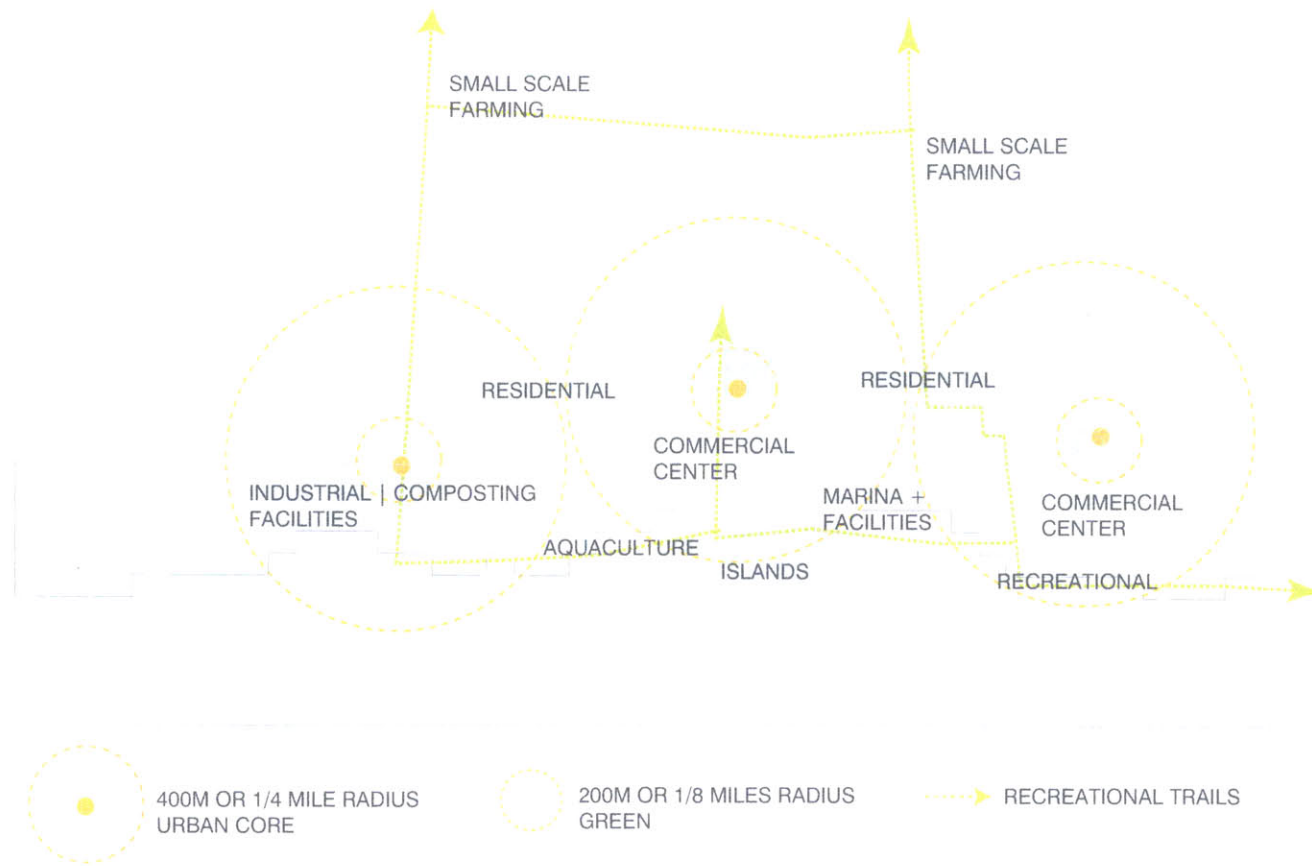
62 a) SITE DEVELOPMENT STRATEGY: DIAGRAMS

WATER HARVESTING



WATER: HARVESTING + PROTECTION



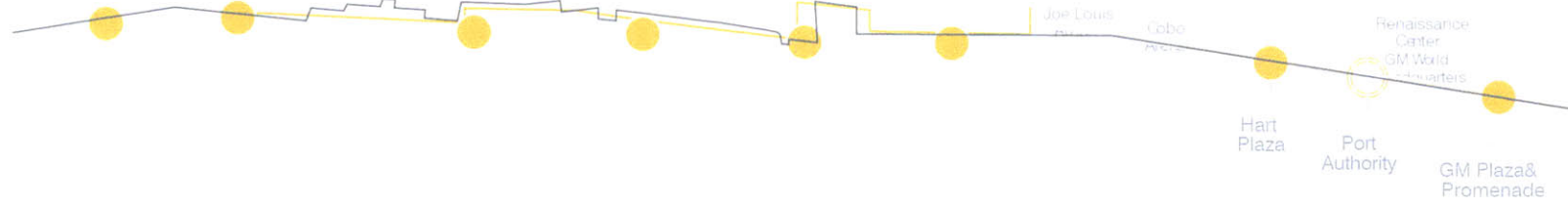


BASIC STRATEGY:

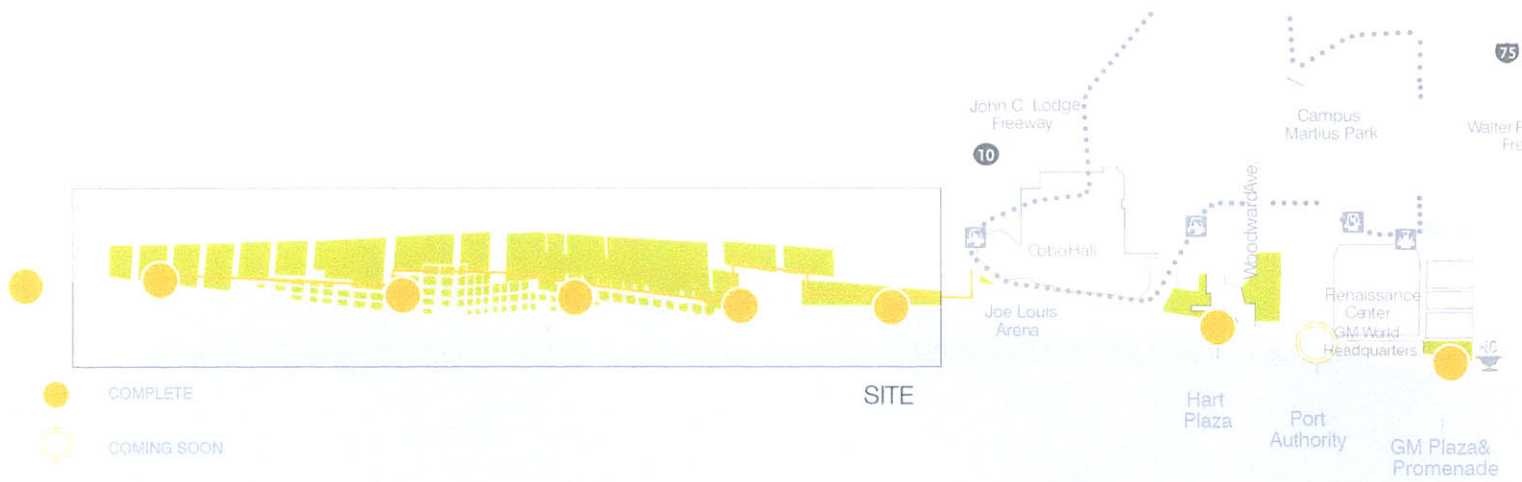
3 COMMERCIAL / MIXED USE PEDESTRIAN FRIENDLY CORES WITH A FINE-GRAINED INTERCONNECTED NETWORK OF STREETS.



