Luctor et Emergo

'An island without an island'

NORTH SEA: LANDSCAPES OF COEXISTENCE

Delta Interventions Graduation Studio 2017-2018 - P5

Deniz Üstem 4512049

Ravenous Water Wolf

Map of the Harlemmermeer with its surrounding Waters and Places, 1641
Drawing on parchment, 65X97,5 cm, University Library, Leiden

“You were born a sinner and had to earn heaven
by doing battle with the sea.”

Adriaan Geuze, Flatness
Mosaics WEST8, January 2008

Wadden Sea

The dynamic interaction between the water and the moving land
Photo: Rijkswaterstaat, Joop van Houdt

THE WADDEN SEA

N
W
E
S

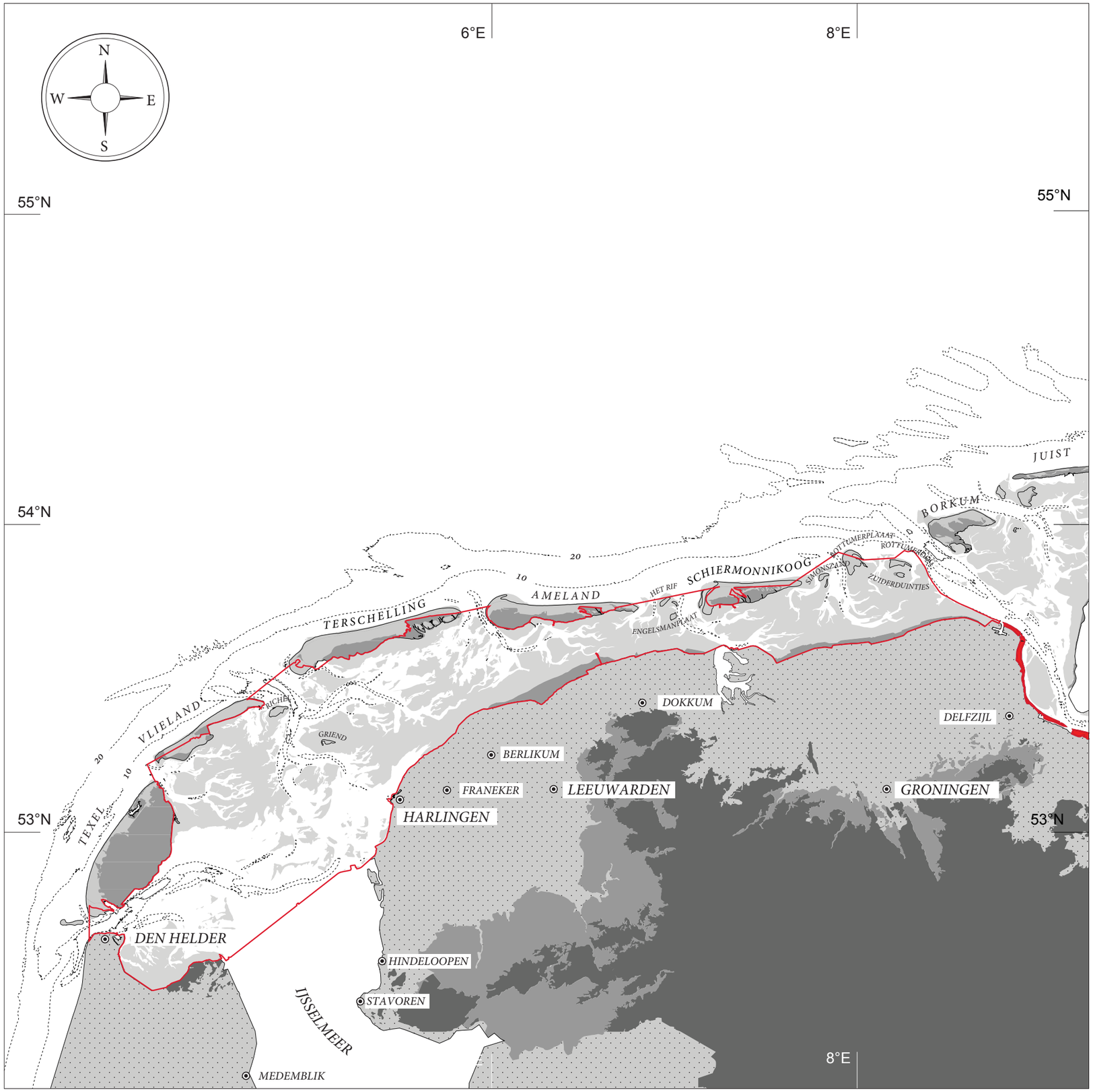
6°E
8°E
55°N
54°N
53°N

Blåvands Huk
Varde
Esbjerg
Fanø
Rømø
DENMARK
NORTH FRISIAN ISLANDS
Nordstrand
Tönning
Heide
Brunsbüttel
Cuxhaven
EAST FRISIAN ISLANDS
WEST FRISIAN ISLANDS
NORDERNEY
JUIST
BORKUM
LANGEOOG
SPIEKEROOG
WANGEROOGE
SCHIERMONNIKOOG
AMELAND
TERSCHELLING
TEXEL
Wilhelmshaven
Bremerhaven
Emden
Delfzijl
Harlingen
Leeuwarden
Groningen
Oldenburg
Bremen
Den Helder
IJSSELMEER
THE NETHERLANDS
GERMANY

Schiermonnikoog

0 20 40 100 km

THE WADDEN SEA



UNESCO

In 2009, the Dutch and German parts of the Wadden Sea were inscribed on UNESCO's World Heritage List and the Danish part was added in June 2014.

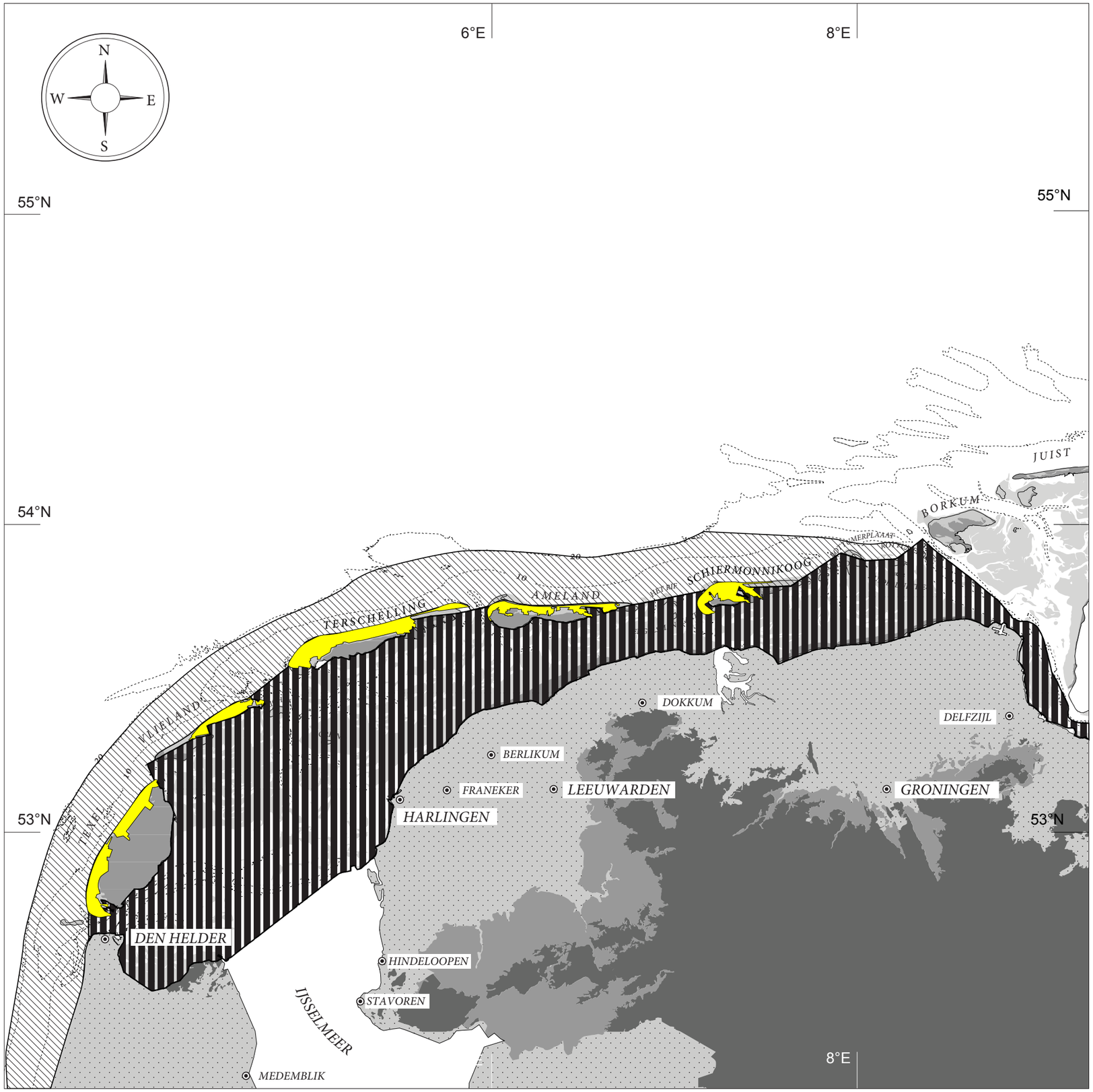
UNESCO SITES

UNESCO DESIGNATED AREAS

* **Source:** *Holocene Landscape Reconstruction of the Wadden Sea Area Between Marsdiep and Weser, Explanation of the coastal evolution and visualisation of the landscape developmen, Netherlands Journal of Geosciences, 2015*

0 5 10 20 30 50 km

THE WADDEN SEA



RAMSAR

The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

The Governments of Denmark, Germany and the Netherlands have formally requested the Secretariat of the Ramsar Convention, through a joint letter dated 1 December 2015, to list the Wadden Sea as a Transboundary Ramsar Site. With that formal request, Wadden Sea became the biggest transboundary RAMSAR site.

There are 7 designated RAMSAR sites in the Netherlands: North Sea Coastal Area (Ramsar Site n°1252), Waddenzee (Ramsar Site n°289), Duinen en Lage land Texel (Ramsar Site n°2213), Duinen Vlielan (Ramsar Site n° 2216), Duinen Terschelling (Ramsar Site n°2215), Duinen Ameland (Ramsar Site n°2212) and Duinen Schiermonnikoog (Ramsar Site n°2214).

RAMSAR SITES

- RAMSAR SITE 289 WADDEN SEA
- RAMSAR SITE 1252 NOORDZEEKUSTRZONE
- RAMSAR SITE OF DUNES 2214,2213,2216,2215,2212

** **Source:** Holocene Landscape Reconstruction of the Wadden Sea Area Between Marsdiep and Weser, Explanation of the coastal evolution and visualisation of the landscape developmen, Netherlands Journal of Geosciences, 2015*

0 5 10 20 30 50 km

★ 1.Archhetypal Struggle Against Water
& Moving Islands

2.The Dynamics of the Island

3.Struggle Against Salinisation and Droughts

(Island as a source of water)

4.Representation of the Struggle
Against Water

(How the Struggle against water is represented
in visual arts in the Netherlands)

Jordsand

The island was destroyed in a series of storm tides
(Source: Googlemaps)

Demise of Jordsand

The ritualistic burning of the observation hunt in September 1999 symbolised the demise of Jordsand as a hallig in the Wadden Sea
(Photo: Svend Tougaard)

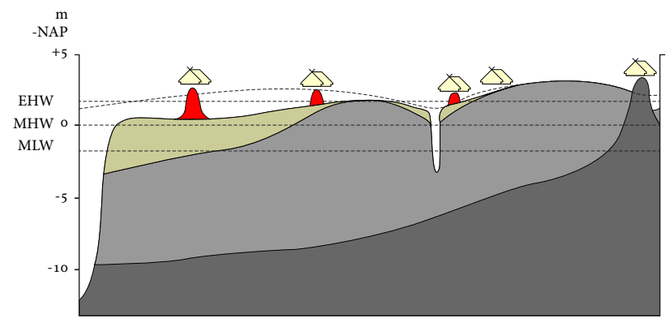
MORPHOLOGICAL DEVELOPMENT OF THE WEST FRISIAN ISLANDS

100 AD

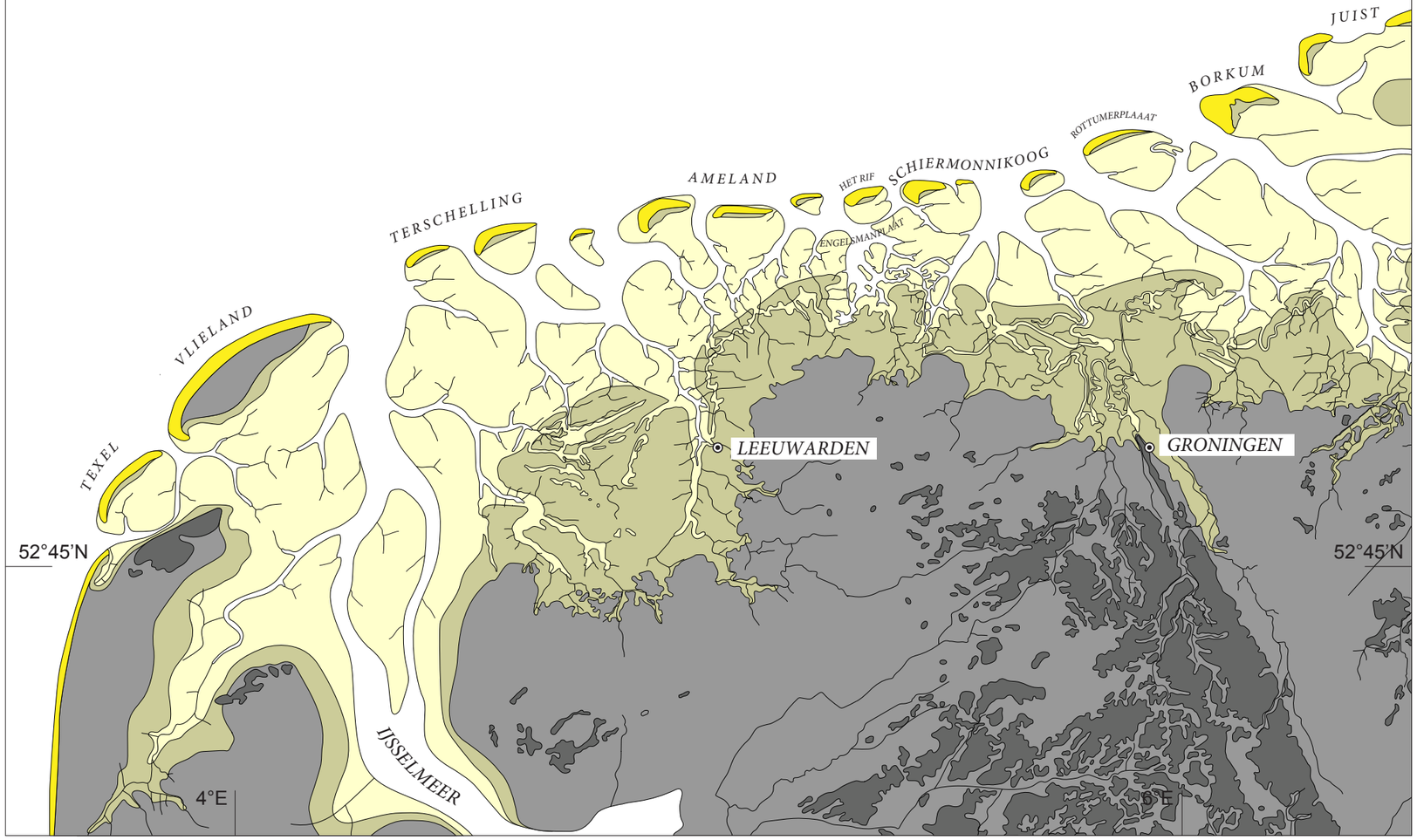
Origins of tidal basins and ingression systems

Geological processes and human interventions induced major changes in the Holocene coastal landscape. As a result of the global Holocene sea-level rise, northern Netherlands changed into a marine environment. Tidal channels locally eroded the subsoil and the lower parts of the Pleistocene valleys were flooded. These valley systems turned into tidal basins and where Eems debouched into the sea they became an estuary. The Wadden Islands, tidal basins and estuaries migrated landward as a result of ongoing sea-level rise.

During the Late Iron Age and Roman times, at increasingly more locations in the Dutch Wadden Sea, marine sedimentation in the marginal peat lands took place. Then the border zones of peat areas started drowning. Human reclamations and continuous sea level rise caused subsidence in the border zones of the peat areas. (The average sea level rose by about 5–10 cm per century)



EHW: extreme high water MHW: mean high water MLW: mean low water



COASTAL DUNES
- DUNE, BEACH, SAND

PEAT BOG
- PEAT

ANTHROPOGENIC AREAS
- RECLAIMED TIDAL AREAS
- FORMER LAKES
- URBAN AREAS
- CITIES

TIDAL LANDSCAPE
- INTERTIDAL AREAS: SAND & MUD FLATS
- SUPRATIDAL AREAS: SALT-MARSH AREA& SALT-MARSH LEVEES & RIDGES

PLEISTOCENE
- HIGHER PLEISTOCENE GROUNDS
- OUTLINE OF THE PRESENT DAY

** **Source:** Holocene Landscape Reconstruction of the Wadden Sea Area Between Marsdiep and Weser, Explanation of the coastal evolution and visualisation of the landscape developmen, Netherlands Journal of Geosciences, 2015*

0 5 10 20 30 50 km

MORPHOLOGICAL DEVELOPMENT OF THE WEST FRISIAN ISLANDS

800 AD

4°E

6°E

53°45'N

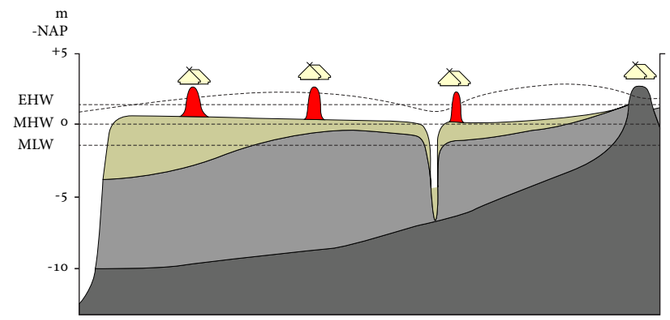
52°45'N

N
W
E
S

JUIST
BORKUM
ROTTUMERPLAAT
ROTTUMEROOG
SIMONSZAND
ZUIDERDUINTJES
SCHIERMONNIKOOG
AMELAND
ENGELSMANPLAAT
TERSCHELLING
VLIELAND
BIJCHEL
GRIEND
TEXEL
LEEUWARDEN
GRONINGEN
IJSSELMEER

800 AD

During the Migration Period (400–500 AD) the occupation intensity in the salt-marsh area of the northwestern Wadden Sea reduced sharply and so did the reclamation activities. The occupancy of salt marshes at the seaward margin of the peat area in the northern Netherlands and northwestern Germany increased strongly again during the Early Middle Ages when the large-scale peat reclamations started, leading to full cultivation of the coastal peat bog and the adjacent peat-moor area on the Pleistocene soils. They caused a significant subsidence in the surface of the seaward margin of the peat area. Because of subsidence the seaward margin of the peat area was flooded during storms.Concomitantly, the tidal currents to the hinterland strengthened, which in turn led to an enlargement of the tidal channels. The Lauwerszee reached its maximum extent in the Early Middle Ages. Because, the subsidence resulting from peat reclamation enabled the tidal system of the Lauwerszee to enlarge.



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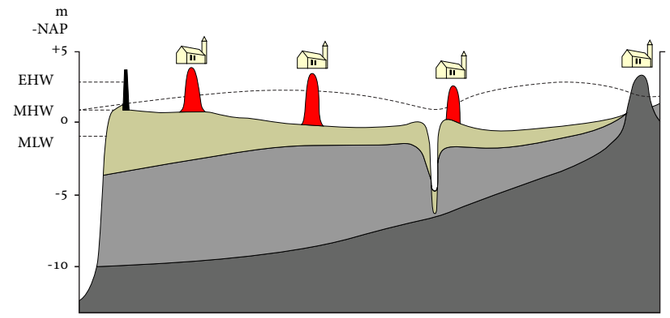
0 5 10 20 30 50 km

MORPHOLOGICAL DEVELOPMENT OF THE WEST FRISIAN ISLANDS

1500 AD

1500 AD

The Zuiderzee enlarged during the Middle Ages, erosion during major storms playing a major role. For example, during the great storm of 1170 AD a large piece of land, seaward of the current dike at Stavoren, was lost and the Marsdiep came into existence. As the inland sea increased in size, wave attack on the shorelines became stronger. The Marsdiep tidal inlet became increasingly important during the Middle Ages. The effects of anthropogenic interventions in the coastal landscape became dramatic in the Late Middle Ages, when the major part of the salt-marsh area was embanked. In the course of the 11th century the construction of dikes had become necessary in areas with strong subsidence. In the previous periods the water flowed back to the sea in a natural way after a flood. However, after the artificial subsidence of the land, water remained present and could only be discharged to the sea during low water through a system of dikes and sluices. In this way almost the entire marsh area of the northwestern, Wadden Sea area of the Netherlands and Germany was diked between 1200 and 1300. As a result of this diking water could no longer be stored in the salt marshes during storms, leading to the impoundment of water against the dikes and an increase in maximum storm water levels in the Wadden Sea.



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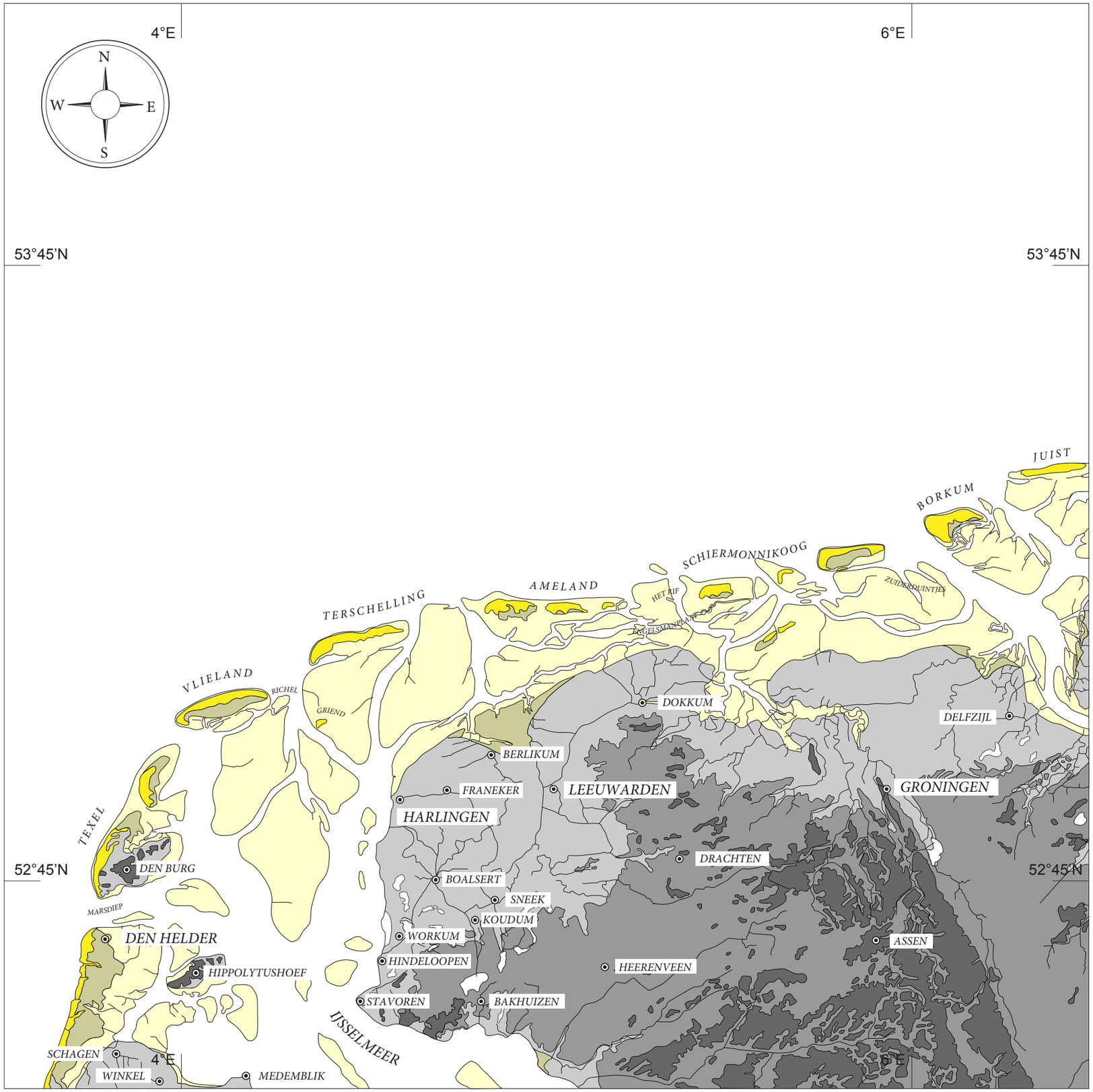

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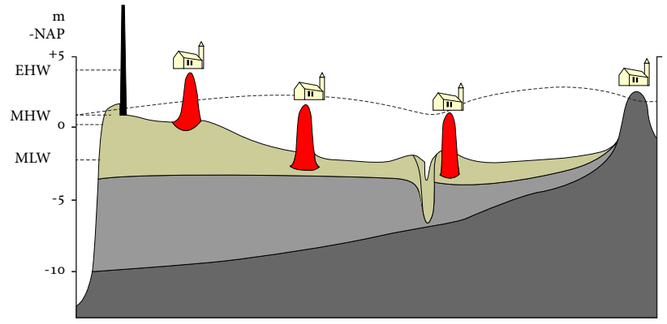
0 5 10 20 30 50 km

MORPHOLOGICAL DEVELOPMENT OF THE WEST FRISIAN ISLANDS

2000 AD

2000 AD

The northern part of Noord-Holland silted up strongly and the silted-up salt marshes were diked in stages. From the 19th century onwards the intertidal coastal zone along the embanked mainland has also been reclaimed using wooden structures along the dike in which silt was trapped.When such reclamation areas had silted up to the level of the salt marsh they were diked. In the 20th century the Zuiderzee and the Lauwerszee were cut off from the Wadden Sea by large dikes. Thus the Wadden Sea area has been reduced. In particular, the salt-marsh areas are only a fraction of what they once were. After 1500 AD the peat area also decreased considerably. The coastal peat and the peat areas on the higher Pleistocene grounds have largely disappeared due to large-scale peat-cutting for fuel (turf) and salt, and by oxidation of peat due to exploitation.



