

**WATERSCAPE**

by

Iman S. Fayyad

Submitted to the Department of Architecture in partial fulfillment of the requirements for the Degree of

Bachelor of Science in Architecture  
at the  
Massachusetts Institute of Technology

June 2012

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Submitted to the Department of Architecture on May 25, 2012 in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Architecture.

### **ABSTRACT:**

Water plays an integral role in mediating the natural environment, ecosystems and habitats, and in shaping our natural landscapes. Using water as a tool for form-finding in landscape design fosters a sense of awareness of the relationship and interaction between people, water and the land. The physical properties of water in all its states encourage thinking in terms of adaptable systems and temporality, of surface behavior and material relevance.

This thesis explores the dialogue between experience and performance-- the reciprocity between form and function-- through the design of a performative landscape that re-interprets the water treatment cycle as an architectural medium in an urban setting. The groundscape topology curates a graduated ecological agenda that, over time, transforms the seamless and the uniform to a cellularized non-uniformity. This physical transformation, along with the integration of geometric scale and rates of change, informs a social program by creating public pools as a 'destination' for the water that is drained through the landscape surface. The level and quality of water in the pools is dictated by the variation of the global topography of the site, and is reflected in the temporal behavior of the groundscape, defining a coherence between the socially interactive (the architecture) and the seemingly passive landscape.

Thesis Supervisor: William O'Brien Jr.  
Title: Assistant Professor of Architecture



## **ACKNOWLEDGEMENTS**

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## **INTRODUCTION**

Water plays an integral role in mediating the natural environment, ecosystems and habitats, and in shaping our natural landscapes. Using water as a tool for form-finding in landscape design fosters a sense of awareness of the relationship and interaction between people, water and the land. The physical properties of water in all its states encourage thinking in terms of adaptable systems and temporality, of surface behavior and material relevance.

This thesis explores the dialogue between experience and performance-- the reciprocity between form and function-- through the design of a performative landscape that re-interprets the water treatment cycle as an architectural medium in an urban setting. The groundscape topology curates a graduated ecological agenda that, over time, transforms the seamless and the uniform to a cellularized non-uniformity. This physical transformation, along with the integration of geometric scale and rates of change, informs a social program by creating public pools as a 'destination' for the water that is drained through the landscape surface. The level and quality of water in the pools is reflected in the temporal behavior of the groundscape, defining a coherence between the socially interactive (the architecture) and the seemingly passive landscape.

The design schematic is motivated by integrating ideals of landscape urbanism (the scale of water is latently urban), water treatment, and flood control, with a strong interest in computational surface geometry. The behavior of water (due to forces of nature) on surfaces of varying degrees of concavity inform programmatic adjacencies, part-to-whole relationships and a material organization that embed the language of architecture into the designed landscape.

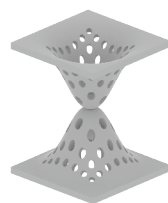
Designing for water and designing for people require that a duality exists in the system that defines the performance of the surface geometry, both physically and conceptually. This duality is revealed not only in the morphology of the groundscape geometry but also through materiality, texture, tectonics and experience.



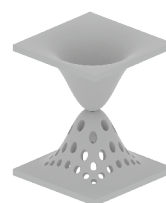
## **SURFACE MANIPULATION AND WATER FLOW**

Initial studies of surface behavior and the geometric manipulation of surfaces were conducted to explore the ability of a surface to achieve or accommodate response to environmental stimuli (for example, air and water flow through a porous membrane). Variable surface properties can operate to achieve a balanced and well-controlled environment for a given subject.

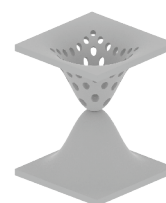
This set of explorations begins to develop a taxonomy of surfaces that can store/contain, filter or drain water based on the varying degrees of porosity achieved through the geometric manipulation of a singular surface. This notion is taken one step further by exploring the effect of the interaction between two or more surfaces on the behavior of water.



Filtration



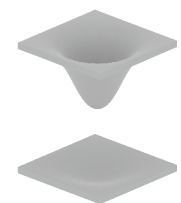
Storage  
+ Filtration



Drainage/  
Run-off

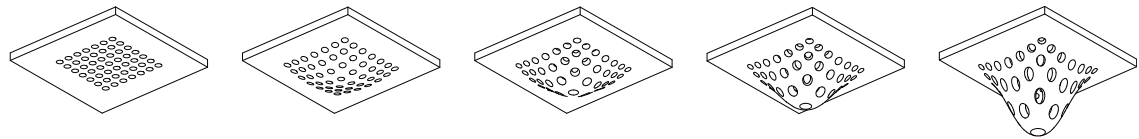
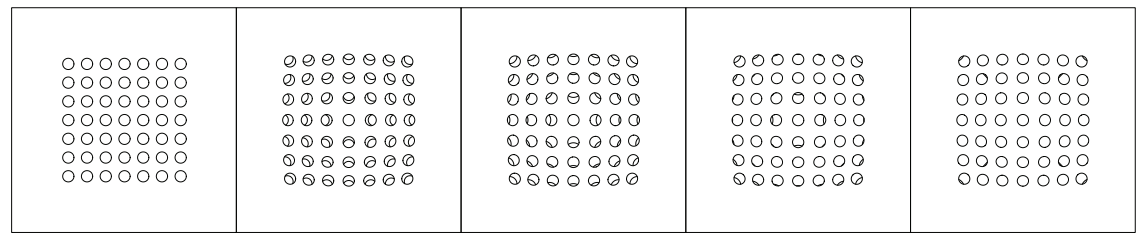


Directional  
Run-off

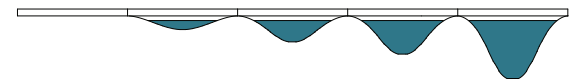


Collection  
+ Evaporation

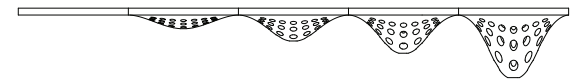
# SURFACE MANIPULATION



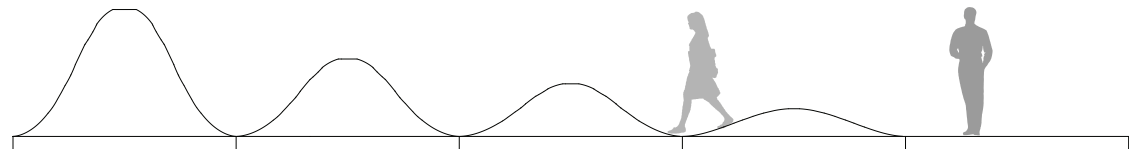
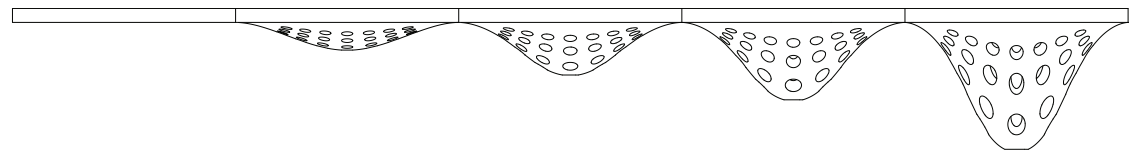
Varying porosity as a function of surface deviation



Storage



Filtration/drainage



Introducing scale + human interaction

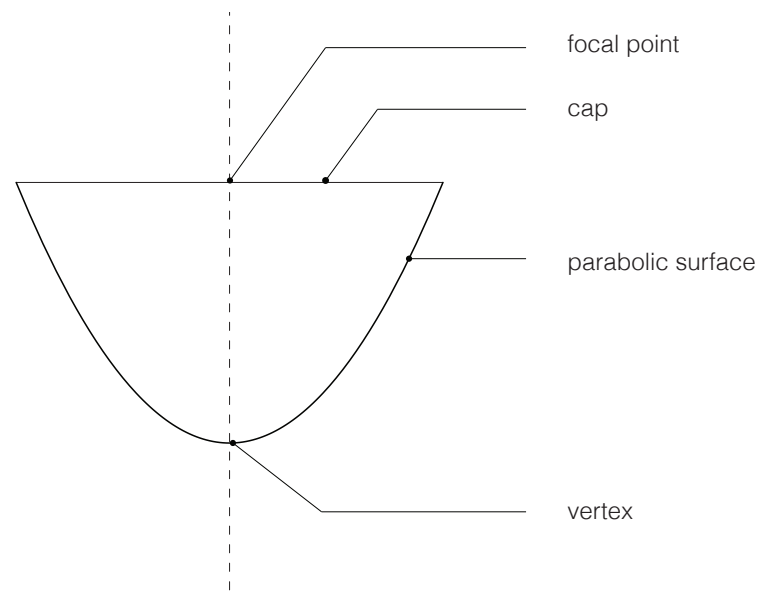
## **PARABOLIC SURFACE STUDIES**

As a concave surface with mathematically controlled parameters, the paraboloid (or parabolic surface) can accommodate water as an element in various forms and in different ways. While the geometry of the surface has the inherent ability to contain and store water, incorporating the paraboloid into a geometric system of layered infrastructure can begin to expand the vocabulary of surface functions. For example, the mathematical parameters of a paraboloid can determine velocity of water flow along the surface based on the degree of concavity. The location of the focal point and hence the vertex determine where water will settle and drain.

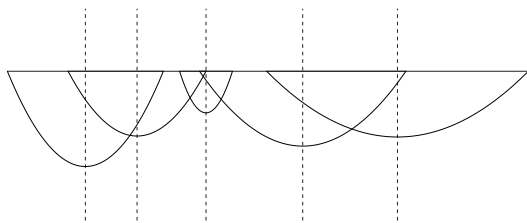
Initial studies utilized two-dimensional geometric grids to explore the relationship of intersecting paraboloids (designed in plan as circles, and given volumetric capacity in the three-dimensional development of the system). The intersection of paraboloids begins to transform what reads as a single volumetric object into a field of open surfaces that privilege the horizontal-- the suggestion of a mat-system, or a landscape.

The geometry of the system implies that paraboloids with a smaller footprint are shallower than those with larger footprints. So, as the system scales up in plan, the basins become very deep and can thus only function as containers of water. The paraboloid can, therefore, be manipulated manually to create a more comprehensive architectural vocabulary-- where 'basins' with a large footprint can be shallow enough to function as walkable surfaces.

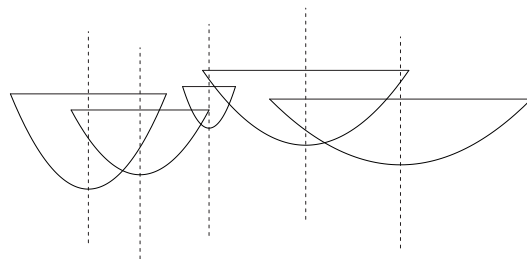
STUDIES OF PARABOLOID INTERSECTIONS  
(PARABOLA IN SECTION)



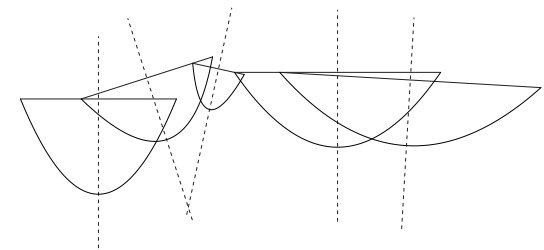
Parameters of a parabola



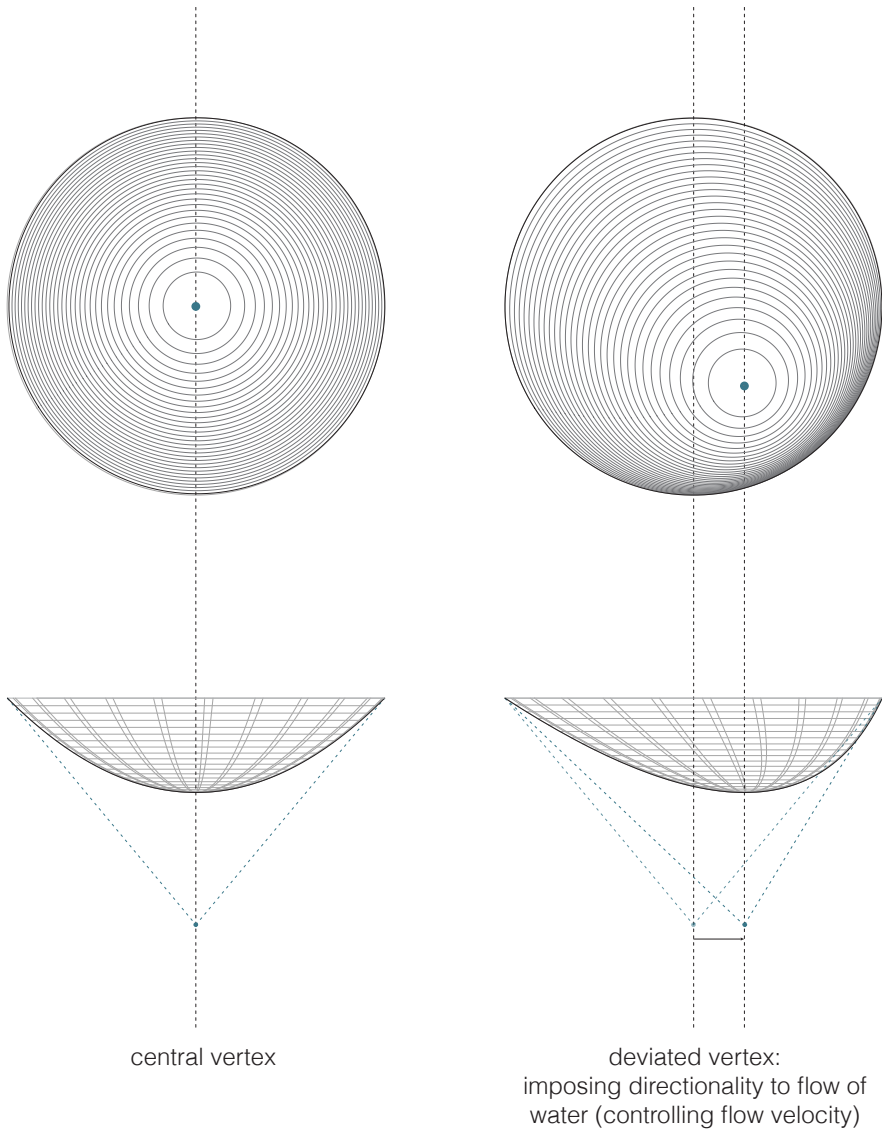
Successful geometric intersection



Unsuccessful geometric intersection

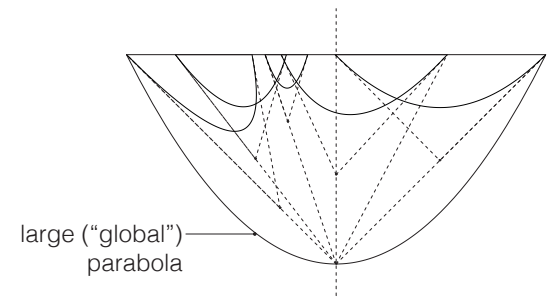
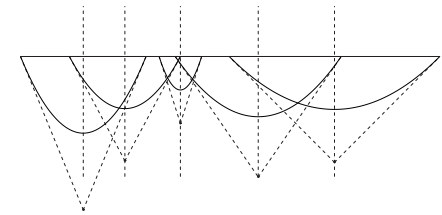


Unsuccessful geometric intersection

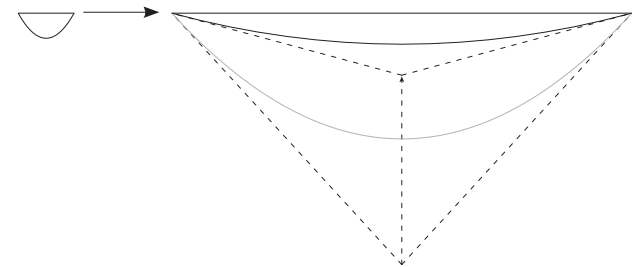


Manipulating geometric properties of the parabolic surface

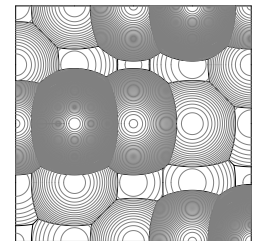
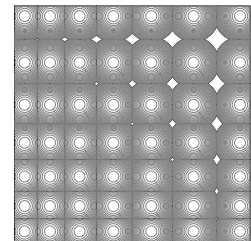
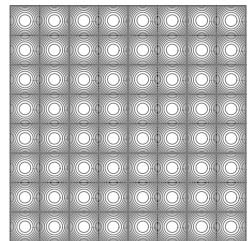
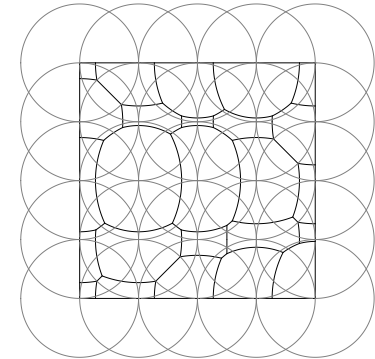
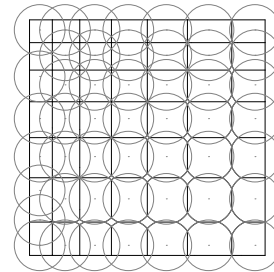
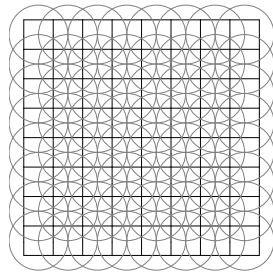
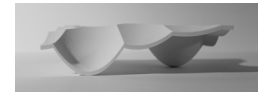
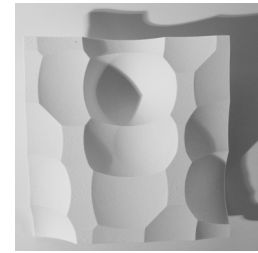
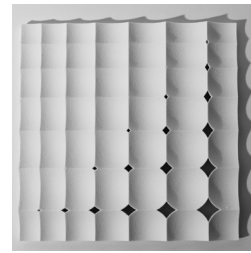
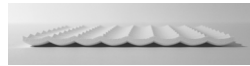
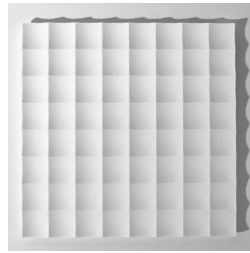
Condition A:  
Lateral translation of vertex  
(parallel to datum plane)



Condition B:  
Vertical translation of vertex point  
(perpendicular to datum plane)



STUDIES OF PARABOLOID INTERSECTIONS

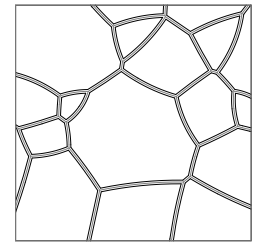
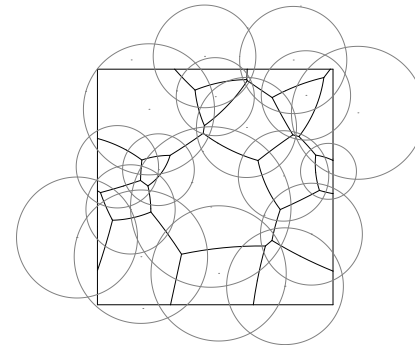
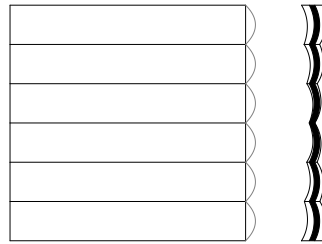
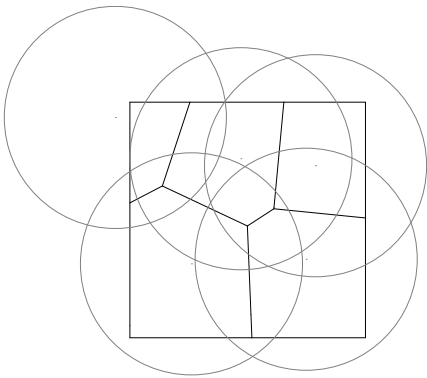
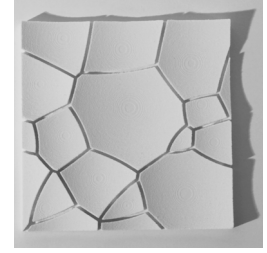
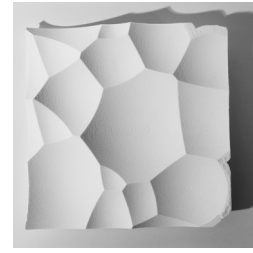
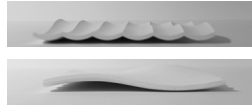
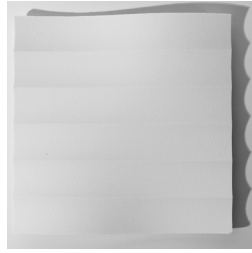
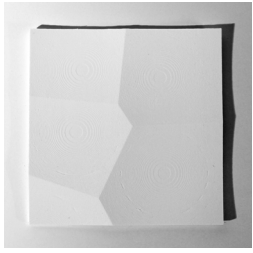


Rectangular grid w/  
uniform spacing

Rectangular grid w/  
non-uniform spacing

Paraboloids of varying  
depth (more volumetric)





Shallow paraboloids: non-volumetric (walkable)

Directional run-off local, regional + global

Distribution of paraboloids of varying sizes

'Cracking' the seams of intersection



Model: Elevation studies

## **A 'SEAMLESS' GEOMETRIC SYSTEM**

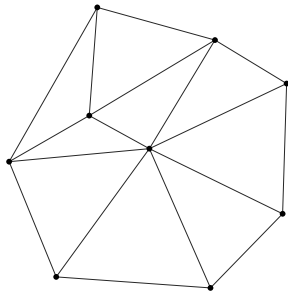
Apart from the volumetric implications suggested, the surface studies begin to develop relational interactions between adjacent surfaces. The intersection of the paraboloids results in two different kinds of edge conditions: a 'seam', or curve that defines the edge of adjacent surfaces, and a 'peak', or point that defines the meeting point or end point of a two adjacent paraboloids. The first condition occurs when the intersection of adjacent surfaces is non-planar, while the second occurs when there is only one single point of intersection between two or more surfaces.

The geometric system utilized for the design of this thesis deploys a combination of both conditions: a mixture of 'seams' and 'peaks' that later define the programmatic distribution and the ecological conditions that result from the what these intersections mean on a cell-to-cell, or unit-to-unit basis. The two-dimensional system is a Delaunay Triangulation of a distribution of points on a site. The triangles are circumscribed by 3-point circles, forming the footprint of what in three-dimensions becomes a paraboloid. These points are later translated to 'peaks' and the intersection results in 3-sided parabolic surfaces with curved seams (adjacent paraboloids are of non-identical depth due to their different-sized circular footprints, thus their respective curvature/concavity results in a non-linear intersection, softening the 'seam' and allowing the field of surfaces to read as a singular 'seamless' landscape).

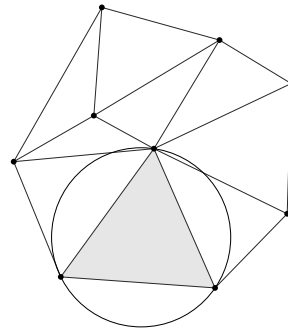
The peaks (distributed points) are co-planar, and thus the vertex of each parabolic surface is perpendicular to its focal point. These vertices are then connected by another layer in the geometric system that creates a subterranean network for water drainage.