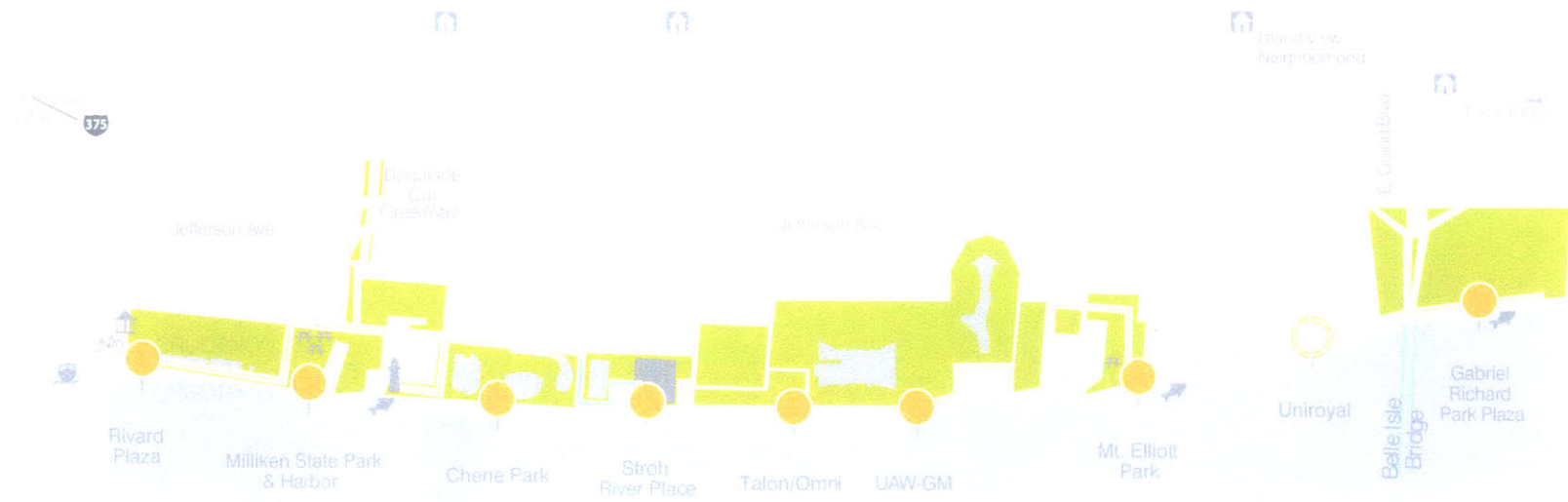
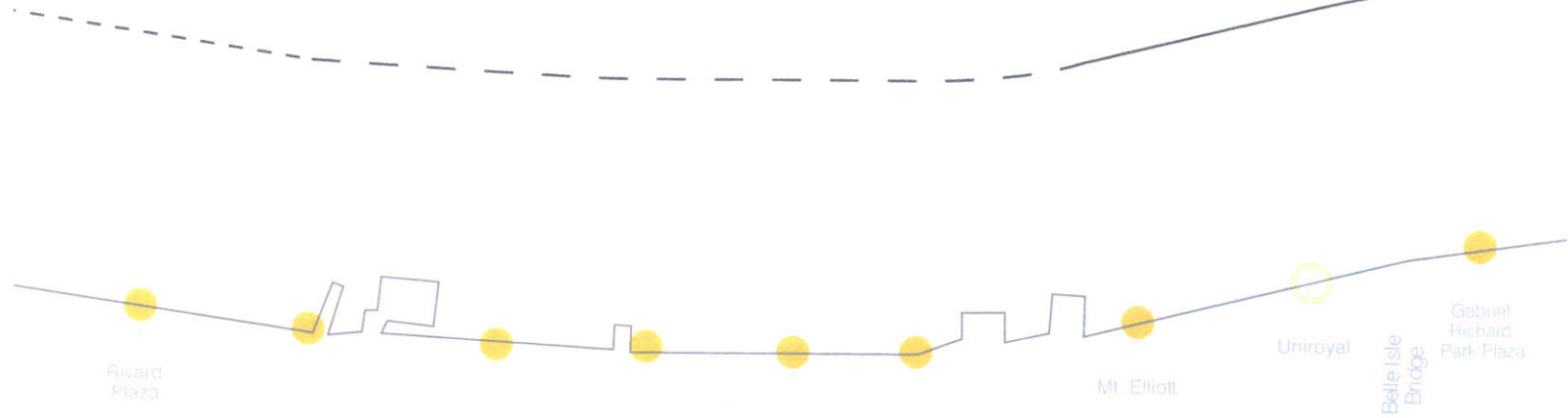
WATERFRONT EDGE POROSITY

