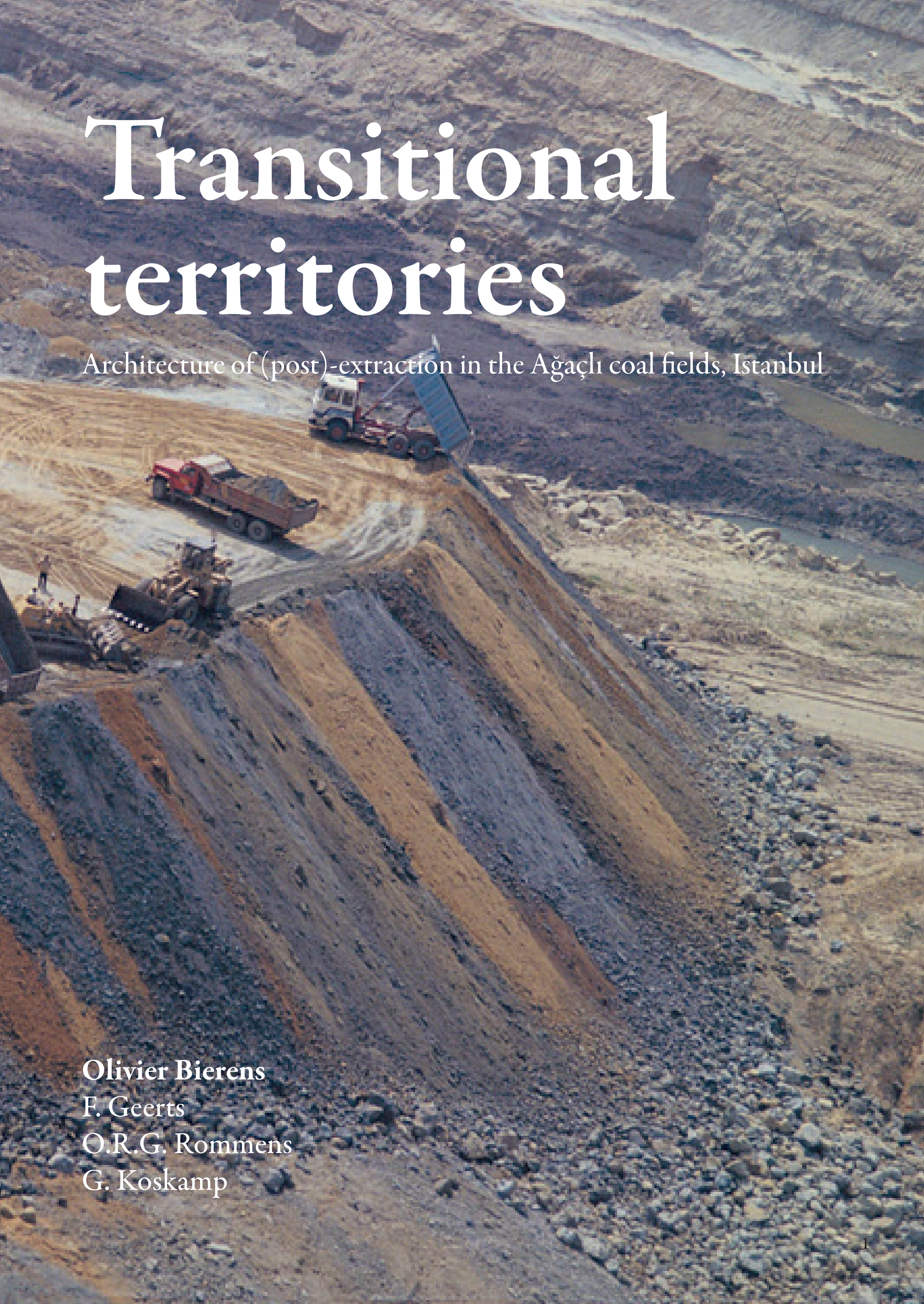

Transitional territories

Architecture of (post)-extraction in the Ağaçlı coal fields, Istanbul

Olivier Bierens
F. Geerts
O.R.G. Rommens
G. Koskamp

Transitional territories: Architecture of (post)-extraction in the Ağaçlı coal fields, Istanbul

Author
Olivier Bierens
4568087

Mentors
Ir. F. Geerts - Research Mentor
O.R.G. Rommens - Design Mentor
G. Koskamp - Technology Mentor

Department of Architecture
Chair of Architecture
Borders and Territories Studio: Transient Liquidities along the New Silk Road II
Studio Coordinator: Dr.ir. M.G.H. Schoonderbeek

MSc Architecture, Urbanism and Building Sciences
Faculty of Architecture and the Built Environment
Delft University of Technology
Delft, The Netherlands

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Architecture of (post)-extraction in the Ağaçlı coal fields, Istanbul

Olivier Bierens

Contents

"Do you shovel to survive, or survive to shovel?"

Kōbō Abe, *The Woman in the Dunes*, 1964

1 | Introduction

Designing the unfinished

Transitional territories: architecture of (post)-extraction revolves around the interaction between soil, extraction and architecture. The project addresses the ephemerality of extractive landscapes, imagining new ways of relating to the earth. Seeing soil not as a static being, but as a dynamic vehicle of becoming, a medium constantly in transition.
Throughout the history of Istanbul, the city has used different forms of energy supply for heating and electricity. The Ağaçli coal fields have been extracted for coal to supply the energy to Istanbul during a large part of the twentieth century. Although the rate and volume of extraction have since then reduced, the landscape is still a a testimony to changing ground. The history of extraction still remains clearly visible in the topography, which is formed by the tailings of extraction sites.
The project considers architectural modes of extraction, changing the logic to incorporate and legitimate the soil in a way that constructs new spatial relations and forms. The project questions the standard reclamation narrative by positioning itself on the frontiers of cultivated and wild land, between past and present.

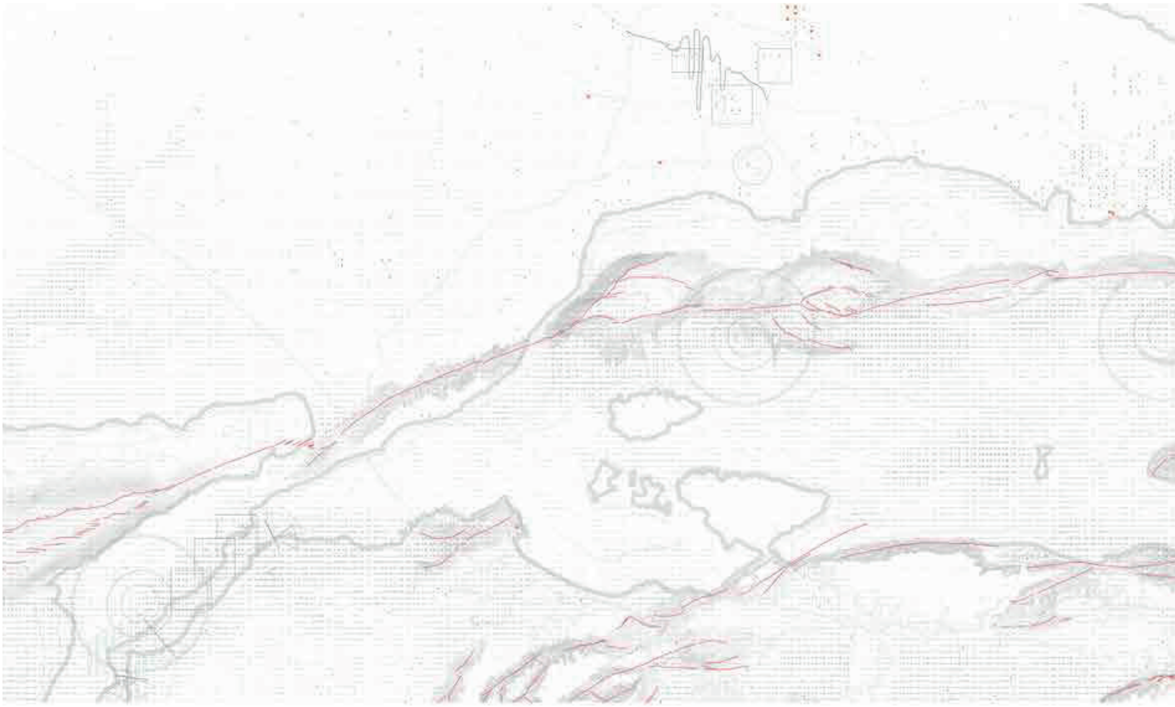
Key words *Extraction landscapes, territory, soil, reclamation, machine*

2 | Collective research

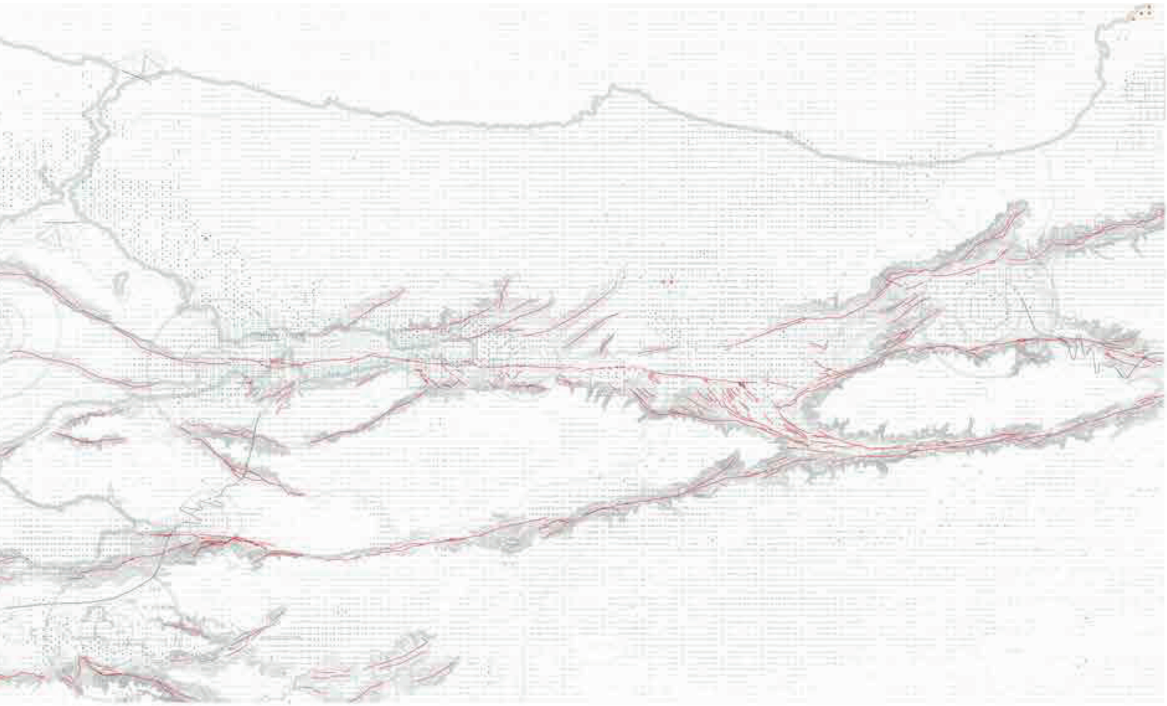
Anticipatory risk map

The group research addresses the geophysical and the geomorphological situation surrounding the Sea of Marmara. Through this research, the group worked to gain a better understanding of the assemblage of the soil and ground, as well as its relationship with collective human life, under the constant threat of seismic activity. Looking at the configuration of the land it becomes paramount that the fault lines are analysed, as these form the land not only in the spatial, but also in their effect of the social sense.

When attempting to map disruptions, creating an anticipatory risk map proved to be the most compendious. This type of map is one that is often found in different capacities, of which the most common uses are found in urban planning and project development; by charting risks, an accurate assessment and preliminary investment of the region can be made. In this map and research, the product is similar to the ones in these fields, but the goal is different; instead of focusing on the risk assessment together, the aim is to organise and define the individual risks and their affected areas. Through layering these disruptions on top of each other, a new understanding of the land and the manner of inhabitation is gained, highlighting the resilience of collective human settlements.



The map itself is built up by first tracing the North Anatolian Fault, after which the land is mapped through an earthquake intensity scale populating the region with numbers; the higher the number, the higher the intensity of a projected earthquake. This is the primary layering in anticipating risk. The secondary layer in anticipating risk is the layer of potential effects of the earthquakes; this is the secondary layer, as this is hypothesised from historical reports on the region. Projected unto the map using a coordinate system, this layer shows tsunamis and collapses, as well as settlements along the North Anatolian Fault line. However, through the method of layering the disruptions alone the understanding of the map would be minimal. As such a tertiary level of analysis was introduced to the research: the mapping of spatial narratives. This layer shows how and why certain settlements are affected, and what the influence of the primary and secondary layering is in the map.



3 | Essay

Extraction scapes

Today, different modes of extraction still sustain Türkiye's society. Located on the Tethyan Metallogenic Belt, the country's landscape hosts a diverse range of minerals including copper, chrome, nickel and gold. Also, sedimentary rocks such as coal are extracted throughout the country which still generates approximately one-fourth of the country's energy demand[1]. Specifically, the city of Istanbul is surrounded by multiple locations of extraction scattered across the landscape. These "extraction scapes", which were originally located far beyond the city centre, are now gradually bordering the rapidly expanding urban territory[2]. At the same time these regions, which are exploited for their resources to secure the development of the city, feel more and more disembodied from society, receded from daily view.

While the distribution and export of extractive materials is increasingly globalized, the actual extraction of the material is a local activity, metabolized by urbanization, a figurative negative of the city[3].

The extractive contexts of these landscapes possess their own logic, tensions, form and process as a response to complex, dynamic systems[4]. The growing conflict of space poses the question how we can utilize, mediate, project and above all, understand these landscapes within the current architectural discourse to offer meaningful connections.

This paper investigates the notion of extraction landscapes for the development of an architectural project. The conditions for current extraction practices are explored and projected within the current debate on soil and the increasing urbanization of the territory. Throughout a process of revaluation, the paper discusses our perception of these spaces, to provide meaning for the urban territory of the future. Finally, this paper discusses how these new insights can inform an architectural project in the Borders & Territories design studio.

Territories of extraction

Extraction, or the forcible taking of material from the earth, depends on the intersection of technology, geology and dynamic markets[5]. The range of material and immaterial substances all modify the landscape's characteristics[6]. The natural production which lies at the basis of these substances transcends the human scale. The mine offers a valuable portal into a geological space where time has formed the ground over the courses of millions of years, which is compressed through instruments of modernity.

Extraction generates multifold dimensions in the landscape. The conditions for earthly materials to form vary between locations, grading the ecological value at the

[1] IEA (2021), Turkey 2021, IEA,Paris https://www.iea.org/reports/turkey-2021, License: CC BY 4.0

[2] Yıldız, Taşkın Deniz & Samsunlu, Ahmet & Kural, Orhan. (2016). Urban Development and Mining in Istanbul – Ağaçli Coal Field and Its Rehabilitation.

[3] Sordi, J., Valenzuela, L., & Vera, F. (2017). The Camp and the City. Territories of Extraction. Ediz. a Colori. ListLab.

[4] Carlisle, S., & Pevzner, N. (2015). Extraction. Scenario Journal, 5.

[5] Ibid.

surface of the earth. The urban territory is expanded through infrastructural and logistical connections, producing 'paired landscapes'[7] as part of the urban metabolism. Extraction territories are primarily perceived as means to an end, an archetypal space of modernity[8]. The value of the landscape is subordinate to the value of raw materials, minerals are simply too valuable to remain in the ground. But while the urban territory profits from extraction, the sites themselves hold their own spatial logic as forms of economic and social enclaves, disrupting the ecological equilibrium of the landscape.

Extraction sites operate the landscape through constant internal reconfiguration. Abstraction, rational and ecological simplification characterize the geological science which supports the different modes of extraction.
The territorial claims are dependent on the mode of extraction. Where oil or gas is extracted through discrete points in the landscape, the mining of minerals generates more extensive space claims. Interestingly, these geographies of extraction are often discontinuous and do not coincide with the notion of city, district or national territory. The axis of competition focuses on exclusive access and security of the extraction point, testing the rules of sovereignty and the colonial past[9]. National, political, social and economic conditions are reflected in the clustering of extraction activities throughout the landscape. The form of extraction landscapes is the result of complex, dynamic systems[10]. Depending on the value of the mineral and the machinery available, the shape of the extraction varies between tunnels following the seams in the earth crust and the excavation of open pits, producing overburden as a consequence, in response to market forces. Mathematically engineered design processes lie at the basis of the commercially exploited areas, transforming space and nature. Extractive processes are interconnected; flows of materials through dynamic networks of transportation, energy and labour characterize extractive operations. Globalization has lengthened material supply chains; distance has ceased to be a relevant determinant of most material availability[11]. Still, the length of mobilization of commodities is dependent on the type of material. Value-to-volume ratios influence the lengths of transportation. This has resulted in types of urbanization with different spatial scales compared to the city. A spatial scale which assumes a temporal dimension, an ephemeral character; they appear and disappear. This is however not visible in the diverse instruments and infrastructures for extraction[12]. Detached from existing communities, extractive settlements evolve and occupy the territory, obeying to different logics compared to the

[6] G. Bridge, "Mapping the Bonanza: Geographies of Mining Investment in an Era of Neoliberal Re-form."

[7] Jane Hutton, "Reciprocal Landscapes: material portraits in New York City and elsewhere," Journal of Landscape Architecture 8:1, 40-47

[8] Mumford, L., & Winner, L. (2010). Technics and Civilization. Amsterdam University Press.

[9] Bridge, Gavin. (2009). The hole world: Scales and spaces of extraction. New Geographies. 2. 43-48.

[10] Carlisle, S., & Pevzner, N. (2015). Extraction. Scenario Journal, 5.

[11] Ibid.

[12] Sordi, J., Valenzuela, L., & Vera, F. (2017). The Camp and the City. Territories of Extraction. Ediz. a Colori. ListLab. 299-300.

current urban dialect.

Extraction processes alter the landscape in a complex and territorial way. De facto, the landscape is the registration of the process of extraction. Activities of mining change the ecological balance of the landscape through the indirect effects on soil, vegetation, air and water. Depleted reservoirs, abandoned mines, landfills, heaps, material depositories and leaks are devastating to the natural equilibrium, shifting the balance both permanent and irreversible. The reciprocal nature of extraction landscapes visualizes the multisided expansion of the urban territory. This expansion requires new concepts and approaches to answer the different scale levels and temporalities[13]. To understand the role of design towards landscapes of extraction, consideration is given to the notion of soil and territory within the current architectural discourse.

Terra e territoria

The term 'territory' is relevant on multiple discontinuous scales[14]. It can be understood as the cultural, social and political delimitation of surroundings, as a bordered surface, as an epistemological notion that distinguishes the territory (social discourse) from reality (geographic space)[15]. These different meanings become relevant in the different scales of extraction landscapes. Throughout history, the awareness of how the territory and soil are conceived within the built environment has been discussed and questioned. Central to this debate is the general increasing abstraction and general disappearance of the ground from the urban discourse. The debate shifted from the marginal importance of human occupation on the condition of the soil in the view of Dokuchaev to Gregotti's argument on the lost focus of the material condition of the territory. Sechi expanded on Gregotti's view and argued that the disappearance of this grounding of urban design was a testimony of the degradation of the mutual relationship between the land and the city. Land had become a technical medium in the vision of modernity. The laws of mathematics and productivity statistics provided the logic for the landscape, plotted economically efficient to maximize yield. Within this discussion, the reflections on landscape of Ton Lemaire provide interesting insights. In Lemaire's view, the landscape is constructed of different layers; through culture, collective memory, technical artifacts and as visual entity[16]. Emphasizing that the landscape should be seen as a cultural concept in which a second form of nature becomes evident, Lemaire argues that the landscape is more than just a scientific natural entity. The mathematical scientific perspectives on land through infrastructure, land division, geography and topology are just fragments of

[13] Avermaete, T., Havik, K., and Teerds, H., (eds.), On Territories / Over territoria, OASE 80 (2009)

[14] Parvu, S. (2009). Discontinous Scales: Building Les Ulis (1960-1979). On Territories, OASE, (80), 25–35.

[15] Jacques Lévy and Michel Lussault (eds.), Dictionnaire de la géographie et de l'espace des sociétés (Paris: Belin, 2003), 907–910.

[16] Lemaire, Philosophy of the landscape, 76.

[17] Ibid.

the landscape. Landscapes always relate to the natural component of the horizon, as part of the larger whole. In this sense, it not solely a calculable form, but also a cultural concept. Landscape is the blending of culture and nature[17].

Today, spatial problems on the regional scale such as environmental, economic, infrastructural questions challenge the structure of the urban territory. Subsequently, the friction between the corresponding actors provides a ground, a margin where design could act as an instrument to explore, mediate, program and raise awareness. This mutual relationship varies from time to time and from place to place. According to Tim Ingold, landscapes are in their true essence temporal[18]. Topography is the cumulative outcome of different physiological processes shaping the landscape, but human activities contribute more and more to processes like erosion and deposition. Cultivating the land continuously binds places to a single horizon of the present. This interaction of nature and culture allows the individual to position within time and space. Ingold argues to see the earth not as a surface, but as a four-dimensional volume which can be understood through the dimension of time[19].
The grounding of our society has degraded in our current day and age due to shifting sensory predominancies. The evolution of land consumption hardly considers the fundamental value of the soil. The non-renewable aspect and slow rate of growth calls for a multifunctional and diversified design approach in relation to soil. The ecological potential of soil requires the maintenance and servicing of this organism, the re-establishment of our interaction with the soil. To this end, the continuous 'becoming of the world, the working on the world and repairing the world'[20] is vital.

To give a new type of value to the landscape, the notion of coexistence has to be put central in the design question. The multifunctionality of the soil offers opportunities for design. The formation of soils involves the gains and losses of matter. Both urban soils and other soils are dynamic systems which change the environment, the main difference is accentuated in time. The speed of soil formation is the result of rapid intensive transformations compared to the slower deep geological formations creating stackings of layers in the soil. Sites which have been transformed by extractive activities offer opportunities of preservation and regeneration. The soil can function as a facilitator of urban and territorial transformations, when it is conceptualized as a part of a four-dimensional living being[21]. In this way, the city can also act as a regenerator of the soil, developing new opportunities in the territory, preserving quantity and quality of space.

[18] Ingold, Tim. "The Temporality of the Landscape." World Archaeology 25, no. 2 (1993): 152–74.

[19] Tim Ingold, Correspondences (Cambridge: Polity, 2021), 85-99.

[20] Corine Pelluchon, Réparons le monde: Humains, animaux, nature (Paris: Payot & Rivages, 2020).

[21] Paola Viganò 'On Soil and Labour. The Transition, a New Biopolitical Project' (2020)

[22] Alan Berger, 'Reclaiming the American West.' (2002)

[23] Nazan Kuter, "Reclamation of Degraded Landscapes Due to Opencast Mining." Advances in Landscape Architecture (2013)

[24] Elliot, Robert. Faking Nature: The Ethics of Environmental Restoration. (1997)

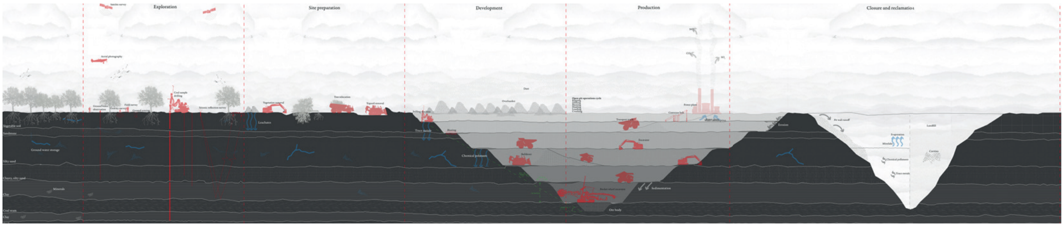
What remains

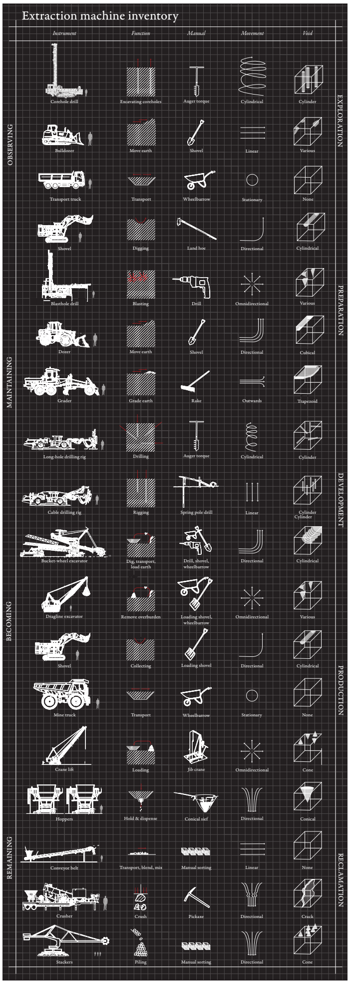
Post-extraction landscapes are a testimony of the major impact of mining the ground for materials. Permanent alterations include sedimentation, erosion, abandoned infrastructure, polluted soil and waters. Reclaiming the land questions the role of these landscapes. Within this process, landscape is often perceived as context, background. But the complex relationship and production of landscape through human and natural processes are both cultural and natural[22]. Rather than envisioning reclaimed landscape, future reclamation should focus on the actual living of the landscape. Different terms surround the theme of reclamation, including restoration and rehabilitation[23]. These terms imply a form of returning to an original condition, a resultant of the modernist attitude towards nature. Practices should focus on adjustment to the altered site conditions. In this way, a new totality emerges which breaks with the former systems before extraction, where nature is no longer viewed as stationary, but as a dynamic and mechanic[24]. Influenced by cultural interests, post-extraction sites could function as testing grounds for new ecologies and reoccupation, revalueing the landscape, creating new forms and functions.

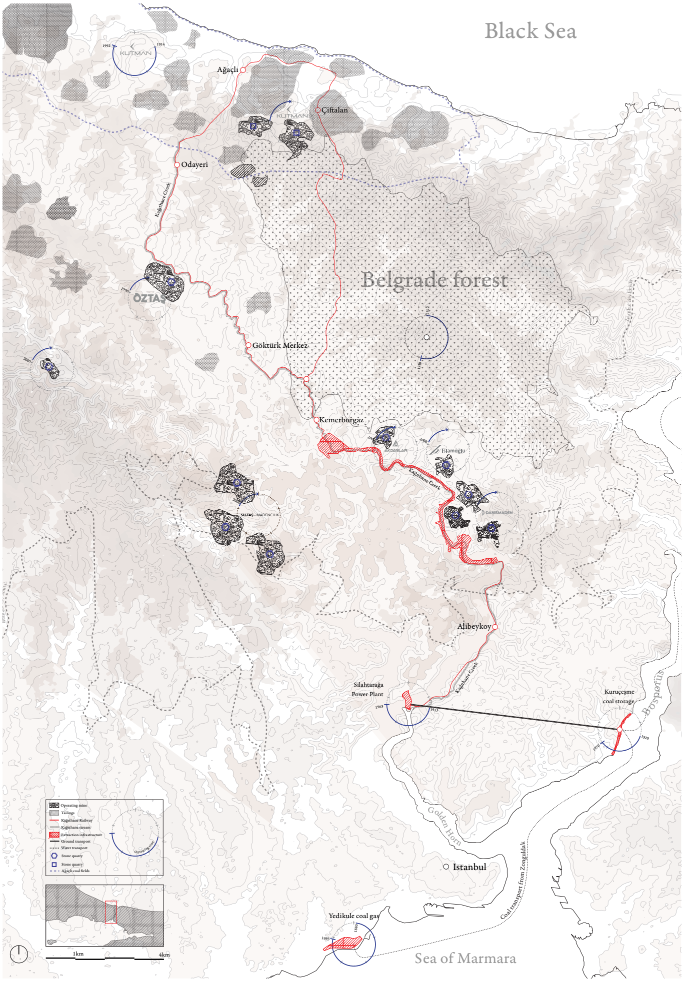
Soil, territory & extraction

The rapid growth of population in Istanbul feeds the need for energy production. The city metabolizes territories that are located far beyond the city centre. These territories provide resources, goods and energy to ensure the development of the urban territory. The different areas of extraction in the past have contributed to the growth of the city, but the landscapes of extraction are currently approaching and colliding with the city. The ephemerality of extractive landscapes is reflected in the configuration and coming and going of accompanied settlements. Perceived as an archetypal space of modernity, extraction sites disrupting the ecological equilibrium of the landscape. Yet the exploiting of the soil for the sole purpose of productivity and yield degrades the landscape and leaves permanent traces in the territory. The dynamics of these extractive landscapes shifts the balance between economy and ecology producing deteriorated ecosystems influencing the territory far beyond the actual location of extraction. The centralized political situation in Türkiye questions the limits and possibilities of territorial architecture in relation to the development of the urban territory to relate to landscapes of extraction. The challenge for the exploration, mediation and programming of extractive landscapes is multifold, where shifting spatial and temporal scales accommodate a multiplicity of proceedings. Design could provide an agency for the development of these spaces of extraction by generating new rules. Designing landscapes of extraction not solely based on mathematical rules of yield and production, but also incorporating and legitimating the soil they exploit. Producing effective responses that provide a real understanding of the complexity behind the process of extraction and grasping the true meaning of soil for society. The plural nature of the territory transcends the notion of region or city. Centralizing the soil as facilitator of coexistence, as a vehicle for urbanism is vital to answer the questions posed by the current spatial urban condition of Istanbul.

