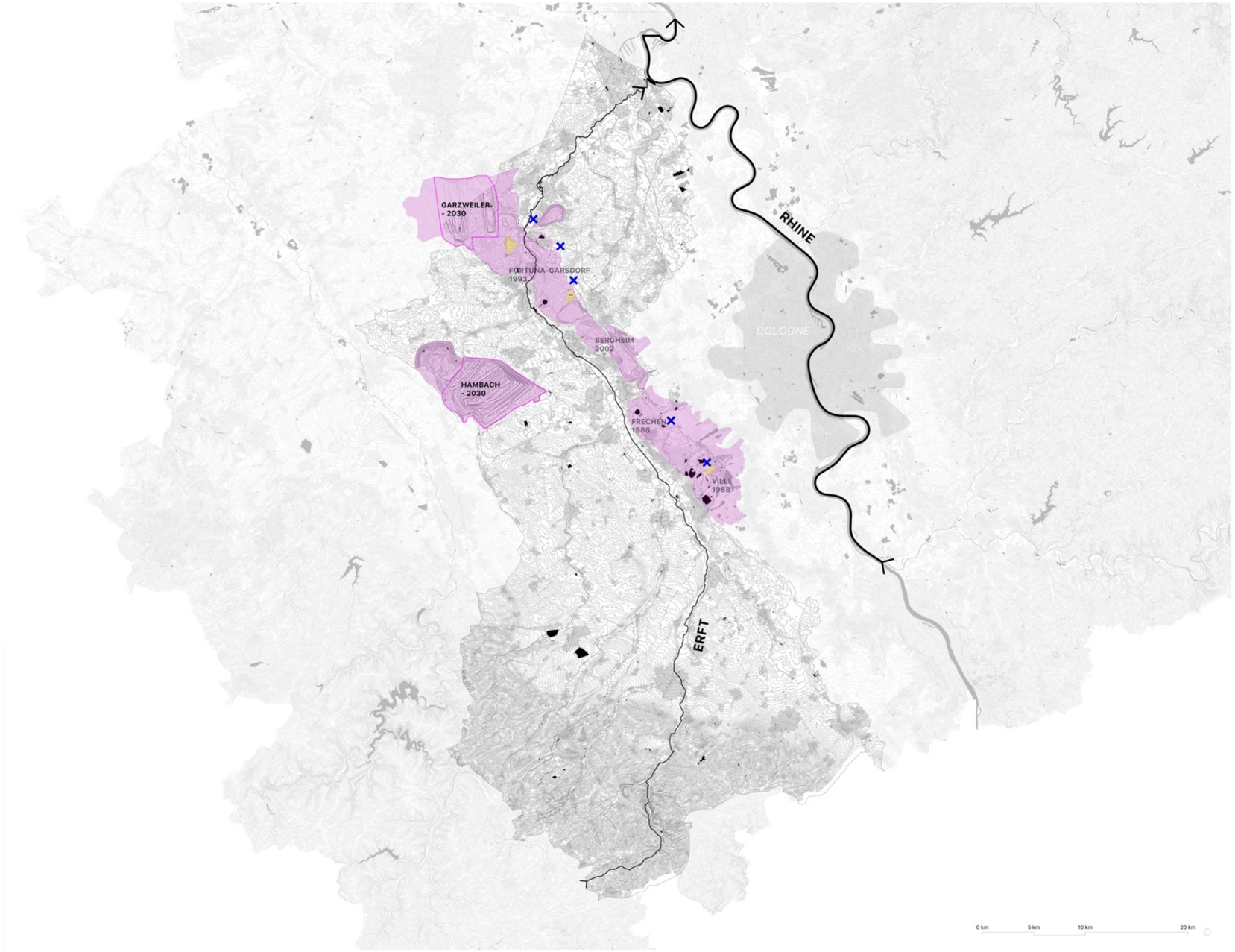
Of Water and Matter

A Material Practice for Post-Extractive Landscapes

Garzweiler mine — 14/12/24



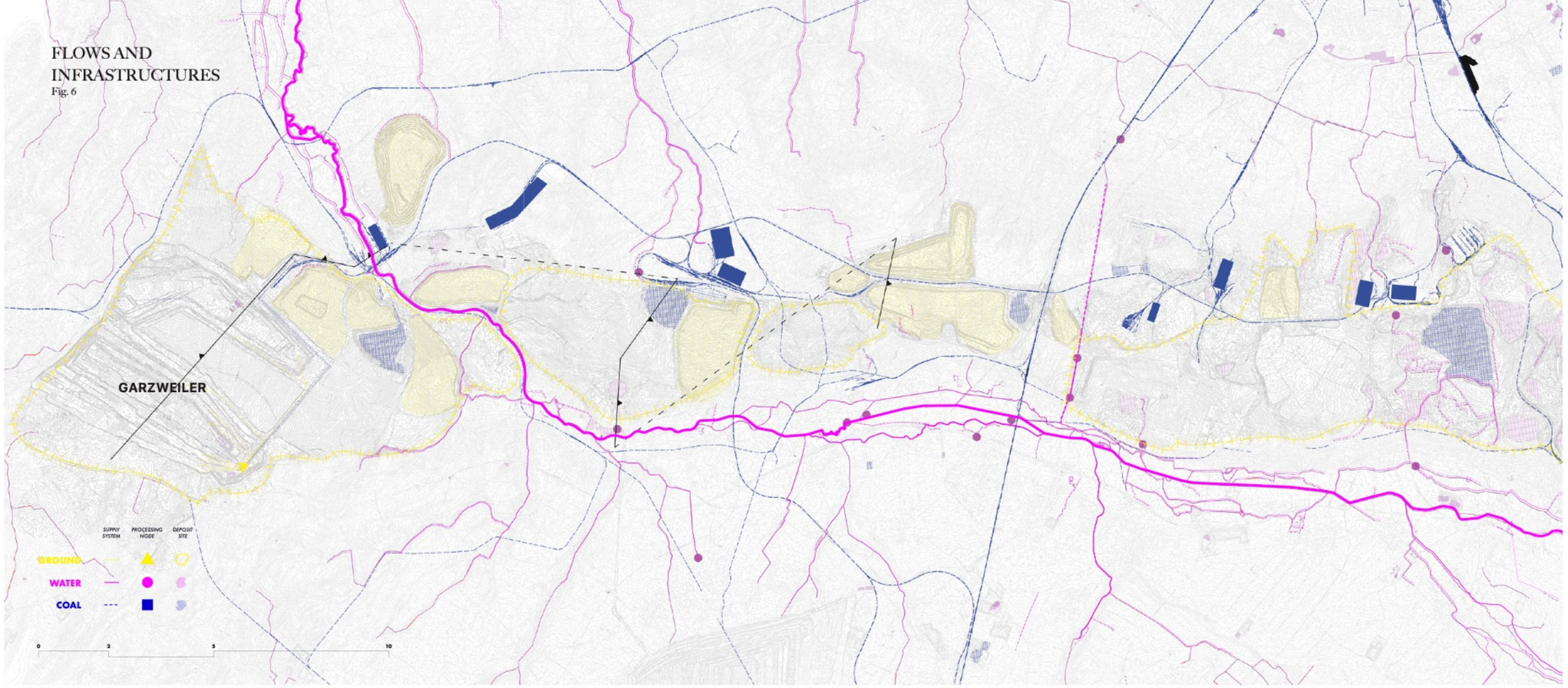
water

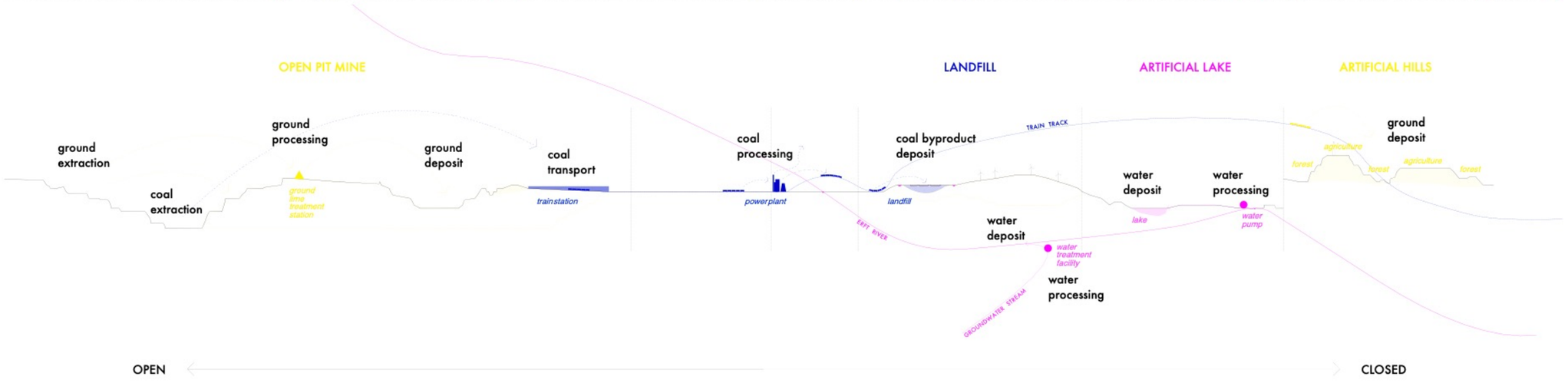
lignite mining areas
possible acid mine drainage

landfills
for coal burning byproducts

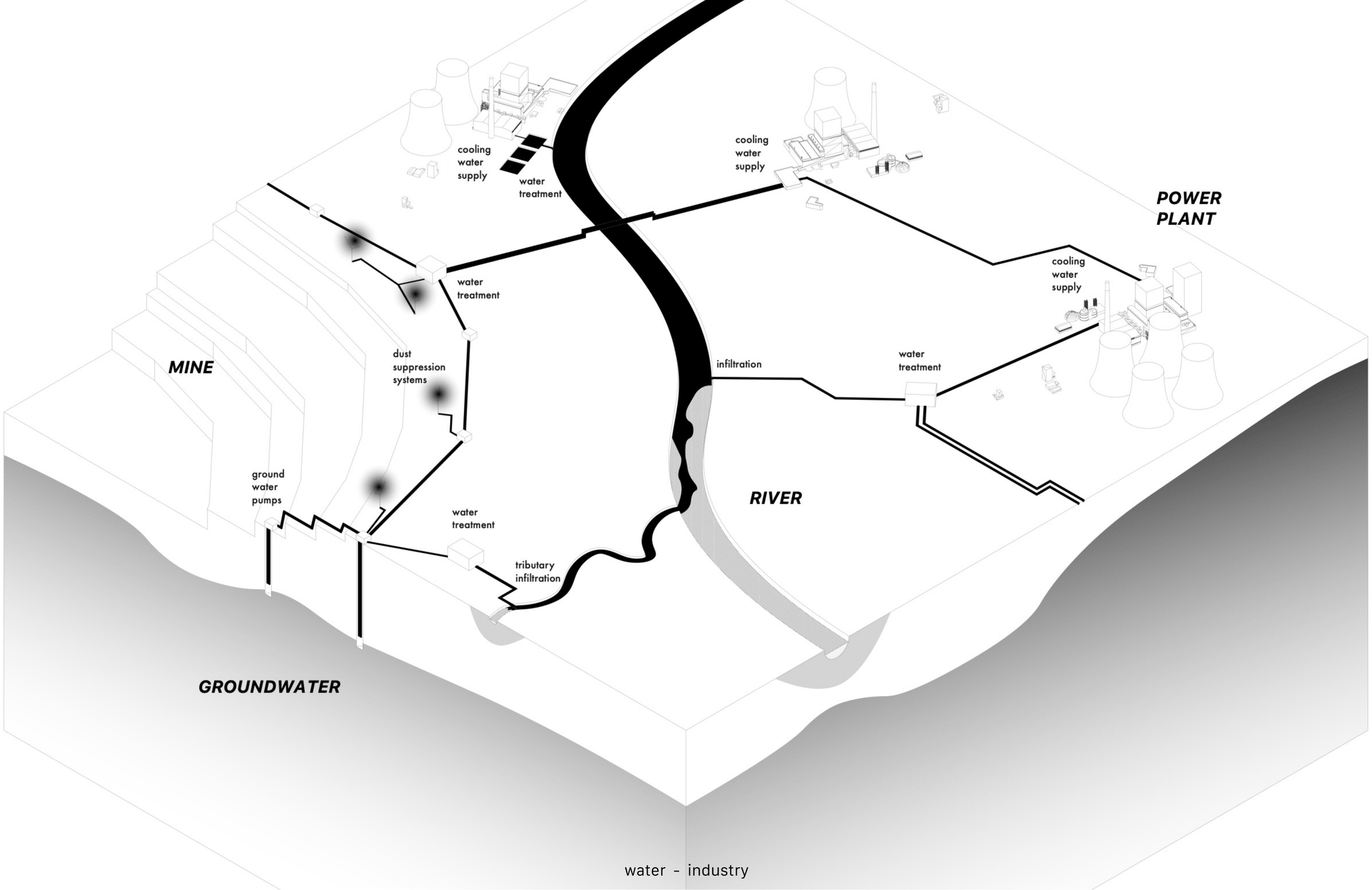
power plant

the mining landscape

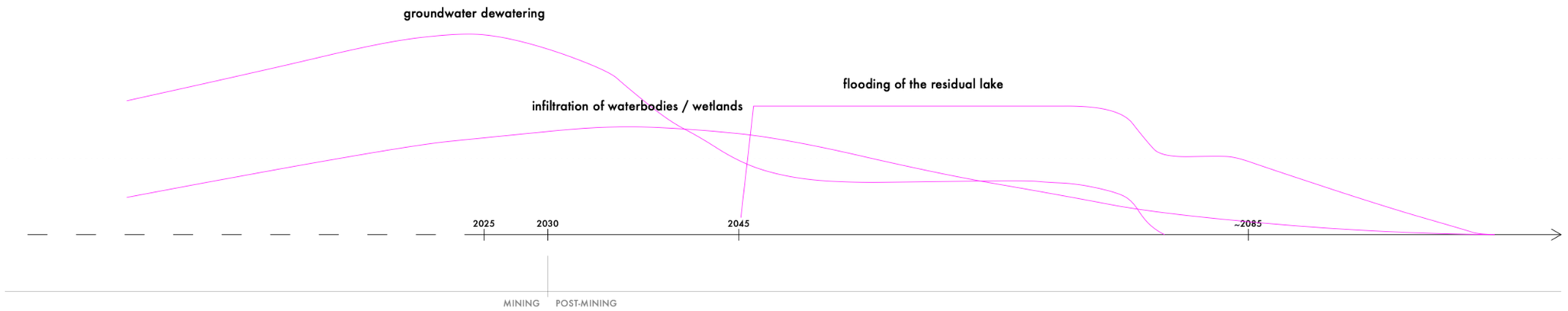




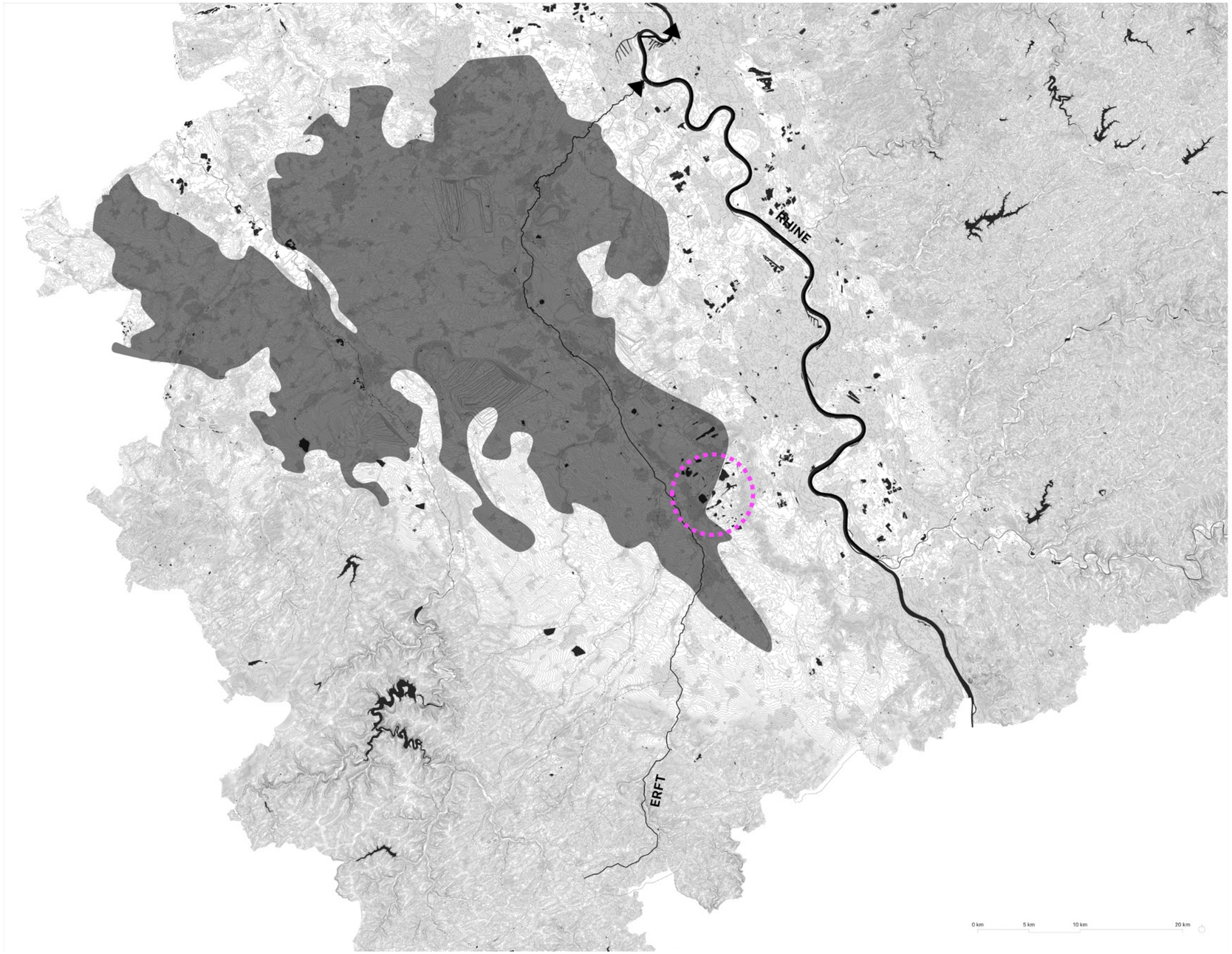
the mining landscape



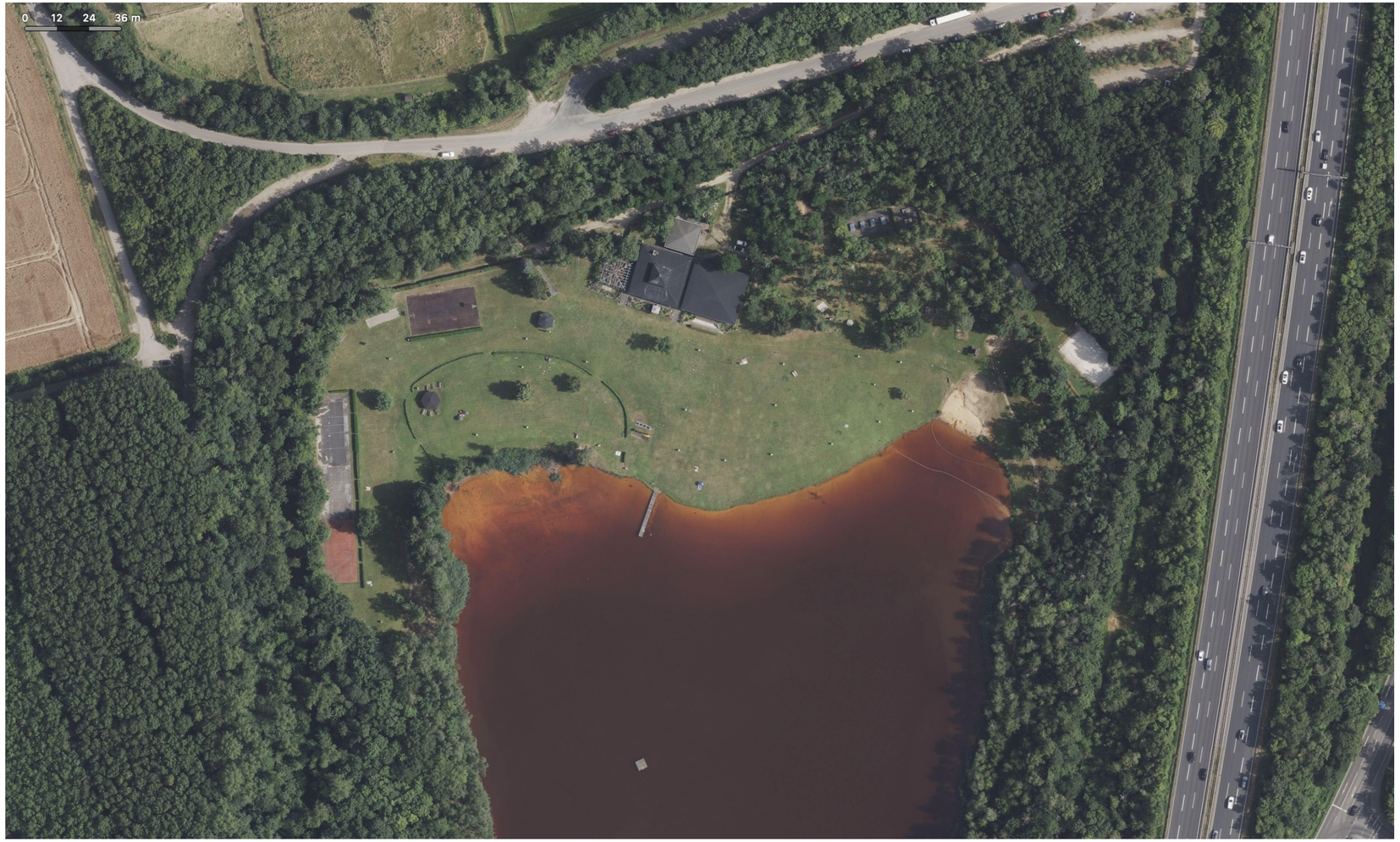
water - industry



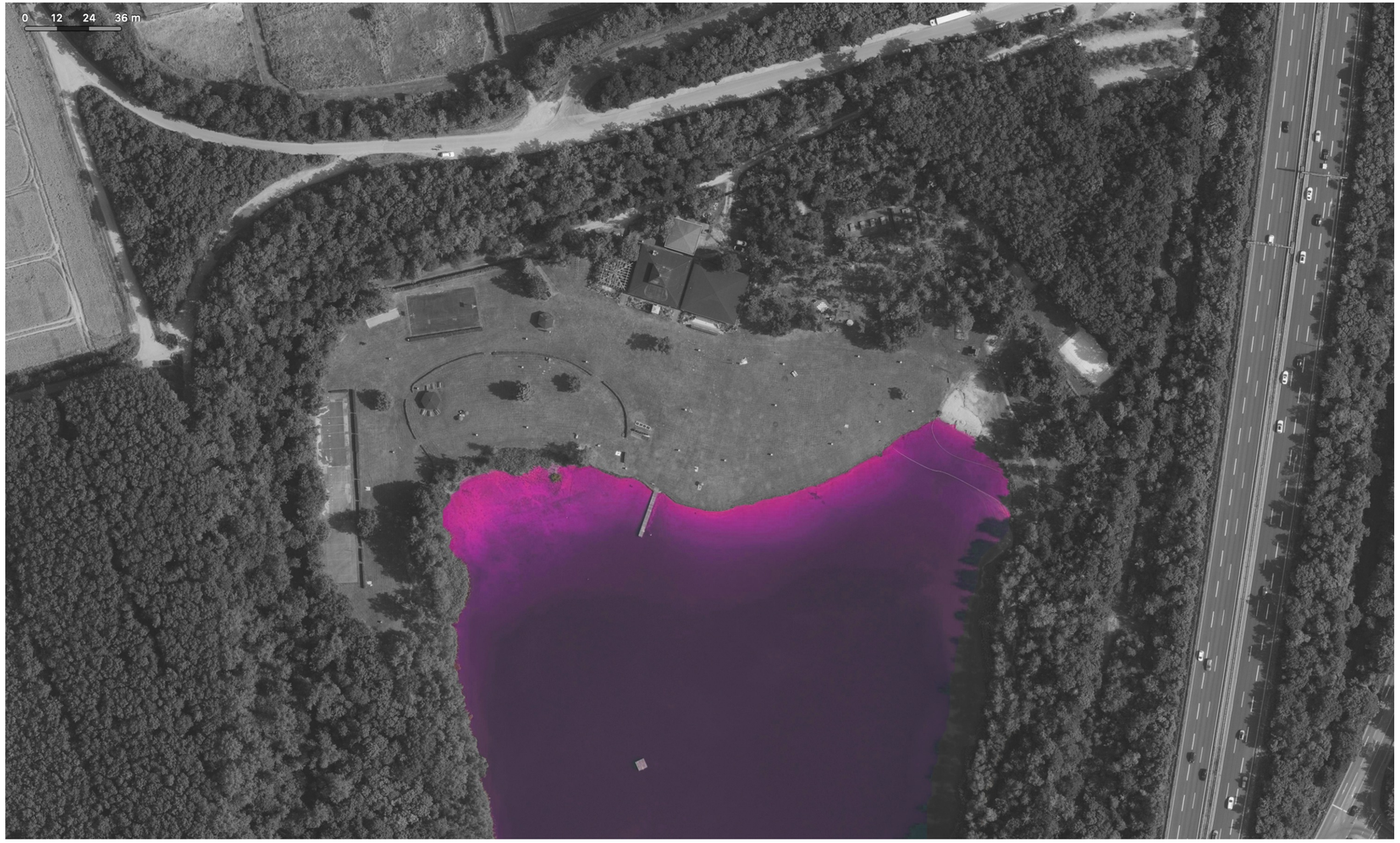
water flows – past and future



groundwater lowering



existing condition


0 12 24 36 m

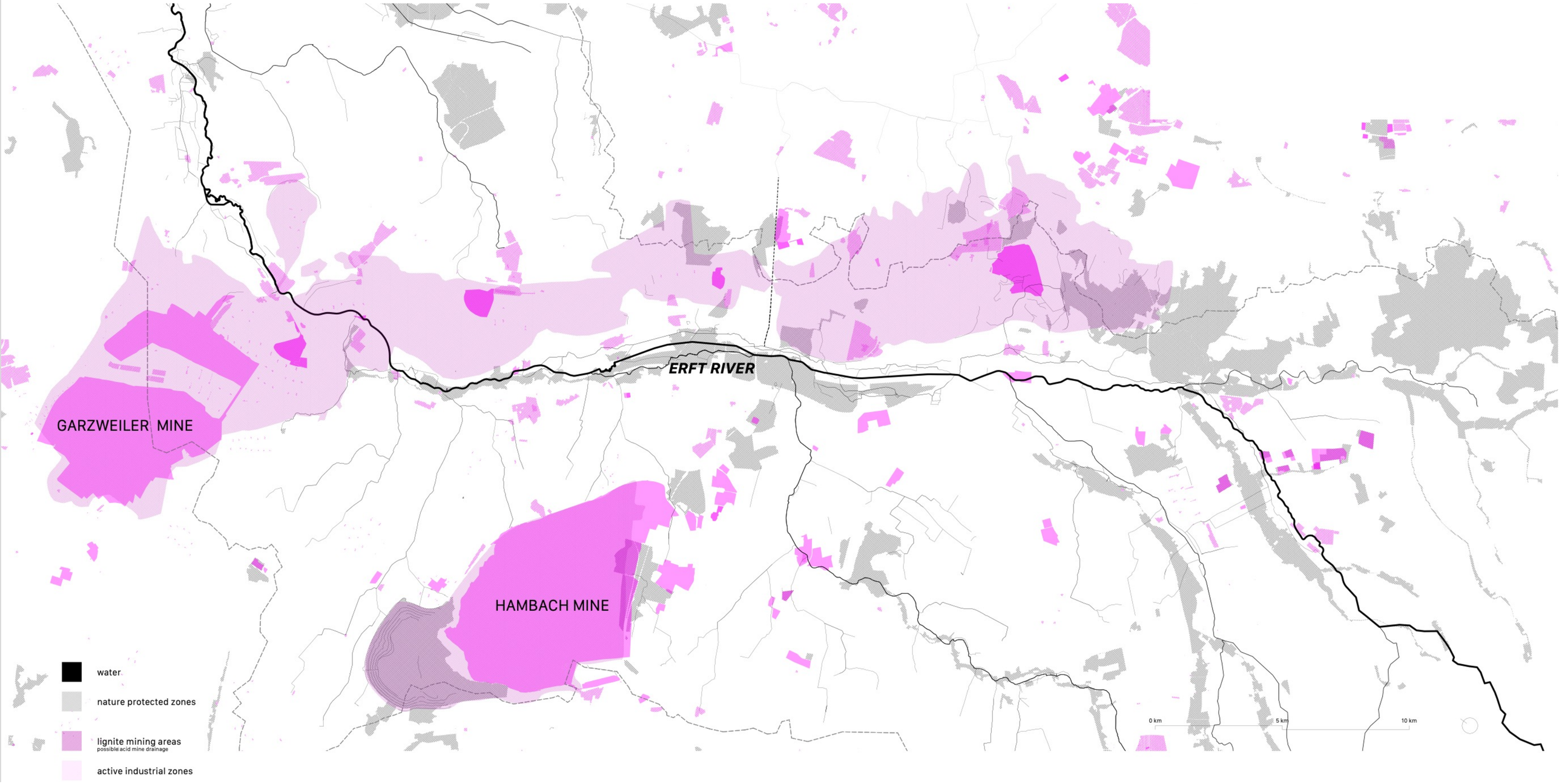
§ 15 Federal Nature Conservation Act

Compensation and Replacement Measures (Condensed)

(1) Avoiding interventions
Interventions in nature and the landscape should be avoided or minimized as much as possible.