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0 5 10 20 30 50 km

N
W
E
S

ROTTUMEROOG

SCHIERMONNIKOOG

BOSCHPLAAT

VOORMALIGE
LAUWERSZEE

1840 1930 1960 1970 1980 1990 2000 2005 2010 2015

90 Years 30 Years 10 10 10 10 5 5 5

MORPHOLOGICAL DEVELOPMENT
OF THE SCHIERMONNIKOOG

1840

N
W
E
S

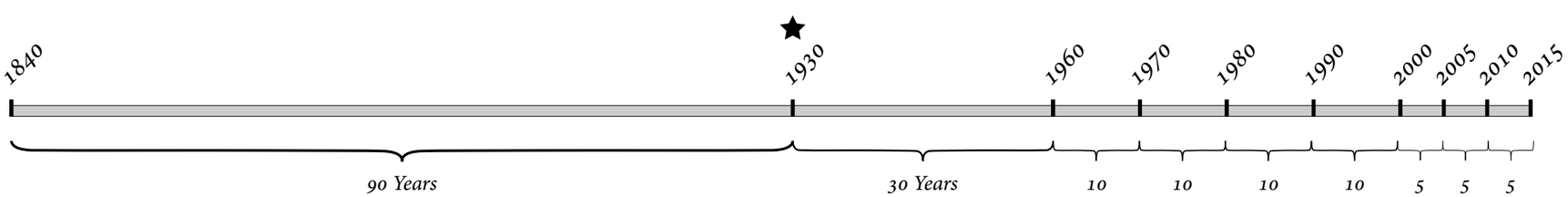
SCHIERMONNIKOOG

BOSCHPLAAT

ROTTUMERPLAAT

ROTTUMEROOG

VOORMALIGE
LAUWERSZEE



MORPHOLOGICAL DEVELOPMENT
OF THE SCHIERMONNIKOOG

1930

N
W
E
S

ROTTUMERPLAAT

ROTTUMEROOG

SIMONSZAND

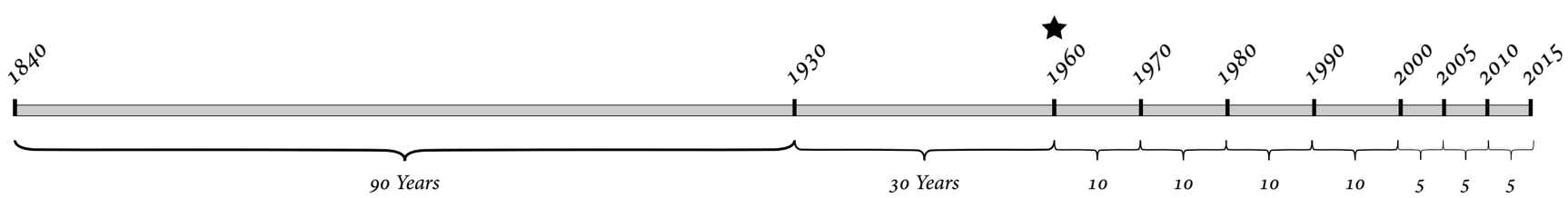
BOSCHPLAAT

ZUIDERDUIN

SCHIERMONNIKOOG

ENGELSMANPLAAT

VOORMALIGE
LAUWERSZEE



MORPHOLOGICAL DEVELOPMENT
OF THE SCHIERMONNIKOOG

1960

N
W E
S

ROTTUMERPLAAT

BOSCHPLAAT

ROTTUMEROOG

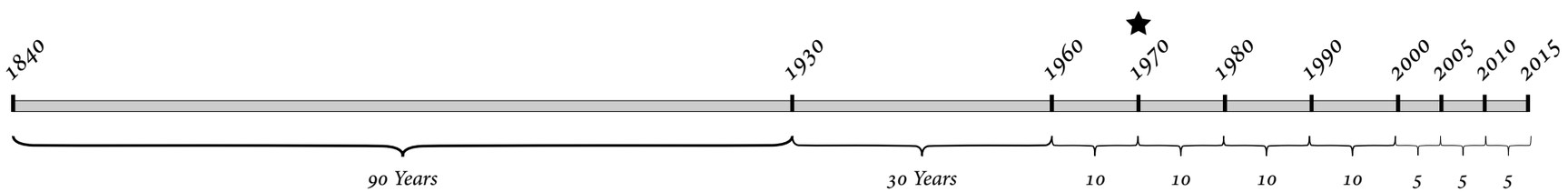
ZUIDERDUIN

SIMONSZAND

SCHIERMONNIKOOG

ENGELSMANPLAAT

VOORMALIGE LAUWERSZEE



MORPHOLOGICAL DEVELOPMENT OF THE SCHIERMONNIKOOG

1970

N
W
E
S

ROTTUMERPLAAT

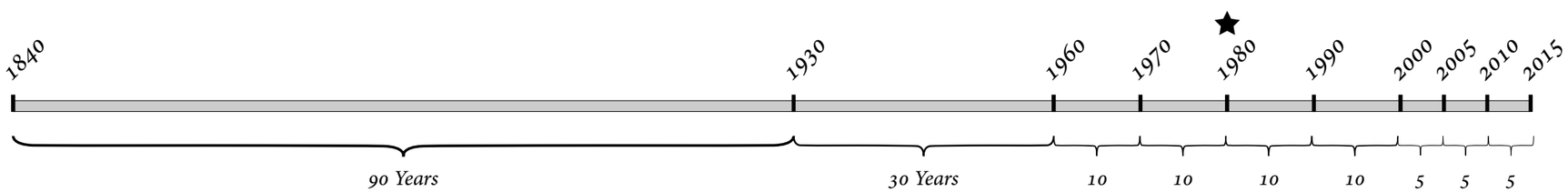
ROTTUMEROOG

ZUIDERDUIN

SIMONSZAND

SCHIERMONNIKOOG

ENGELSMANPLAAT



MORPHOLOGICAL DEVELOPMENT OF THE SCHIERMONNIKOOG

1980

N
W
E
S

ROTTUMERPLAAT

ROTTUMEROOG

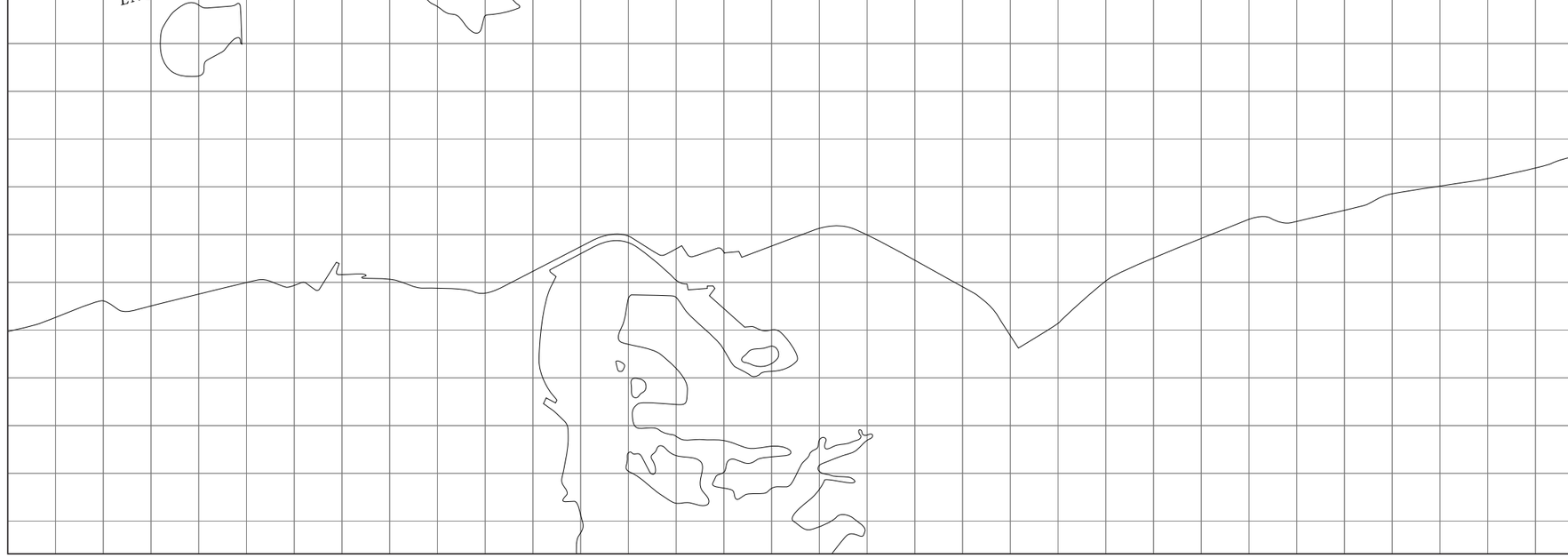
ZUIDERDUIN

SIMONSZAND

SCHIERMONNIKOOG

SIMONSZAND

ENGELSMANPLAAT



MORPHOLOGICAL DEVELOPMENT OF THE SCHIERMONNIKOOG

1990

N
W
E
S

ROTTUMERPLAAT

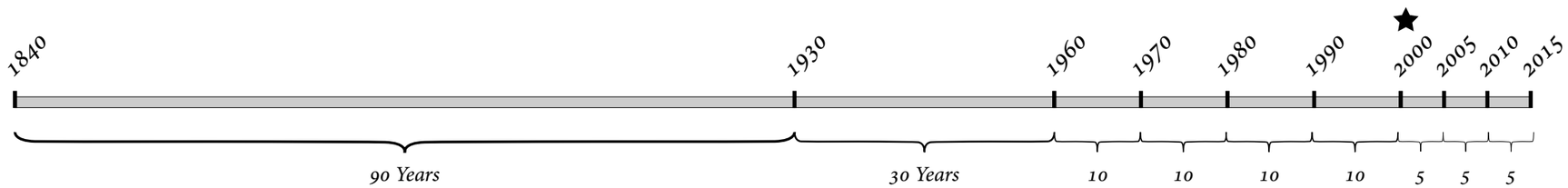
ROTTUMEROOG

ZUIDERDUIN

SIMONSZAND

SCHIERMONNIKOOG

ENGELSMANPLAAT



MORPHOLOGICAL DEVELOPMENT OF THE SCHIERMONNIKOOG

2000

N
W
E
S

ROTTUMERPLAAT

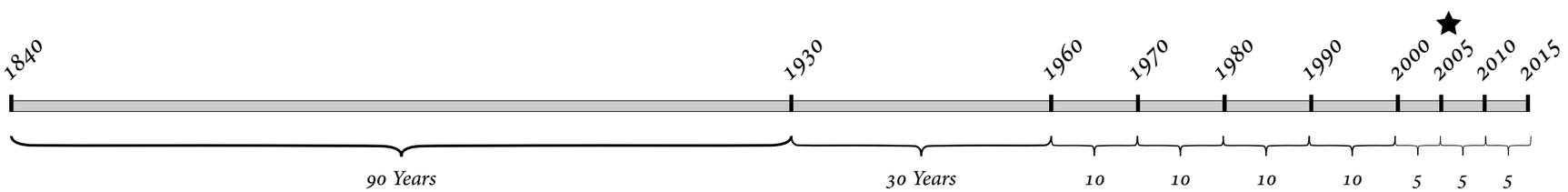
ROTTUMEROOG

ZUIDERDUIN

SIMONSZAND

SCHIERMONNIKOOG

ENGELSMANPLAAT



MORPHOLOGICAL DEVELOPMENT OF THE SCHIERMONNIKOOG

2005

N
W
E
S

ROTTUMERPLAAT

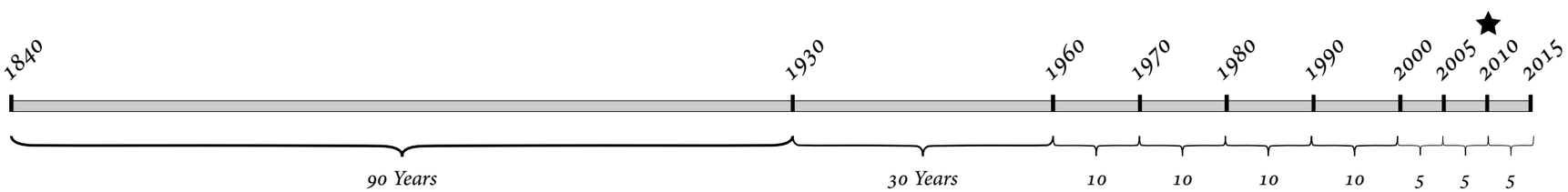
ROTTUMEROOG

ZUIDERDUIN

SIMONSZAND

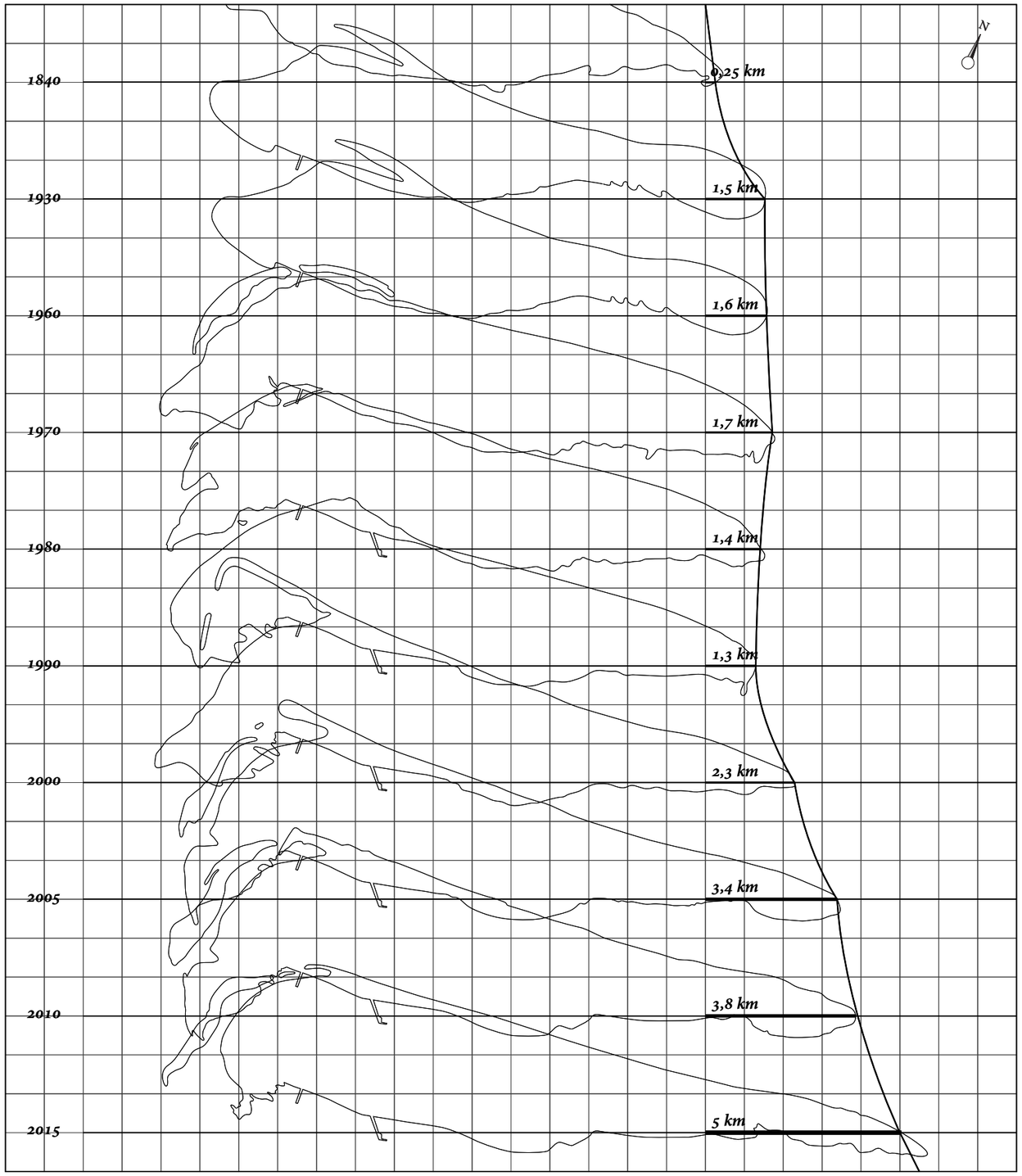
SCHIERMONNIKOOG

ENGELSMANPLAAT



MORPHOLOGICAL DEVELOPMENT OF THE SCHIERMONNIKOOG

2010



175 Years

Last 175 Years of Island Schiermonnikoog

Island moves approximately 1,2 kilometres in the last 5 years.

What if the island Schiermonnikoog *slowly disappears* in the currents of the North Sea?

Scenario Method

Outcome of the Morphological Research
A Scenario for the far Future

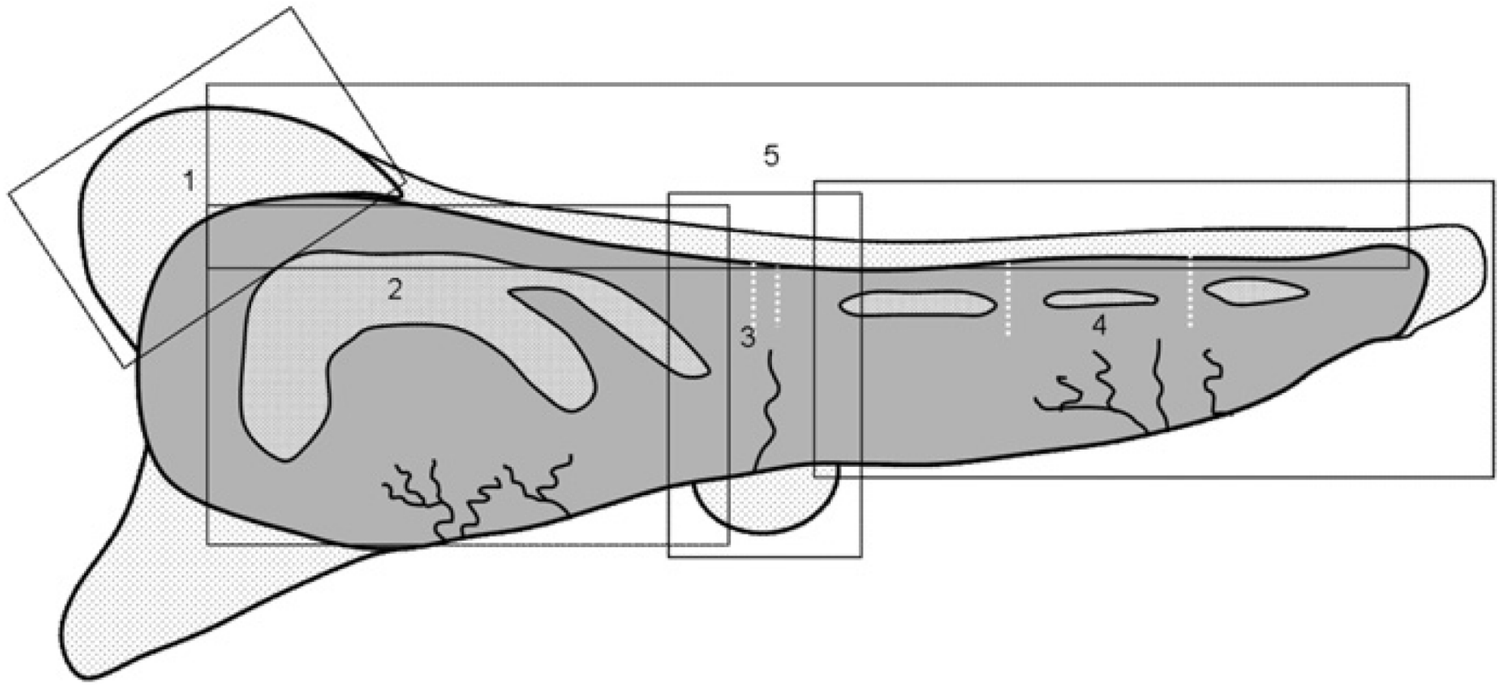
1.Archhetypal Struggle Against Water

★ 2.The Dynamics of the Island

3.Struggle Against Salinisation and Droughts

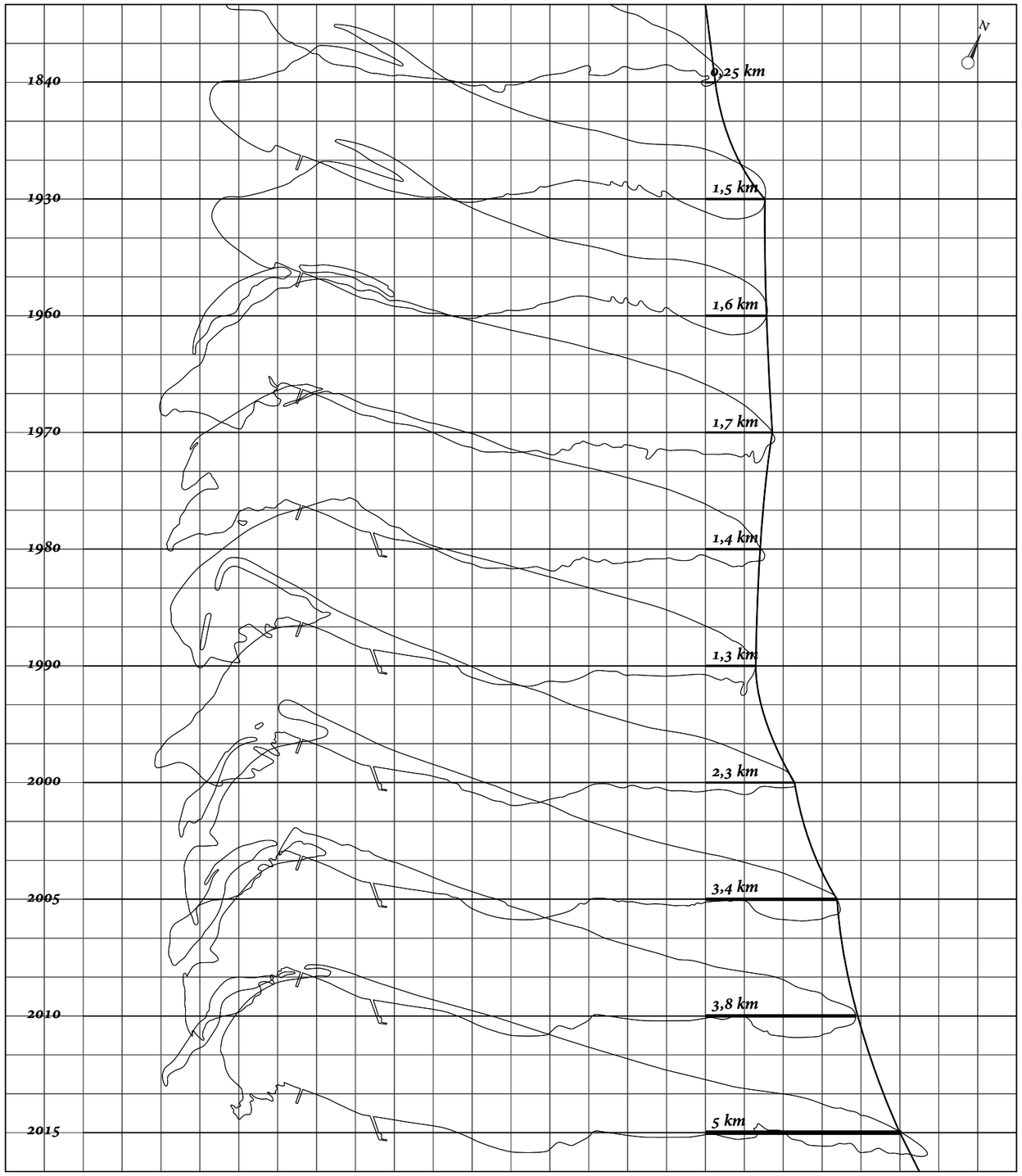
4.Representation of the Struggle Against Water

(How the Struggle against water is represented in visual arts in the Netherlands)



Prototype Island

The prototype West and East Frisian barrier island is characterized by the presence of five large-scale morpho-ecological units: (1) island head; (2) dune arc; (3) washover complex; (4) island tail; (5) Beach and shoreface *(Source: Löffler et al., 2011)*