4 | Individual research


Exploration
Site preparation
Development
Production
Closure and reclamation


Extraction machine inventory
Instrument
Function
Manual
Movement
Void
OBSERVING
MAINTAINING
BECOMING
REMAINING
EXPLORATION
PREPARATION
DEVELOPMENT
PRODUCTION
RECLAMATION
Corehole drill
Excavating coreholes
Auger torque
Cylindrical
Cylinder
Bulldozer
Move earth
Shovel
Linear
Various
Transport truck
Transport
Wheelbarrow
Stationary
None
Shovel
Digging
Land hoe
Directional
Cylindrical
Blasthole drill
Blasting
Drill
Omnidirectional
Various
Dozer
Move earth
Shovel
Directional
Cubical
Grader
Grade earth
Rake
Outwards
Trapezoid
Long-hole drilling rig
Drilling
Auger torque
Cylindrical
Cylinder
Cable drilling rig
Rigging
Spring pole drill
Linear
Cylinder Cylinder
Bucket-wheel excavator
Dig, transport, load earth
Drill, shovel, wheelbarrow
Directional
Cylindrical
Dragline excavator
Remove overburden
Loading shovel, wheelbarrow
Omnidirectional
Various
Shovel
Collecting
Loading shovel
Directional
Cylindrical
Mine truck
Transport
Wheelbarrow
Stationary
None
Crane lift
Loading
Jib crane
Omnidirectional
Cone
Hoppers
Hold & dispense
Conical sief
Directional
Conical
Conveyor belt
Transport, blend, mix
Manual sorting
Linear
None
Crusher
Crush
Pickaxe
Directional
Crack
Stackers
Piling
Manual sorting
Directional
Cone


Black Sea
Ağaçlı
Çiftalan
KUTMAN
Odayeri
Kağıthane Creek
ÖZTAŞ
Belgrade forest
Göktürk Merkez
Kemerburgaz
İstanoğlu
Alibeykoy
Silahtarağa
Power Plant
Kuruçeşme
coal storage
Bosphorus
Golden Horn
Istanbul
Coal transport from Zonguldak
Yedikule coal gas
Sea of Marmara
1km
4km

Mappings

Stages of extraction

Extracting Istanbul

Earth machines

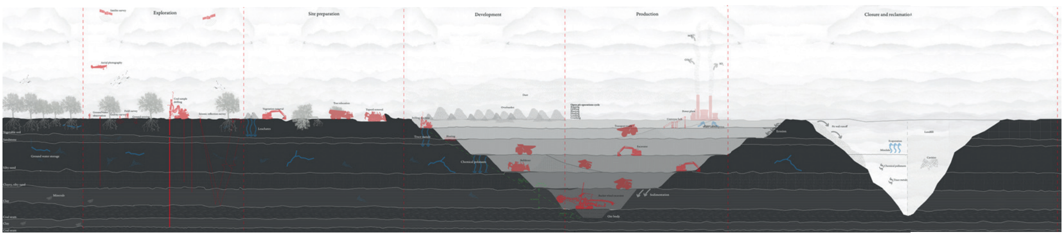
Overburden topography

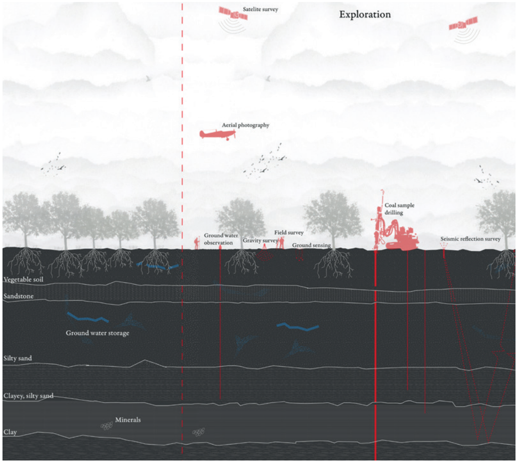
Stages of extraction

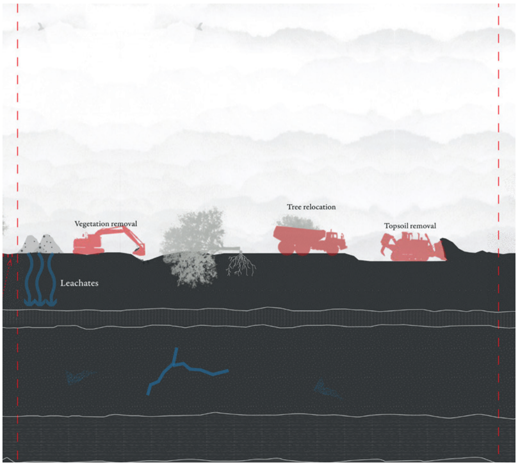
While the distribution and export of extractive materials is increasingly globalized, the actual extraction of the material is a local activity. Although neither two extraction projects are the same, there are key stages of the extraction cycle which form the basis of the process. Before every extraction, a throrough process of exploration takes place, where different research methods are used such as remote sensing, gravity surveying, ground water surveying, corehole sampling and field survey. This first stage takes years of research before the actual preparation stage starts[1]. This second stage involves researching safety aspects, economical aspects, and reclamation studies. After this, the site is prepared by removing the topsoil including vegetation and trees. Next the first excavations begin, often first excavating multiple layers of earth before reaching the actual rock seam. The overburden is temporarily relocated until the extraction of the particular material is finished. What follows is the stage of closure and reclamation, where the excavated site is filled again through various methods, including replanting and filling the resulting hole with water[2].

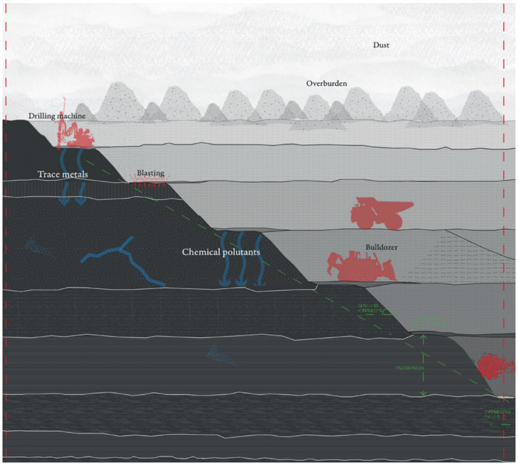
[1] Thomas, Larry, Coal Geology.

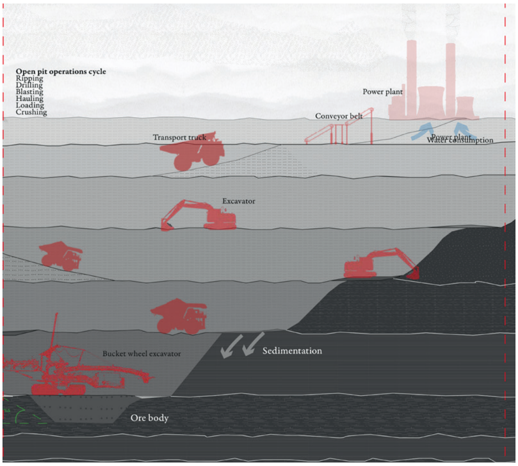
[2] Thomas, Larry, and Larry Thomas. Handbook of Practical Coal Geology.

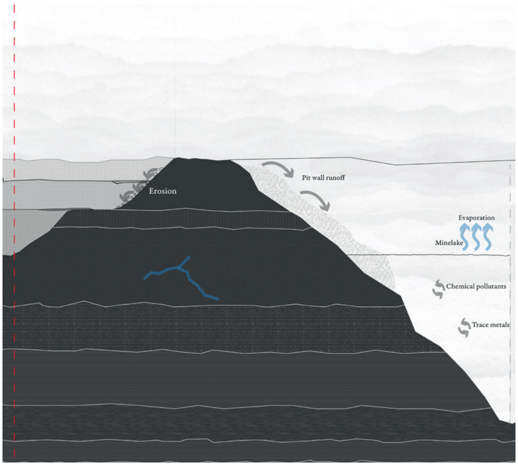


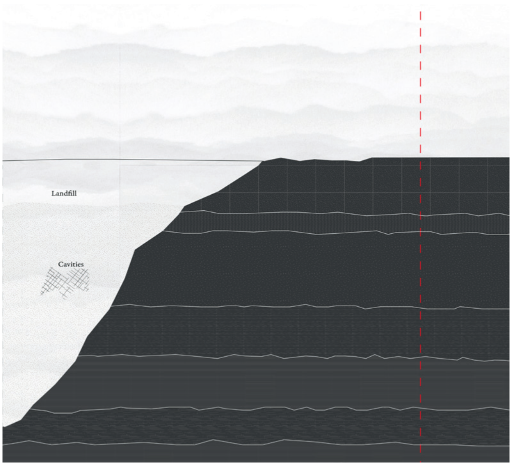

Exploration
Satelite survey
Aerial photography
Coal sample drilling
Ground water observation
Gravity survey
Field survey
Ground sensing
Seismic reflection survey
Vegetable soil
Sandstone
Ground water storage
Silty sand
Clayey, silty sand
Minerals
Clay


Vegetation removal
Tree relocation
Topsoil removal
Leachates


Dust
Overburden
Drilling machine
Trace metals
Blasting
Chemical polutants
Bulldozer


Open pit operations cycle
Ripping
Drilling
Blasting
Hauling
Loading
Crushing
Power plant
Conveyor belt
Transport truck
Power plant
Water consumption
Excavator
Bucket wheel excavator
Sedimentation
Ore body


Pit wall runoff
Erosion
Evaporation
Minelake
Chemical pollutants
Trace metals


Landfill
Cavities

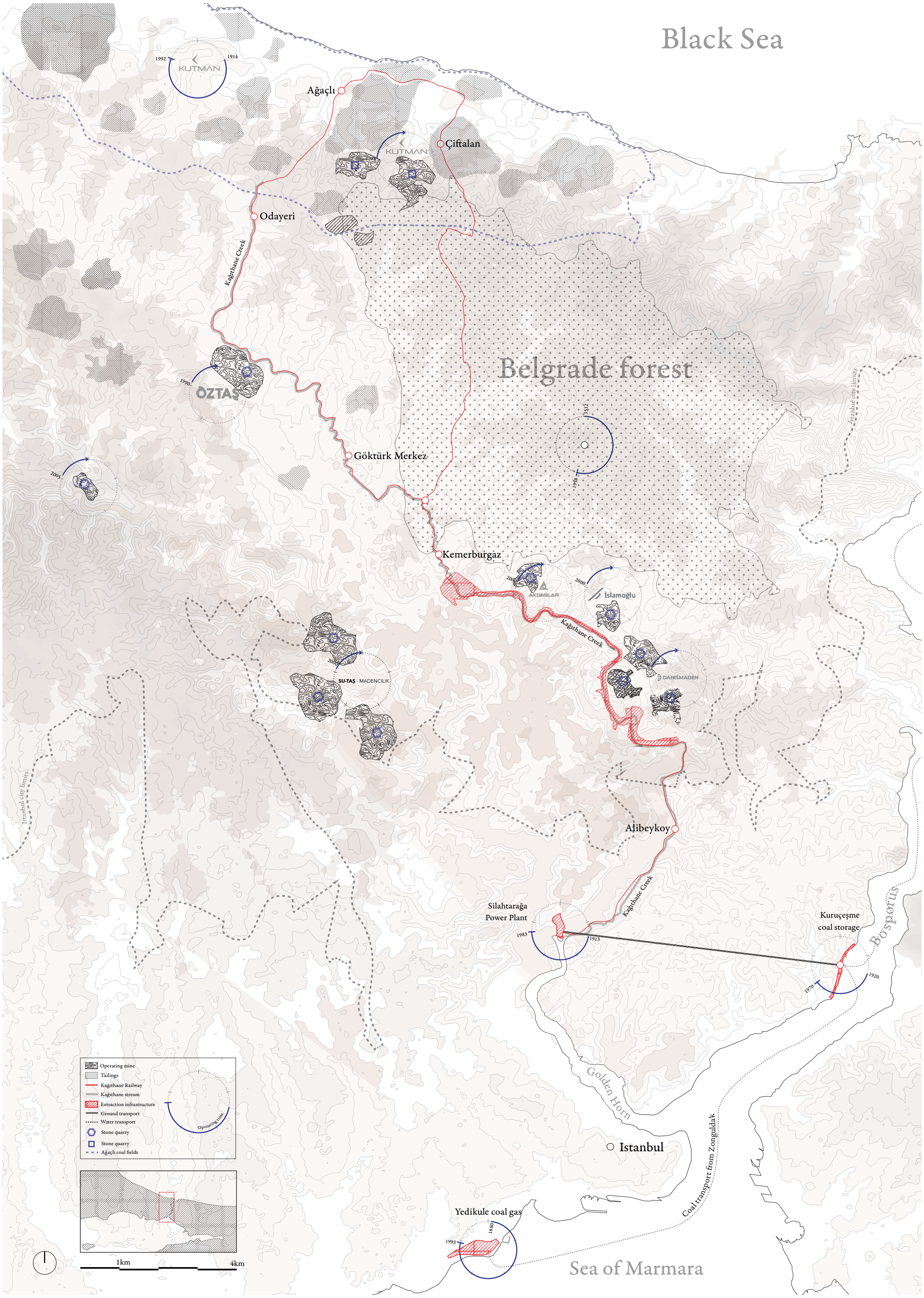
Extracting Istanbul

Throughout the history of Istanbul, the city has used different forms of energy supply for heating and electricity. The major supply of energy was provided by the Zonguldak coal mines which was shipped over the Black Sea and the Bosporus to the Kuruçeşme coal storages, close to the city centre. During World War I, this import of coal stocked, resulting in a search for new areas to be mined. This is when the region to the north of the city, between Karaburun and Kilyos, also known as the Ağaçli coal fields, was reactivated. Mining started here from the 1800s for the first time. The low-grade lignite coal was used to supply the city with energy over the course of the next fifty years. In 1914, the Silahtarağa Power Plant was established in the neighbourhood of Haliç, at the northern end of the Golden Horn. The power plant was connected to the Ağaçli coal fields through a railway, which supplied 800 tons of coal daily[1]. This compensated for the difficulty of obtaining coal from the Zonguldak mines by sea. The railway line served until 1956, when it was removed, but the coal mines remained in operation to encourage citizens to use coal instead of wood from the protected Belgrade Forest for heating[2]. In 1983, the Silahtarağa Power Plant completed its economic life and was closed. In the 90s, the city transferred to a supply of natural gas for heating. The use of coals from the Ağaçli coal fields have reduced ever since.

Today, different mines and quarries border the city limits due to the rapidly expanding urban territory. Although the old railway from Haliç to Ağaçli has disappeared, multiple sites are still excavated along its original path. The Ağaçli coal fields are still extracted, albeit in a reduced tempo and scope. The history of extraction still remains clearly visible in the topography, which is formed by the tailings of the extraction sites.

[1] Yıldız, Taşkın Deniz & Samsunlu, Ahmet & Kural, Orhan. (2016). Urban Development and Mining in Istanbul – Ağaçli Coal Field and Its Rehabilitation.

[2] Emre Dölen & Mert Sandalci. (2005) The Book of Kagithane-Kemerburgaz - Agacli - Ciftalan Railway (1914 - 1916) .


Black Sea
Ağaçlı
Çiftalan
Odayeri
Kağıthane Creek
Belgrade forest
Göktürk Merkez
Kemerburgaz
İslamoğlu
Alibeykoy
Silahtarağa
Power Plant
Kuruçeşme
coal storage
Bosporus
Golden Horn
Istanbul
Coal transport from Zonguldak
Yedikule coal gas
Sea of Marmara
Operating mine
Tailings
Kağıthane Railway
Kağıthane stream
Extraction infrastructure
Ground transport
Water transport
Stone quarry
Stone quarry
Ağaçlı coal fields
Operating time
1km
4km

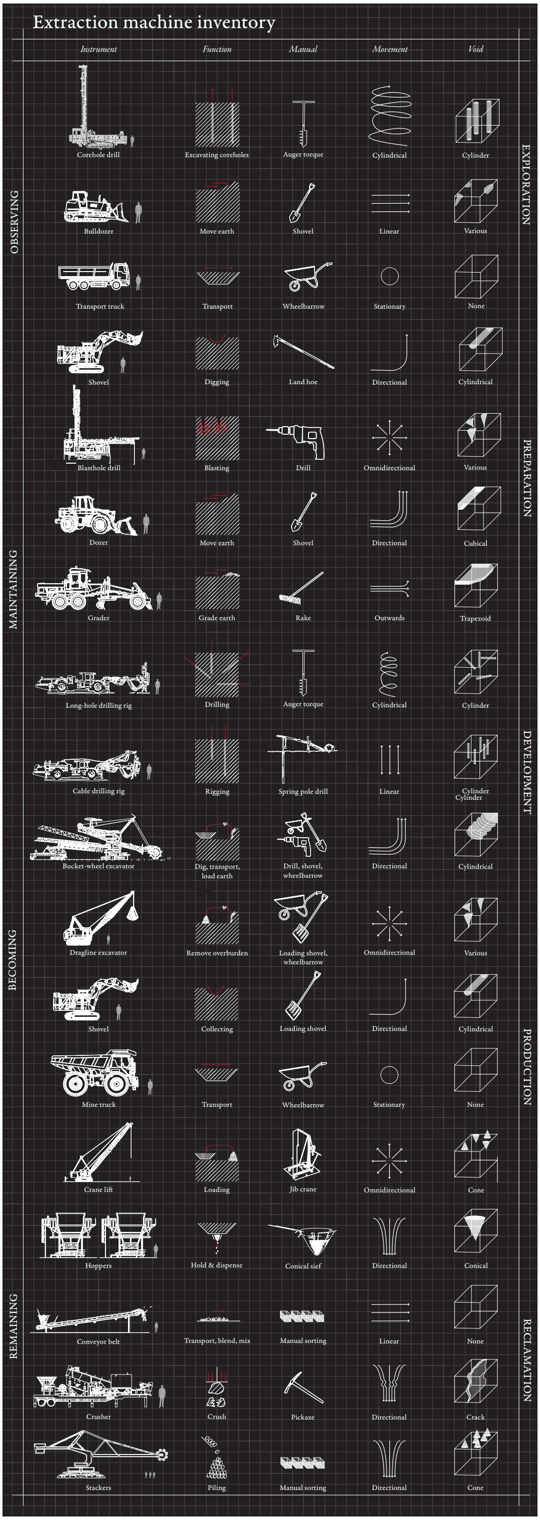
Earth machines

The mining of materials requires different methods of extraction. These methods can be divided into surface mining and underground mining. When the material is close to the earth, surface mining methods are often used as an extraction method. This includes strip mining, open pit mining and quarrying. On the other hand, some minerals cannot be extracted through surface mining[1]. A variety of methods is used in this case, ranging from longwall mining to blast mining. Every method is intrinsically linked with different type of rocks, both soft and hard[2].
The list of machinery which is used for extraction is almost endless. Interestingly, these machines are specifically tailored to the operation and are designed through a comprehensive understanding of the earth[3]. 'Creation by excavation' forms the basis of the extraction procedures. The inventory investigates these machines and specifies their function, movement and void.

[1] Flyability. "Mining Tools in 2022—A Guide to Mining Equipment and Mining Machines,"

[2] Thomas, Larry, Coal Geology.

[3] Thomas, Larry, and Larry Thomas. Handbook of Practical Coal Geology.


Extraction machine inventory
Instrument
Function
Manual
Movement
Void
Corehole drill
Excavating coreholes
Auger torque
Cylindrical
Cylinder
Bulldozer
Move earth
Shovel
Linear
Various
Transport truck
Transport
Wheelbarrow
Stationary
None
Shovel
Digging
Land hoe
Directional
Cylindrical
Blasthole drill
Blasting
Drill
Omnidirectional
Various
Dozer
Move earth
Shovel
Directional
Cubical
Grader
Grade earth
Rake
Outwards
Trapezoid
Long-hole drilling rig
Drilling
Auger torque
Cylindrical
Cylinder
Cable drilling rig
Rigging
Spring pole drill
Linear
Cylinder
Cylinder
Bucket-wheel excavator
Dig, transport, load earth
Drill, shovel, wheelbarrow
Directional
Cylindrical
Dragline excavator
Remove overburden
Loading shovel, wheelbarrow
Omnidirectional
Various
Shovel
Collecting
Loading shovel
Directional
Cylindrical
Mine truck
Transport
Wheelbarrow
Stationary
None
Crane lift
Loading
Jib crane
Omnidirectional
Cone
Hoppers
Hold & dispense
Conical sief
Directional
Conical
Conveyor belt
Transport, blend, mix
Manual sorting
Linear
None
Crusher
Crush
Pickaxe
Directional
Crack
Stackers
Piling
Manual sorting
Directional
Cone
OBSERVING
MAINTAINING
BECOMING
REMAINING
EXPLORATION
PREPARATION
DEVELOPMENT
PRODUCTION
RECLAMATION

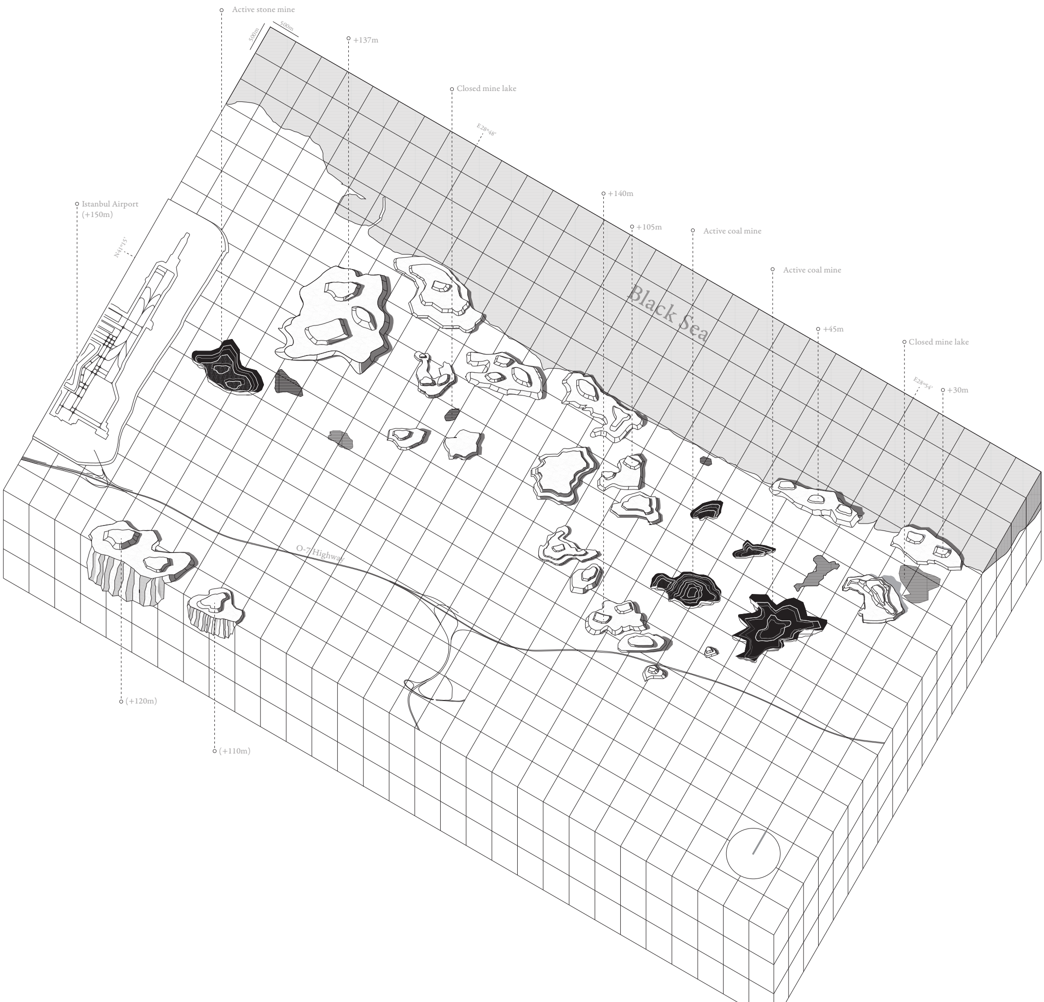
Overburden topography

Extracting materials from the earth produces different tailings, overburden and waste dumps. The overburden is the volume of earth that lies above the targeted material, such as coal or ore. Overburden differs from tailings, which is the leftover material after the extracted material is processed. Tailings are often loaded with toxic chemicals, producing environmental and health hazards. For this reason, the tailings are often stored permanently in locations confined by dams[1]. Overburden is often temporarily stored while the mine is being exploited for materials, after which the overburden is restored during the reclamation phase[2]. The Ağaçli coal fields have been extracted for Lignite coal to supply Istanbul during a large part of the twentieth century[3]. Although the rate and volume of extraction have since then reduced, the landscape is scattered with overburden.
The area is characterized by earth being moved around and restored. The new Istanbul Airport has added yet another layer of land movement, dictating the topography of the site.

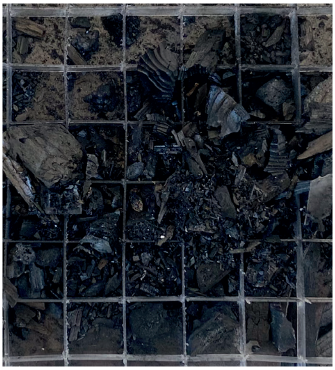
[1] Morgenstern, Norbert R. (2001). "Geotechnics and Mine Waste Management – Update"

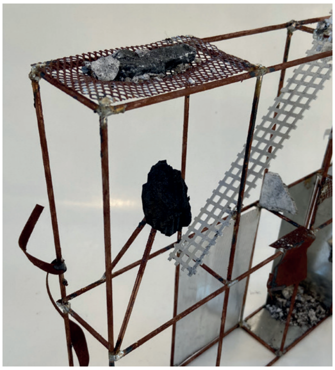
[2] Bates, R.L., and Jackson, J.A., (1987) Glossary of geology American Geological Institute, Alexandria, Virginia.

[3] Yıldız, Taşkın Deniz & Samsunlu, Ahmet & Kural, Orhan. (2016). Urban Development and Mining in Istanbul – Ağaçli Coal Field and Its Rehabilitation.



Active stone mine
+137m
Closed mine lake
Istanbul Airport
(+150m)
+140m
+105m
Active coal mine
Active coal mine
Black Sea
+45m
Closed mine lake
+30m
O-7 Highway
(+120m)
(+110m)





Modi Operandi

Underground logic

Excavating architecture

Theatre of earthworks

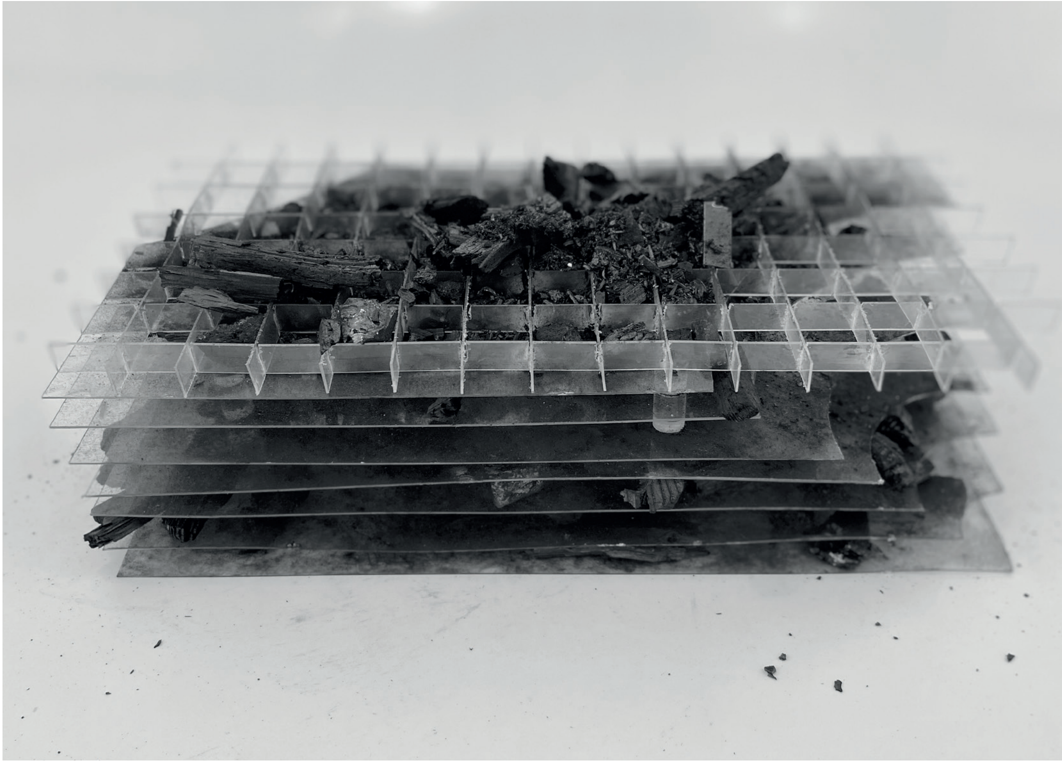
Underground logic

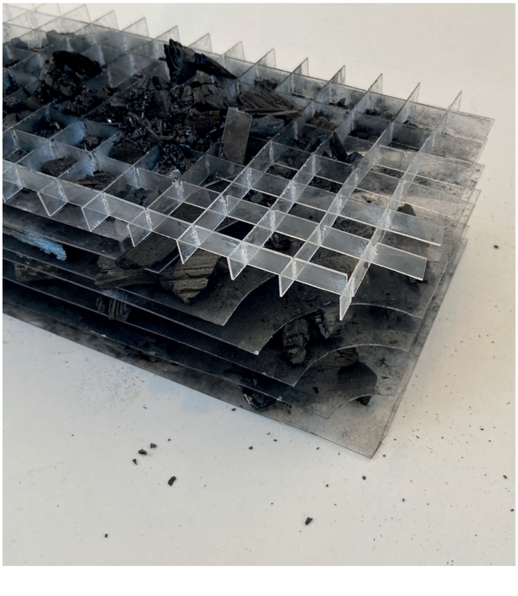
[1] What are the types of coal? | U.S. Geological Survey, 2017

[2] Coal explained - U.S. Energy Information Administration (EIA)

The first Modi Operandi Workshop explores the hidden stacking of the ground through the visualization of different types and sizes of coal. Coal is ranked differently through the amount of carbon and energy content. Coal is produced through the natural process of coalification, changing buried plant into harder coal types over time[1]. The different coal types are, in order of increasing heat and pressure: peat, lignite, subbituminous, bituminous, anthracite.