(2) Compensation and replacement measures
Unavoidable impacts must be compensated through compensation measures (restoring the affected functions) or replacement measures (equivalent ecological improvements).

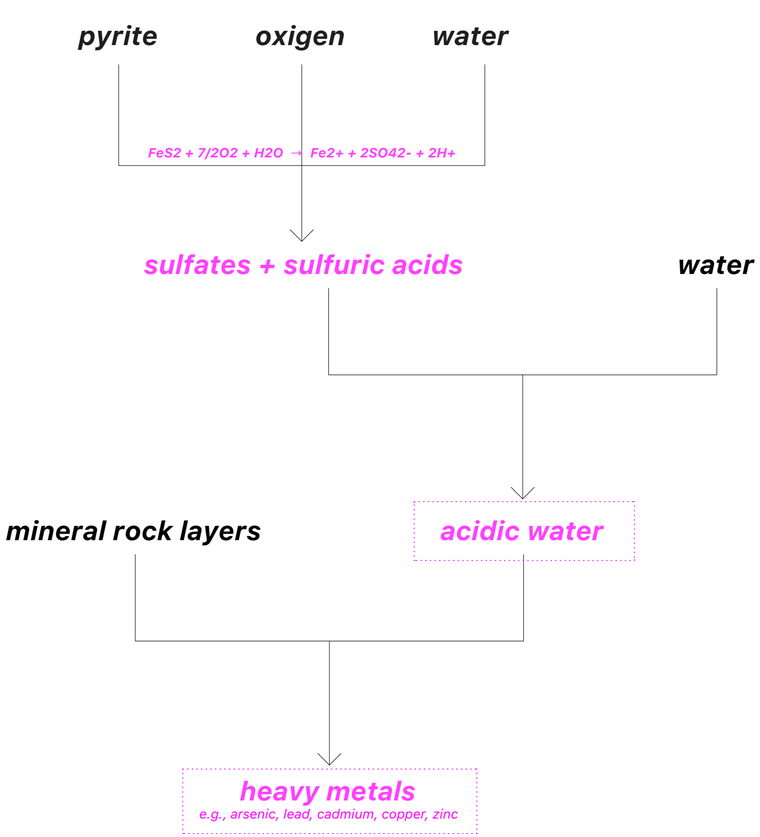
(3) Compensatory payment
If compensation or replacement measures are not possible, a compensatory payment must be made, which is earmarked for nature conservation and landscape management measures.

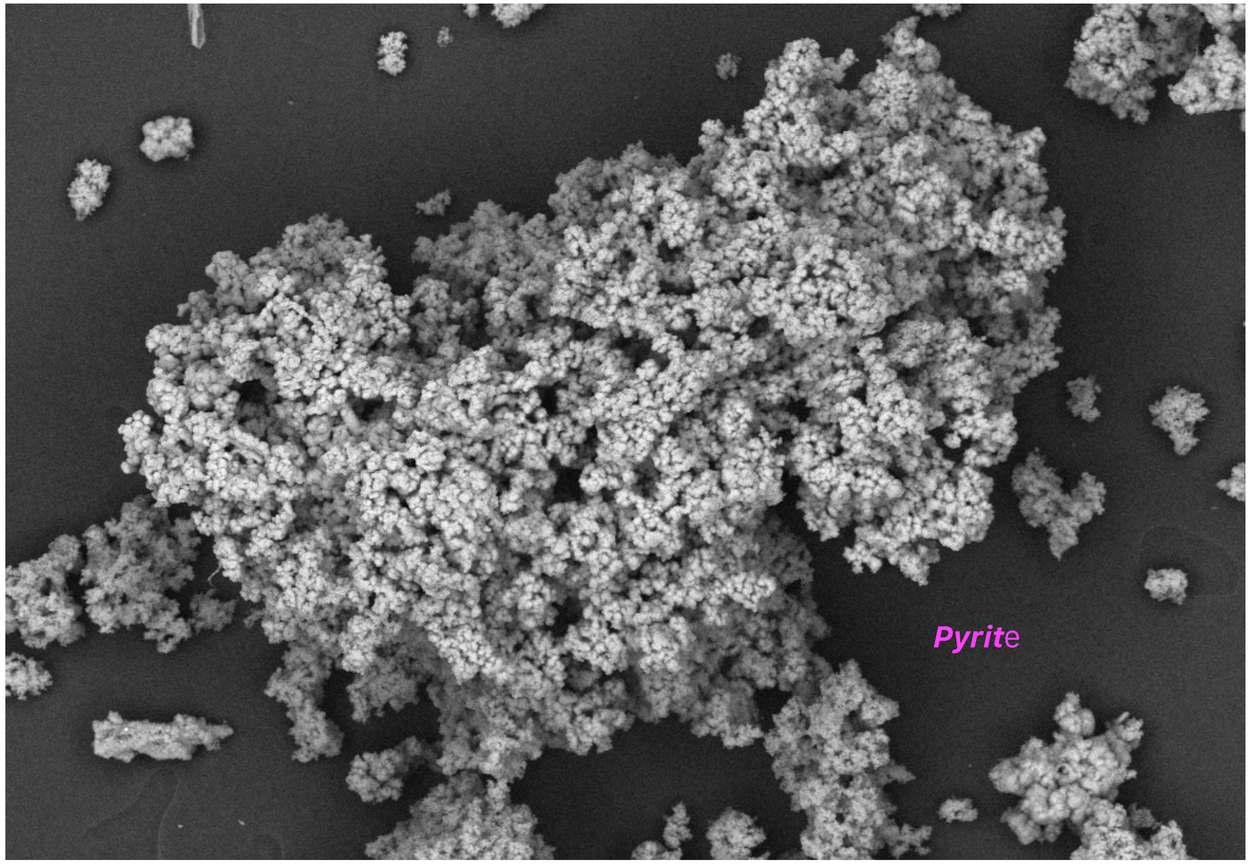


Ausgleichsflächen

Human and *Non-Human*

The separation between human and non-human actors mirrors the current vocabulary of landscapes shaped by industrial activity. This binary is evident in the rigid distinction between isolated, idealized nature-protected zones and the highly extractive operations that dominate surrounding areas. While this framing reflects the dominant approach to managing these landscapes, it risks oversimplifying the dynamic and fluid relationships that define such environmnets. This research challenges the rigidity of this framework, advocating for a perspective that embraces fluidity and less-defined interactions.





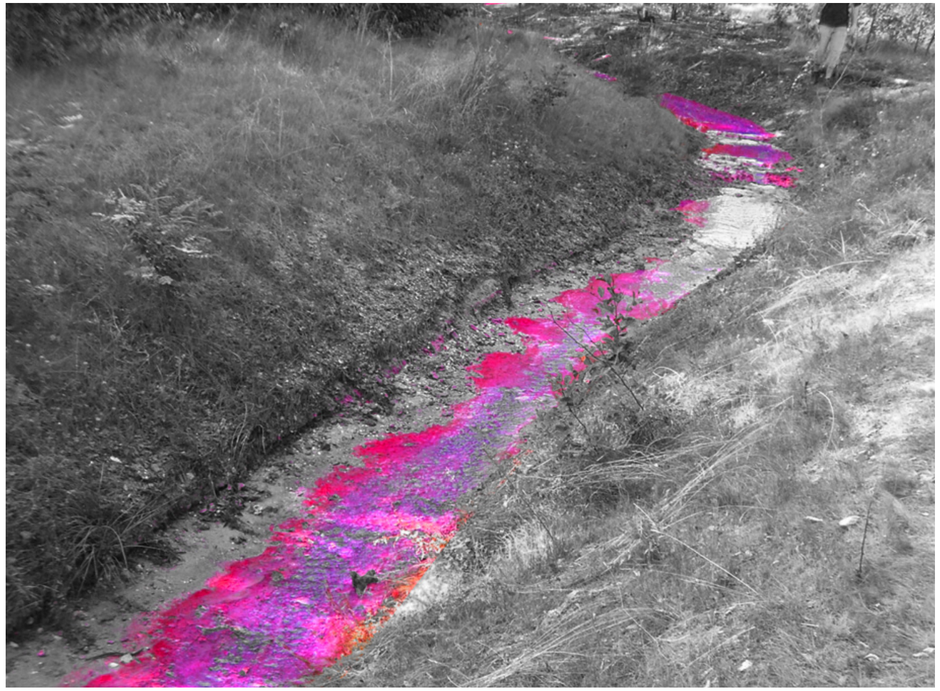
contamination process

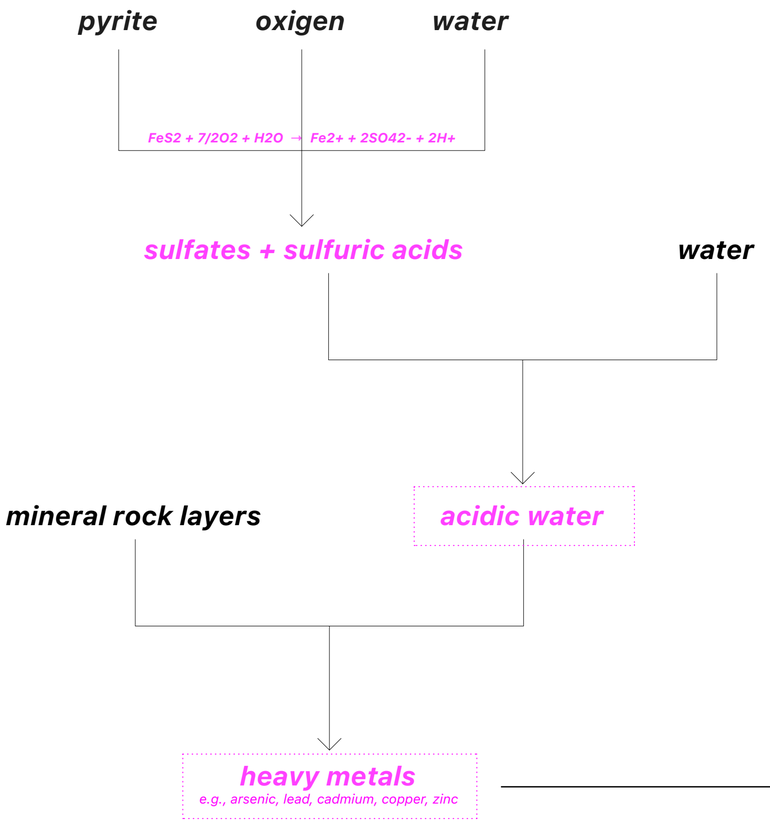
surface water

mining site

groundwater

contamination - visible signs





190 ground water testings / 32 surface water testings:

		Kippengrundwasser		Oberflächenwasser
		(Min - Max)	(Mittel)	(Min - Max)
pH-value	[-]	3,5 - 7,4	5,8	2,4 - 6,0
Calcium	[mg/l]	35 - 906	543	323 - 680
Magnesium	[mg/l]	39,9 - 296	144	76 - 160
Iron	[mg/l]	5,9 - 2260	588	17 - 1182
Sulfate	[mg/l]	700 - 5842	2809	1090 - 6590
Nickel	[mg/l]	0,005 - 14,0	2,15	0,107 - 3,88
Zinc	[mg/l]	0,02 - 33,1	4,65	0,090 - 6,39
Cobalt	[mg/l]	0,002 - 3,1	0,71	0,051 - 2,77
Arsenic	[mg/l]	<0,005 - 3,15	0,44	<0,005 - 0,14

reactions

degradation

not locally confinable
destructible
dictates new condition

countermeasure of "repair" / "restoration"

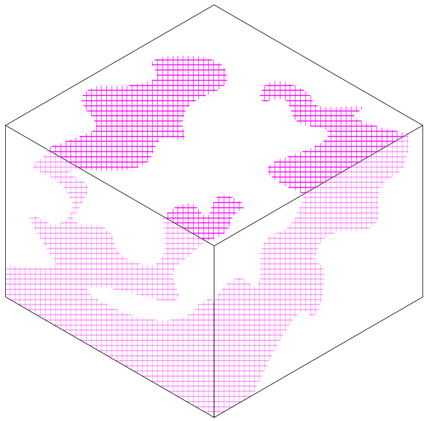
BUFFER ZONES

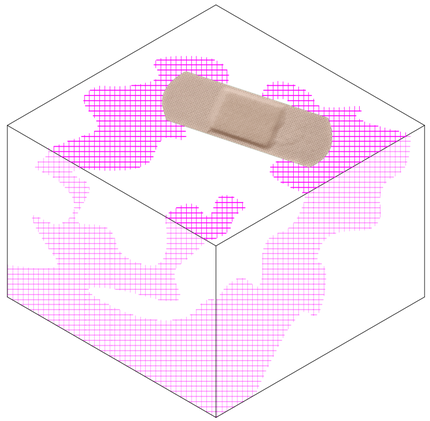
nature protected areas

artificially generated
dependent on external input
held in static state

environment

human/non-human mesh
ever changing and adapting
uncontrollable





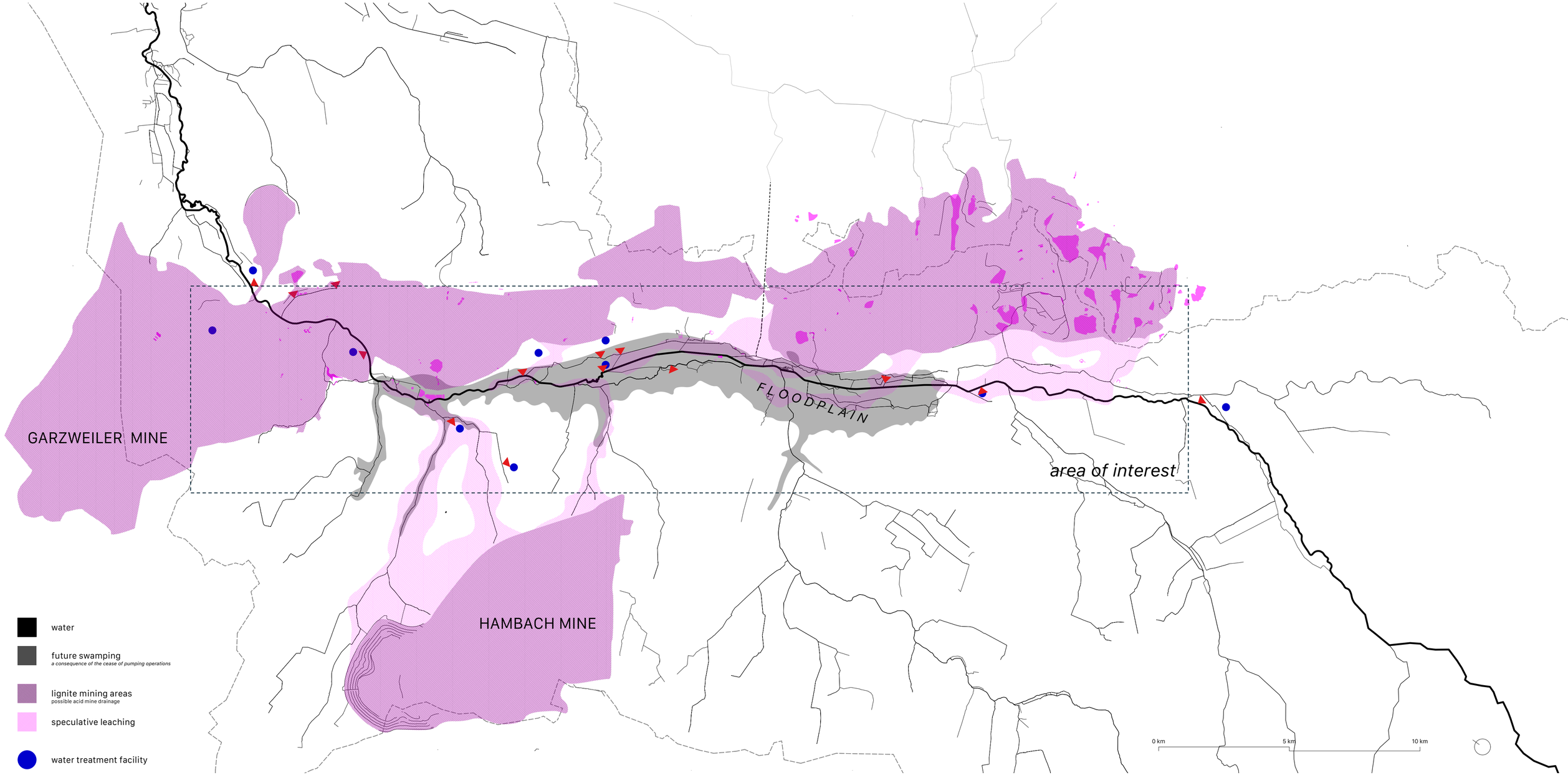
current approach

What defines the relationship between human and non-human actors within a contaminated landscape?

What is the alternative to artificial restoration?

How can we avoid degradation without dictating the condition?

How can architecture be a tool within contamination to allow adaptation?