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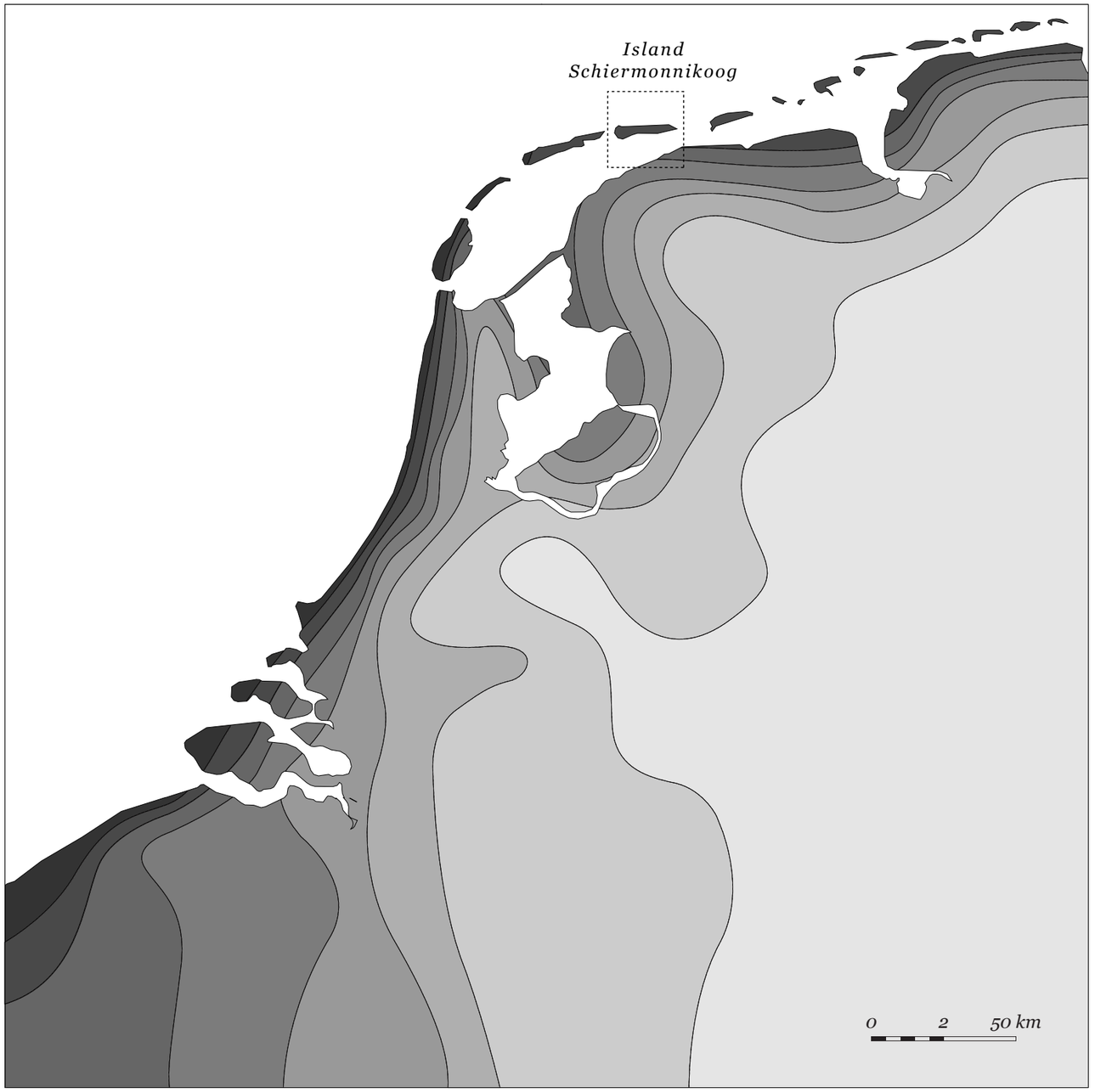
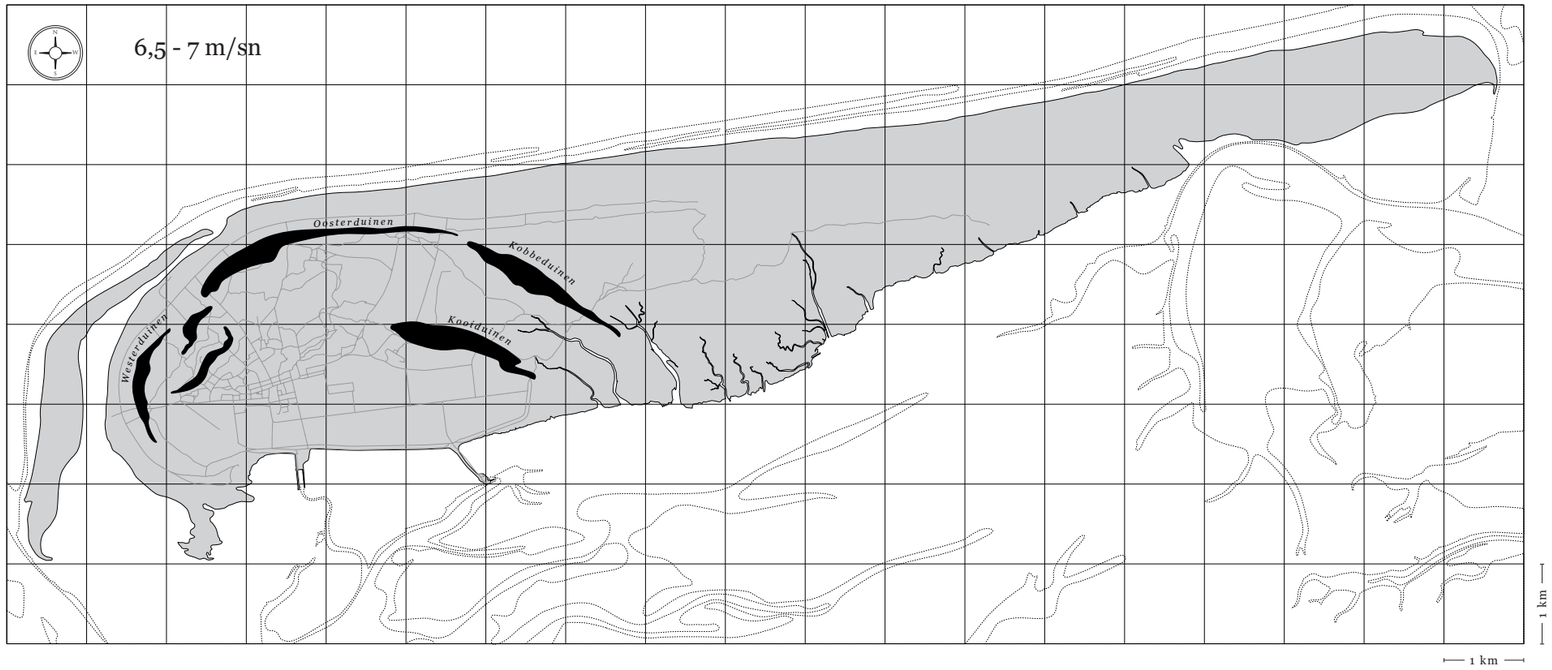


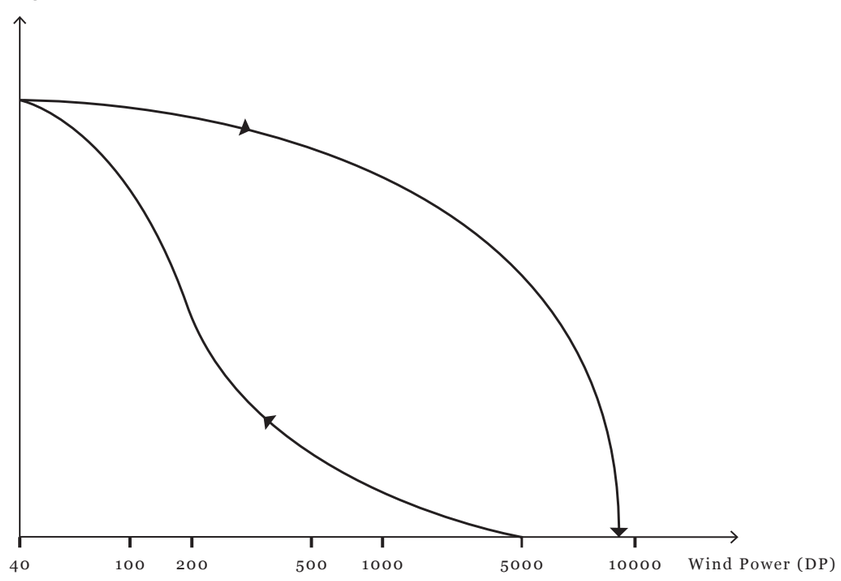
Wind Map of the Netherlands (m/s)

3,50 - 4,00 | 4,00 - 4,50 | 4,50 - 5,00 | 5,00 - 5,50 | 5,50 - 6,00 | 6,00 - 6,50 | 6,50 - 7,00 | 7,00 - 7,50

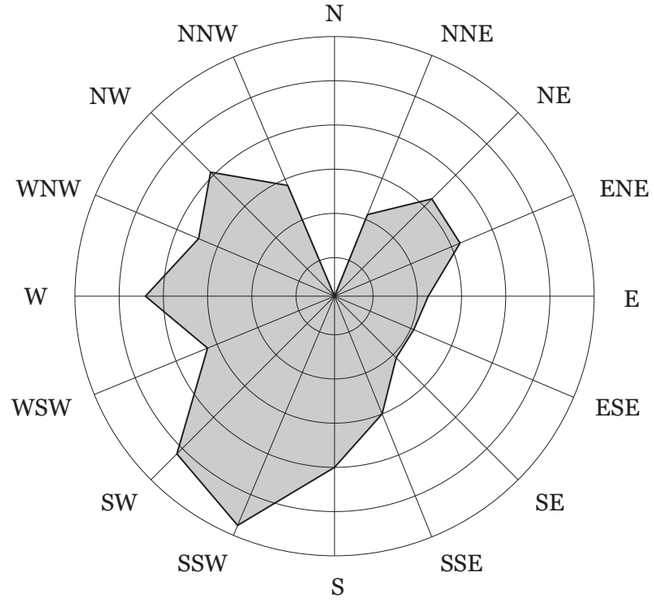
Wind Map

The average wind speed in the Netherlands varies from 9.5 to 4.0 m/s in the East to 7.0-7.5 m/s on the coast.
The values relate to an axle height of 10 meters in open grassland. *(Source: KNMI)*





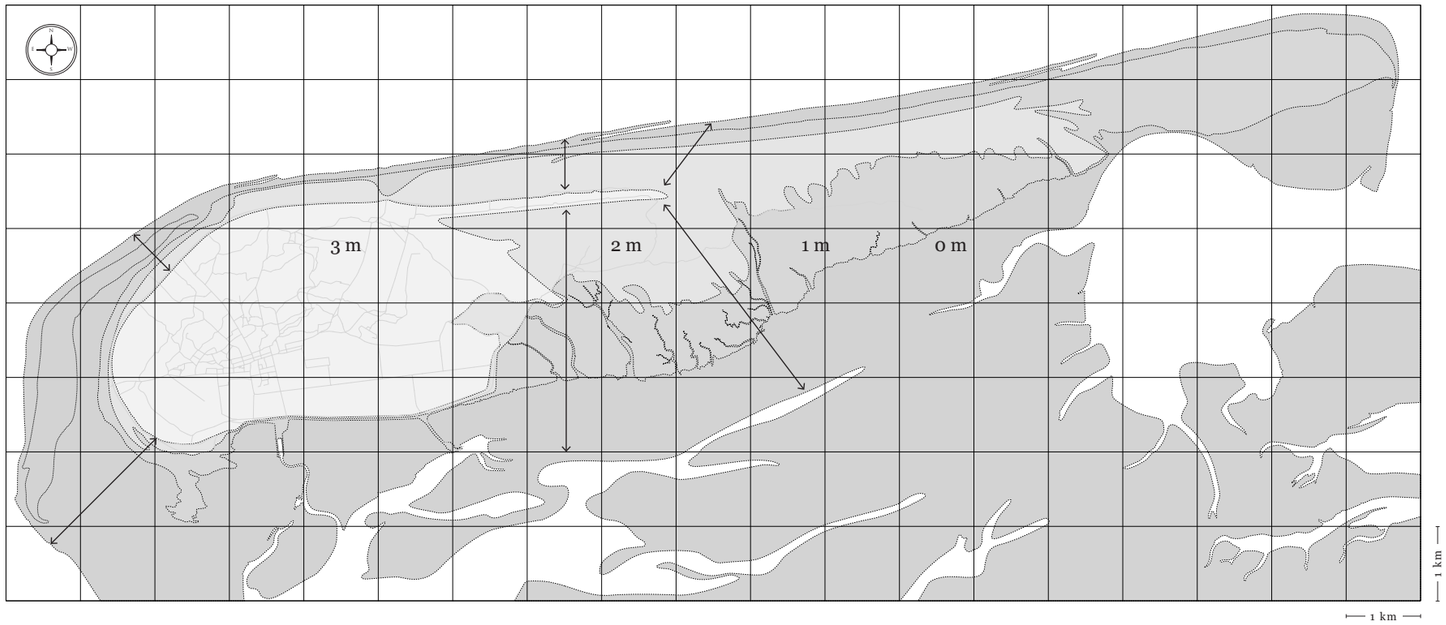
Hysteresis curve related to changes in wind power
and vegetation cover. (Source: H. Tsoar)

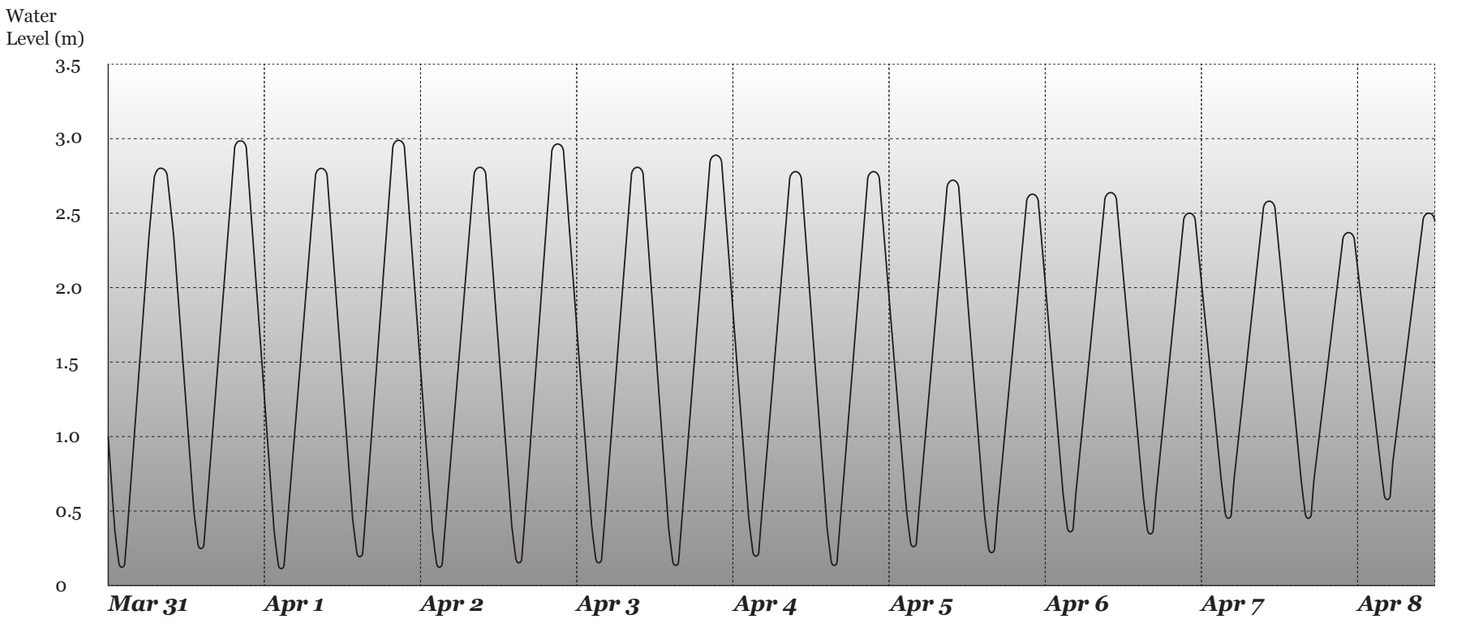


Wind Distribution in Year(%)
in the island Schiermonnikoog

Prevailing Wind

The size and morphology of coastal dunes is dependent on the complex interaction between controlling winds, sediment supply and the geomorphology of the nearshore and beach environment.
At the most basic level, dunes can be divided into those that form from the direct supply of sediment from the beach face (primary dunes), and those that form from the subsequent modification of primary dunes (secondary dunes)





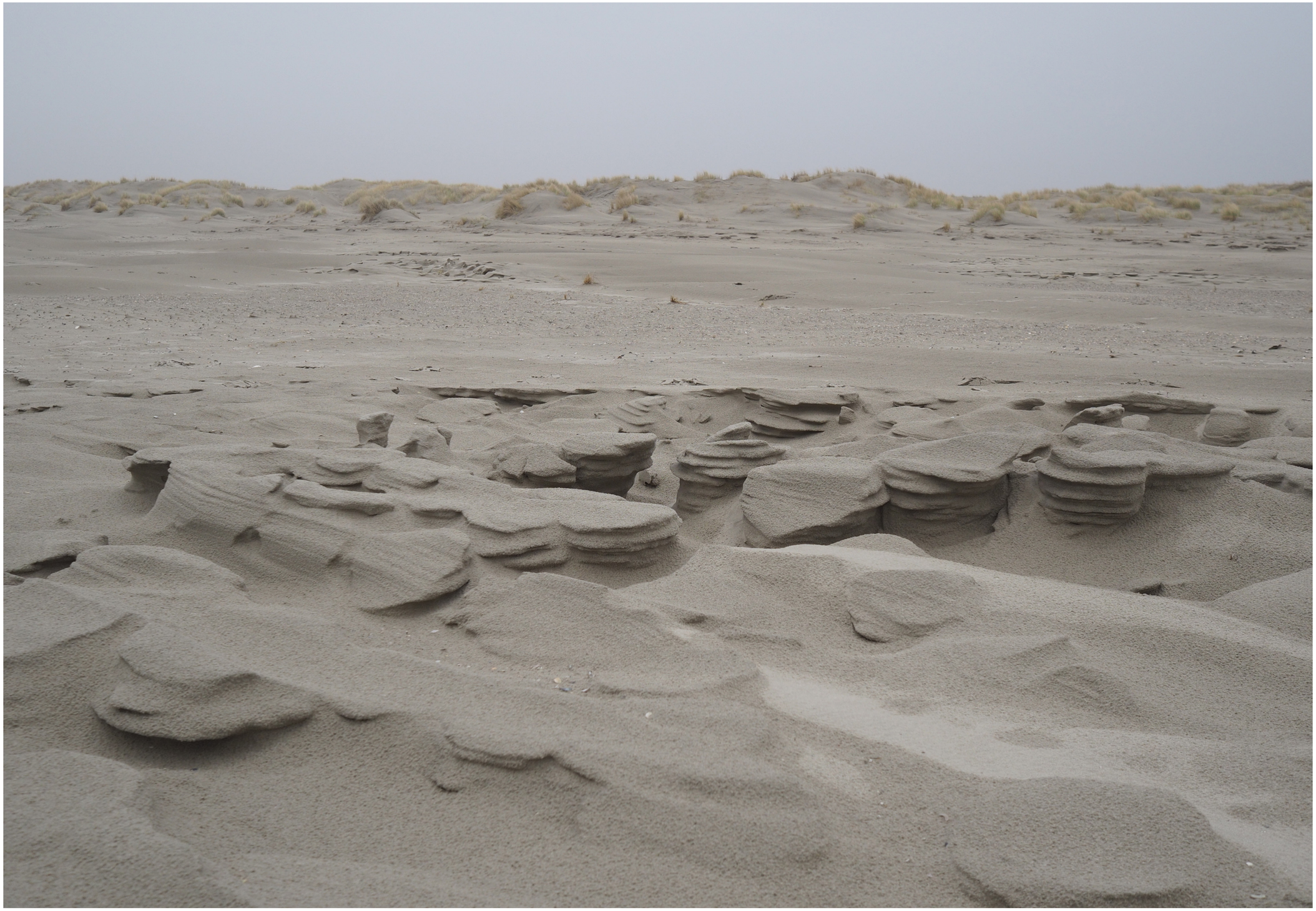
TIME & WATER LEVEL	TIME & WATER LEVEL	TIME & WATER LEVEL	TIME & WATER LEVEL	TIME & WATER LEVEL	TIME & WATER LEVEL	TIME & WATER LEVEL	TIME & WATER LEVEL	TIME & WATER LEVEL
05:23 0.11 m	06:09 0.10 m	06:46 0.11 m	01:00 2.96 m	01:37 2.89 m	02:11 2.77 m	02:43 2.63 m	03:15 2.49 m	03:55 2.37 m
11:37 2.80 m	12:18 2.81 m	06:47 0.11 m	07:17 0.14 m	07:43 0.18 m	08:11 0.25 m	08:41 0.34 m	09:13 0.44 m	09:50 0.56 m
17:41 0.23 m	18:23 0.18 m	12:54 2.81 m	13:26 2.81 m	13:57 2.78 m	14:27 2.72 m	14:59 2.64 m	15:33 2.57 m	16:18 2.50 m
23:41 2.99 m	00:22 2.99 m	18:58 0.14 m	19:27 0.12 m	19:56 0.14 m	20:27 0.20 m	21:00 0.31 m	21:36 0.43 m	22:21 0.57 m

The Tide

Tide prediction from the nearest tide station in Schiermonnikoog.
4.97 km SE Schiermonnikoog Beach

The Beach

Excursion to the island Schiermonnikoog
Sand Shapes



The Beach

Excursion to the island Schiermonnikoog
Sand Shapes

The Beach

Excursion to the island Schiermonnikoog
Decay

Water Extraction

Water Production plant of the Vitens

Water Extraction

Water Production plant of the Vitens

Water Well

Water well of the company

1.Archhetypal Struggle Against Water
& Moving Islands

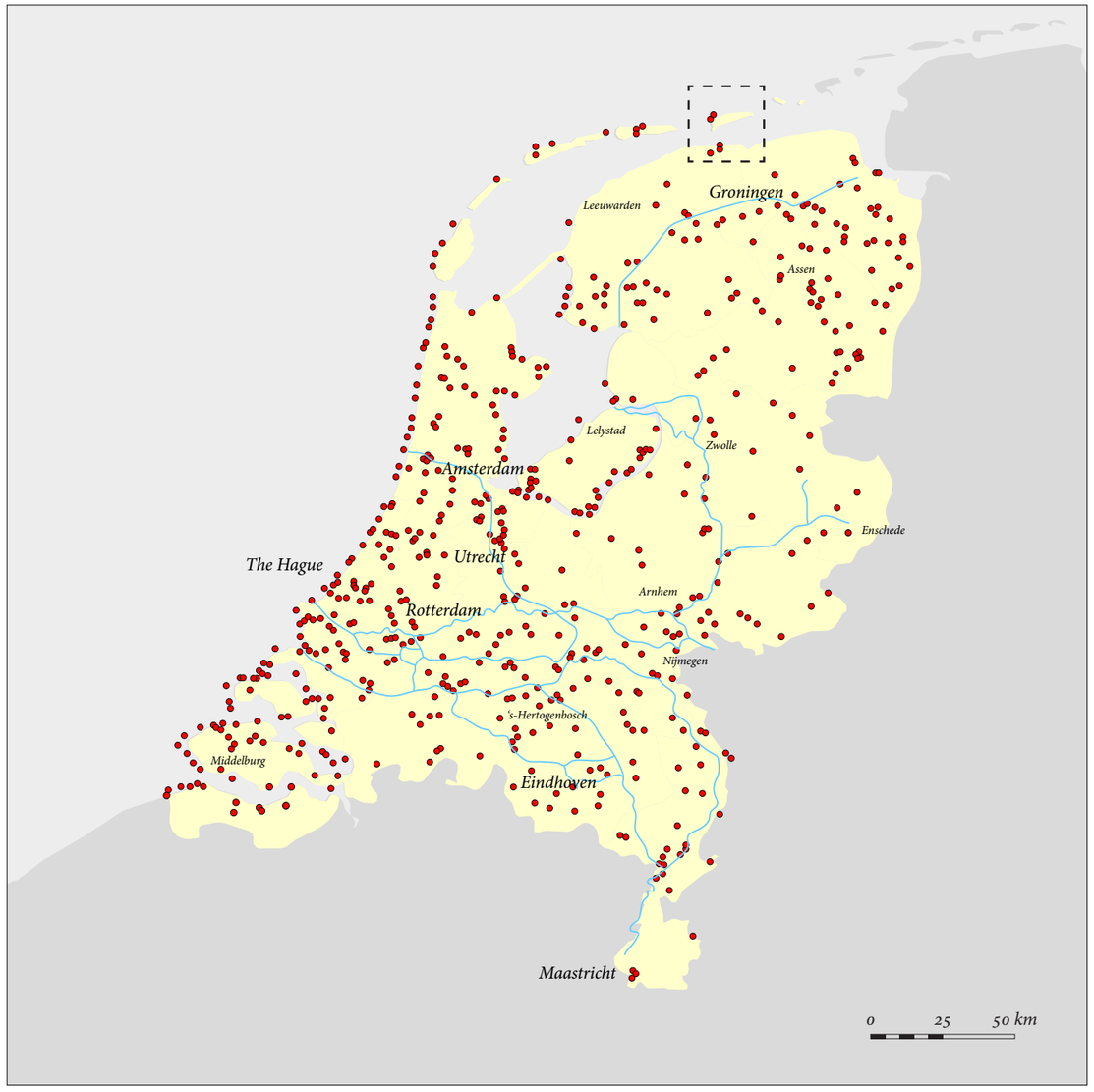
2.The Dynamics of the Island

★ 3.Struggle Against Salinisation and Droughts

(Island as a source of water)