Coal seams are formed over the course of millions of years, following geological formations in the crust of the Earth[2]. Buried deep down, they are invisible and unknown. In search for coal, the earth is excavated through mathematical capitalist logic. Above ground, the coal is processed to sustain civilization's energy demand.





Excavating architecture

[1] Thomas, Larry, and Larry Thomas. Handbook of Practical Coal Geology.

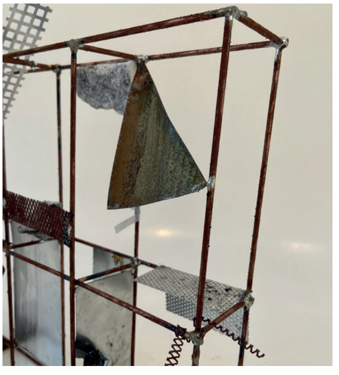
Extraction of material from the earth is performed by a wide range of machinery. Over the course of history these machines have improved, but were always based on the basic principles of extraction, drilling, cutting, blasting, dumping and crushing the ground[1]. Machinery is designed to extract the material as efficiently as possible, excavating the minimum possible amount of overburden.
The second Modi Operandi workshop explores these interactions with the earth. This resulted in experiments with different techniques manipulating multiple volumes of gypsum. During the process of casting the gypsum, multiple sizes and types of coal were mixed in the volumes of gypsum randomly. During the following excavation of these coal objects, the gypsum was excavated with different tools, such as a hammer, chisel, trowel and drill. The resulting volumes were stacked in different formations to explore the interaction of spaces.



Theatre of earthworks

The final Modi Operandi Workshop centres on the theme of the theatre. Various elements and materials of the extraction cycle are placed in multiple compositions to create interesting encounters. The idea of the theatre as an intriguing 2.5D space originates in the 'Teatrini' of Fausto Melotti, where daily life is investigated through terracotta compositions, conceived as habitable spaces[1]. Next to a compositional exercise, the theatre is also intended as a first study into material. Different textures of steel, aluminium and copper are used to frame and interact with the earth and coal. The composition poses the question how we can interact with the different spaces of extraction.

[1] Galleria dello Scudo. "Fausto Melotti. Teatrini 1931-1985.", 2021

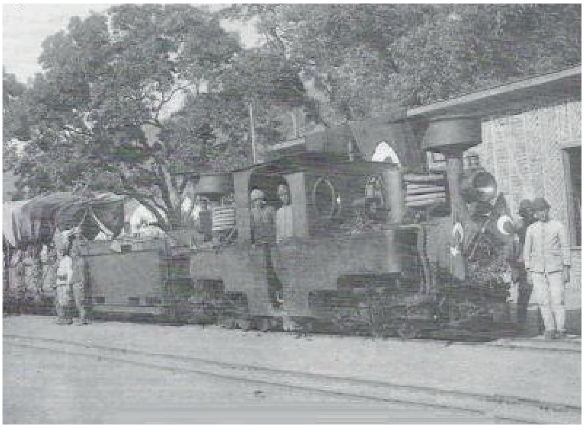


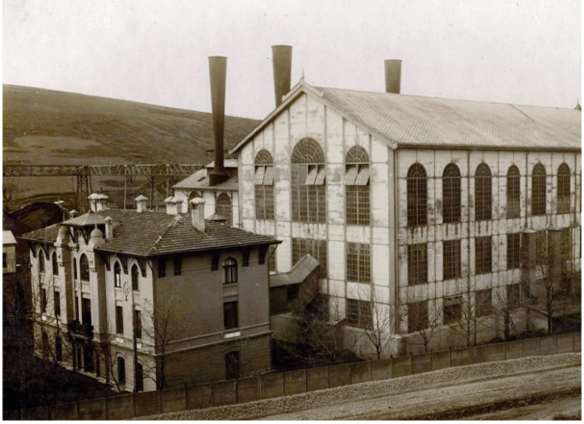
Site
Ağaçlı coal fields, Istanbul

History

[1]Dogan T., The minimisation methods and techniques of environmental hazards of coal mining. (2001).

Coal was found in the Agacli Region prior to 1908, leading to widespread mining by various methods by 1914. Today, coal is still extracted by surface mining at recently established mines located on the coast between Kilyos and Karaburun. The land-use pattern, surface topography, and coastline in this area have experienced constant change since 1908 because of ongoing surface mining[1]. Eighteen small-scale coal mines have operated in the area. Between 1995 and 2006, around 100 million m3 of over- burden was removed each year to extract 4.5 million tons of coal, corresponding to a stripping ratio of 22 m3 of overburden per ton of coal. Coal seams extend beneath the Black Sea in some regions. In order to extract this coal (-40 m), overburden material is used to fill in these regions a lagoon forms over the coal mine, and the water is drained away. The next step is to reach the depth of the coal by removing the dumped overburden. Coal production has currently reached the –40 m level.





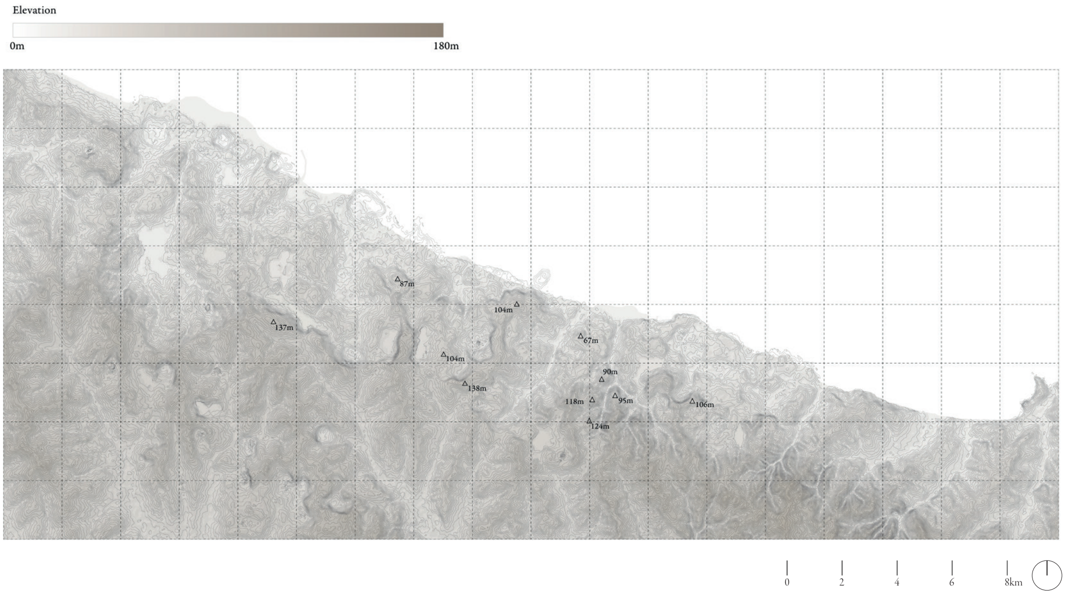
Ağaçli coal fields, railway and Silahtarağa Power Plant (Dölen & Sandalci, 2005)

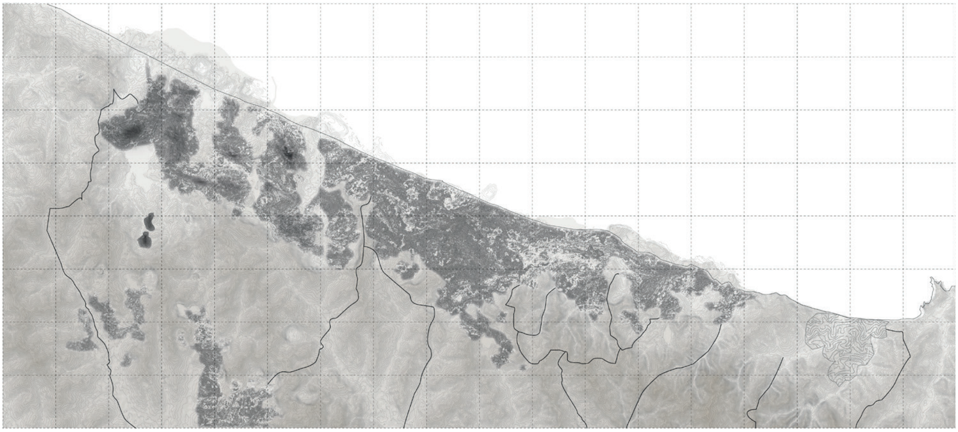
Kutman, 2017

Topographic alterations

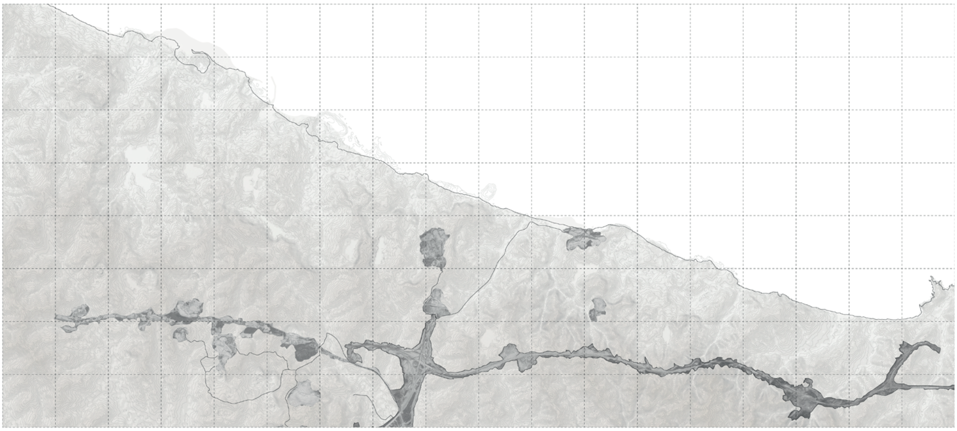
Over the coarse of history, the Ağaçlı coal fields have been subjected to numerous topographic alterations[1]. The different ecologies of the highway, the airport and the mining have exerted pressures on the landscape. In total, the historical mining activities excavated approximately 4.5 million m^3 of overburden material and 2 million tons coal in the working area. The current topography of the landscape is a sublimation of landscape modifications, changing the soil into mathematical rules of space and time. all the interventions are the result of a static view in relation to the soil. Surrounding the objects, the soil is reduced to a geometric grid which is excavated. The measure of the landscape is taken through the size of the excavator scoop, the rotational axis of the stackers.

[1] E.M. Fanusçu, (1999), Possibilities of The Using of Degraded Area in Terms of The Use of Urban Areas (Example of Istanbul Ağaçli Region Open Pit Mine Area), Istanbul University, PhD thesis, p. 254.

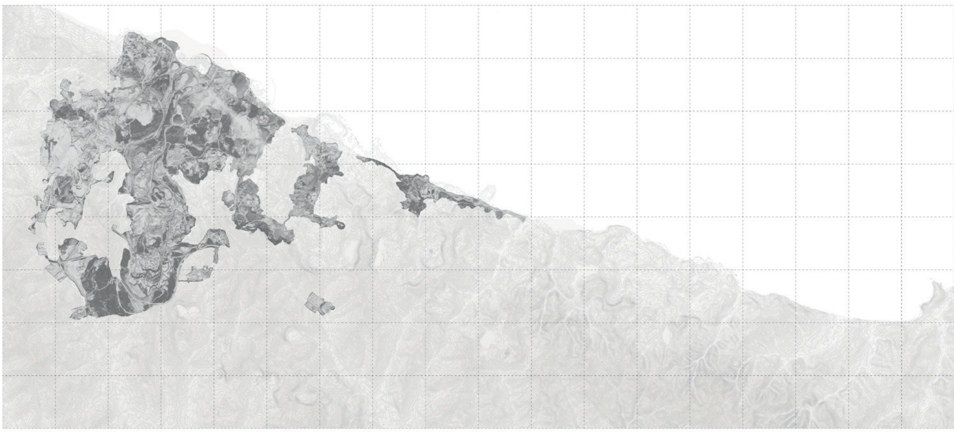




1985



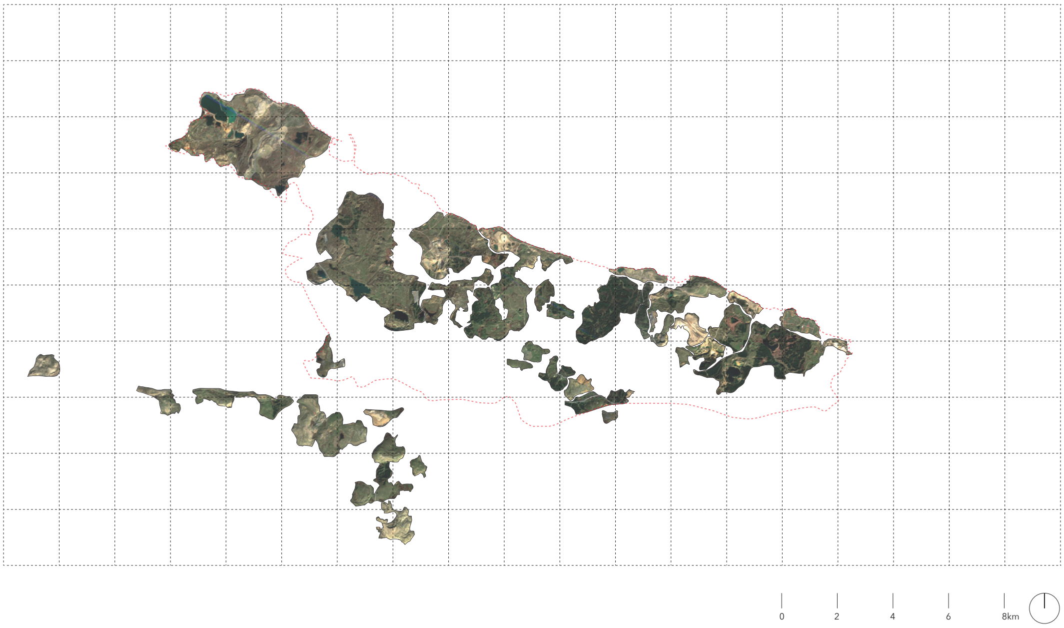
2015



2017

Earthworks

On the map at the bottom of this page, the result of all the earthmoving procedures is analyzed through a historical research using Google Earth. Over 70 percent of the site is or has been reworked in the past. The images on the right side show the impact these procedures have on a smaller scale. The main involvement of shifting, compressing, spreading, digging and dumping has had a major impact on the villages and residents in the area.



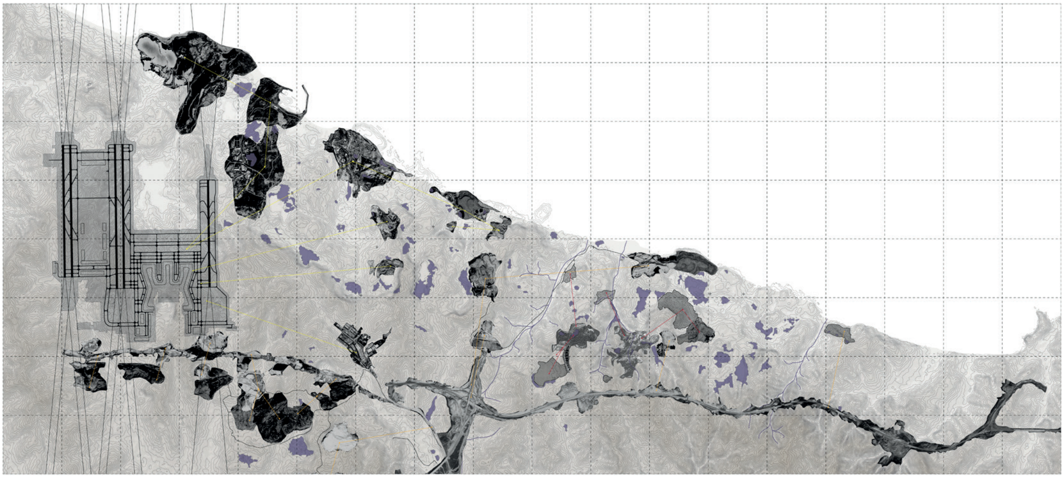





Google Earth, 2023

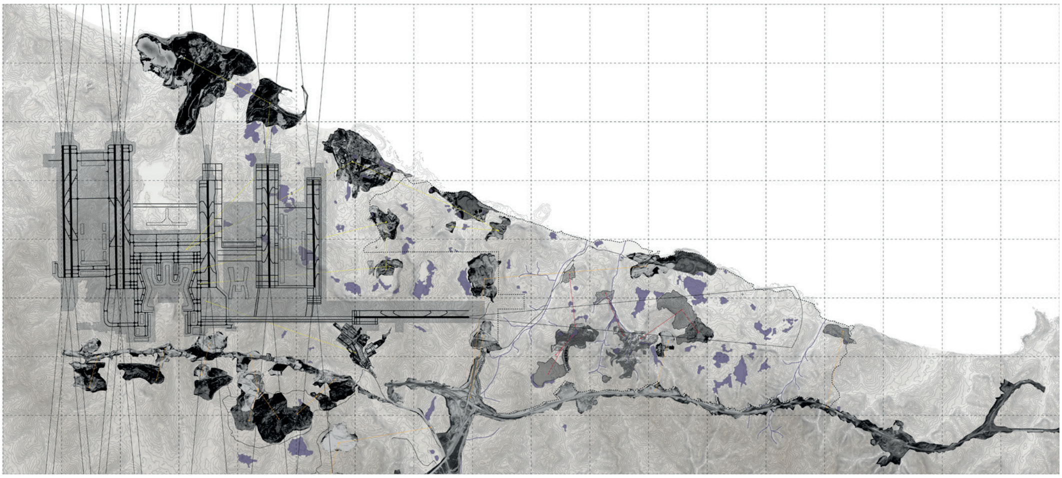
Present & future condition

The current infrastructural projects are still underway. The Marmara highway which started development around 2014 is currently in the final state of the process. The airport is currently operational but only 5 of the 8 runways in total have been realized yet. Planning suggests that the airport will continue to develop and finish within the next 5 to 10 years. The addition of a runway which faces an east to west direction adds another layer of impact in the atmosphere above the Ağaçlı coal fields.



2023

0 2 4 6 8km



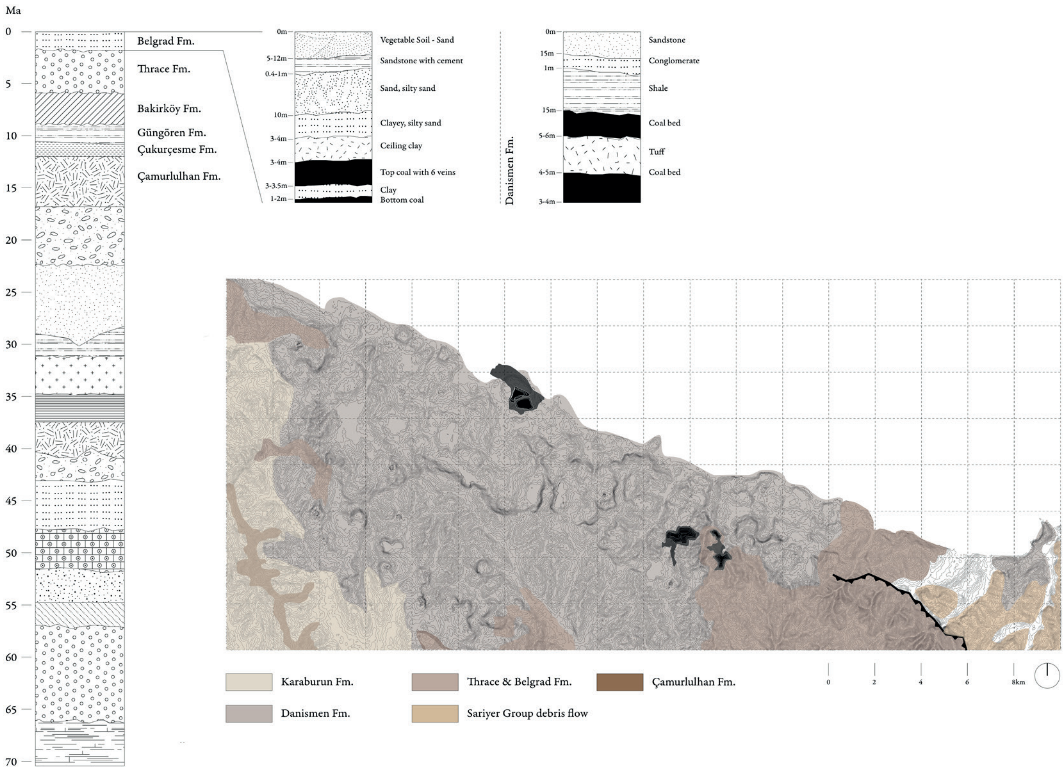
2028

0 2 4 6 8km

Geology

[1] E.M. Fanusçu, (1999), Possibilities of The Using of Degraded Area in Terms of The Use of Urban Areas (Example of Istanbul Ağaçli Region Open Pit Mine Area), Istanbul University, PhD thesis, p. 254

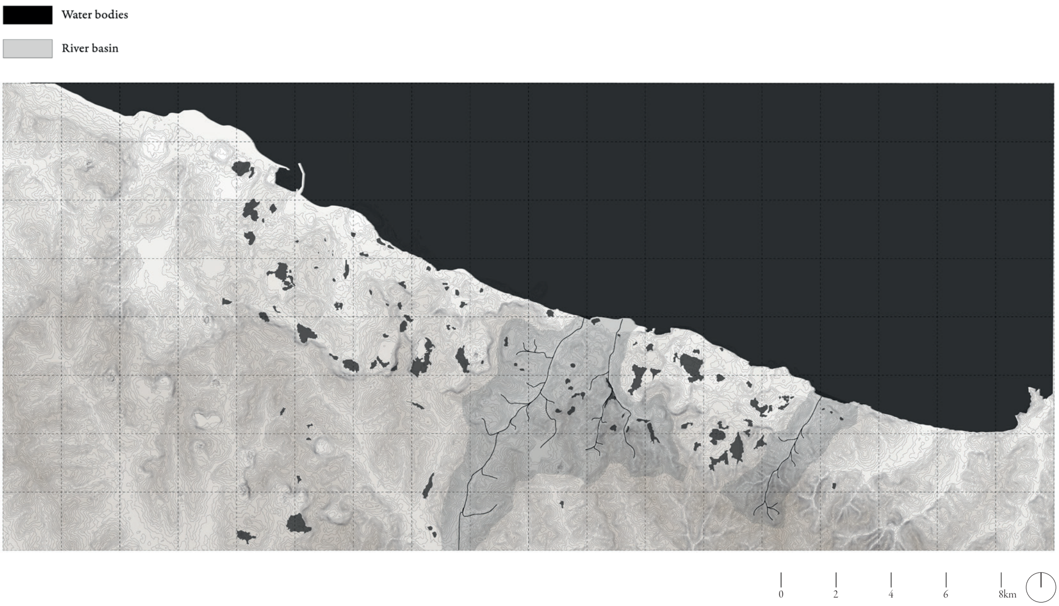
The stratigraphy of the Ağaçlı coal fields consists of thee sequential formations. These are firstly the 1500m thick Thrace Formation, mainly consisting of siltstone, sandstone and shale. This layer is covered by the second layer, namely the Upper Cretaceous Sariyer Formation. This layer is 250m in thickness consisting of tuff, limestone and andesite. On top of this rests the Belgrade Formation, being 60m in thickness. This layer contains the reason for the endless excavations; coal. The seams are generally located about 30 to 50 meters below the surface. The two seams vary in depth throughout the territory. The mining operation locations indicate the most feasible locations to extract the overburden to reach the coal seams.



Hydrology

The site is located on the northern edge of the Istanbul Peninsula. Located south of the Black Sea, the area's climate is influenced by the northerly winds generated from this water body. Because of the mining operations, a condition known as end-pit lakes have been developing over the coarse of years. These lakes are the result of the partial backfilling of open-pit mines, which are in turn filled with a combination of ground water, rain and runoff water.
The heavy metal and pollution rate of the abandoned mines causes the water to degrade in quality. Depending on the type of mining, the water becomes either acidic or alkaline.

[1] E.M. Fanusçu, (1999), Possibilities of The Using of Degraded Area in Terms of The Use of Urban Areas (Example of Istanbul Ağaçli Region Open Pit Mine Area), Istanbul University, PhD thesis, p. 254

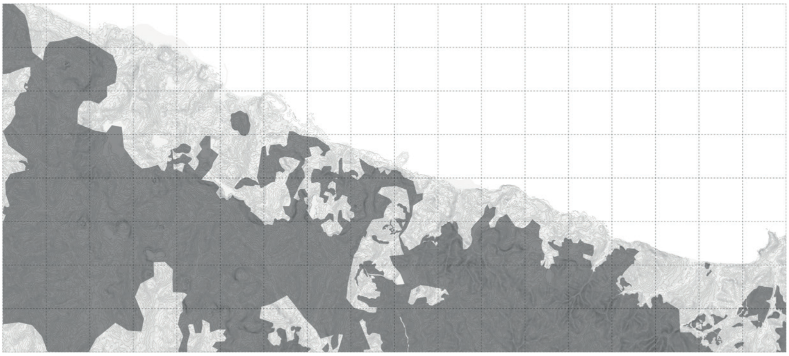


Natural forest decay

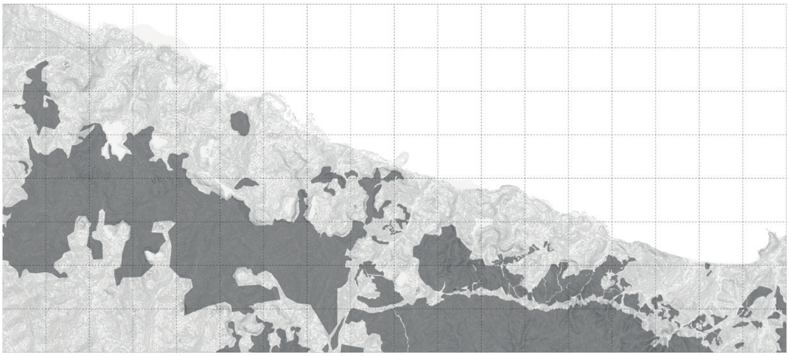
[1]Kırca, S. (2013). Belgrad Ormanı: (bir doğa ve kültür mirası).

The originally Belgrad Forest, planted in 1521, currently consists of an area of about 5400 hectares[1]. The forest is composition of decidiuous forest, Sessile Oak being the main tree represented.

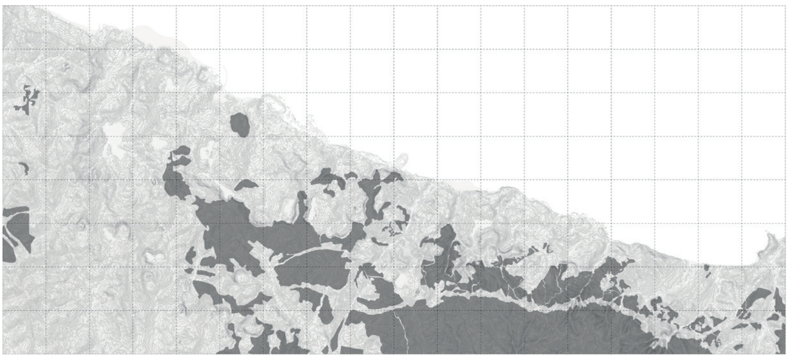
The vast scale of mining operations caused the forest quality and size to reduce in the last 100 years. Currently the forest is about 20 percent of it's original size.