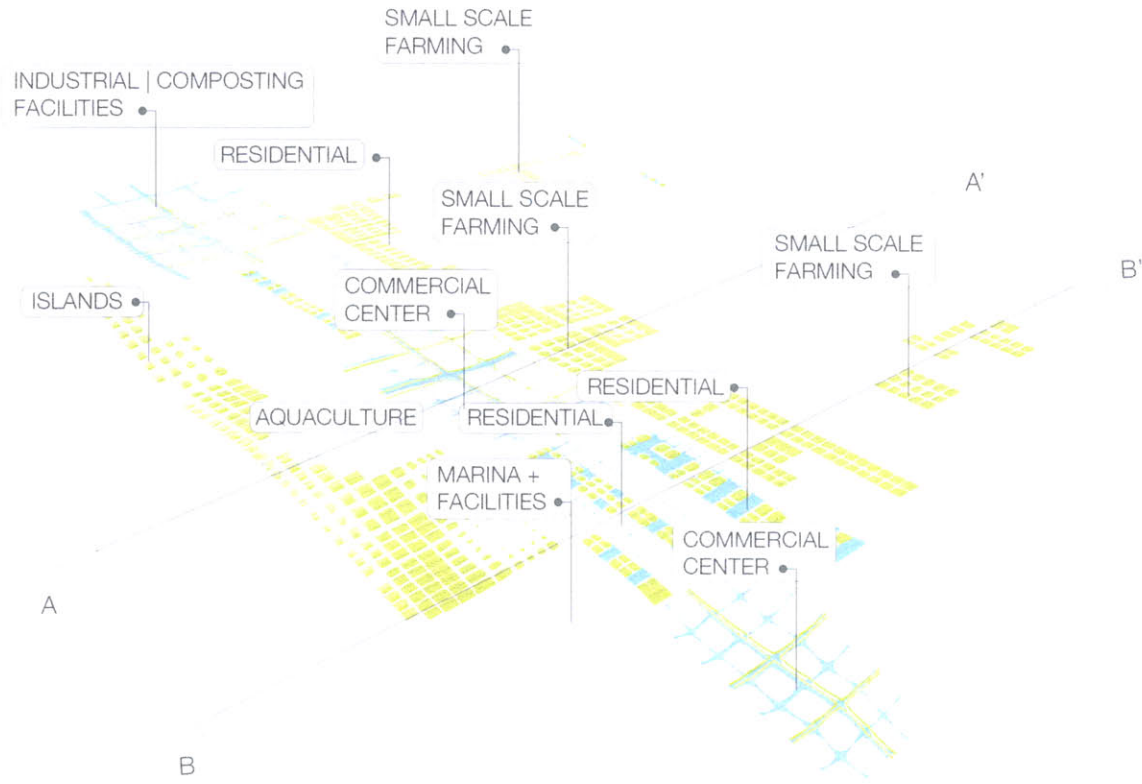


AREAS OF INTEREST ALONG WATERFRONT



COASTLINE ALONG DETROIT RIVER





20m CONTOURS

2 m CONTOURS



GREEN



WATER

TEXTURAL MODULATIONS

An intensively mounded surface varies in thickness in order to manage water drainage, with differentiated water drainage strategies depending on the particularities of the program.

The water drainage strategy for the core urban areas are porous streets, while a system of channels and water retention ponds channel and drain the water in residential areas. Small scale farm land within the city, constituting of greenhouses, use the same strategy, while large scale farming outside the city use a flooding strategy. Agricultural research labs, strategically located in farming areas accessible to road infrastructure, consist of floating pontoons on water harvesting ponds.

The gradual transition from the land into the water creates a soft edge, in the form of barrier islands. The artificial structures sit atop, cantilever over, float, and hang from the surficial mounds, thus creating a mutual constitution of natural and artificial structures.