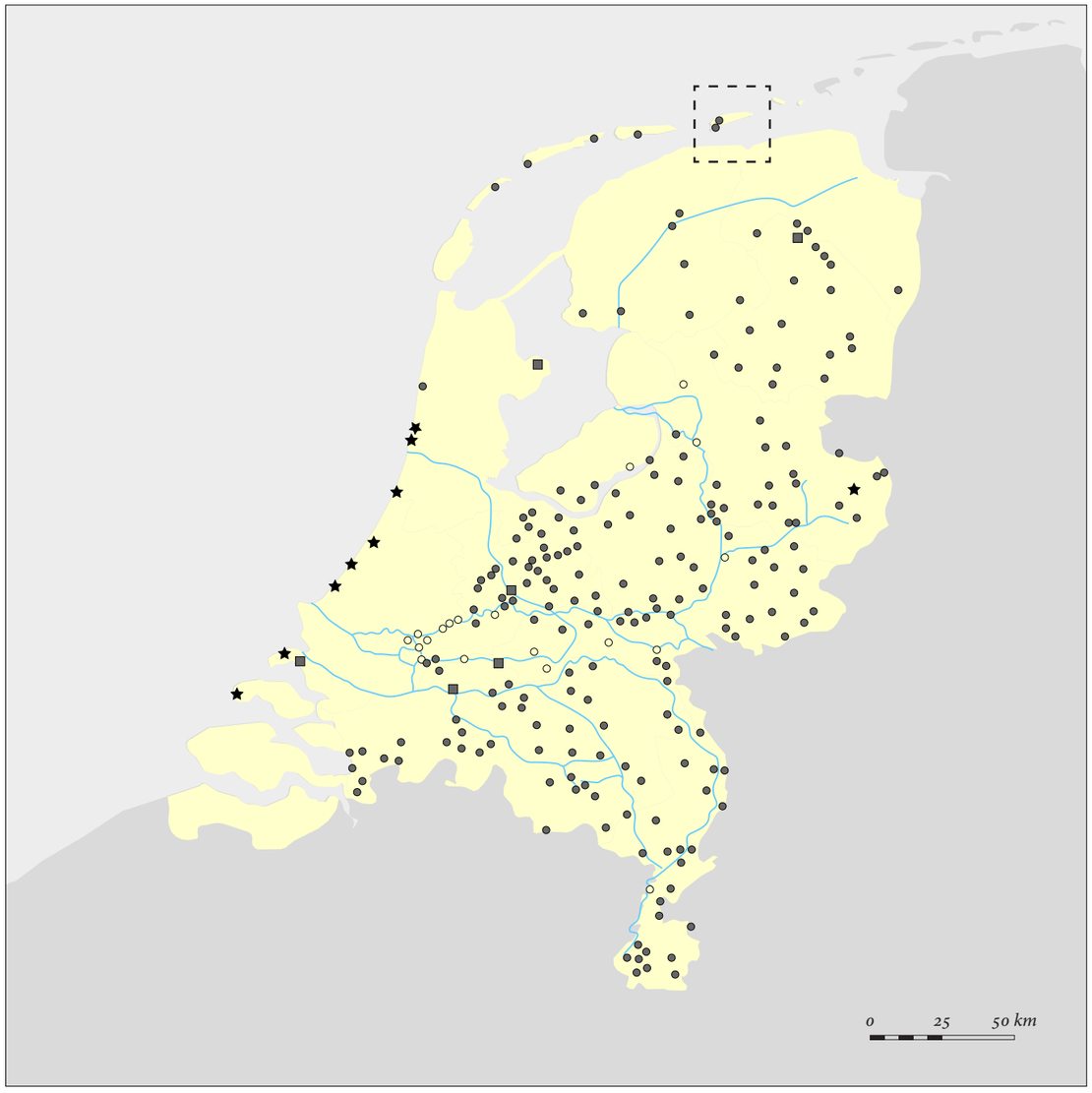
4.Representation of the Struggle
Against Water

(How the Struggle against water is represented
in visual arts in the Netherlands)



BATHING WATER LOCATIONS

BATHING WATER LOCATIONS ACCORDING TO 2009



WATER EXTRACTION

GROUND WATER EXTRACTION

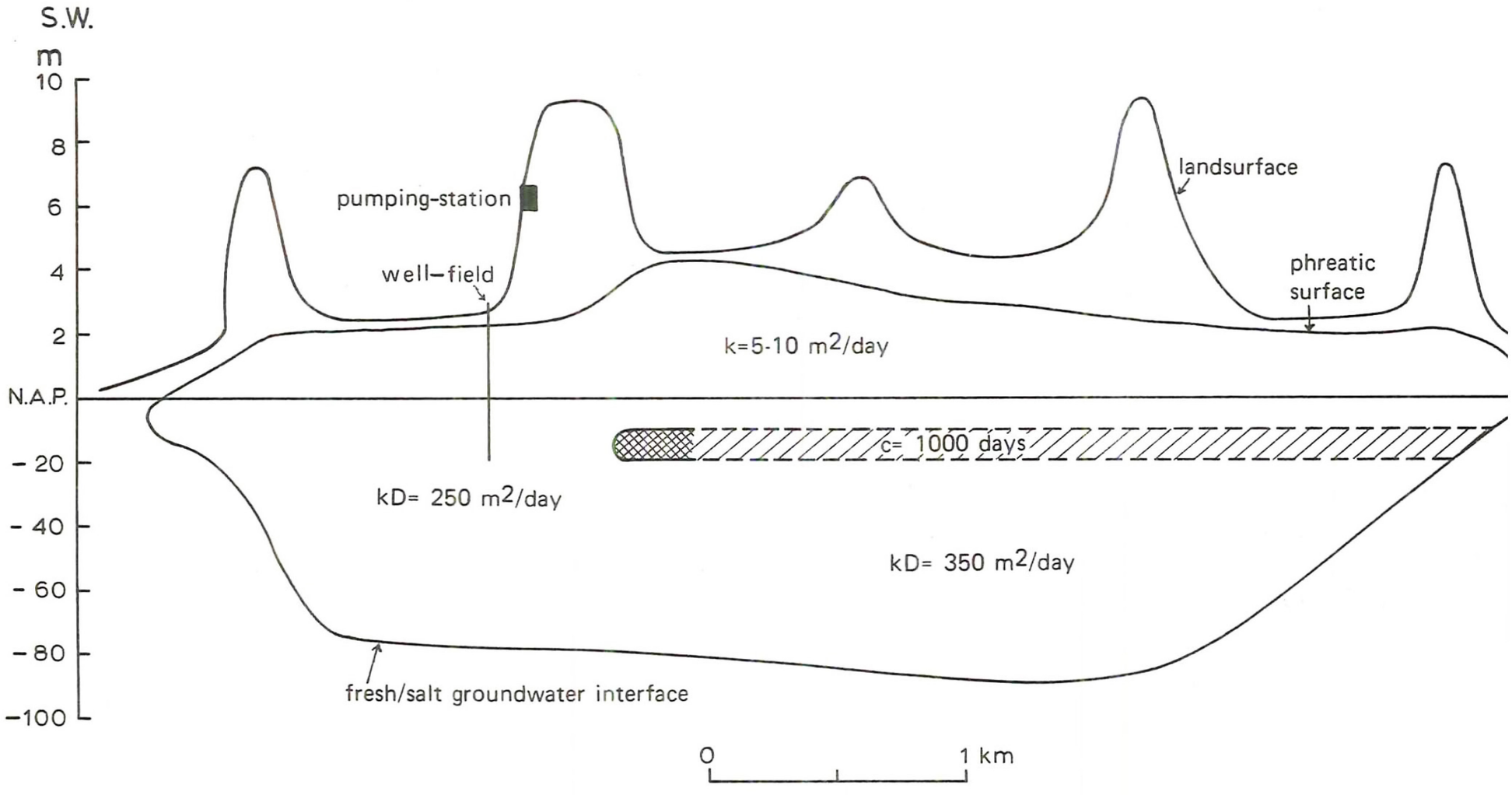
SURFACE WATER EXTRACTION

INFILTRATION, EXTRACTION

RIVERBANK GROUND WATER EXTRACTION

Source of Water

Island as a fresh water source
Purification of the dune water



Fresh Water Lens

Fresh Salt Ground Water Interface
Source: The Hydrology of the Frisian Islands, Th.J.Beukeboom

EFFECT OF WATER SHORTAGES

1 **Northern Netherlands**
Salinisation along the Wadden Sea coast, drought-related problems on the islands.

2 **Northeastern Netherlands**
Dry areas due to a lack of water supply infrastructure.

3 **Centraleastern Netherlands**
Groundwater related drought.
Supply from the IJssel and the Vecht in cases of drought.

4 **Eastern Netherlands**
Presence of hilly areas where water supply is impossible.

5 **Central Netherlands**
Shortage of cooling water in the Amsterdam-Rijnkanaal/ Noordzeekanaal, no other drought-related problems.

6 **Northwestern Netherlands**
Few drought-related problems, occasional deficiencies of the water supply system.

7 **Western Netherlands**
Salinisation and small-scale water supply.

8 **Southwestern Netherlands**
Salinisation.

9 **Southeastern Netherlands**
Presence of hilly areas where water supplyis impossible.

10 **Southern Netherlands**
Water shortage in hilly areas where water supply is impossible. Dependent on water supply from Belgium, though no agreements exist to that end. In dry periods, therefore, the water supply is significantly limited.

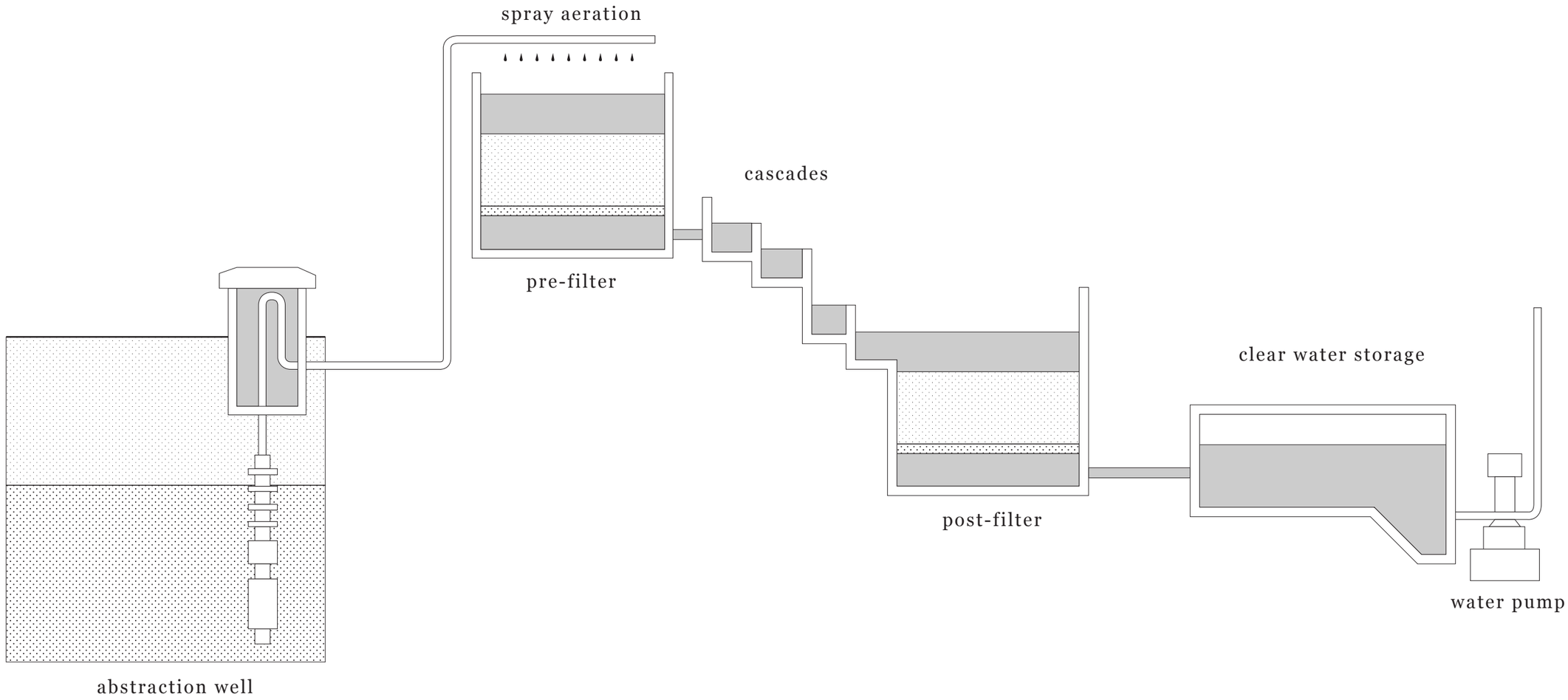
11 **Area around the major rivers of the Netherlands**
Few drought-related problems, occasional deficiencies of the water supply system.

EFFECTS OF HEAT AND DROUGHT ON THE WATER SYSTEM

RIVERS

Droughts & Salinisation

Drastic consequences of the water shortages and droughts
Purification of the dune water



Purification

Schematic impression of a conventional ground water treatment system in the Netherlands with submerged sand filters.
Source: W.W.J.M. de Vet, C.C.A. van Genuchten, M.C.M. van Loosdrecht, J.C van Dijk)

1.Archhetypal Struggle Against Water
& Moving Islands

2.The Dynamics of the Island

3.Struggle Against Salinisation and Droughts

(Island as a source of water)

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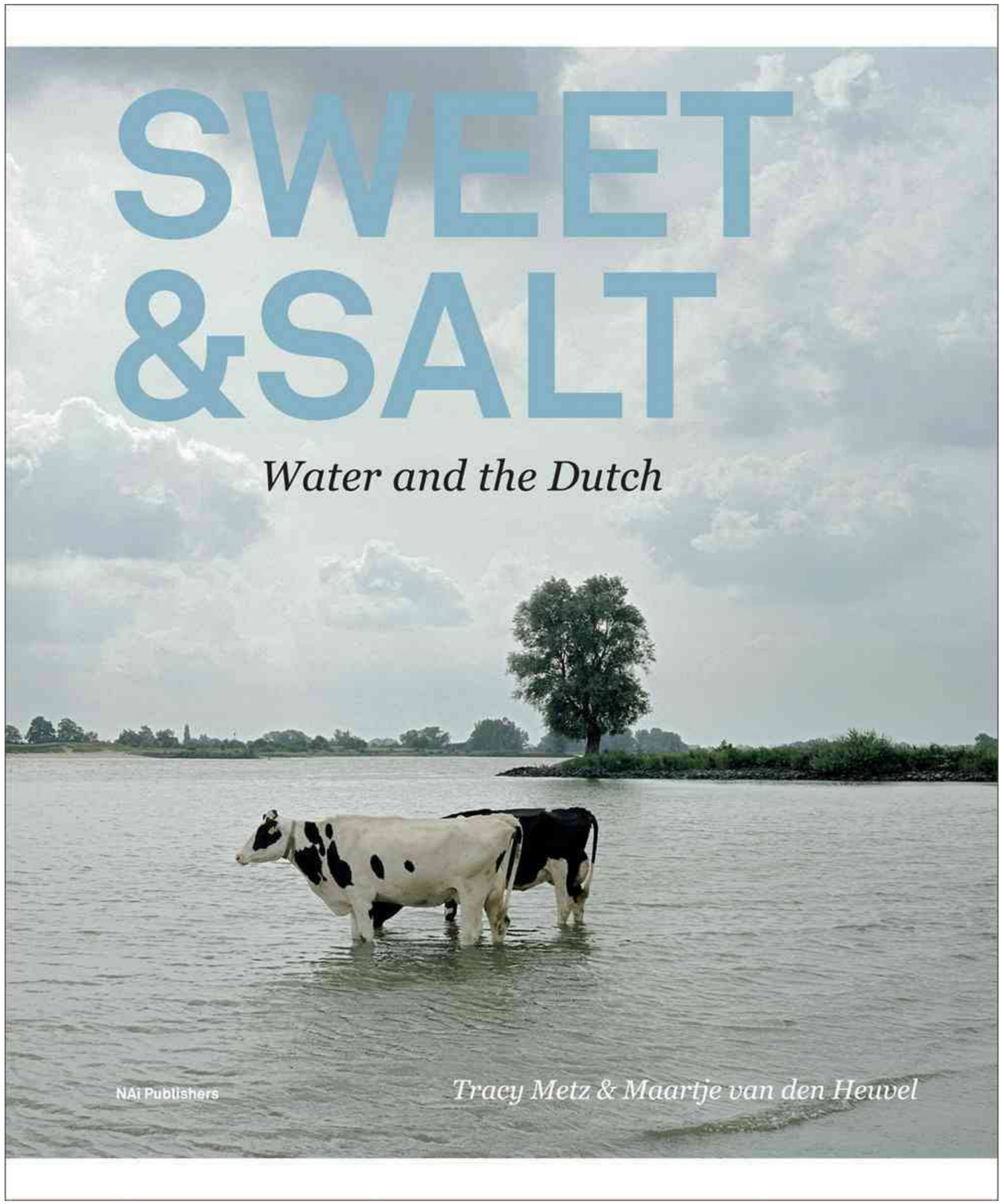


Four Themes

The project tracing the myth of “making new land” by investigating four major themes adopted from a recent publication ‘Sweet and Salt: The Water and The Dutch’.

Conflict

De doorbraak van de Sint Anthonisdijk bij Amsterdam
Willem Schellinks, 1651, Amsterdam Museum

Concord

Siege of Leiden
Jan Maire, Henrick Haestens, Jan Jansz Orlers. 1614

Profit

Departure of a Number of East Indiamen from the Marsdiep
Hendrick Cornelisz Vroom, c.1600-1630, Rijksmuseum

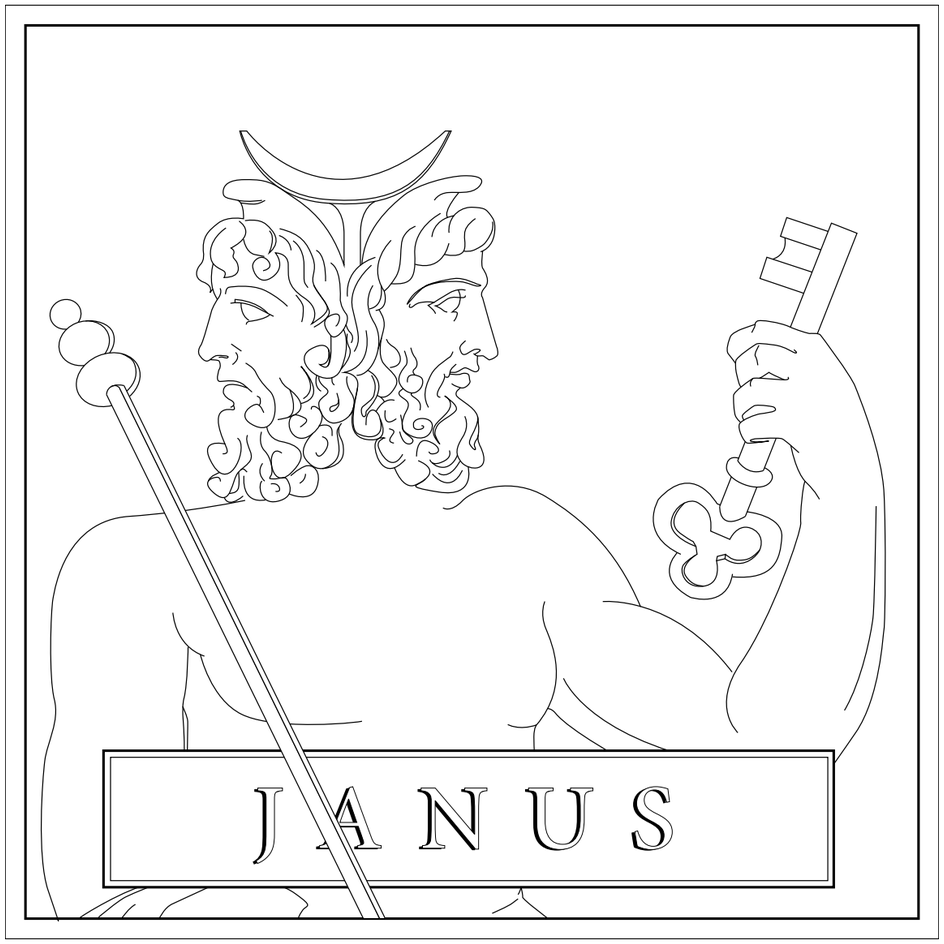
Pleasure

Winter Landscape with Skaters
Hendrick Avercamp, 1608, Rijksmuseum

Research questions:

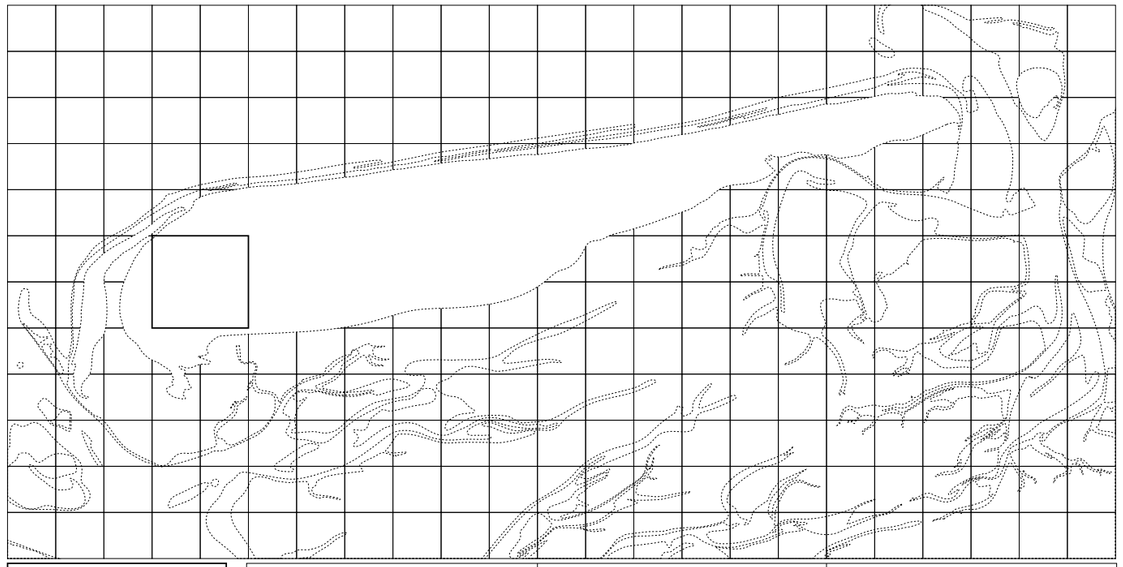
What would be the new myth of water defence which response and works with the accelerated dynamics of the Wadden Sea in the future?

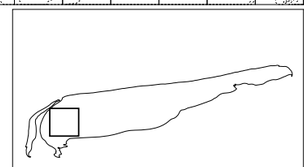
How these four themes: conflict, concord, profit and pleasure can be implemented in future designs and what would be the spatial consequences of interpretation of these themes?