1984



2013



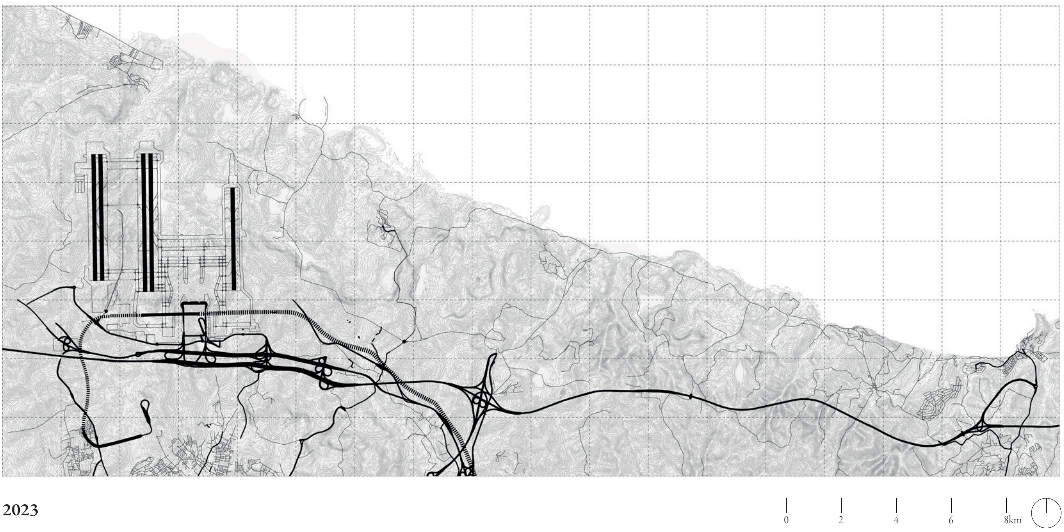
2023

Transportation

Although the mining operations have reduced in the last 30 years, the new infrastructural projects are having a major impact on the area. The construction of the Marmara highway, which started in 2013, cut right through the Belgrad Forest, resulting in a hard boundary, reducing the size and quality of the forest. The scalar scale of the New Istanbul Airport not only influenced the atmospherical traffic, but also the resulting car, bus, cargo and ship traffic. During the construction of the airports seaport was realized north of the airport to provide direct access for building materials and fuel. The contrast between the Marmara highway and the local roads is large. Whereas the eight-lane highway runs creates it's own ecology, the local roads consist mainly of gravel roads.

[1] E.M. Fanusçu, (1999), Possibilities of The Using of Degraded Area in Terms of The Use of Urban Areas (Example of Istanbul Ağaçli Region Open Pit Mine Area), Istanbul University, PhD thesis, p. 254

Metro
Highway
Regional road
Dirt road

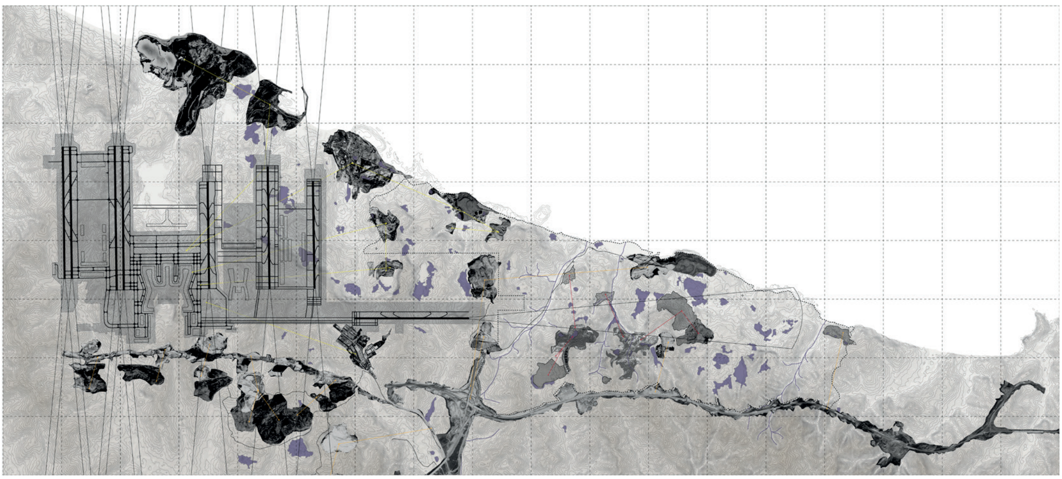


2023

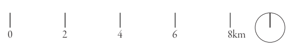
Infrastructure

[1] E.M. Fanusçu, (1999), Possibilities of The Using of Degraded Area in Terms of The Use of Urban Areas (Example of Istanbul Ağaçli Region Open Pit Mine Area), Istanbul University, PhD thesis, p. 254

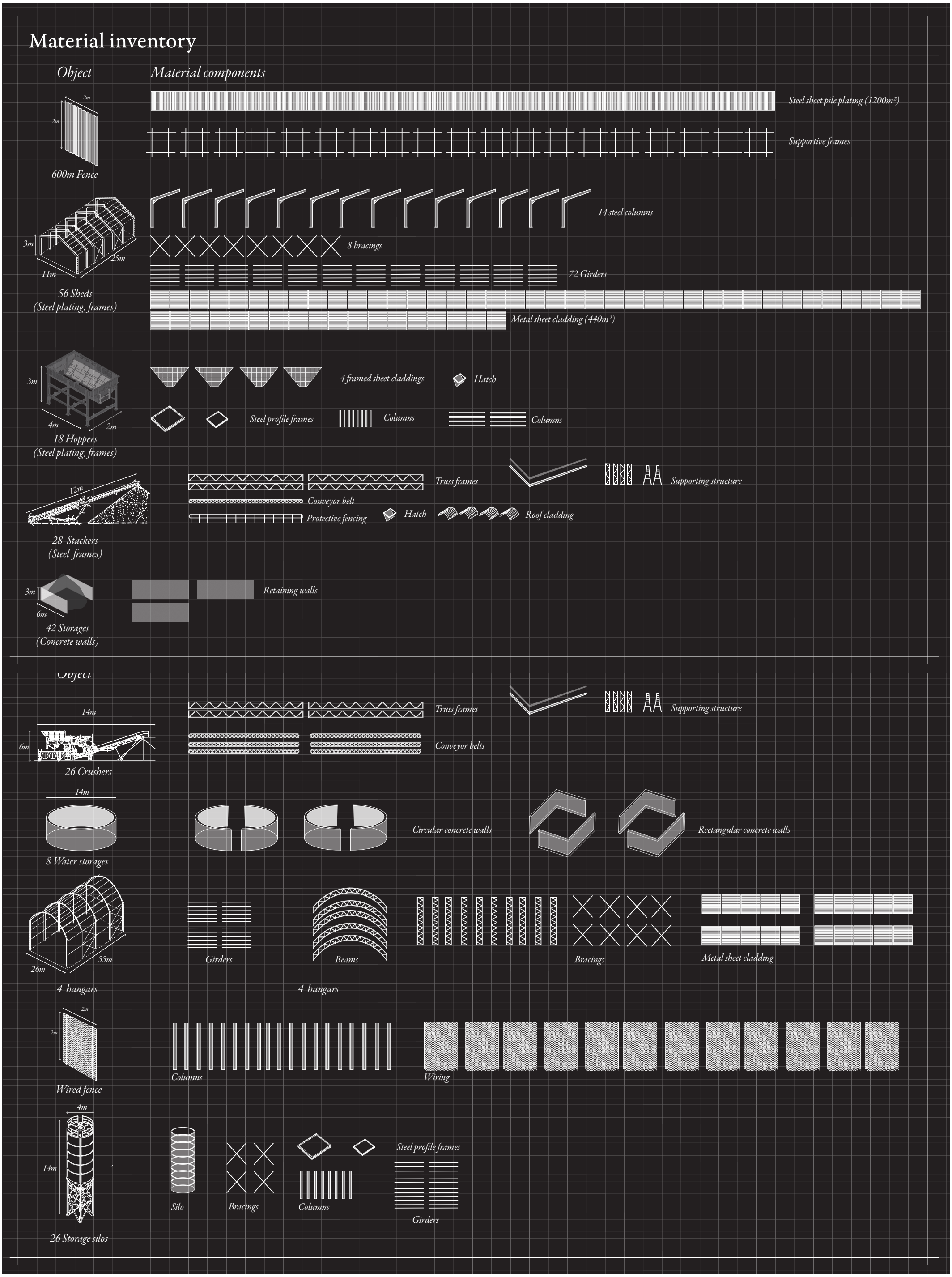
The interesting aspect of the infrastructure within the site is the temporal scale. Mining operations bring a multitude of objects, transportation and excavation materials, which are only constructed for the time the mine is in operation. The airport on the other hand is build using vast amounts of concrete and steel, tailored specifically for the dedicated operation. The relation between the earth and infrastructure is visible in the flattened topography of the airport. The soil is changed into a static object, flattened for the purpose of runways and taxi tracks.



2028



Material inventory

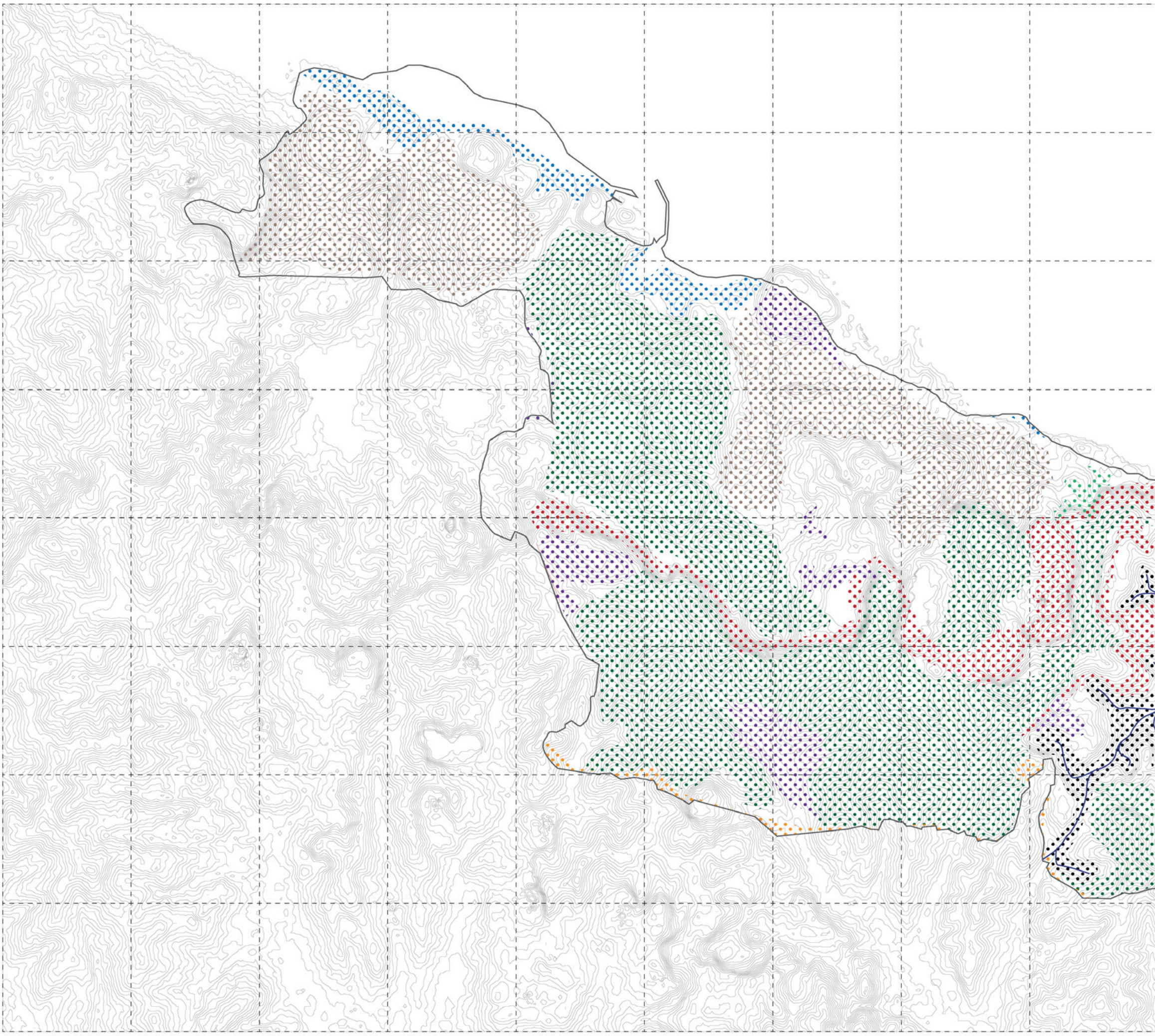


Google Earth, 2023

Google Earth, 2023

5 | Projection

Intervening in time



Improving forest quality

Containment of erosion

Enhancing infiltration

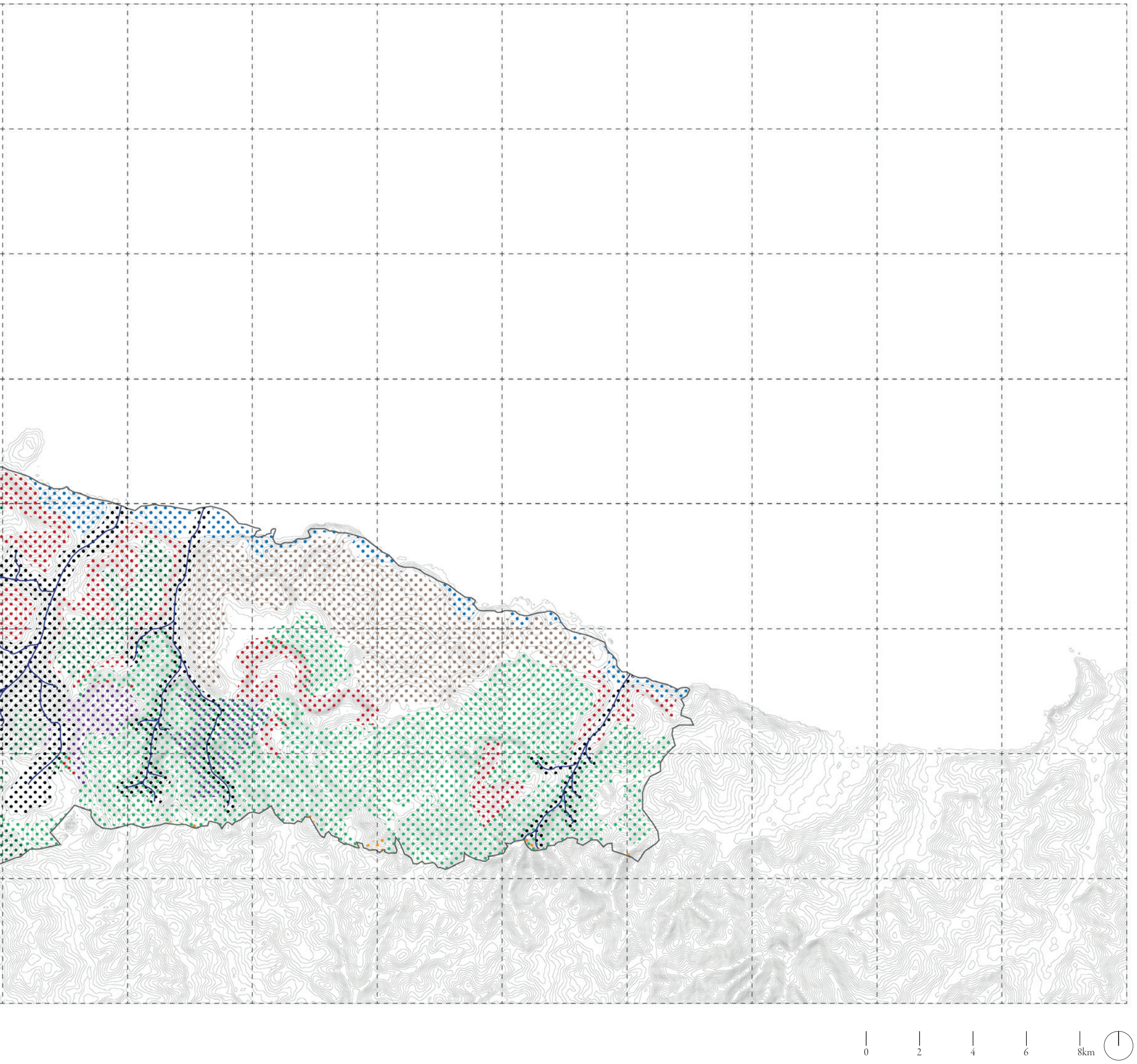
Reusing mining materials

Restoration of biomes

Preserving coastal areas

Connecting forest patches

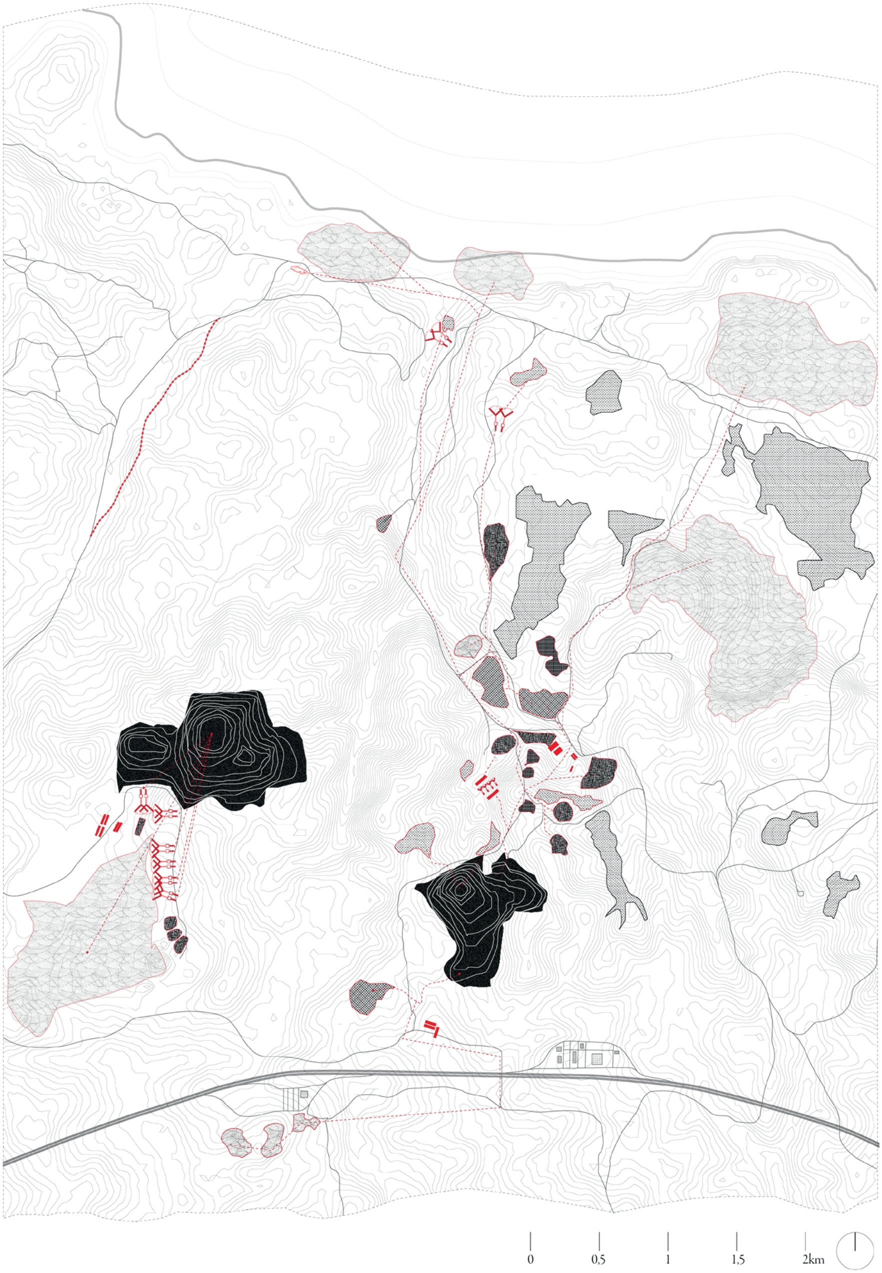
Establishing green corridors


0
2
4
6
8km

Current landscape logic

Coal is produced through the natural process of coalification, changing buried plant into harder coal types over time. The different coal types are, in order of increasing heat and pressure: peat, lignite, subbituminous, bituminous, anthracite.

Coal seams are formed over the course of millions of years, following geological formations in the crust of the Earth. Buried deep down, they are invisible and unknown. In search for coal, the earth is excavated through mathematical capitalist logic. Above ground, the coal is processed to sustain civilization's energy demand.
The mine operates the landscape according to a specific logic. The ground above the coal seam is excavated and relocated for the duration of the mining operation. The coal is extracted from the seam through a series of machines, ranging from the excavator, crusher, feeder and reclaimer into the further distribution across the territory.



Legend

Open pit mine	Hopper	Road
Crusher	Overburden	End pilt lakes
Feeder	Topsoil stacking	Slag
Reclaimer	Highway	Extracted coal

Design timeline

Infrastructure projects

Mine in operation

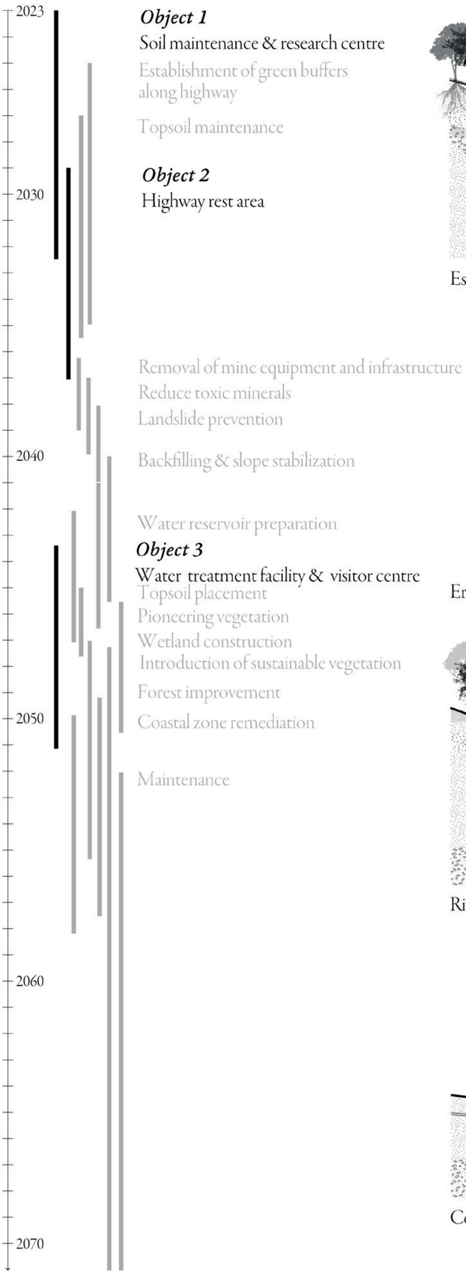
Istanbul Canal construction

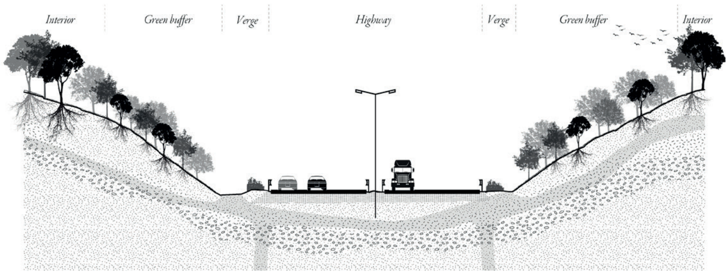
Istanbul Airport completion

Mine operation completed

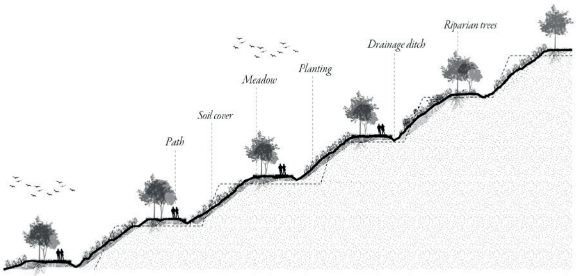
Mine closure

Remediation interventions

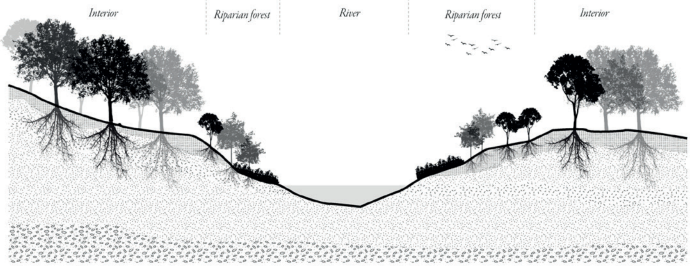




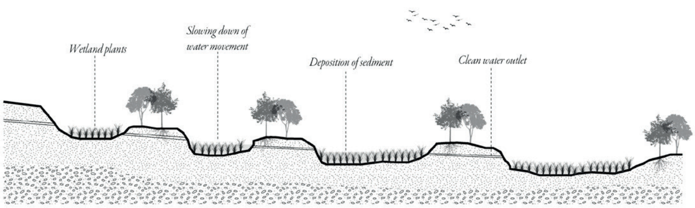
Establishment of green buffers along highway (Section A-A)



Erosion control & slope stabilization (Section B-B)



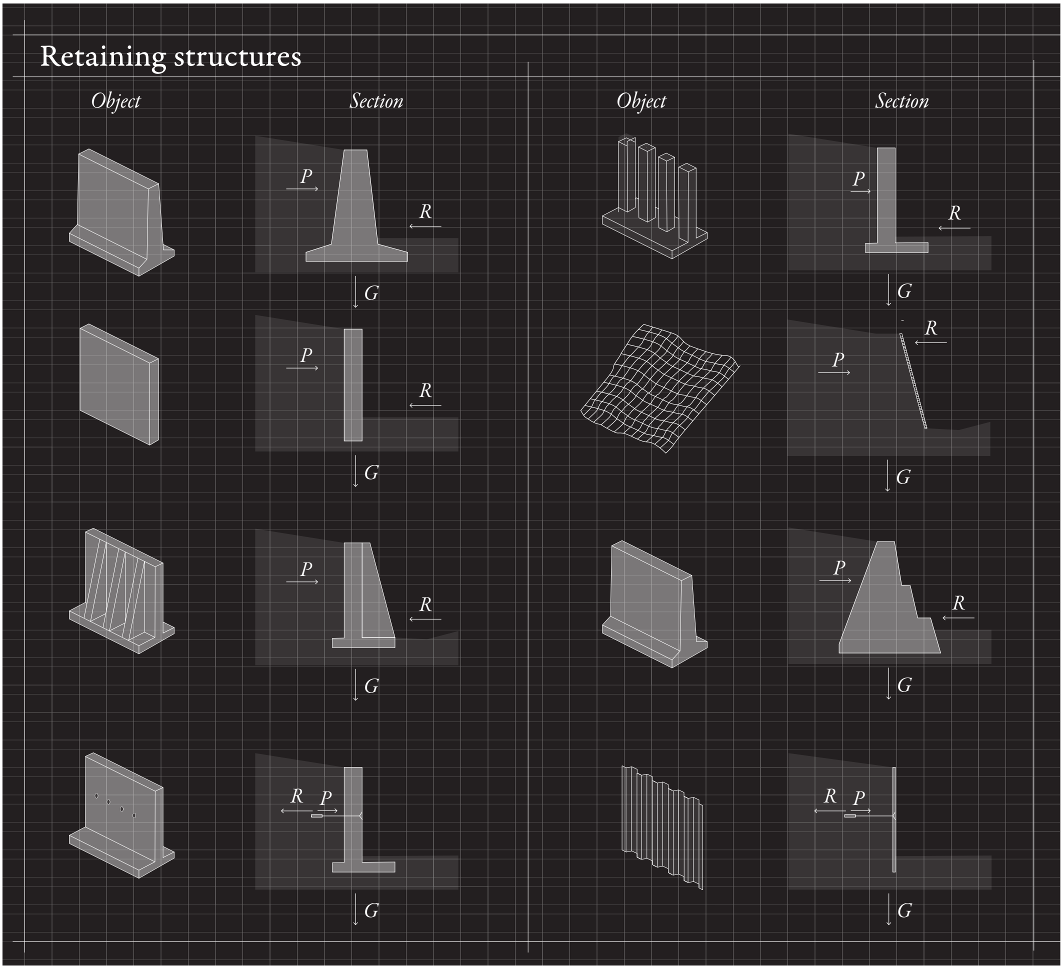
River corridors (Section C-C)



Constructed wetlands (Section (D-D)

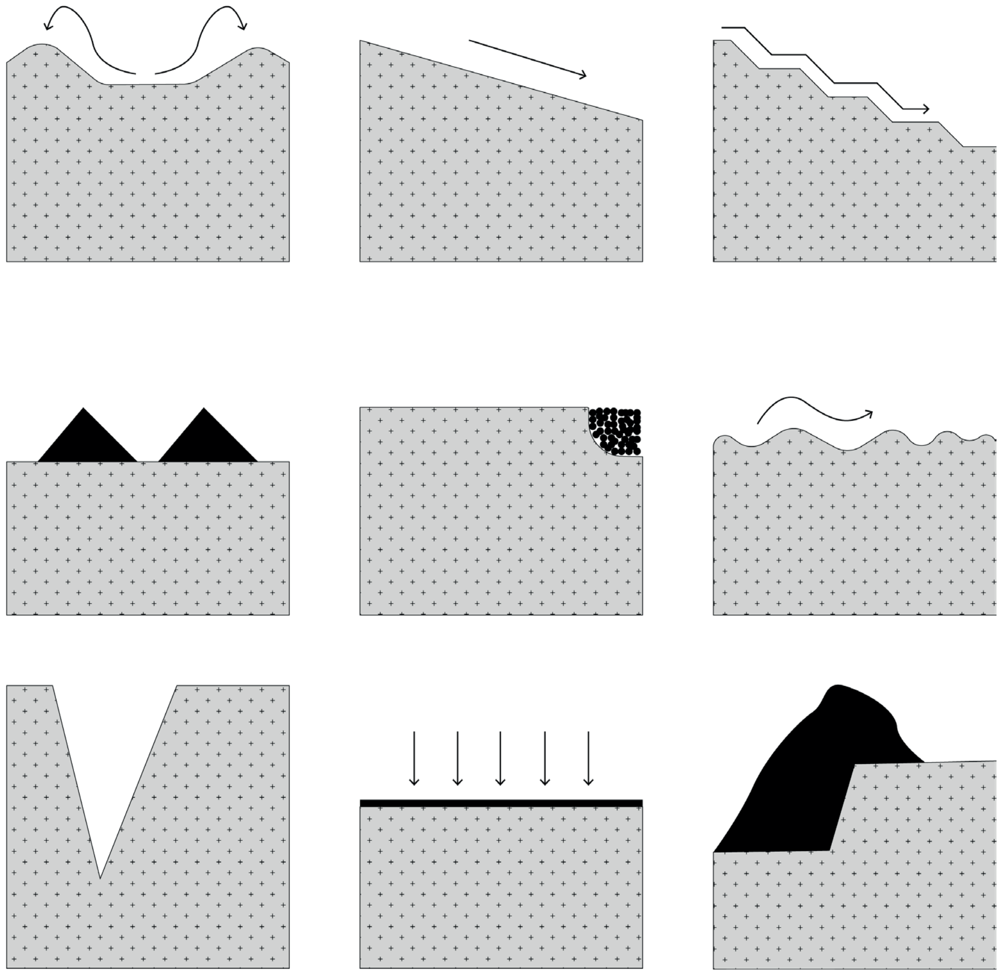
Retaining earth

Earth can be manipulated in different ways. Retaining walls are constructed to prevent soil erosion. Designed to restrain the earth, a retaining wall assists in creating a slope which would not be naturally possible. The structures are constructed to resist lateral pressures of earth when there is a desire for an elevation change which exceeds the angle of repose. The different types of retaining structures provide an opportunity to consider these objects as architectural elements. In this way, the retaining wall can add new meaning to the idea of territory and earth.