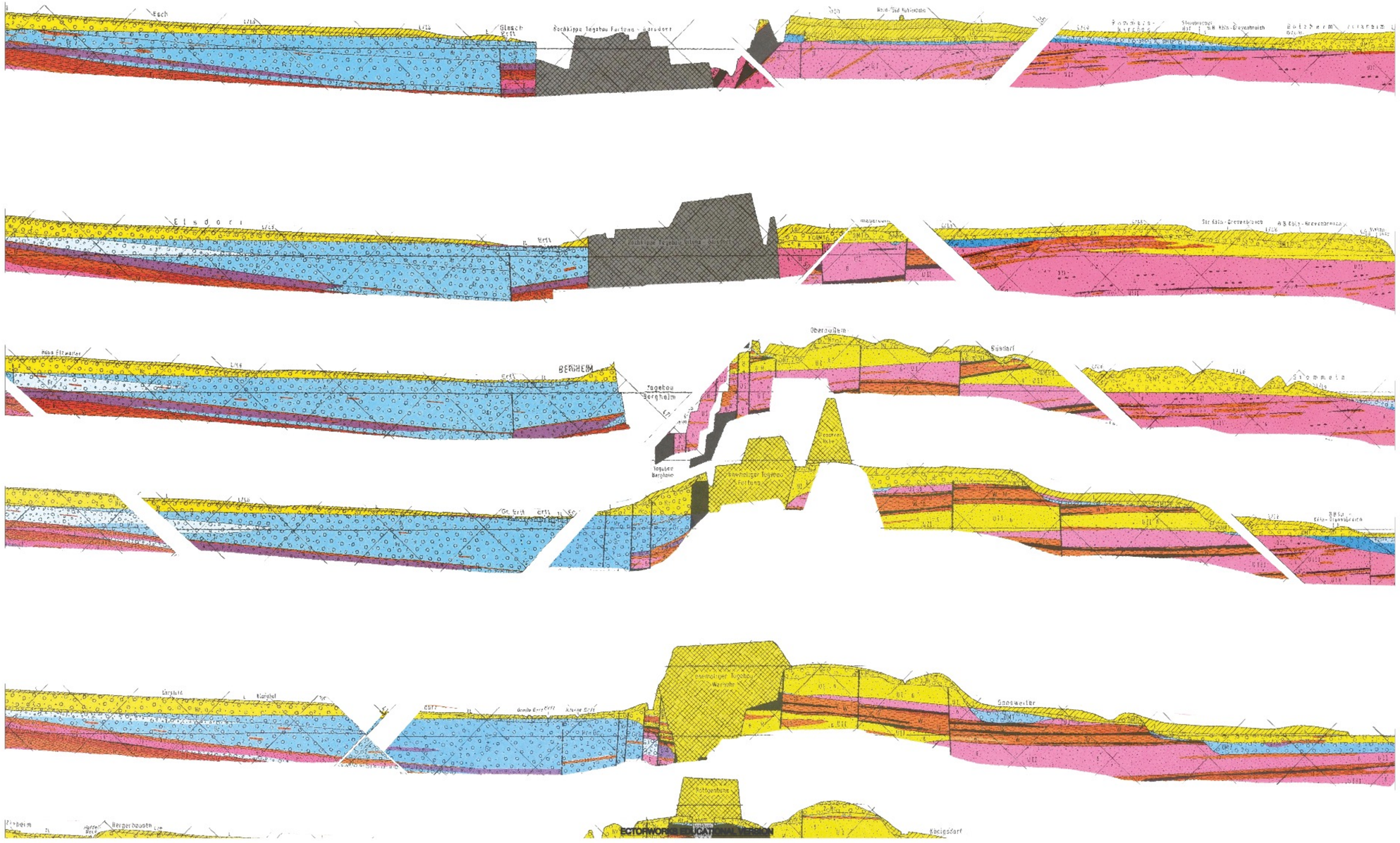


area of interest

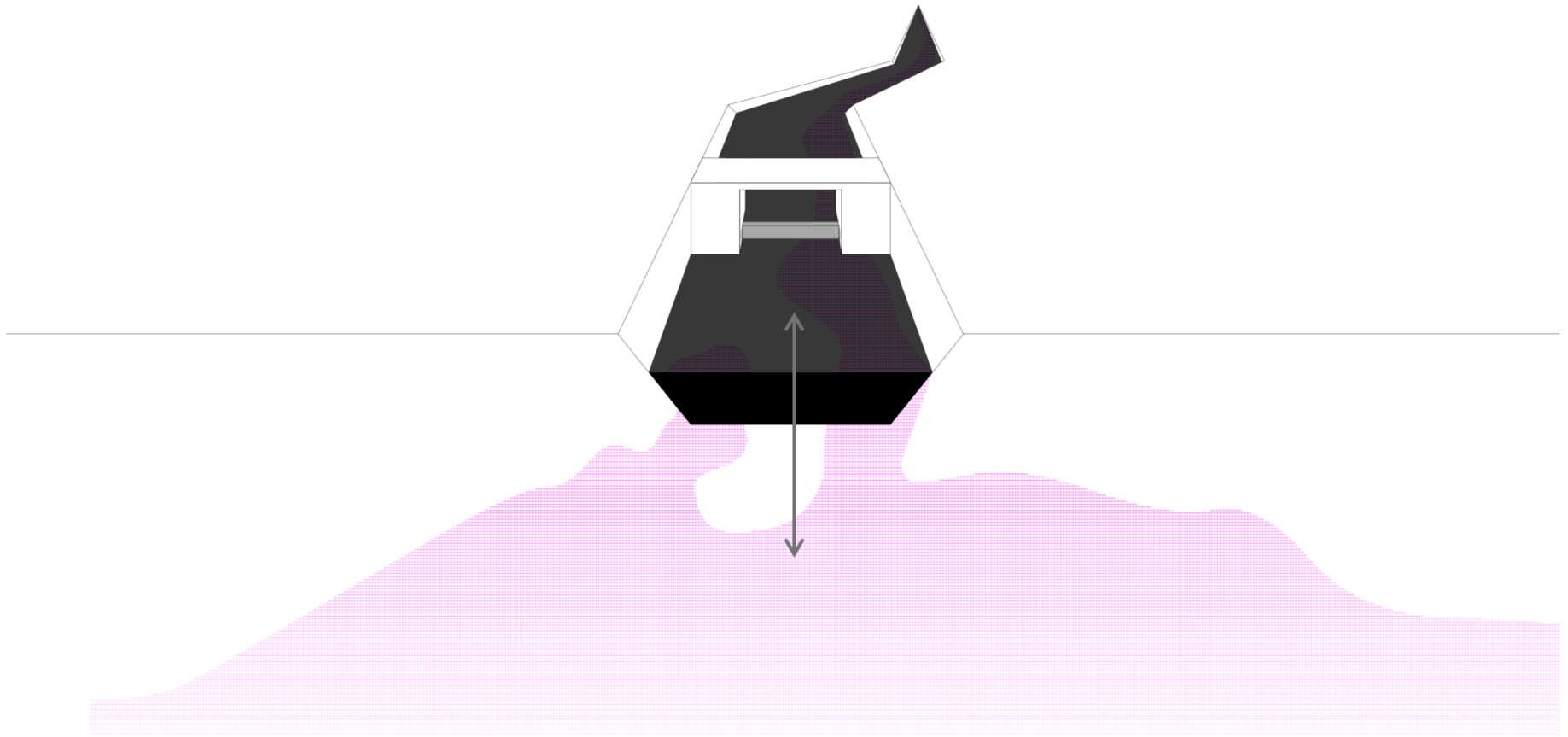
infiltration

interface

infiltration

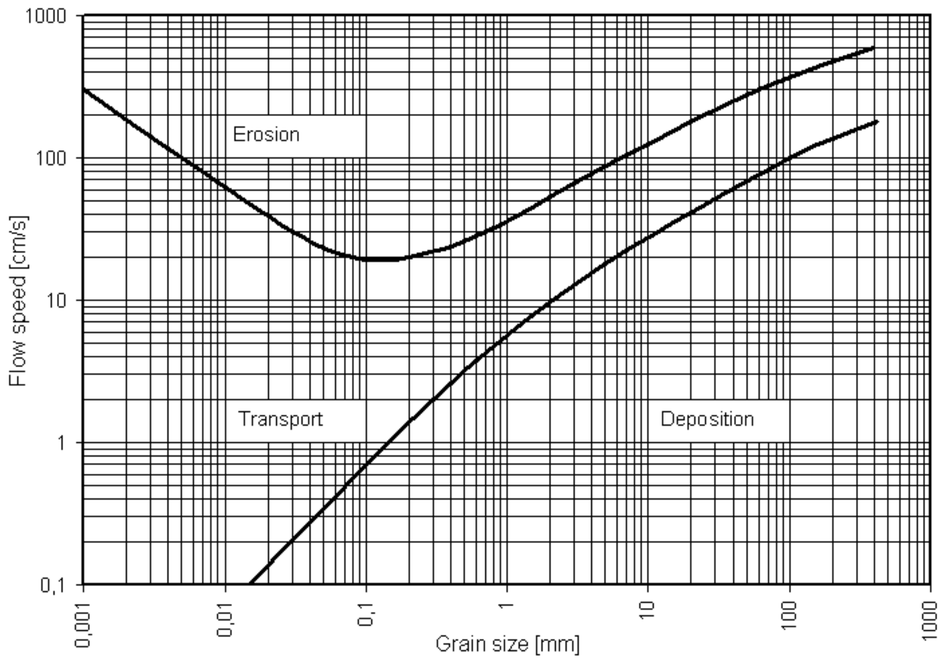


the river as an interface

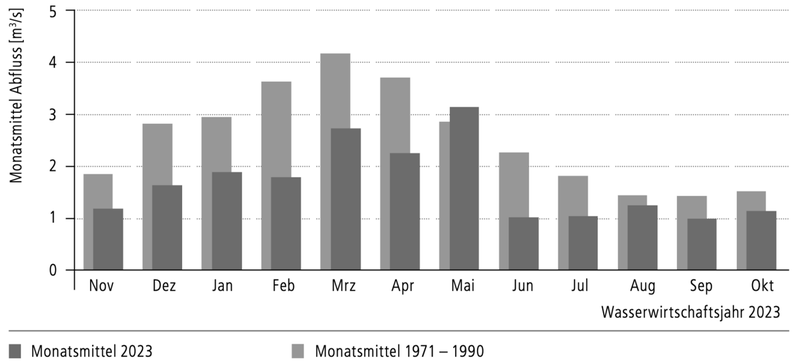


the river as an interface

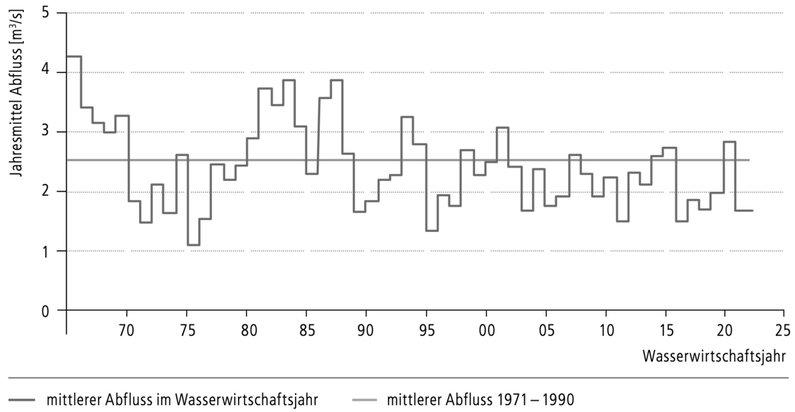
sedimentation



mean monthly discharge

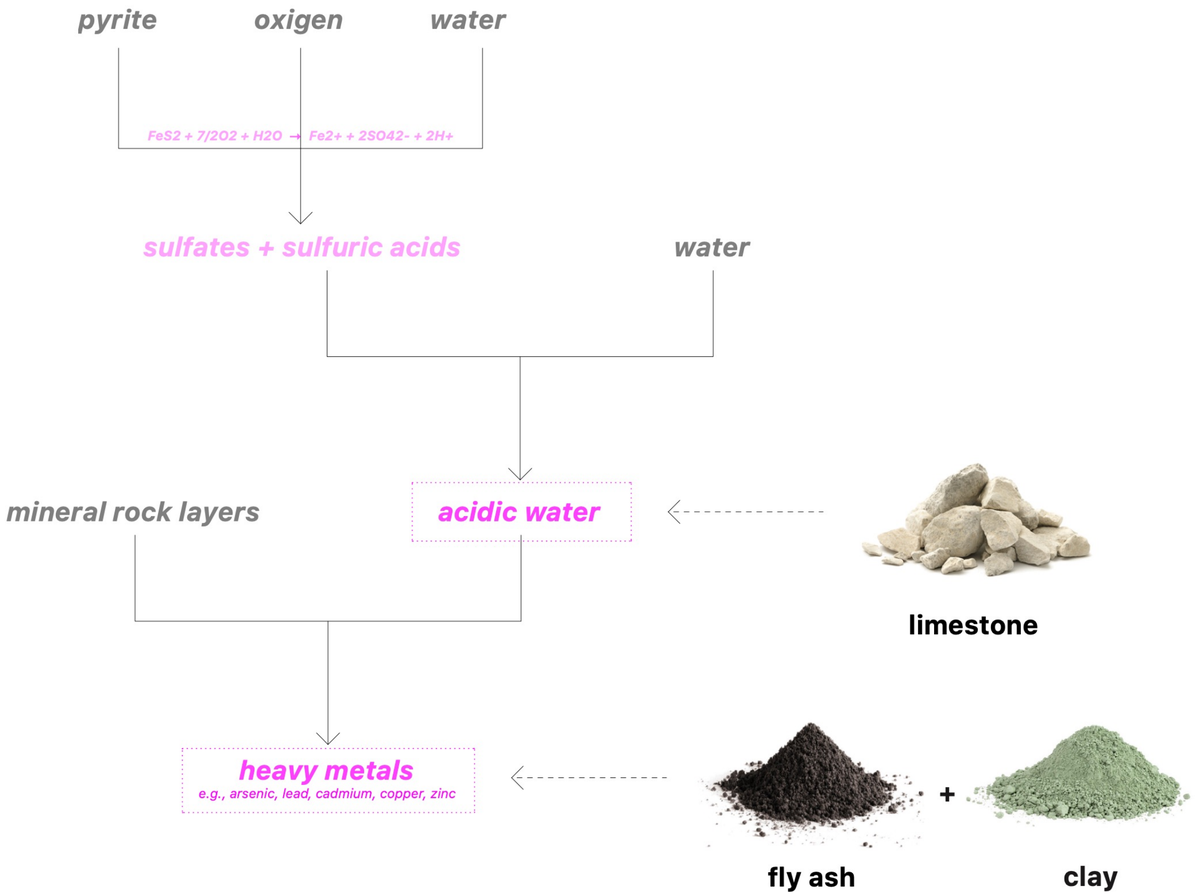


annual average discharge



sedimentation and seasonal floodings

https://www.erftverband.de/wp-content/uploads/2024/06/jahresbericht2023_erftverband_web.pdf
https://en.wikipedia.org/wiki/Hjulström_curve



material responses

MATERIAL ORIGINS

Fig. 44

speculative objects

Geo-: relating to the Earth or land.

Prosthetic: an artificial extension or device that replaces or enhances a missing or impaired part.

A Geoprosthetic refers to an artificial or designed material intervention into the Earth or Landscape that acts as an extension, replacement, or augmentation of natural systems.