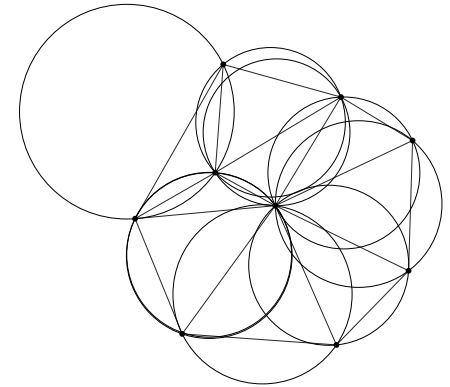
Point Distribution



Triangulation

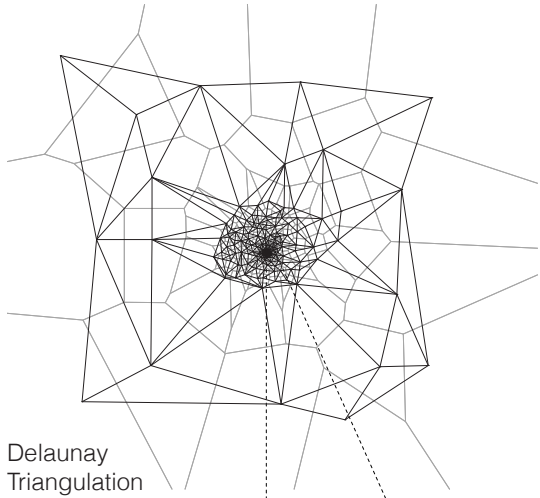


3-point circle  
(circumscribed triangle)

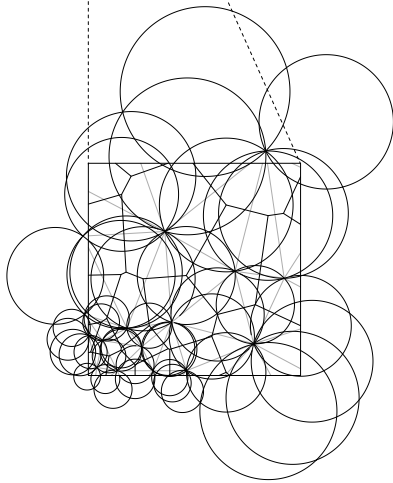


Intersecting circles on  
triangulated grid

Delaunay Triangulation

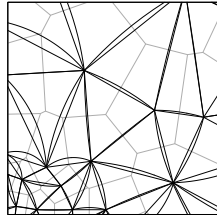


Delaunay  
Triangulation

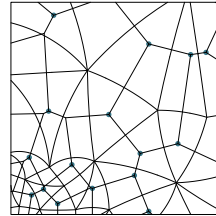


Intersecting Paraboloids

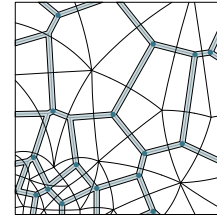
Intersecting  
paraboloids result in  
'triangulated' grid



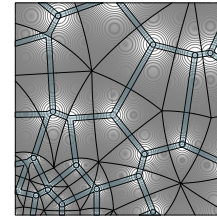
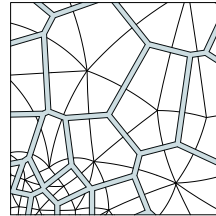
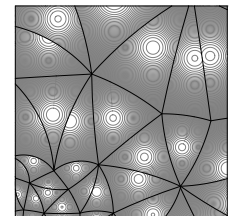
Secondary cracking  
system:  
connecting vertices  
of paraboloids)

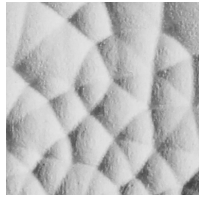


Secondary  
cracking system:  
water drainage

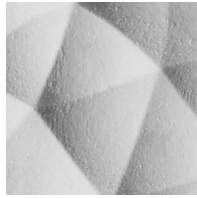


Topography

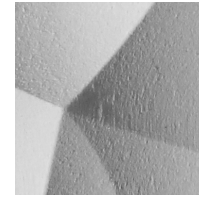




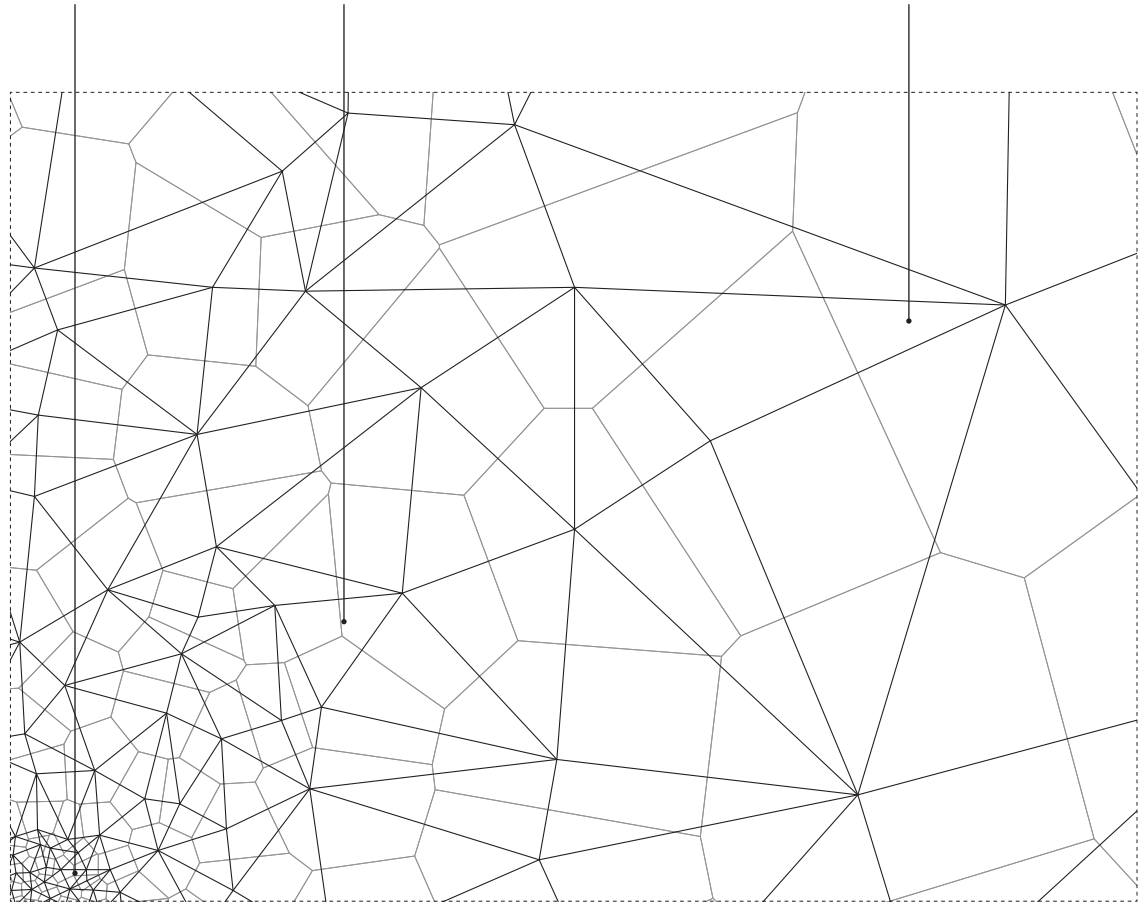
high density/  
small scale



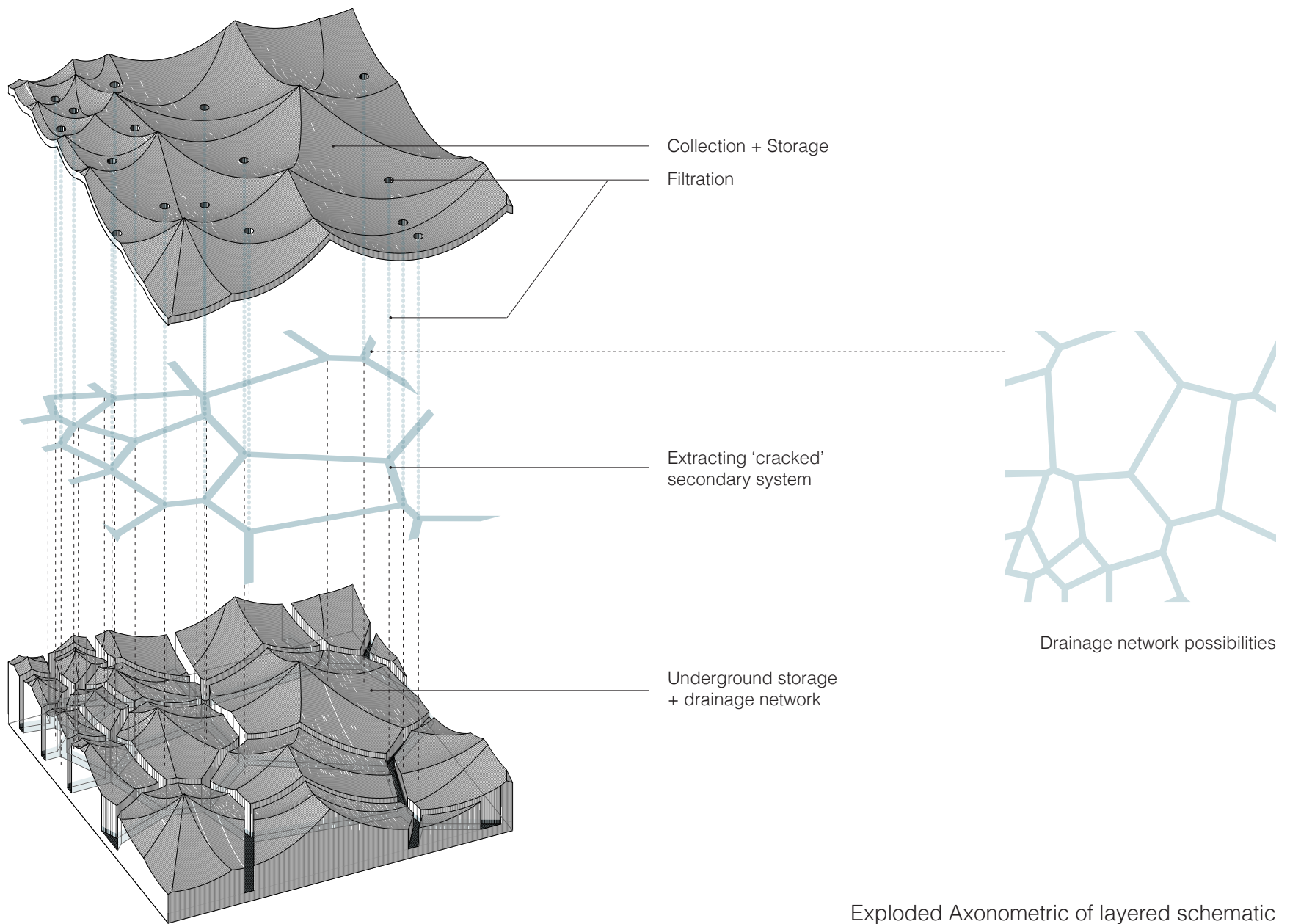
medium density



low density/  
large scale

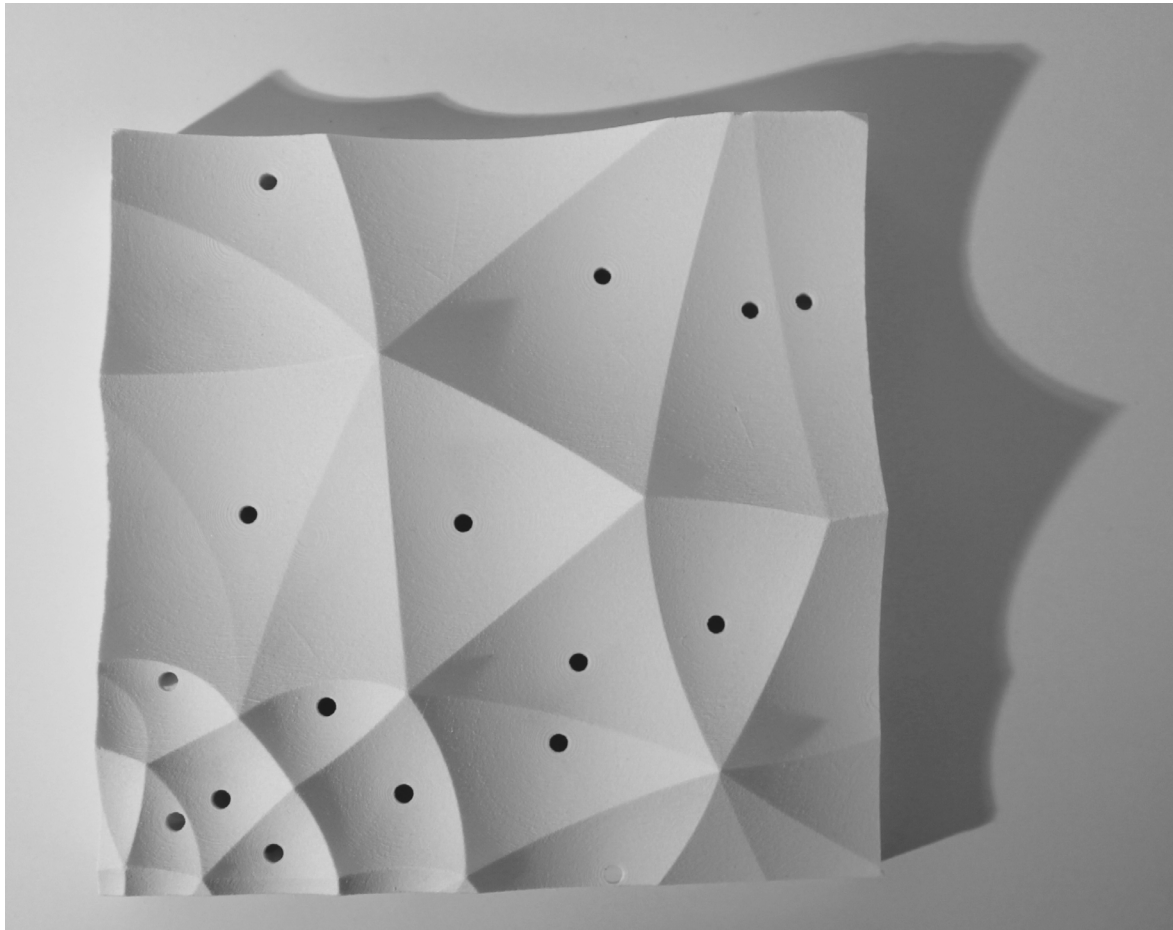


Sample of system: scale and rates of change

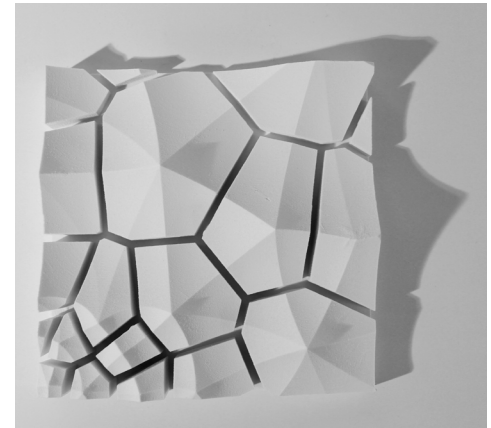


Exploded Axonometric of layered schematic

MODEL STUDIES



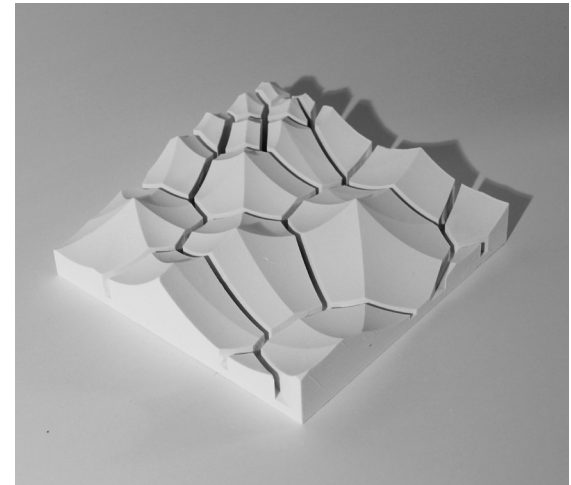
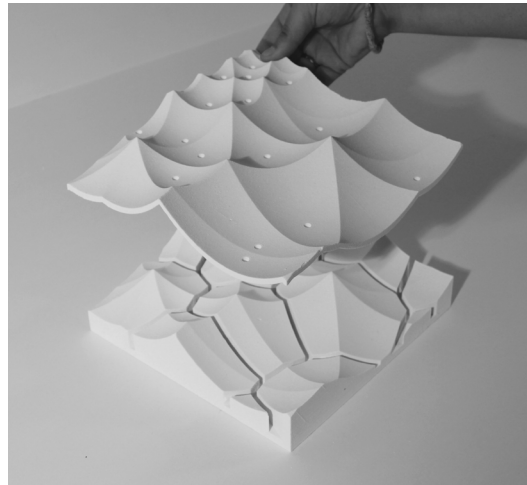
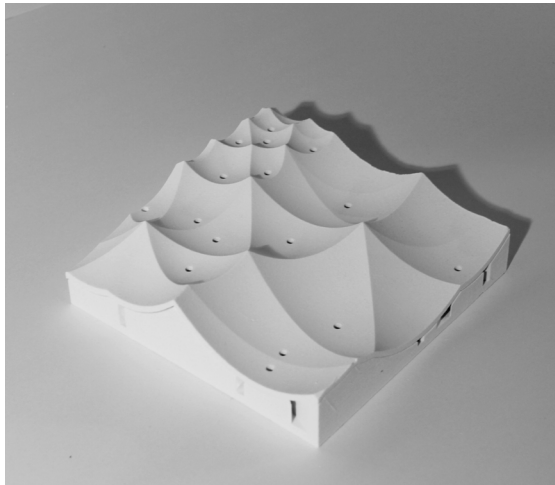
Groundscape surface with pores



Underground drainage network



MODEL STUDIES



Revealing relationship between pores (vertices) and drainage network

### **UNITIZING A SEAMLESS GROUNDSCAPE**

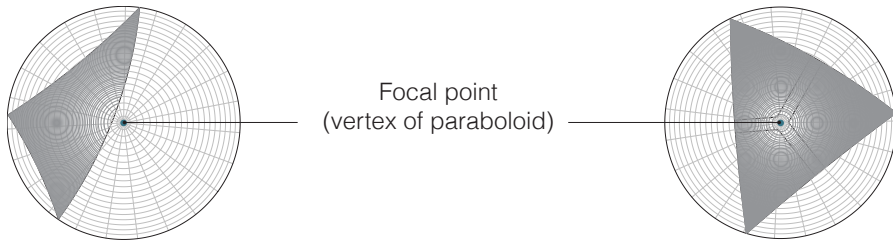
The 3-sided parabolic surfaces that result from the intersection of adjacent paraboloids on the grid vary widely in shape and size. The point of intersection between two adjacent paraboloids begins to categorize the 'cells', transforming a 'seamless' field of concave surfaces into a unitized landscape. The performative features of each cell depends on the condition of intersection with its neighboring cell. This, with the inclusion of material considerations, results in three types of surfaces that serve different functions in terms of water treatment, and inherently lead to various ecological conditions that contribute to the temporal behavior of the landscape as a whole.

Type I surfaces occur when the point of intersection of two paraboloids surpasses the vertex of one of the paraboloids. This means that the surface can no longer function as a basin or container for water, and can thus only transport water from one cell to another. These are made of impervious concrete and thus do not drain water.

Type II surfaces both contain and drain water. Made of impervious concrete (as with Type I), this surface has a pore inscribed at its vertex, where the water collects and then filters through to the underground drainage network.

Type III surfaces are a variation of Type II, but are made of porous/organic concrete and do not have an inscribed pore at the vertex. Therefore, the surface can contain and drain water, but at a much slower rate.

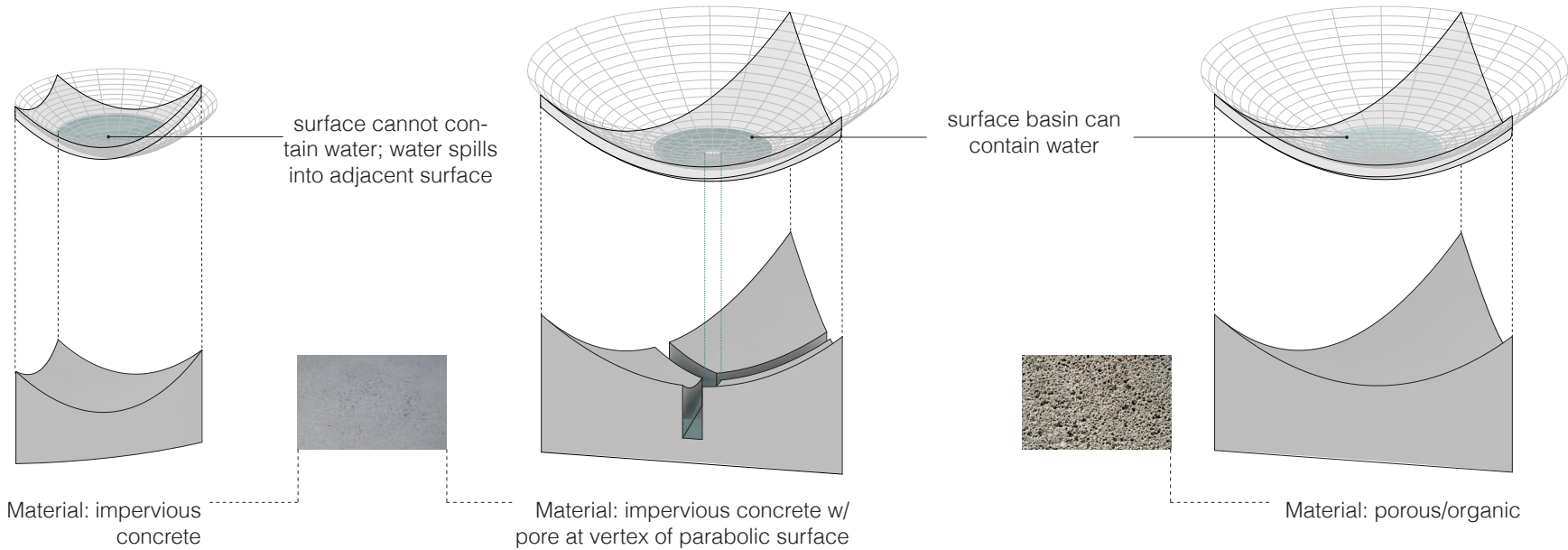
SURFACE TYPES: A taxonomy



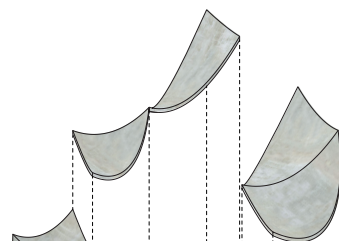
TYPE I:  
Water Transport

TYPE II:  
Water Containment  
(+ drainage)

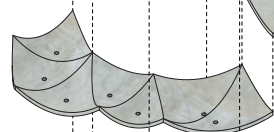
TYPE III:  
Water containment  
(+ slow drainage)



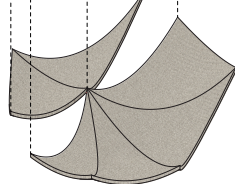
TYPE I SURFACES  
(impervious concrete)



TYPE II SURFACES  
(impervious concrete w/ inscribed  
central pore)



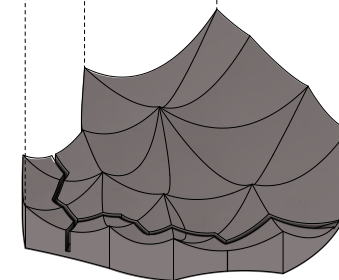
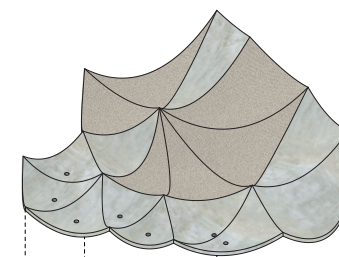
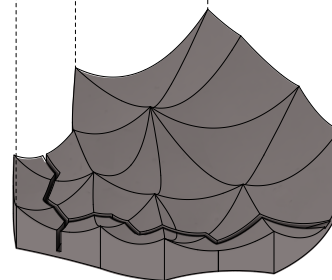
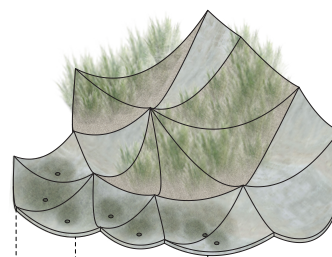
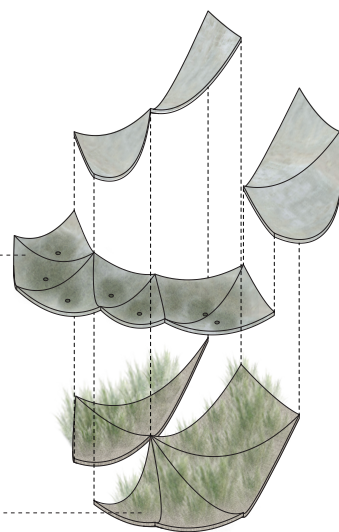
TYPE III SURFACES  
(porous/organic concrete)



Moss



Grass

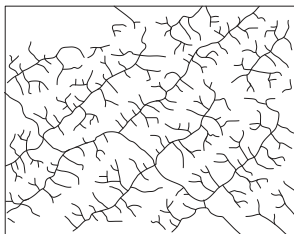


Ecological conditions created out of system unitization

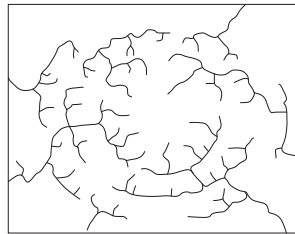
## WATER DRAINAGE PATTERNS

The secondary 'cracked' grid in the geometric system allows for the carving of an underground network of channels that link vertices of paraboloids together. The variable topographical conditions of the site both on a local and global scale suggest a certain kind of responsibility to be assumed by the drainage pattern.

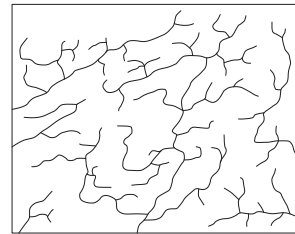
The following is a study of natural drainage patterns on different types of terrain and soil/material conditions. The idea is to incorporate these natural drainage schematics into the geometric relationship of the systematic network to accommodate for the topography of the site as well as to create a more controlled, directional water flow beneath the groundscape surface, leading to larger programmatic implications.