Landscape operations

Using the machinery of the earth, different landscape operations can be conducted. The creation of space using earth is often done by taking matter away, leaving a void. When perceiving the earth on the aspect of granular composition and dynamicity, a new angle can be introduced to designing and working with earth.

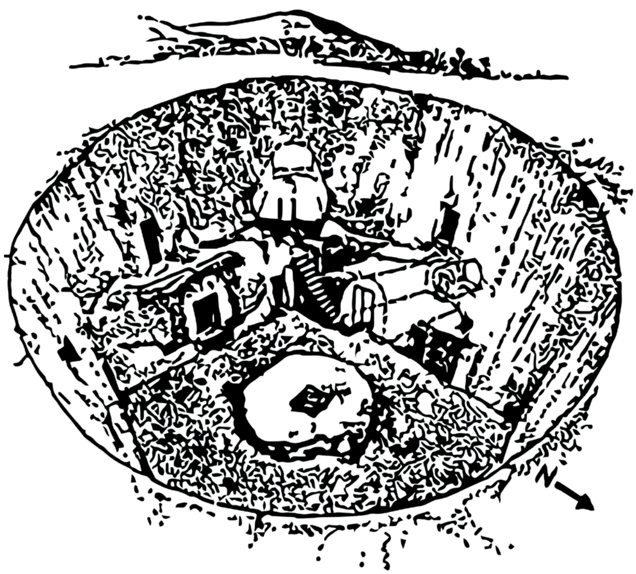


Object 1:

Topsoil maintenance centre

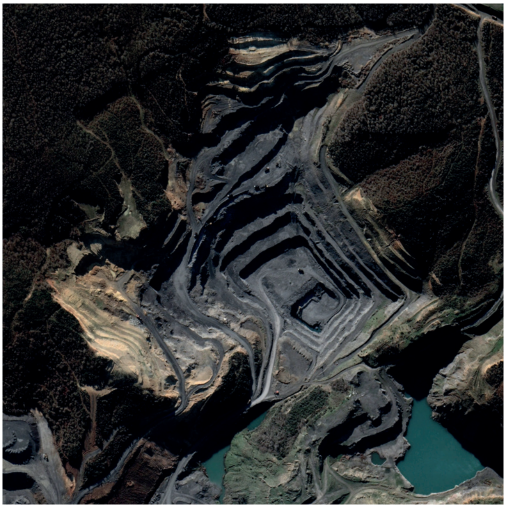
The upper 10 cm

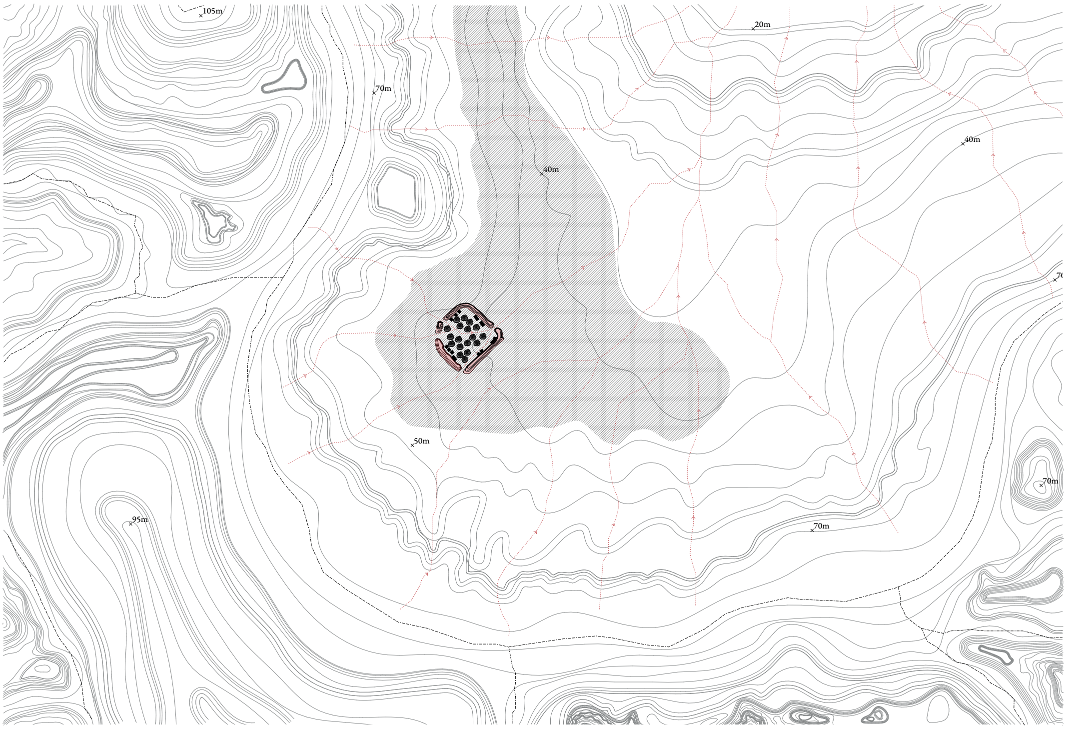
During the process of mining operations, the earth above the coal seam is excavated to reach the coal. The upper layer of the earth, the topsoil, is often stacked into large piles, degrading in organic quality over time. The intervention proposes to excavate part of the overburden landscape to provide a shelter and protection for the topsoil of excavated mines. The intervention is designed a sunken courtyard, where different ecological dykes define the perimeter. Within these dykes, different objects are situated, relating to the maintenance and development of the topsoil. The construction of the dyke is done using known machinery and objects, but puting these into different perspectives and compositions.



Vernacular sunken courtyard in Matmata (Aseem A, 2010)

Location

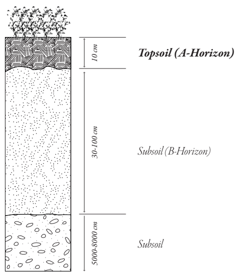




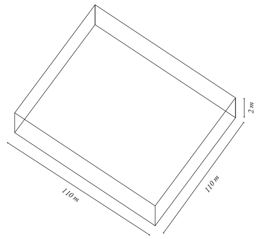
Establishing quantity

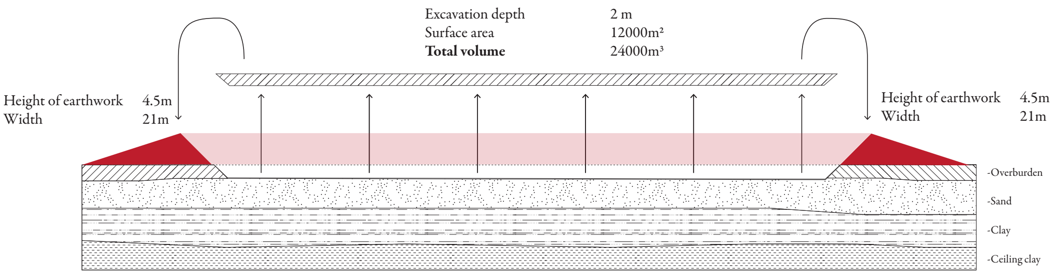
Mine surface area
240.000m²

Topsoil volume
24.000m³

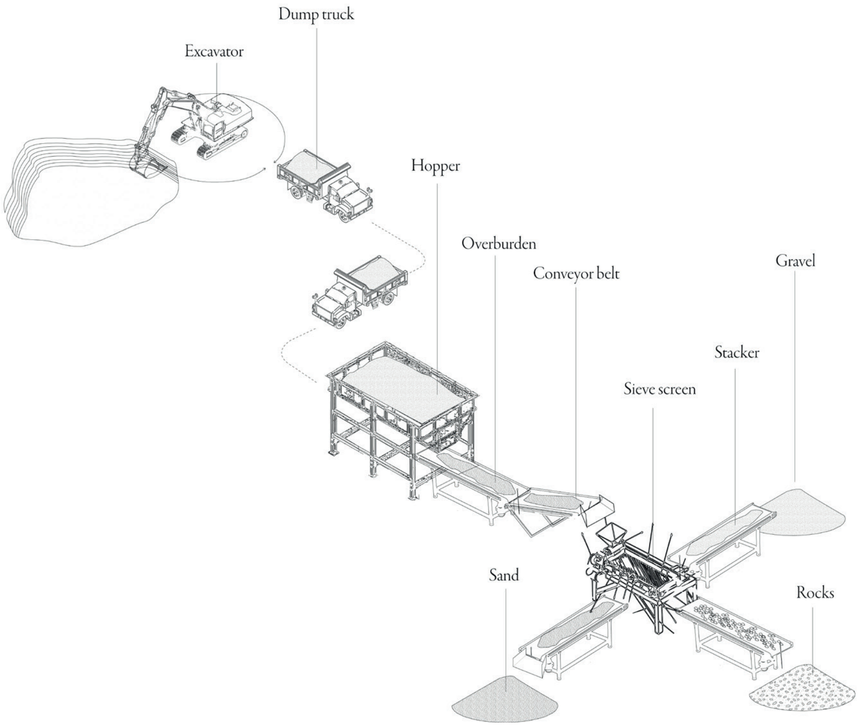


Topsoil storage surface
12.000m²

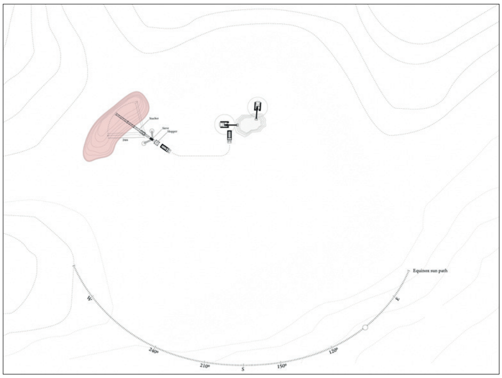


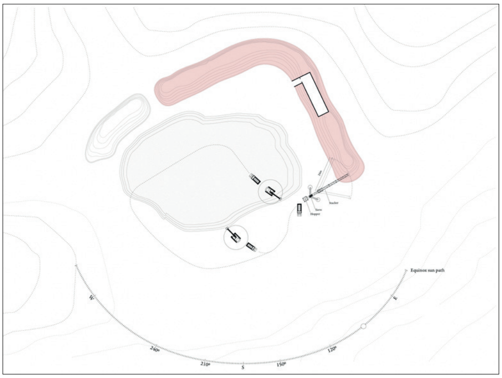


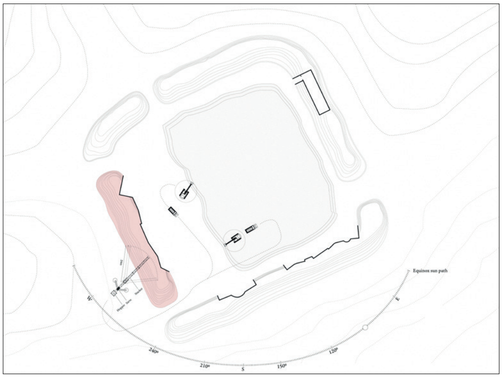
Machine logic

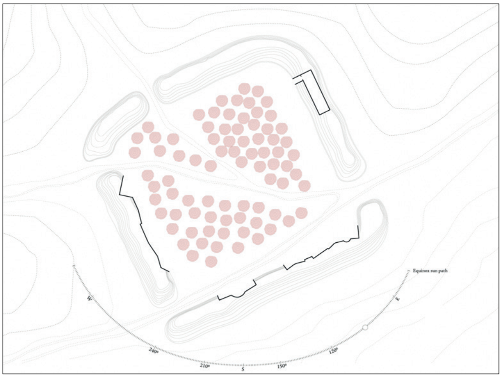


Build-up

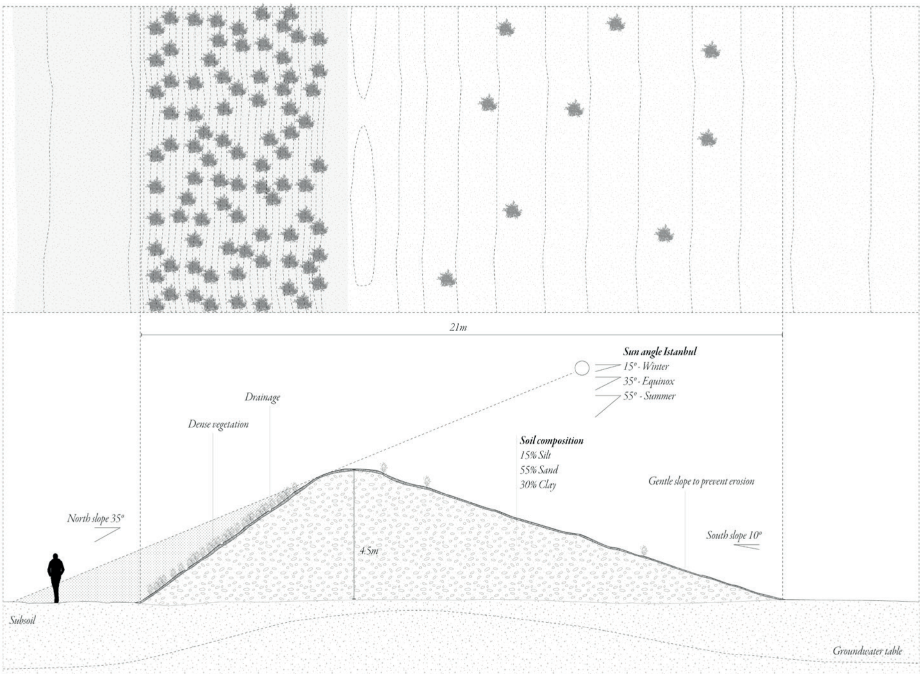

Equinox sun path
W
E
240°
210°
S
150°
120°


Equinox sun path
W
E
240°
210°
S
150°
120°

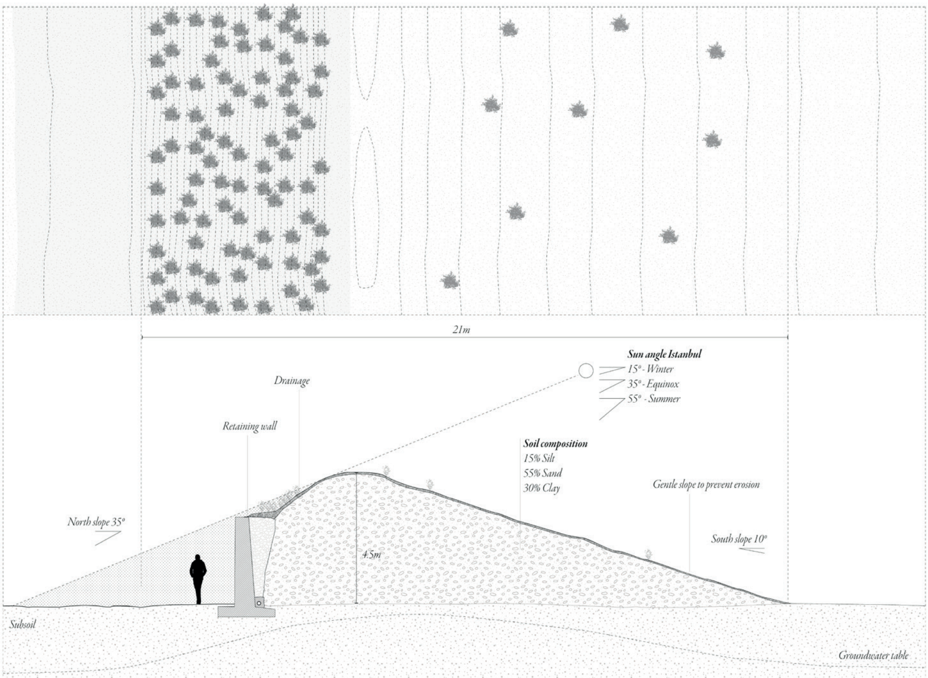

Equinox sun path
W
E
240°
210°
S
150°
120°


Equinox sun path
W
E
240°
210°
S
150°
120°

Dyke design



21m
Sun angle Istanbul
15° - Winter
35° - Equinox
55° - Summer
Drainage
Dense vegetation
Soil composition
15% Silt
55% Sand
30% Clay
Gentle slope to prevent erosion
North slope 35°
4.5m
South slope 10°
Subsoil
Groundwater table



21m
Sun angle Istanbul
15° - Winter
35° - Equinox
55° - Summer
Drainage
Retaining wall
Soil composition
15% Silt
55% Sand
30% Clay
Gentle slope to prevent erosion
North slope 35°
4.5m
South slope 10°
Subsoil
Groundwater table

Plan

Legend

1. Topsoil heaps
2. Walking paths

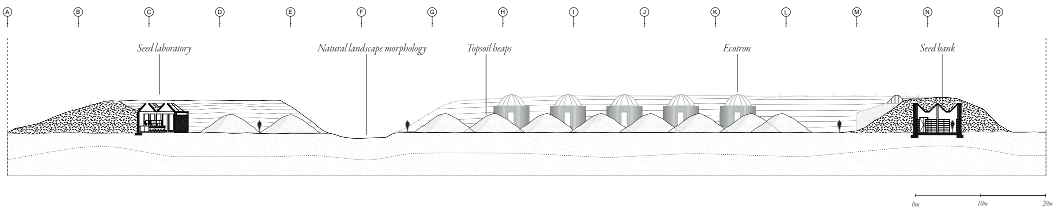
Seed bank
3. Entrance
4. Reception
5. MEP room
6. Access air lock
7. Seed archive

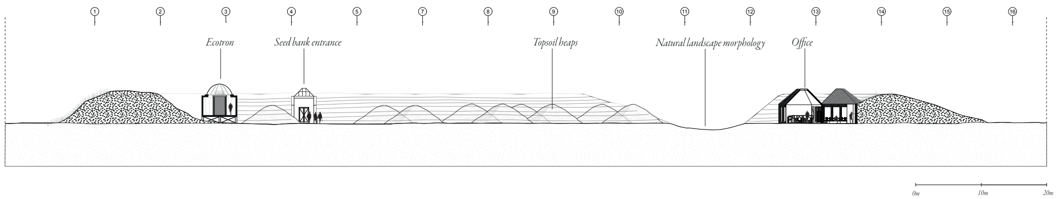
Maintenance
8. Machine garage
9. Workshop
10. Residu soil

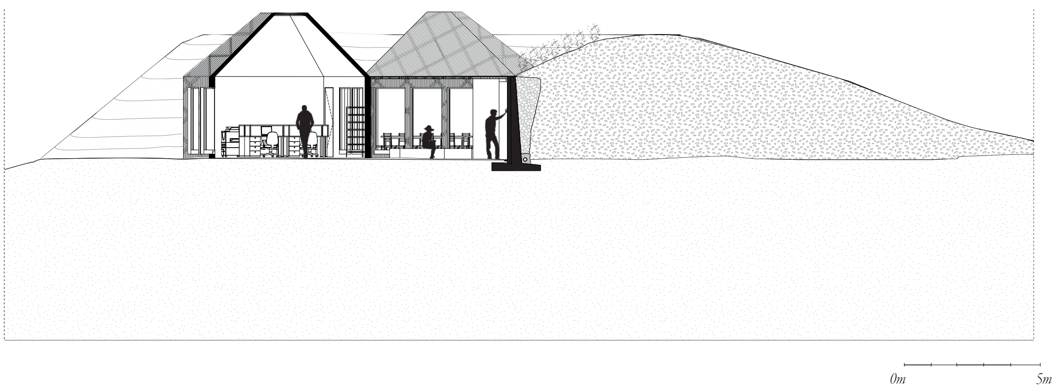
Office
11. Administration
12. Canteen
13. Office space
14. Meeting room
15. Toilets

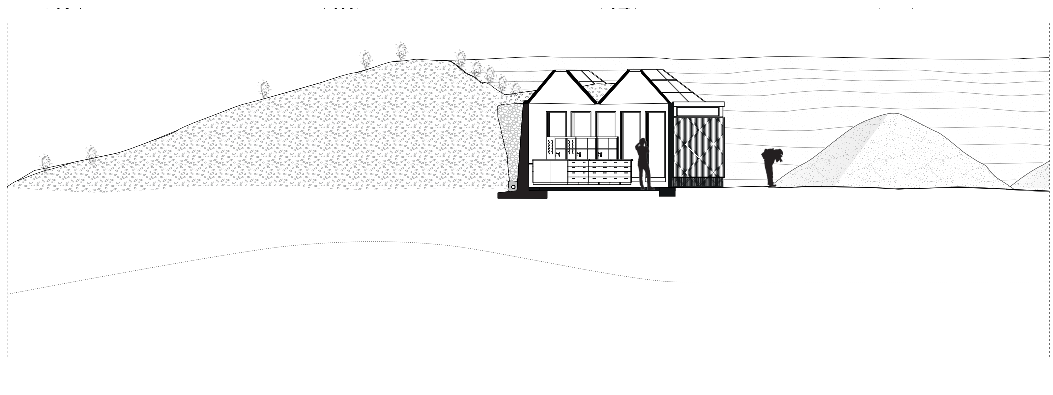
Laboratory
16. Reception
17. MEP room
18. Toilet
19. Storage & Server room
20. Microscopy
21. Germination laboratory
22. Meeting room
23. Seed laboratory
24. Cleaning room
25. Growth room
26. Ecotrons

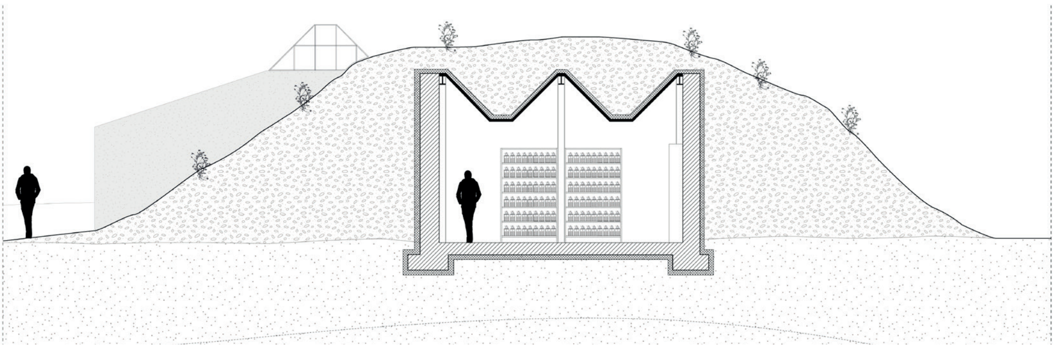
Sections

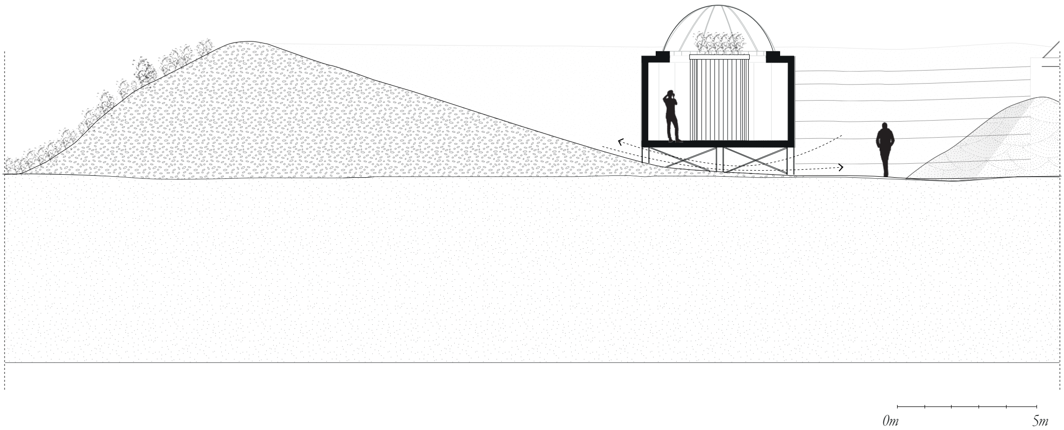

A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
Seed laboratory
Natural landscape morphology
Topsoil heaps
Ecotron
Seed bank
0m
10m
20m


1
2
3
4
5
7
8
9
10
11
12
13
14
15
16
Ecotron
Seed bank entrance
Topsoil heaps
Natural landscape morphology
Office
0m
10m
20m