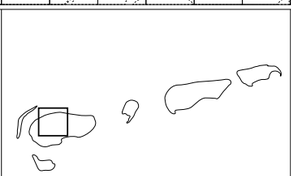
Four Themes

Four Themes as Four Janus-like Gods
Conflict, Concord, Profit, Pleasure





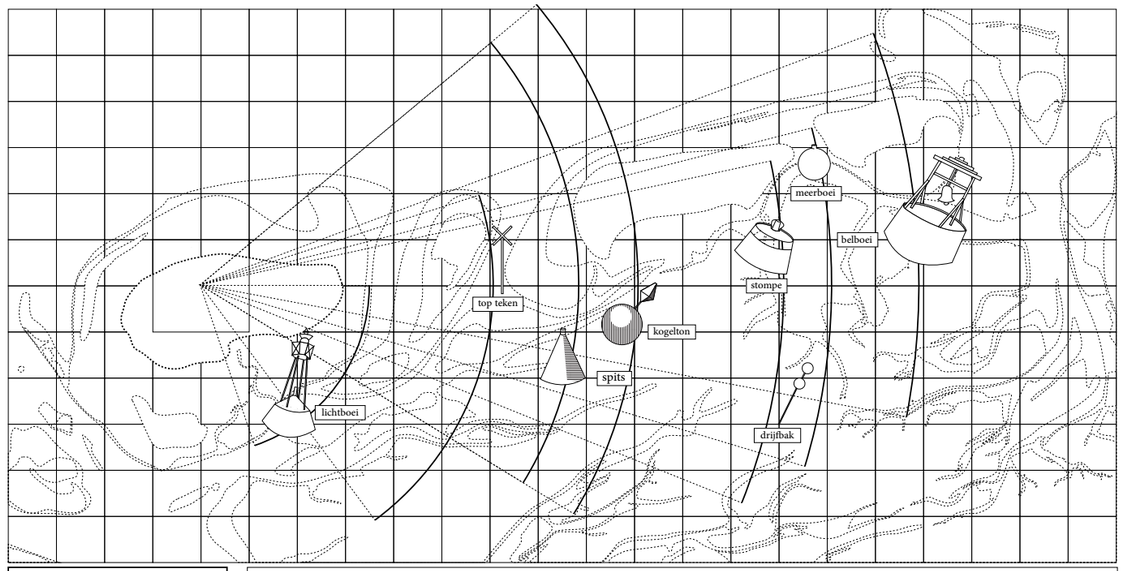
1



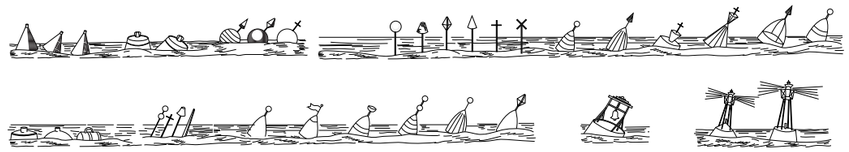
2

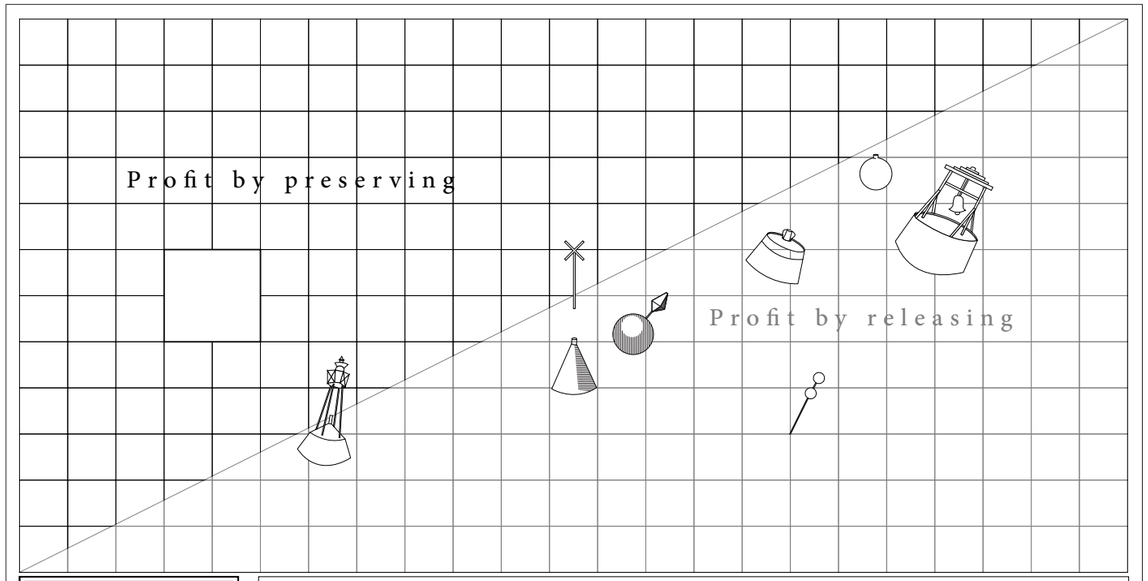
myth

3

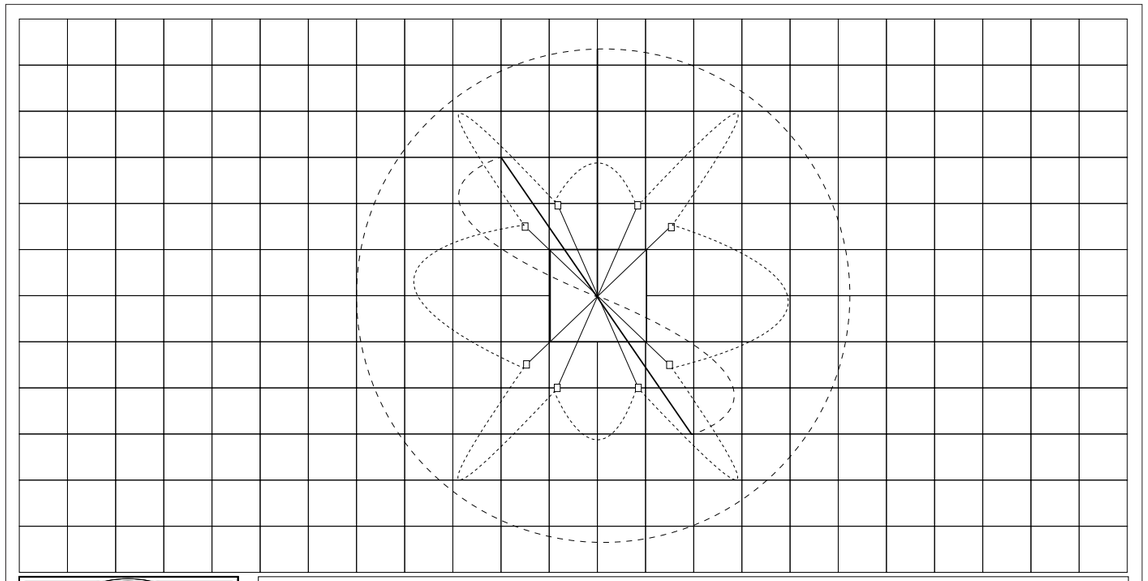


Navigation in the Netherlands

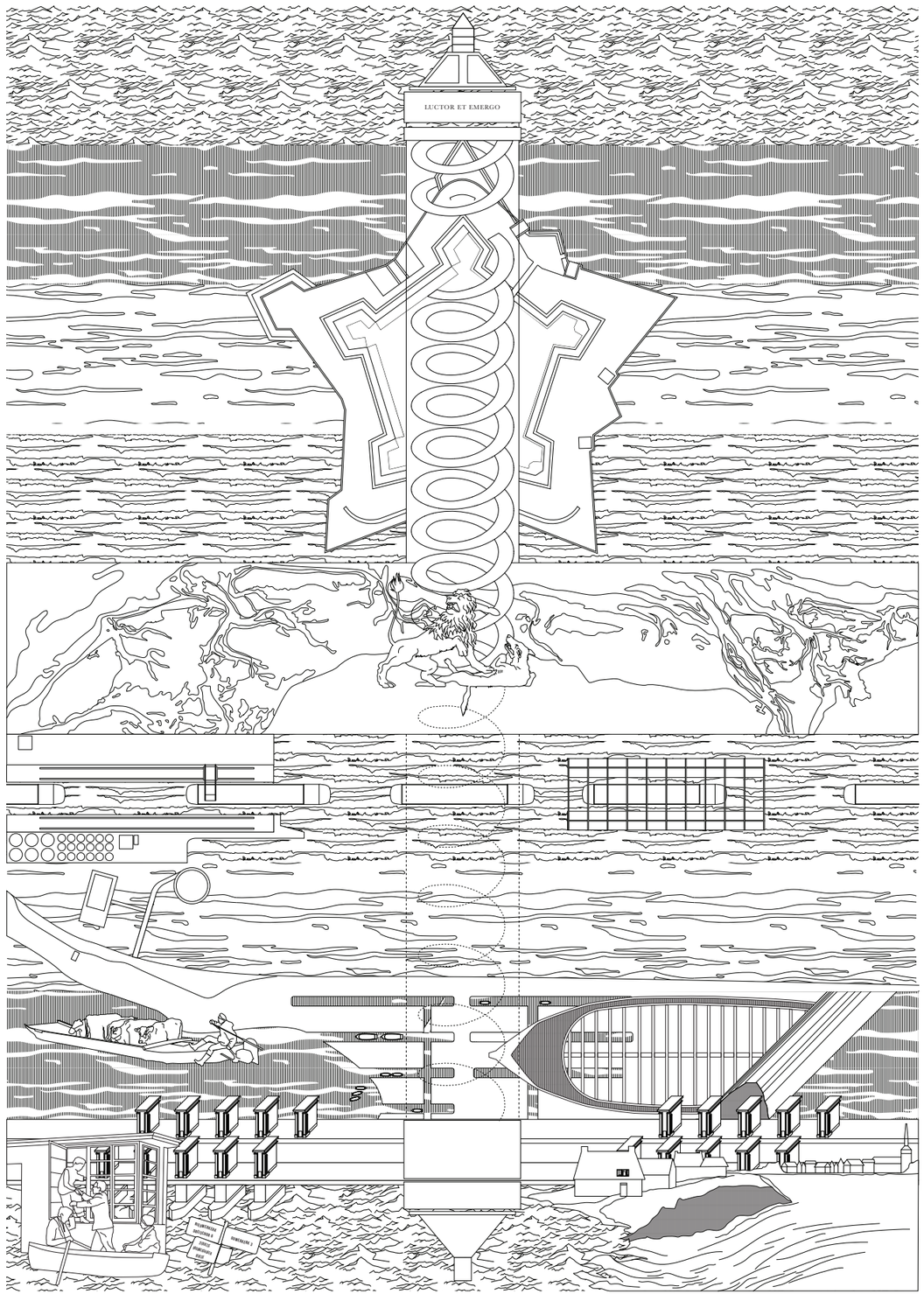


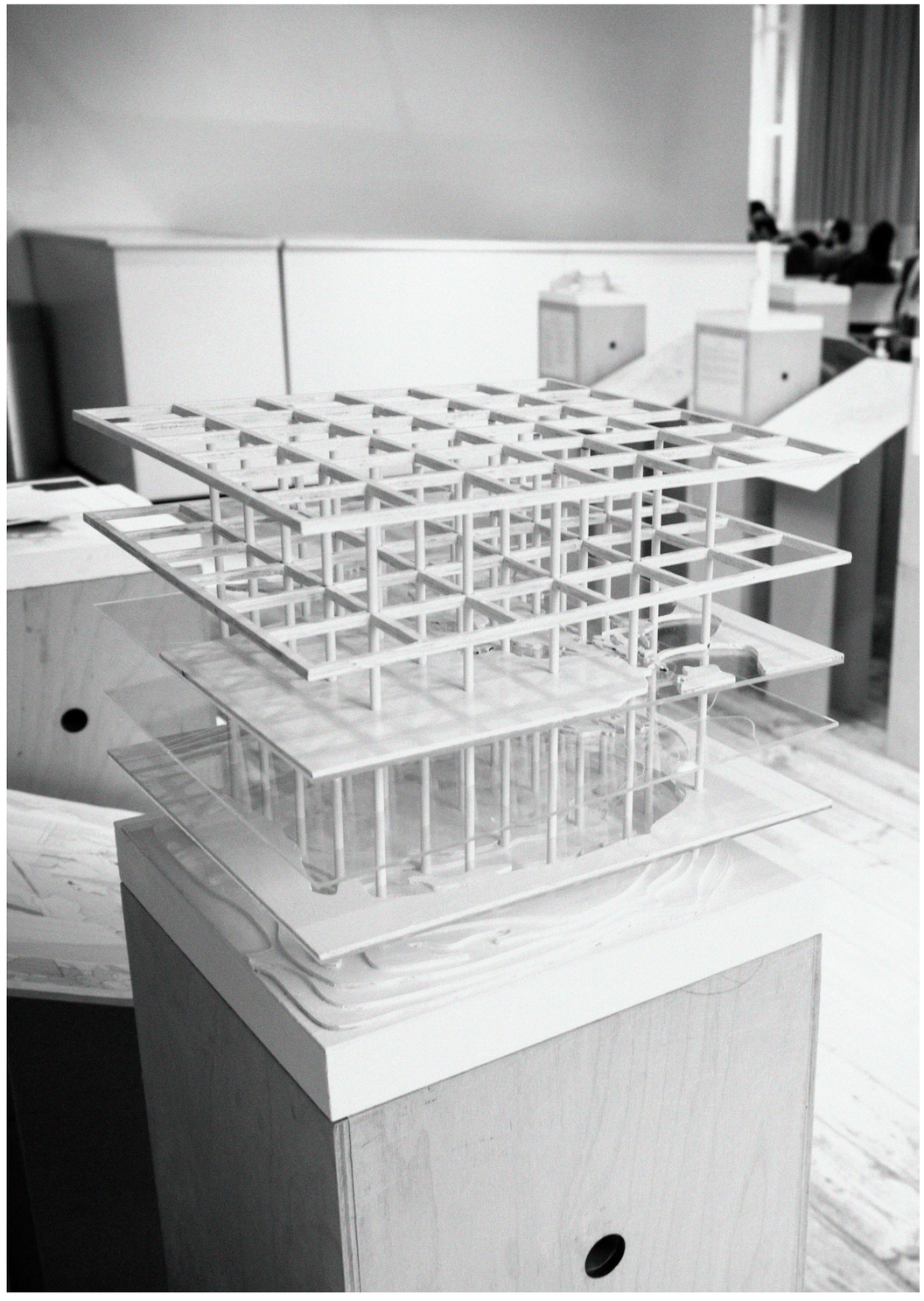


“Protect and Prosper”



“Cyclical Life”



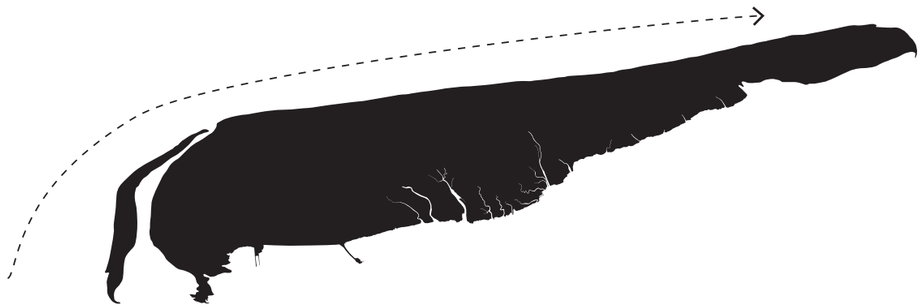


Four Themes

Exhibition Panel and Physical model ‘Territory as a project’
Conflict, Concord, Profit, Pleasure

What if the island Schiermonnikoog *slowly disappears* in the currents of the North Sea?

1



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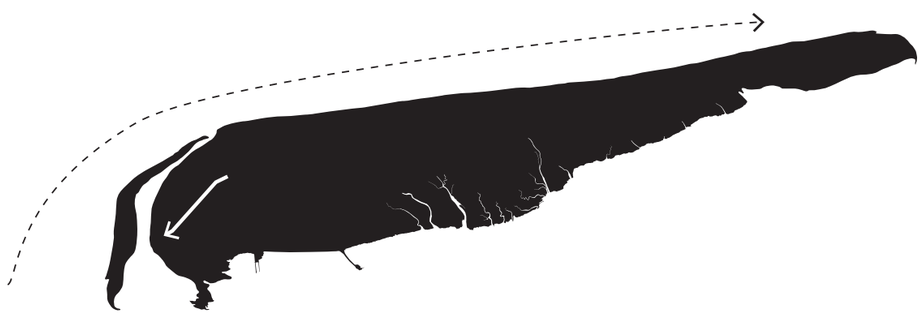

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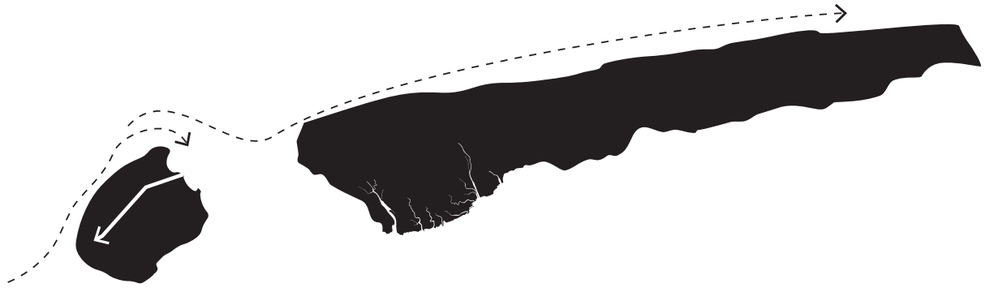
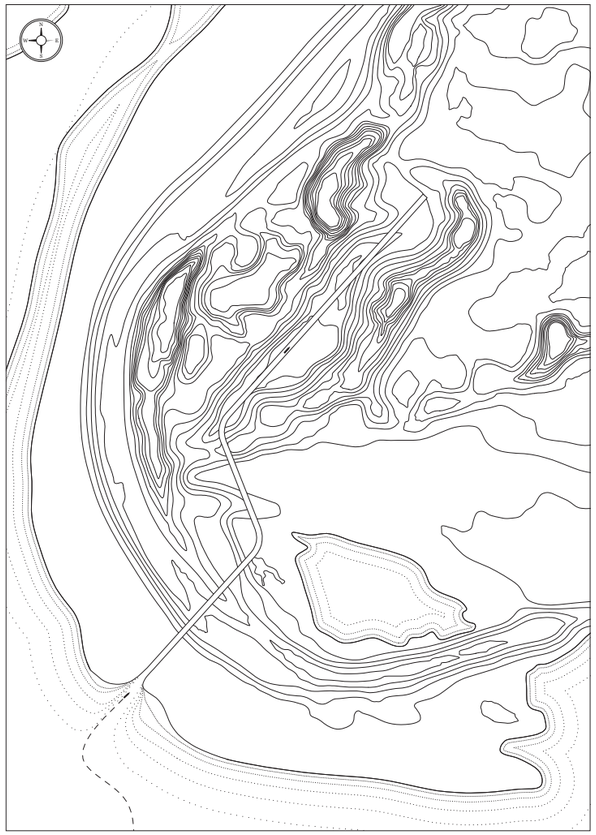


4

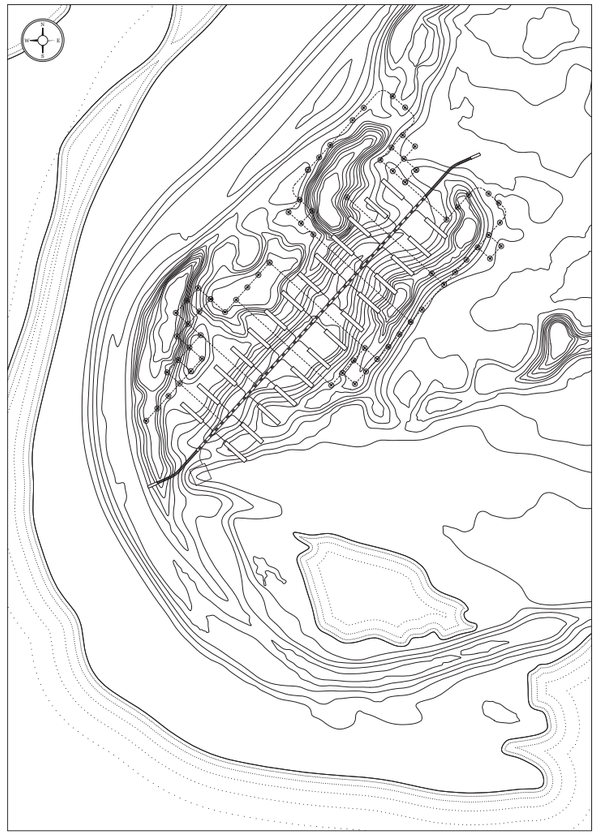
Four Chapters

Four Chapters of the Decay
The Pontoon, The Hydraulic Machine, The Sand Machine, Inhabited Infrastrcuture