TRELLIS  
folded mountains

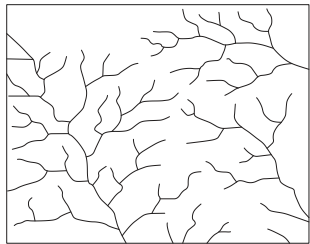


ANNULAR  
forms on volcanoes

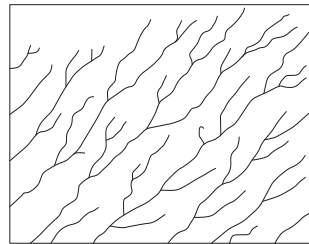


CONTORTED

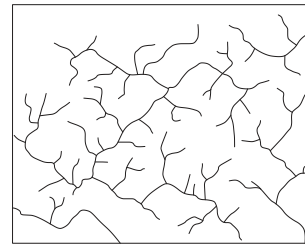
# WATER DRAINAGE PATTERNS



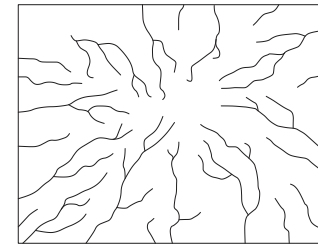
**DENDRITIC**  
forms in v-shaped valleys



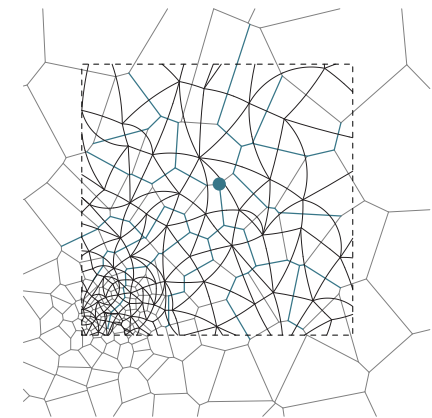
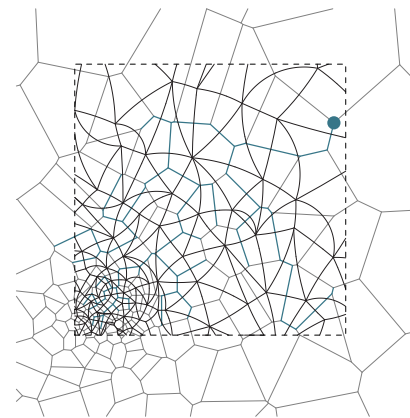
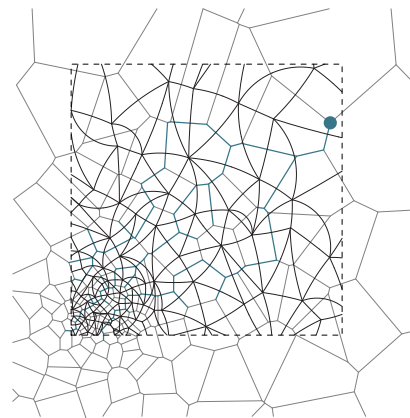
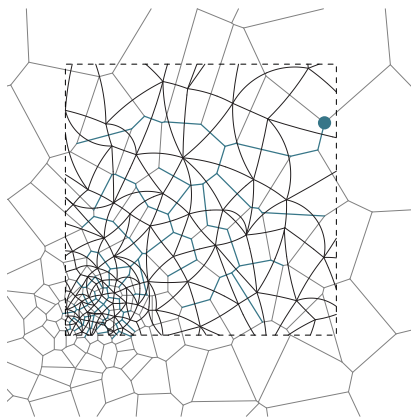
**PARALLEL**  
steep slopes w/ some relief



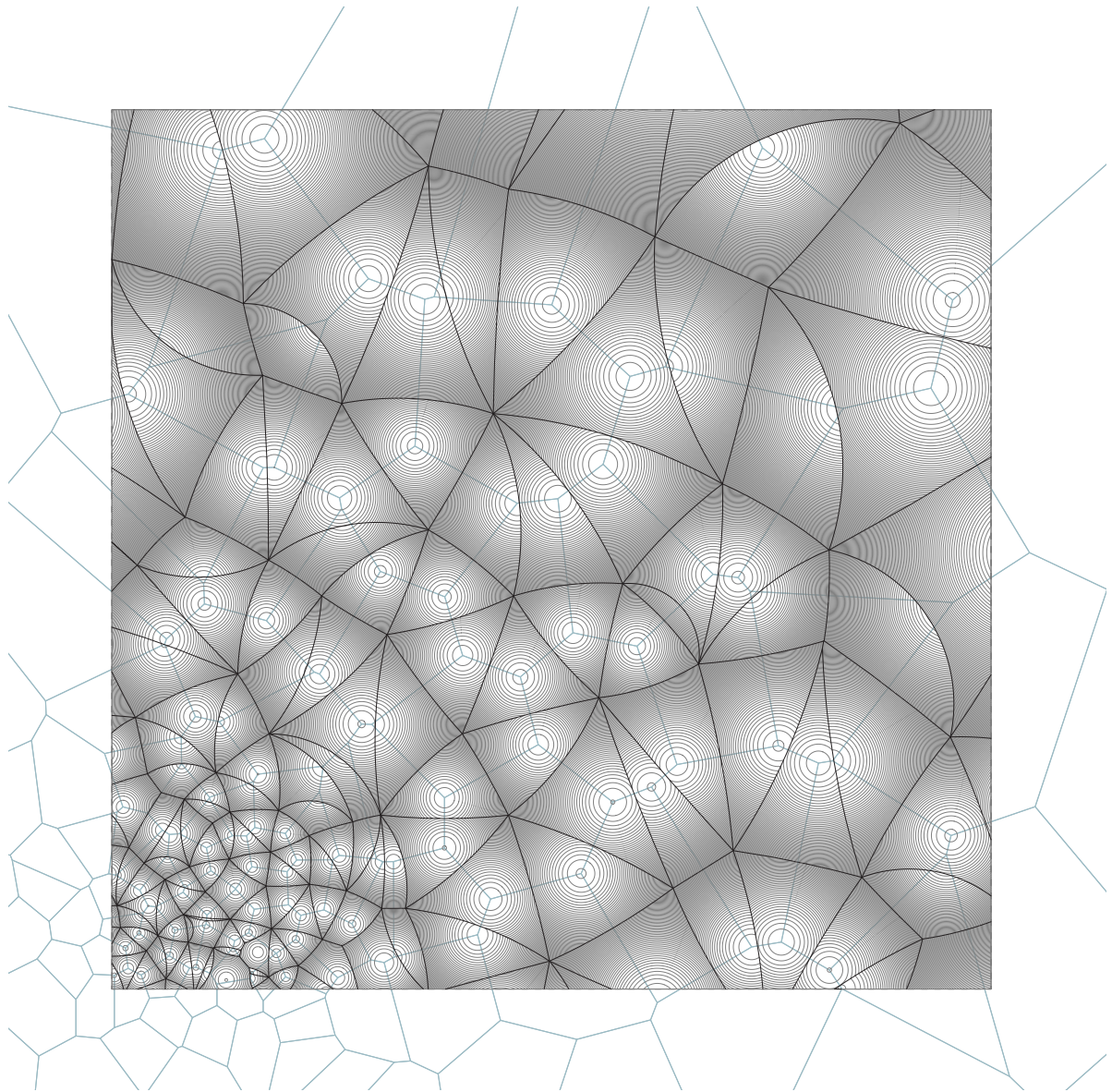
**RECTANGULAR**  
faulted/fractured bedrock



**RADIAL**  
volcanoes + round uplifts of land

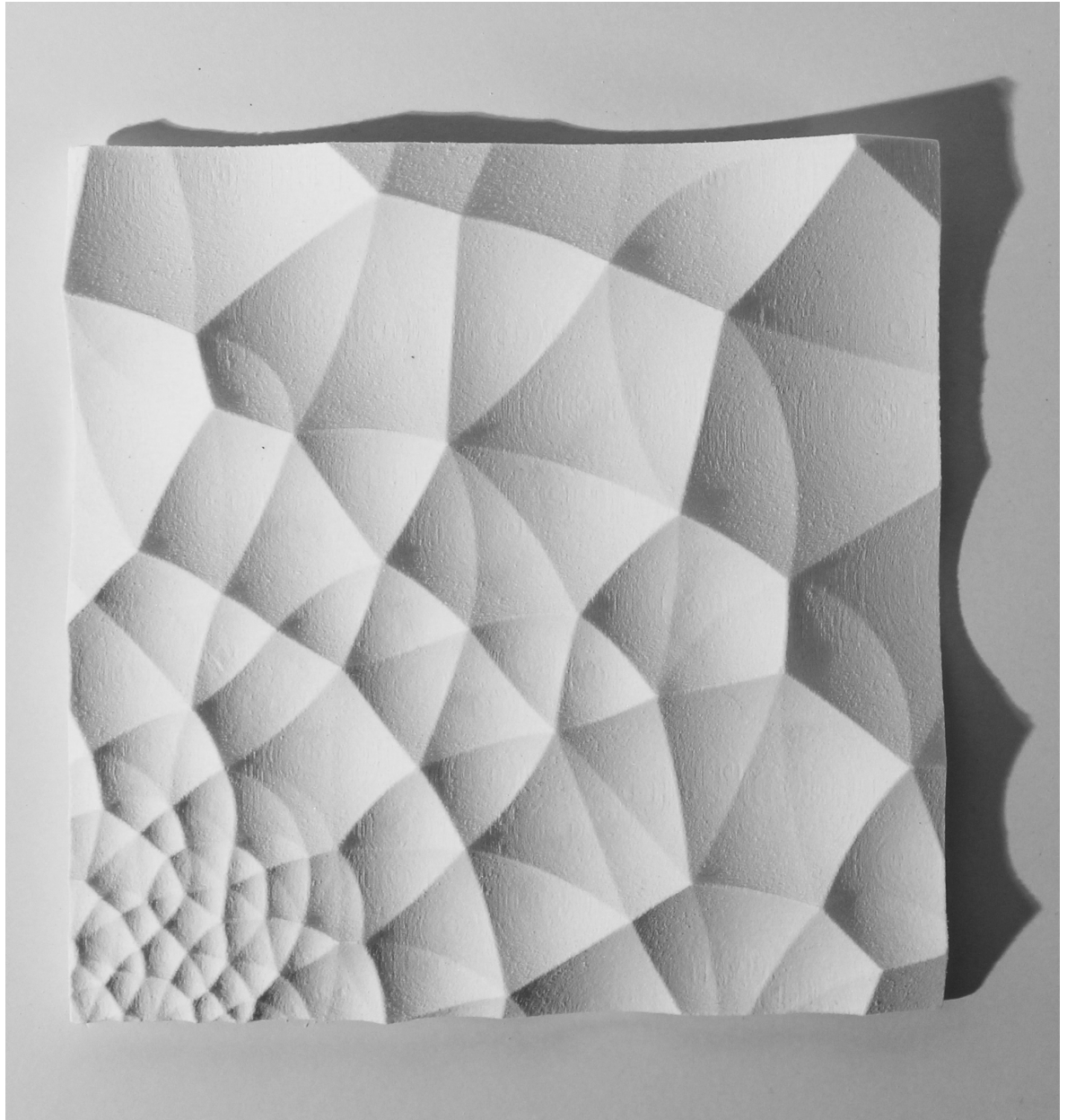


Modifying systematic drainage pattern for different topographical/programmatic conditions



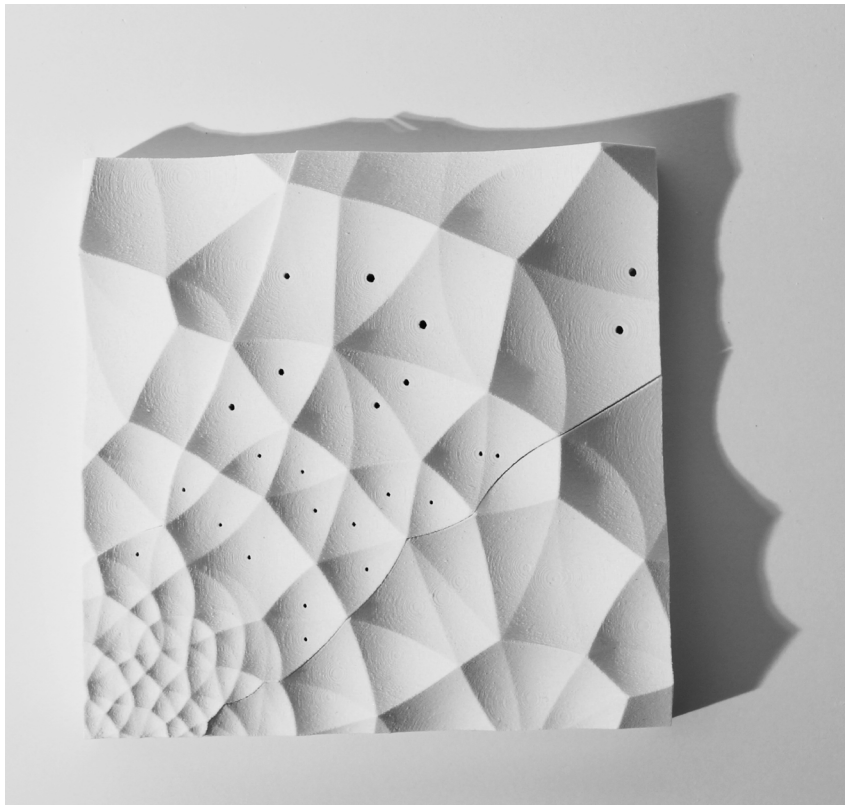
Sample of system

MODEL OF SYSTEM SAMPLE

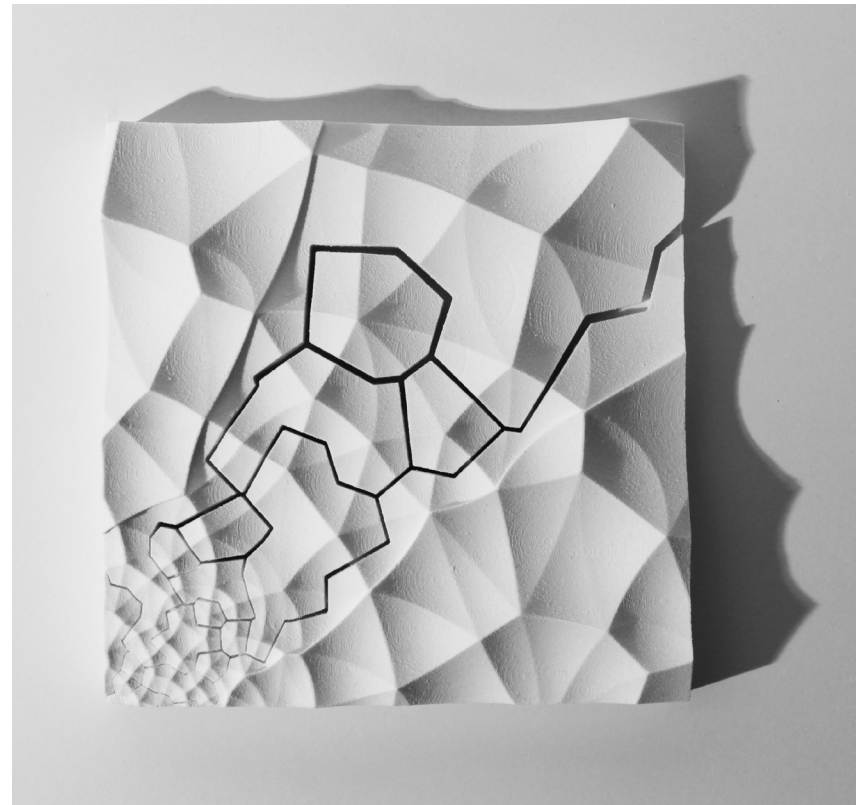




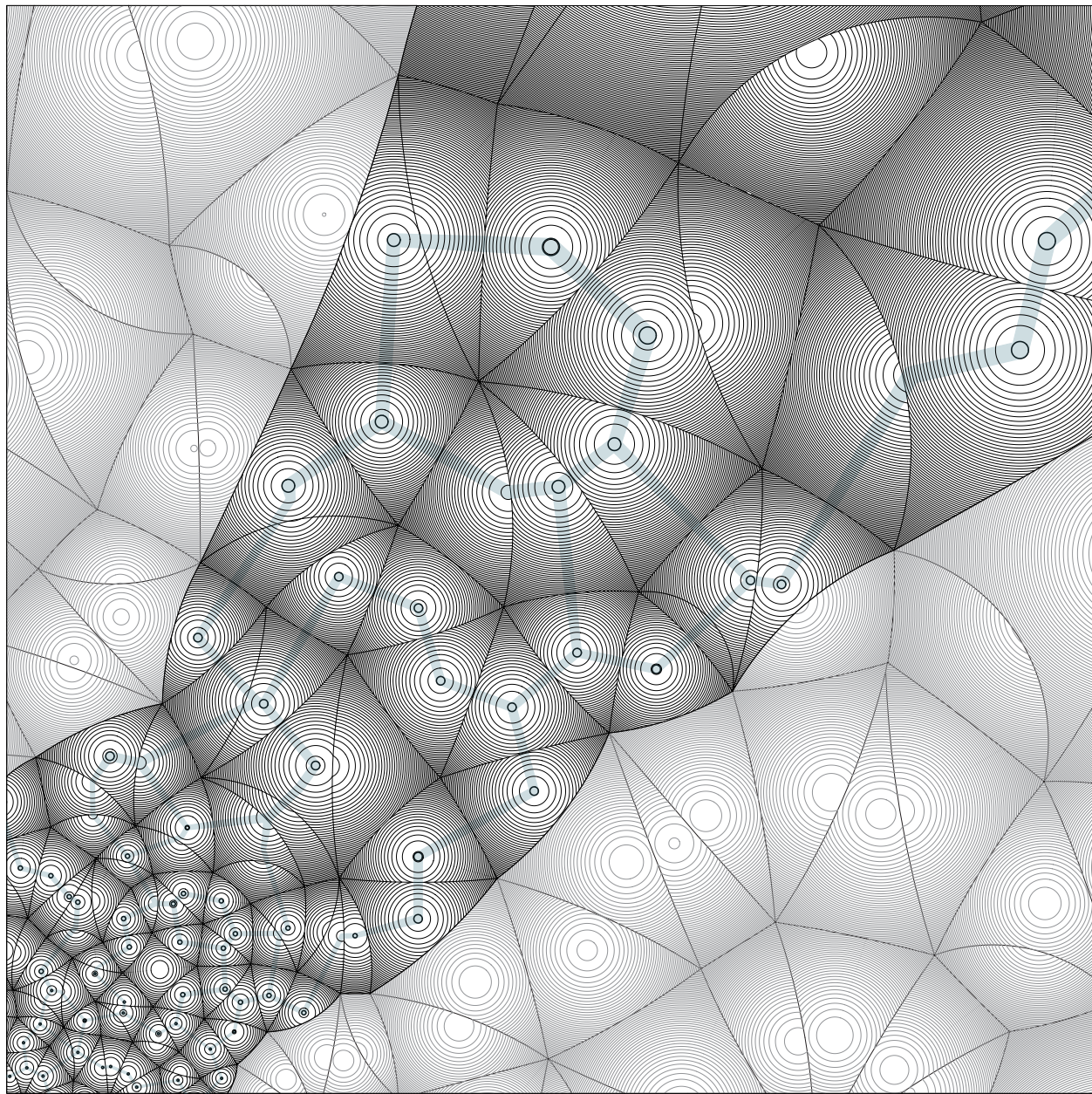
MODEL OF SYSTEM SAMPLE



Groundscape surface with pores

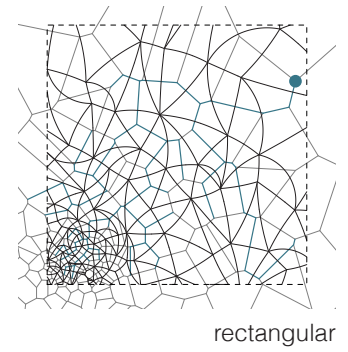
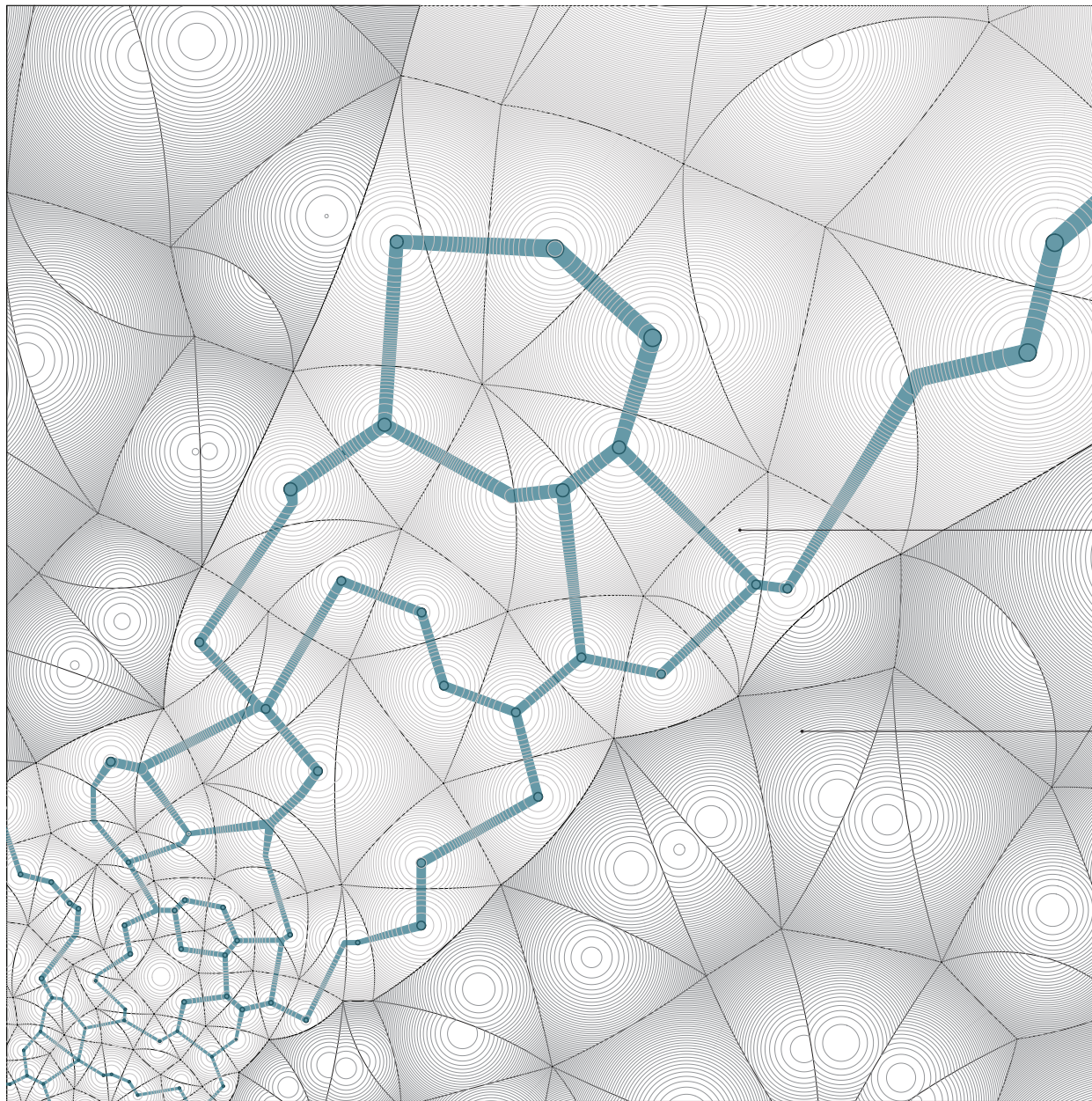


Underground drainage network



Size of pore (and width of stream) scales accordingly with the scale of the geometric system-- larger basins will hold more water and thus need to drain faster

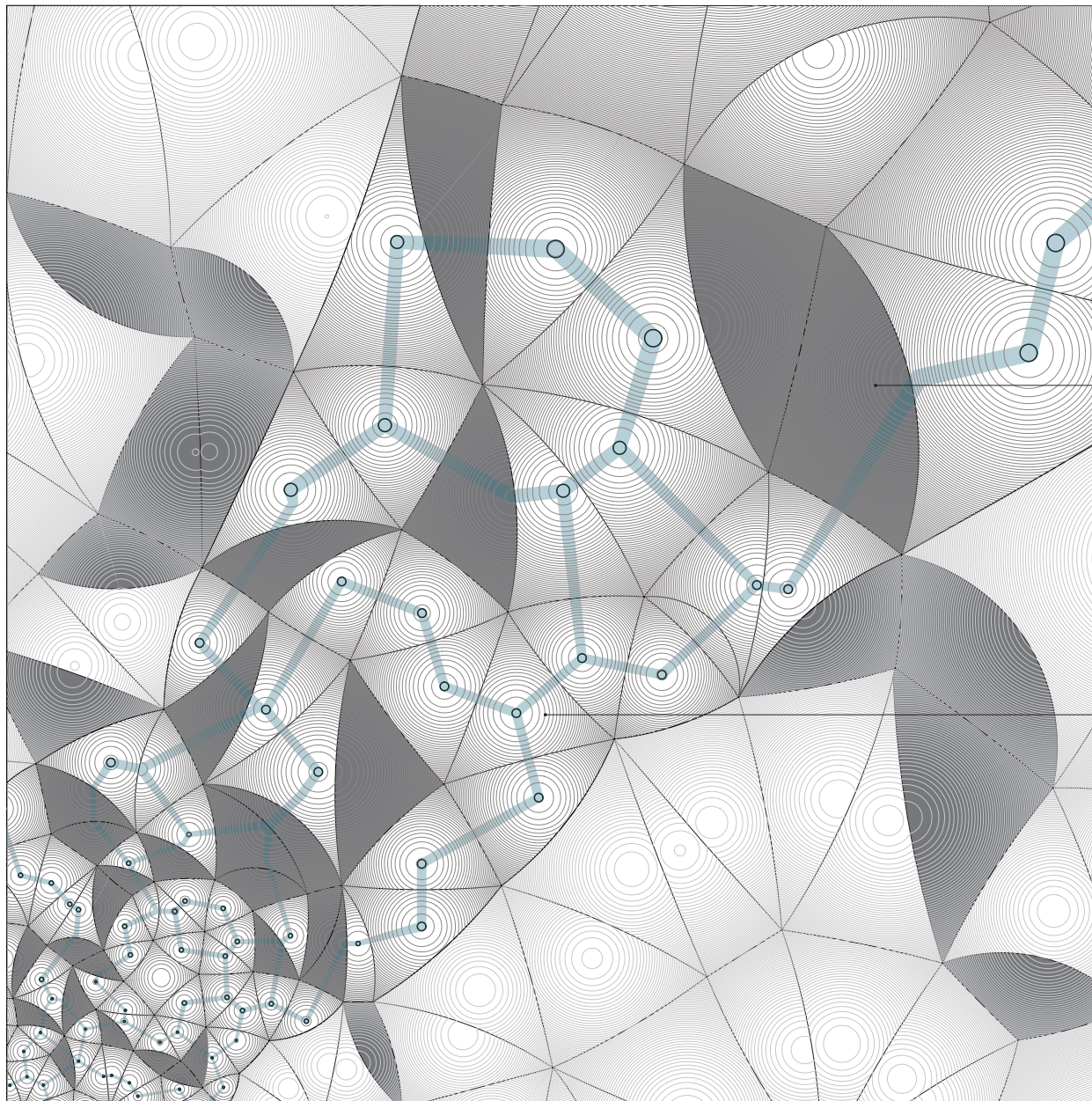
Sample of System: topographical map



Hardscape (concrete)

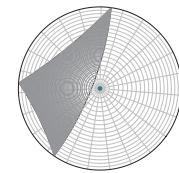
Softscape (natural landscape/ grass)

Sample of System:  
drainage pattern

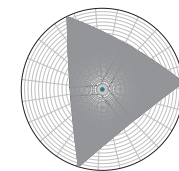


Potential experiential/ecological effect: plant growth varies across cells

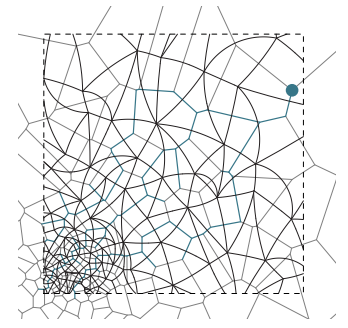
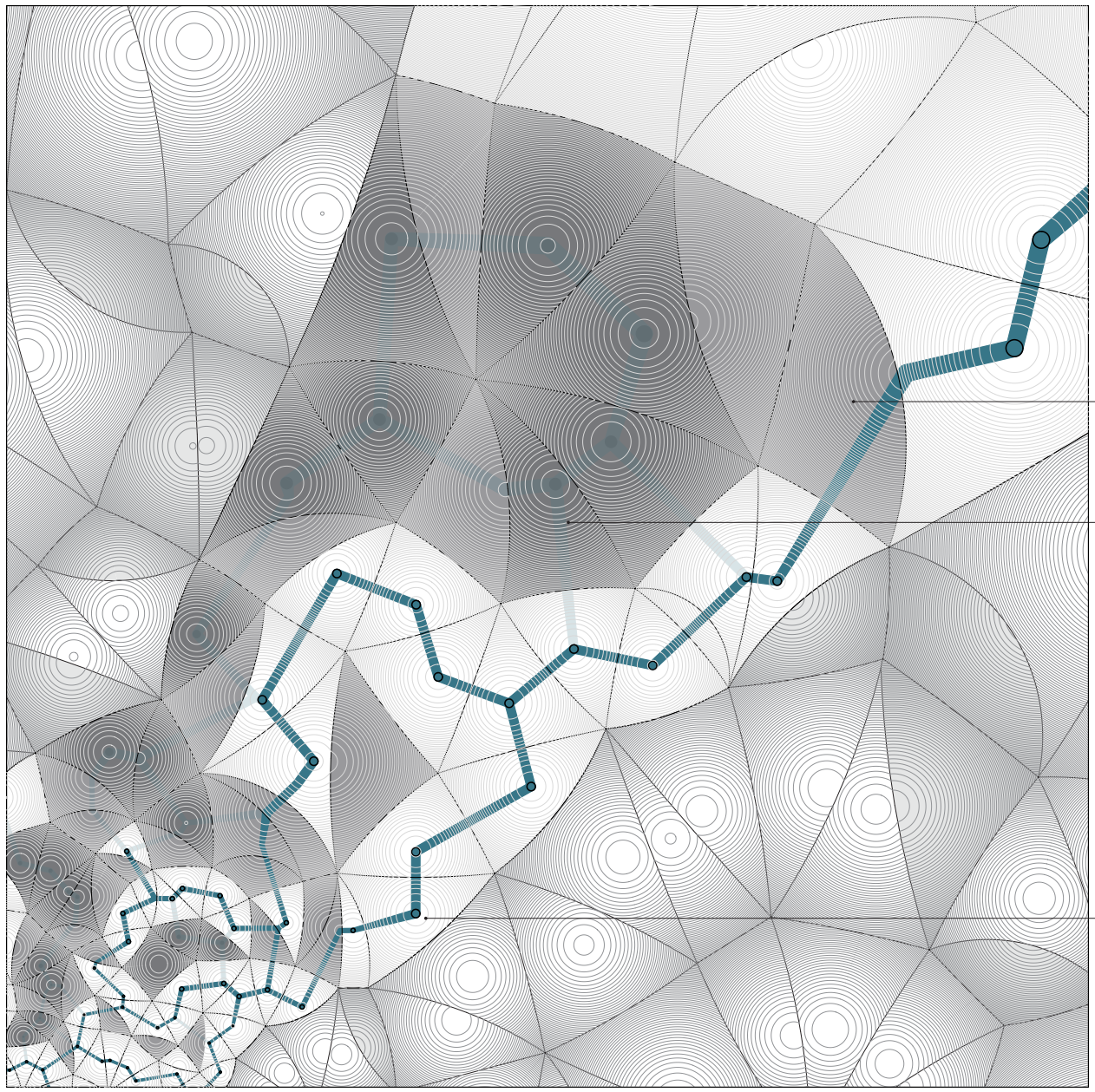
TYPE I SURFACES: transport water (non-porous)