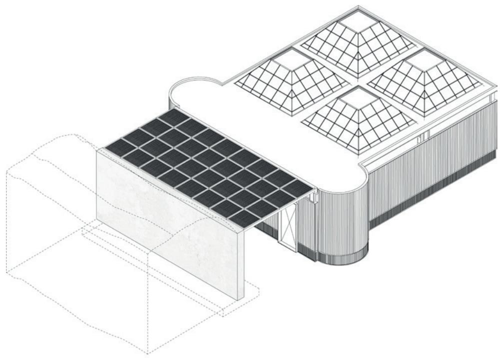

0m
5m



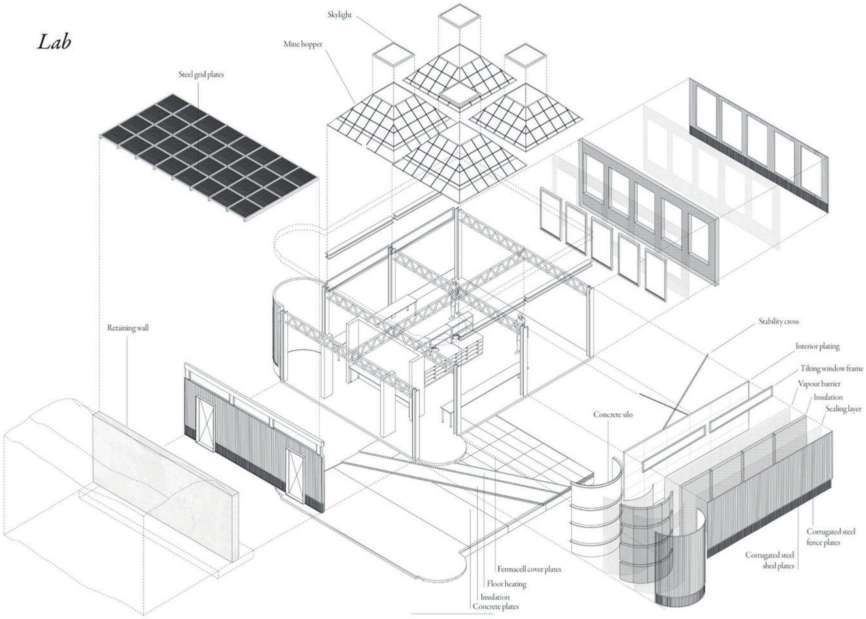



0m
5m

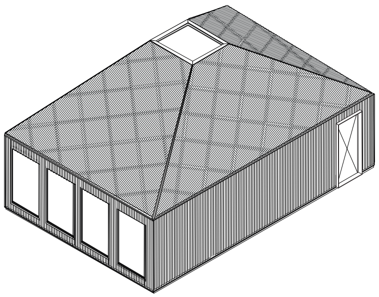
Laboratory

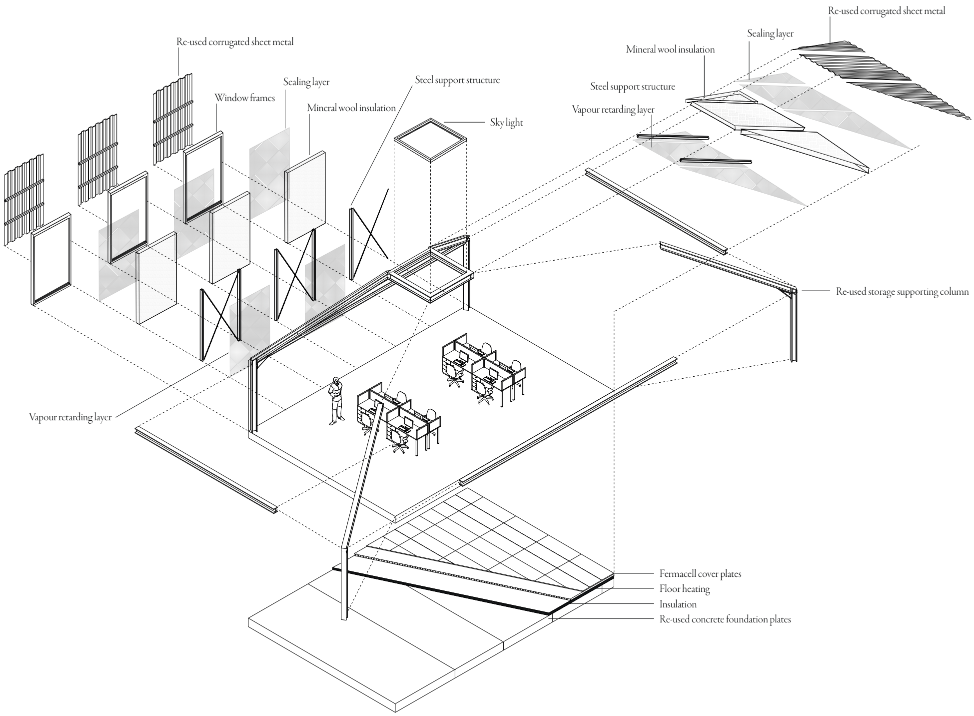


Lab

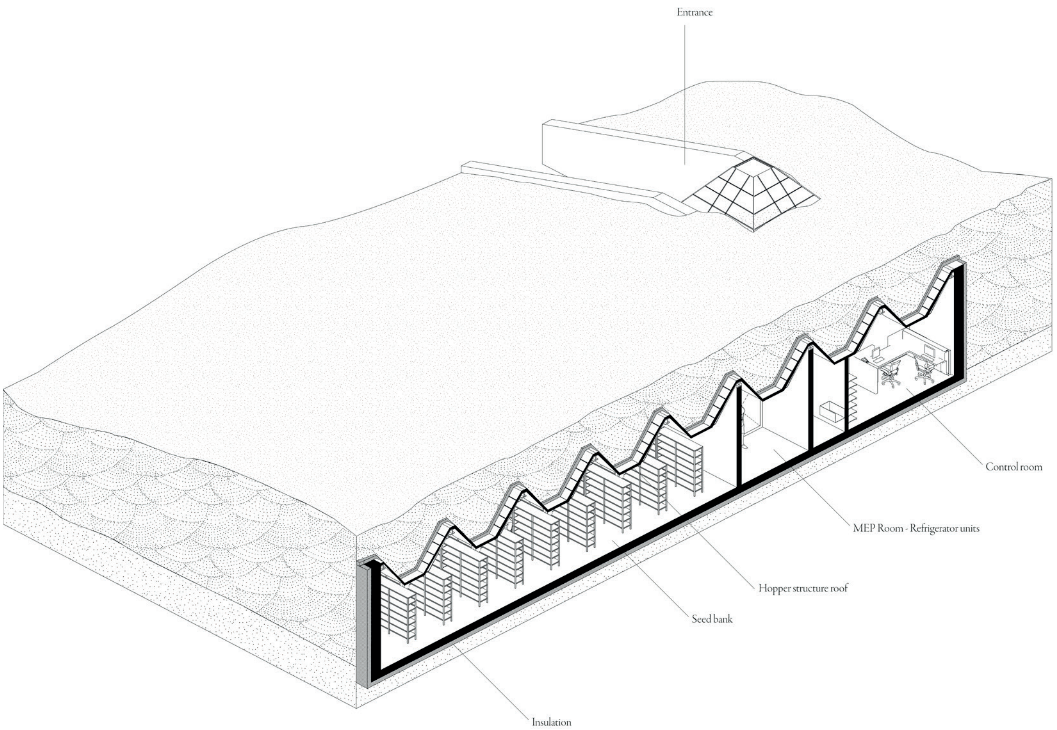


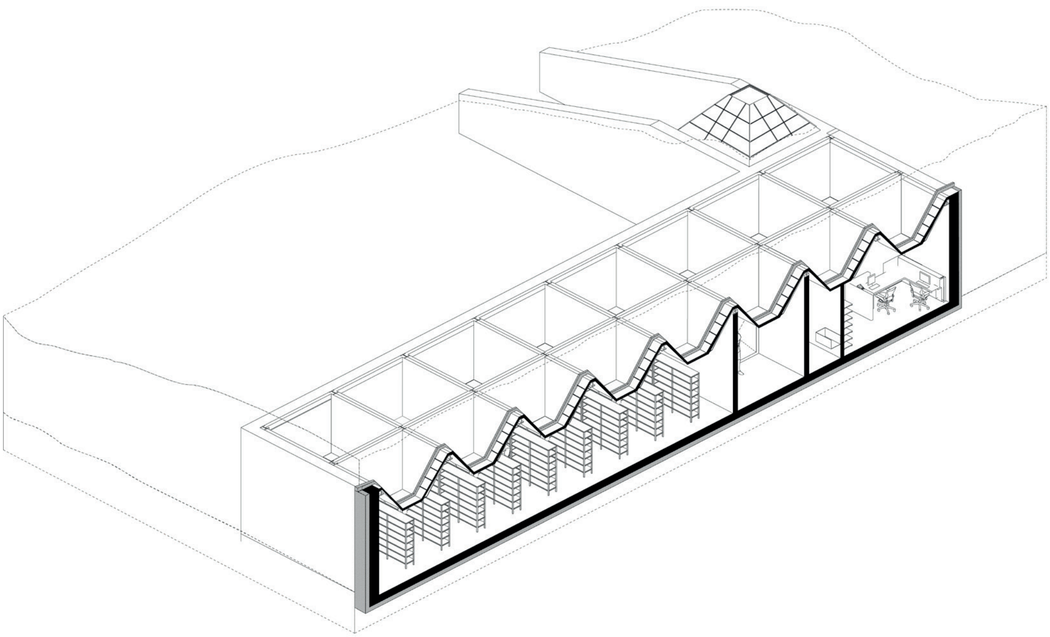
Office



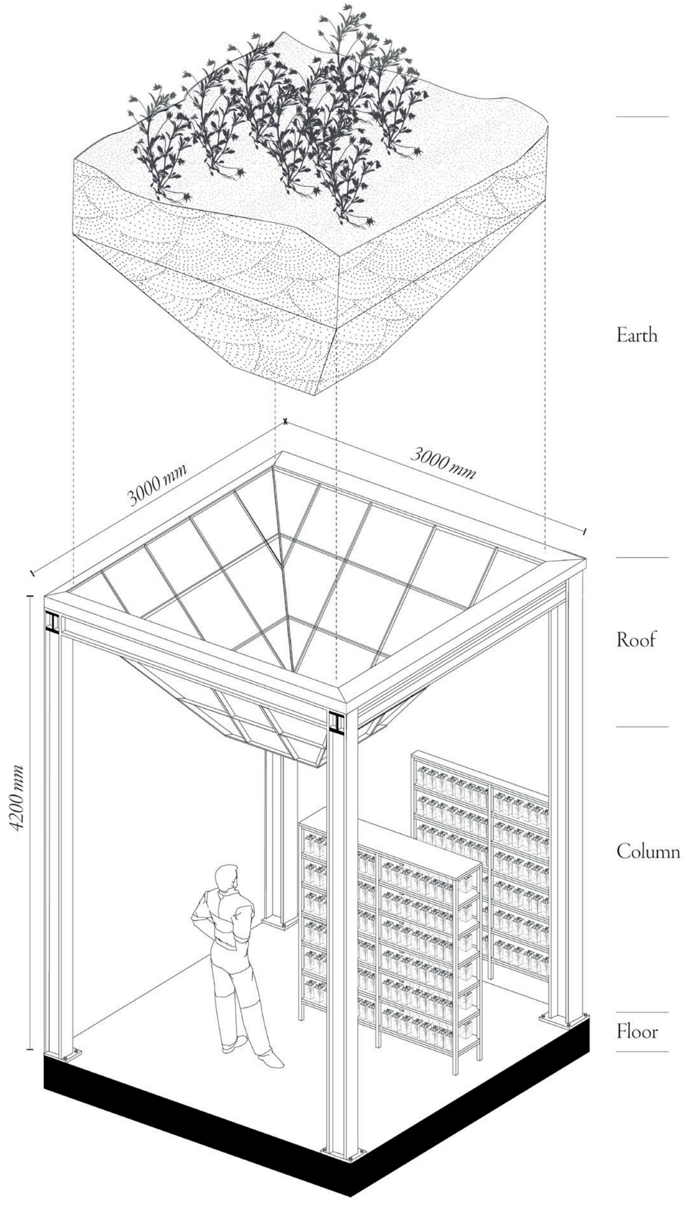

Re-used corrugated sheet metal
Window frames
Sealing layer
Mineral wool insulation
Steel support structure
Sky light
Vapour retarding layer
Re-used corrugated sheet metal
Sealing layer
Mineral wool insulation
Steel support structure
Vapour retarding layer
Re-used storage supporting column
Fermacell cover plates
Floor heating
Insulation
Re-used concrete foundation plates

Seed bank

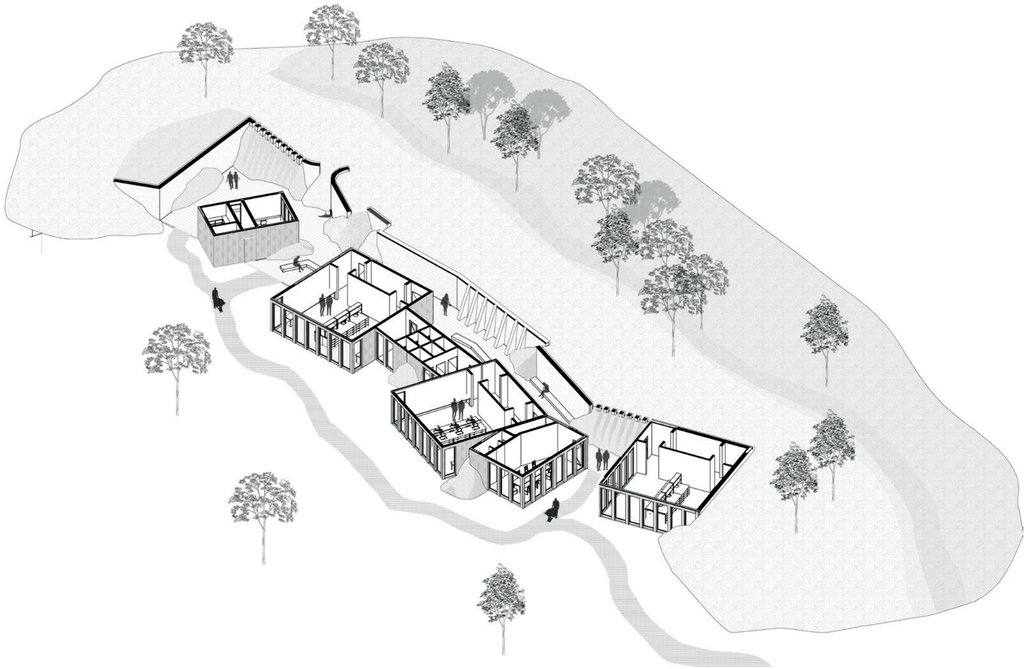

Entrance
Control room
MEP Room - Refrigerator units
Hopper structure roof
Seed bank
Insulation

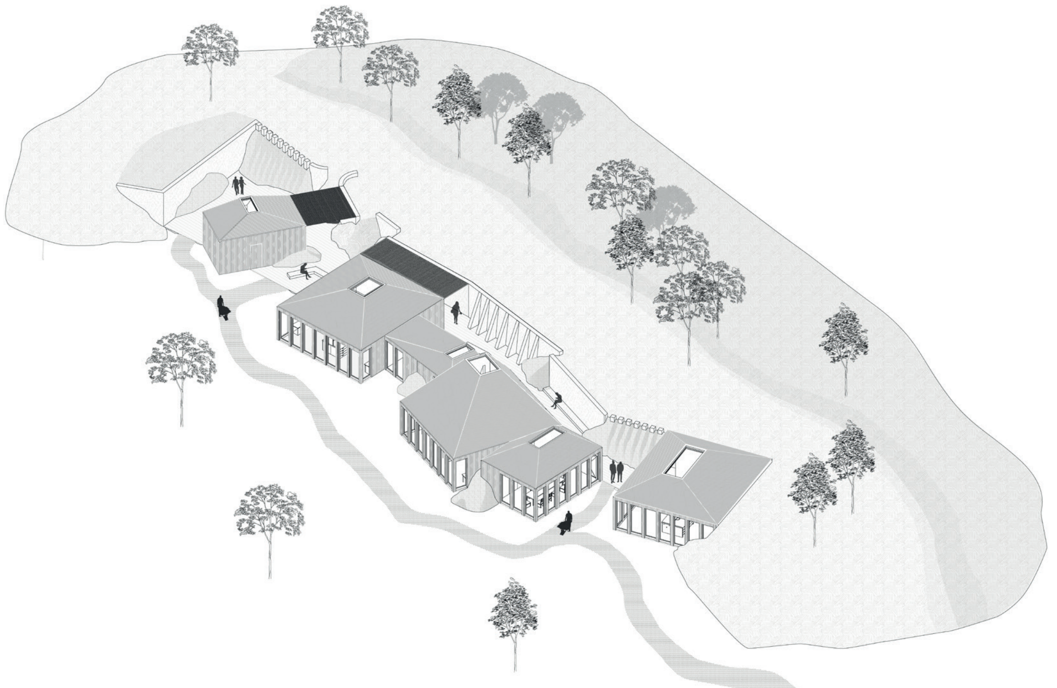


Seed bank - Element



Overview





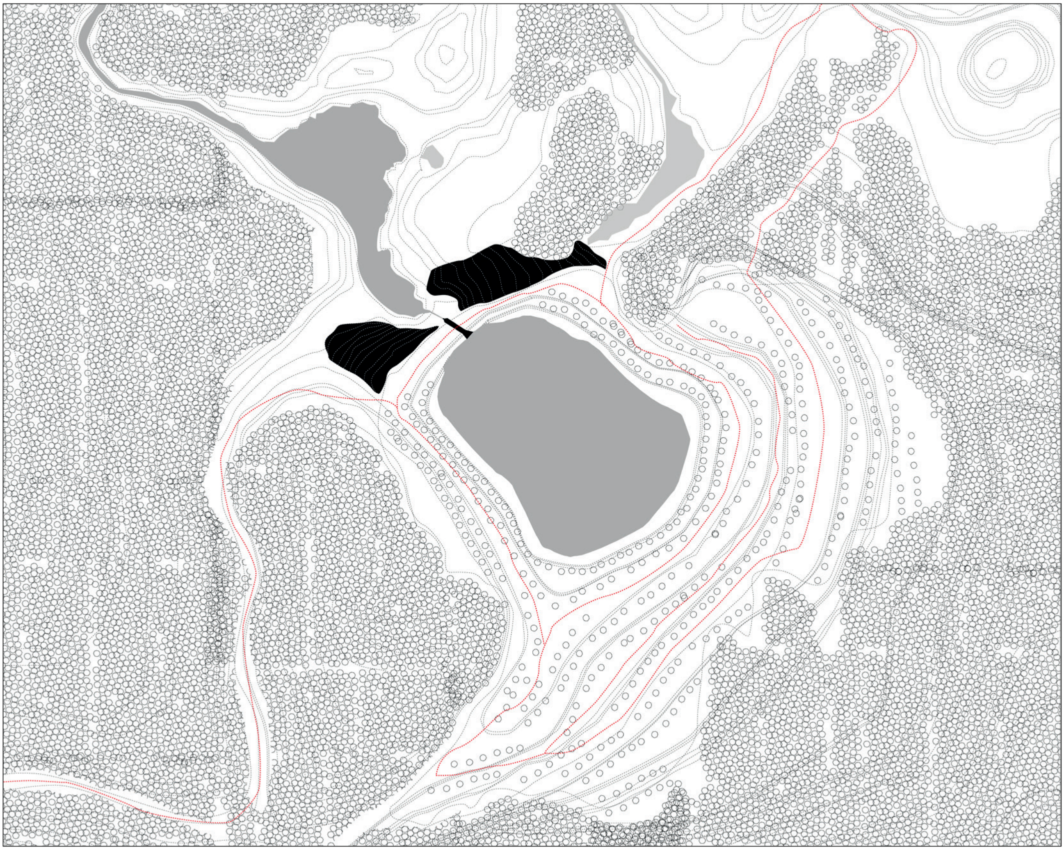
Object 2:

Water treatment facility

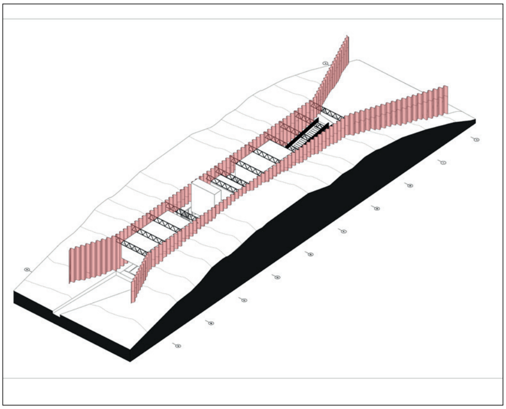
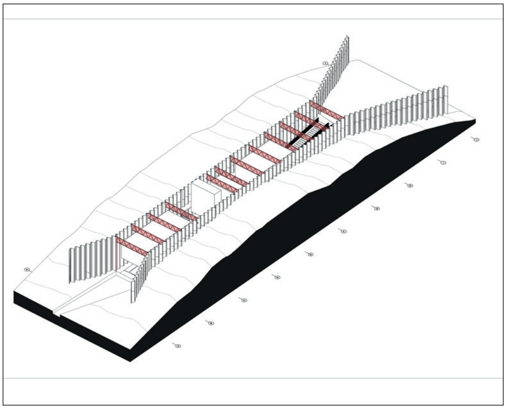
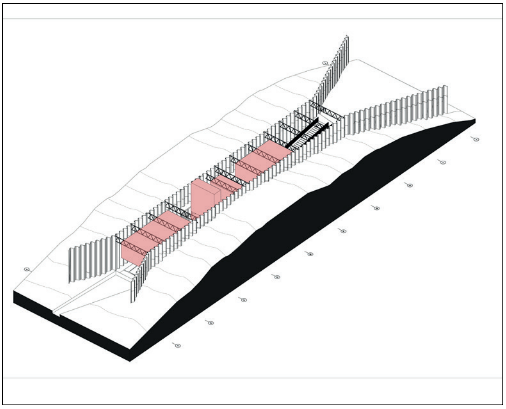
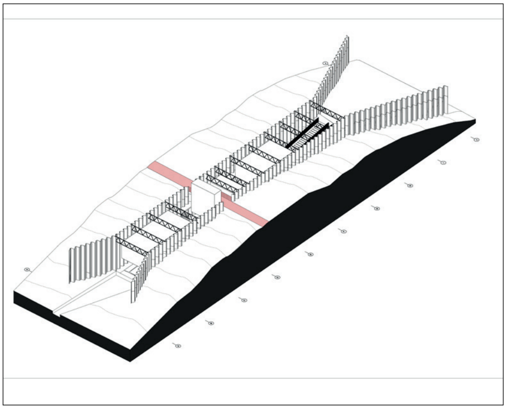
Acidic matter

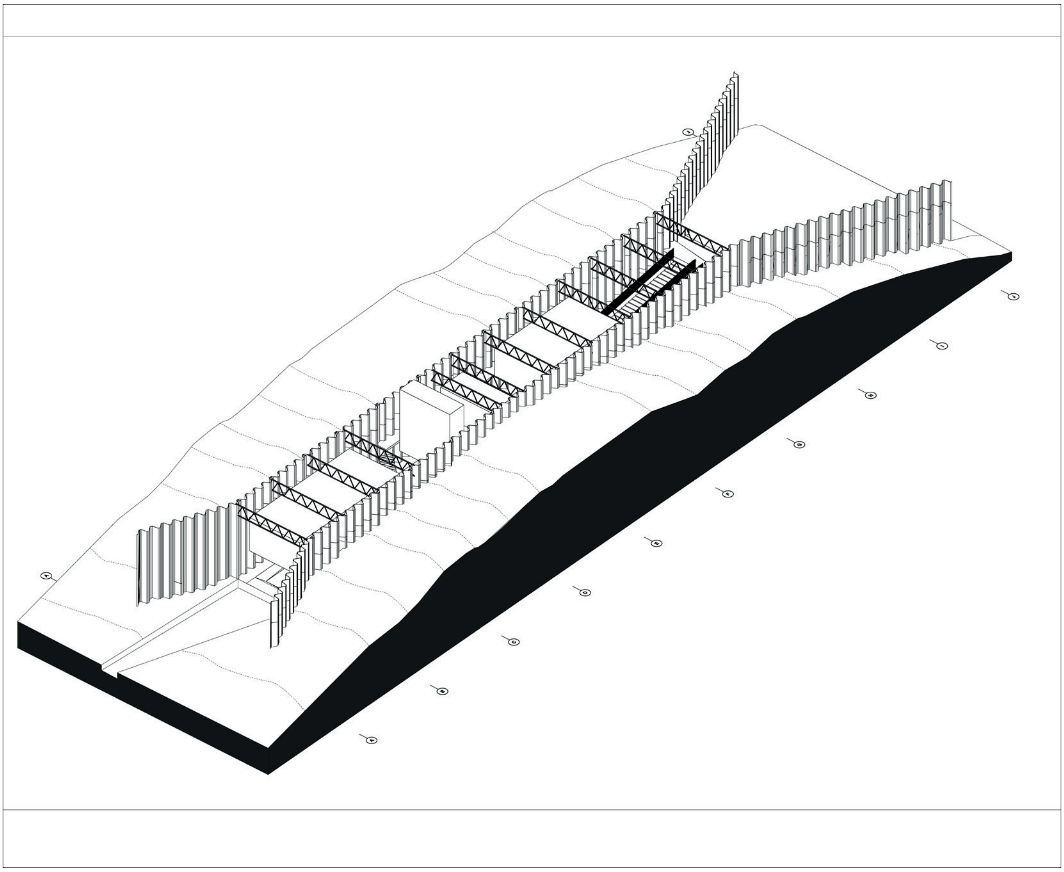
When the mine will close it's operations in 8-10 years, the usual sequence of events involves backfilling the hole with overburden to cover the exposed seam. This results consequently in the development of end-pit lakes, which causes contaminant waters to exist due to the exposure to metals and pollutants in the ground from the mining. The mine currently in operations is connected to an important water body feeding the larger territory. During the recovery of the overburden, an opportunity arises to change the topographics of the mine and construct a water treatment facility. The object acts as a plug to filter the water in a natural way and dispose the treated water into the river behind. The object is created through the retaining of earth using sheet piling to push and retain the earth. The object has 3 levels: a natural cleaning level, a visitor centre and an entrance.