Geoprosthetic definition

STANDARD
BRICK

20cm

PAVING
BRICK

25cm

GEOPROSTHETIC

30cm

HEAT BATTERY
BLOCK

80cm

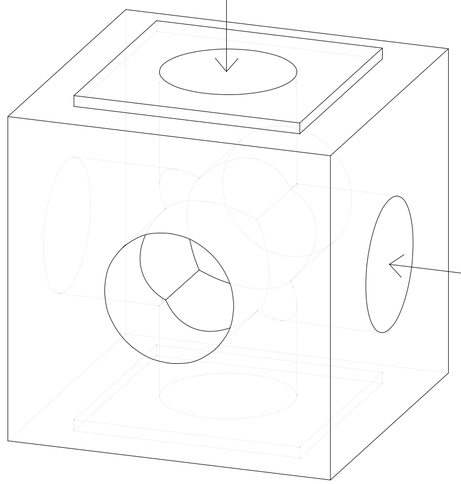
GABION
CAGE

100cm

QUARRY
BLOCK

200cm

SUPPORTING
STRUCTURE



HEAT
WATER
LIVING MATTER

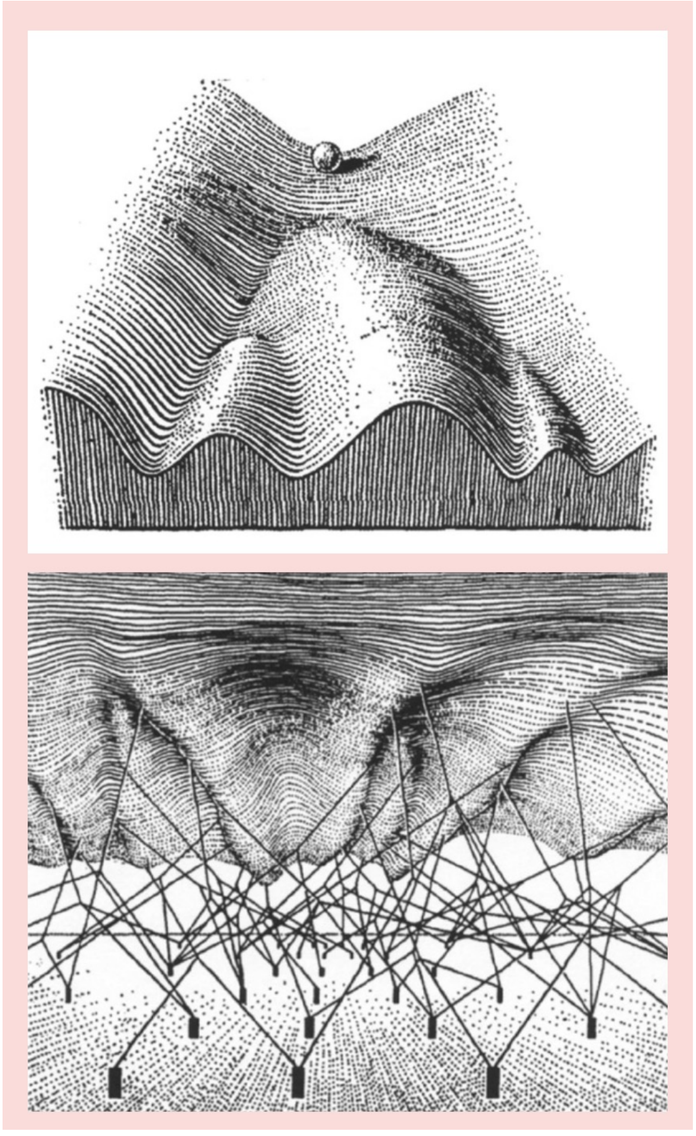
shape

blocks

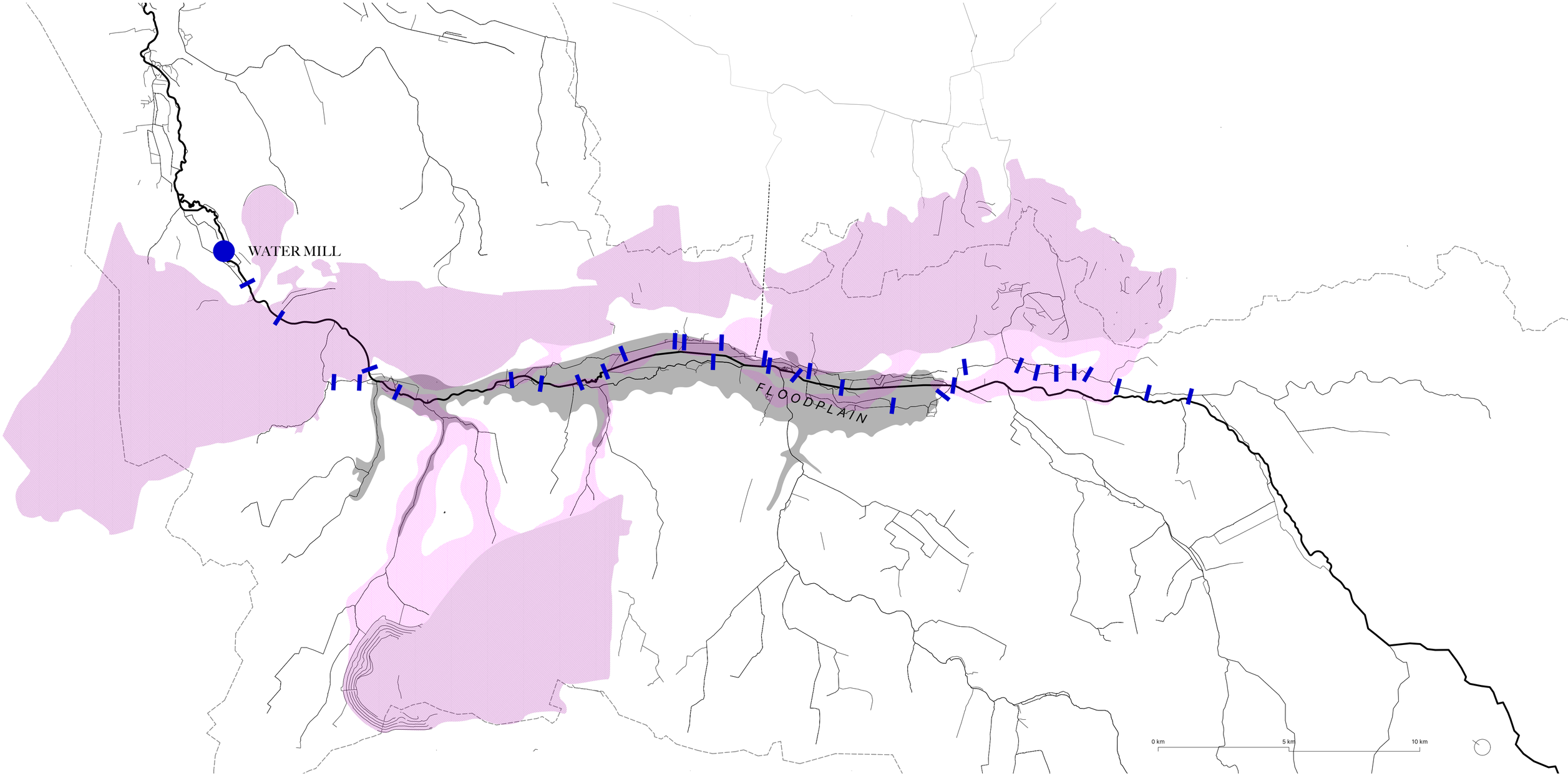
blocks

blocks

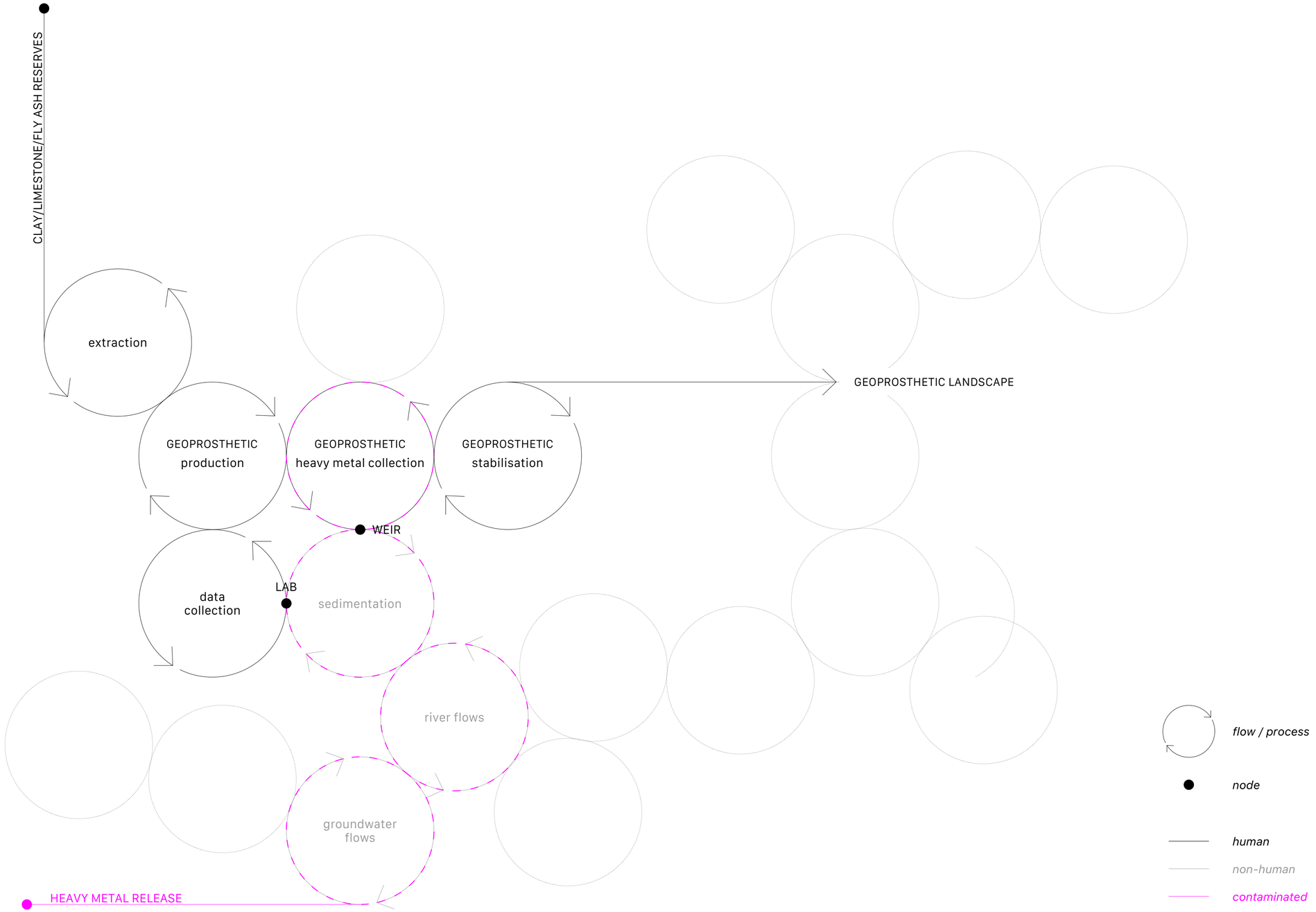
matter-in-transition



Epigenetic Territory



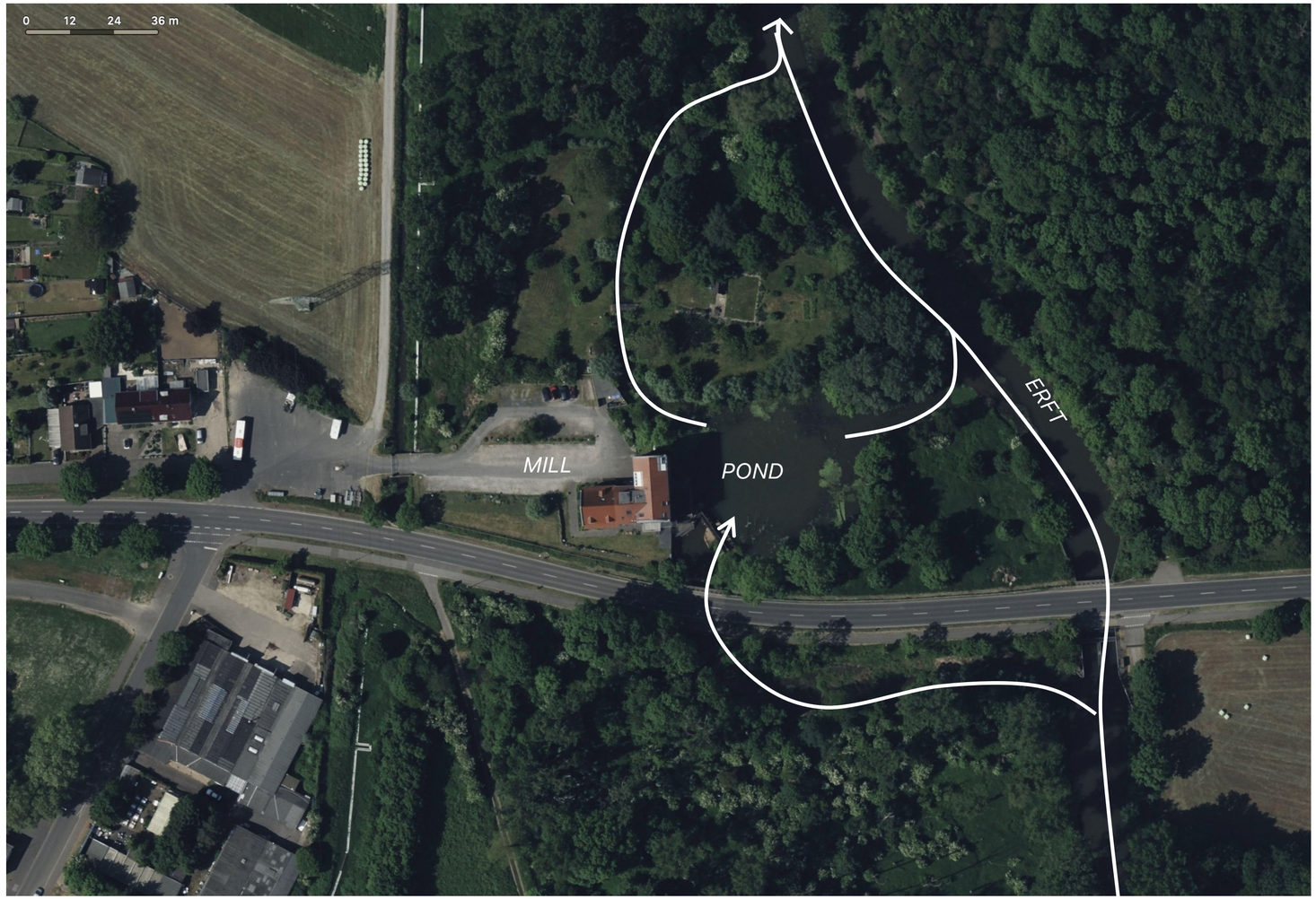
weir systems



flows and nodes

the gustorfer mill

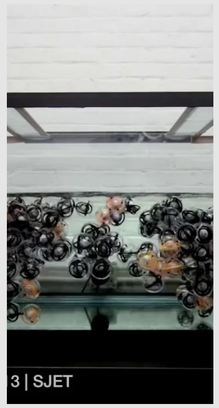
the gustorfer mill



the gustorfer mill

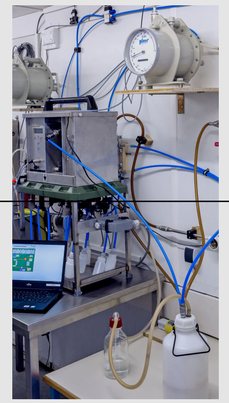
gustorfer watermill

RESEARCH / MONITORING



material testing

lab



electrochemical treatment

storage

storage pool

pond

sediment catchment

RIVER

informing

RESPONSIVE PRODUCTION

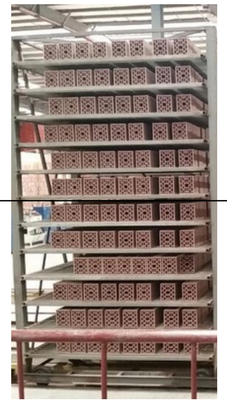
LOCAL EXCAVATION

storage

silos

mixing

molding



drying

burning

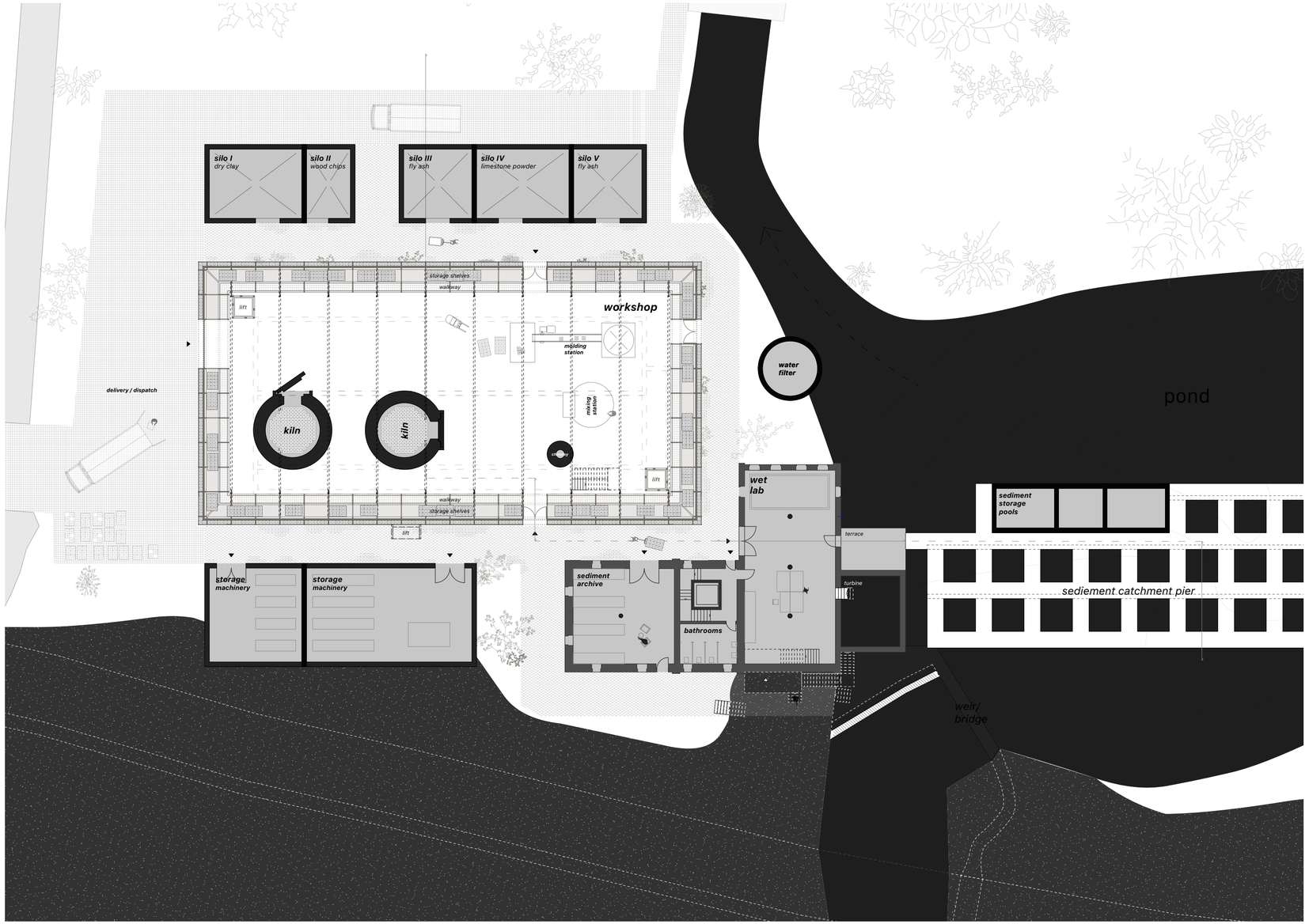
kiln

cooling

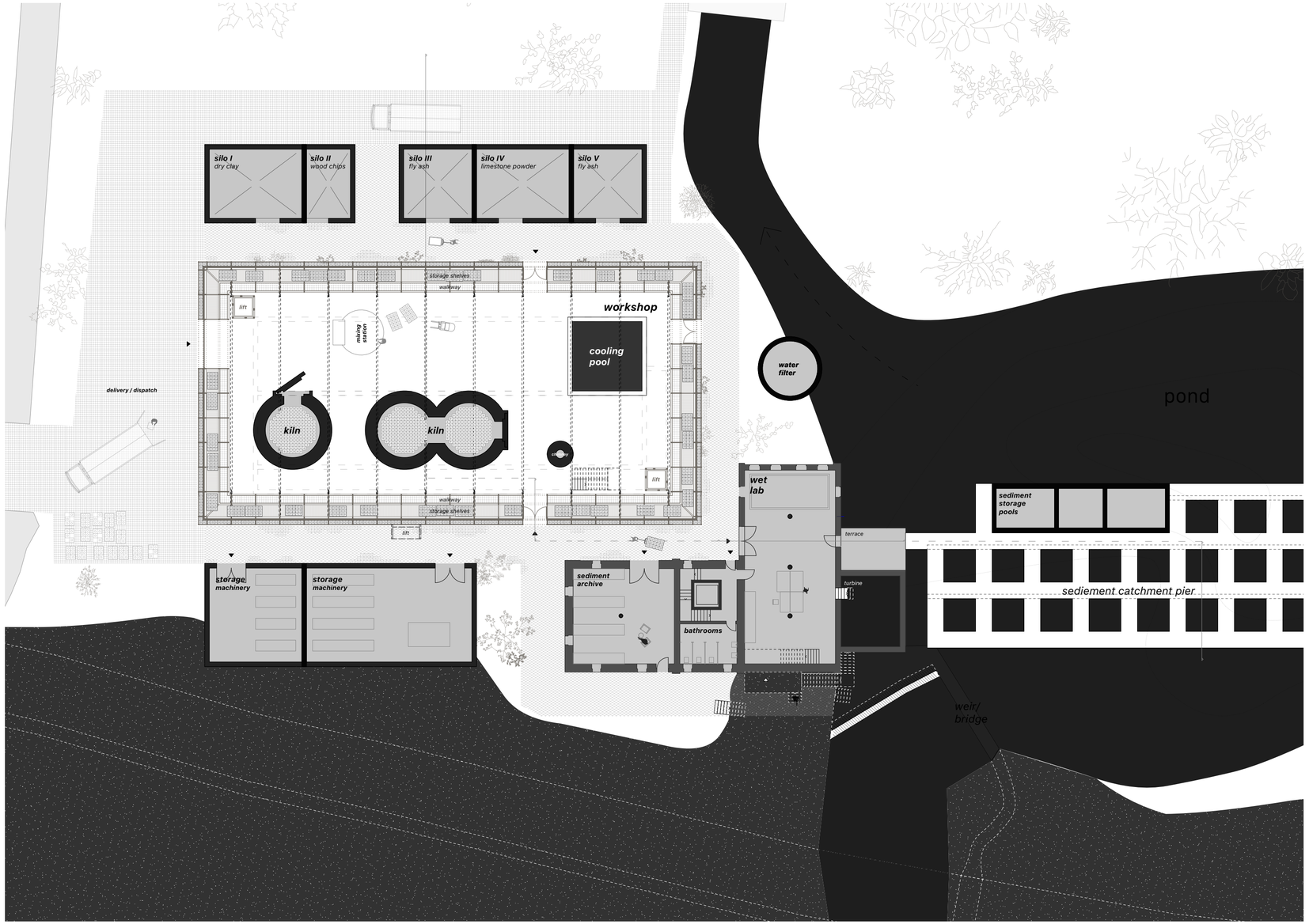
workshop

BLOCK

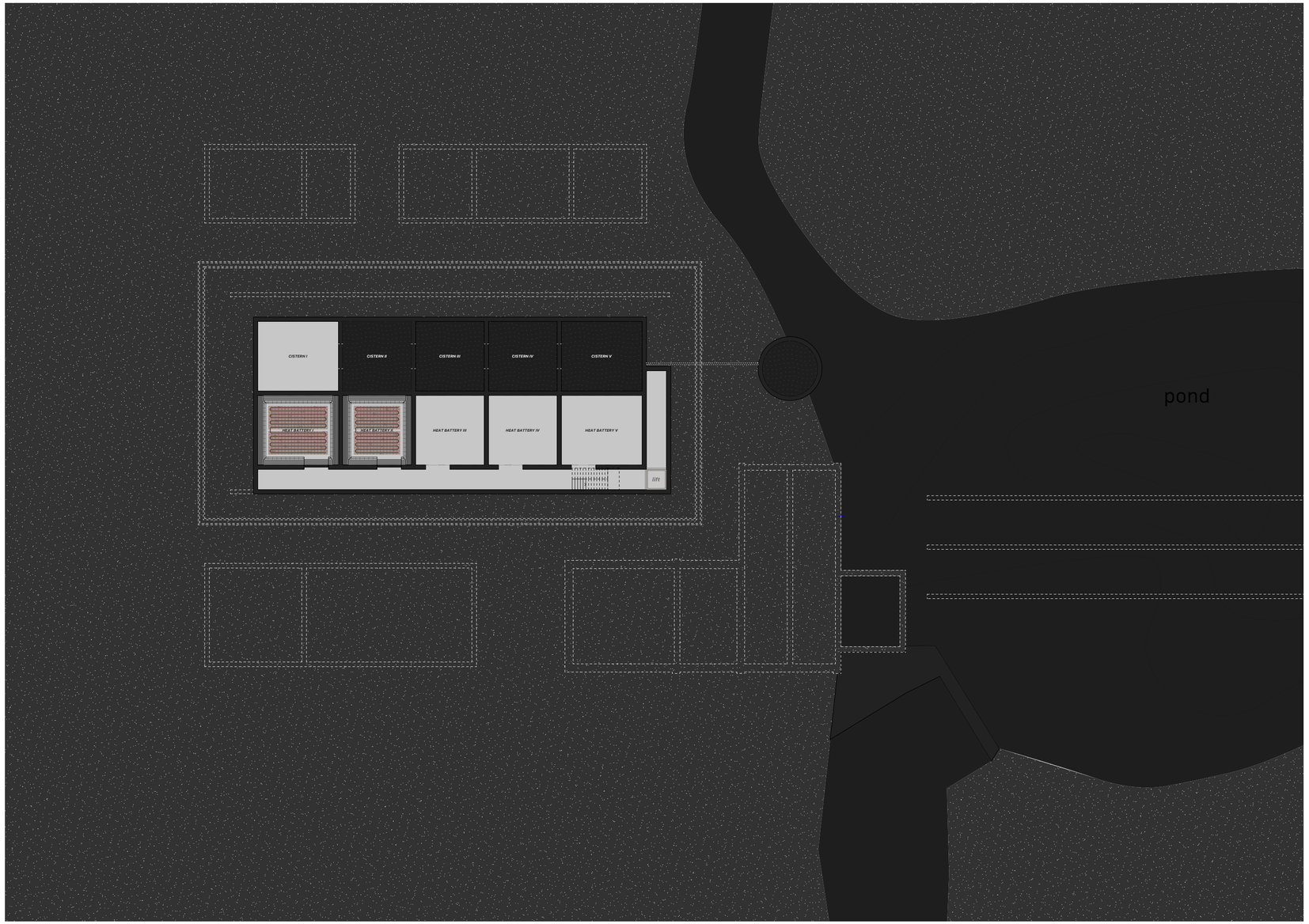
program



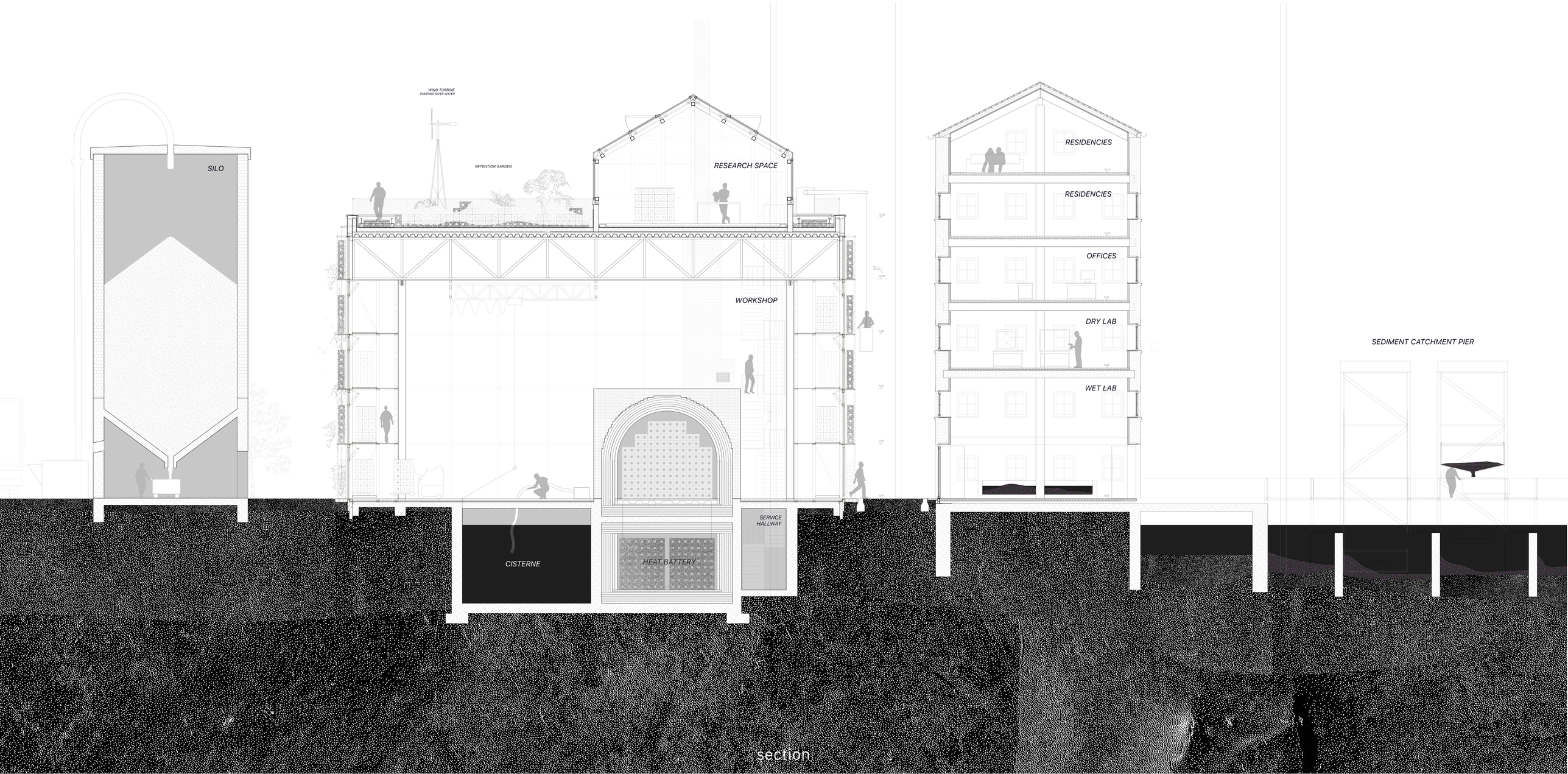
ground floor



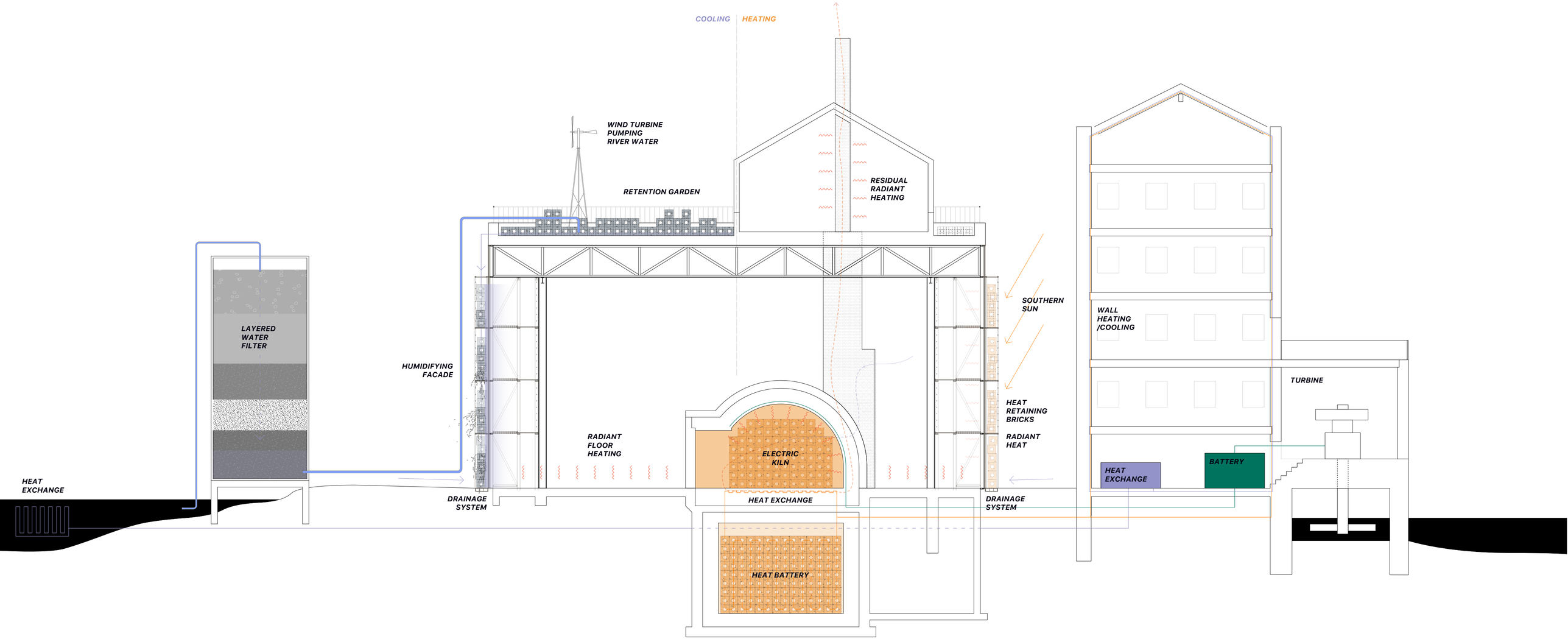
ground floor


CISTERN I
CISTERN II
CISTERN III
CISTERN IV
CISTERN V
HEAT BATTERY III
HEAT BATTERY IV
HEAT BATTERY V
lift
pond

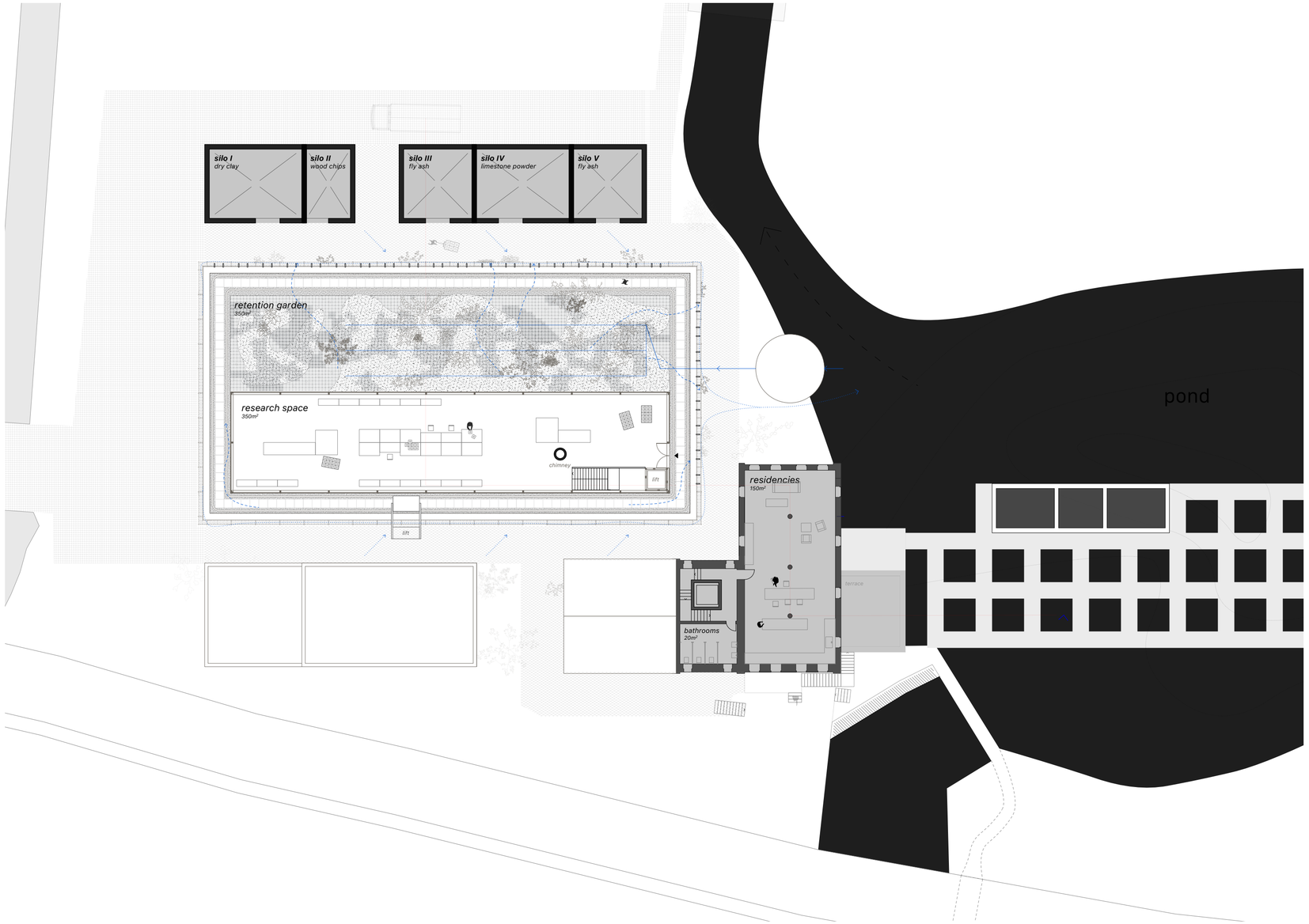
basement


WIND TURBINE
PUMPING RIVER WATER
SILO
RETENTION GARDEN
RESEARCH SPACE
WORKSHOP
SERVICE HALLWAY
CISTERNE
HEAT BATTERY
RESIDENCIES
RESIDENCIES
OFFICES
DRY LAB
WET LAB
SEDIMENT CATCHMENT PIER

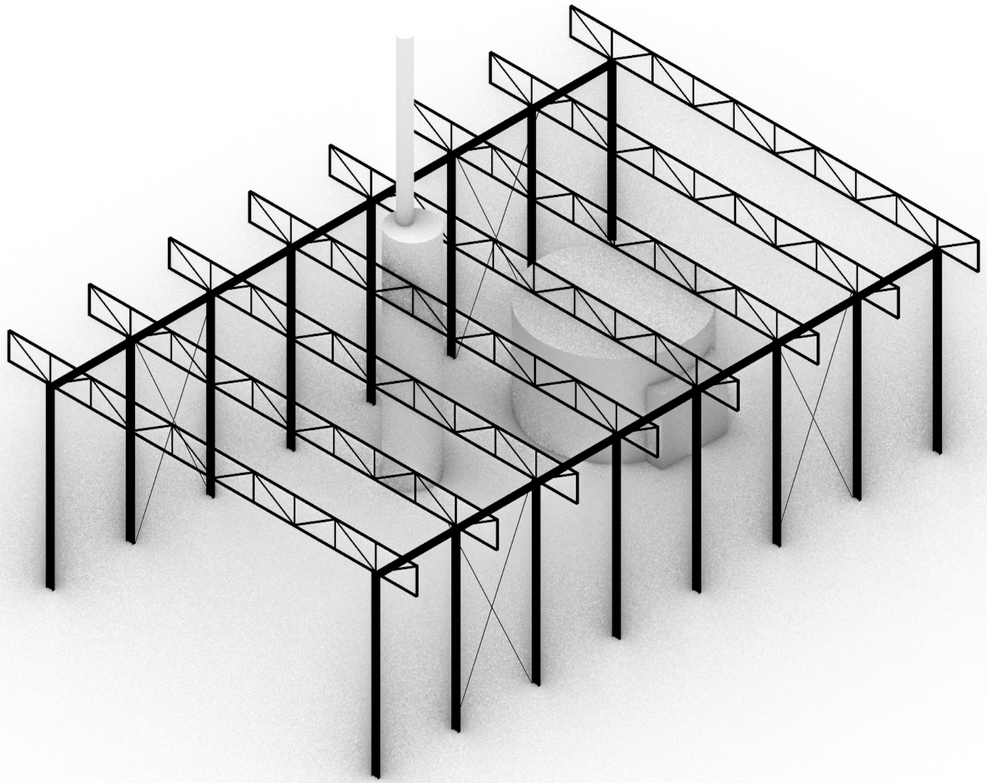
section


COOLING
HEATING
WIND TURBINE
PUMPING
RIVER WATER
RETENTION GARDEN
RESIDUAL
RADIANT
HEATING
SOUTHERN
SUN
WALL
HEATING
/COOLING
LAYERED
WATER
FILTER
HUMIDIFYING
FACADE
TURBINE
HEAT
RETAINING
BRICKS
RADIANT
HEAT
RADIANT
FLOOR
HEATING
ELECTRIC
KILN
HEAT
EXCHANGE
BATTERY
HEAT
EXCHANGE
DRAINAGE
SYSTEM
HEAT EXCHANGE
DRAINAGE
SYSTEM
HEAT BATTERY

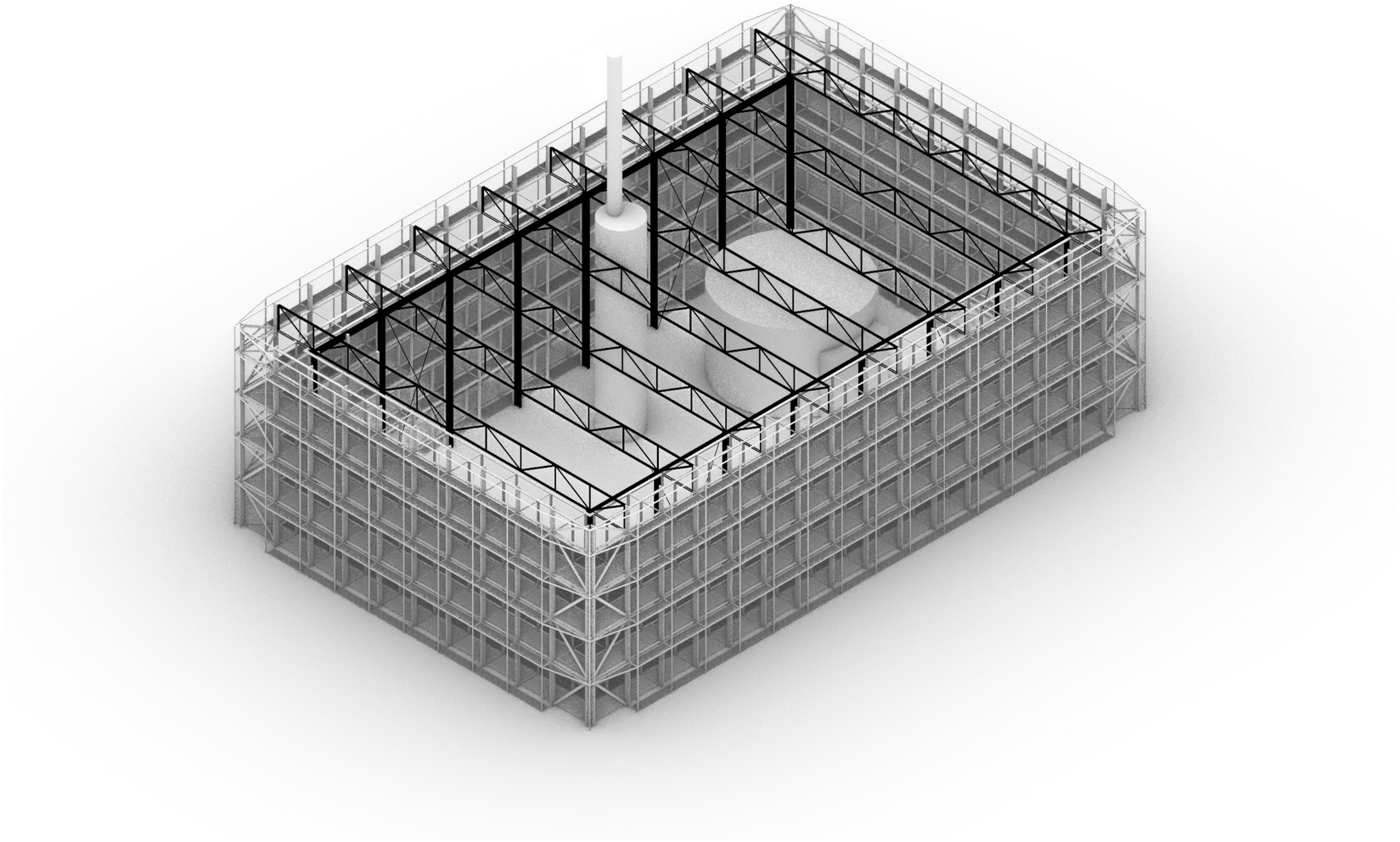
climate


silo I
dry clay
silo II
wood chips
silo III
fly ash
silo IV
limestone powder
silo V
fly ash
retention garden
350m²
research space
350m²
chimney
lift
lift
residencies
150m²
terrace
bathrooms
20m²
pond