TYPE II SURFACES: contain water (non-porous material w/ central pore for drainage)



Sample of System:  
Type I and Type II surfaces



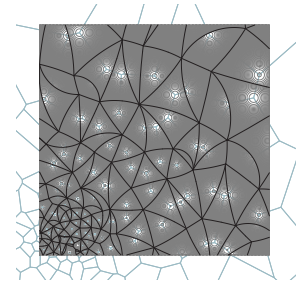
parallel

TYPE I SURFACES: transport water (non-porous)

TYPE III SURFACES: contain water (porous material w/o central pore - drainage occurs very slowly, allowing for plant growth over a long period of time)

TYPE II SURFACES: contain water (non-porous material w/ central pore for drainage)

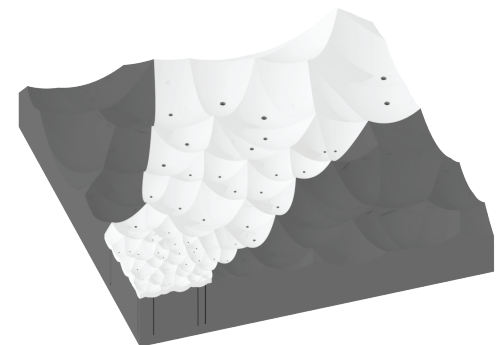
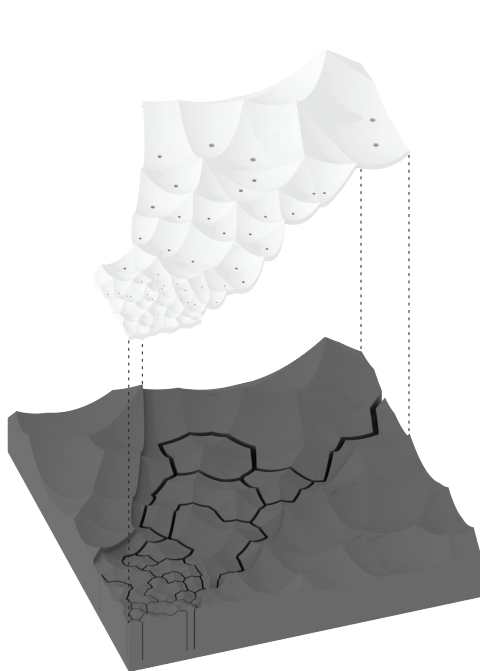
Sample of System:  
 drainage pattern: reflecting underground infrastructure onto surface + introducing Type III surfaces



### FUNCTIONAL HIERARCHY

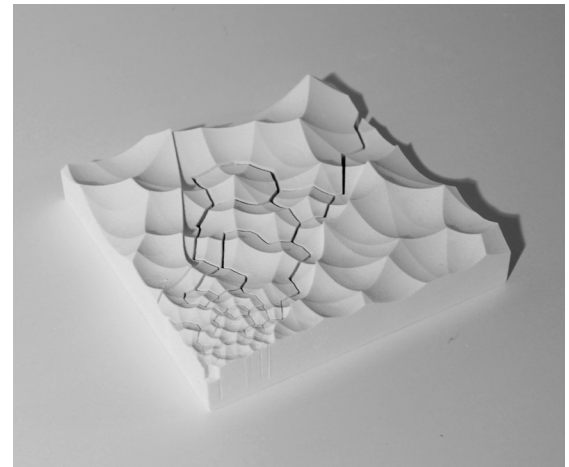
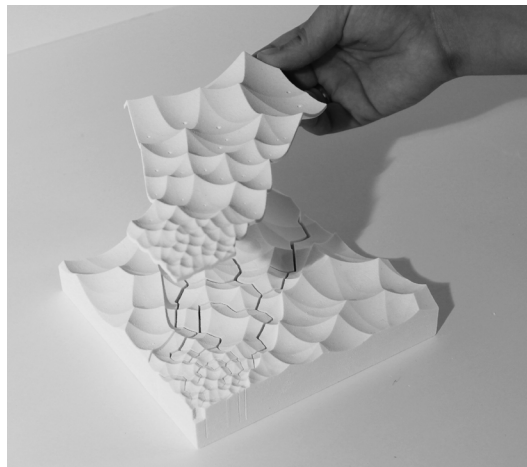
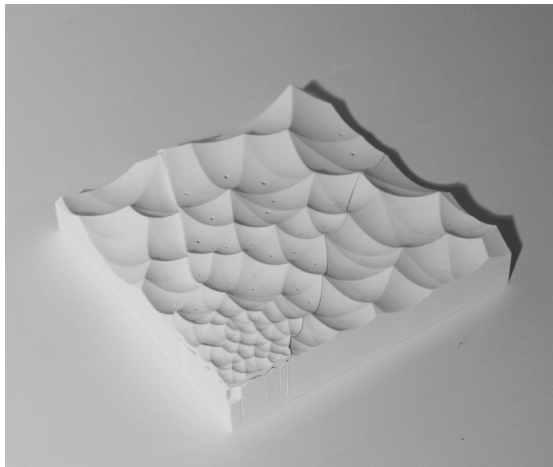
Paraboloids carved into natural 'softscape'. Water travels on surface, drains naturally, spills into tributary (non-purified water)

Hardscape 'inserted' into landscape. Water flows on surface, is drained + treated underground, spills into public pools (cleaner water)



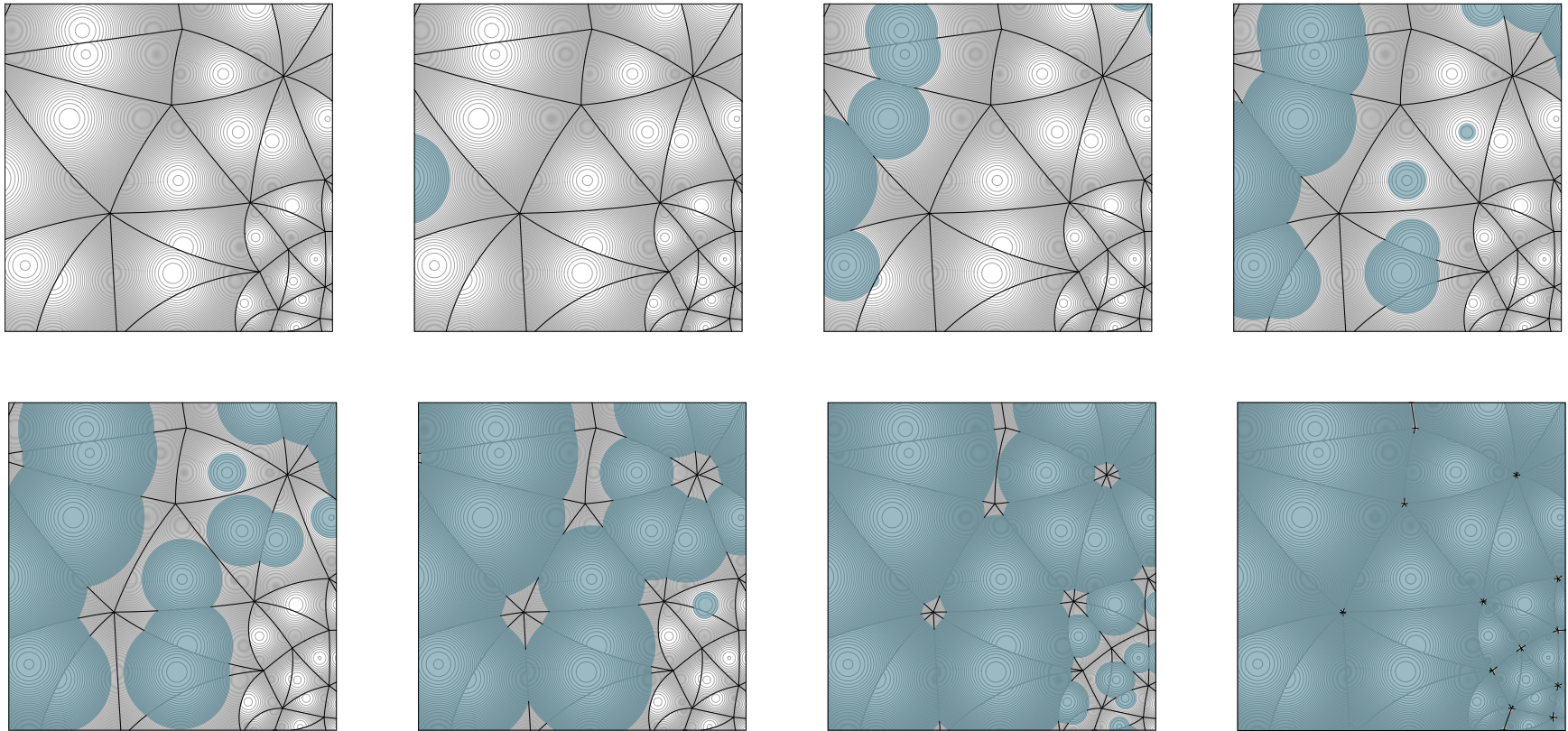
Integrating hardscape into natural landscape

MODEL STUDIES



Separating the hardscape from the softscape

STUDYING WATER FLOW ON SURFACES



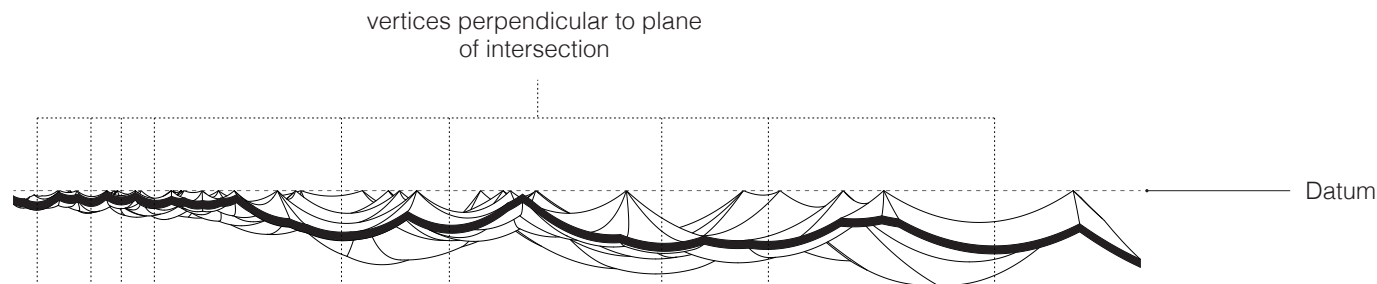
Increasing water levels

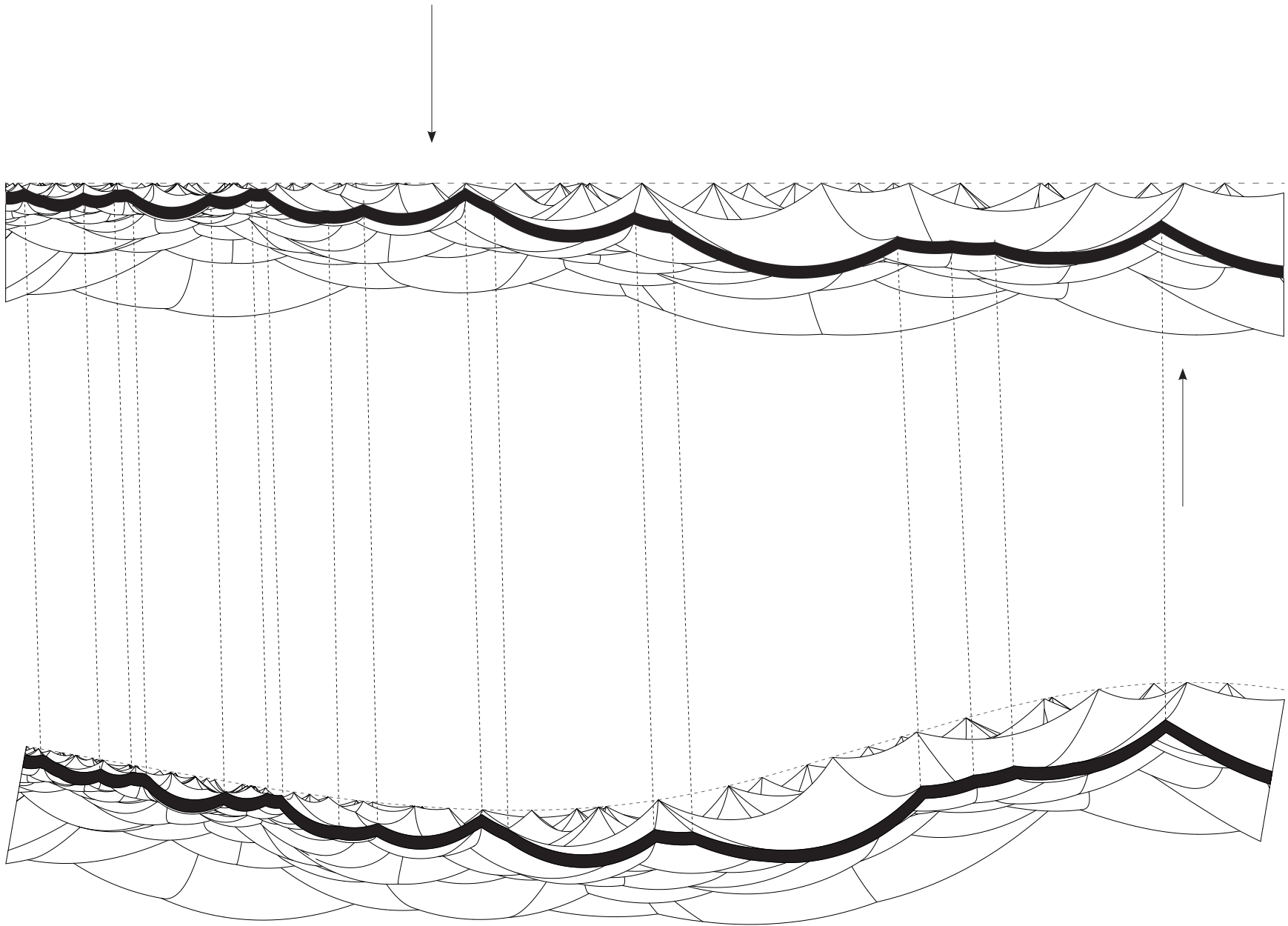


## ADDRESSING SYSTEM LIMITATIONS: Integrating geometry into the urban fabric

Paraboloid intersections are only possible when the caps of the paraboloids are co-planar. This results in a 'datum' that defines the peaks of the geometric intersection, suggesting that the parabolic surfaces are 'carved' into the landscape through a manner of boolean operations. This limitation prevents the 'upper' datum of the system from being manipulated, thus limiting the number of ways the system can be controlled globally if treated as a series of individual paraboloids intersecting one another.

This limitation is addressed by treating the intersecting surfaces as a singular, undulating landscape surface that is then morphed globally to match the elevational qualities of the existing site topography.





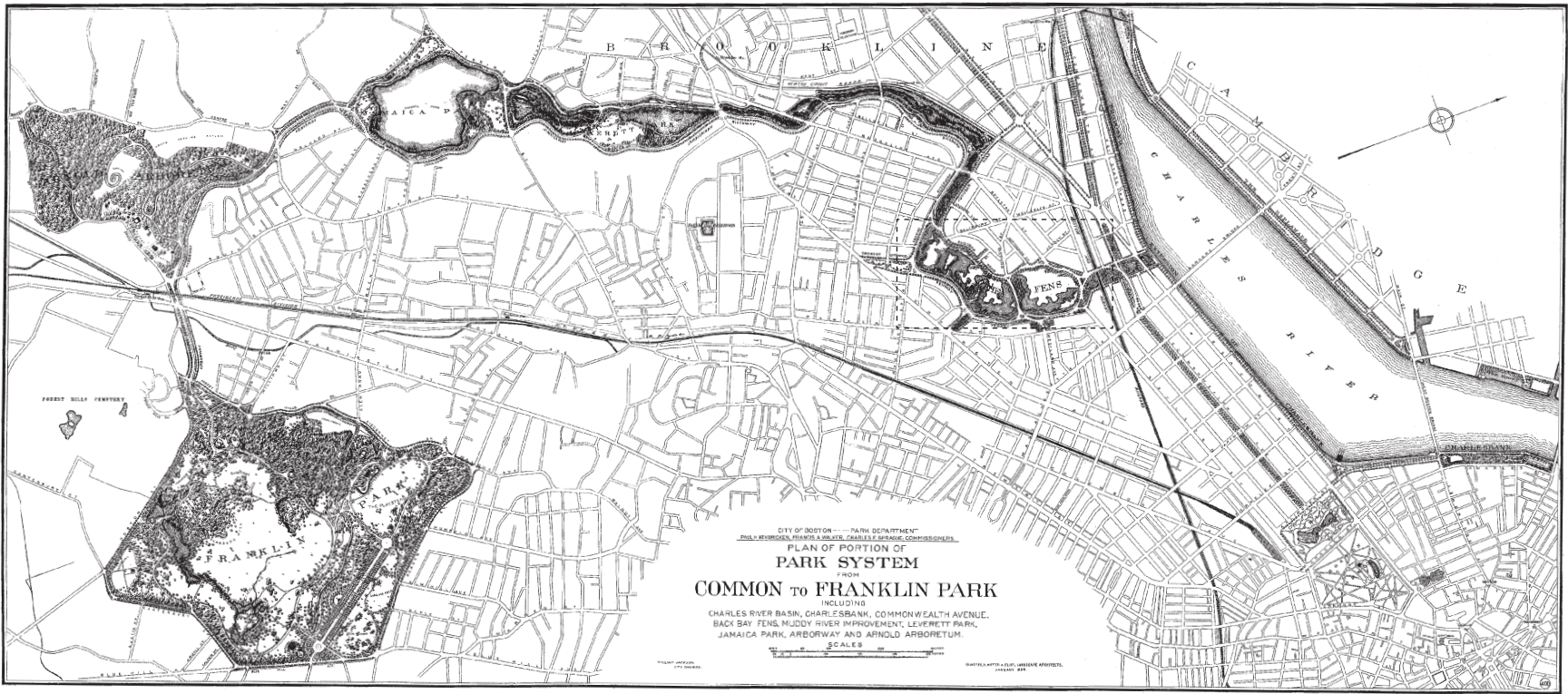
Global manipulation of system geometry: applied to topography of site (sample shown)

## **SITE SELECTION AND ANALYSIS**

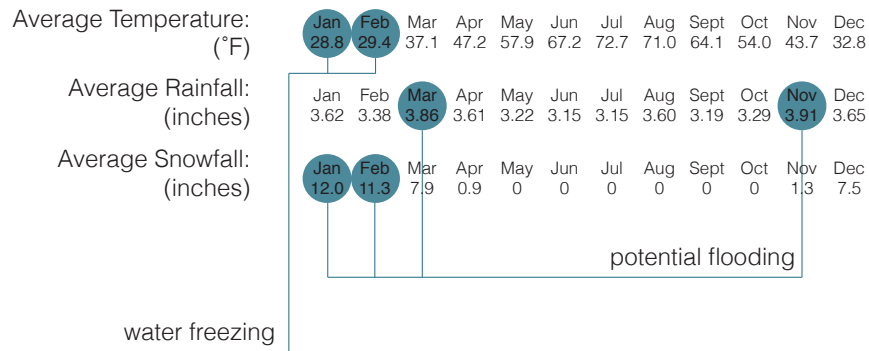
In choosing the site for this project, it was important to consider the social, ecological and architectural responsibilities evoked by the design of this intervention, and ultimately finding a site that resonates with these ideals both physically and historically.

The Back Bay Fens was selected firstly as a historical symbol of land reclamation as part of Boston's Emerald Necklace. Designed by Frederick Law Olmsted, its objective was to transform the city's urban wild into a recreational and ecologically healthy parkland. Its location in an urban setting means that the site has to deal with water quality control due to urban stormwater run-off, which carries sand, sediment and various pollutants from streets and parking areas into the river. With Back Bay in danger of flooding, Olmsted's objective was to improve water quality in the Muddy River and Stony Brook (the tributaries that feed into the Charles River) and the quality of stormwater entering the river from local storm drainage systems. The low flow rate of water during dry weather did not allow for channel flushing or sufficient dilution of pollutants discharged from the storm drains. Olmsted's idea was to create a 'Stormwater park' and argued for the juxtaposition of the salt marsh and the city, resulting in a freshwater lagoon.

The site has the added benefit (for this thesis) of being located in a humid subtropical climate, where the weather fluctuates dramatically between hot and below-freezing temperatures. This enriches the presence and behavior of water on the site as it naturally implies that water can and will exist in both its liquid and solid states. This informs the temporal morphology of the groundscape as well as the seasonal variation in its experiential qualities.



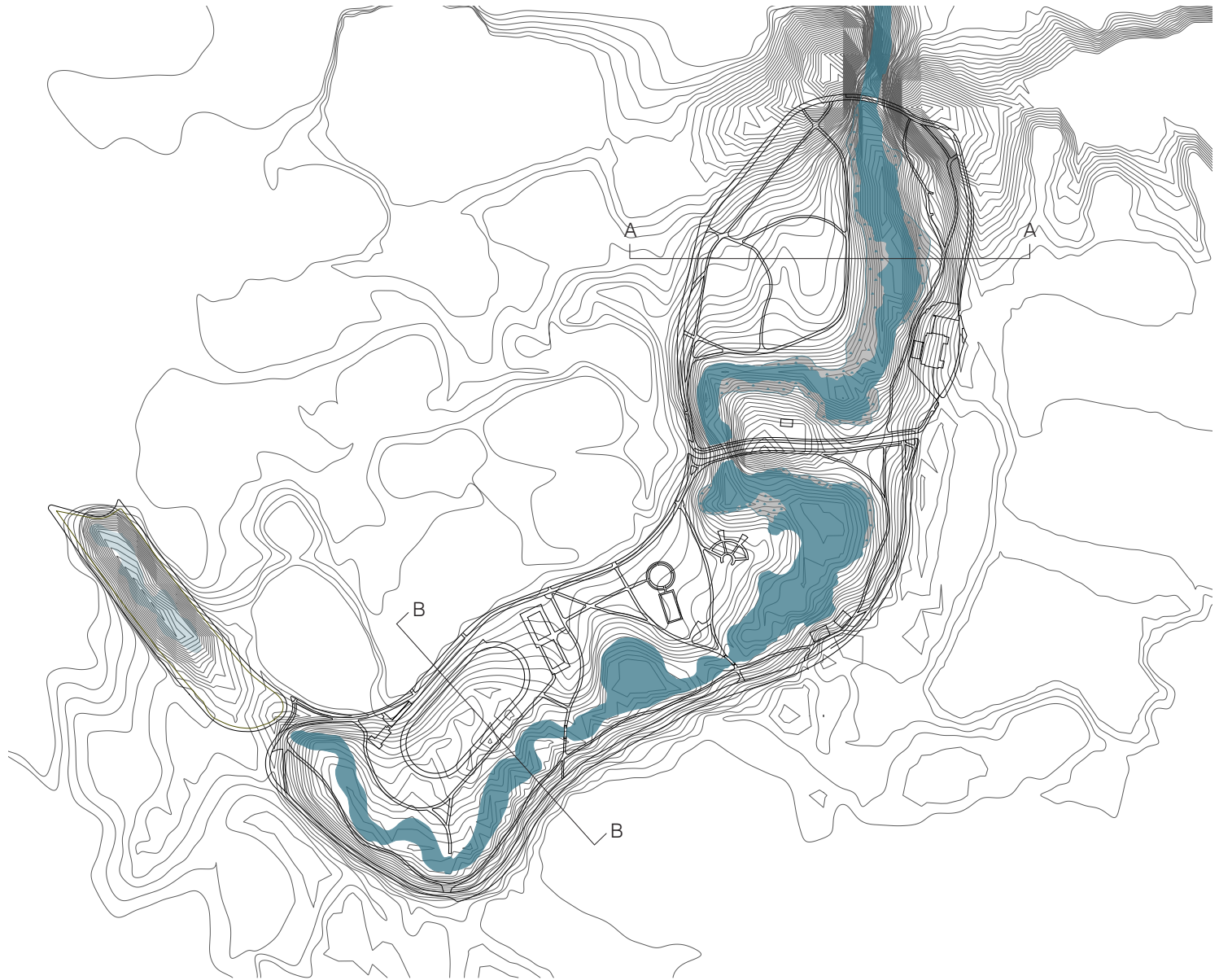
Plan of the Emerald Necklace from the Olmsted Archives