Build-up

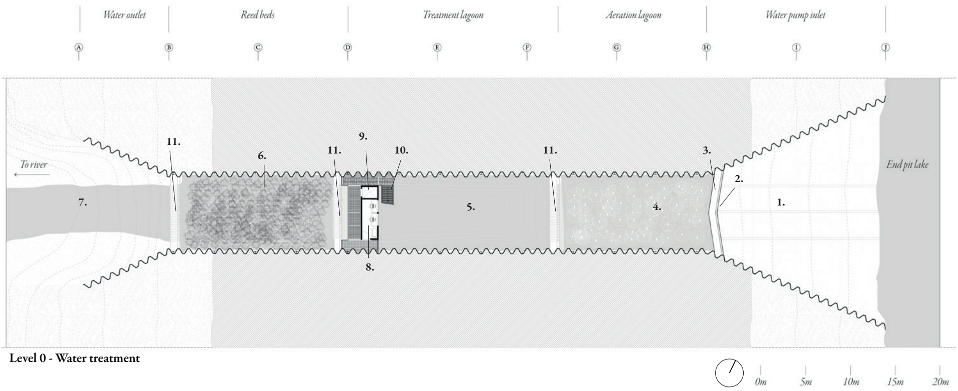


Object design

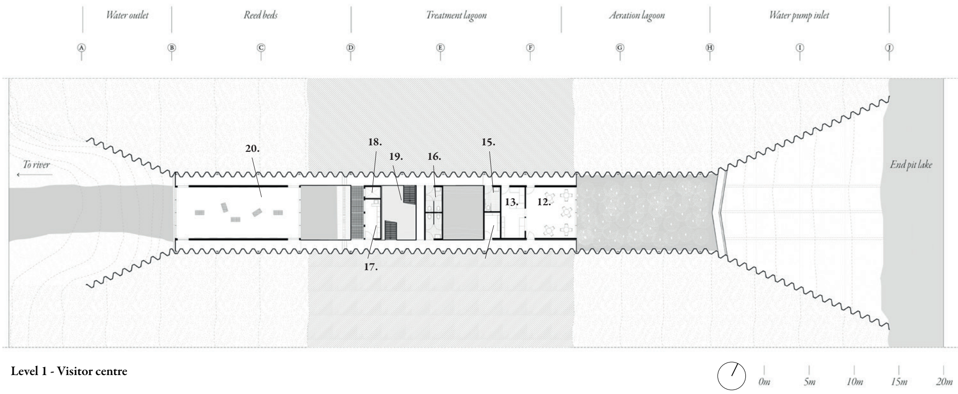







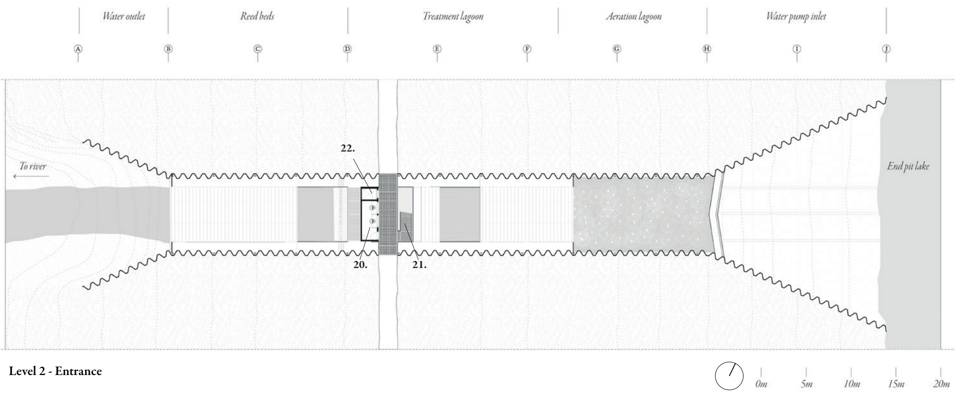
Floorplans



Level 0 - Water treatment



Level 1 - Visitor centre



Level 2 - Entrance

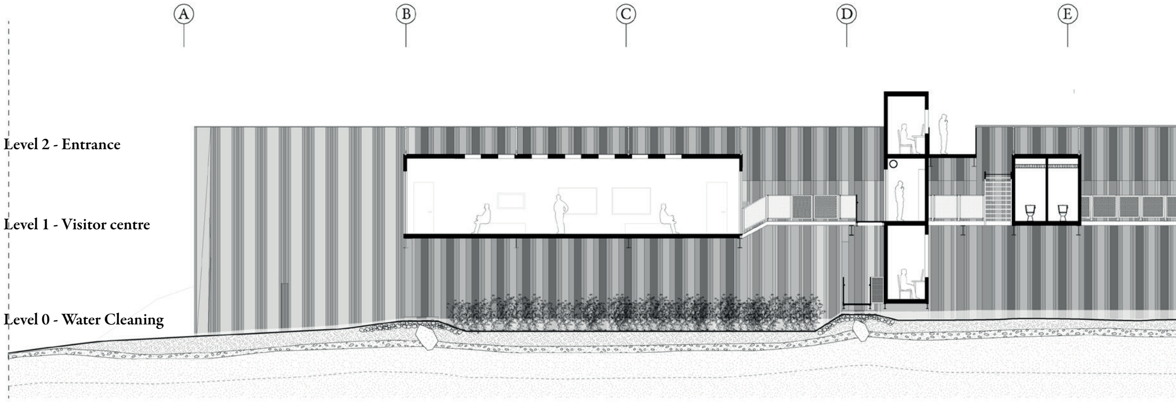
Legend

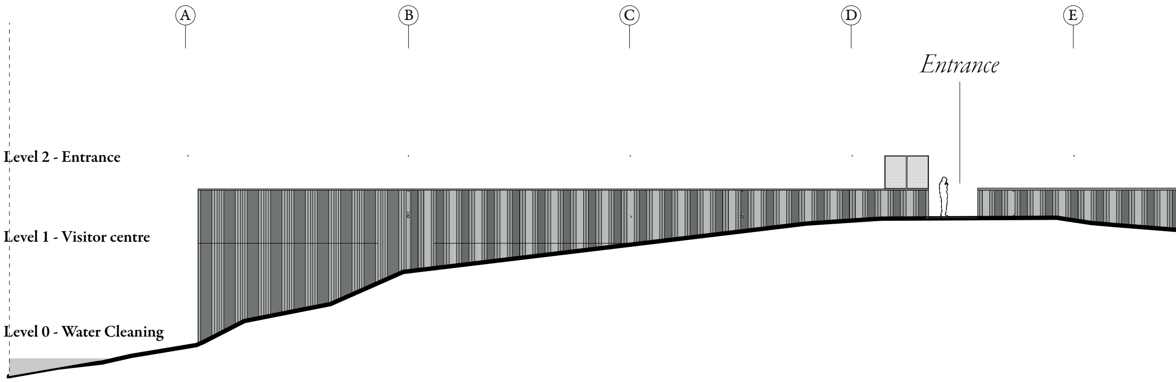
Level 0
1. Water pumps
2. Inlet
3. Retaining wall
4. Aeration
5. Treatment
6. Reed beds
7. Outlet
8. Control room
9. Lift
10. Stairs
11. Filter

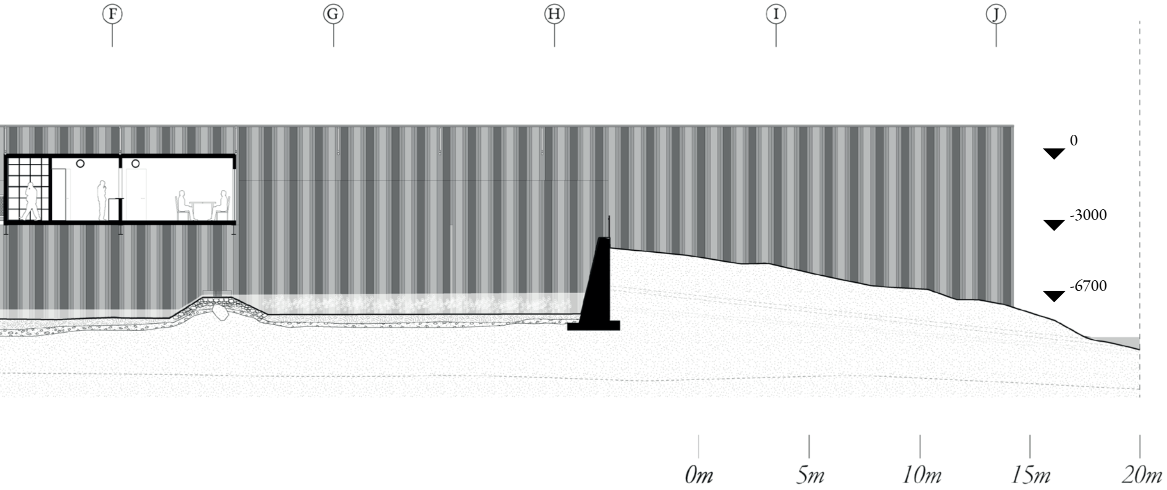
Level 1
12. Cafe
13. Kitchen
14. Storage
15. Disabled toilet
16. Toilet
17. Shop
18. Lift
19. Stairs
20. Exhibition

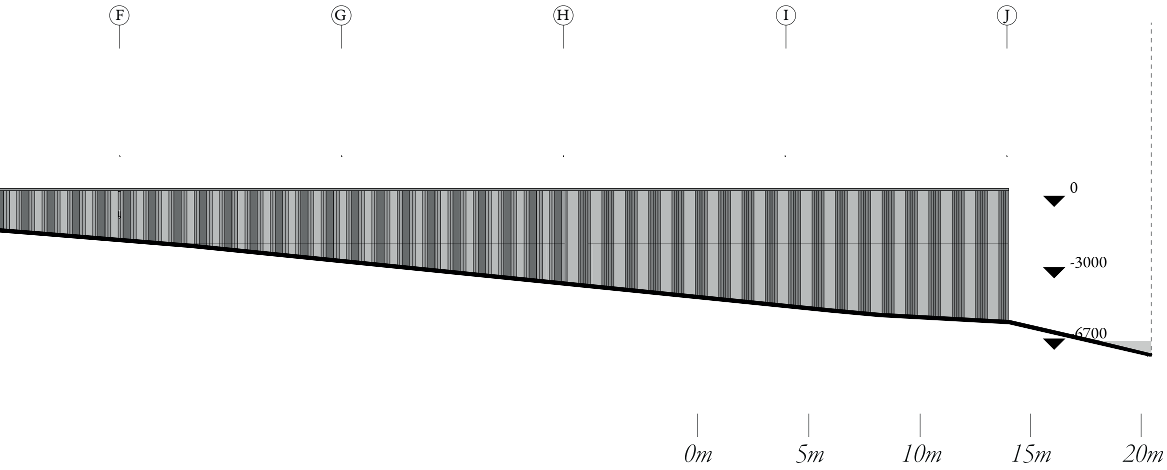
Level 2
20.Reception
21. Stairs
22. Lift

Sections

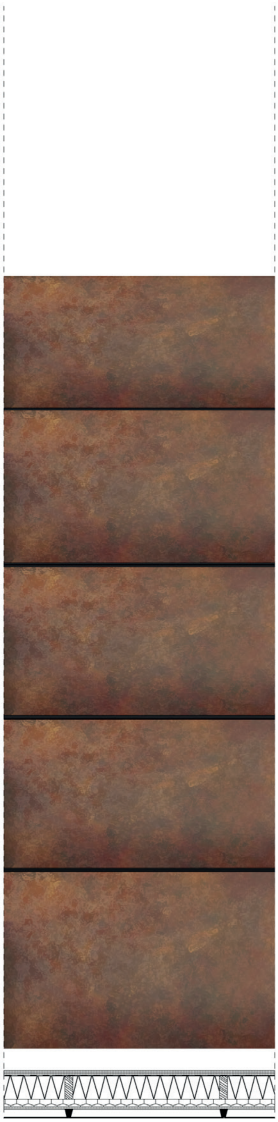

A
B
C
D
E
Level 2 - Entrance
Level 1 - Visitor centre
Level 0 - Water Cleaning

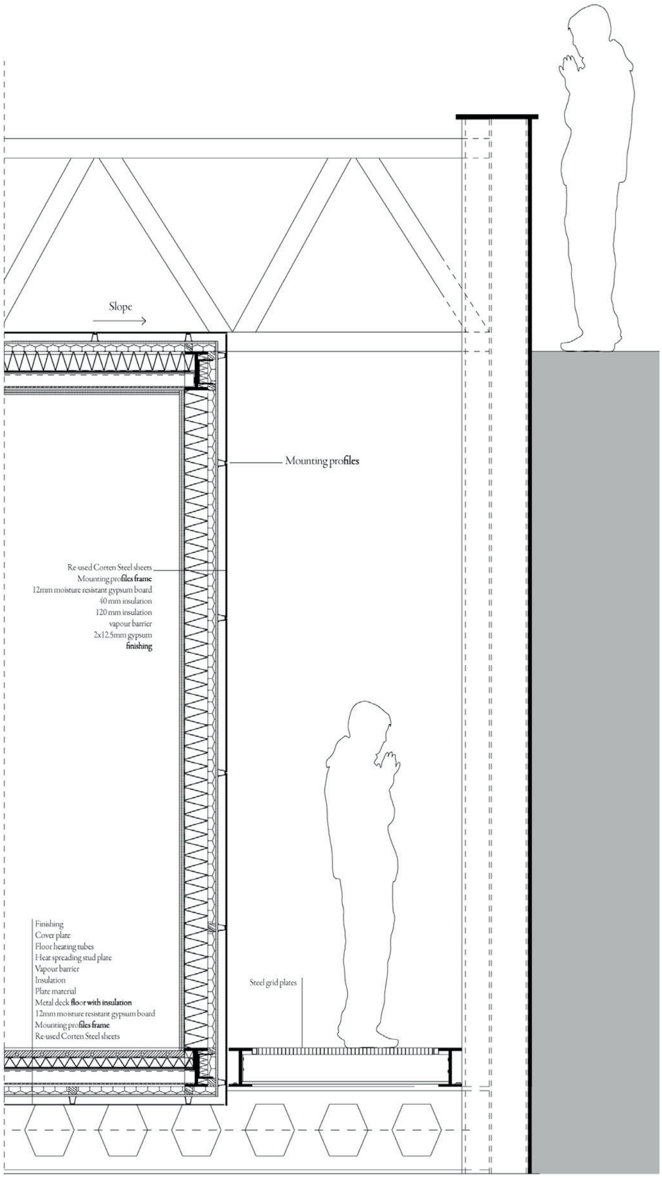

A
B
C
D
E
Entrance
Level 2 - Entrance
Level 1 - Visitor centre
Level 0 - Water Cleaning


F
G
H
I
J
0
-3000
-6700
0m
5m
10m
15m
20m


F
G
H
I
J
0
-3000
-6700
0m
5m
10m
15m
20m

Details




Slope
Mounting profiles
Re-used Corten Steel sheets
Mounting profiles frame
12mm moisture resistant gypsum board
40 mm insulation
120 mm insulation
vapour barrier
2x12.5mm gypsum
finishing
Steel grid plates
Finishing
Cover plate
Floor heating tubes
Heat spreading stud plate
Vapour barrier
Insulation
Plate material
Metal deck floor with insulation
12mm moisture resistant gypsum board
Mounting profiles frame
Re-used Corten Steel sheets

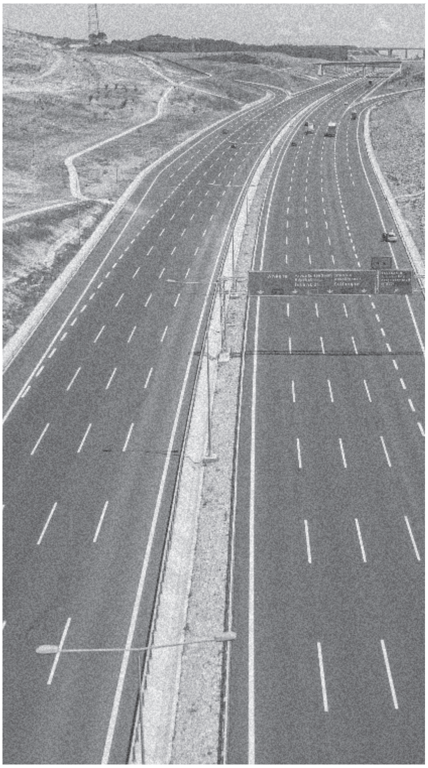
Object 3:

Highway rest stop

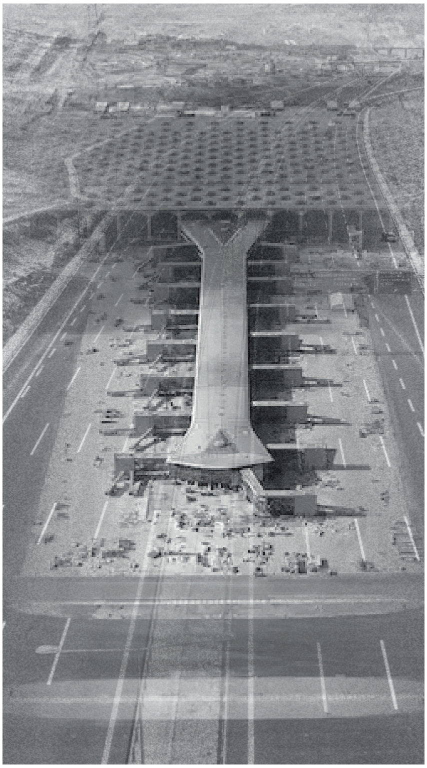
Sensory perception

The highway rest stop considers all the ecologies in the site. Different infrastructural operations have influenced the site in their own way. The objects seeks to design a panorama of earthworks, which acts as a storage for different types of soil and trees, which at the same time form the load bearing structure for the roof. The interaction between synthetic and non-synthetic architecture provides a dynamic object which is constantly in change depending on time of year, weather, climate etc. Visitors can take a break from the flowscape of the highway and wonderr at the panorama of the landcape, visible through the systems of the soil.