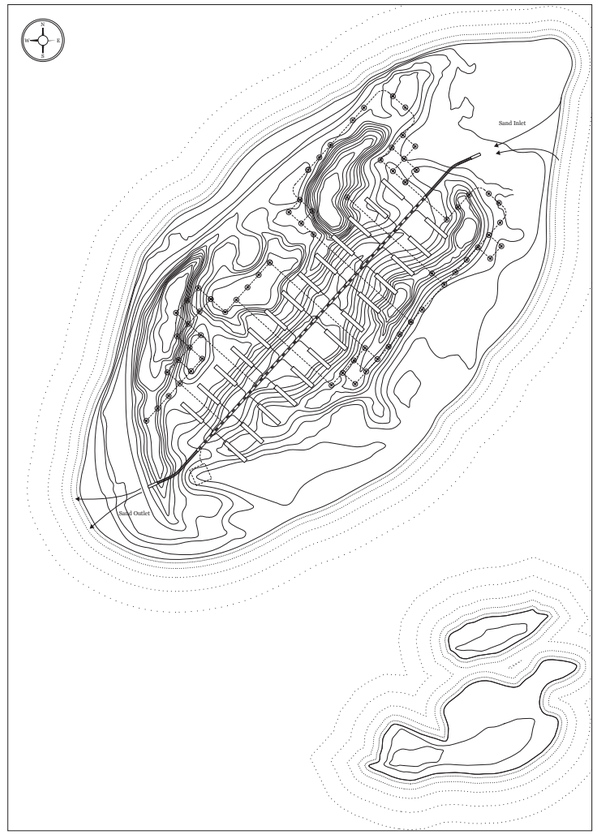
THE PONTOON



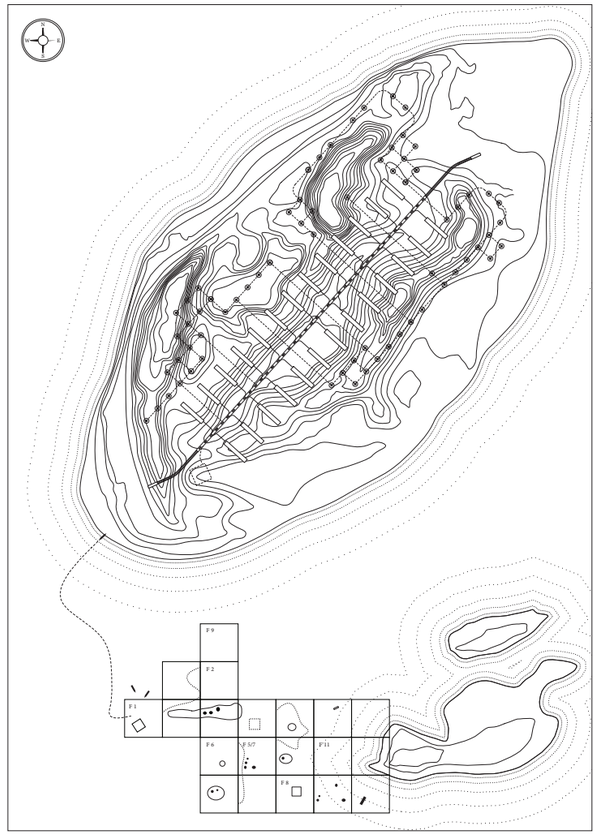
THE HYDRAULIC MACHINE

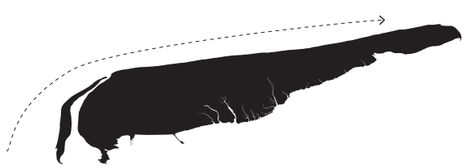


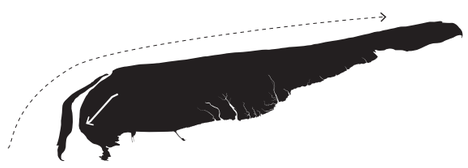
THE SAND MACHINE

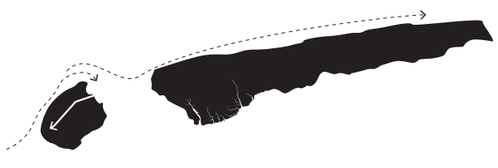


INHABITED INFRASTRUCTURE



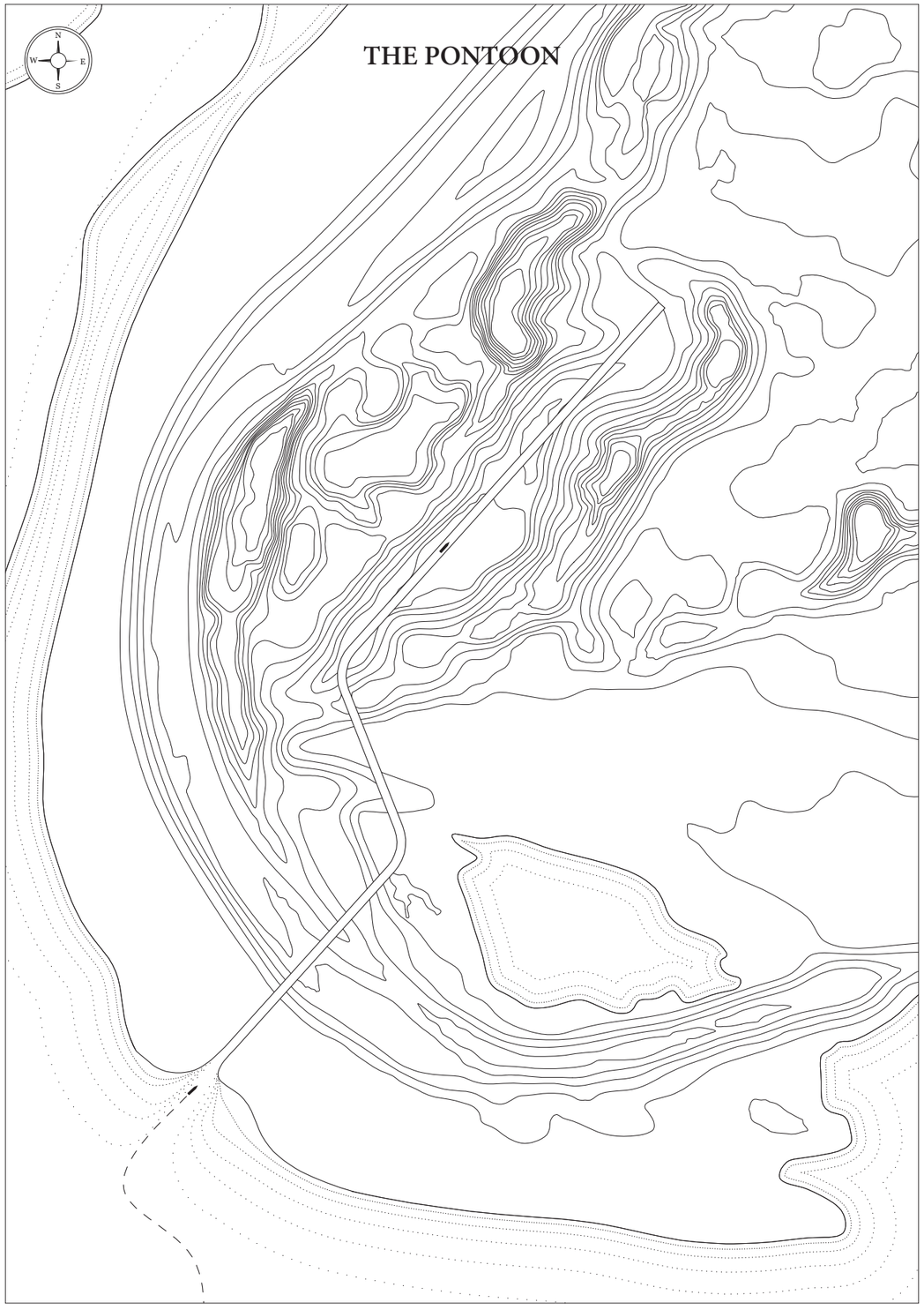




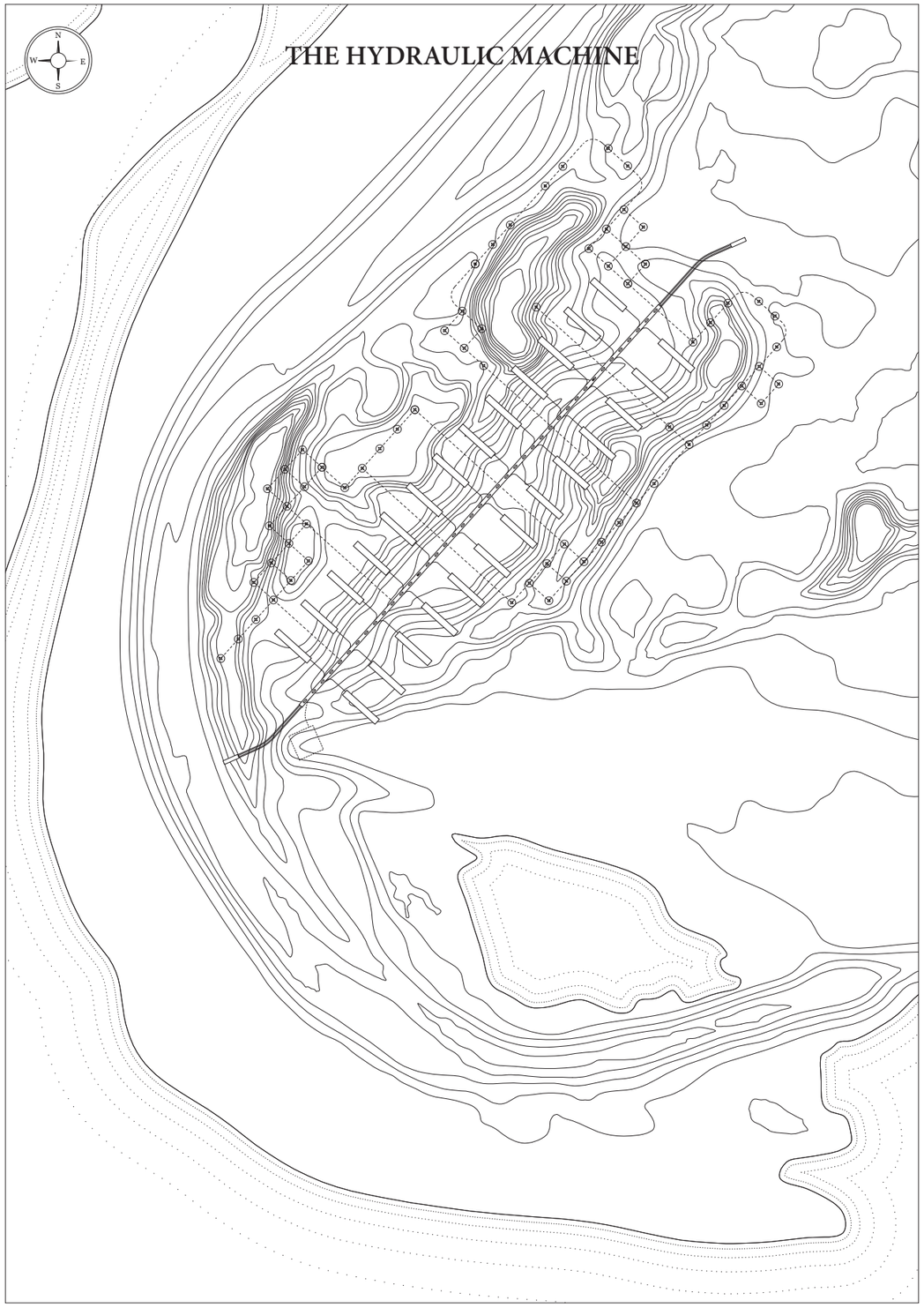


Four Chapters

Four Chapters of the Decay
The Pontoon, The Hydraulic Machine, The Sand Machine, Inhabited Infrastrcuture

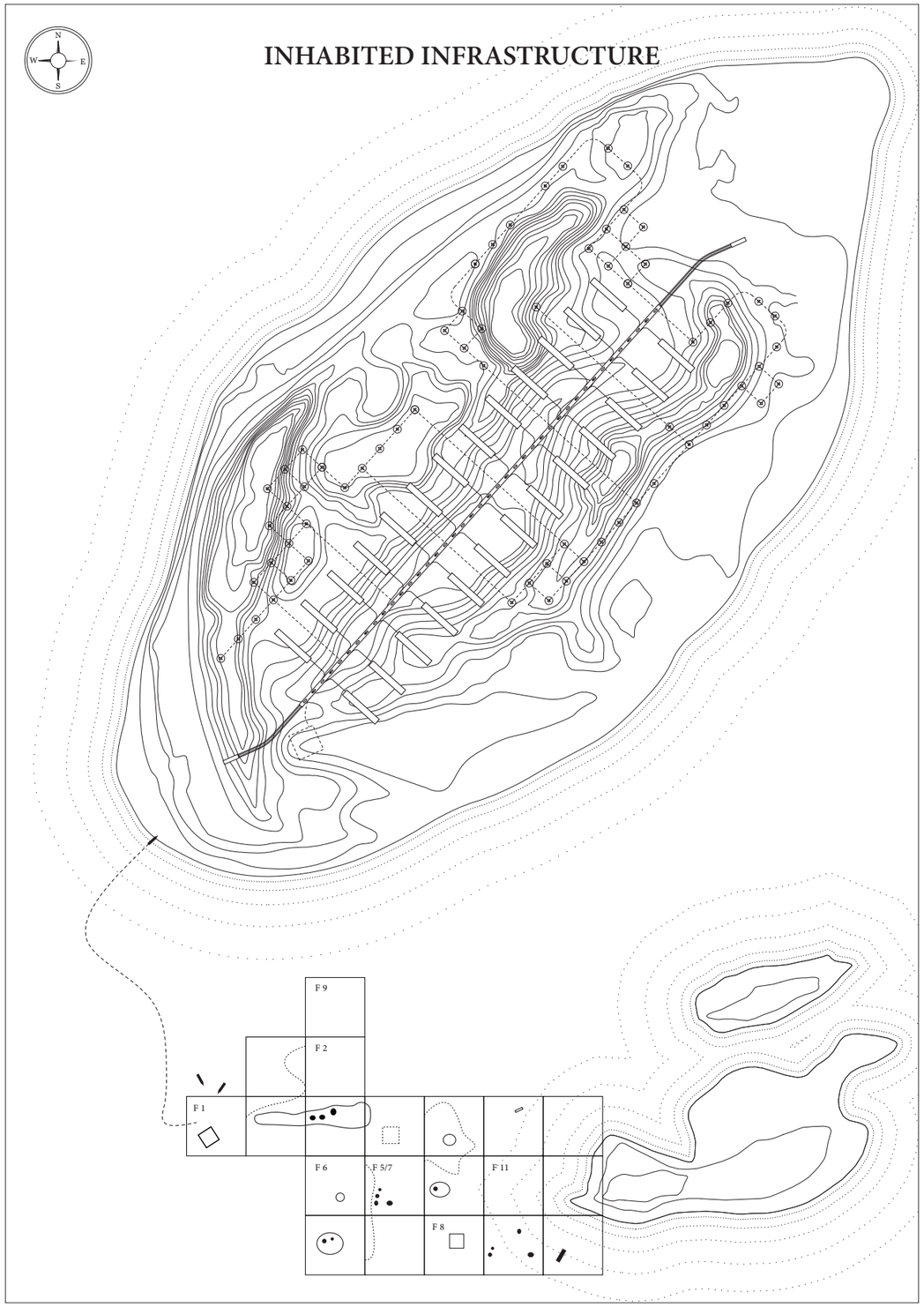


1 The construction was decided to be made by pontoons and the dredging of a canal on the island.

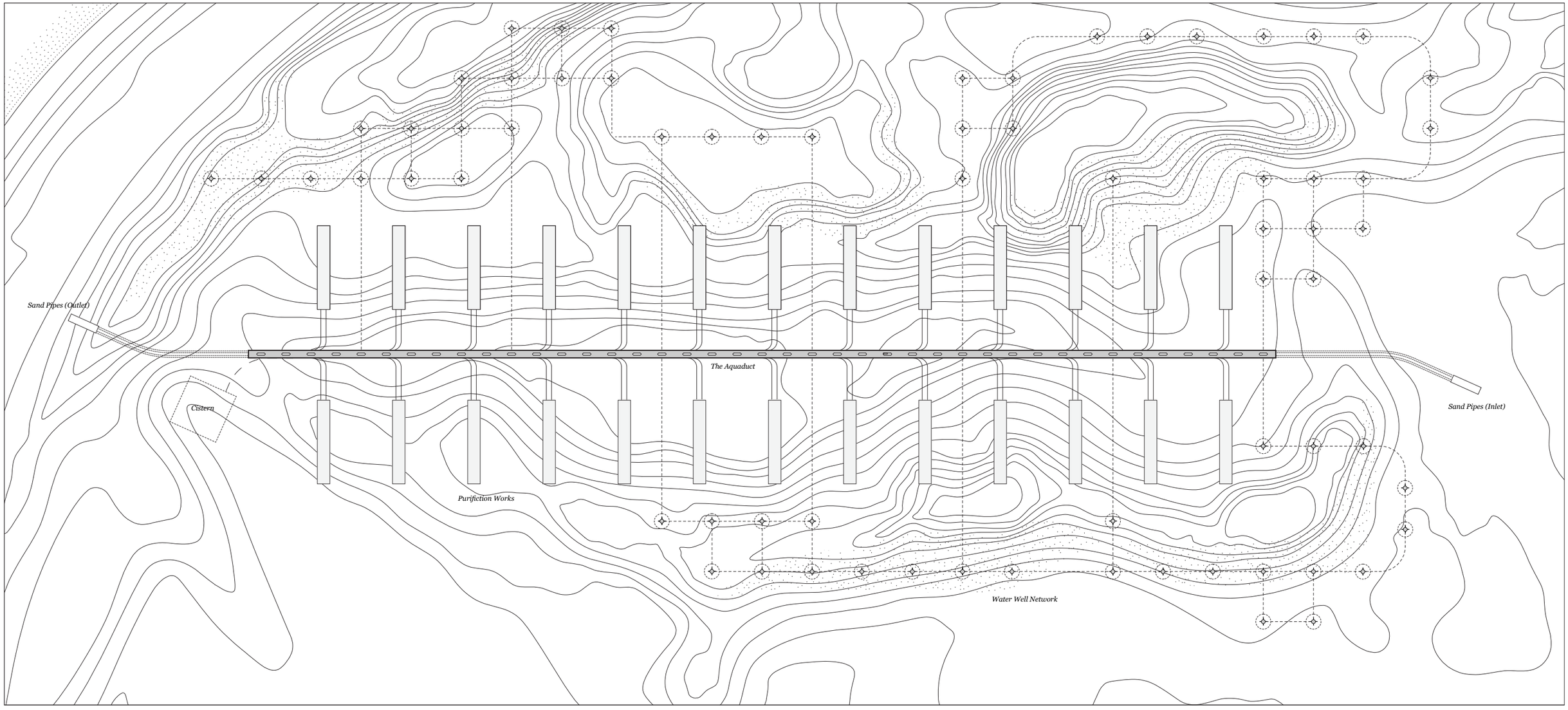


2 The Hydraulic machine produces fresh water by using freshwater lenses that are formed under the dunes of the Schiermonnikoog.

3 When the landscape gets extremely dynamic the polder, where the islanders are mostly settled, is flooded. Then, the island is divided into two by the separation of the eastern peninsula from the mainland.