Boston Climate Data



The Back Bay Fens



Site map with natural topography



Site map with surrounding urban context

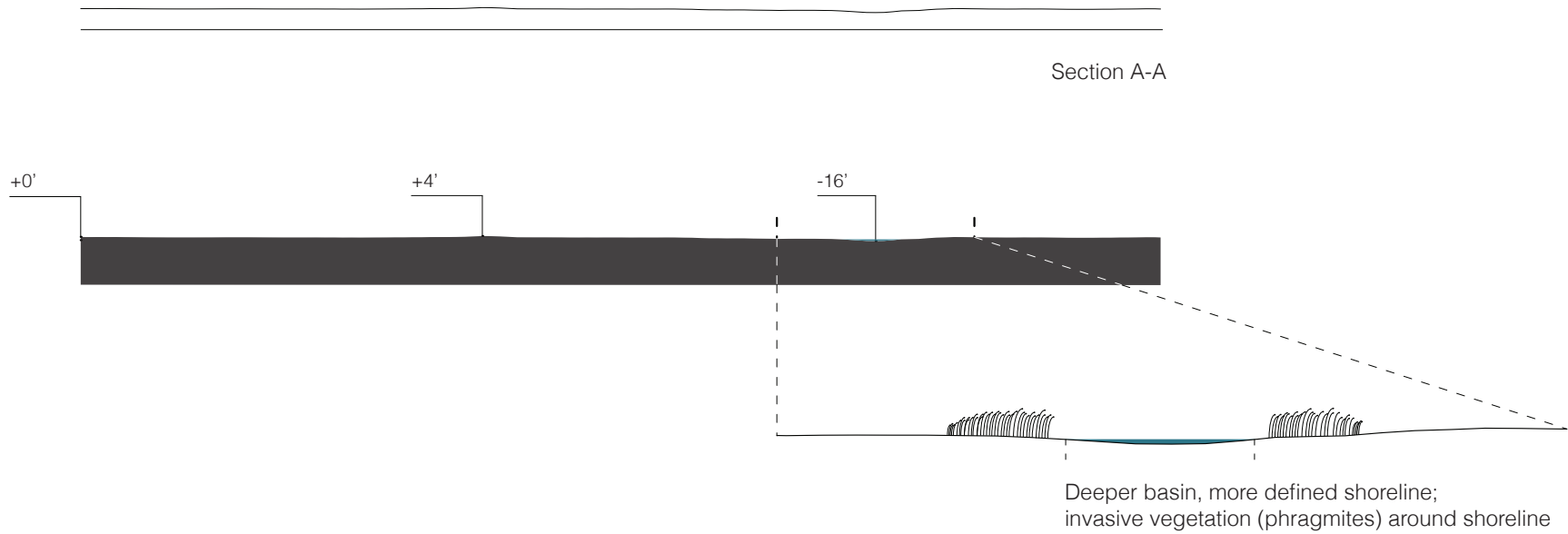
SITE SECTION  
Section A-A



Invasive vegetation (Phragmites)  
on site



Site plan w/ section cuts



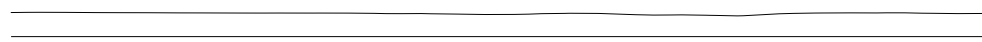
Section A-A

Deeper basin, more defined shoreline;  
invasive vegetation (phragmites) around shoreline

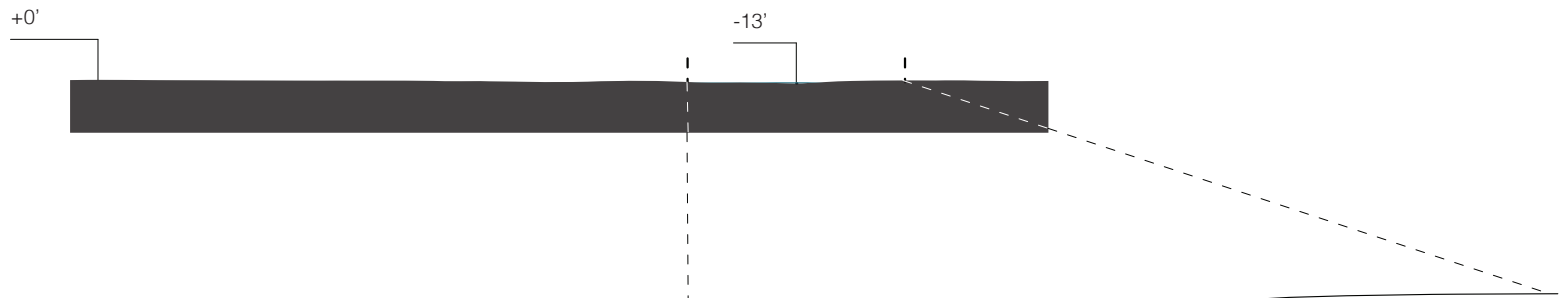
SITE SECTION  
Section B-B



Site plan w/ section cuts



Section B-B



Shallower basin, less defined shoreline;  
minimal plant growth (soil too saturated)





Photograph of Site (Back Bay Fens), February 2012



Photographs of Site (Back Bay Fens), February 2012

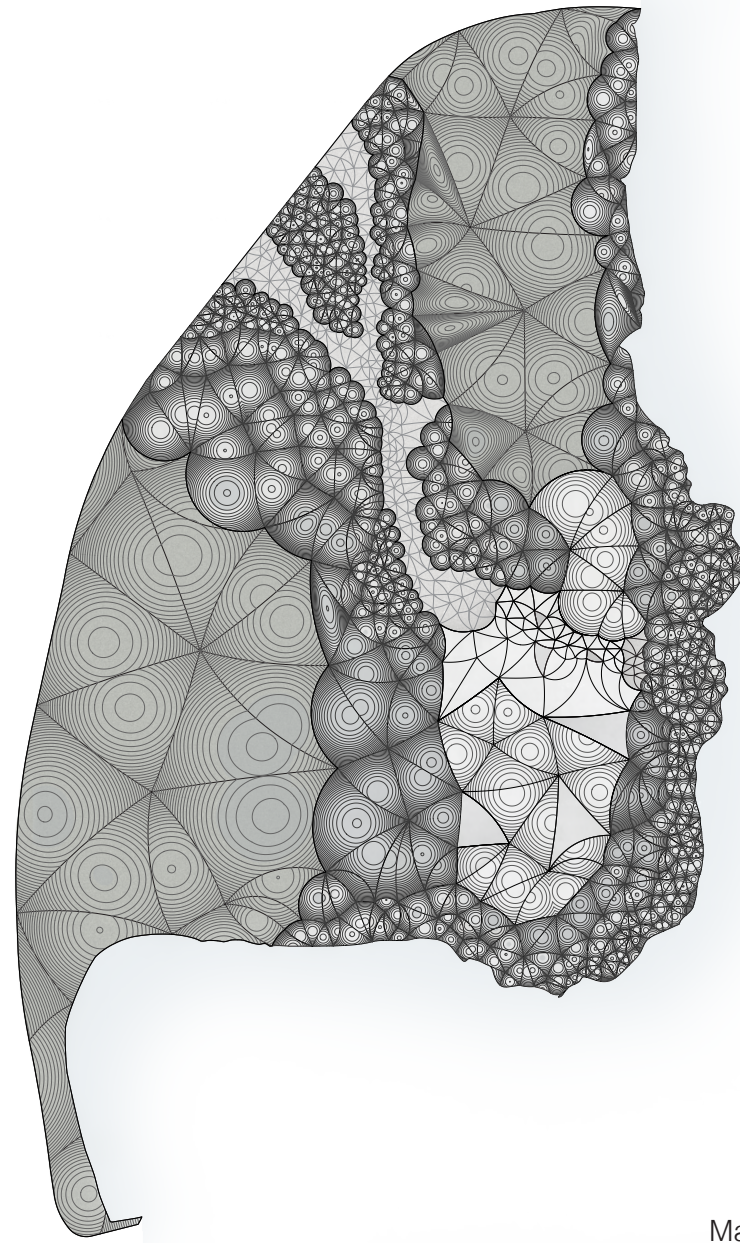
## **DESIGNING THE WATERSCAPE**

The geometric system deployed is applied to the site with considerations for topographical information of the natural landscape. The rate of change of scale and density of the geometry is incorporated into the urban fabric, accommodating for collection of urban run-off at the highest elevational region of the site. The scale of the system fluctuates accordingly, where larger basins are strategically situated in areas where water needs to be collected and stored, and smaller/shallower basins slowly transform into 'flattened' surfaces for pedestrian use. The edge of the groundscape (where it meets the water) has a high density of units (smaller basins) as it means that they are inherently at a higher elevation than larger basins. This is used as a method of flood control. Furthermore, the largest of basins are transformed into pools open for public use, and are located at a point where all underground drainage networks converge both planimetrically and topographically to supply the pools with water.

The integration of the system into the urban context yields both programmatic and performative agendas. The scale of the system begins to identify the tectonic and infrastructural relationship between surfaces used by people, surfaces used for water, and those used by both. This duality in the system generates an architectural vocabulary that begins to blur the boundary between architecture and landscape.



Master plan (roof plan) with urban context





Model

SITE MODEL



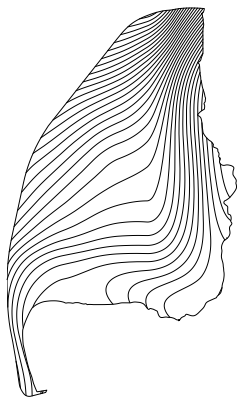


Perspective rendering

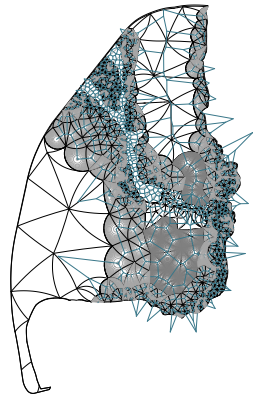


# GLOBAL DRAINAGE NETWORK

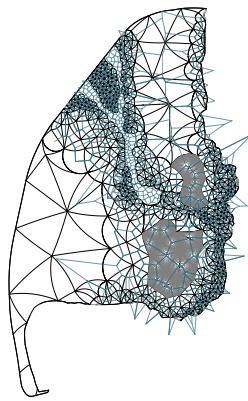
Incorporating the topography of the site and natural drainage schematics into the directional underground drainage system leading to the public pools



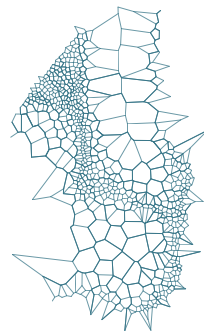
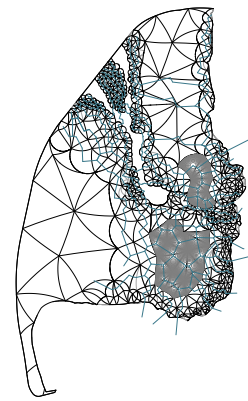
Global topography of site



All possible network branches



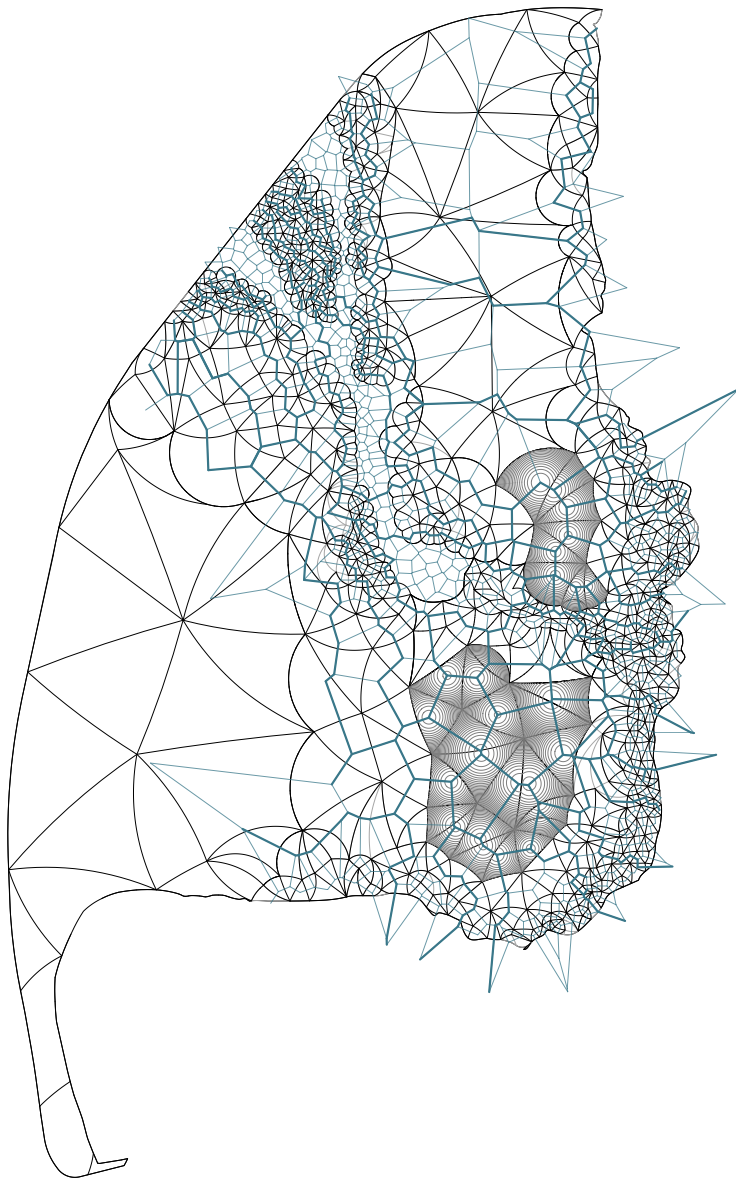
Designed network (selected branches for directional flow)



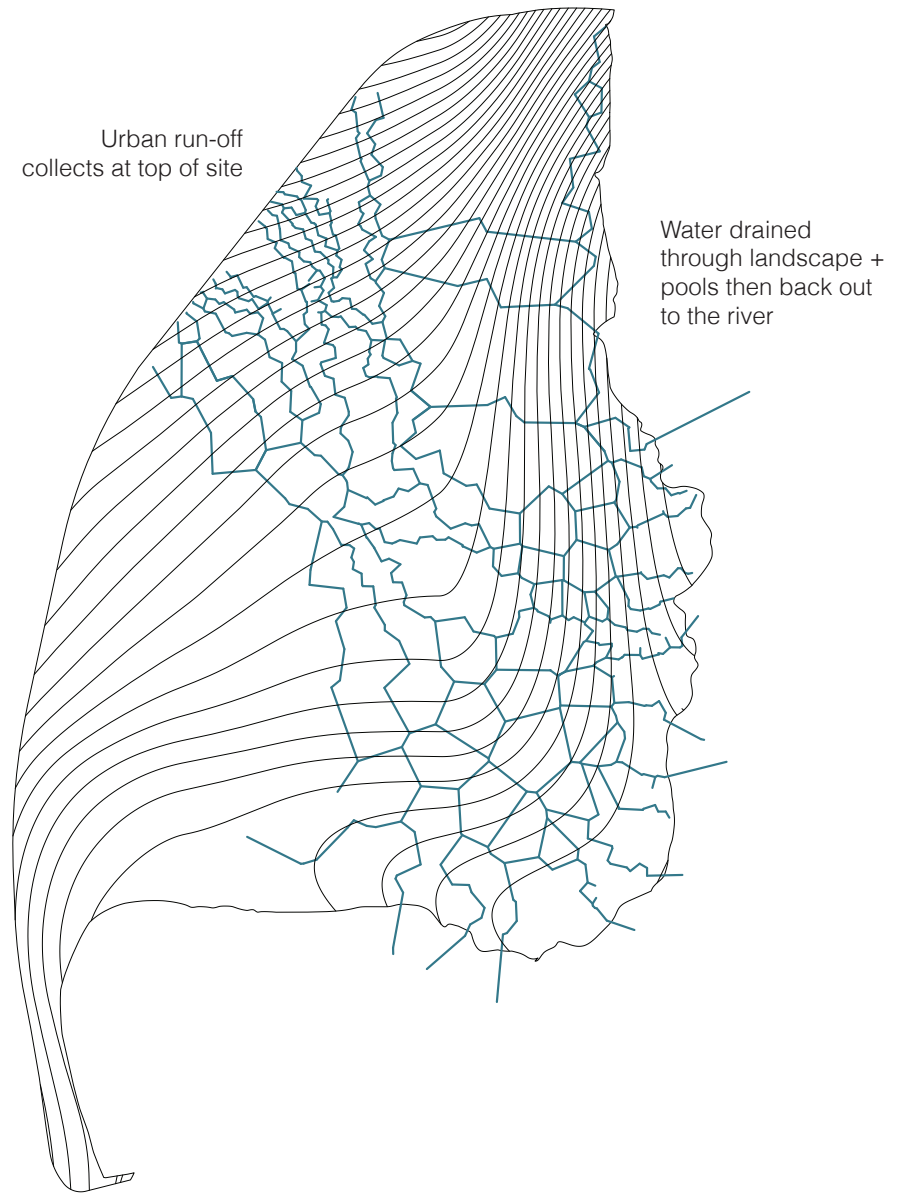
Parallel network (global)

Rectangular network (regional)

Rectangular network (local)



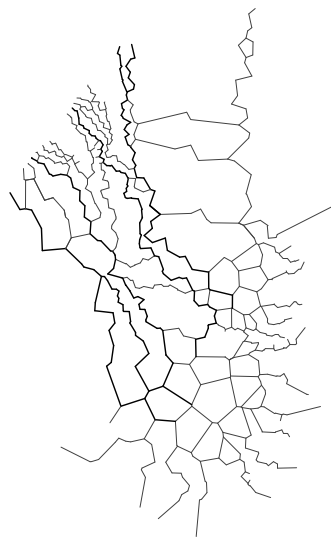
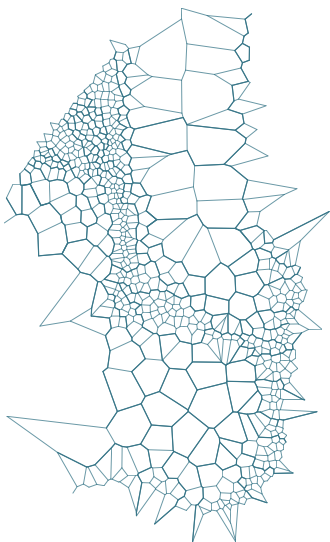
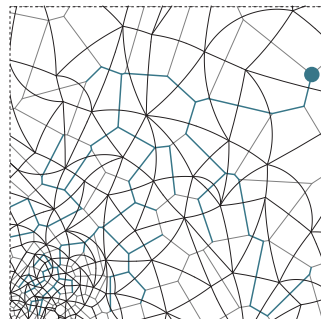
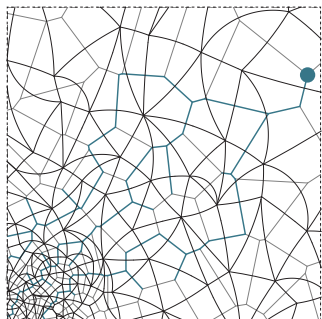
Designed drainage network on site



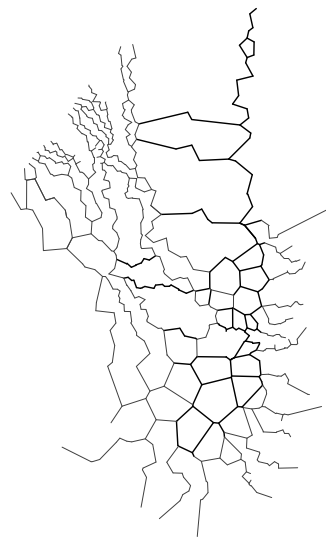
Urban run-off  
collects at top of site

Water drained  
through landscape +  
pools then back out  
to the river

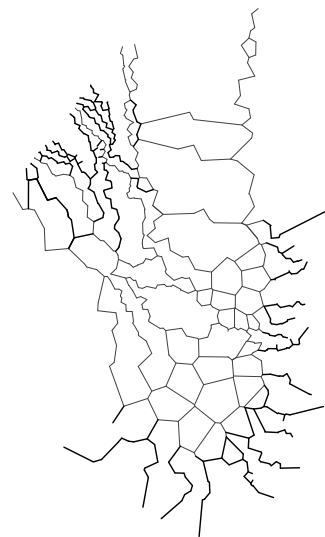
Drainage network with global topography of site



Parallel network  
(global)

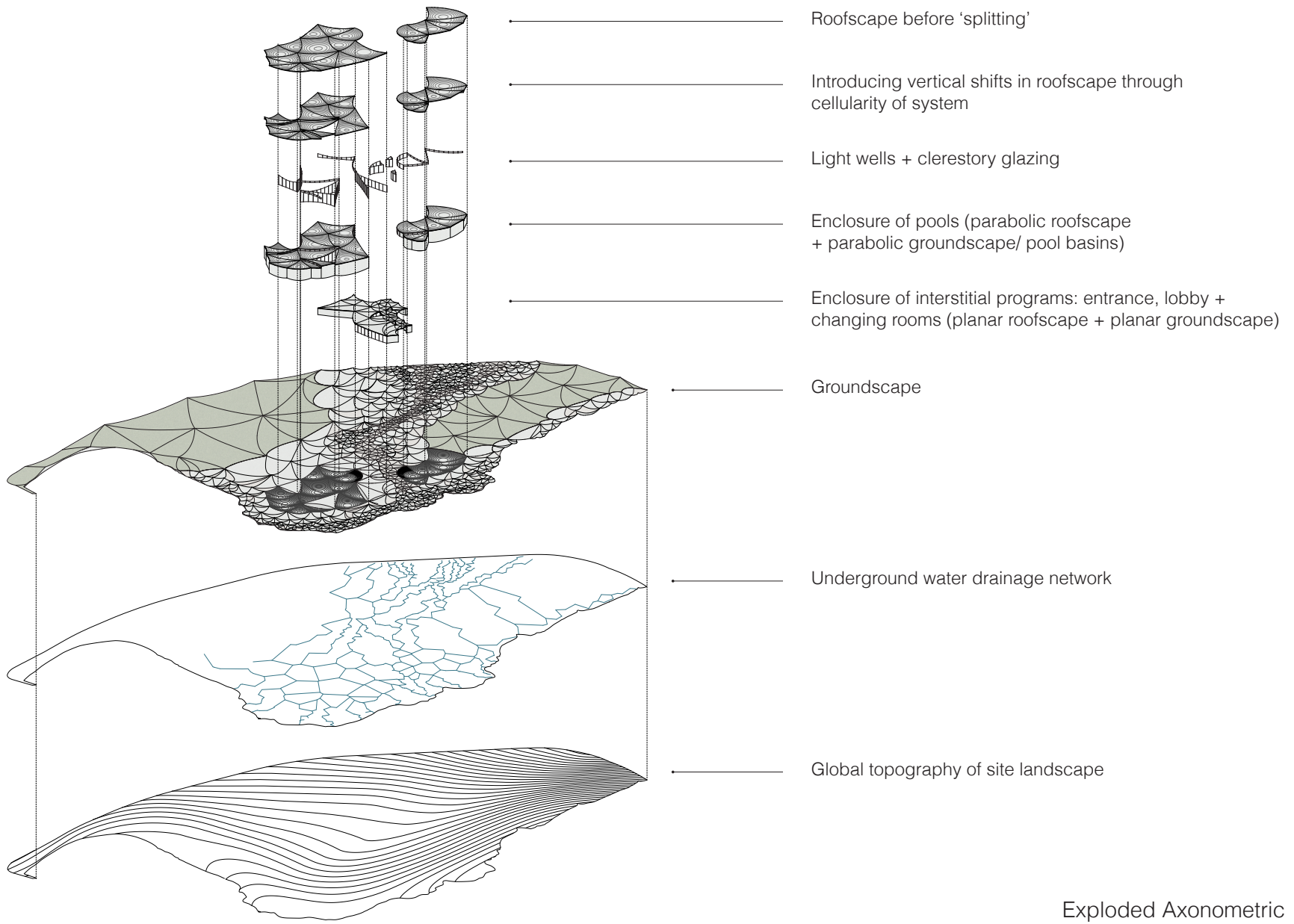


Rectangular network  
(regional)

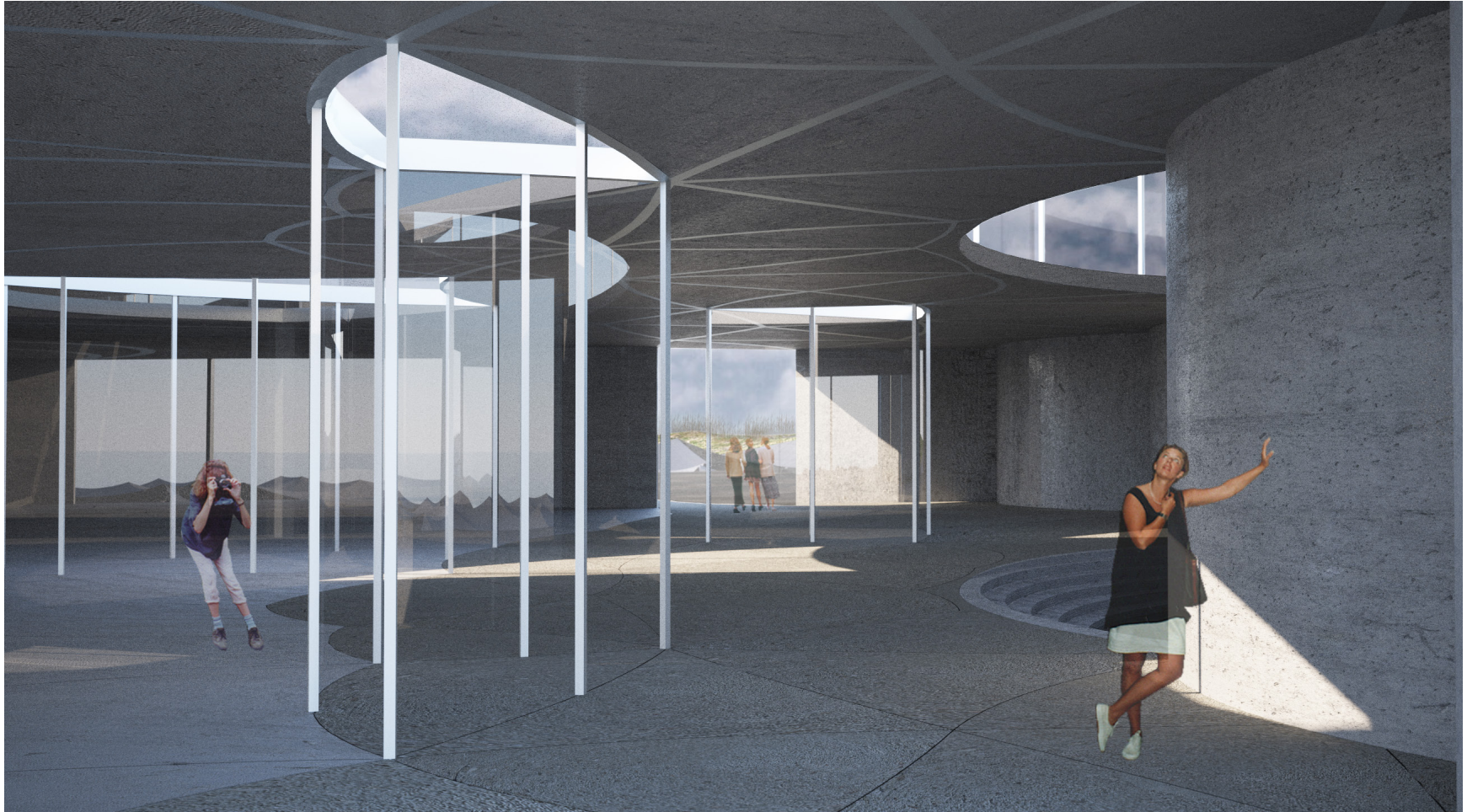


Rectangular network  
(local)

Designed drainage network



Exploded Axonometric



Interior perspective: entrance/lobby



Interior perspective: pools

## **PROGRAM**

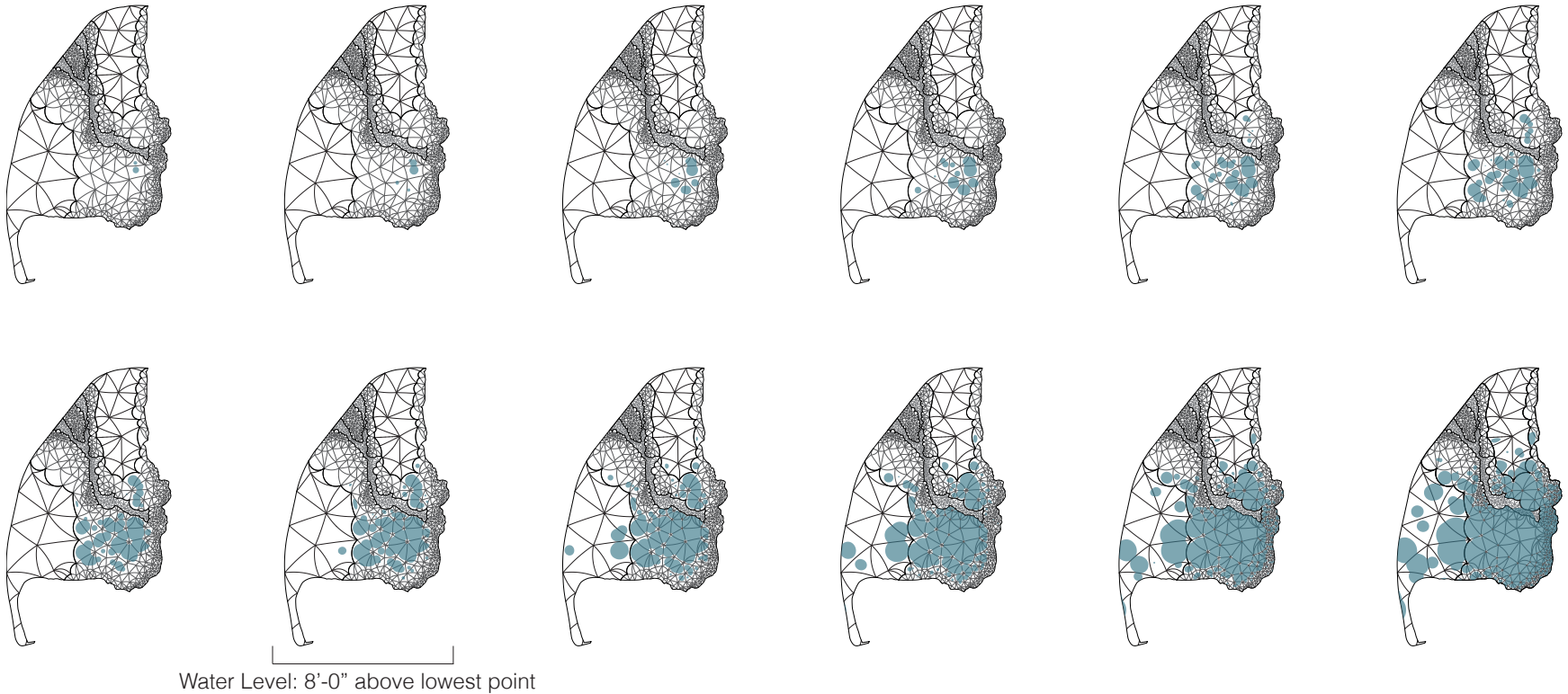
The program of the 'architecture' consists of two areas of enclosed pools, and a lobby/entrance (which includes changing rooms) that weaves the two pool spaces together. While the pools are enclosed by a parabolic roofscape, defining one of two 'types' of interior space, the lobby consists of both a planar ground surface and a planar roofscape. As the only spaces in the building that require a performative roof, the pools are distinguished as the principal programmatic elements in the architecture.