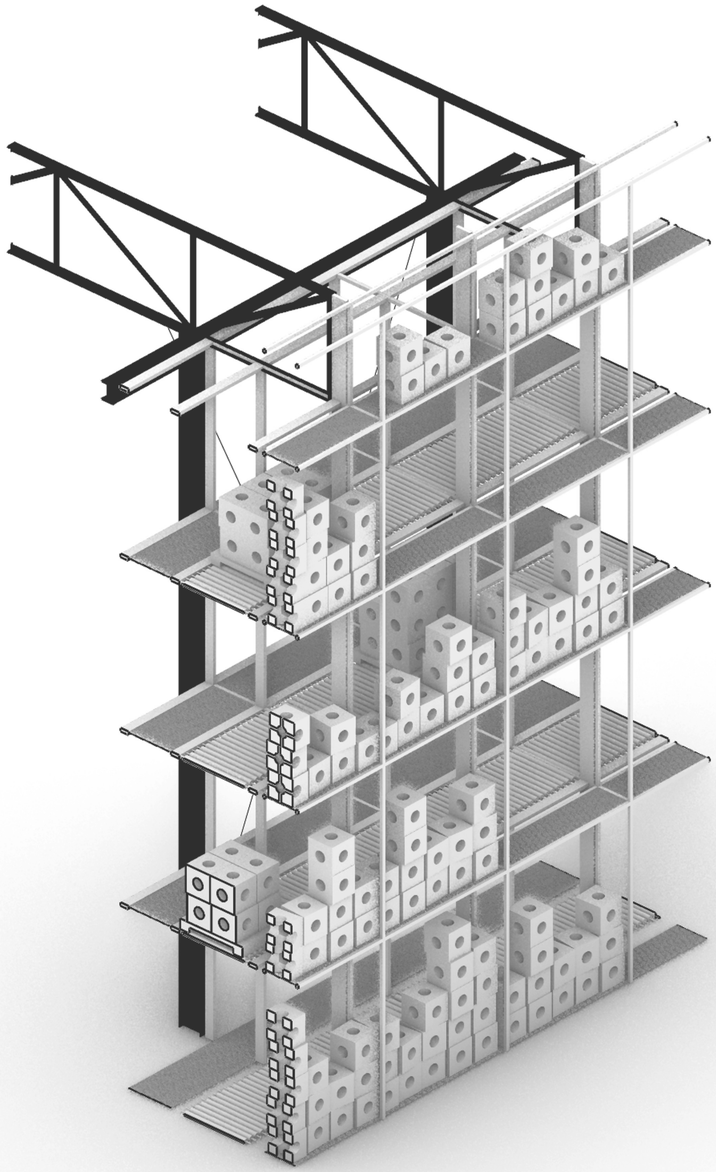
third floor



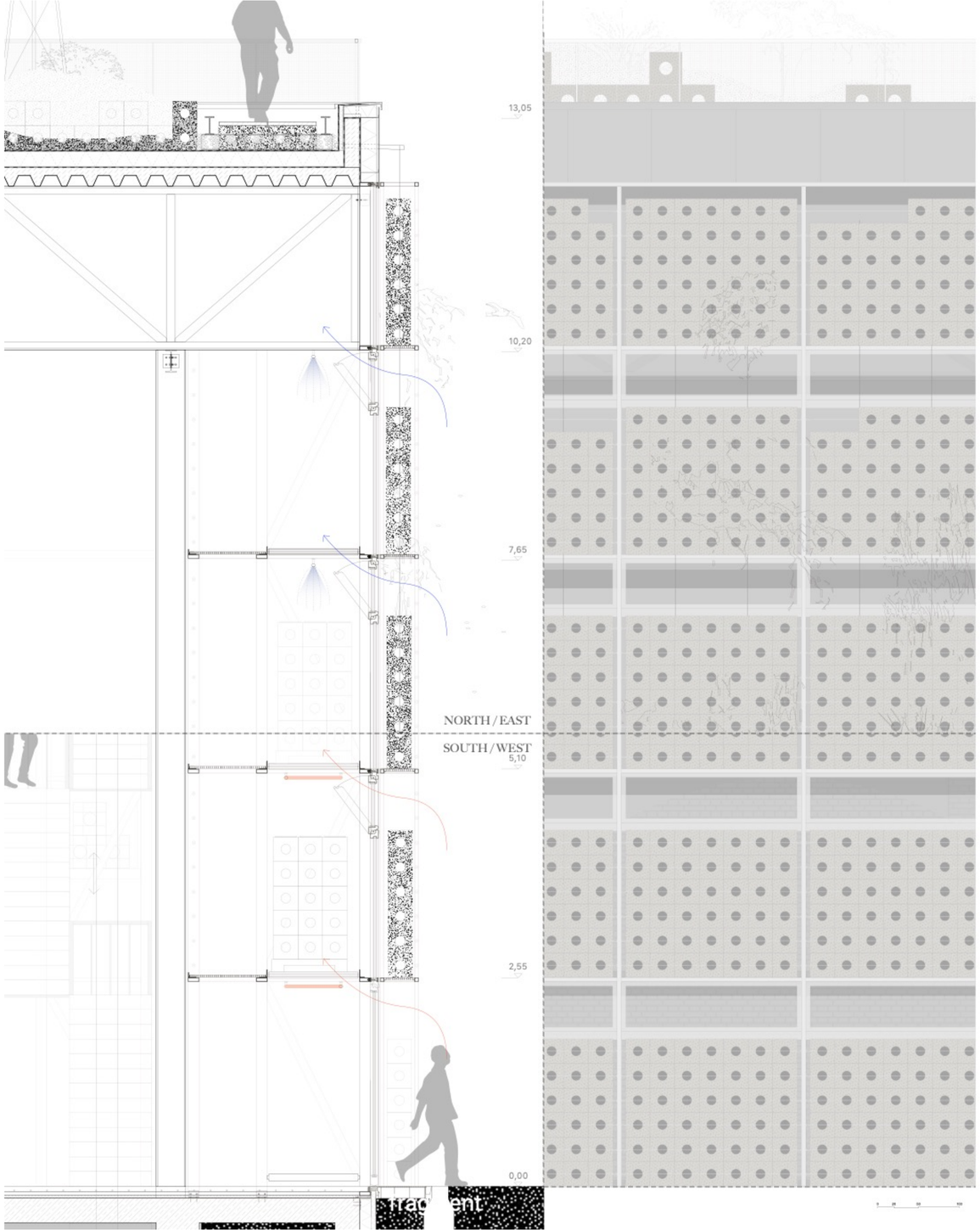
construction

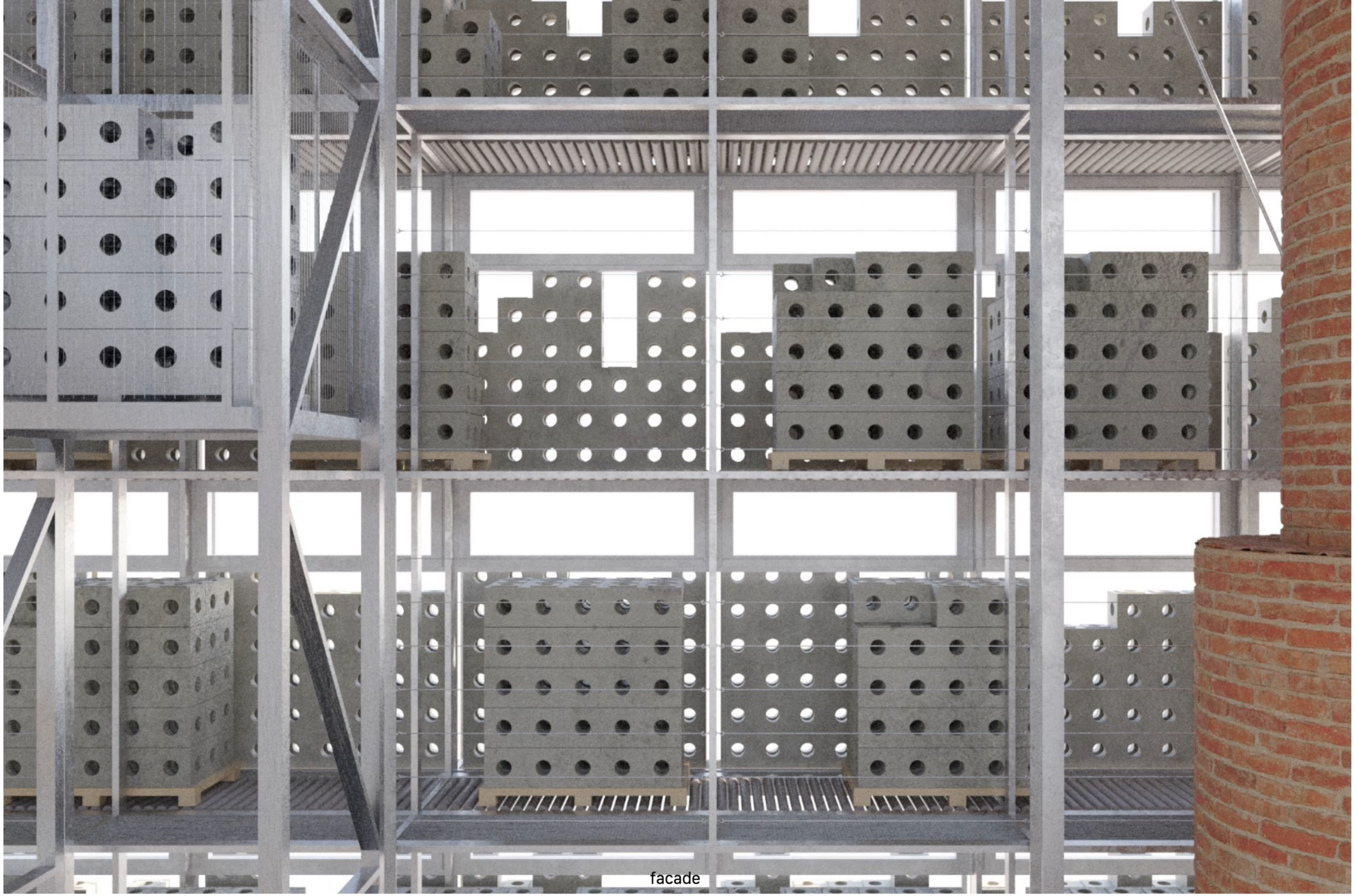


construction

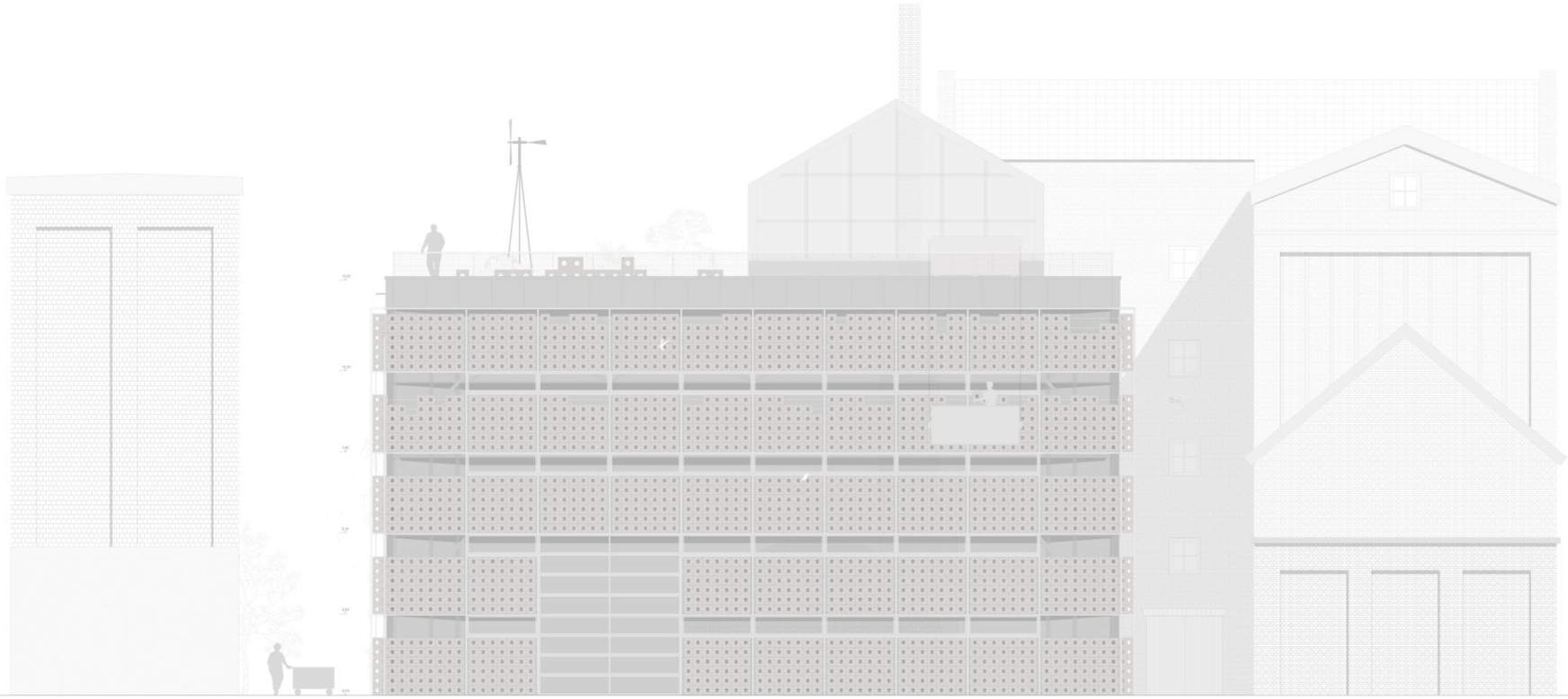


façade system

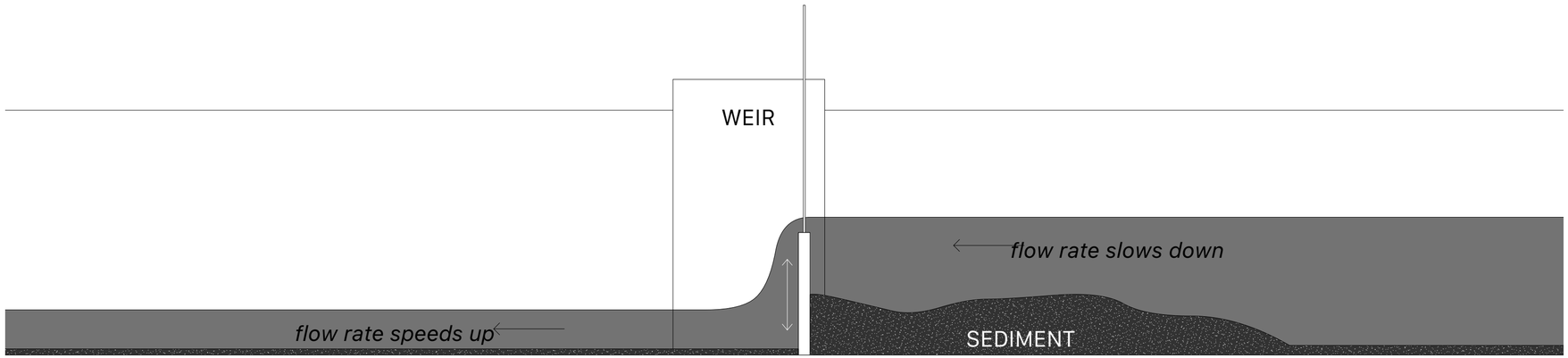

13,05
10,20
7,65
NORTH / EAST
SOUTH / WEST
5,10
2,55
0,00



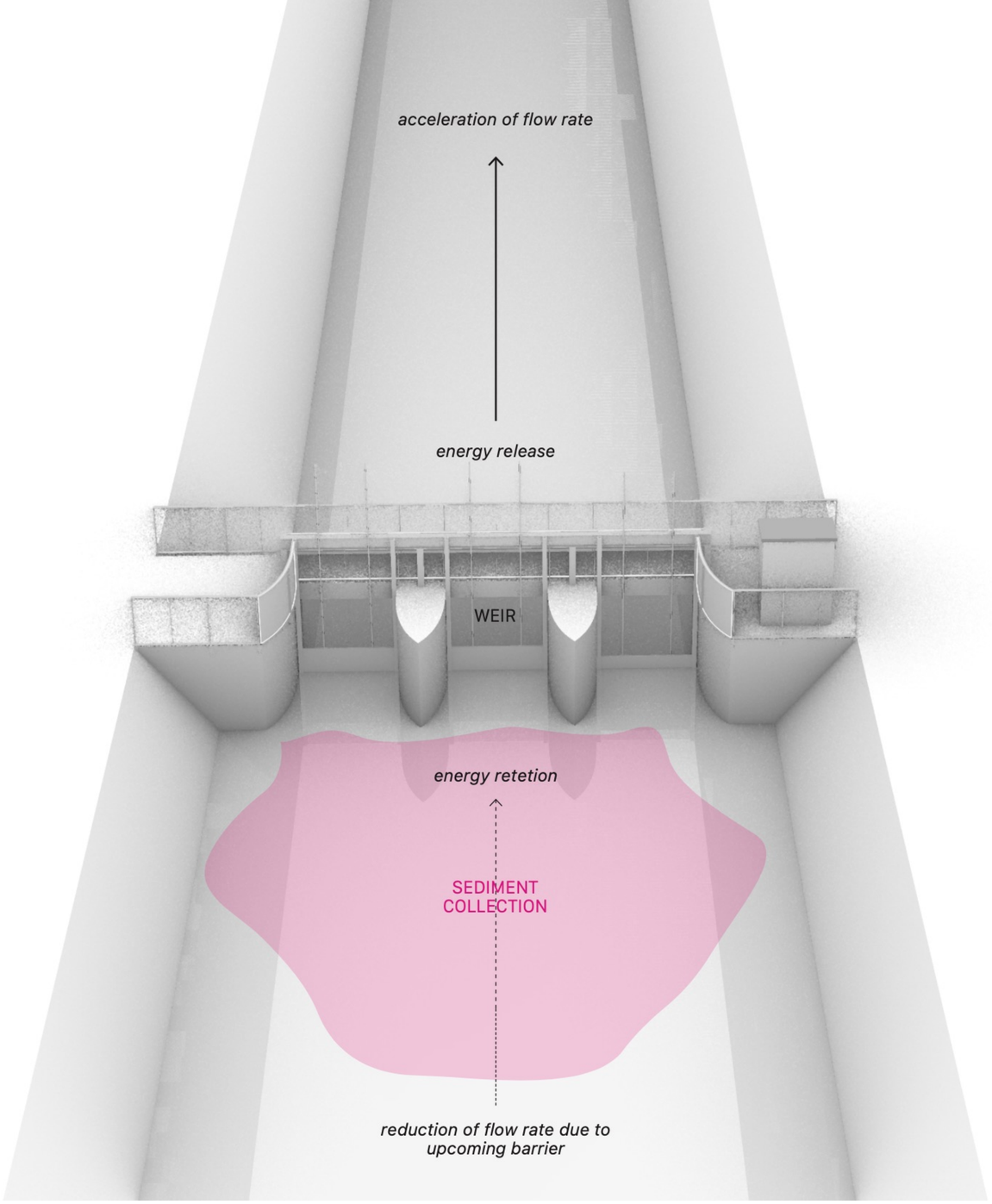
facade



elevation

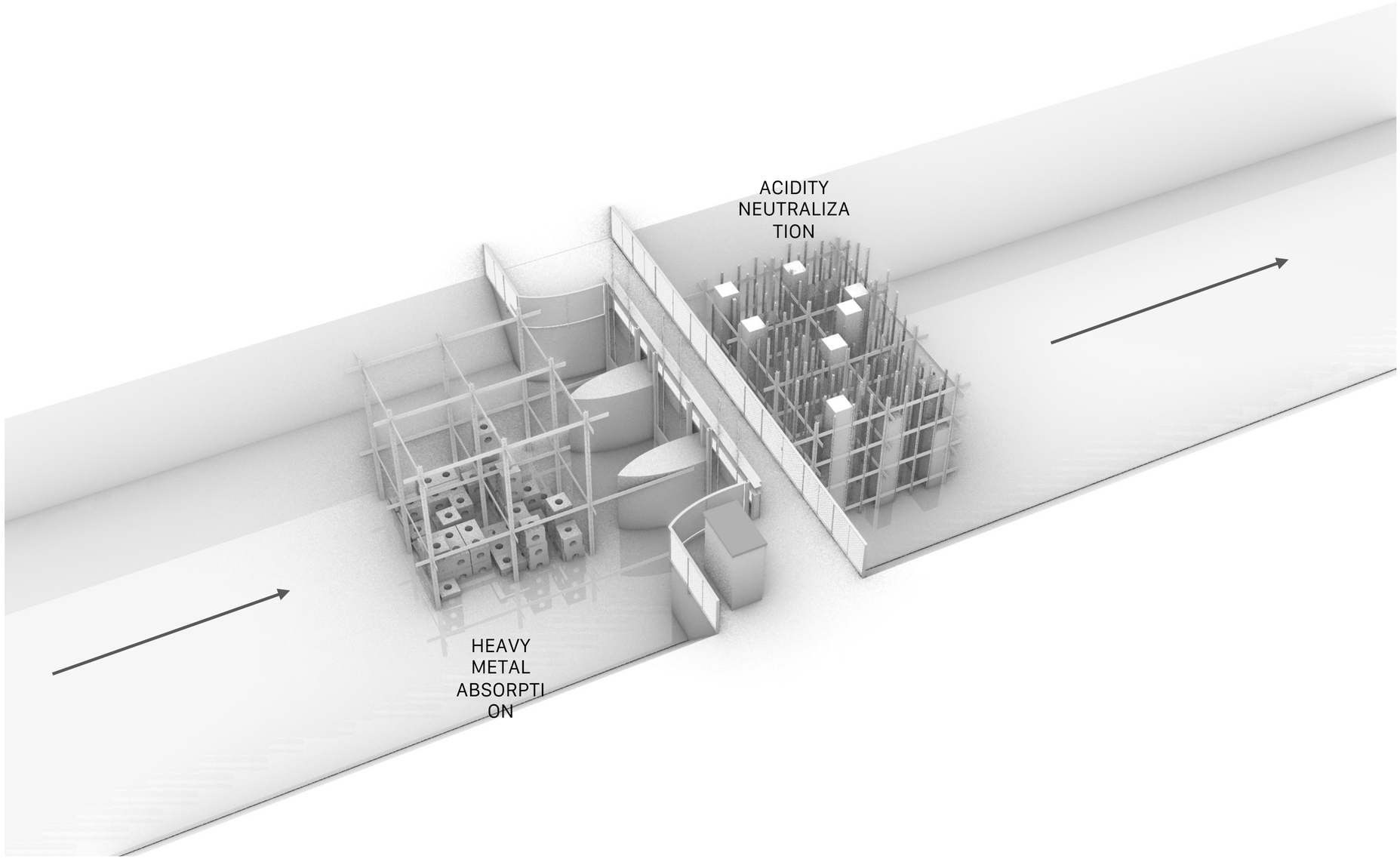


weir systems

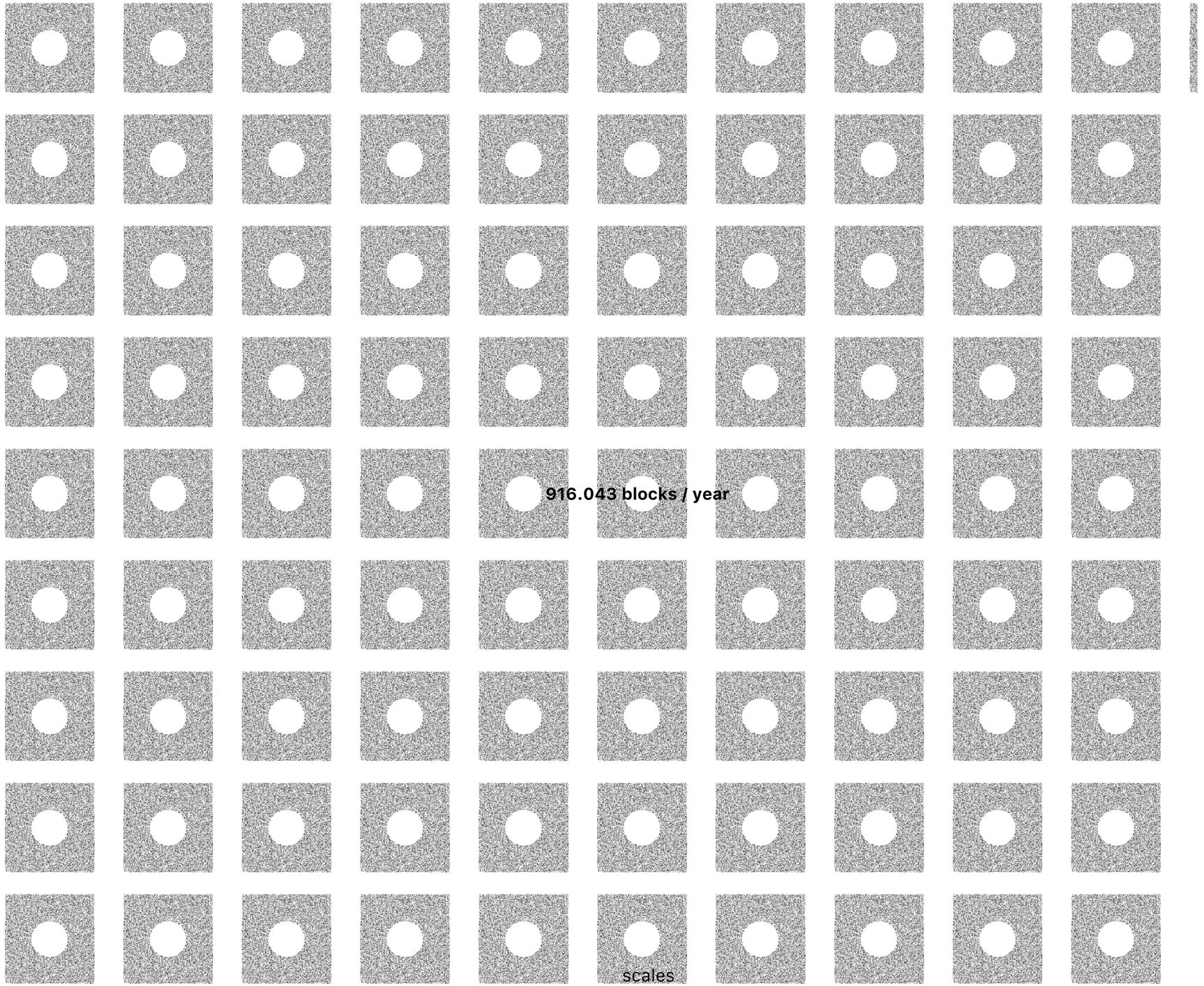


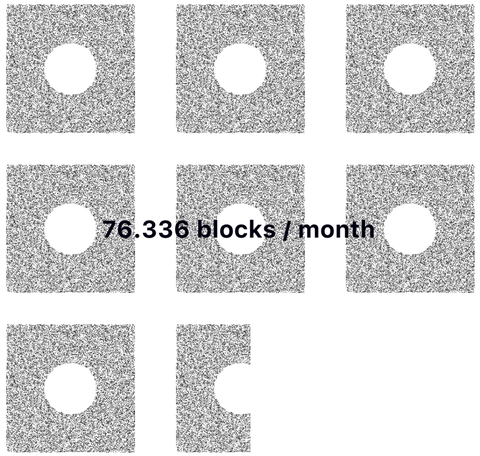
weir systems

adsorption / erosion



weir systems


916.043 blocks / year
scales



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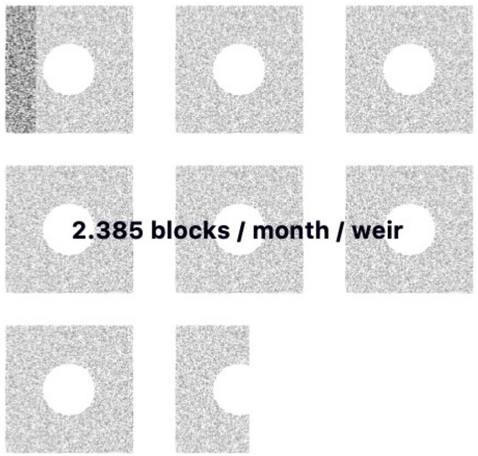