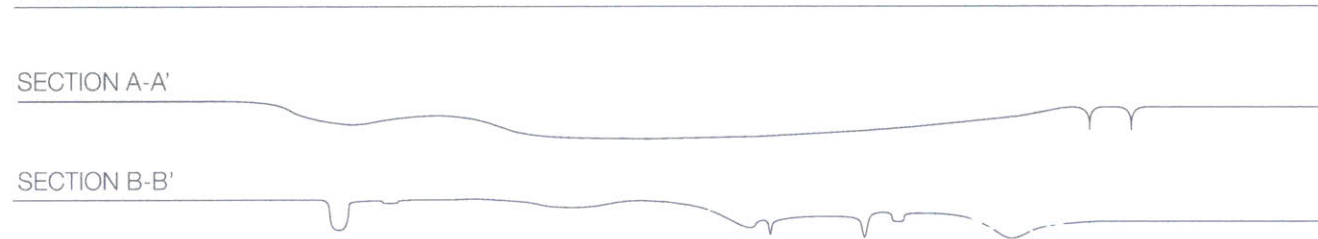
TYPICAL

ARCHITECTURE
LANDSCAPE

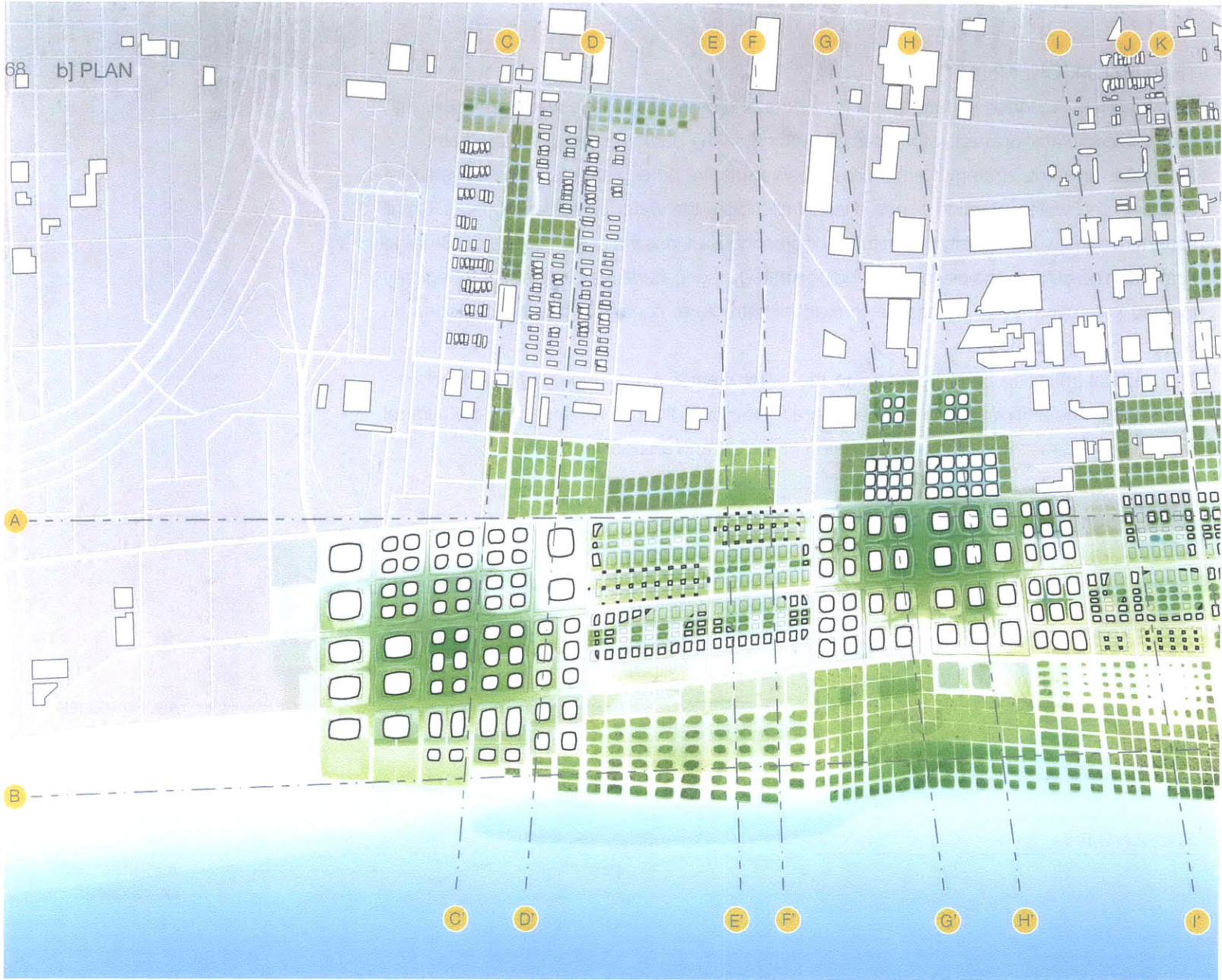
SECTION A-A'

ARCHITECTURE
LANDSCAPE

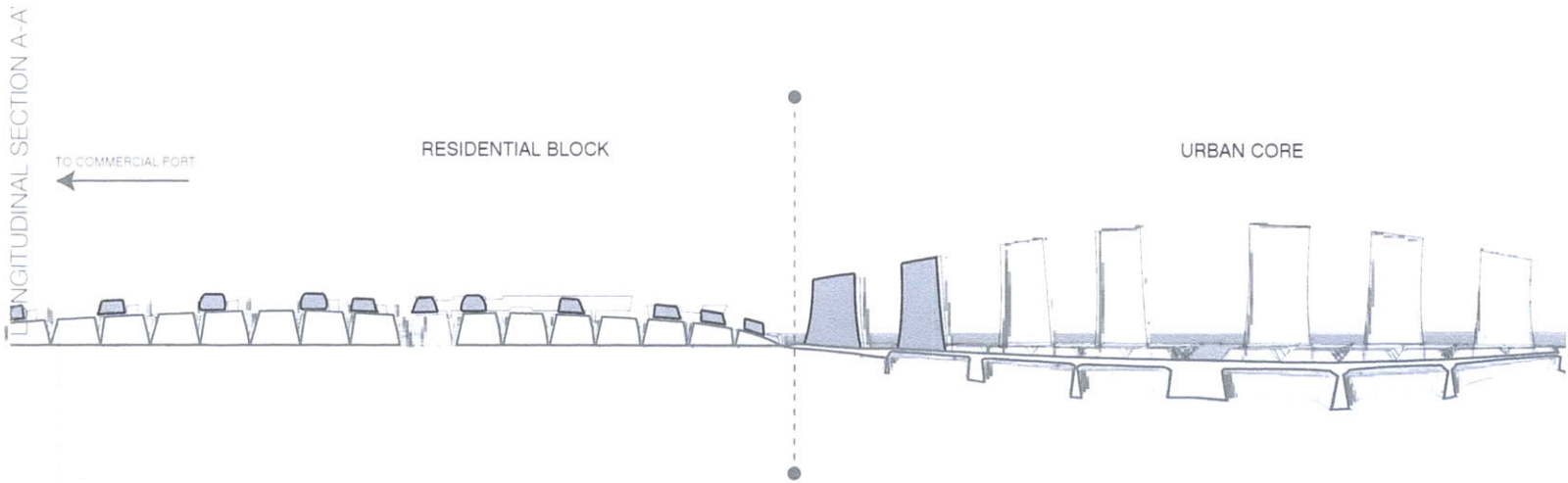
SECTION B-B'