The architecture reads as an extrusion of the landscape-- the roofscape being a vertical translation of the groundscape with modifications that distinguish the two entities (roofscape versus groundscape) from each other. The idea is that the building, or enclosure of the pools, reads as a monolithic form that is relatively opaque on the exterior, but highly transparent in the interior spaces. The walls and roof are constructed of the same concrete as that used in the majority of the groundscape, thus forming a 'seamless' transition from the parabolic, to the horizontal, to the vertical.

The global topography of the groundscape dictates the location of water on the site. This informs the placement of the indoor pools as the basins that are at the lowest point fill up first and will always contain more water than their neighboring cells.

## GLOBAL TOPOGRAPHY AND WATER LEVELS

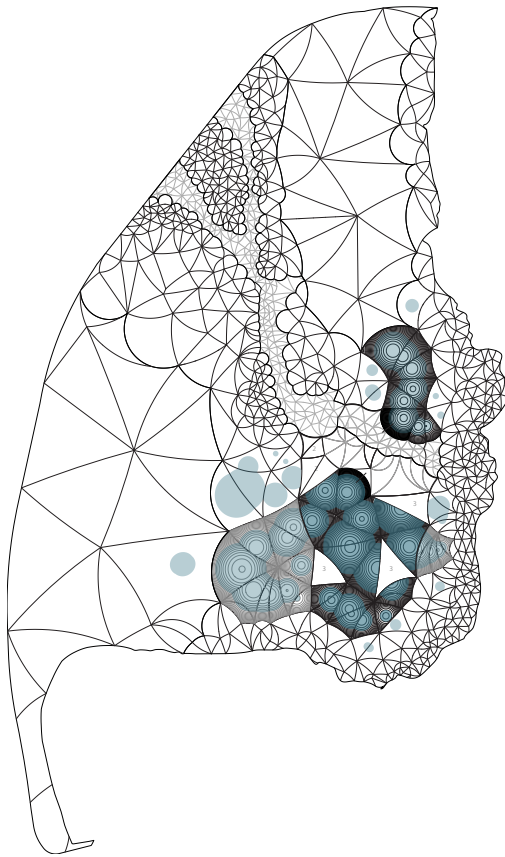
Effect of global topography on location of water on the site:  
Global topography dictates location of pools- lowest point fills up first, deepest basins are enclosed to become public pools



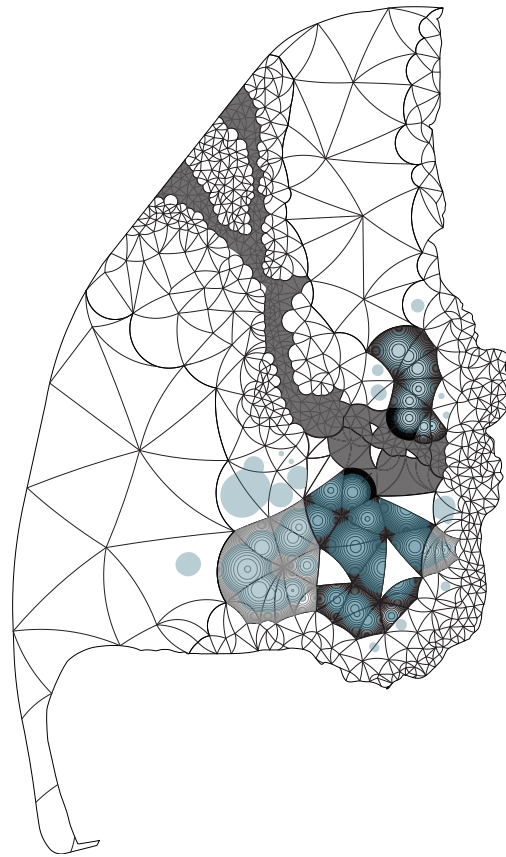
Increasing water levels on site



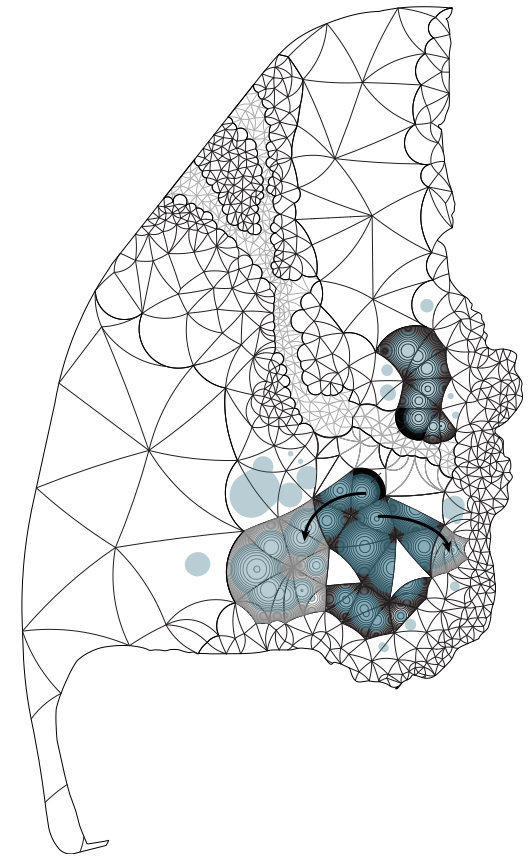
PLANS



PLAN CUT  
entrance/lobby 1  
changing rooms 2  
light wells 3

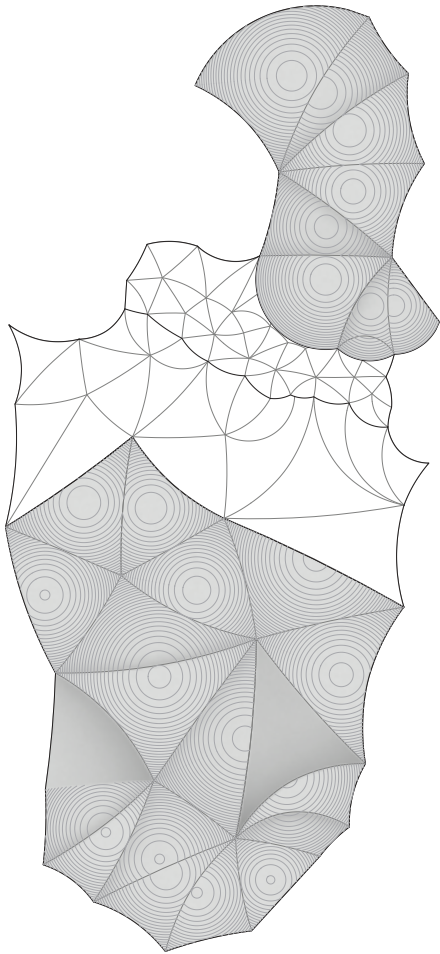


Circulation across site (landscape) through  
the building

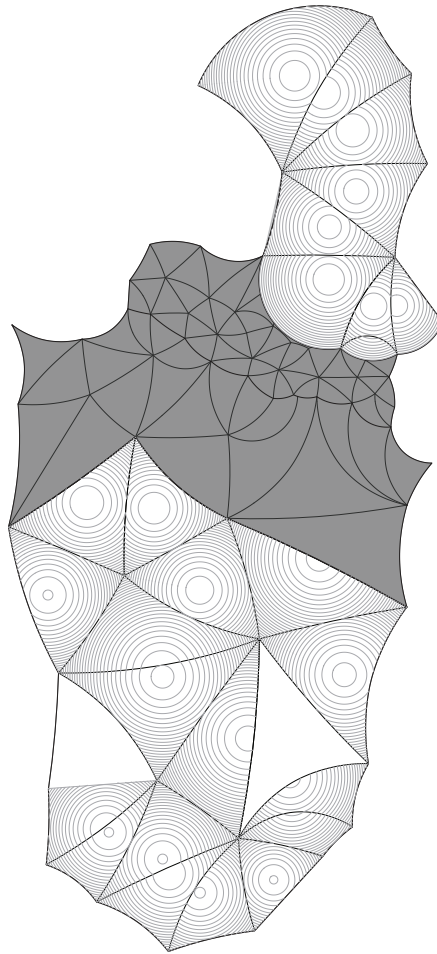


Water flow between interior and exterior  
pools

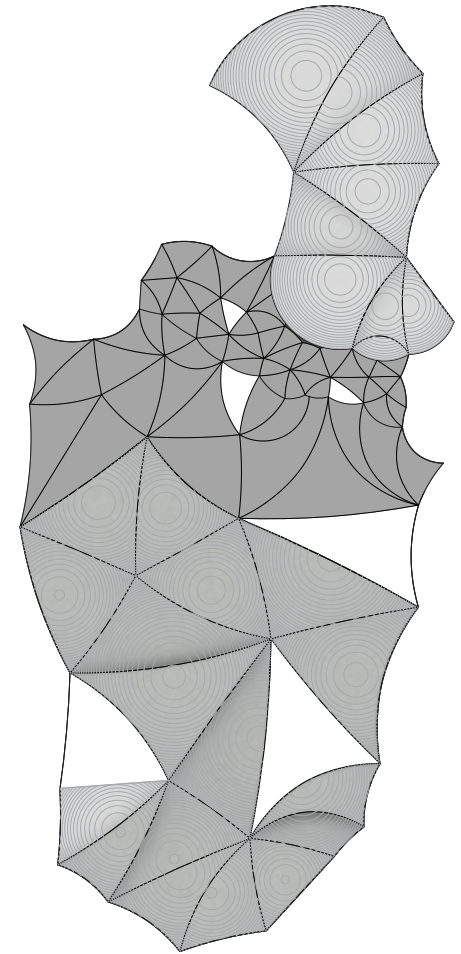
PLAN DIAGRAMS OF BUILDING



Enclosed pools (parabolic roofscape)

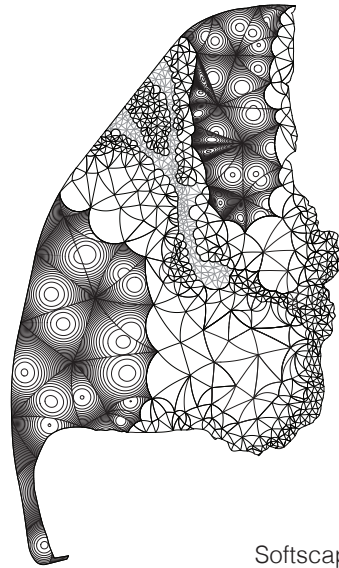


Interstitial space (ground and roof  
both planar surfaces)

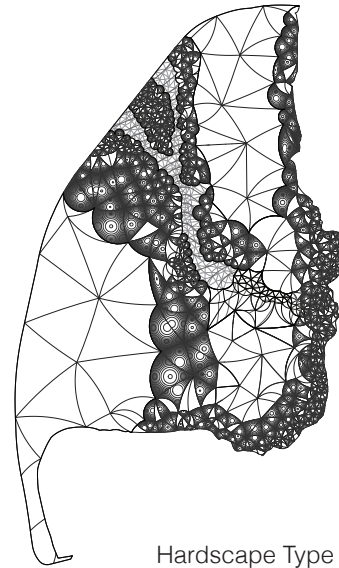


Light wells/ courtyards

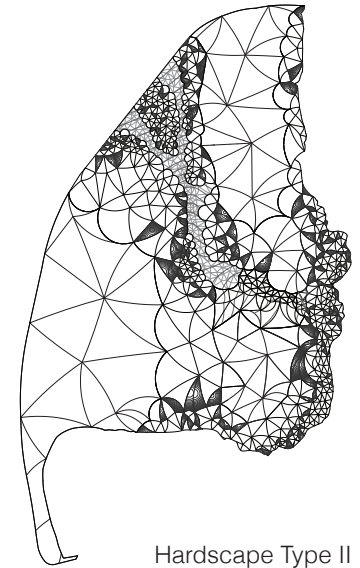
PLAN DIAGRAMS OF SITE



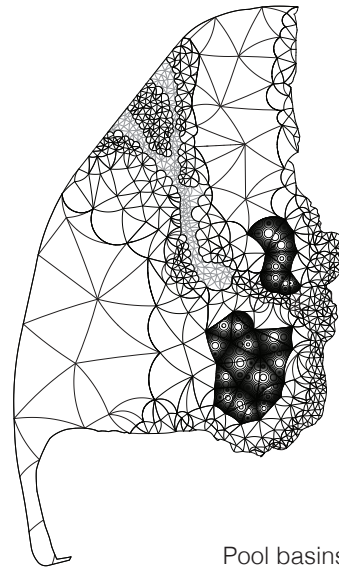
Softscape



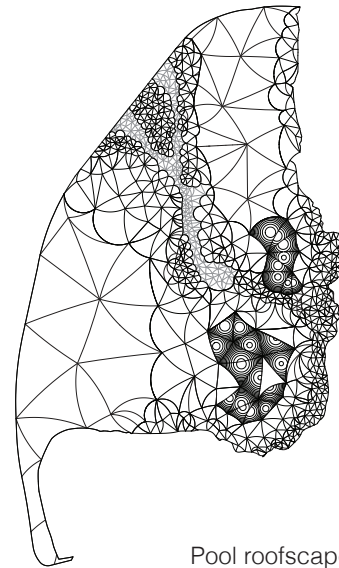
Hardscape Type I



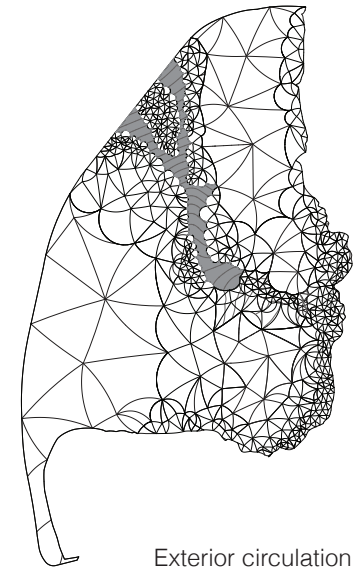
Hardscape Type II



Pool basins



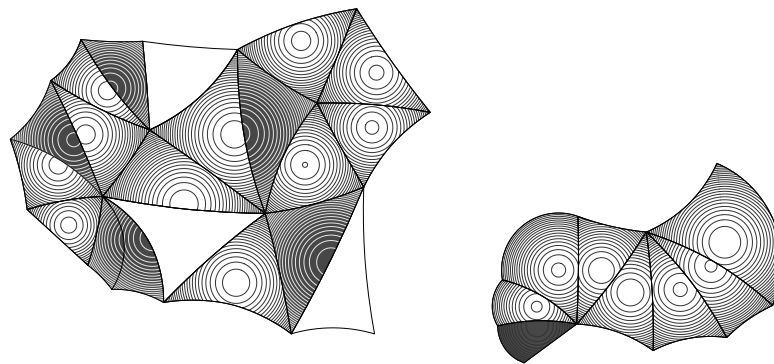
Pool roofscape



Exterior circulation

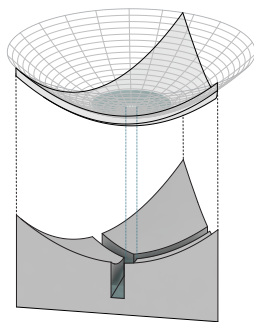
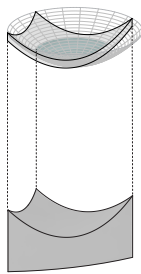
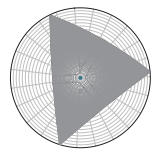
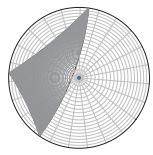
## ROOFSCAPE

The roofscape deploys a similar geometric system of intersecting paraboloids as the groundscape. Thus the performative aspects of the groundscape translate directly to those of the roofscape. In order to differentiate between them, a new architectural vocabulary is embedded into the roof. In addition to the parabolic surfaces being shallower, the 'seamlessness' of the scape is broken by introducing a vertical shift between Type I and Type II surfaces. This allows for light to enter the building from the roof, and water to drain through the gaps forming waterwalls inside the pools. This re-appropriation of the groundscape system transforms and re-directs the performance of the geometry to treat water as not a landscape, but an architecture.



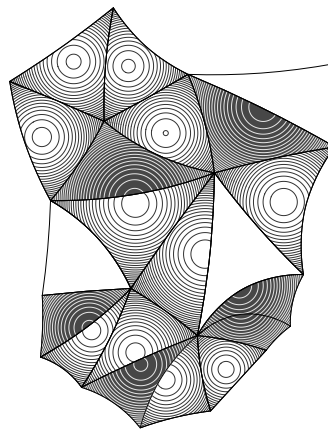
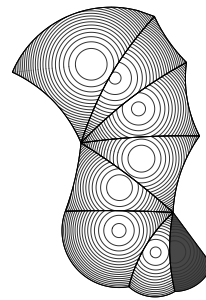
Type II surfaces in the roofscape

# ROOFSCAPE SCHEMATIC



TYPE I:  
Water  
Transport

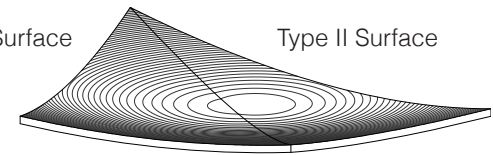
TYPE II:  
Water Containment  
(+ drainage)