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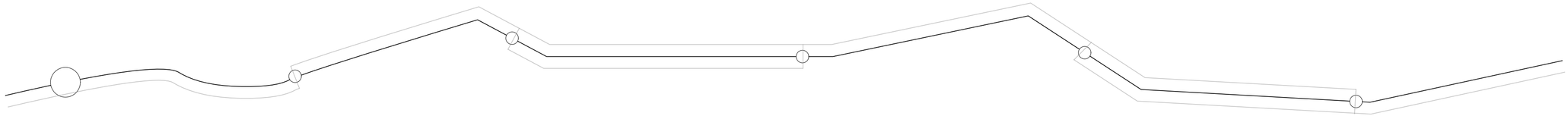
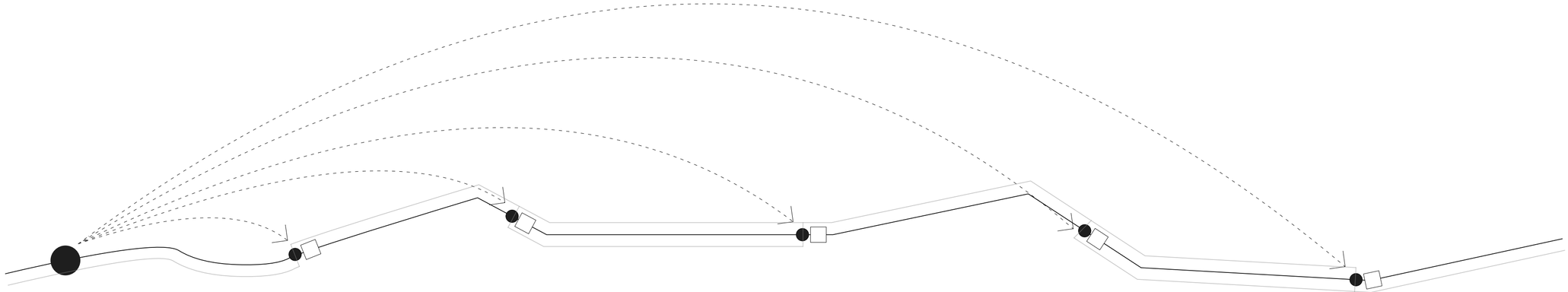
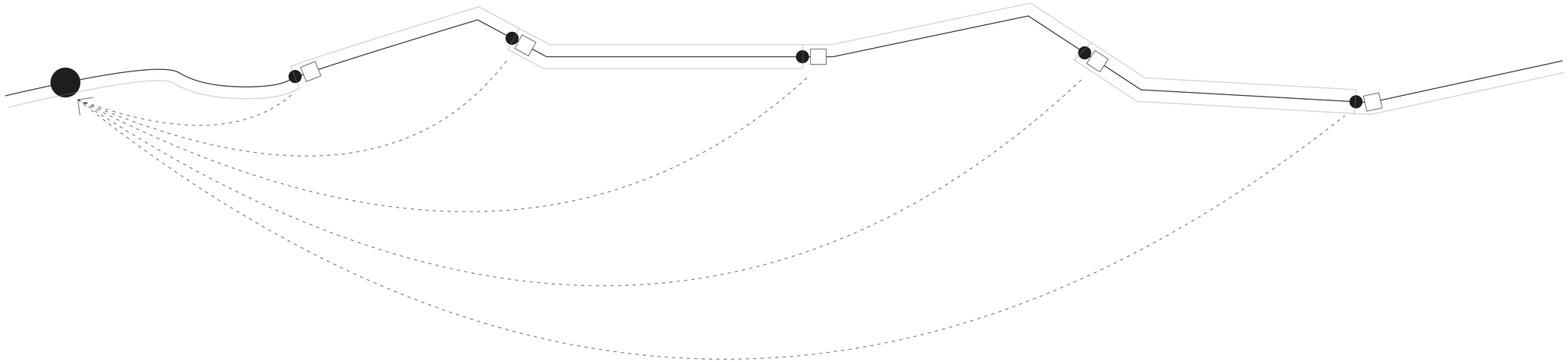


landscape strategy



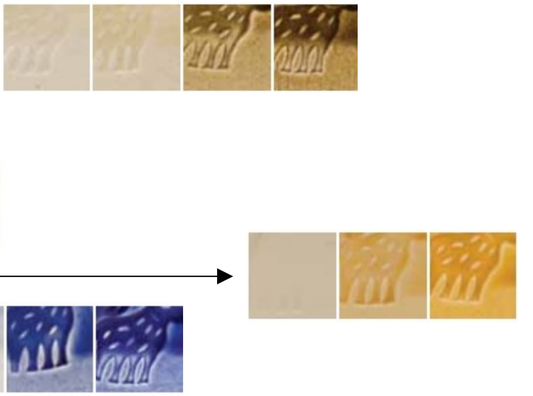
landscape strategy



landscape strategy

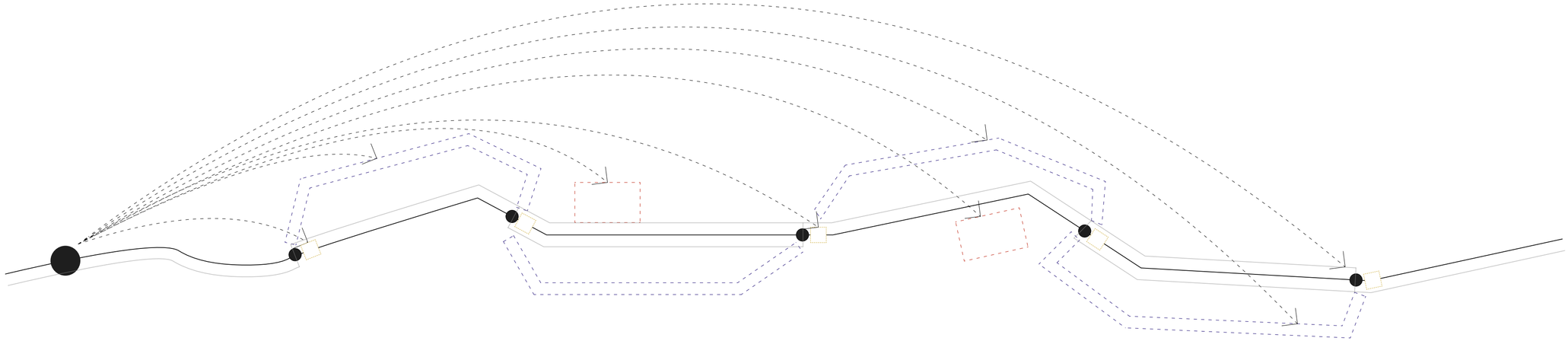
190 ground water testings / 32 surface water testings:

		Kippengrundwasser		Oberflächenwasser
		(Min - Max)	(Mittel)	(Min - Max)
pH-value	[-]	3,5 - 7,4	5,8	2,4 - 6,0
Calcium	[mg/l]	35 - 906	543	323 - 680
Magnesium	[mg/l]	39,9 - 296	144	76 - 160
Iron	[mg/l]	5,9 - 2260	588	17 - 1182
Sulfate	[mg/l]	700 - 5842	2809	1090 - 6590
Nickel	[mg/l]	0,005 - 14,0	2,15	0,107 - 3,88
Zinc	[mg/l]	0,02 - 33,1	4,65	0,090 - 6,39
Cobalt	[mg/l]	0,002 - 3,1	0,71	0,051 - 2,77
Arsenic	[mg/l]	<0,005 - 3,15	0,44	<0,005 - 0,14

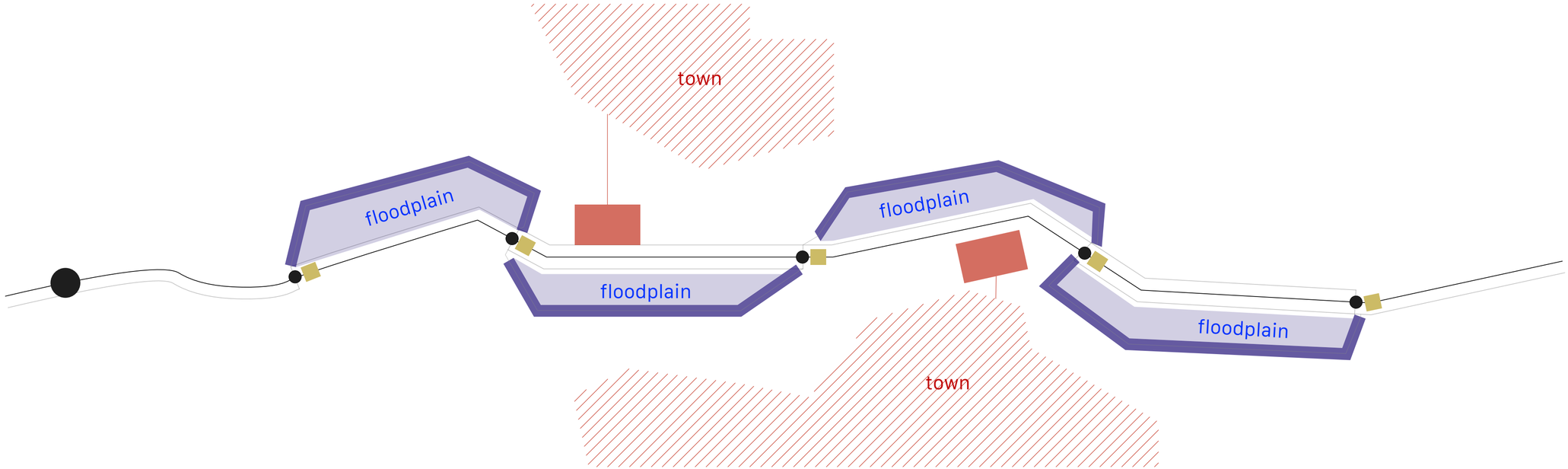


colouring

colouring

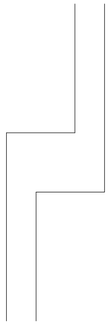


landscape strategy



landscape strategy

LINE



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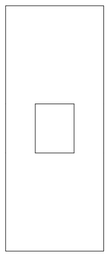

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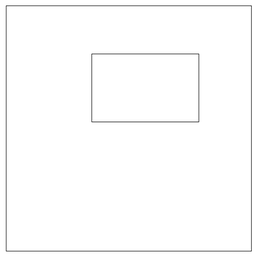
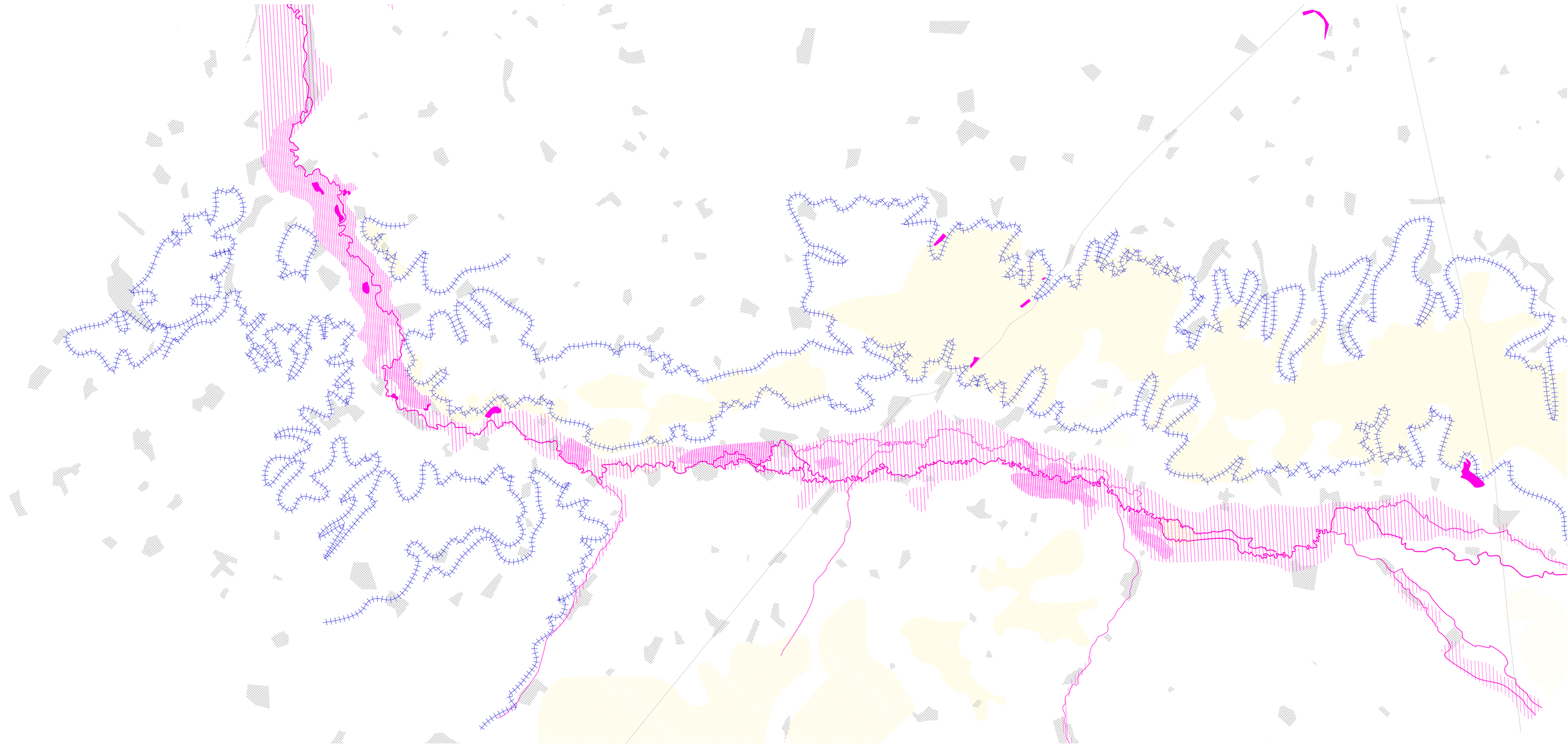
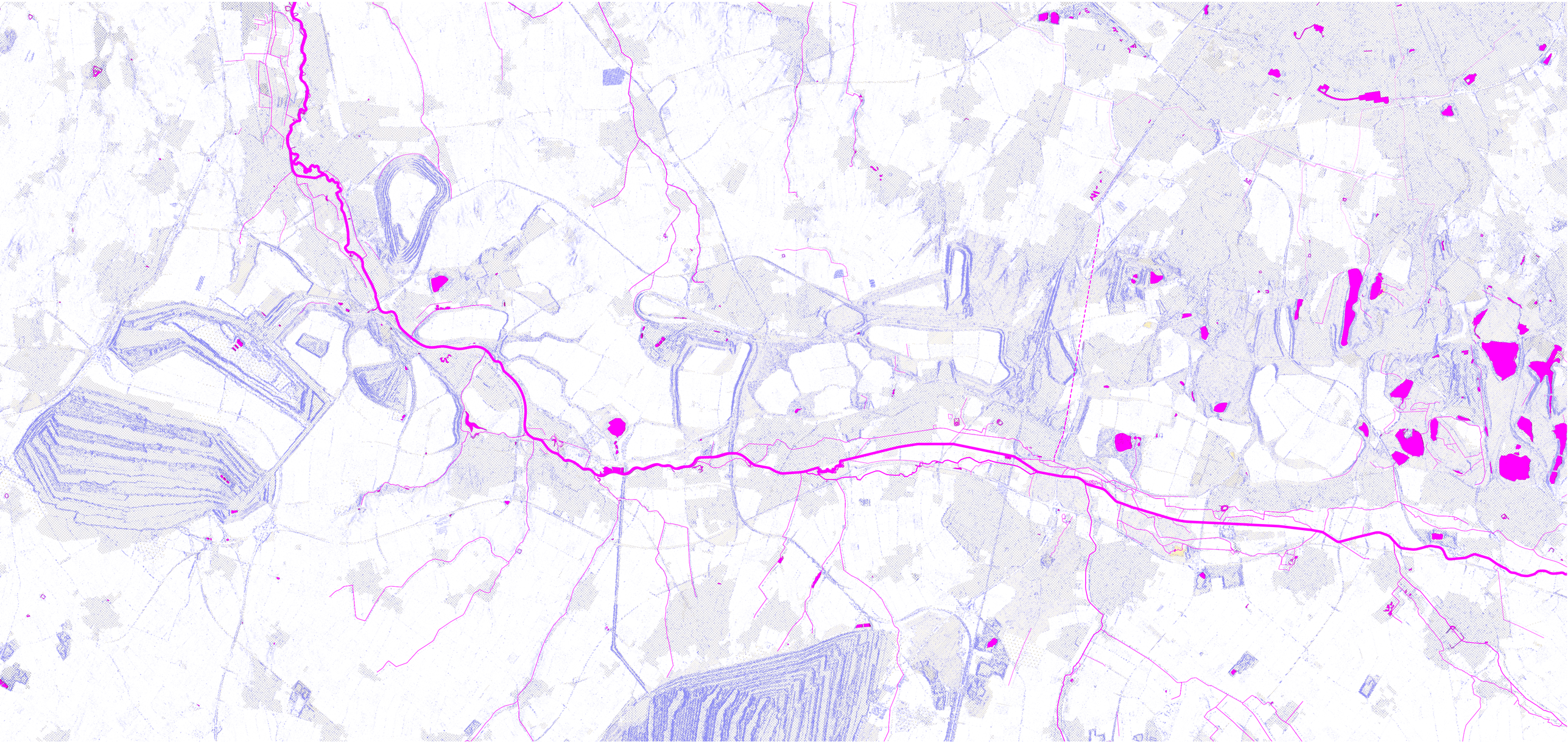


shape

25
50 m
dyke
weir /
tower
field /
battery
interventions
18°
LQI
N



1805



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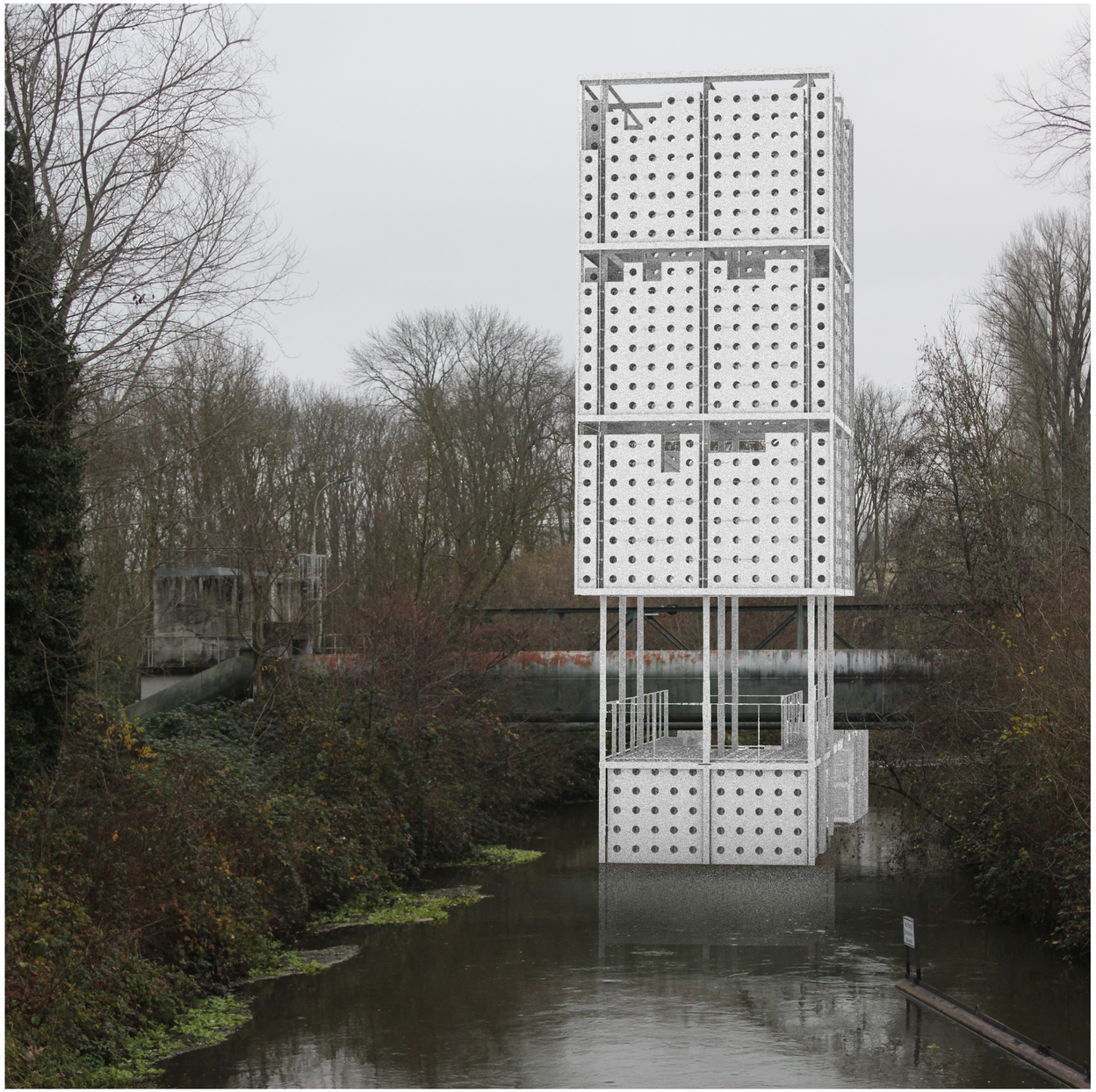
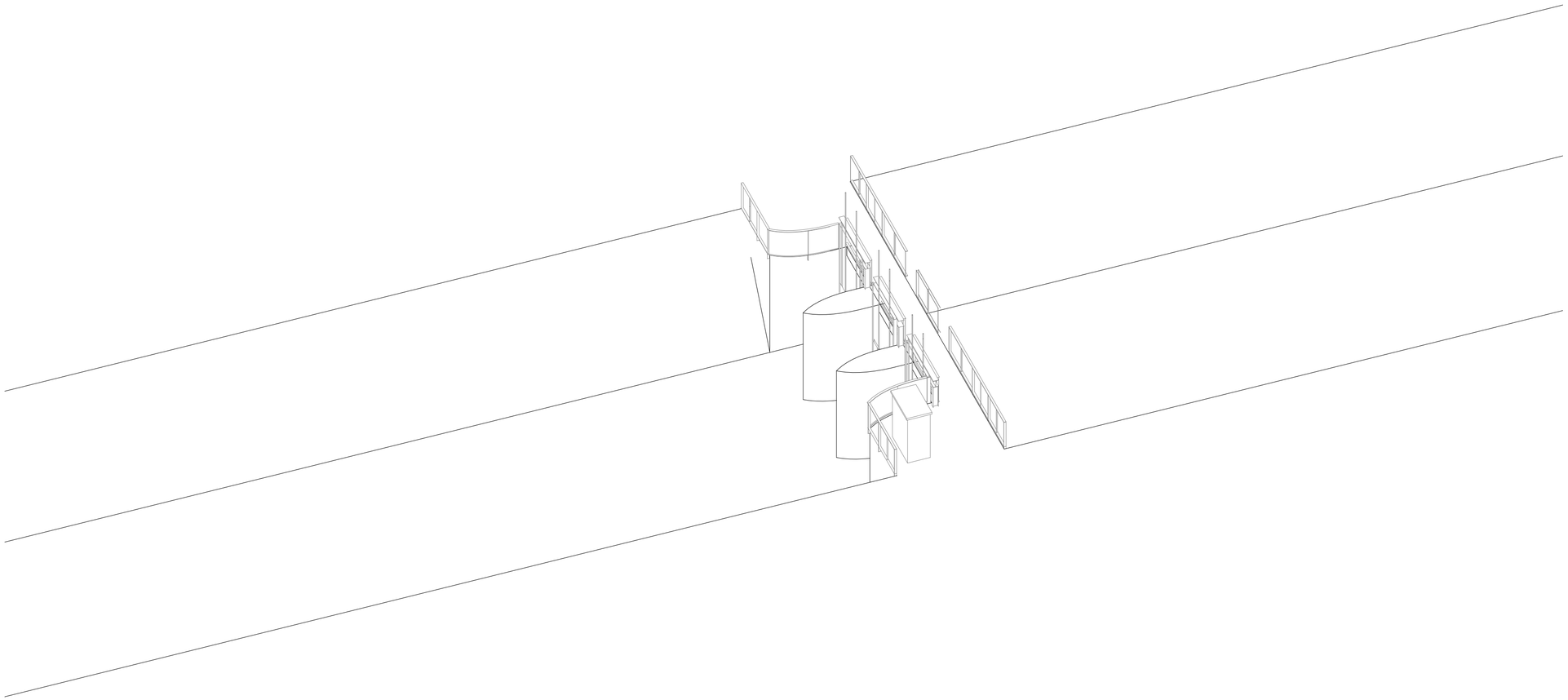
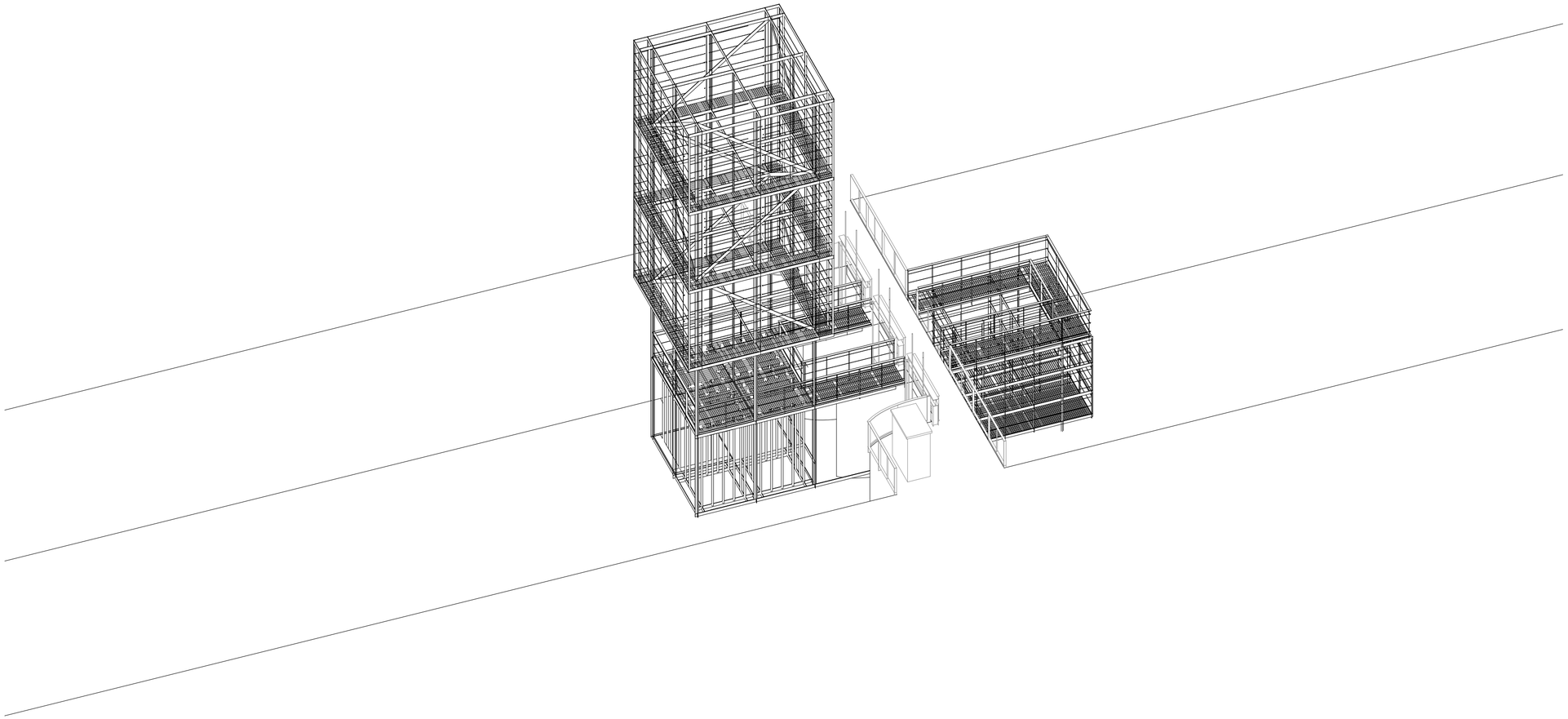


intervention 1



extension of the weir



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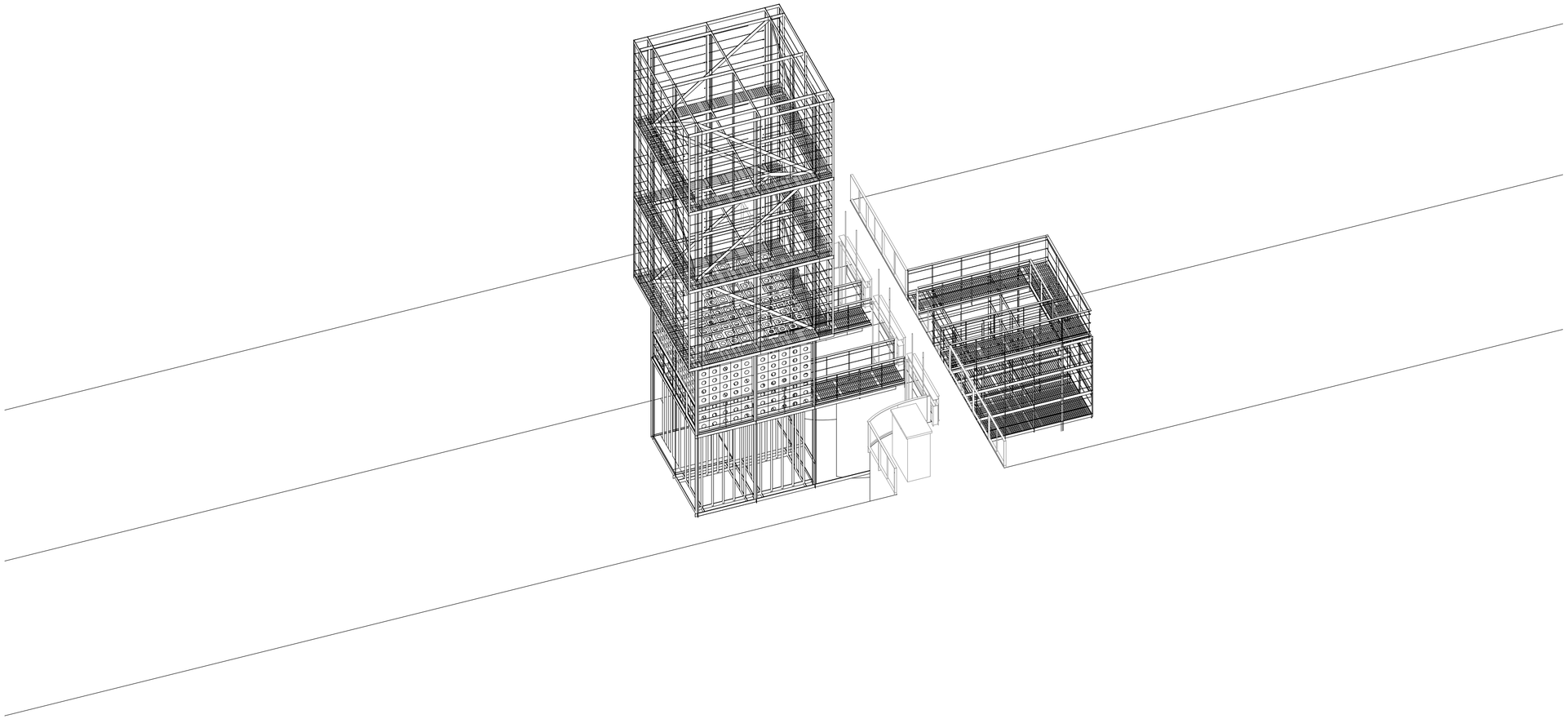