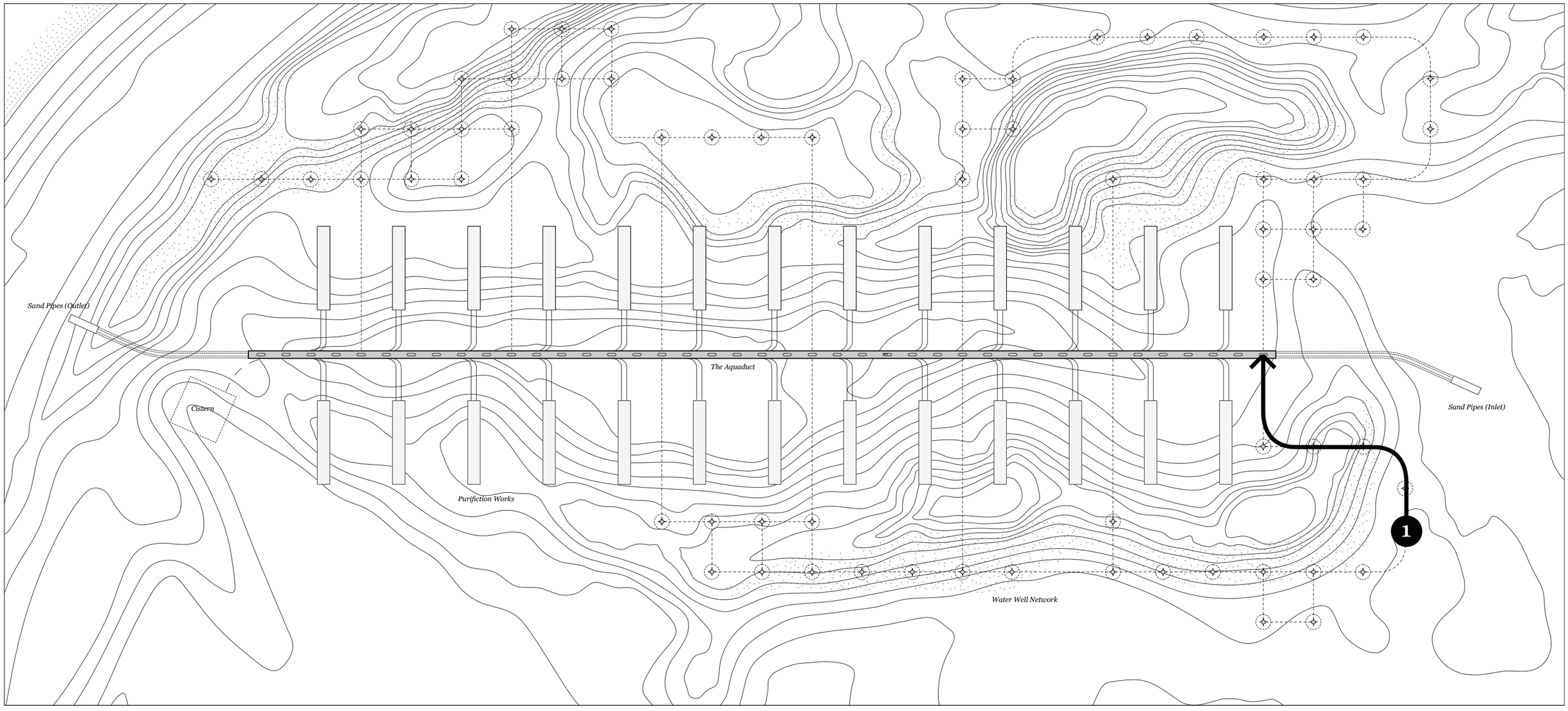


4 Eventually the fort becomes an infrastructure for the dead souls of the island Schiermonnikoog.



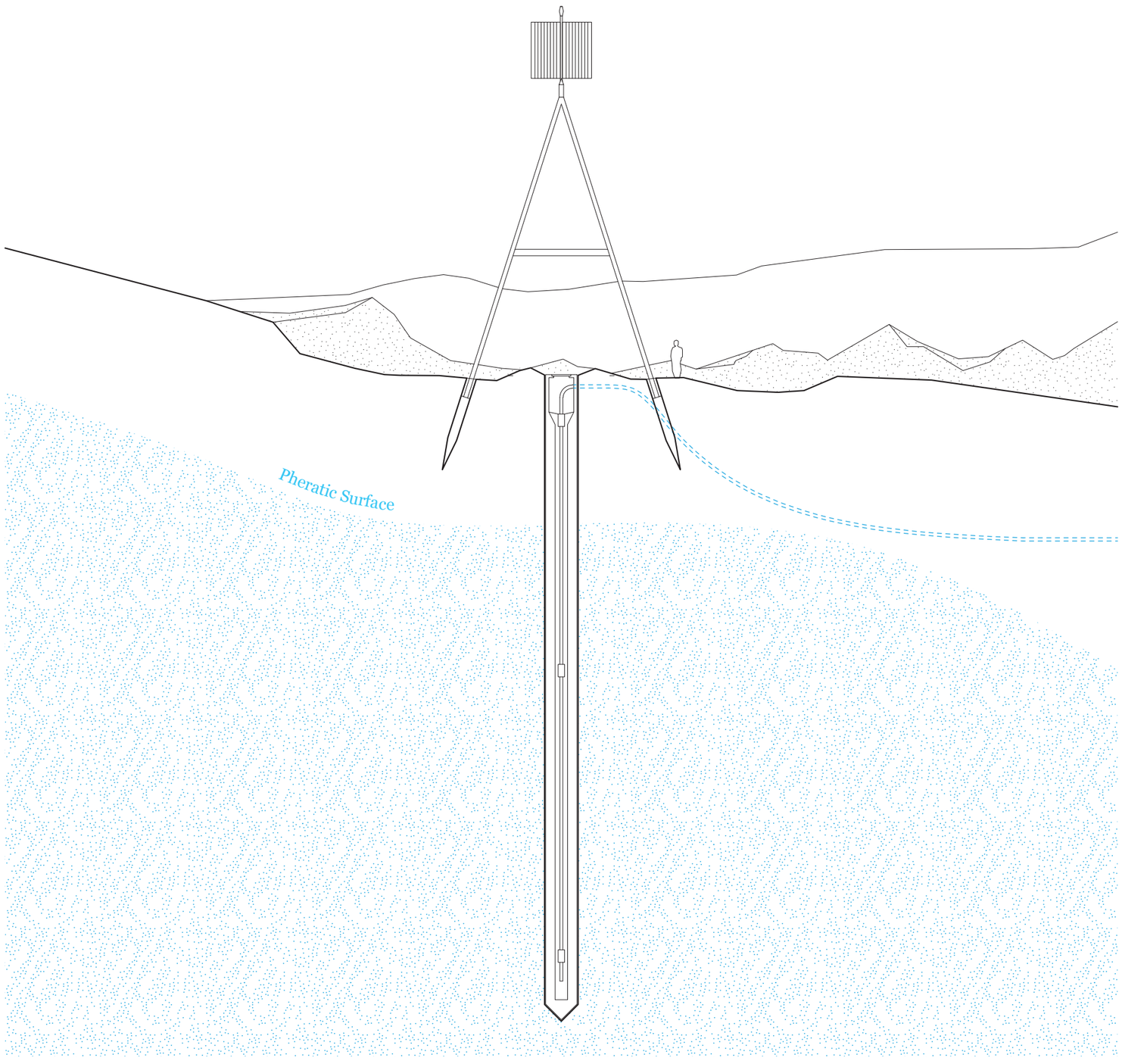
The Hydraulic Machine

Site Plan & Components of the Design
Working Principle of the Machine

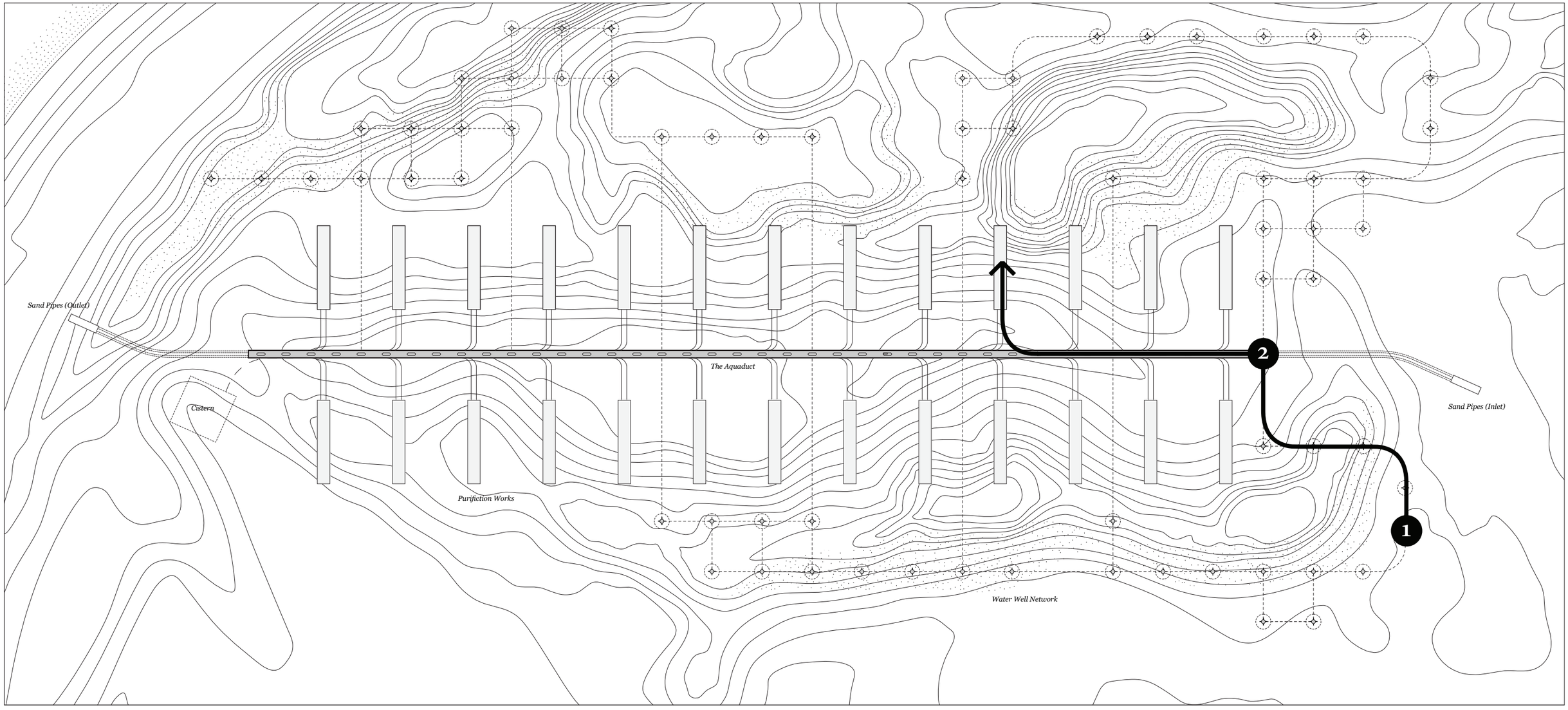


The Hydraulic Machine

Water Wells
Collection of Ground Water

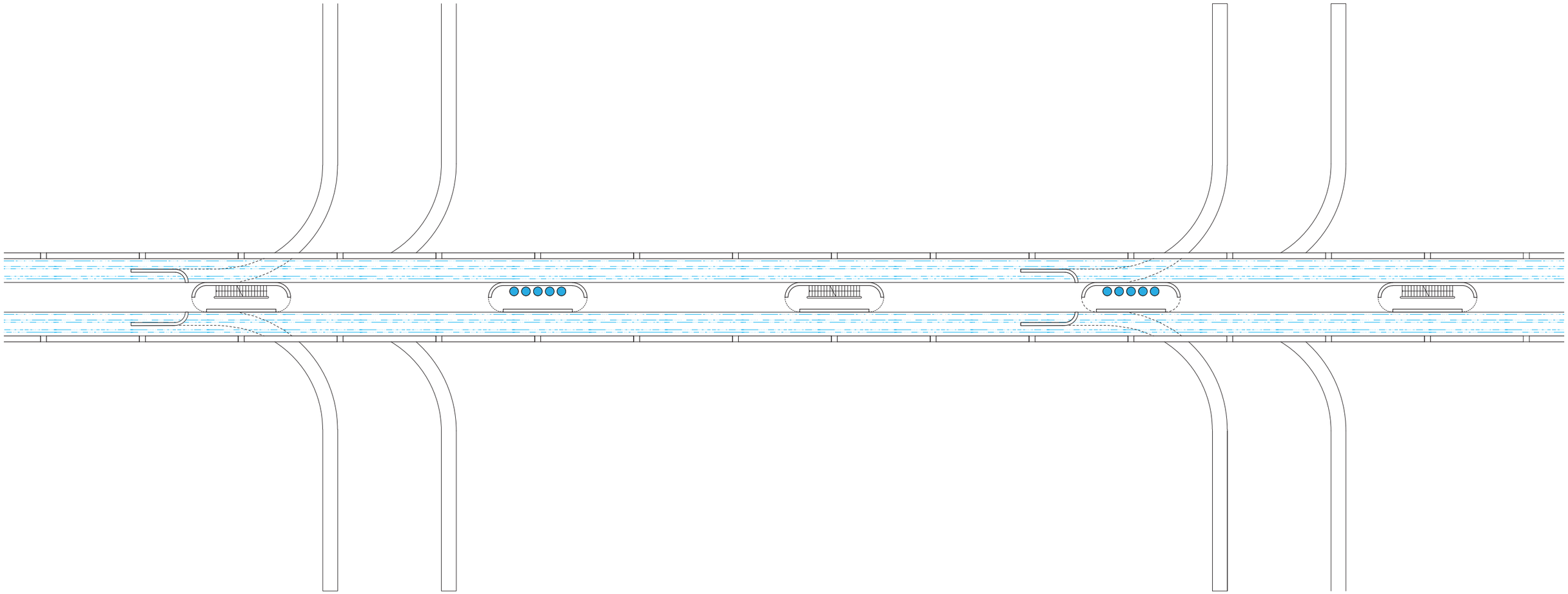


Water Well
Cross Section

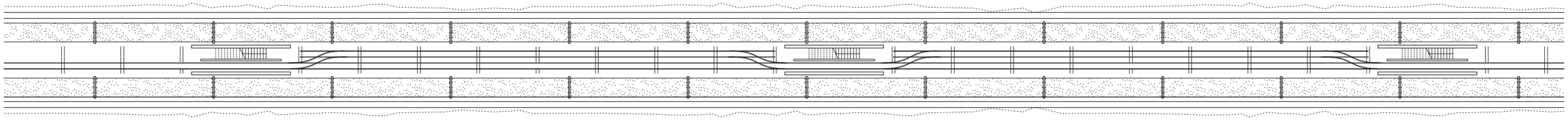


The Hydraulic Machine

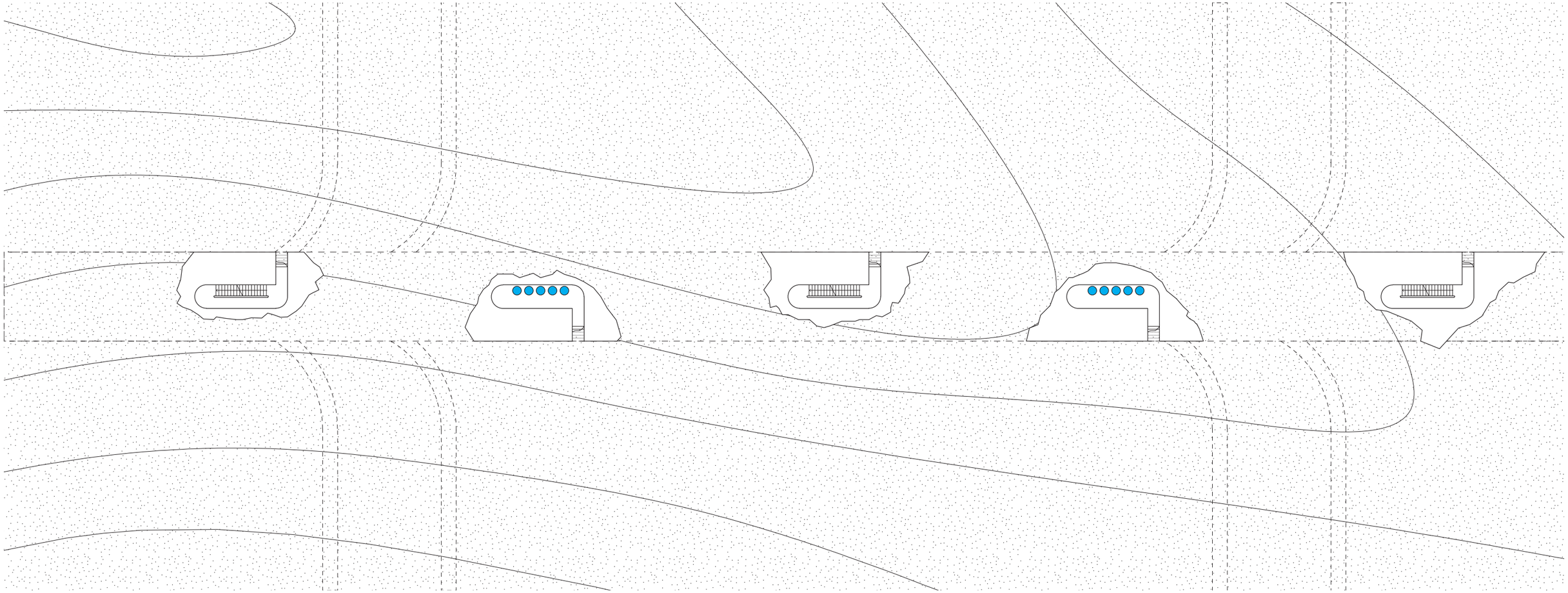
The Aquaduct
Transfer of the Water



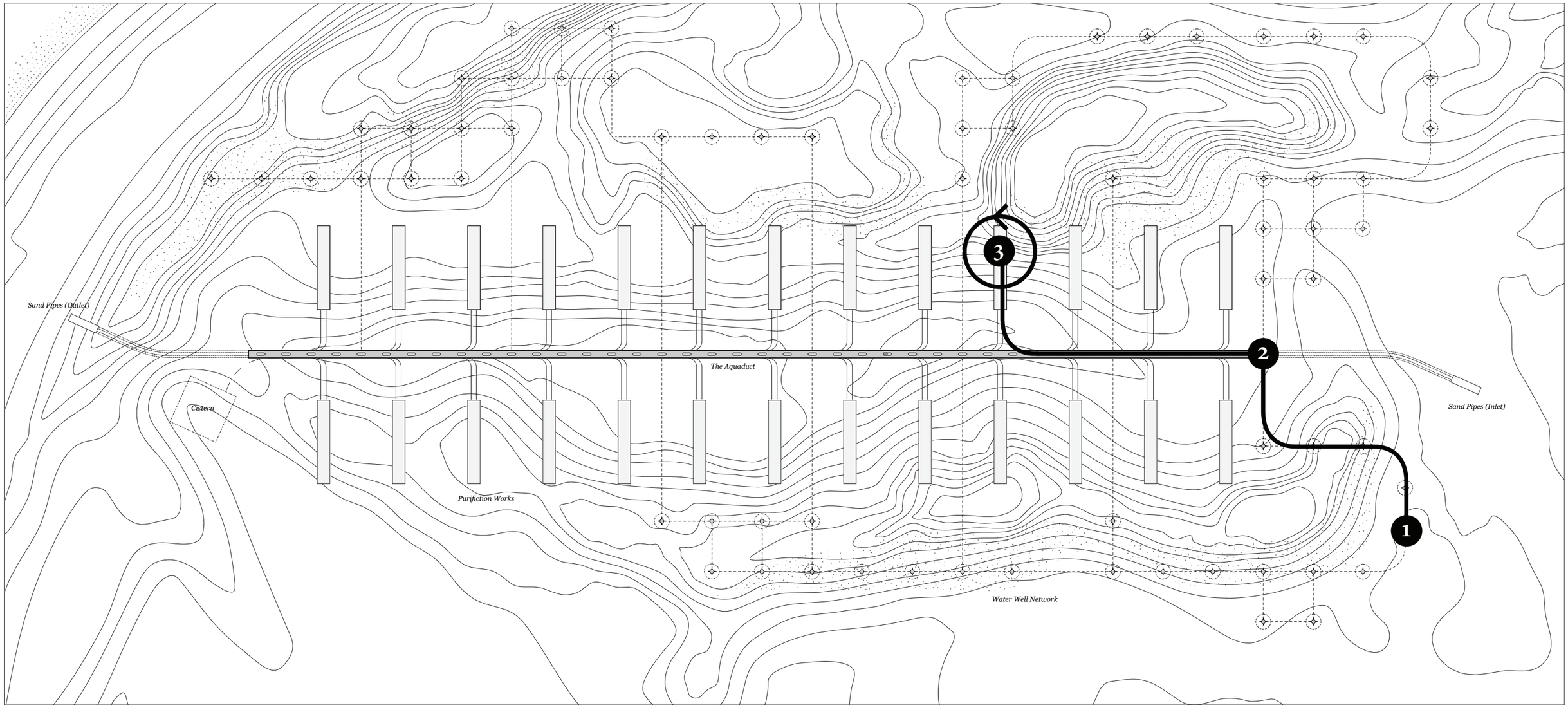
The Aquaduct
+21 Level Plan



The Aquaduct
-6 Level Plan

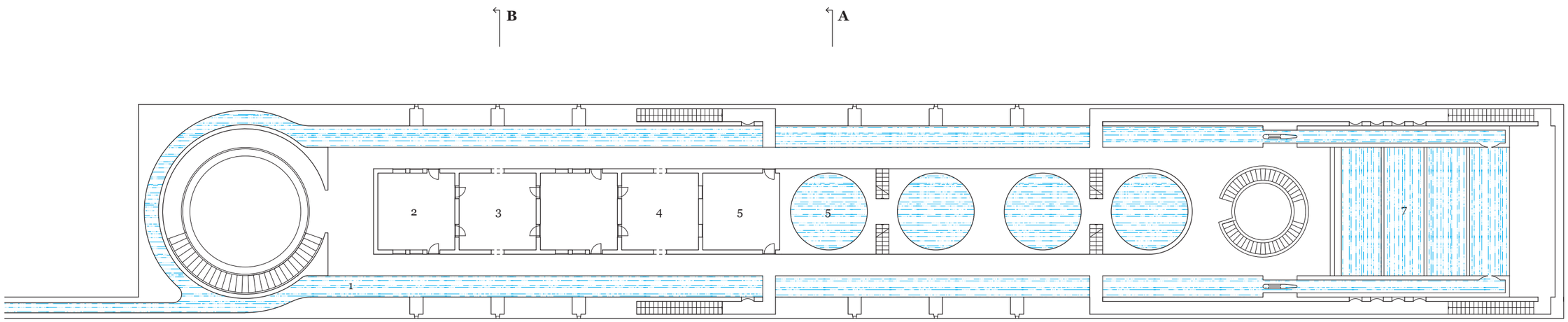


The Aquaduct
Ground Level Plan

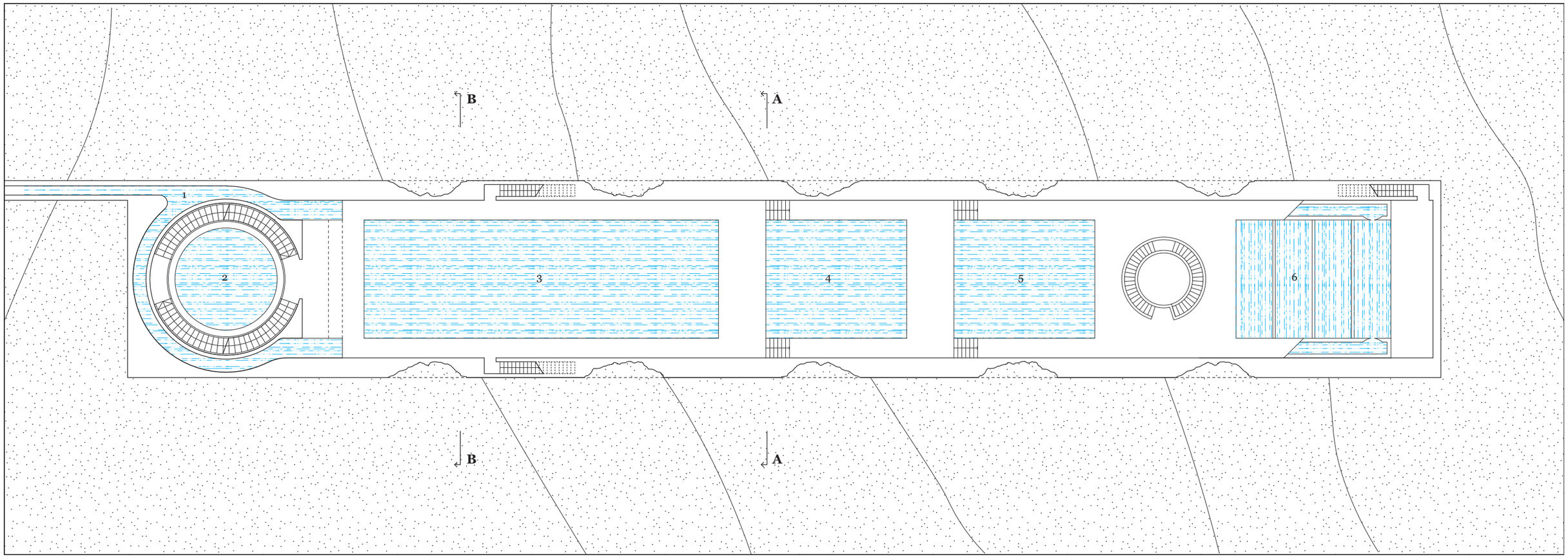


The Hydraulic Machine

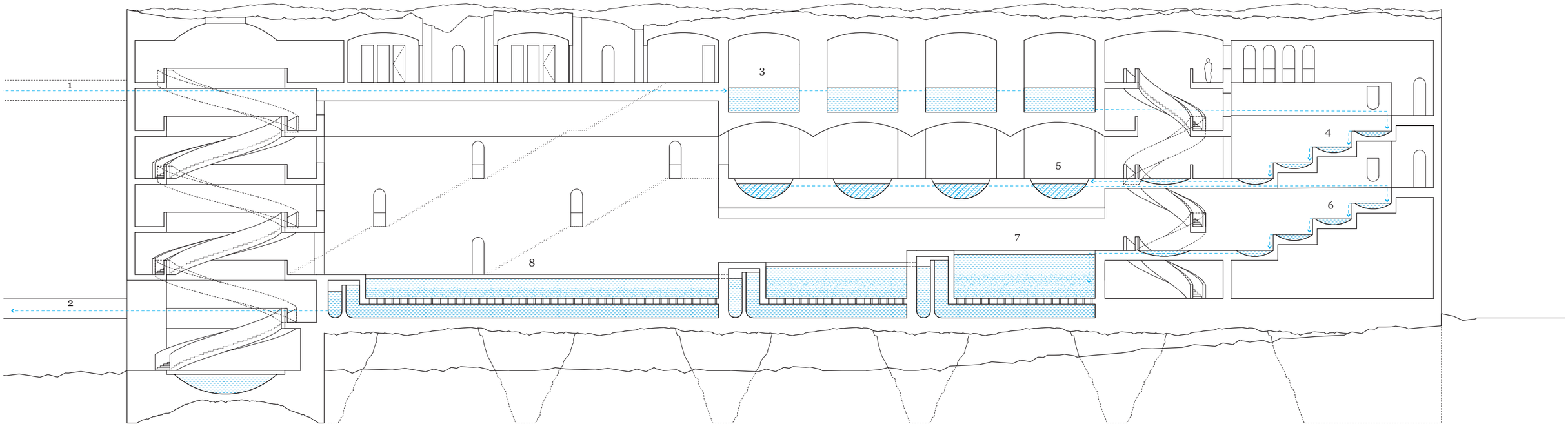
Purification Works
Purificaton of the water with 5 different processes