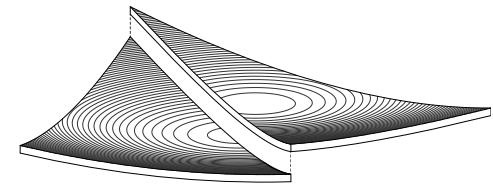
Type II surfaces in the roofscape

Type I Surface

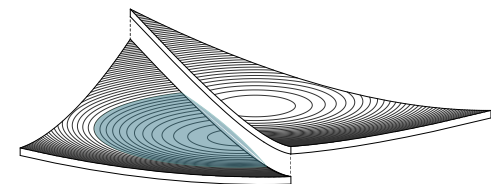
Type II Surface



Seamless relationship



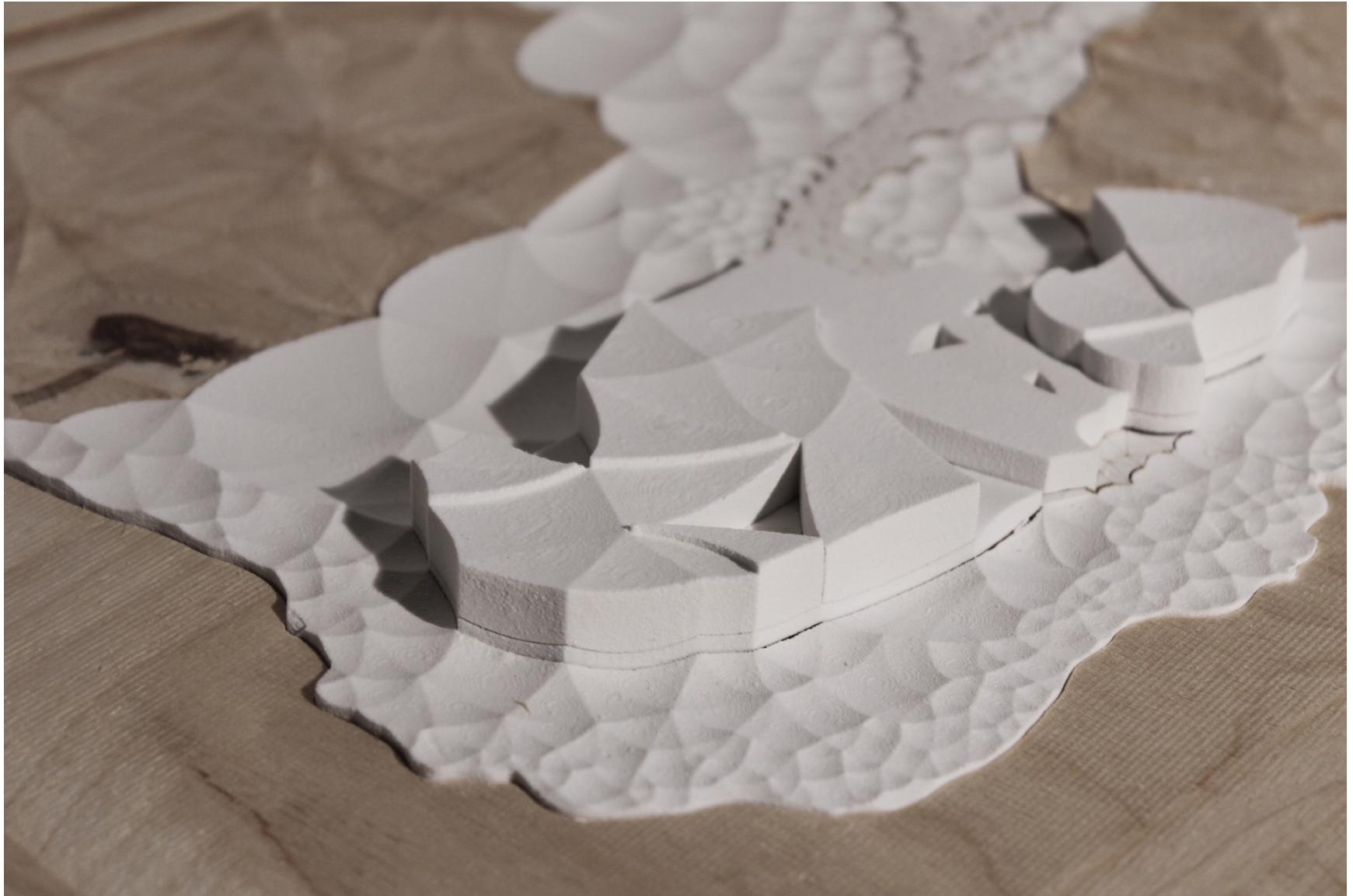
Vertical translation



Assigning function to the roofscape



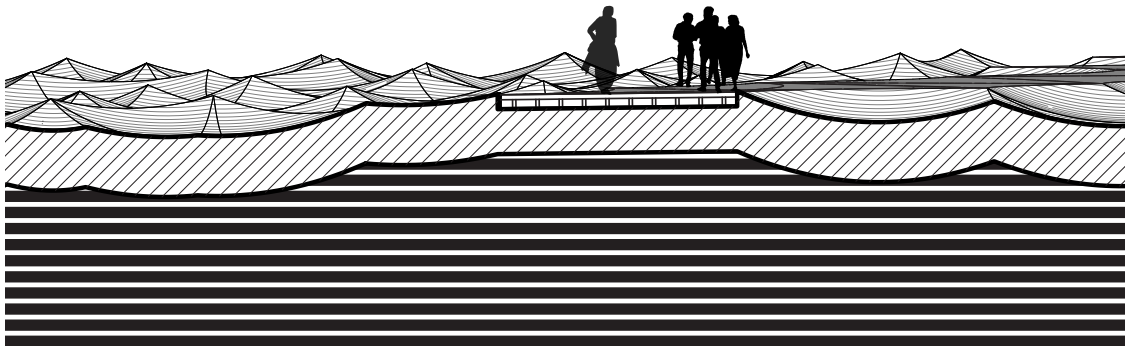
Interior Perspective



Model: close-up of building

## SURFACES FOR WATER, SURFACES FOR PEOPLE

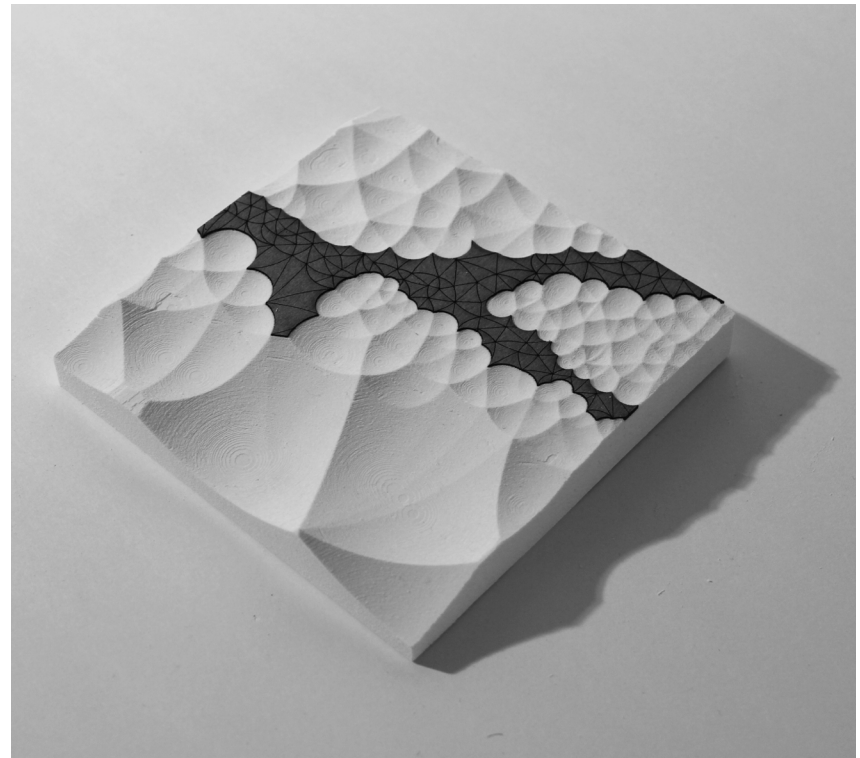
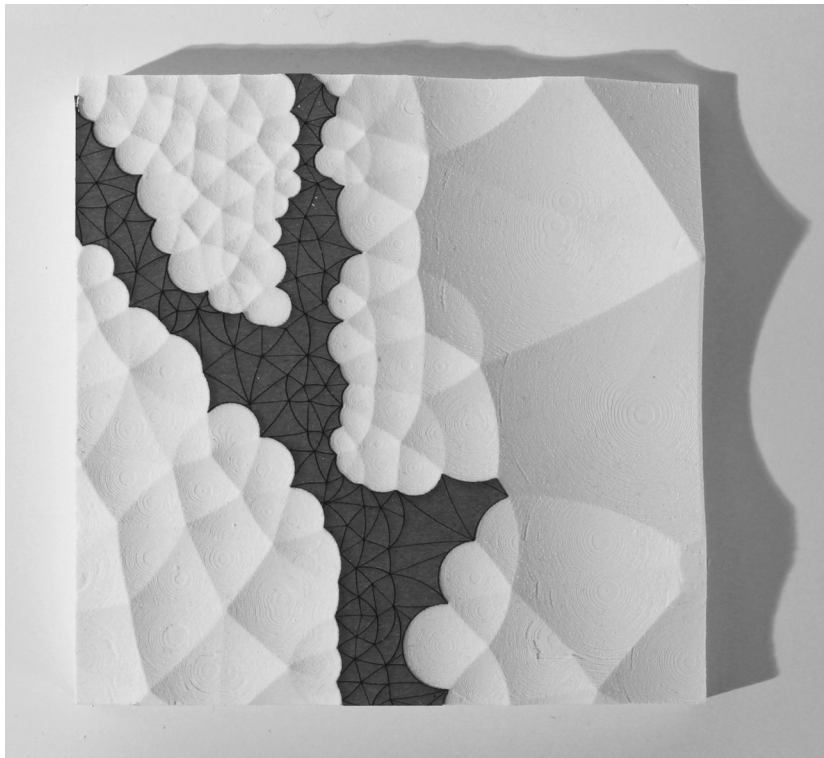
The concave, parabolic surfaces in the groundscape reserve their performative abilities for water. A duality exists in the system, however, where surfaces are 'flattened' to become walkable terrain for pedestrians. This dialogue between people and the landscape, water and the landscape, and people and water is exemplified in the programmatic agenda of the site and the relationship between the ground surface and the roof in the building enclosure.



Section through landscape (hardscape and path)



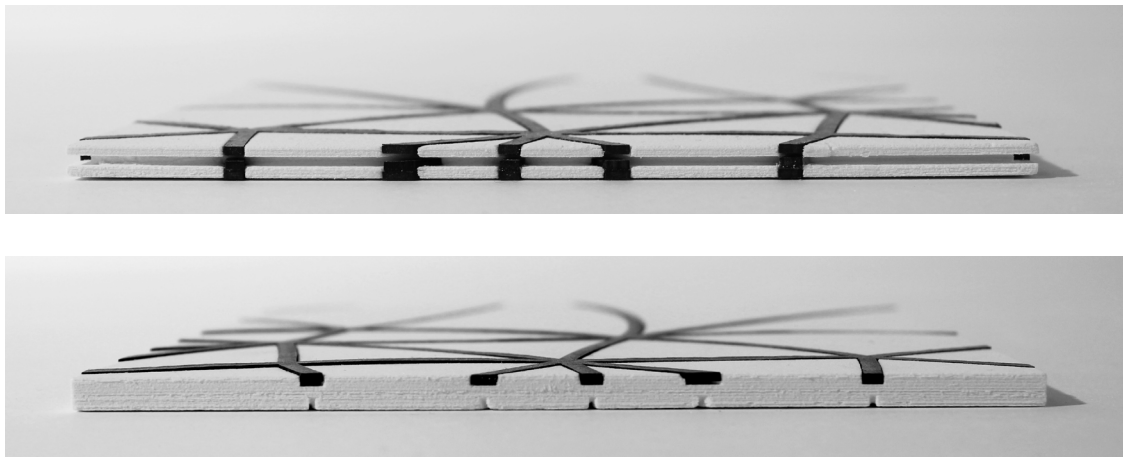
SURFACE DUALITY: Paving walkable terrain for pedestrian circulation



Model: differentiating between parabolic surfaces and 'flattened' surfaces through materiality

## EMBEDDING STRUCTURE INTO THE GEOMETRY

The “flat” or non-parabolic portion of the groundscape is a way of introducing human interaction with the landscape. This is echoed in the intermediary/interstitial space in the building that connects the two areas of enclosed pools. The original triangulation pattern resulting from the intersection of the paraboloids is inscribed onto the ‘flattened’ surfaces, which in the roof is leveraged as an opportunity to embed structure into the concrete slabs. The seams are utilized to inform the tiling sequence in the floor slabs (both on the exterior pathway and the interior floor).



Structural detailing in the roof

STRUCTURE AND TILING



Floor tiling patterns

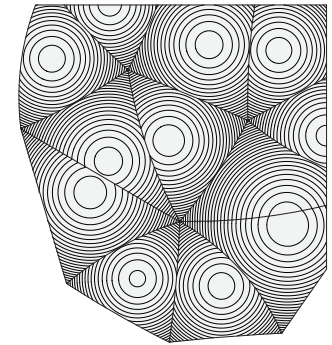
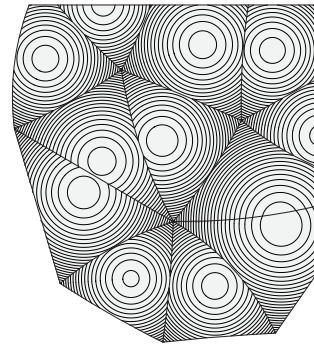
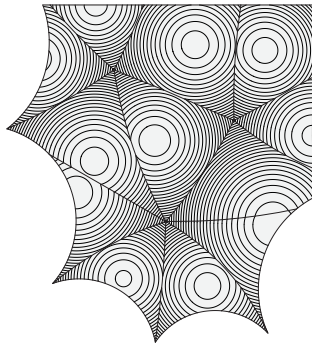


Structure in the roof slab

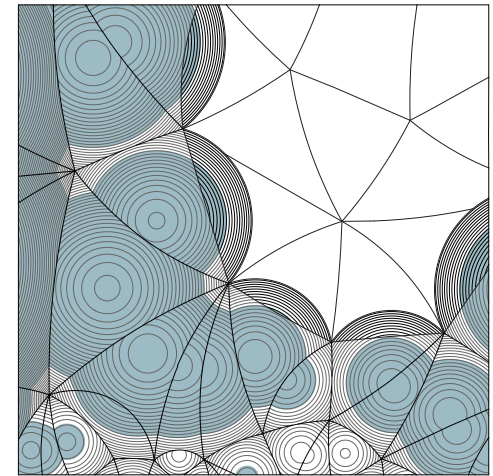
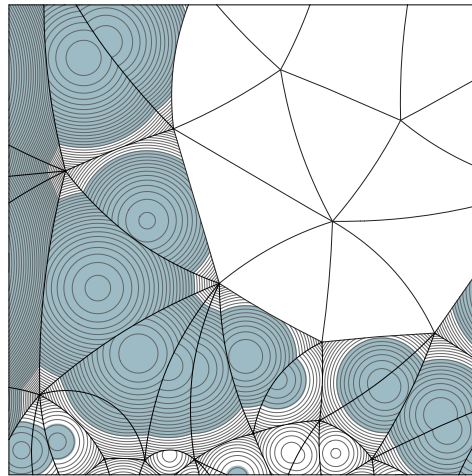
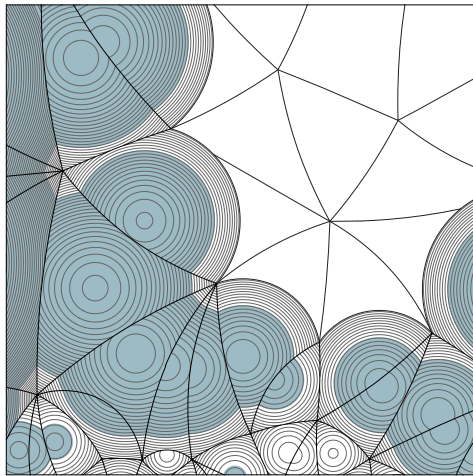


Interior Perspective: Pool as viewed from lobby

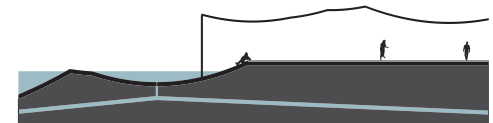
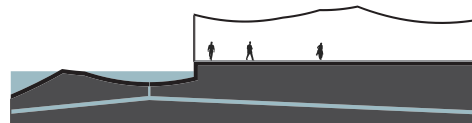
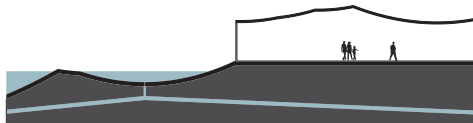
SURFACE CONTINUITY: Transition from parabolic to planar, wall connection schematics



Roofscape topography

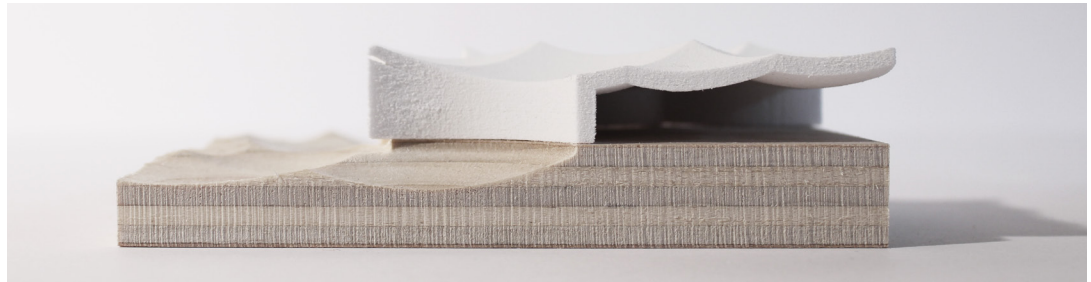
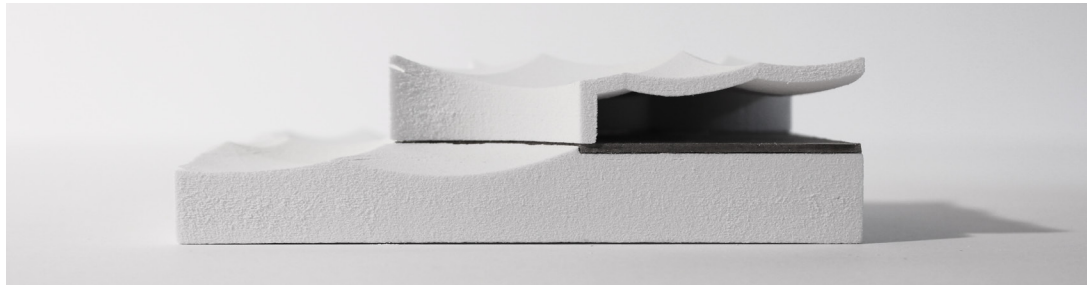
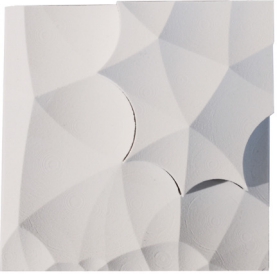


Groundscape topography

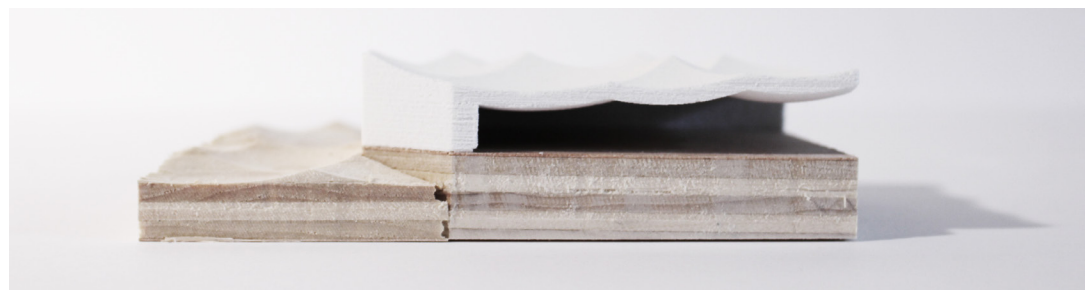
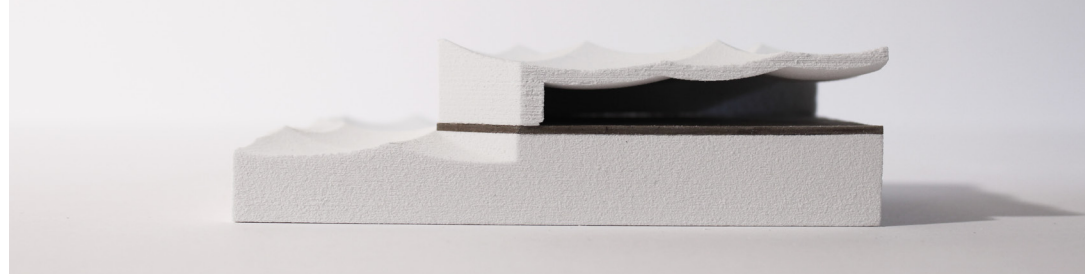
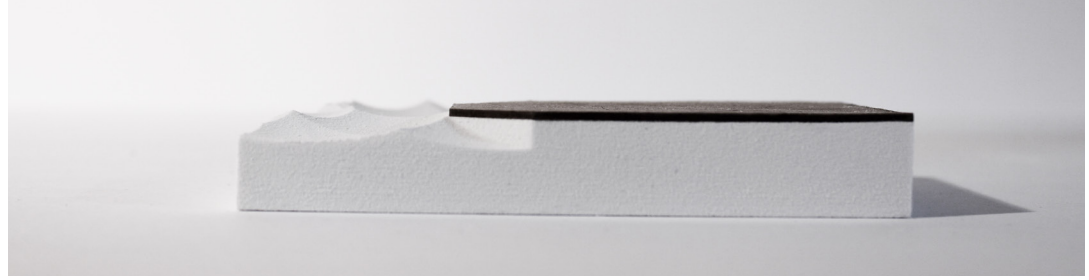


Diagrammatic sections

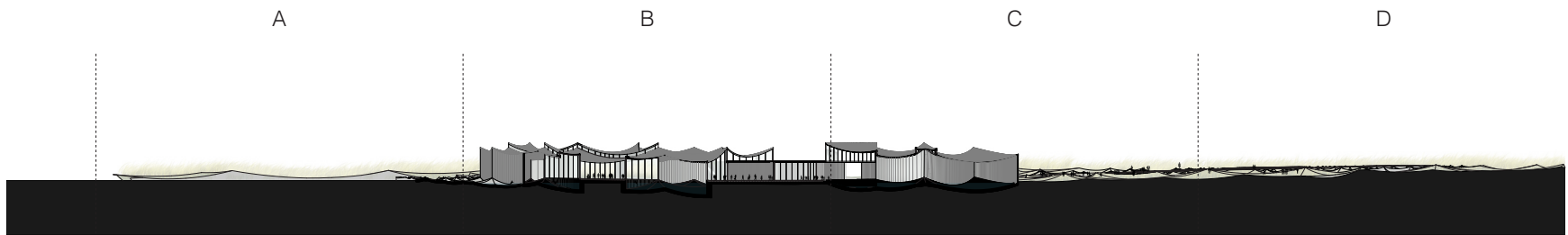
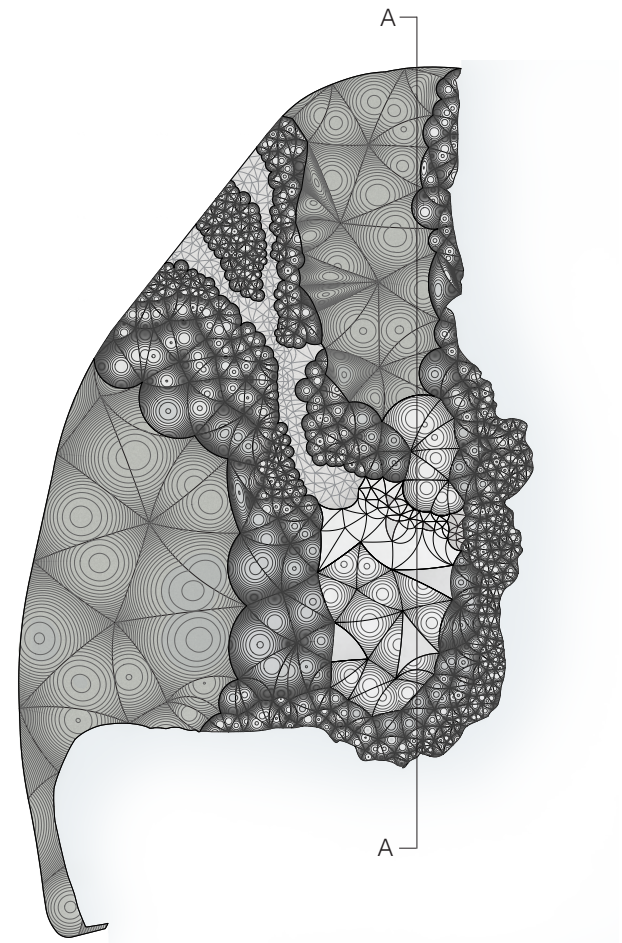
MODEL STUDIES OF SURFACE CONTINUITY + CHANGING MATERIALITY