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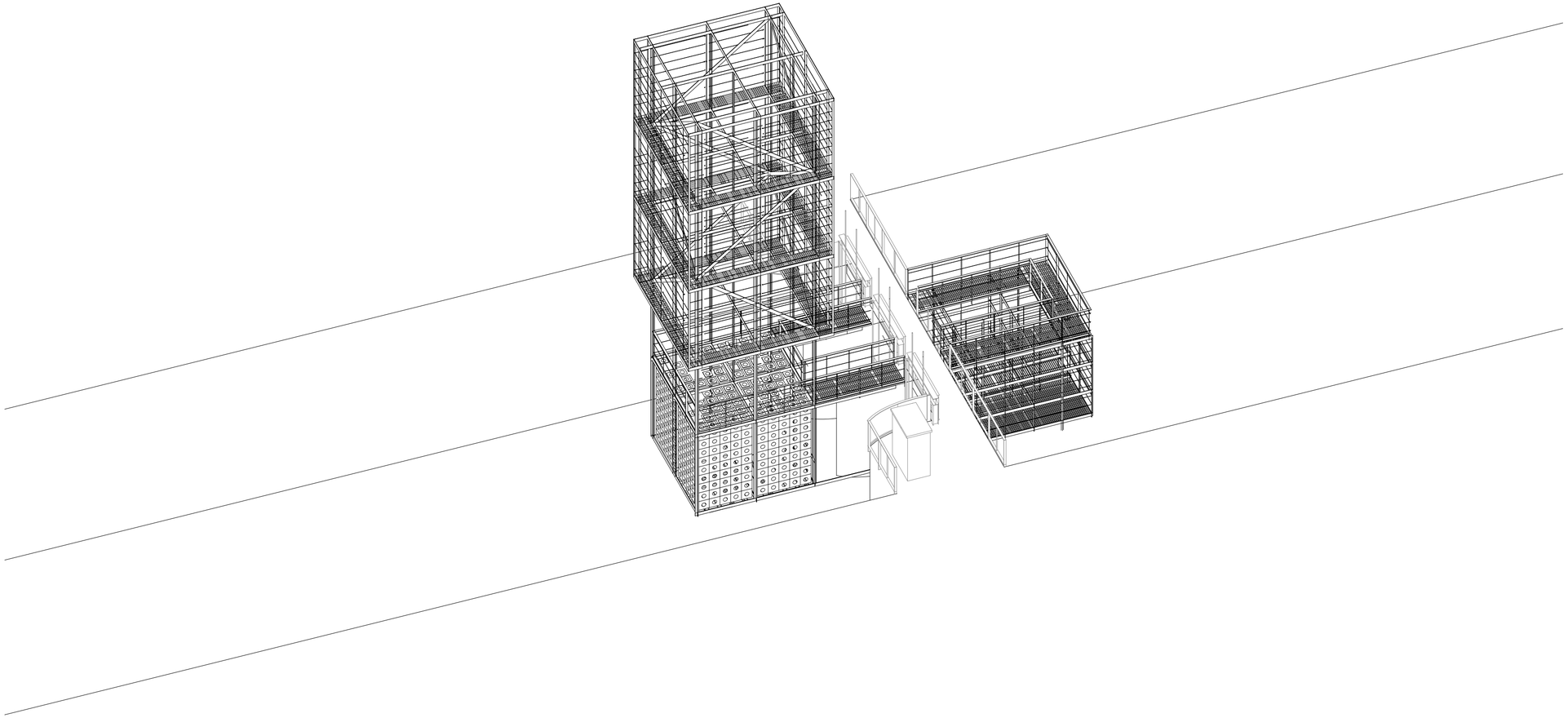

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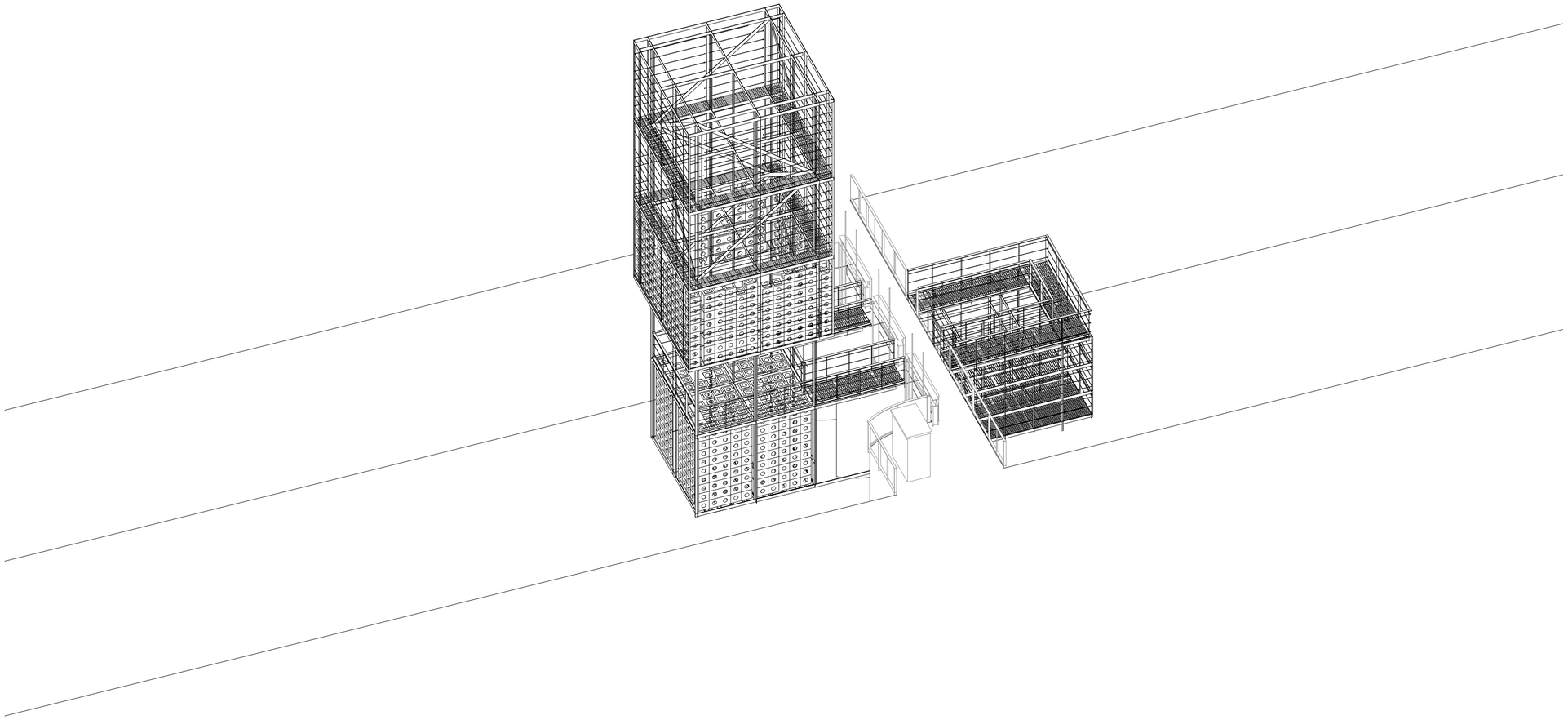

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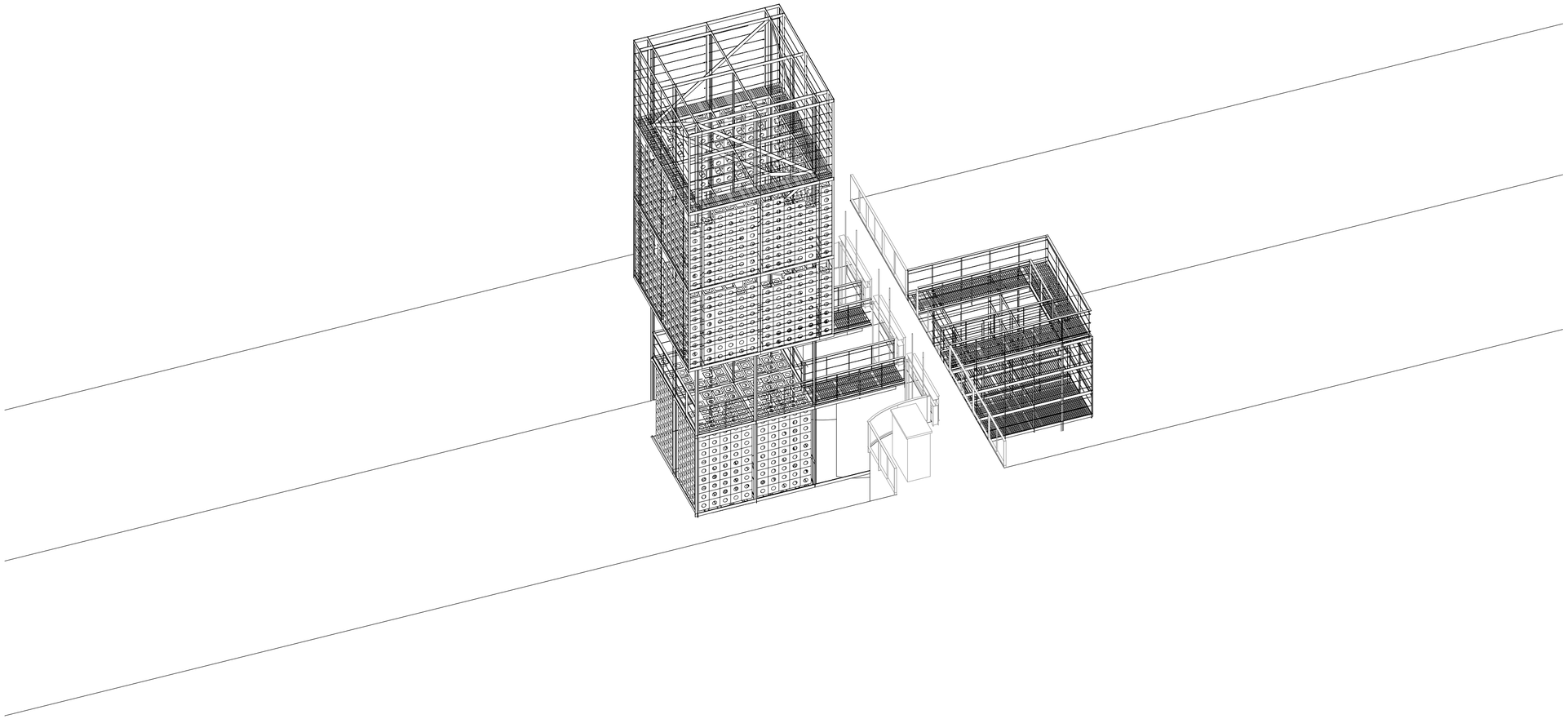

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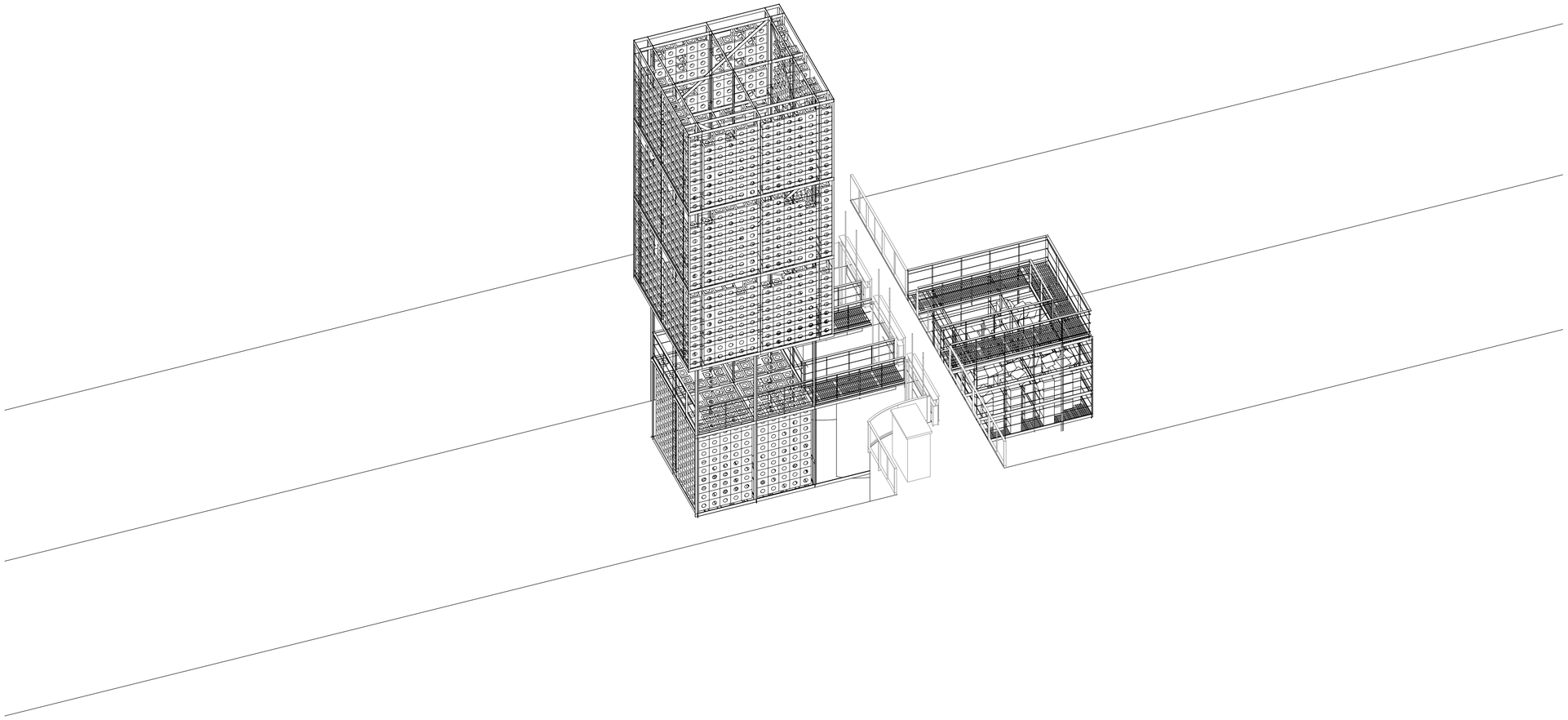

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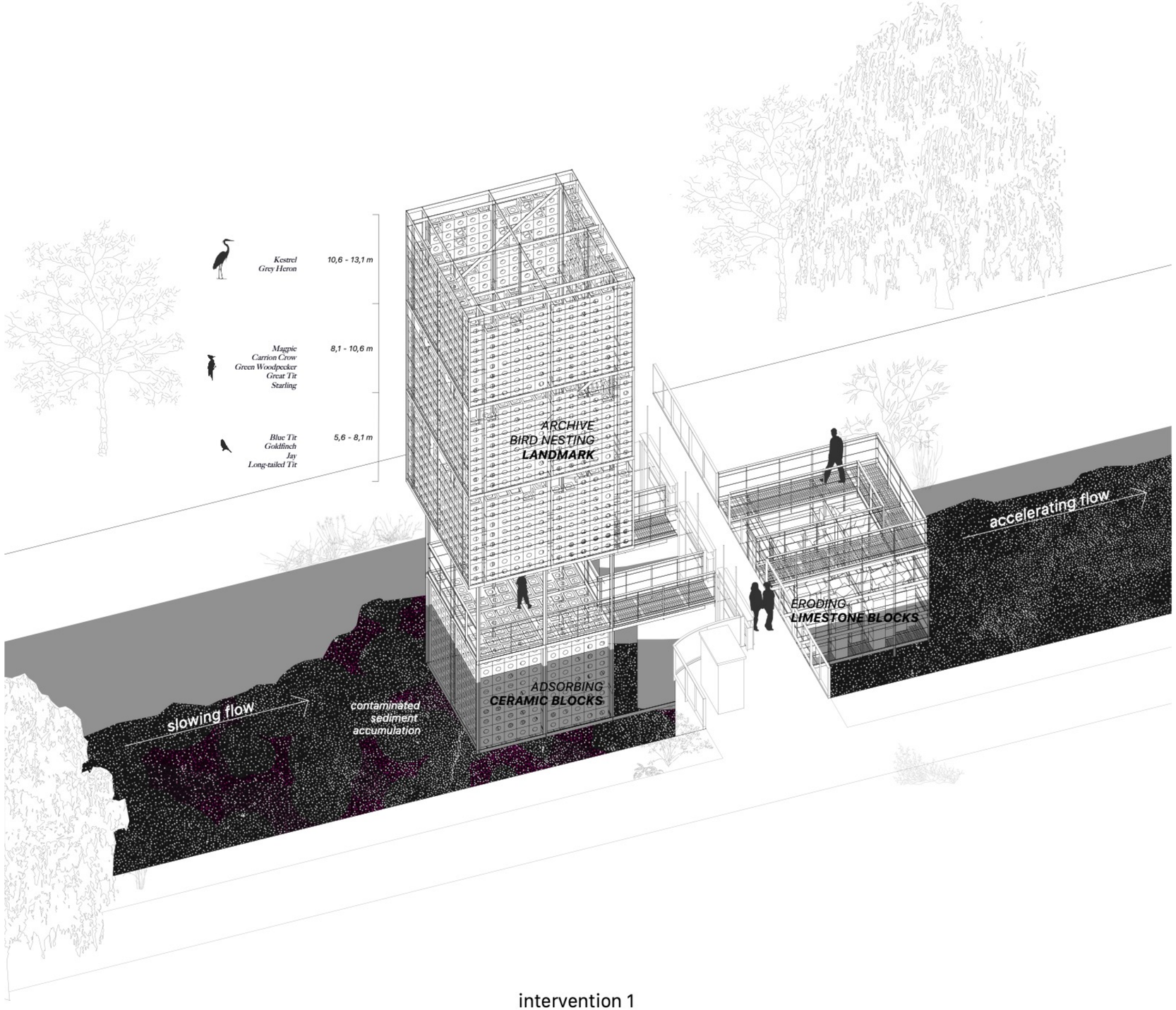
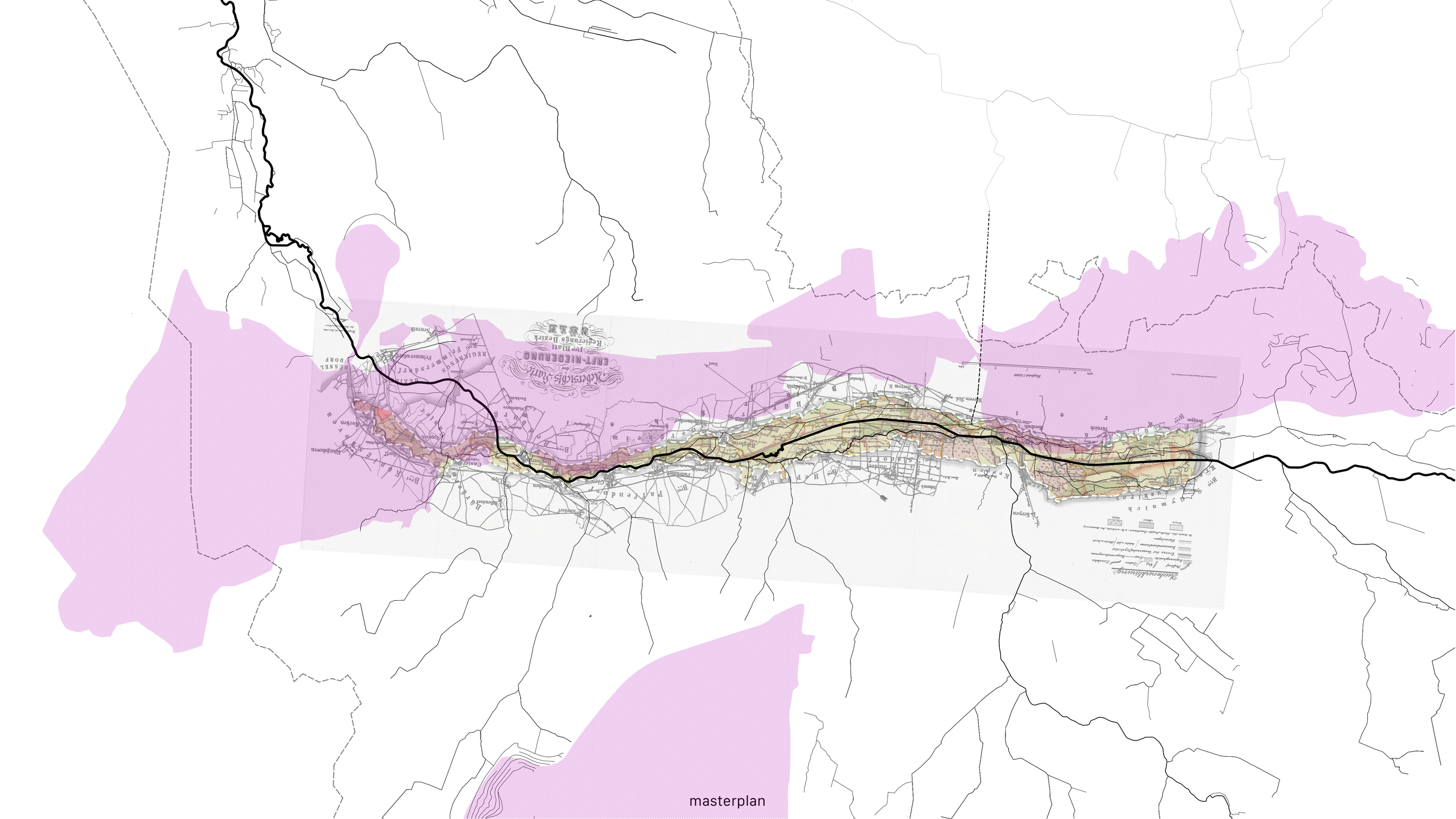