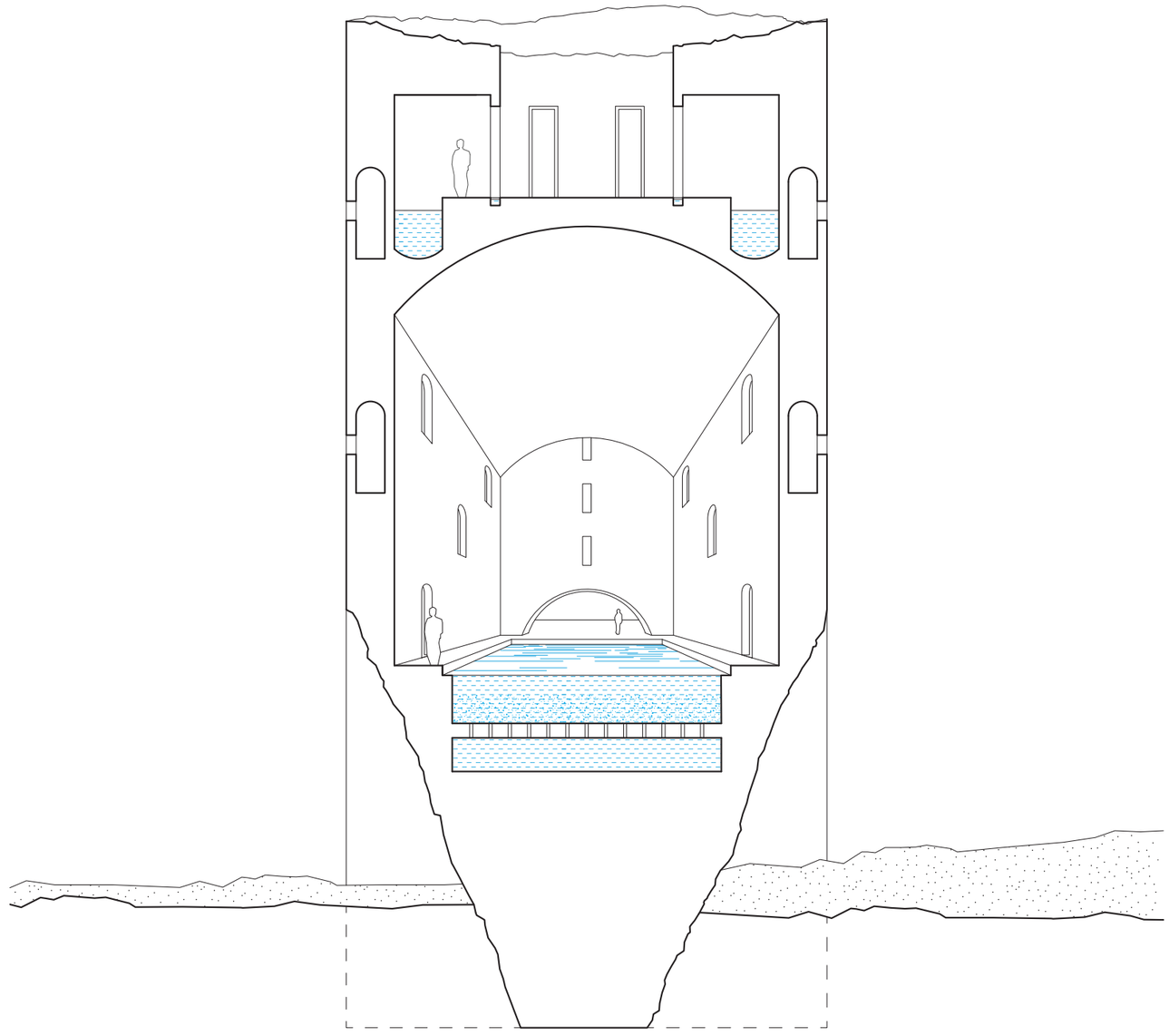
Purification Works
+21 Level Plan



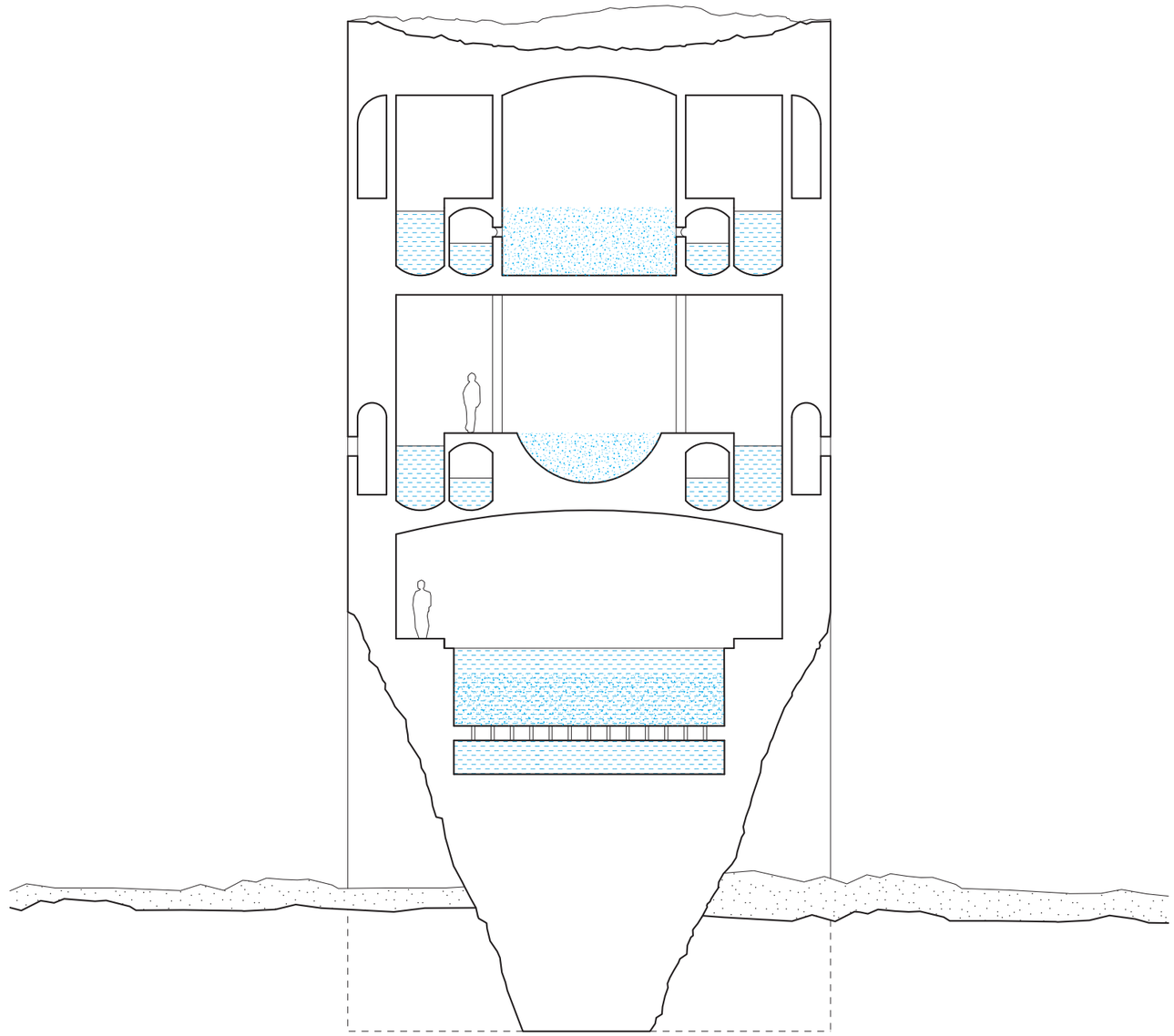
Purification Works
+09 Level Plan



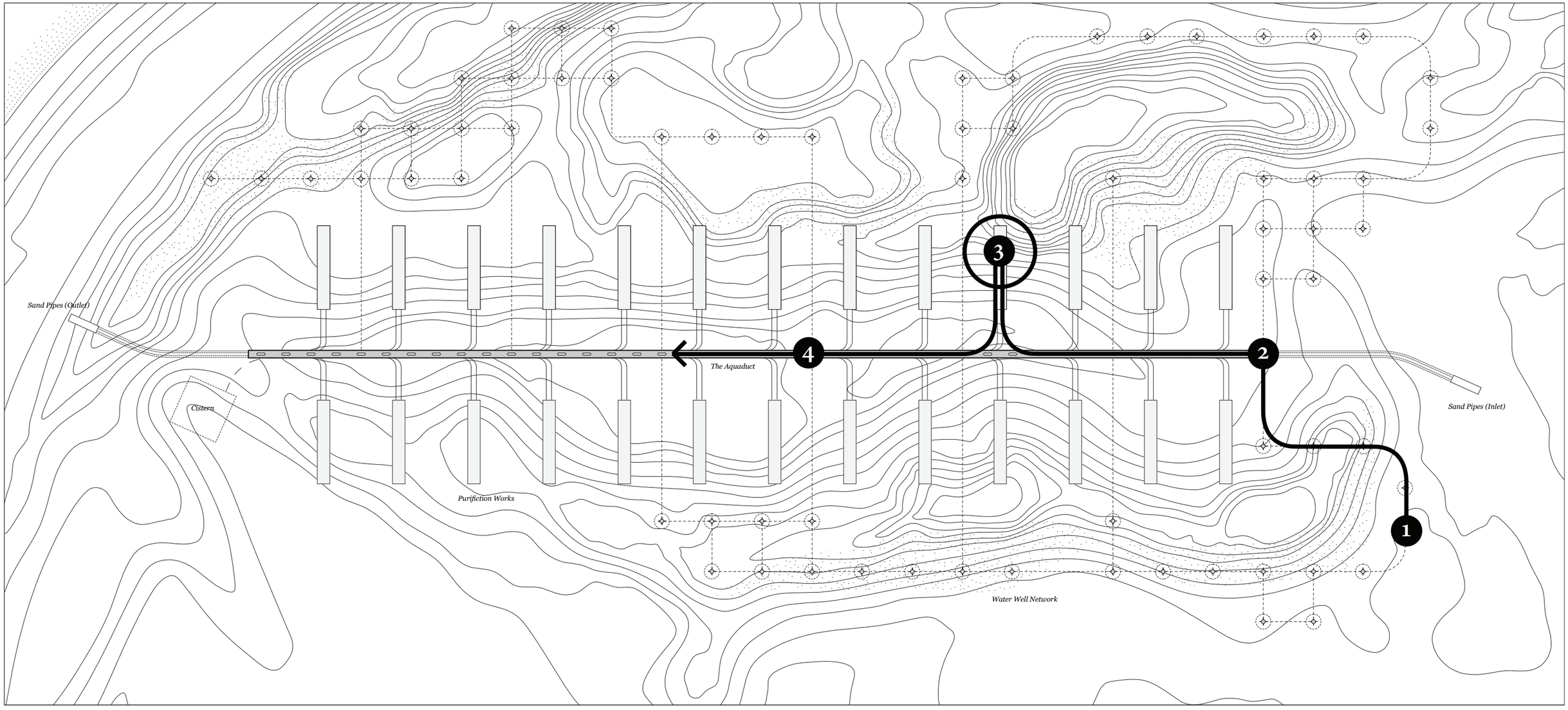
Purification Works
Longitudinal Section



Purification Works
Section B-B

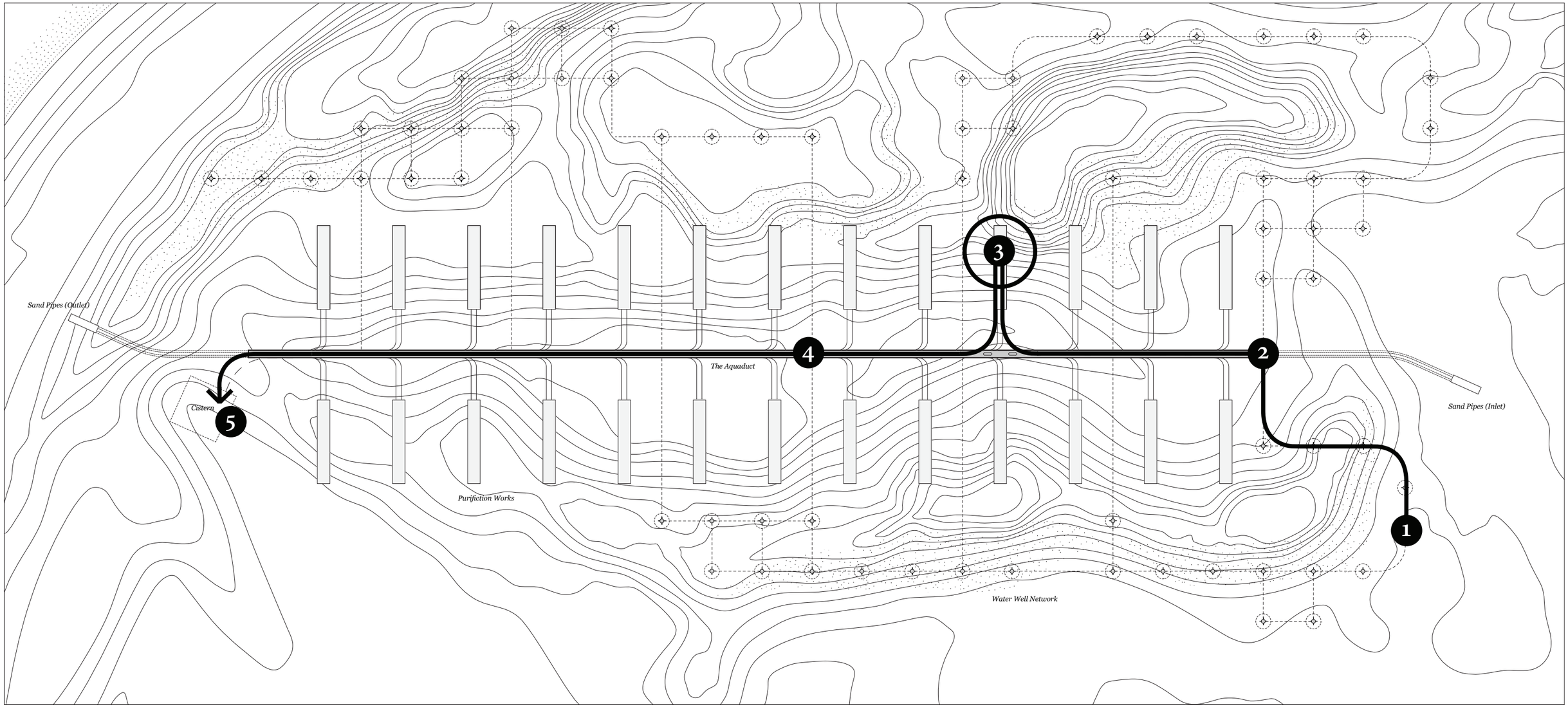


Purification Works
Section A-A



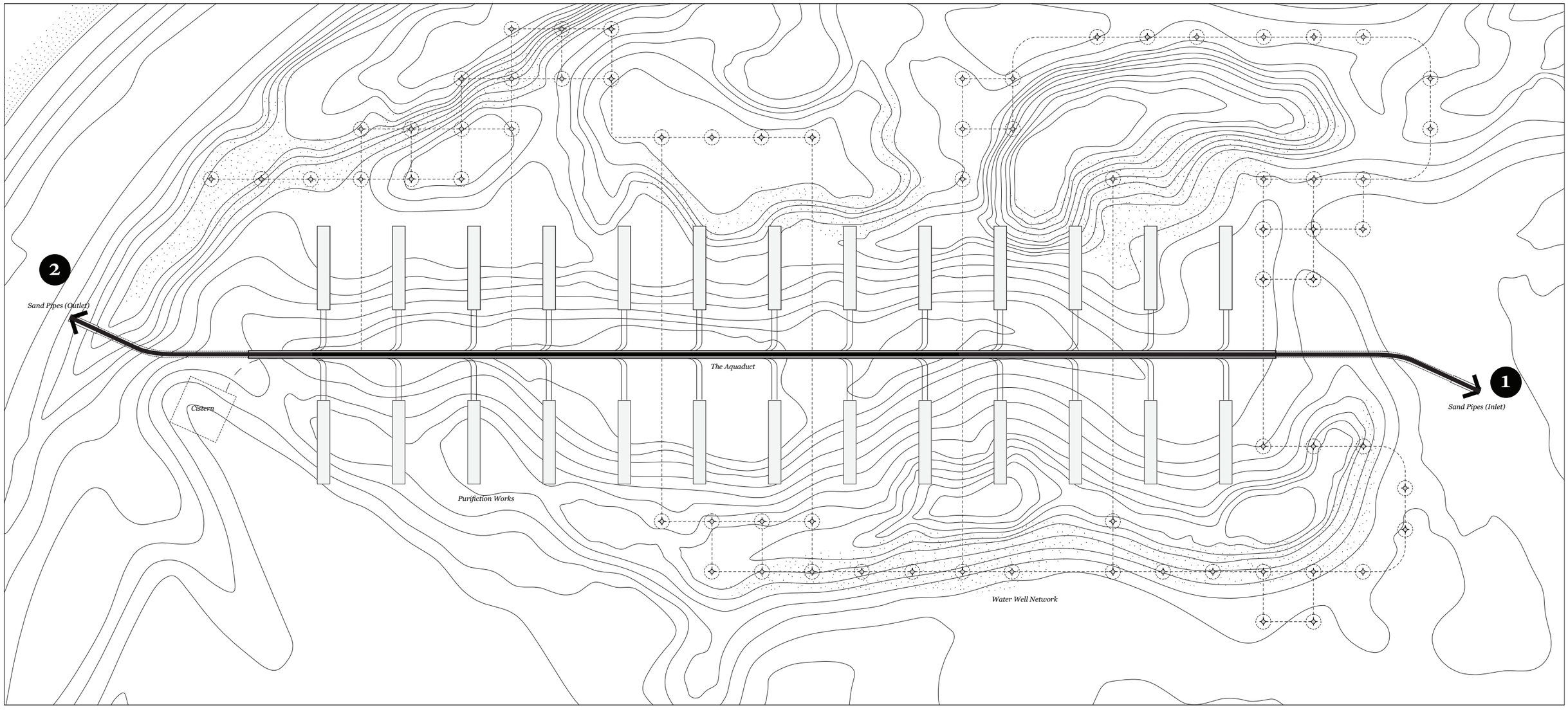
The Hydraulic Machine

The Aquaduct
Transfer of the Water



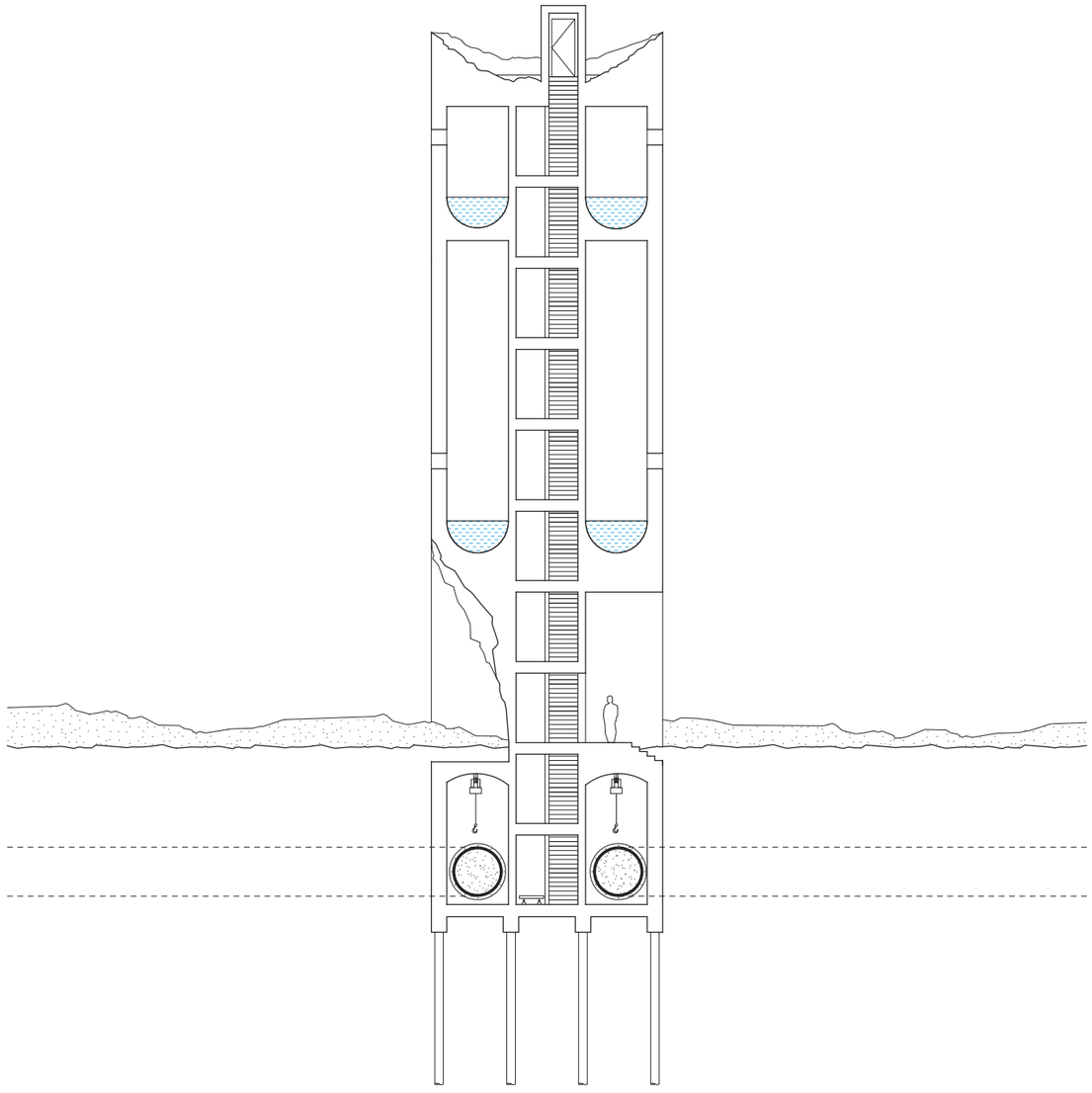
The Hydraulic Machine

The Cistern
Storing the water

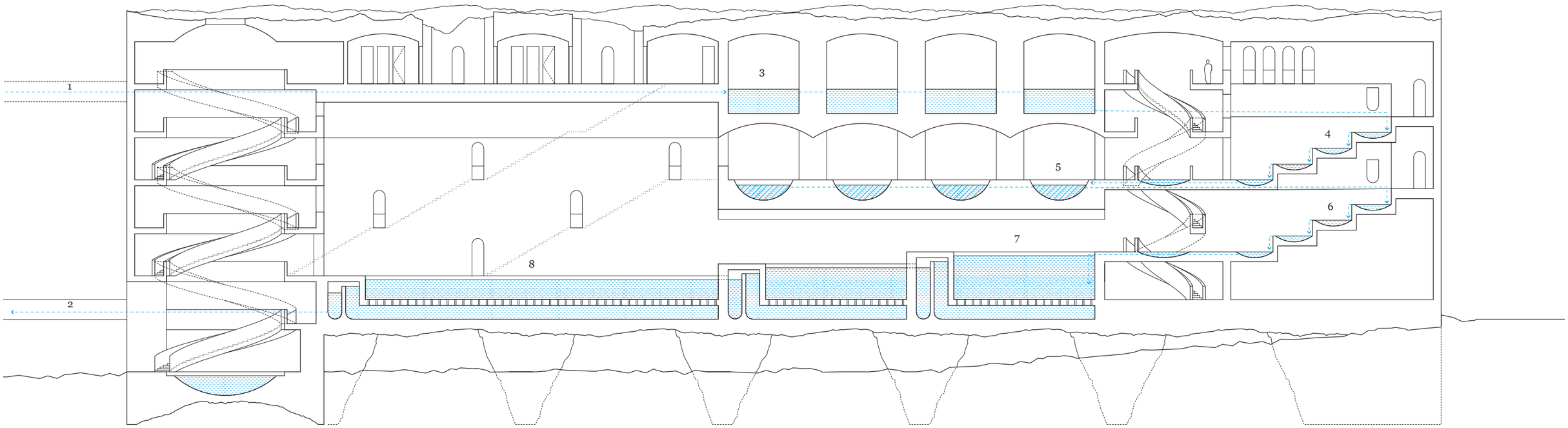


The Sand Machine

The Aquaduct carries also the sand
The sand is carried from where it is depositing to where the island is eroding

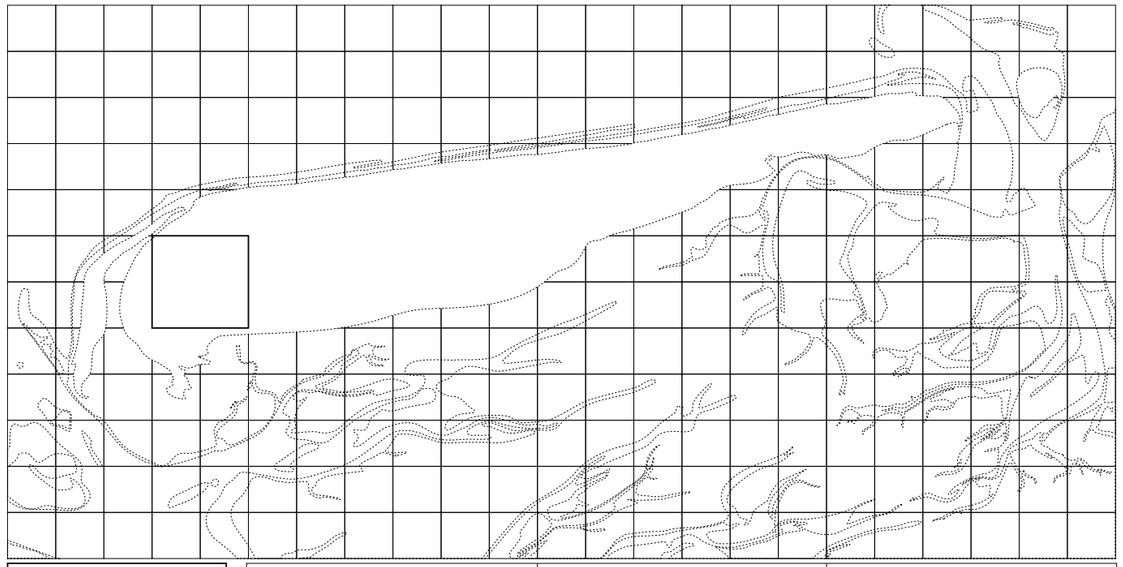


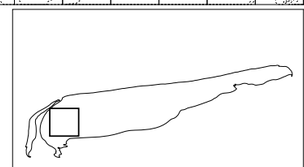
The Aquaduct
Cross Section



Sand &Water

Casting with the Sand & Flow Forms
Jagged & Smooth Surfaces





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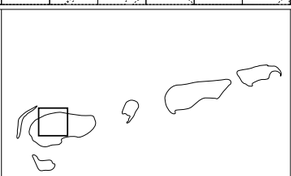
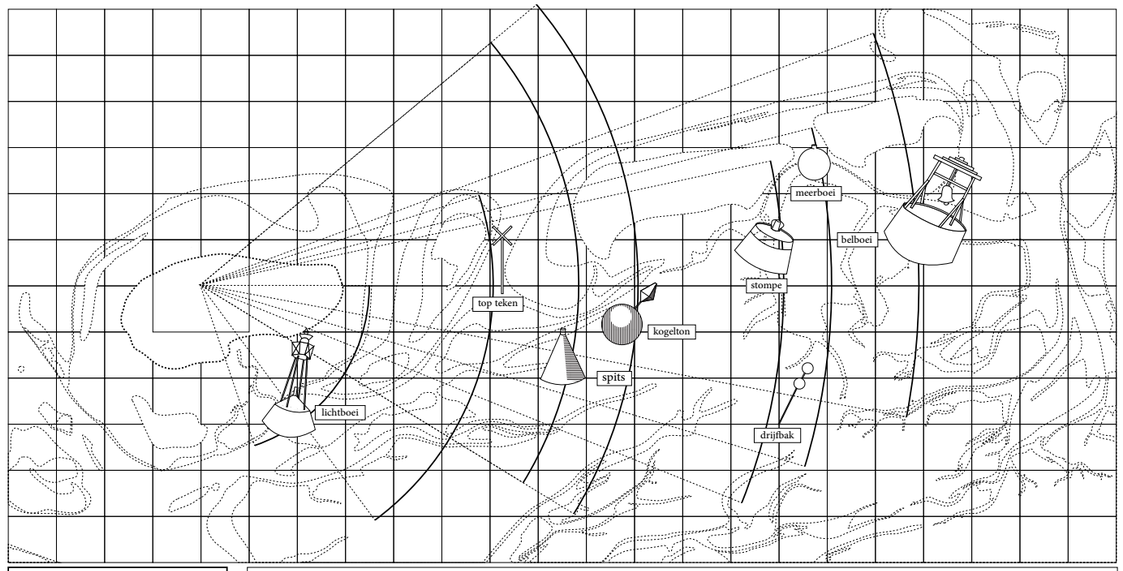


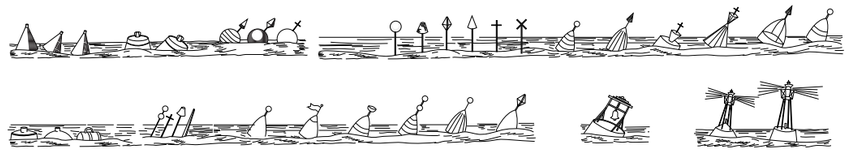
2

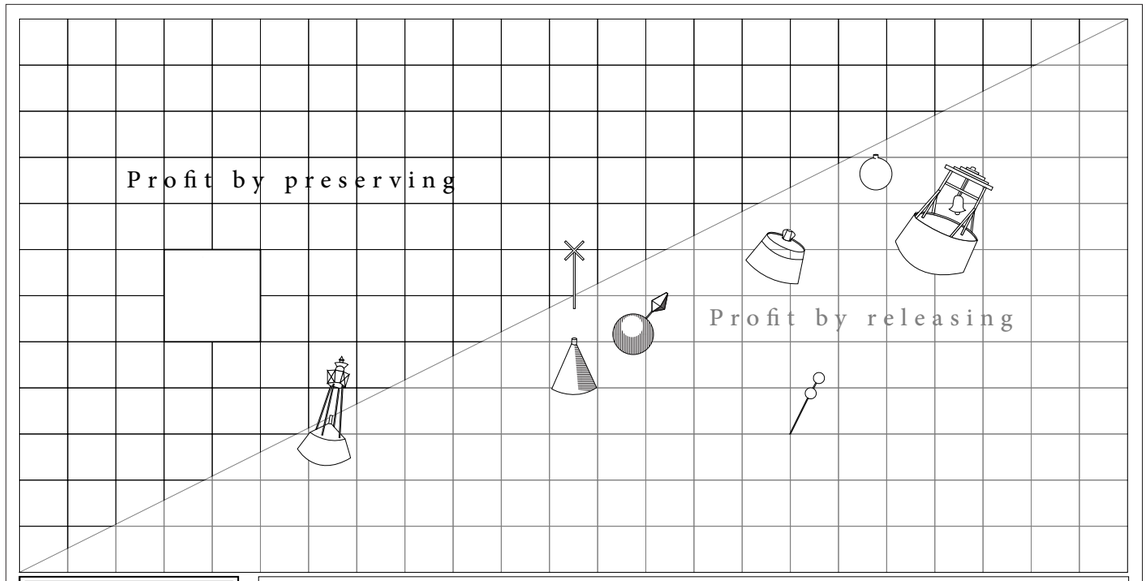
myth

3

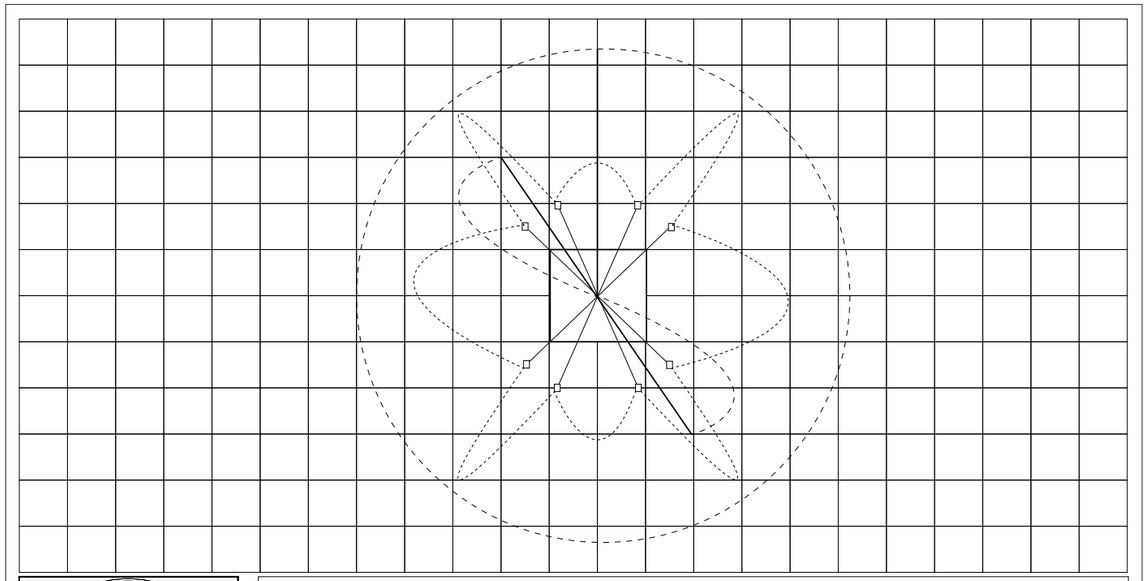


Navigation in the Netherlands



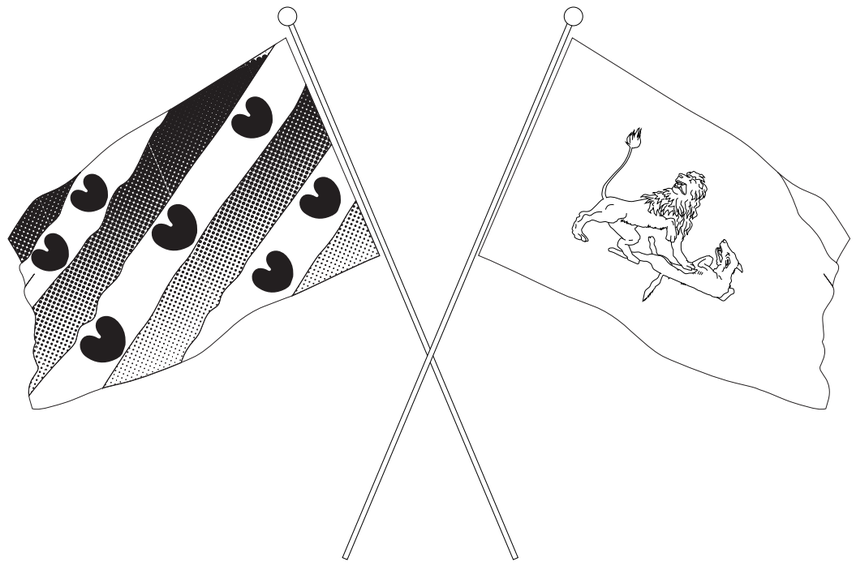


“Protect and Prosper”



“Cyclical Life”

Civil Guards
Guarding the island and its sources



Calm in the midst of wild waves.
Long live the Geux.

** Translation from Latin and French text: Saevis tranquillus in undis. Vive les Guelx. Taken from the engraving of the emblem of the Geuzen resistance movement against Philip II of Spain in The Netherlands during the Eighty Years' War.*