MODEL STUDIES OF SURFACE CONTINUITY + CHANGING MATERIALITY

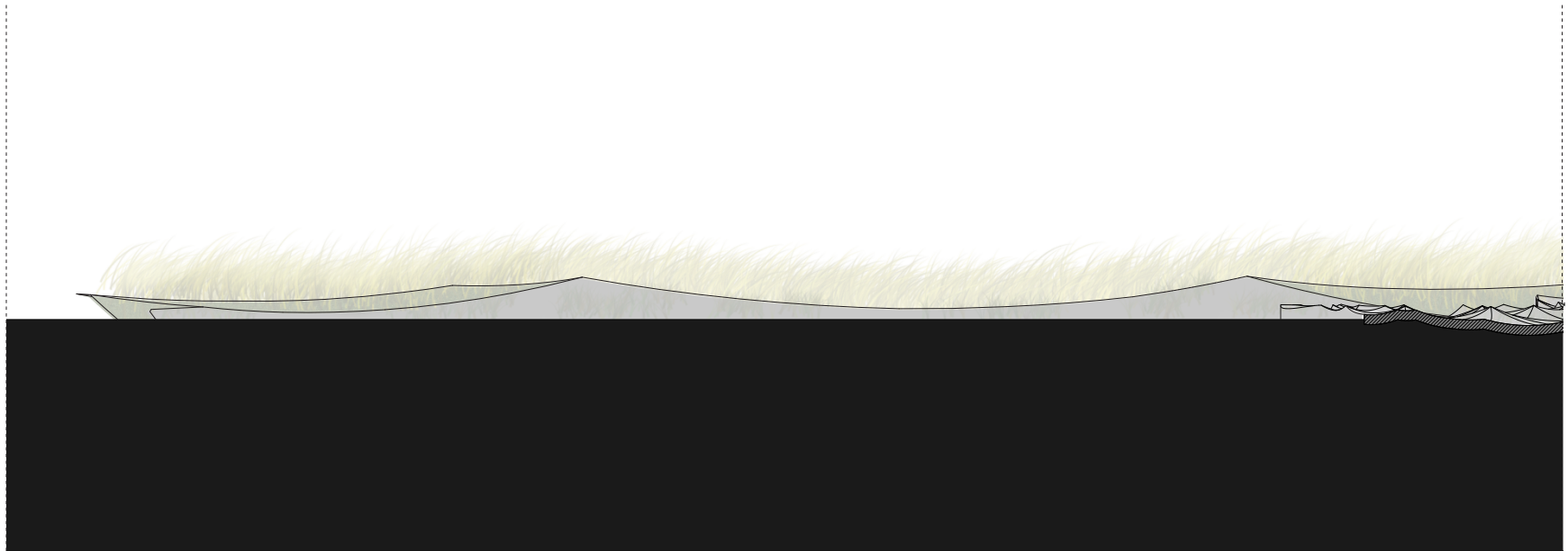


SECTION A-A  
Section through landscape + building

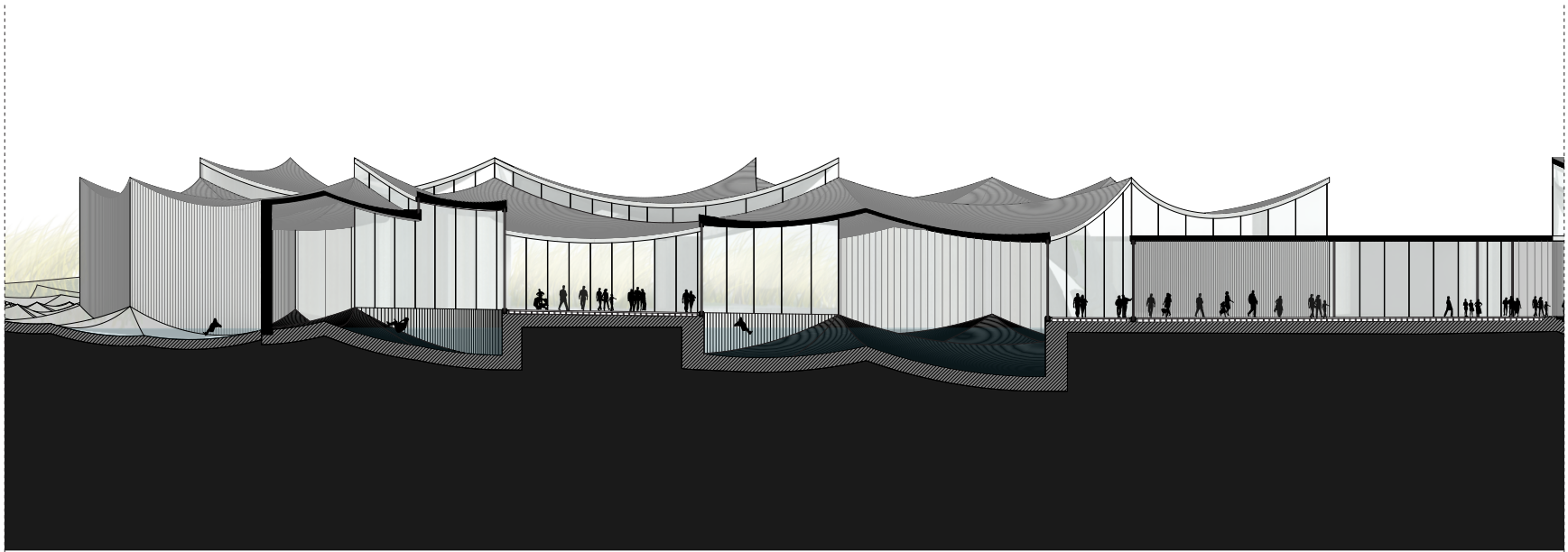




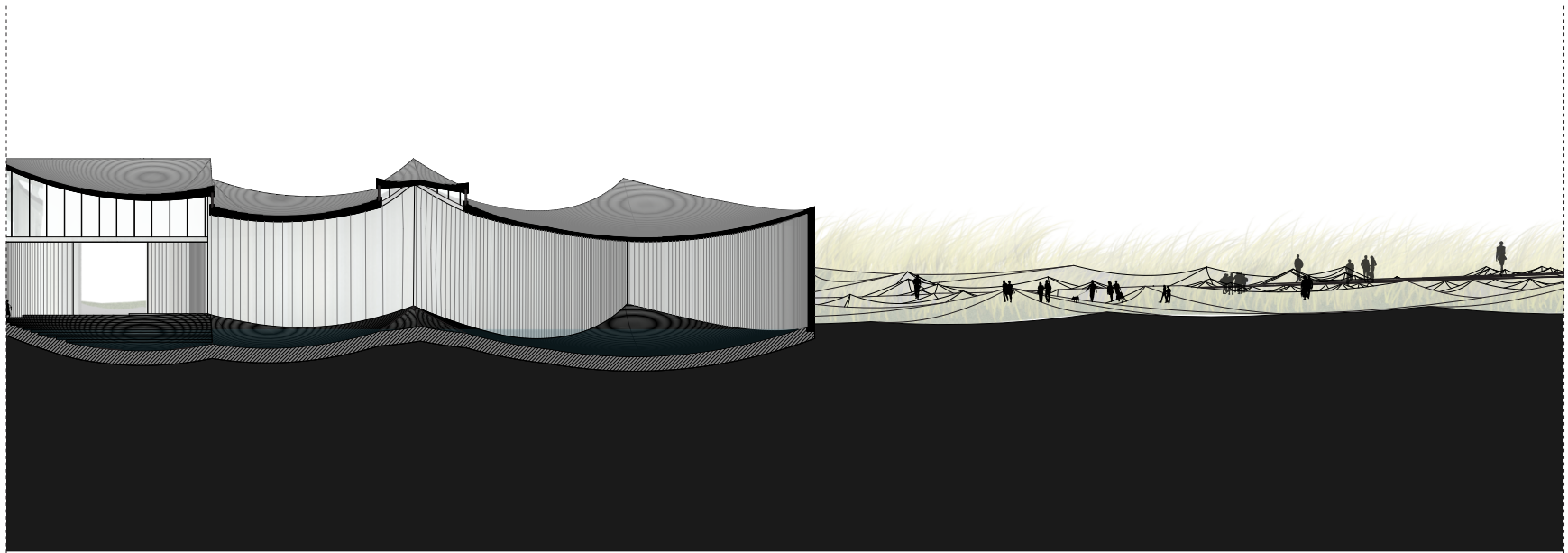
SECTION A-A CLOSE-UP  
SEGMENT A



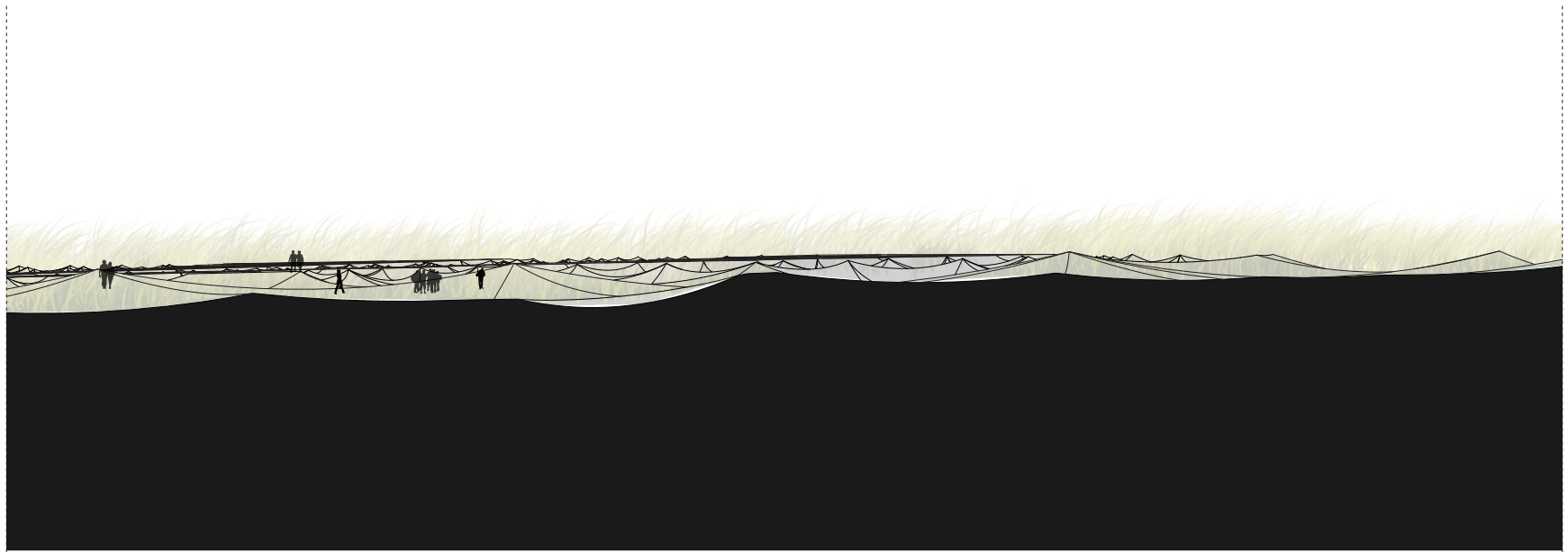
SECTION A-A CLOSE-UP  
SEGMENT B



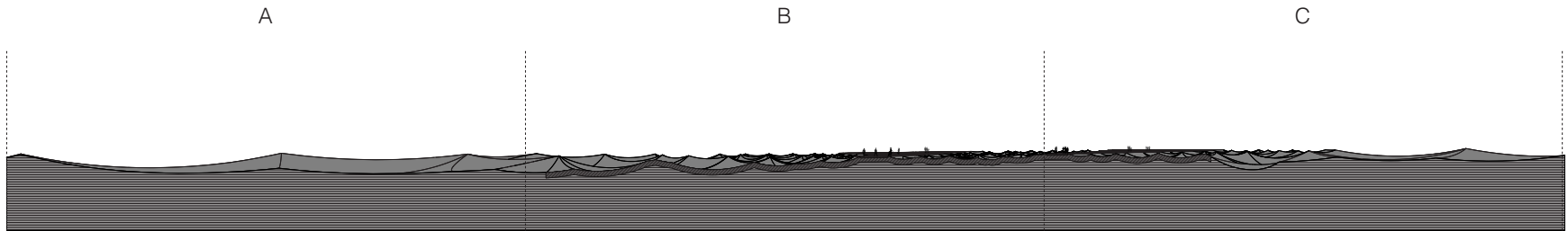
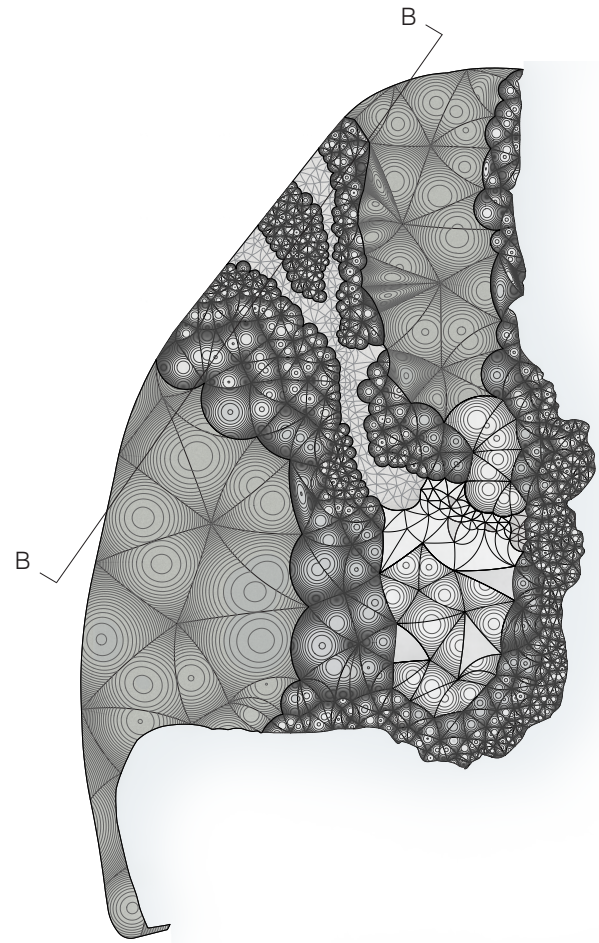
SECTION A-A CLOSE-UP  
SEGMENT C



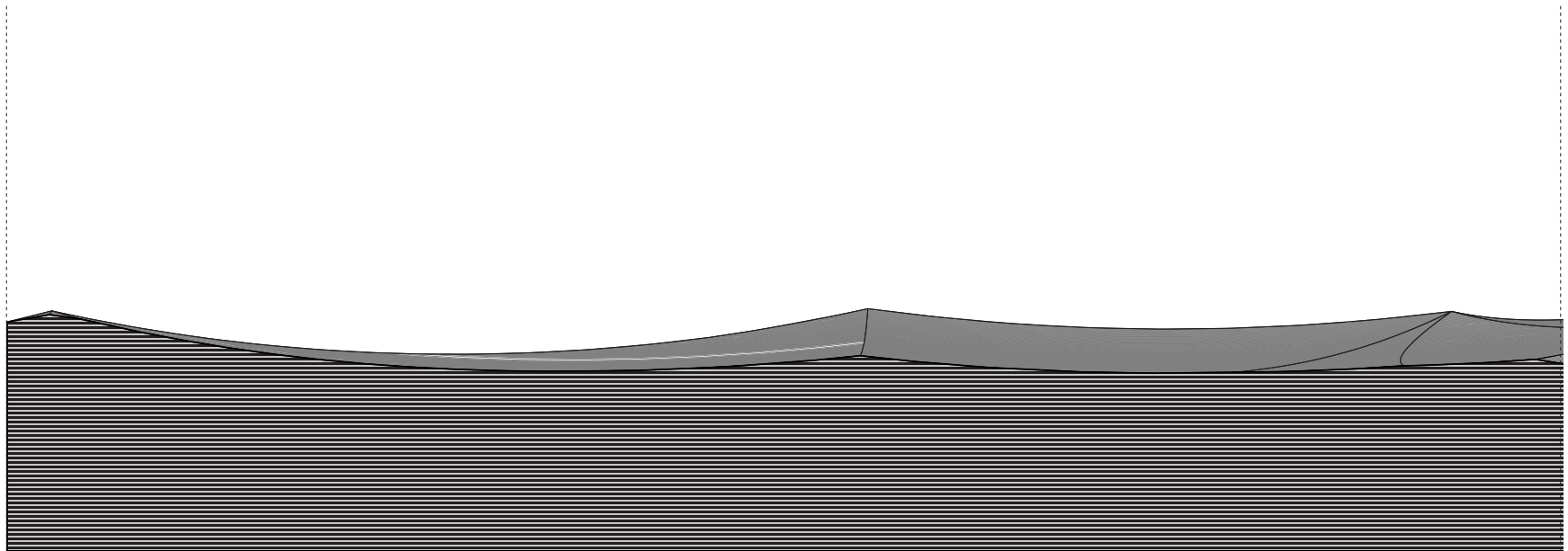
SECTION A-A CLOSE-UP  
SEGMENT D



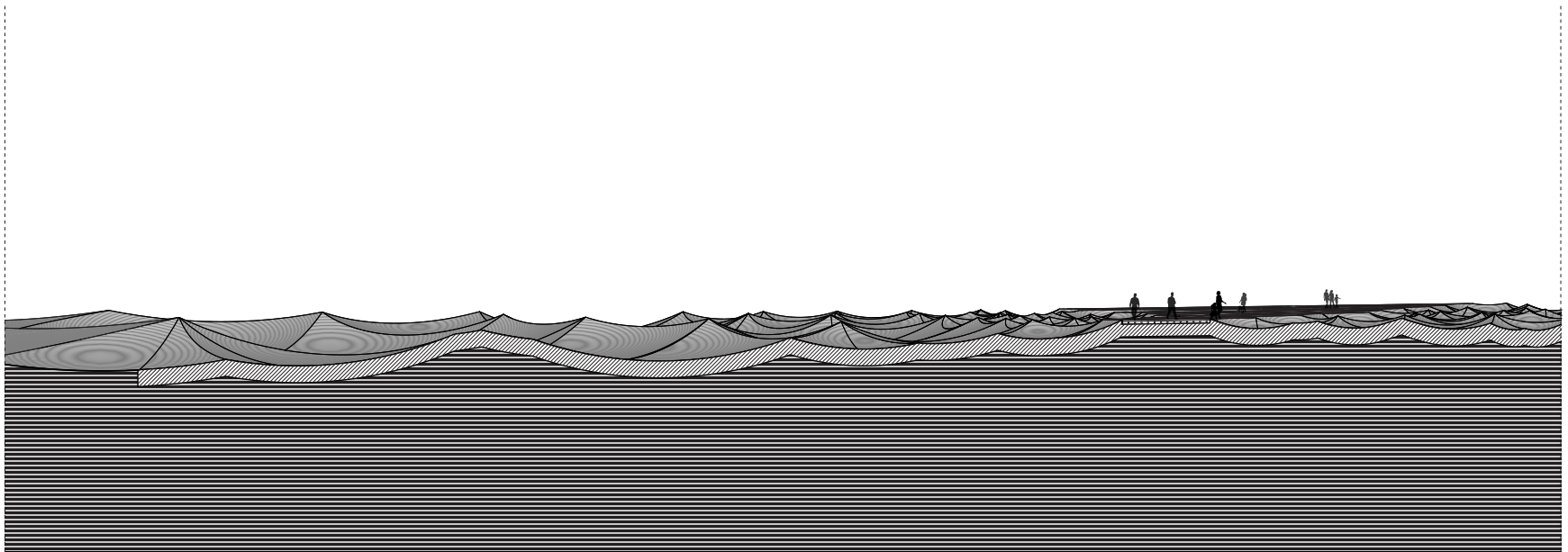
SECTION B-B  
Section through landscape



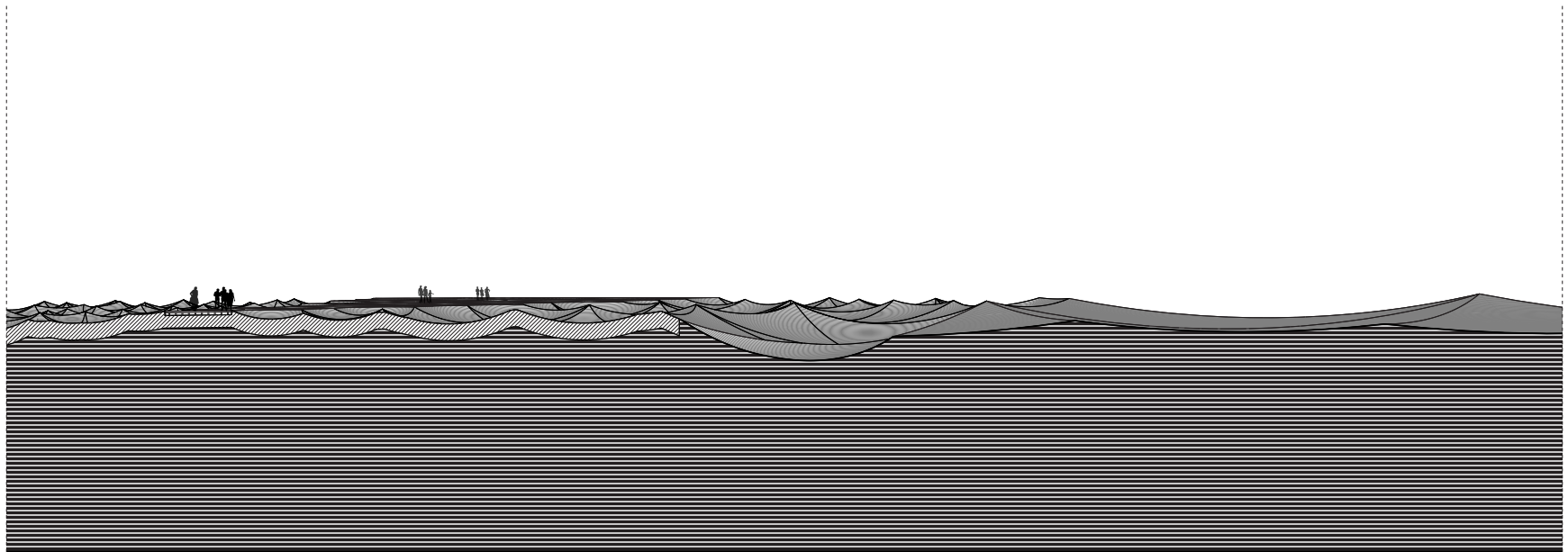
SECTION B-B CLOSE-UP  
SEGMENT A



SECTION B-B CLOSE-UP  
SEGMENT B



SECTION B-B CLOSE-UP  
SEGMENT C





### **A TEMPORAL LANDSCAPE: Whole to part**

The geometry of the landscape curates a temporal experiential agenda on the site. The presence of water and its behavior as influenced by the geometry of the surfaces causes the landscape to undergo a process of morphology across seasons. The presence of water on individual surfaces for a prescribed period of time divides the whole into parts-- 'neighborhoods' of different physical and experiential conditions foster a mosaic of activities across the landscape.

While at one point the concrete of the hardscape is bare, sharp and pure, the utility of these surfaces is completely transformed once they fill up with water at different points and levels, eventually leading to plant growth. In the winter the water freezes, and the basins are transformed into ice ponds. The building simultaneously exudes itself differently according to atmospheric conditions affected by the groundscape.



Perspective: Spring



Perspective: Summer

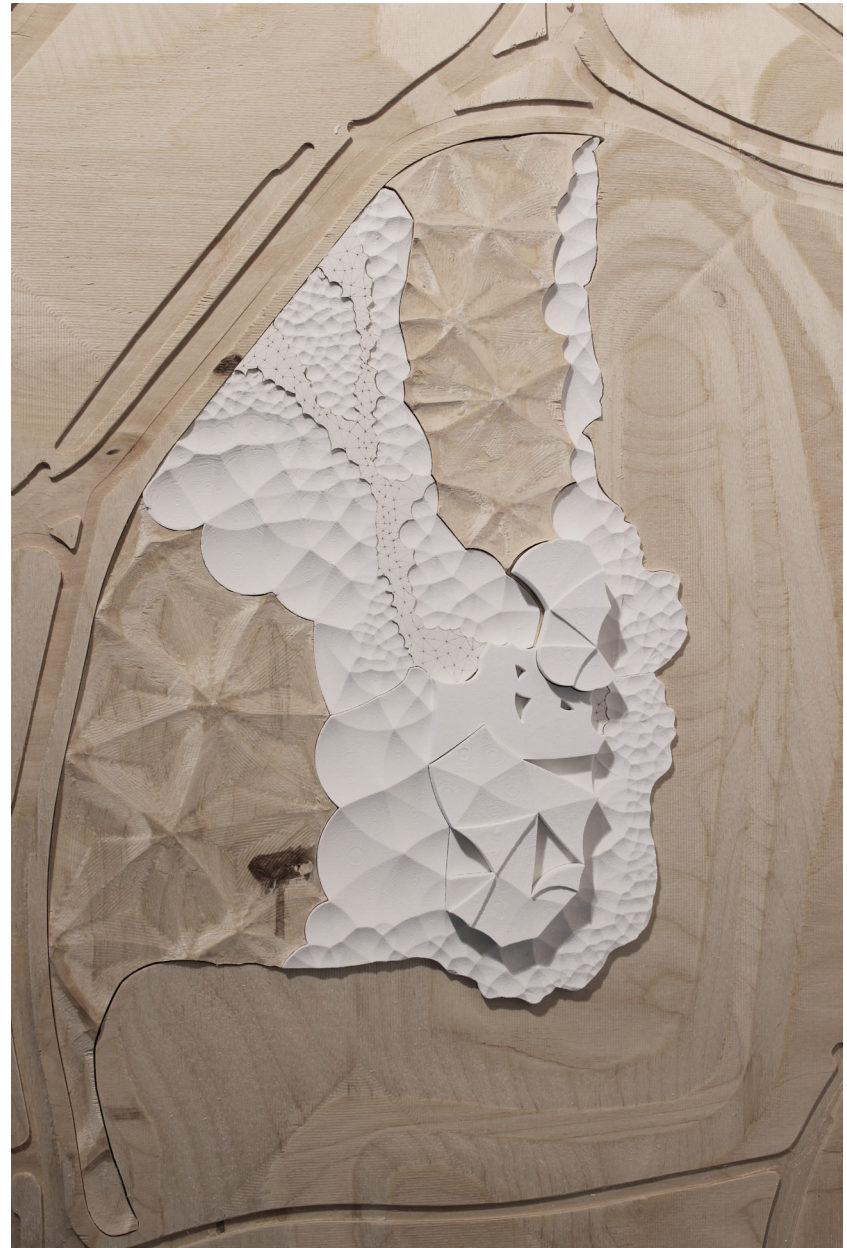


Perspective: Fall



Perspective: Winter

FINAL MODEL



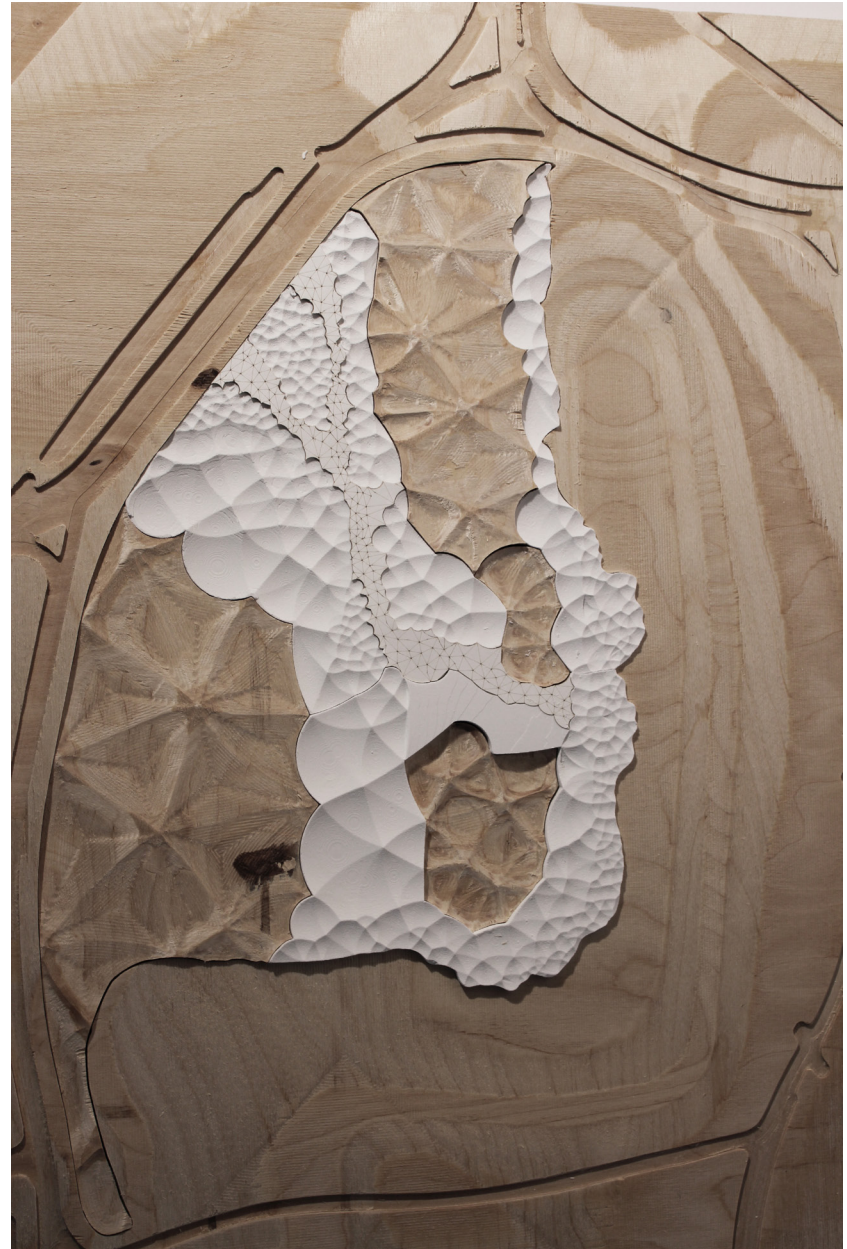
With enclosures (roofscape)

FINAL MODEL



Interior ground surfaces (removed roofscape)

FINAL MODEL

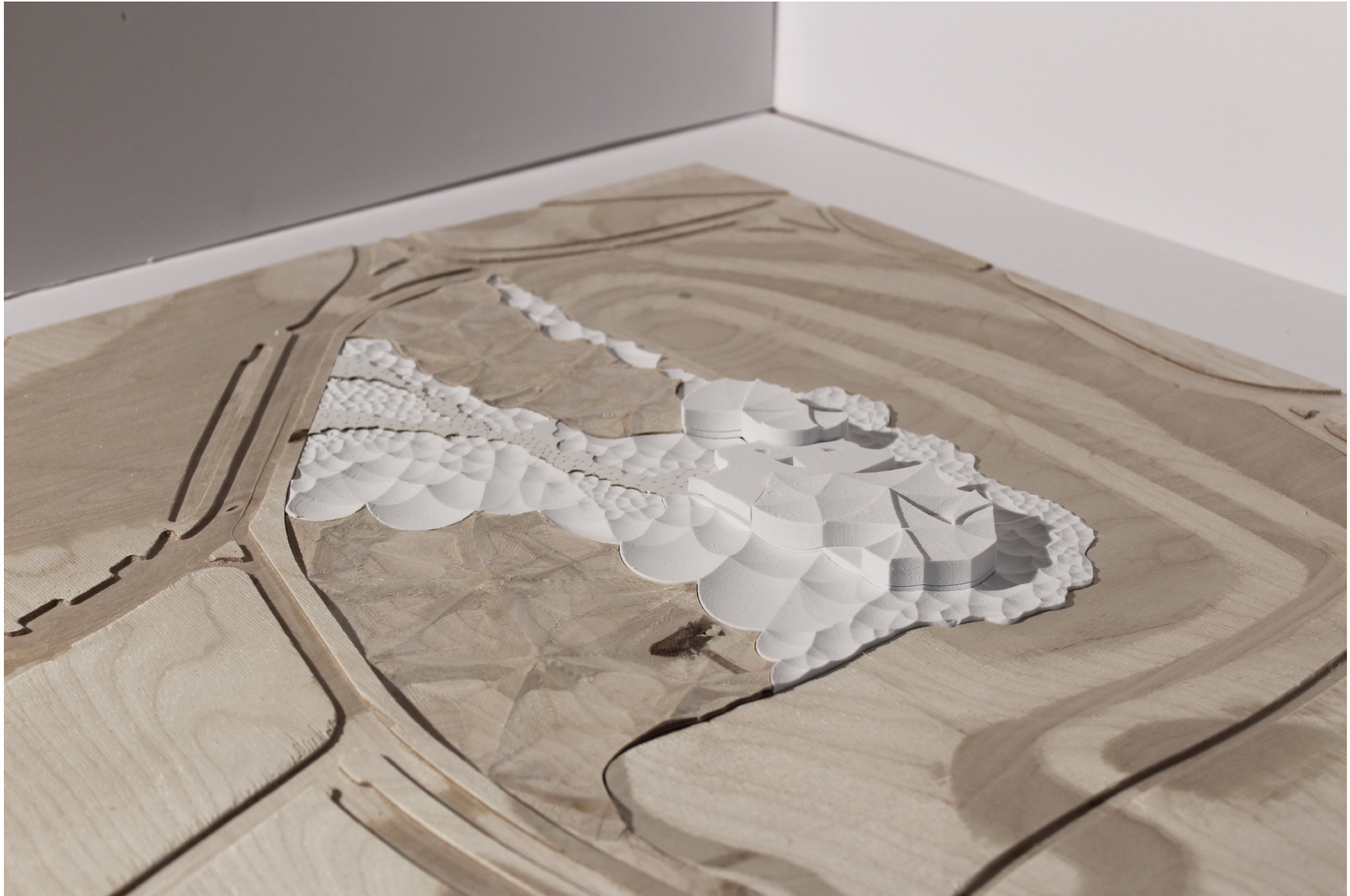


Natural landscape beneath the hardscape (building footprint)





Final model: perspective showing interior groundscape



Final model: overall perspective



Final model: perspective of building



Final model: perspective showing groundscape without building



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