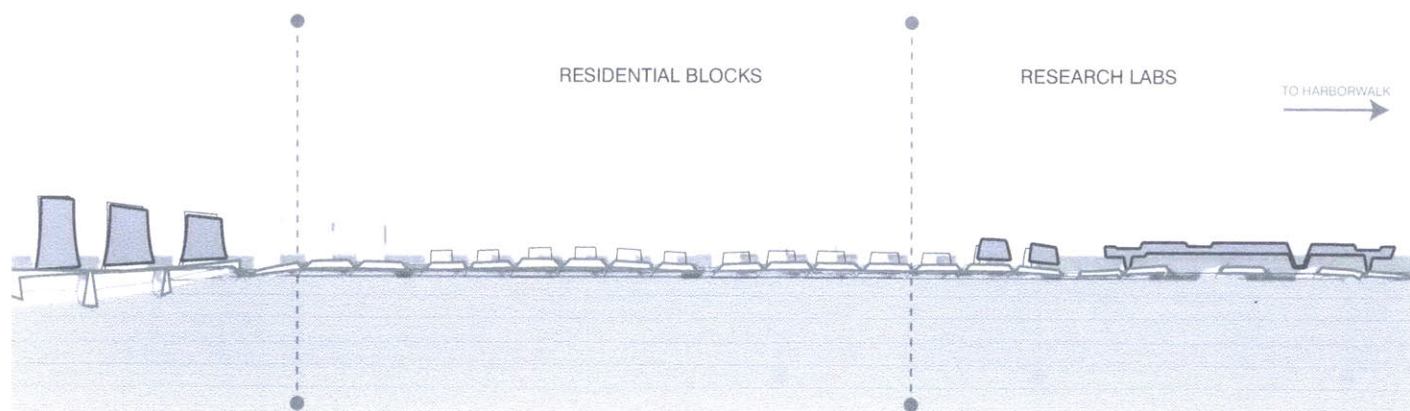
ARCHITECTURE
LANDSCAPE

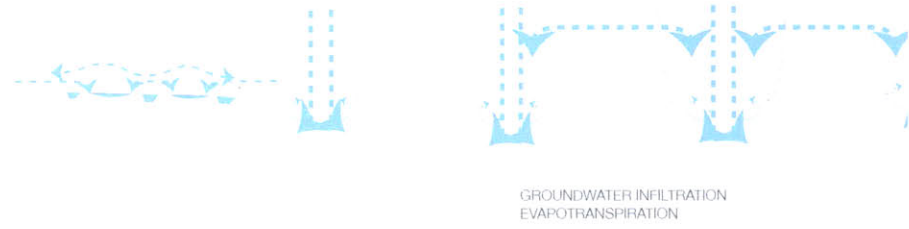
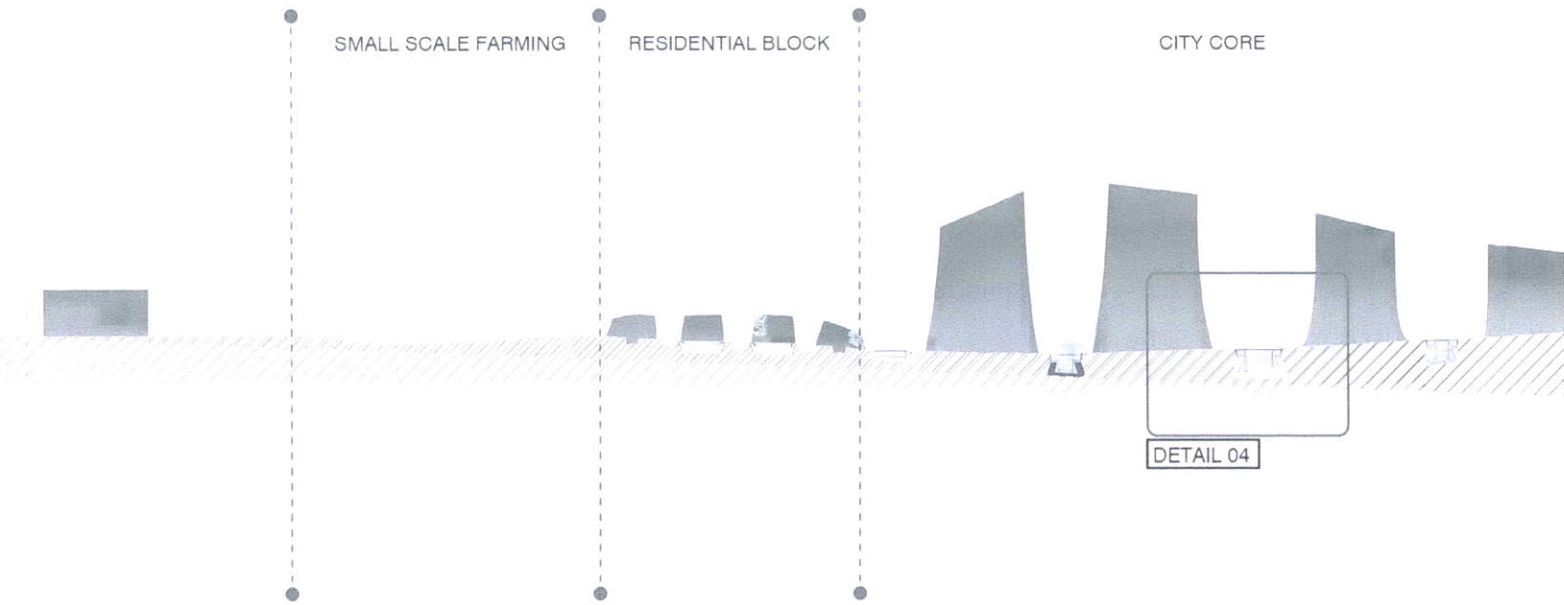
68 b) PLAN