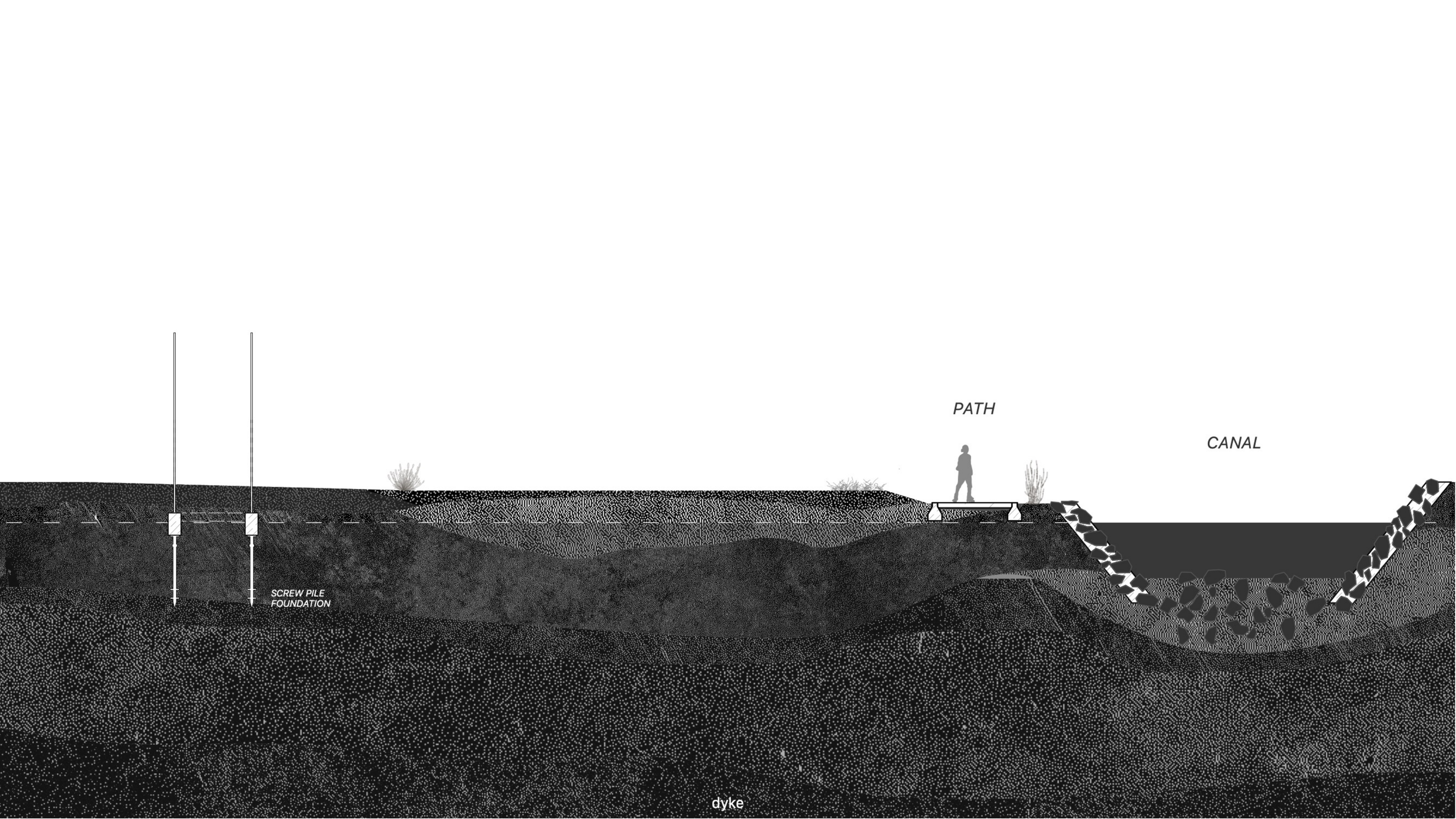
intervention 1

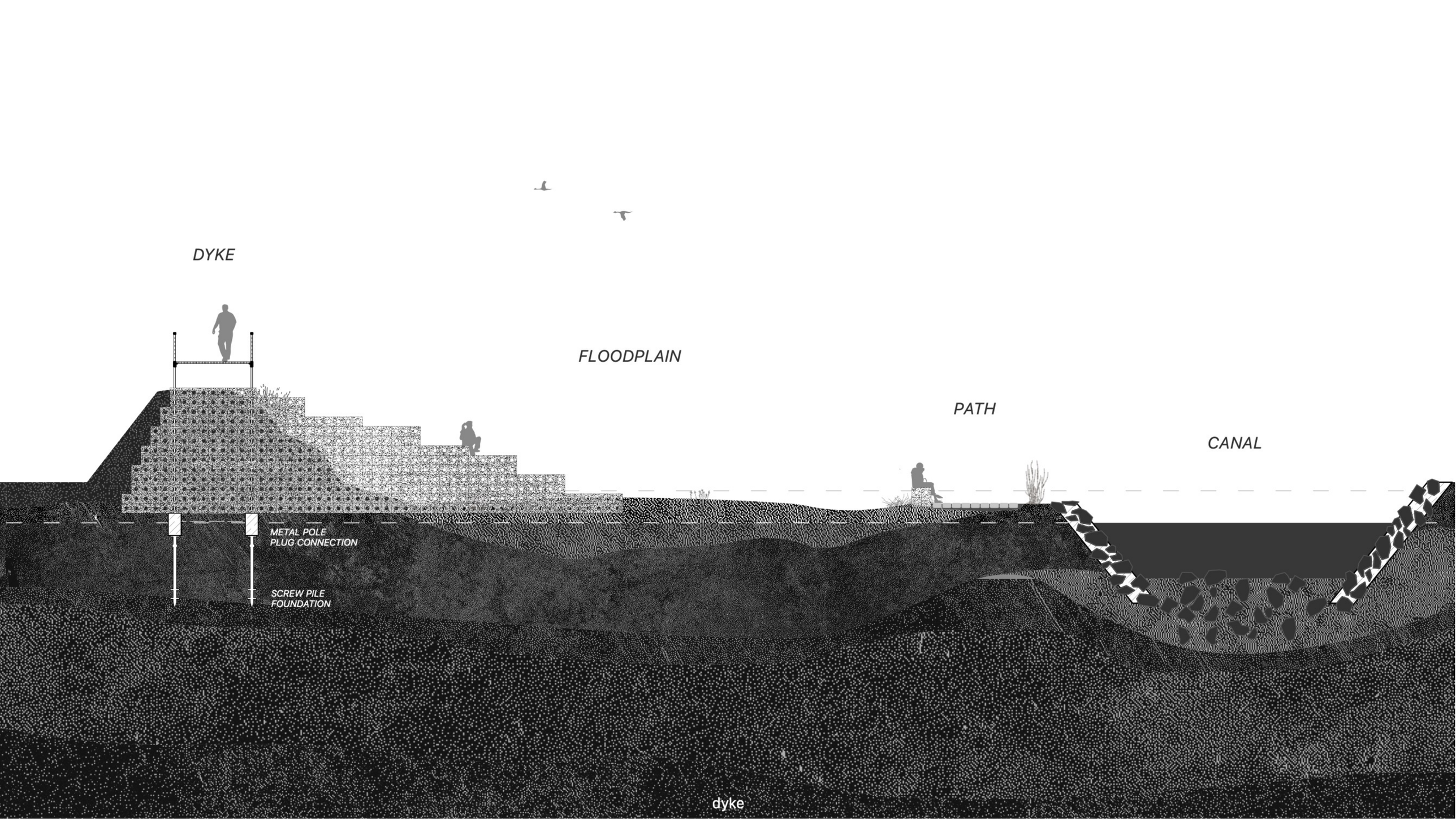
intervention 2

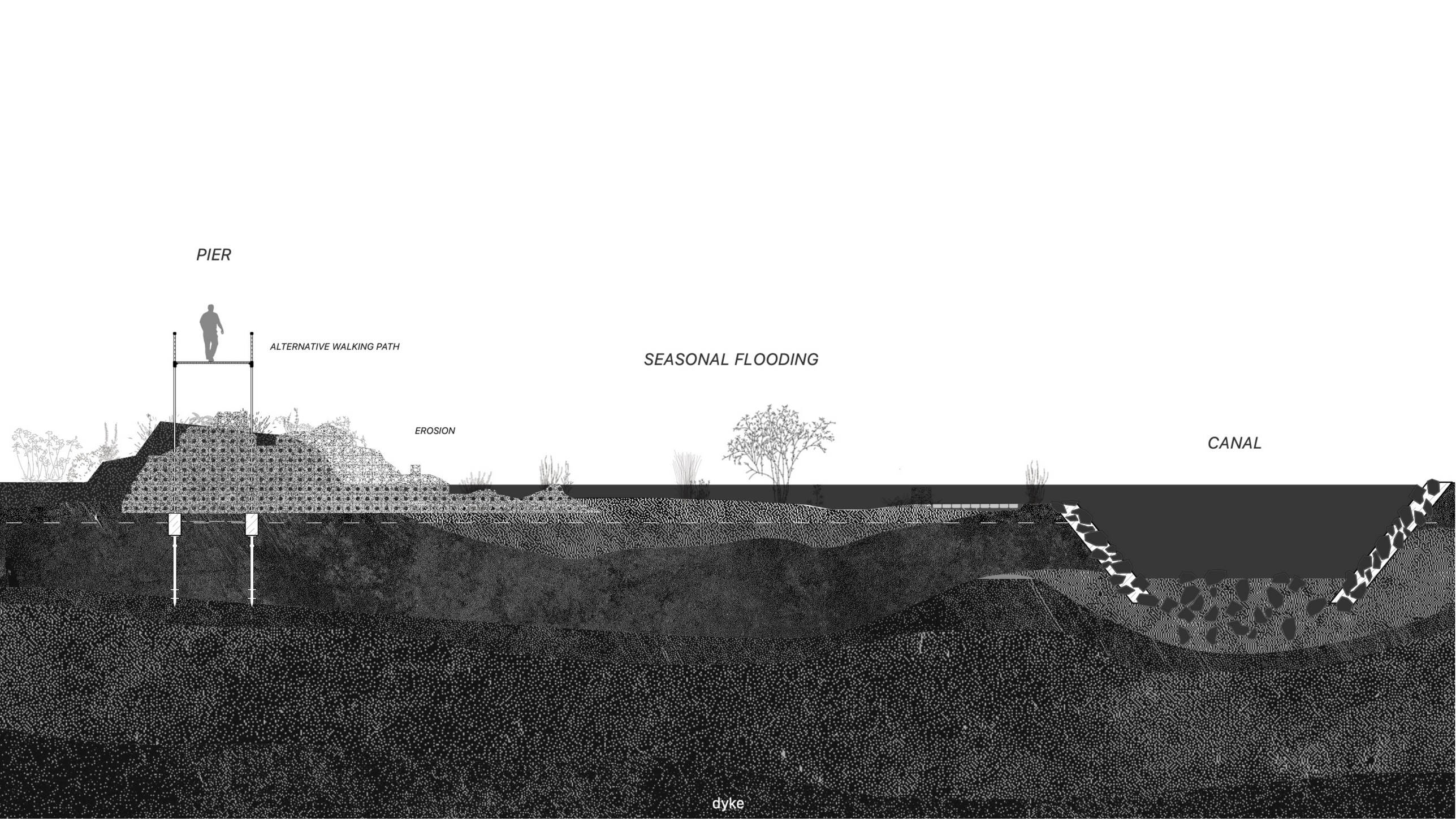

masterplan

masterplan

flood 2021

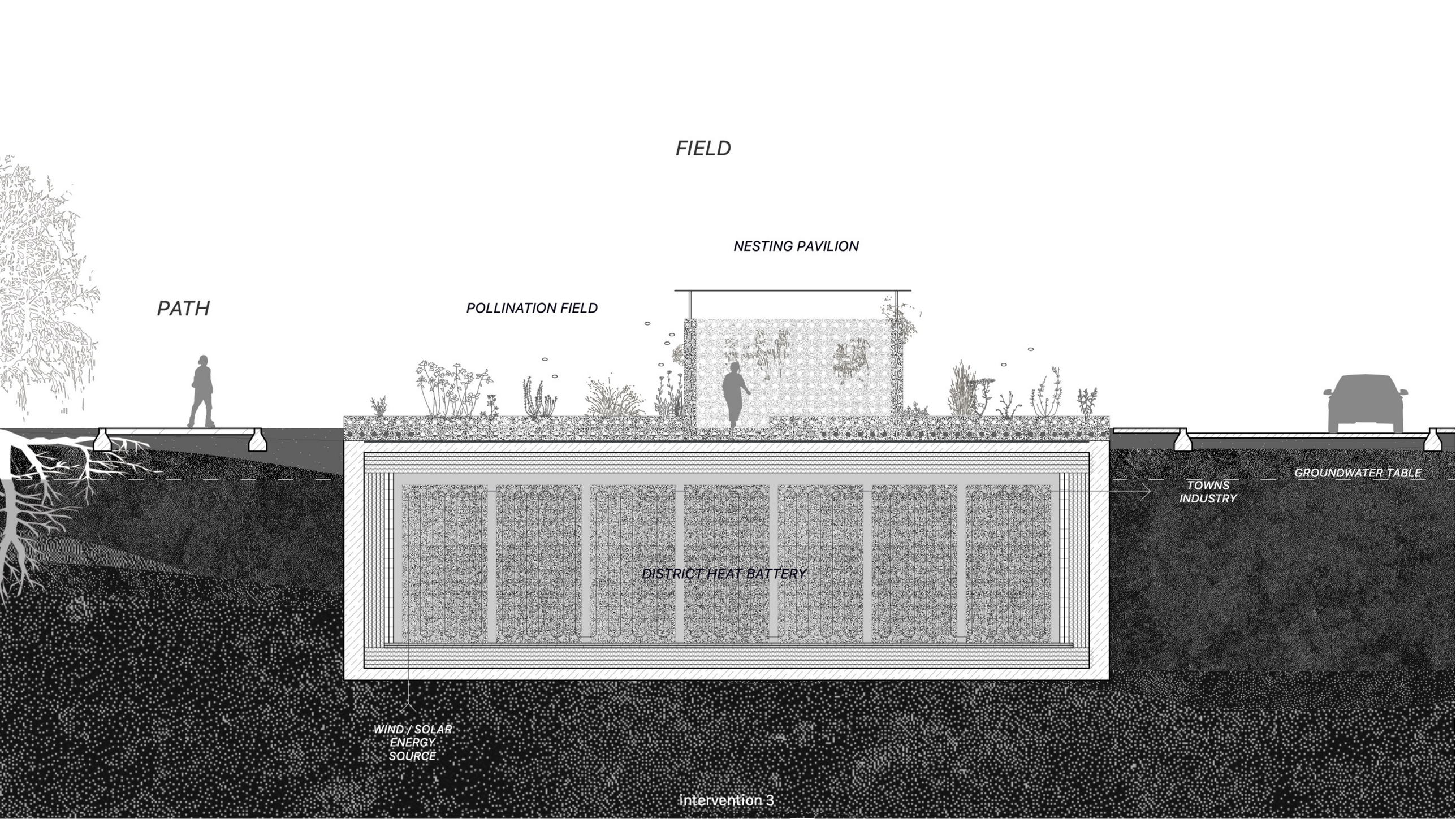

PATH
CANAL
SCREW PILE
FOUNDATION
dyke


DYKE
FLOODPLAIN
PATH
CANAL
METAL POLE
PLUG CONNECTION
SCREW PILE
FOUNDATION
dyke

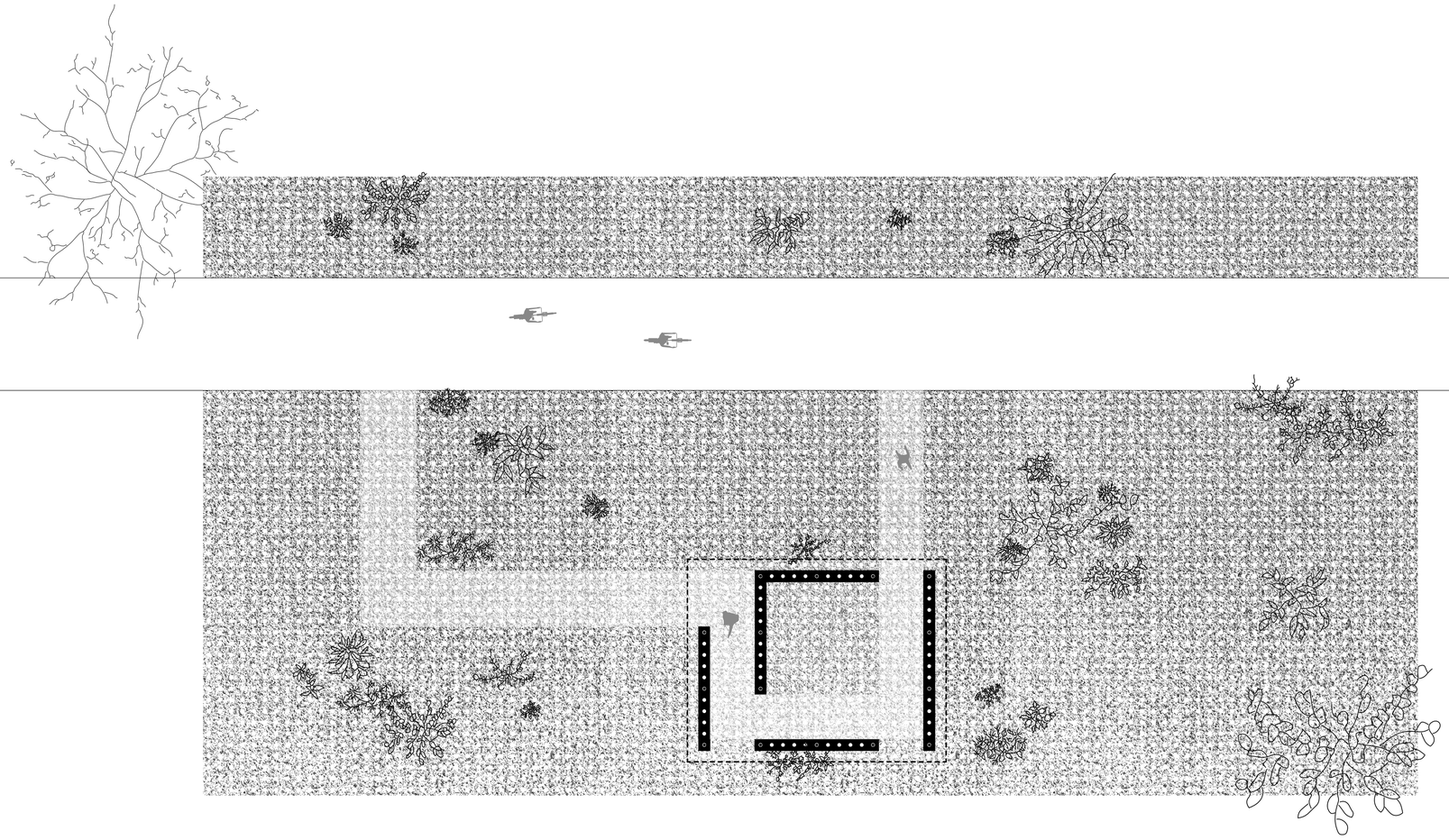

PIER
ALTERNATIVE WALKING PATH
EROSION
SEASONAL FLOODING
CANAL
dyke

PIER
FLOODPLAIN
WETLAND
CANAL
dyke

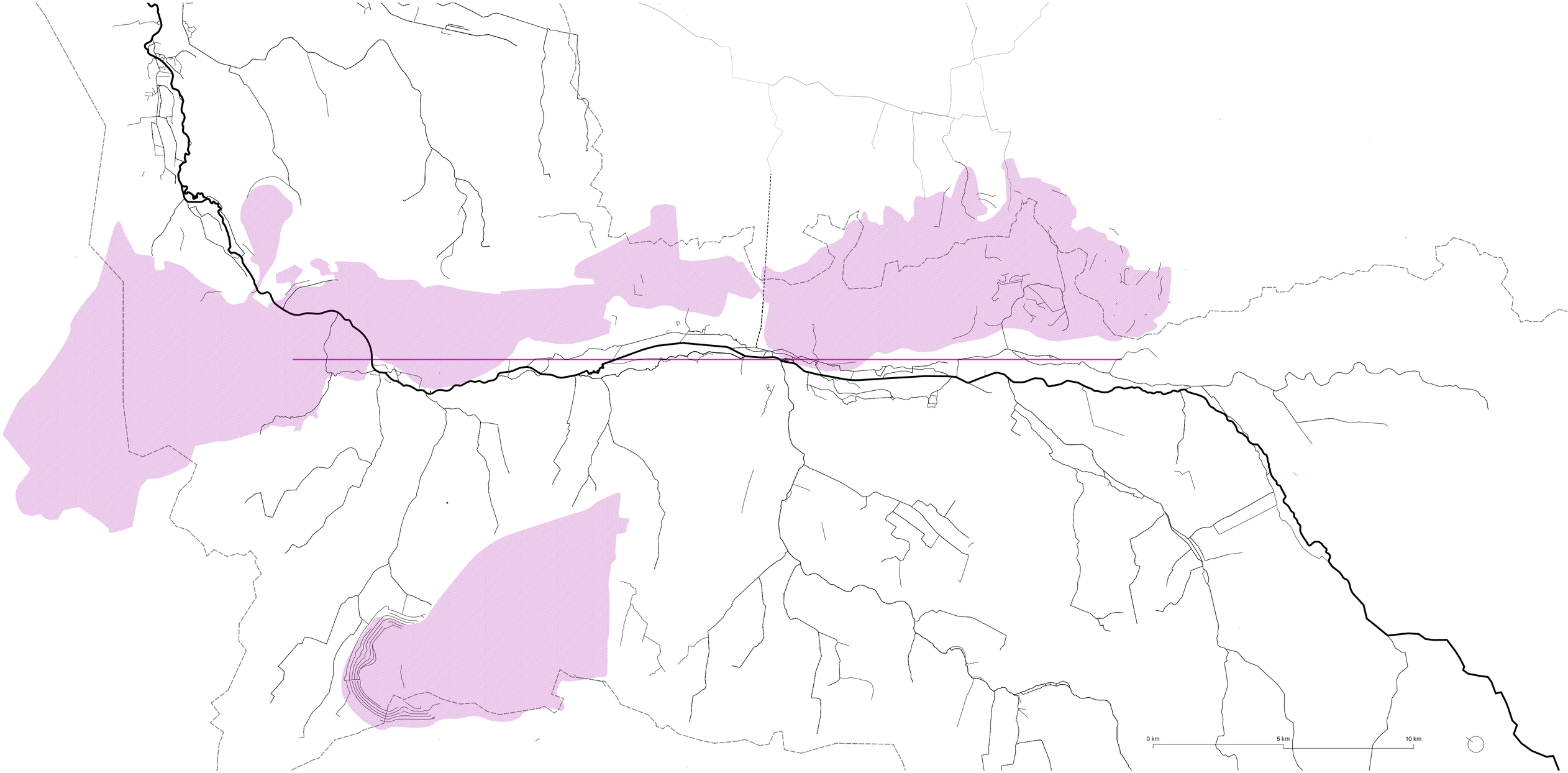
intervention 3



intervention 3

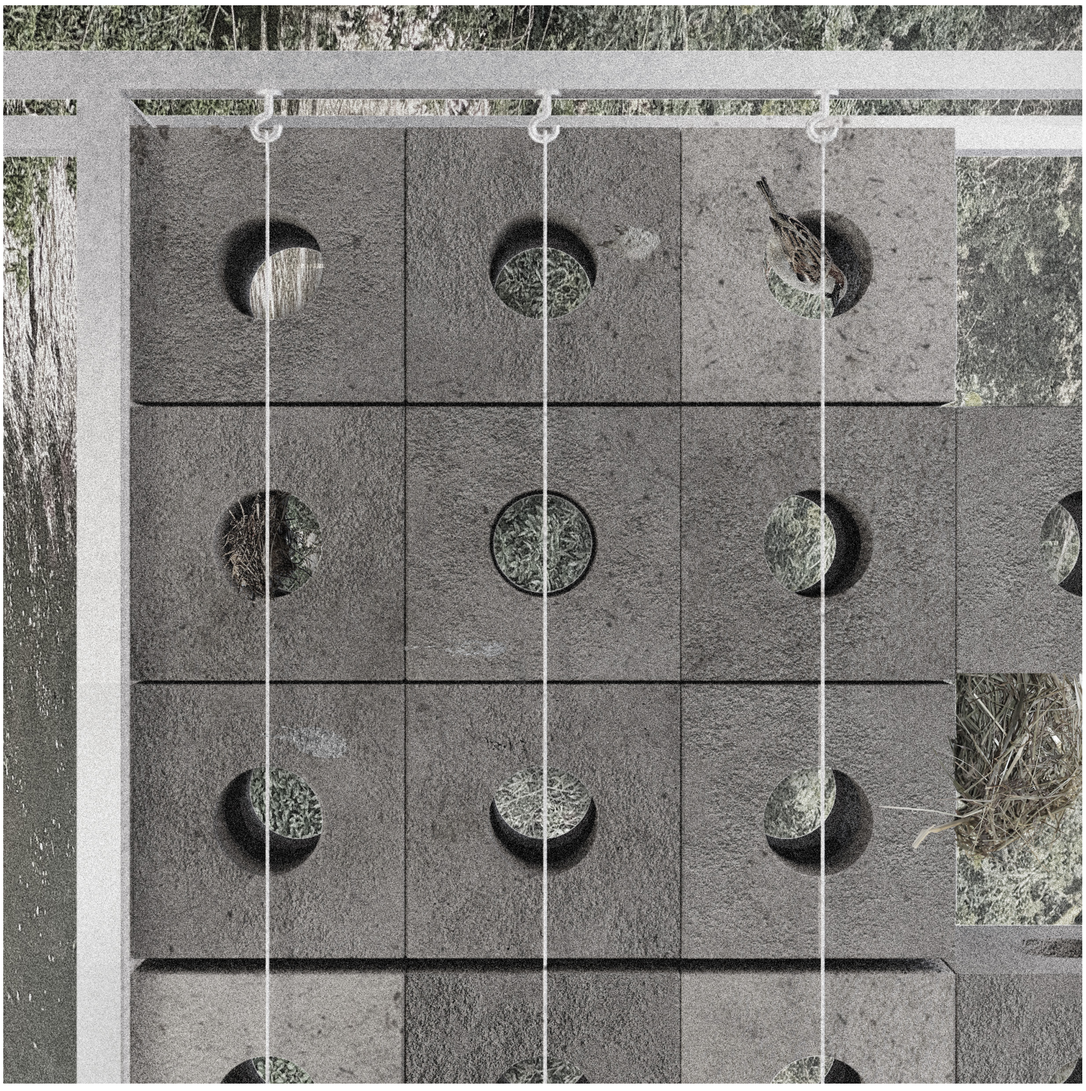


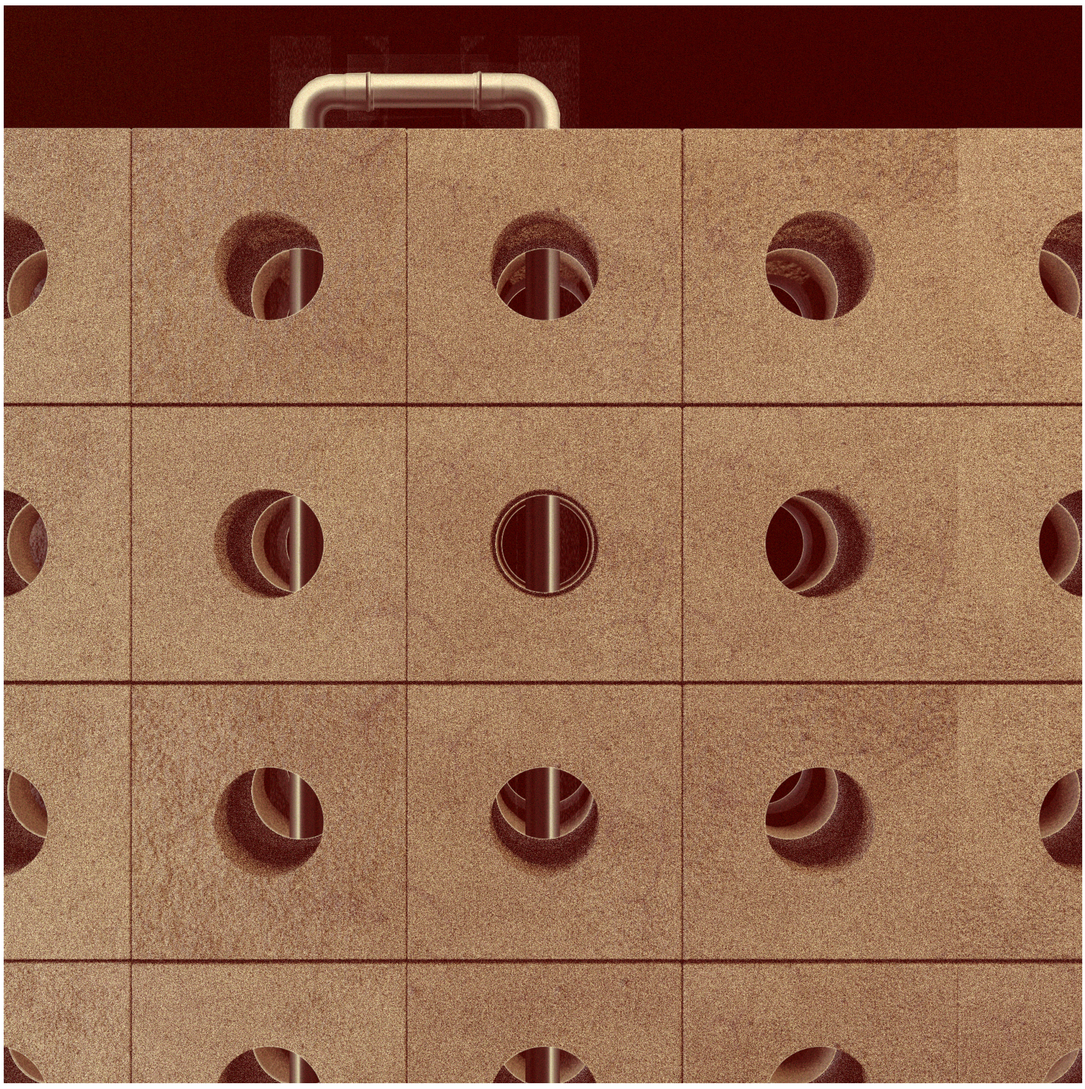
intervention 3



masterplan

dis- / re- integration





thank you !