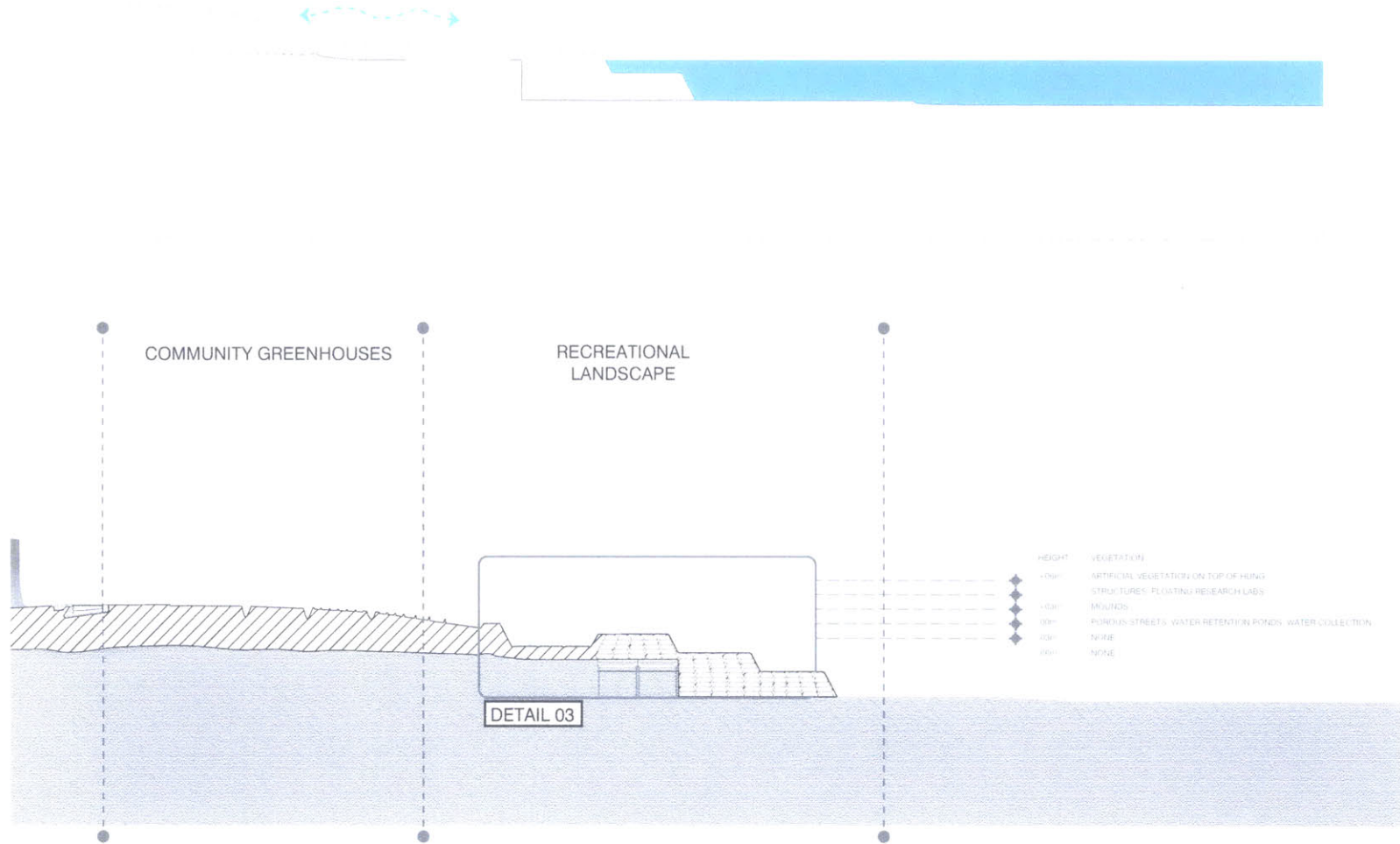










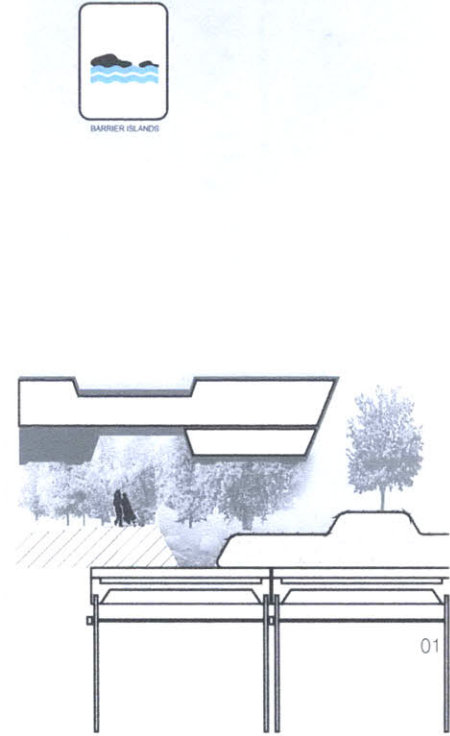


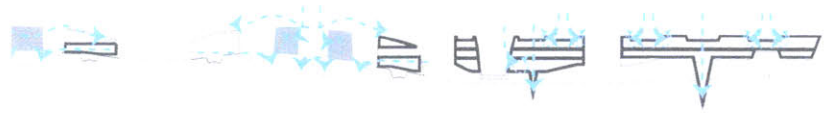


DETAIL SECTION THROUGH RESIDENTIAL BLOCK : INFILTRATION ISLANDS

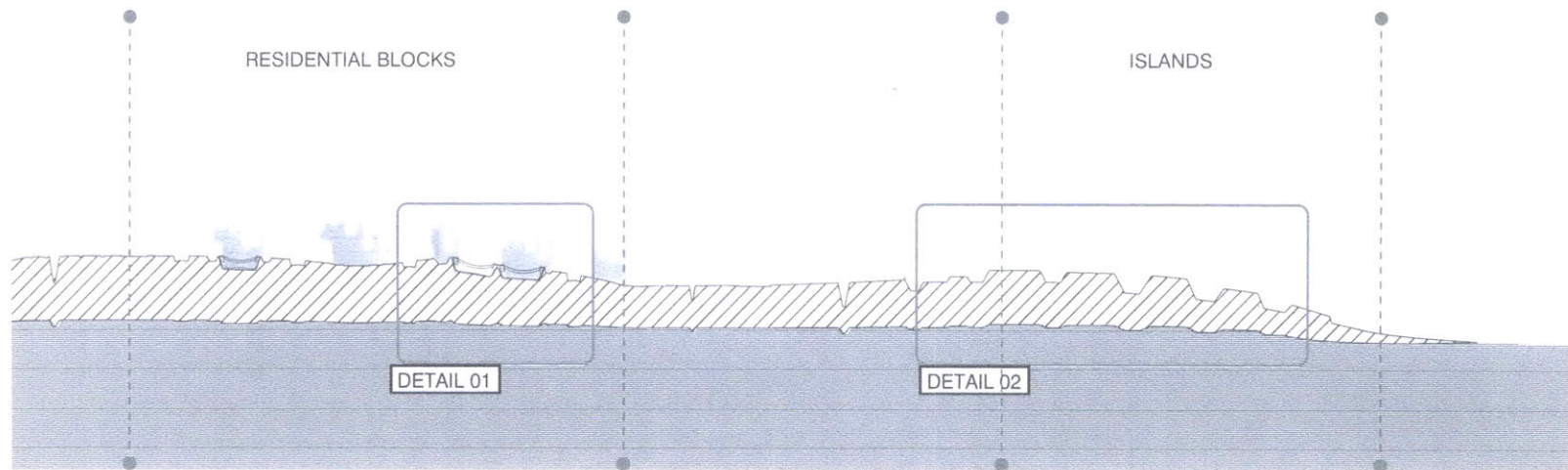


DETAIL SECTION THROUGH BARRIER ISLANDS

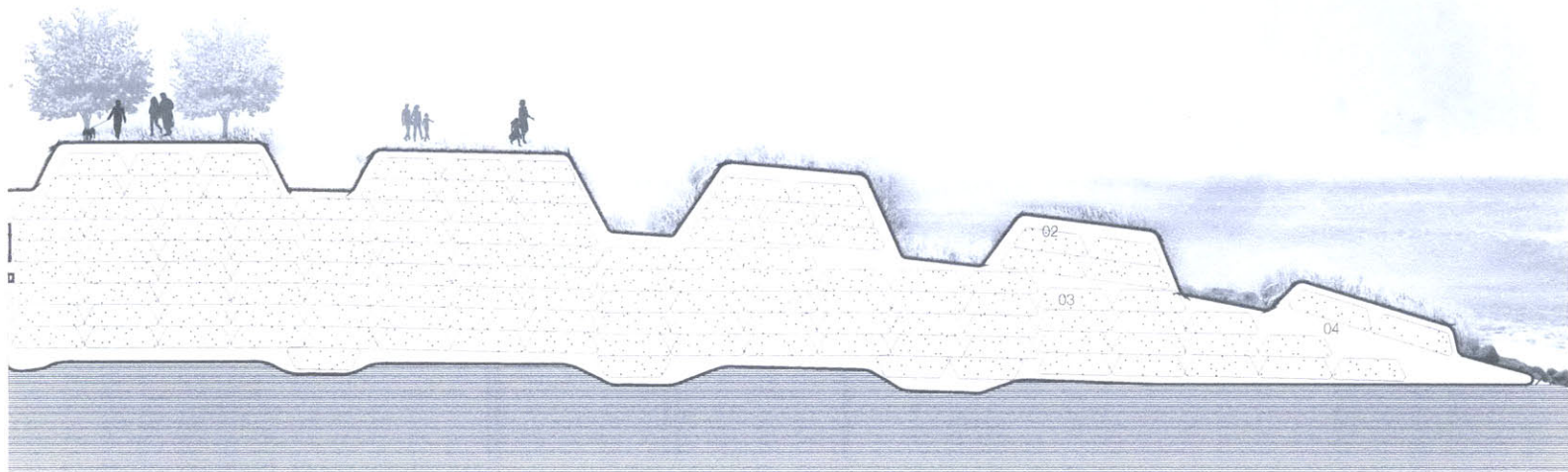




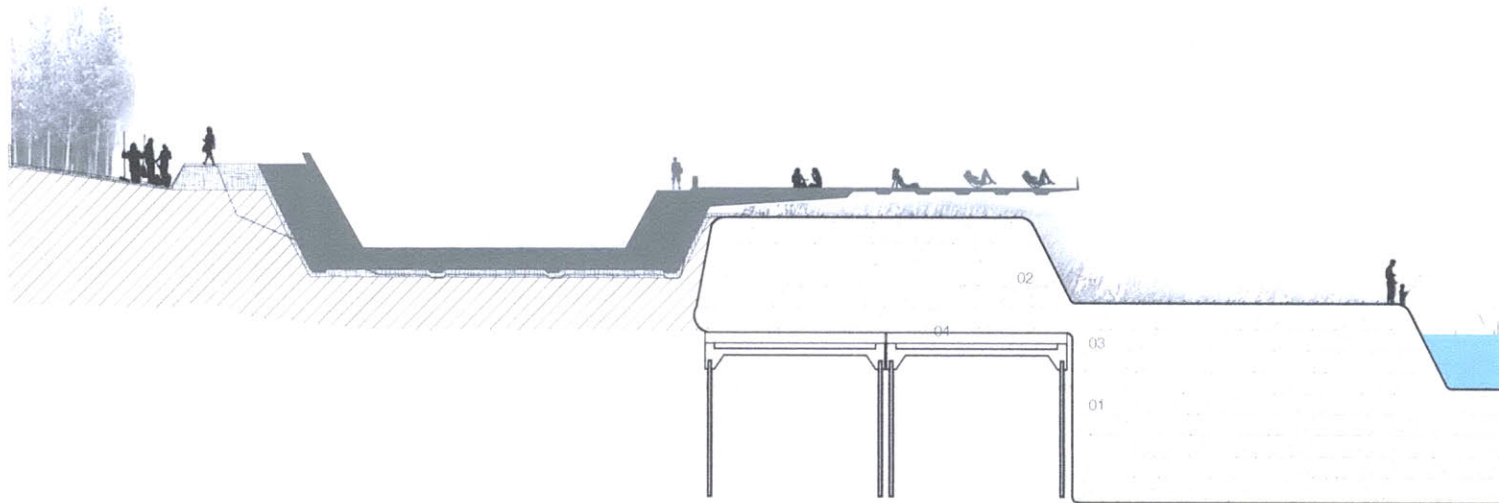
GROUNDWATER INFILTRATION
EVAPOTRANSPIRATION



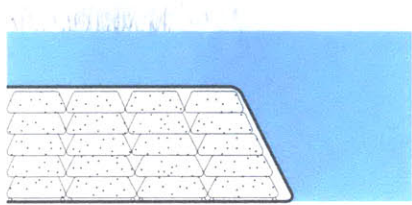
- 01. SHEET PILED-TILED WALL PIER
- 02. 2 LAYERS OF WOVEN GEOTEXTILE
- 03. DREDGED DISCHARGE
- 04. 0.2 m DIAMETER PIPE



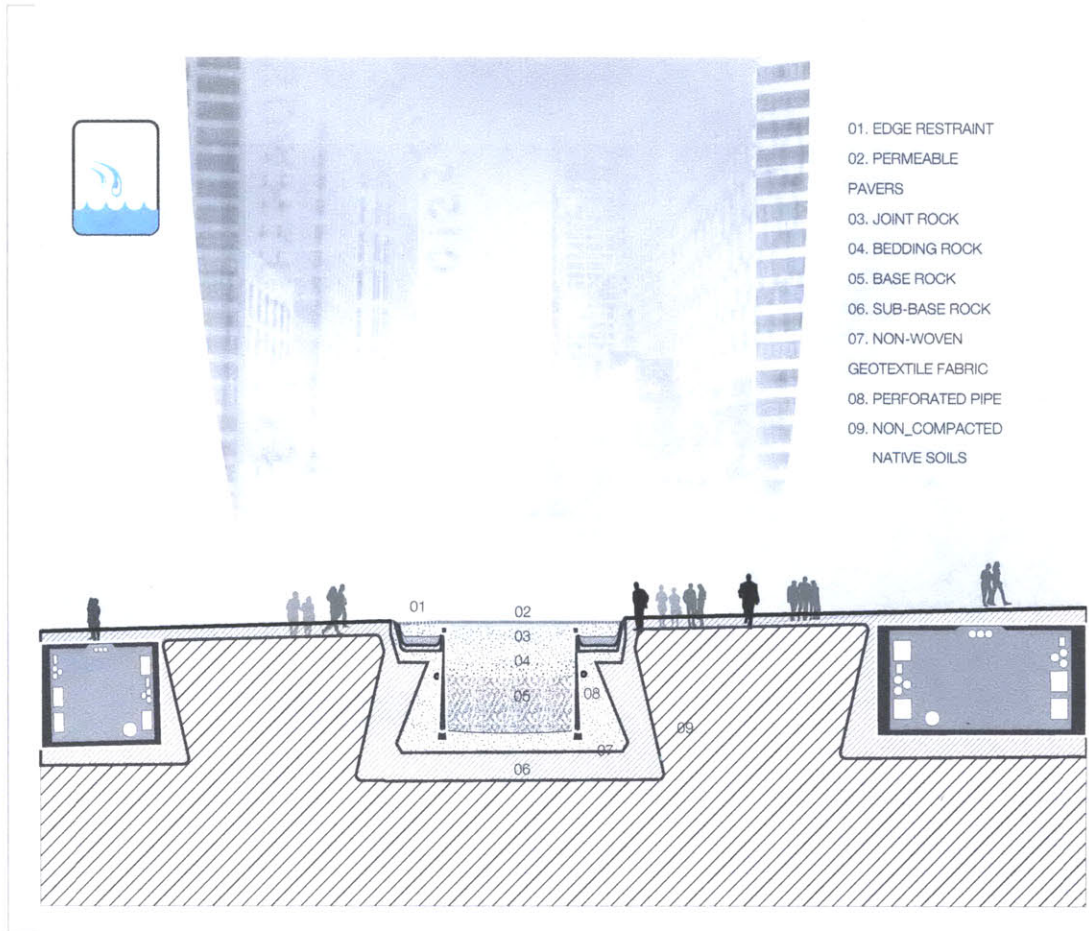
DETAIL SECTION THROUGH RECREATIONAL ZONES : DIKE



- 01. SHEET PILED-TILED WALL PIER
- 02. 2 LAYERS OF WOVEN GEOTEXTILE
- 03. DREDGED DISCHARGE
- 04. 0.2 m DIAMETER PIPE

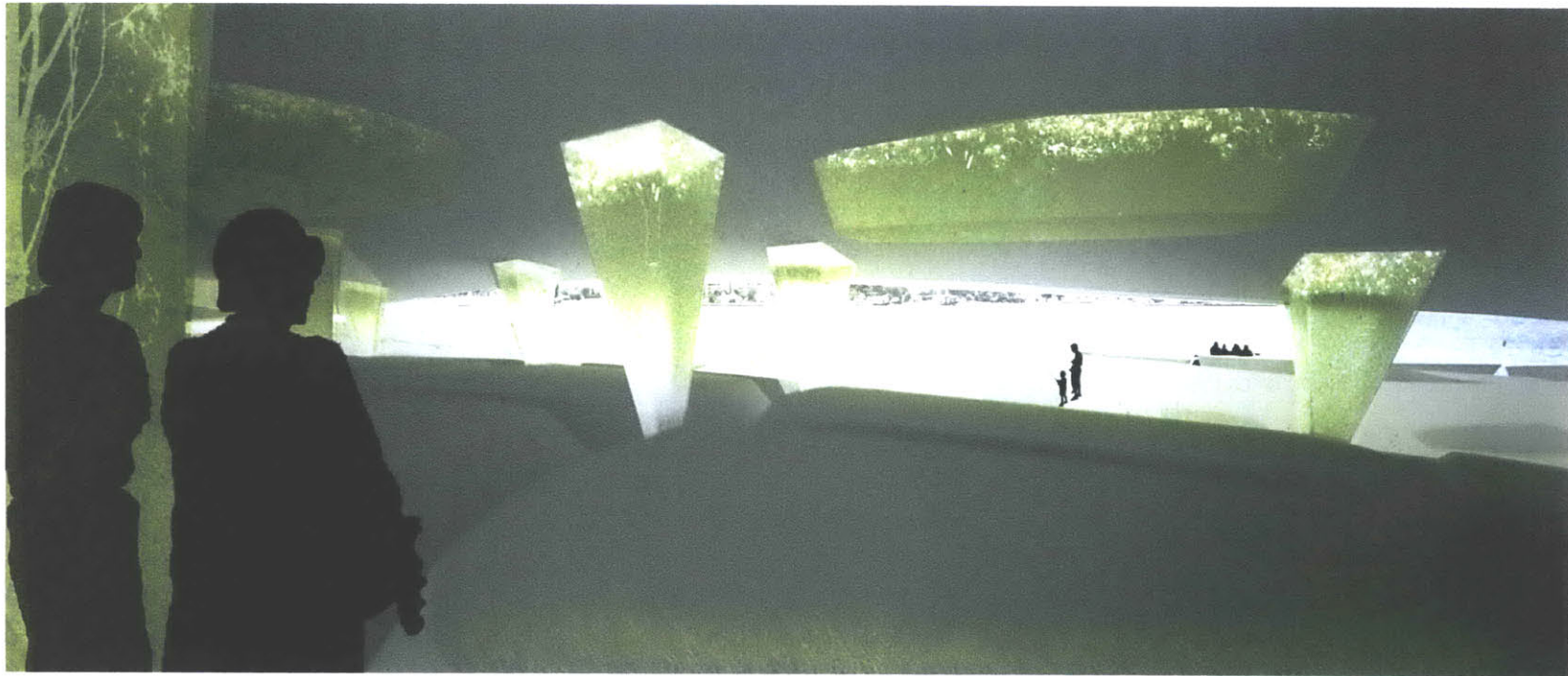


DETAIL SECTION THROUGH CITY : POROUS STREET





VIEW OF WATERFRONT: AQUACULTURE POOLS + NURSERY MOUNDS



VIEW UNDER THE RESEARCH LABS | HOTEL TOWARD THE WATERFRONT

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86 FIGURES, ILLUSTRATIONS, PHOTOGRAPHS

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