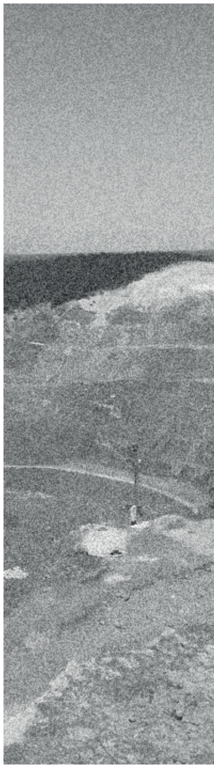
Panorama of different ecologies



Highway



Airport



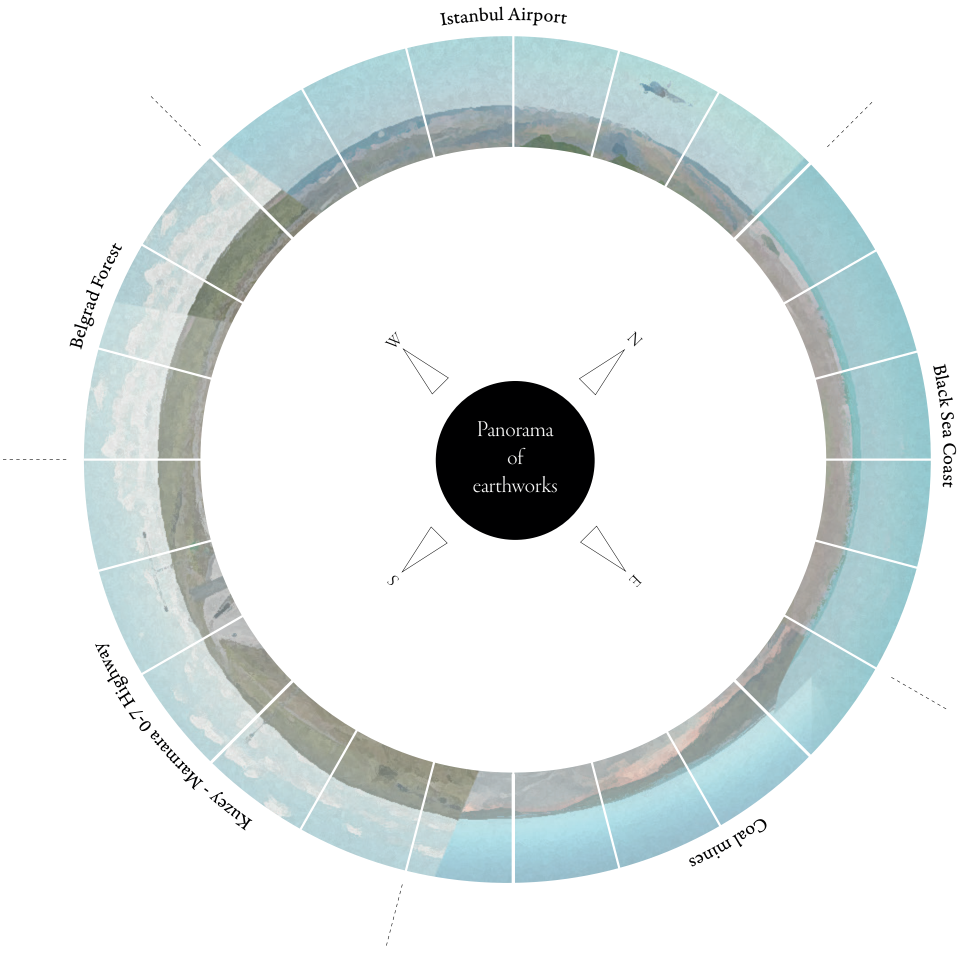
Mi

nes

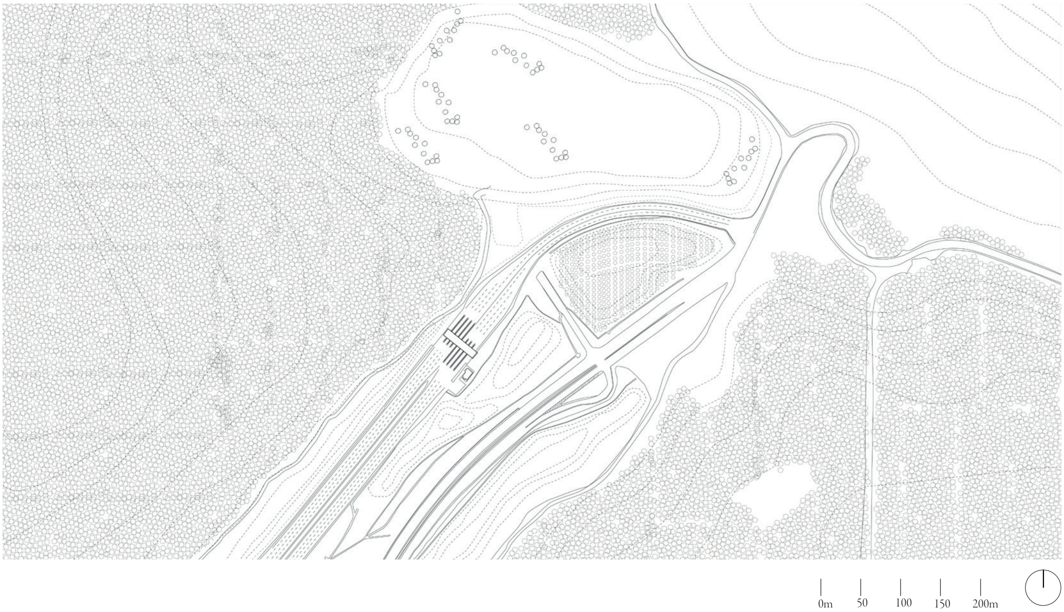
Black Sea coast

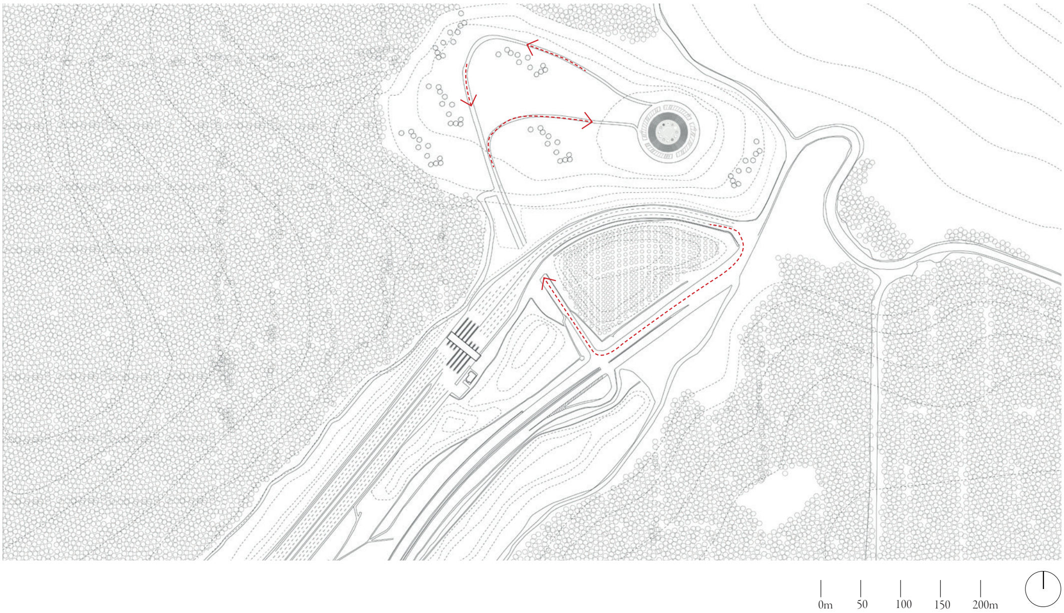
Belgrade Forest

Panorama of earthworks

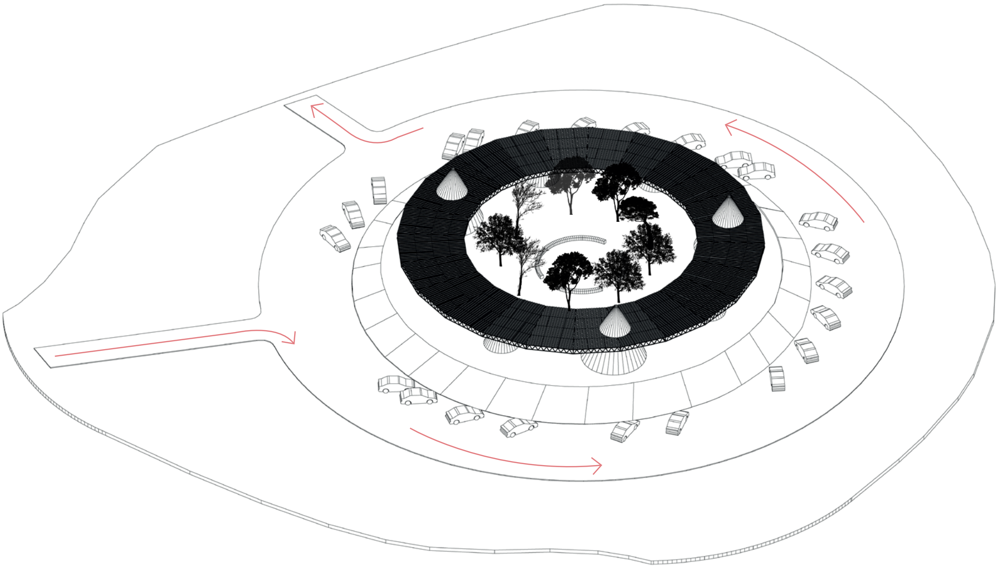


Build-up

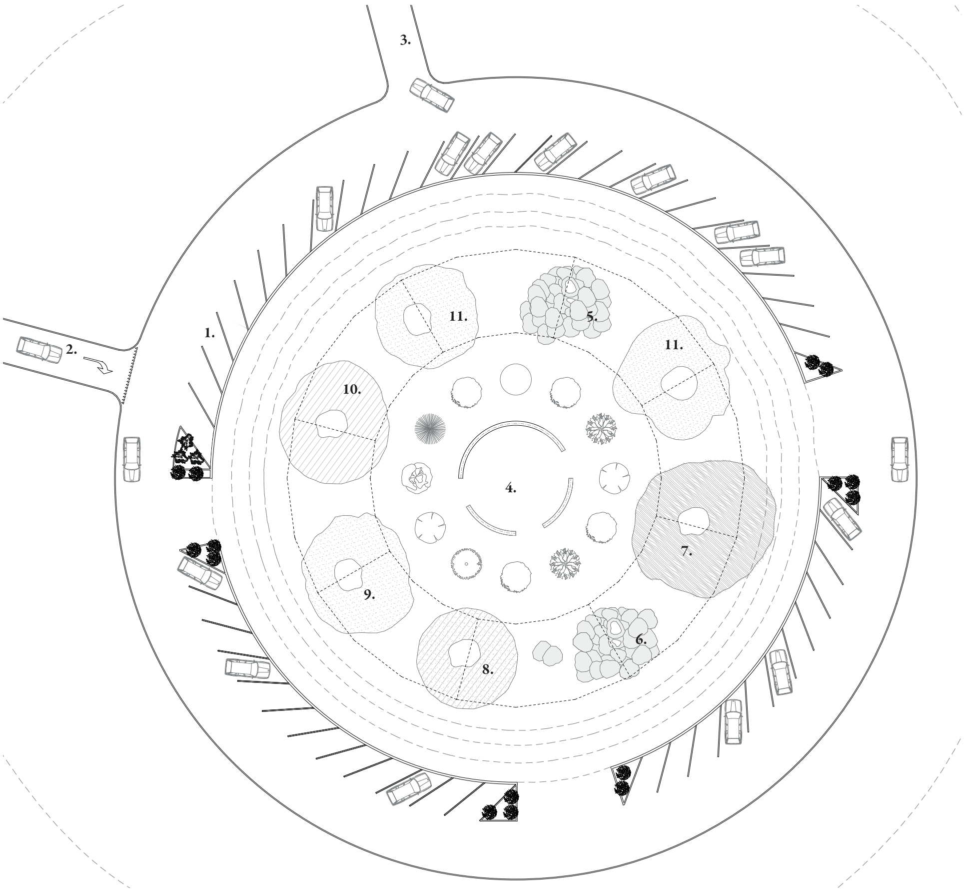




Pausing the flowscape



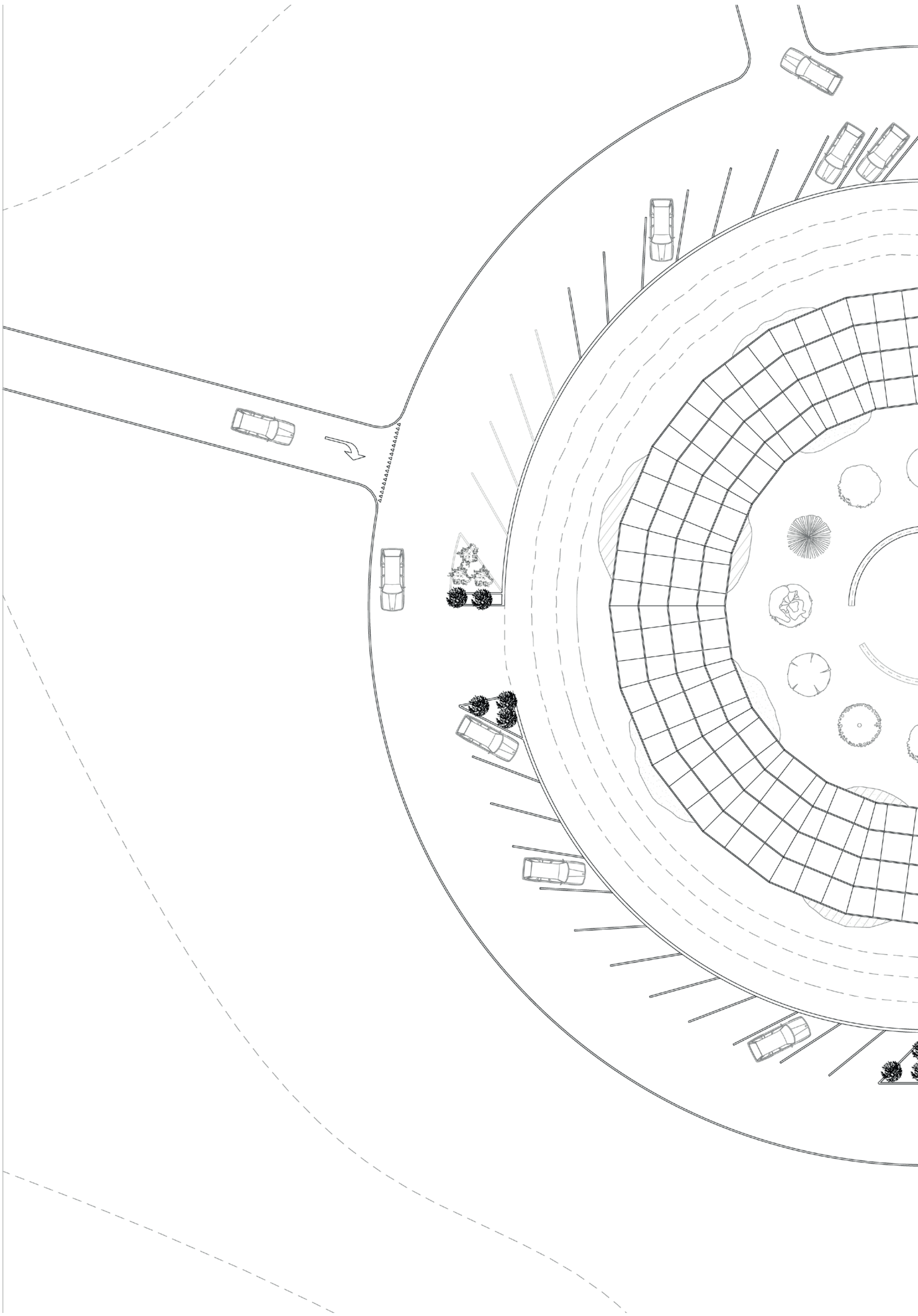
Floorplans

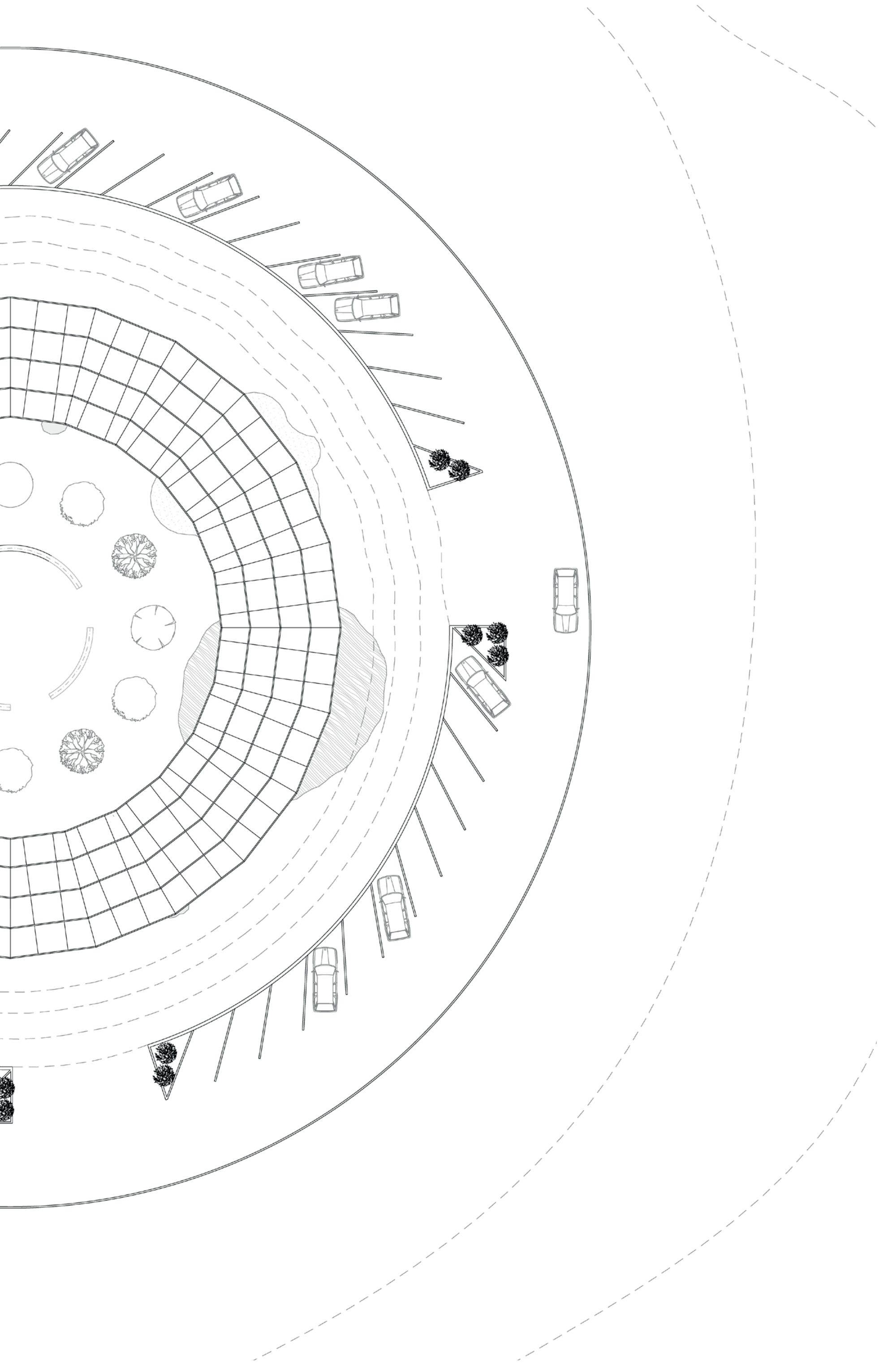


Legend

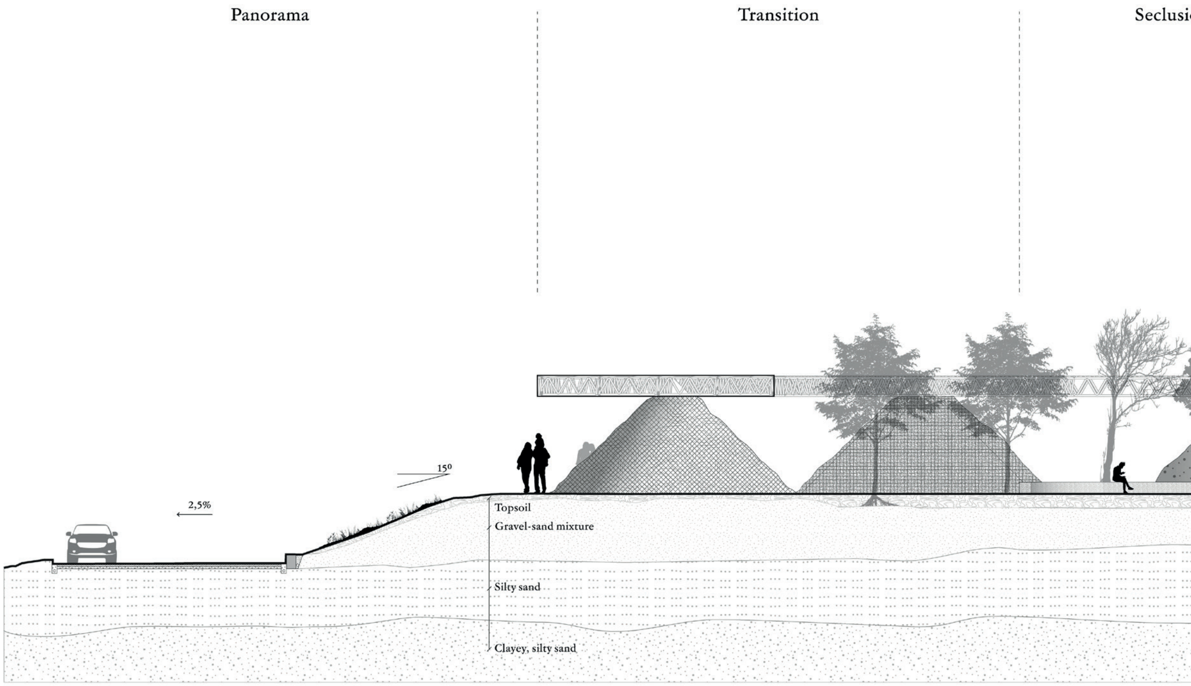
1. Parking
2. Entrance road
3. Exit road
4. Seating

Soil columns
5. Sandstone
6. Crushed concrete
7. Sand-silt mixture
8. Chippings
9. Clayey sand
10.Gravel
11. Gravel sand





Section

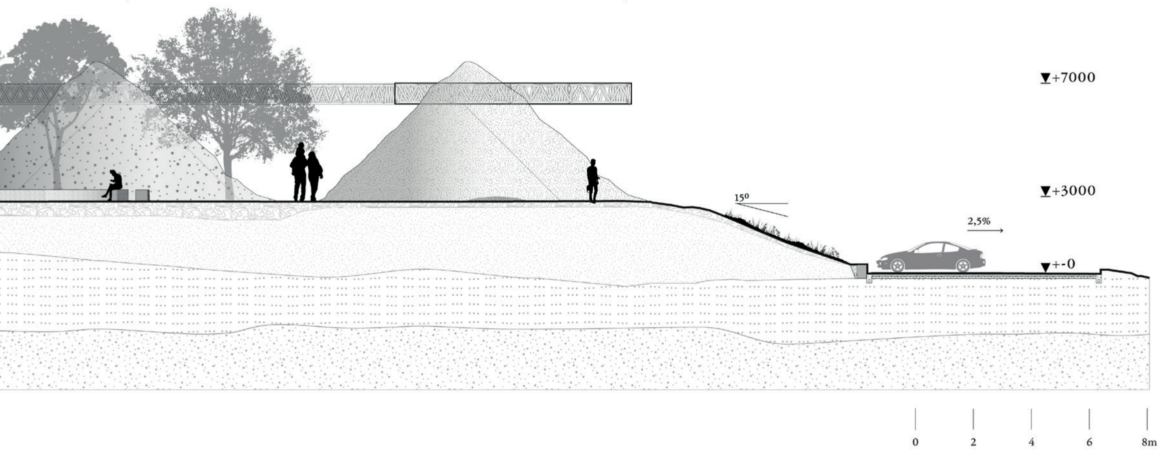


Panorama
Transition
Seclusi
15⁰
2,5%
Topsoil
Gravel-sand mixture
Silty sand
Clayey, silty sand

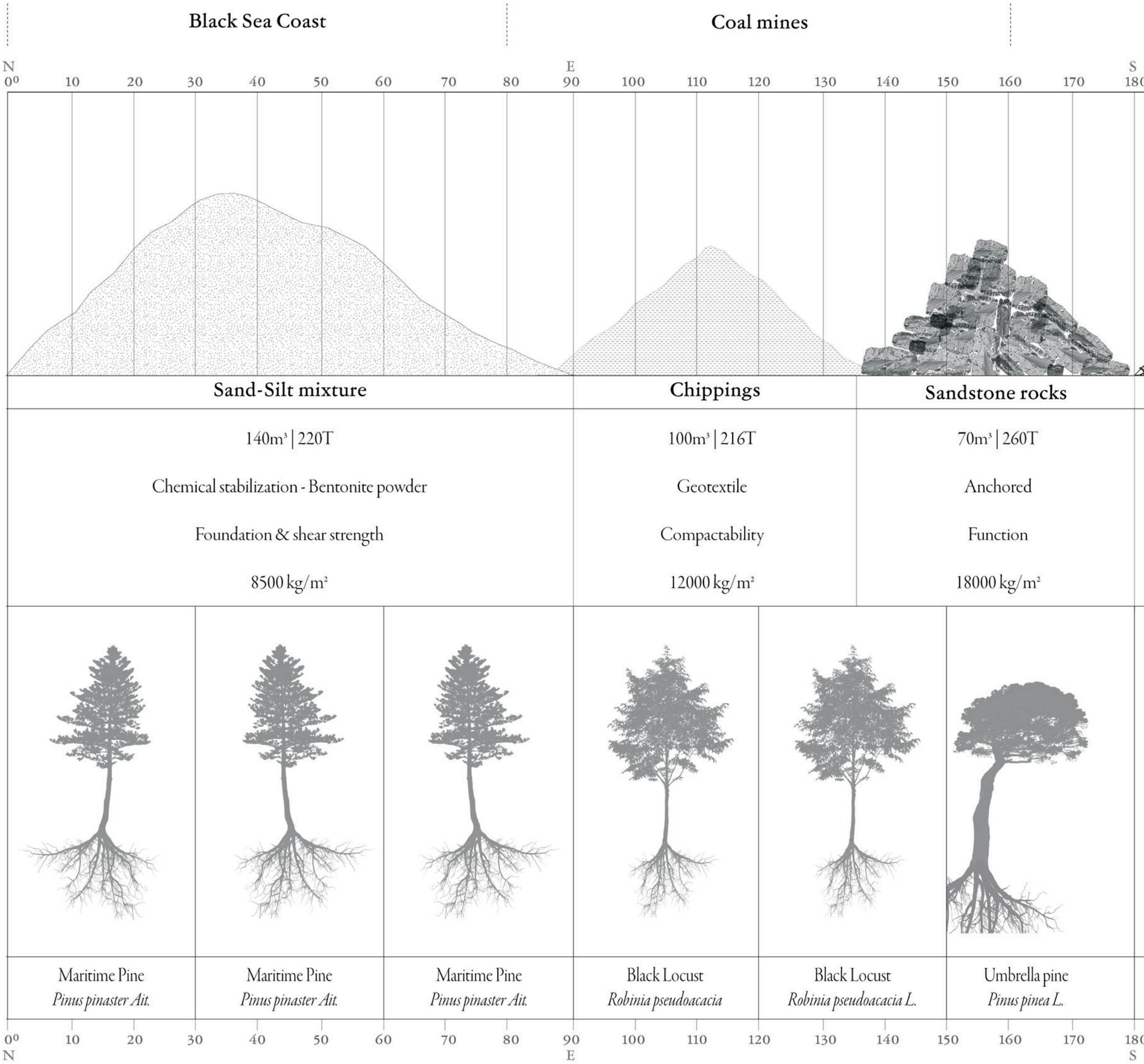
on

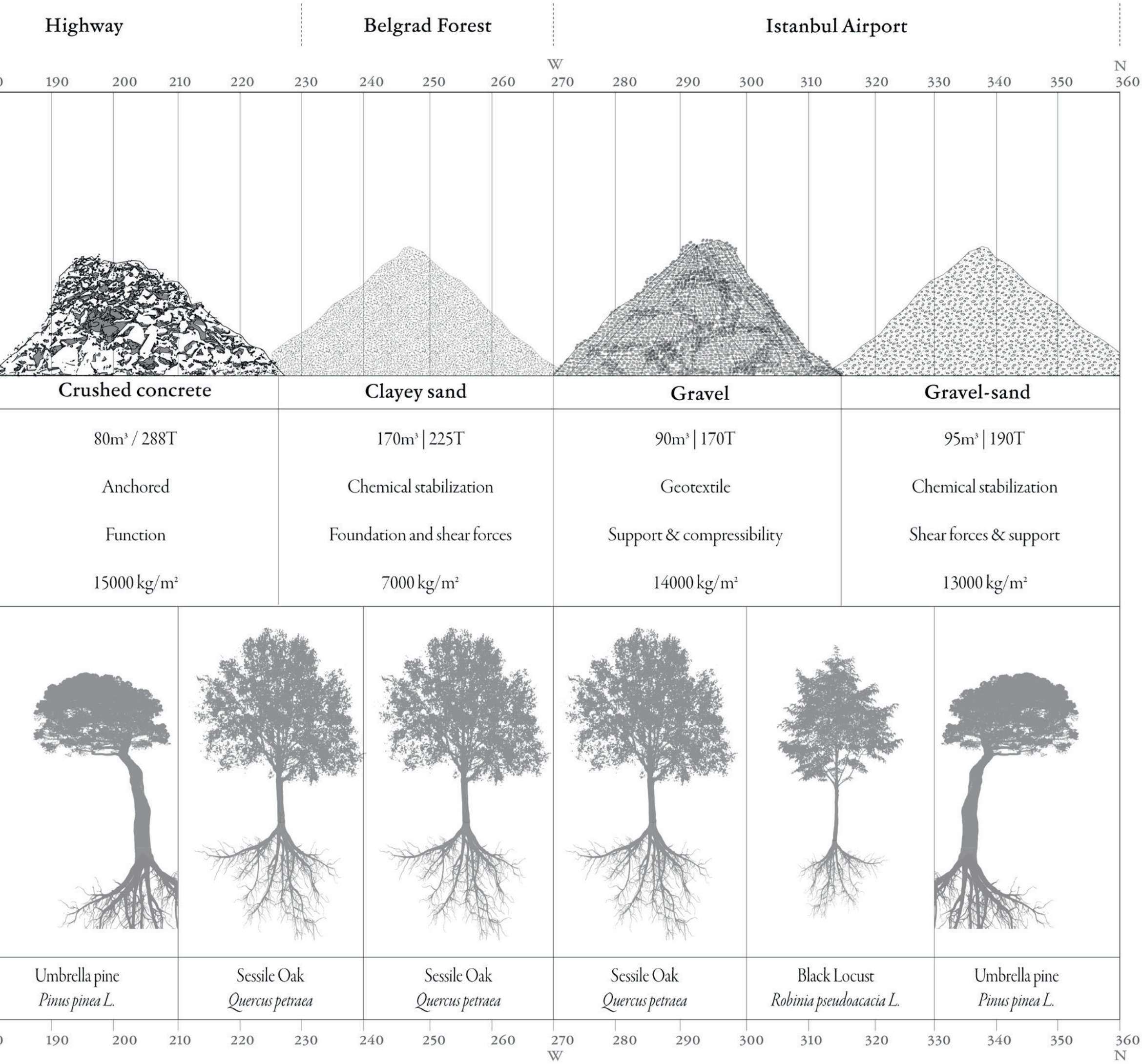
Transition

Panorama

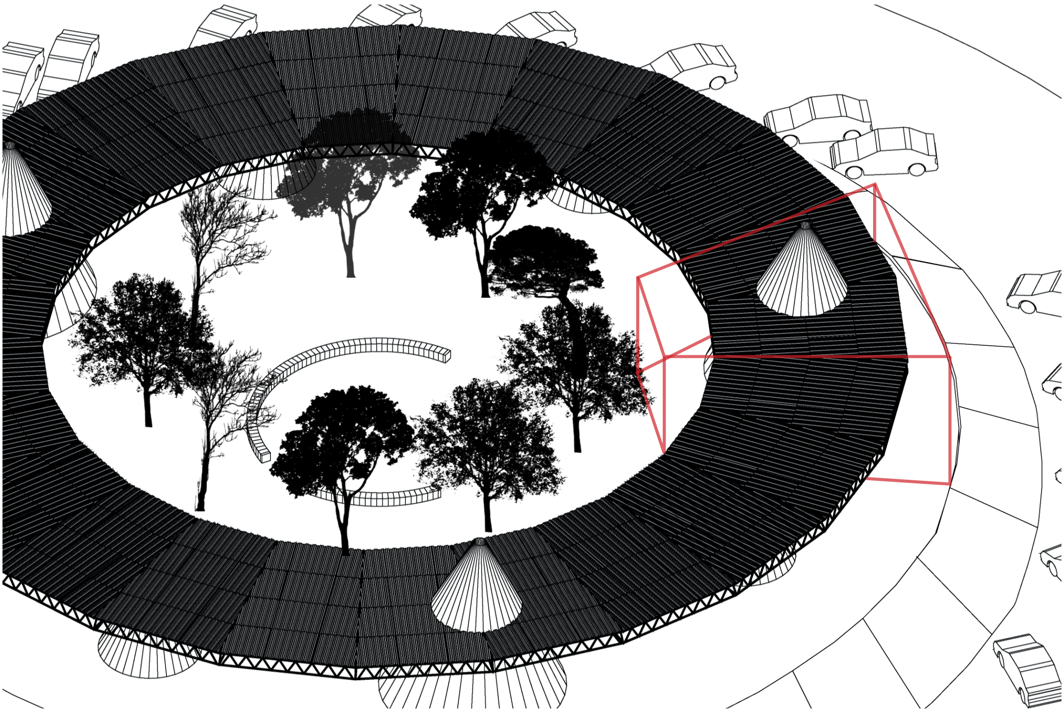


Earthwork columns

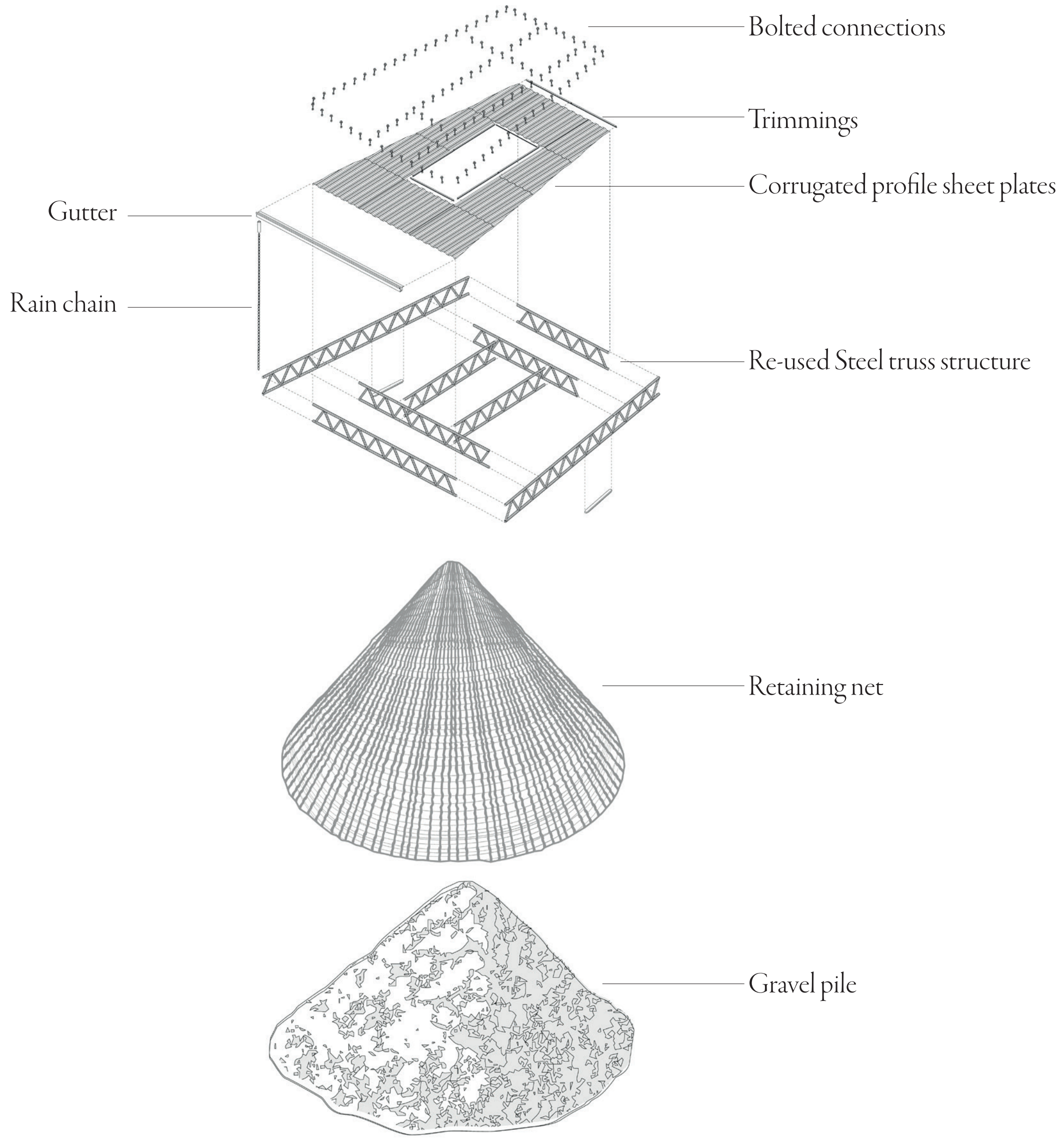



Highway
Belgrad Forest
Istanbul Airport
W
N
190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360
Crushed concrete
Clayey sand
Gravel
Gravel-sand
80m³ / 288T
170m³ | 225T
90m³ | 170T
95m³ | 190T
Anchored
Chemical stabilization
Geotextile
Chemical stabilization
Function
Foundation and shear forces
Support & compressibility
Shear forces & support
15000 kg/m²
7000 kg/m²
14000 kg/m²
13000 kg/m²
Umbrella pine
Pinus pinea L.
Sessile Oak
Quercus petraea
Sessile Oak
Quercus petraea
Sessile Oak
Quercus petraea
Black Locust
Robinia pseudoacacia L.
Umbrella pine
Pinus pinea L.
190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360
W
N

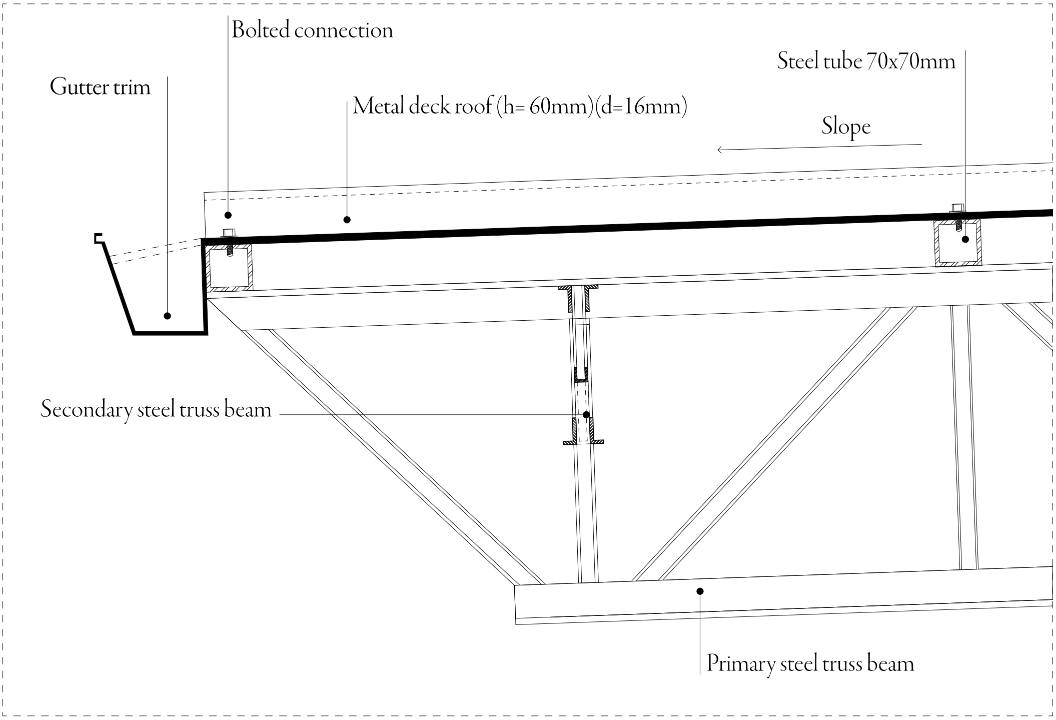
Structural section



Synthetic vs. non-synthetic architecture



Roof detail


Bolted connection
Steel tube 70x70mm
Gutter trim
Metal deck roof (h= 60mm)(d=16mm)
Slope
Secondary steel truss beam
Primary steel truss beam

Interior

Exterior

6 | Conclusion

Reflection

Relation between graduation project topic, Architecture track and MSc programme.

In the present day, space seems more and more influenced by political, economic and ecological pressures. Diverse spatial conditions provide important context and pose challenges which transcend the field of architecture. The contemporary landscape becomes more and more complex and requires interdisciplinary collaboration to test new approaches. The Borders and Territories Studio provides the instruments to research these relationships along the New Silk Road. Extraction sites operate the landscape through constant internal reconfiguration, altering the landscape in a complex and territorial way. Geographies of extraction are often discontinuous and do not coincide with the notion of city, district or national territory. The graduation project aims to generate alternative strategies and architectural interventions for these extractive landscapes, which can act both local and global. The project can inform and challenge the status-quo and test the limits of the contemporary architectural discourse, changing the perception of these spaces and provide meaning for future territories of extraction.

Relationship between research and design

The research was done through a variety of methods and techniques. Firstly, the larger territory around Istanbul was analyzed collectively through the mapping of the soil. Within the area of the research, the focus was on fault lines and associated consequences for the landscape of Turkey. Within this larger collective map, smaller individual case studies were carried out to explore the specific implications for smaller areas of interest. The collective research has been an important foundation for the further exploration of the relationship between soil and architecture. It provided the first lens through which the territory could be interpreted. The research was further elaborated by an excursion to the Istanbul area. Arriving in Istanbul by air provided a clear view of the vast amount of extraction landscapes surrounding the city. The implication of mega-infrastructural projects such as the new Istanbul Airport and the multiple highways became visible looking down from above. During the excursion, it became apparent that these entangled, reciprocal landscapes of extraction are invisible in the urban landscape where those extracted materials are used.

These reciprocal landscapes, specifically tailored to landscapes of extraction, were researched through academic literature to provide a theoretical framework for the graduation project, which resulted in a theoretical essay. This essay served as a more philosophical reflection on what these landscapes mean and how we can understand them. The conditions for current extraction practices were explored and projected within the current debate on soil and the increasing urbanization of the territory.

Multiple collective theoretical seminars studied mappings as an instrument for architectural investigation. Specifically, the different readings and interpretations in Alan Berger's "Taking Measures Across the American Landscape" formed an inspiration for researching the way landscapes are seen and acted upon by different pressures. The individual mappings continued on the collective mapping investigation. The individual mappings investigated the spatial conditions and relationships relating to the themes of 'soil' and 'extraction' on different scales. These three mappings can be seen as moments of inquiry, analyzing the territory through the lens of architecture.

The research was translated into architectural expressions in the 'modi operandi' workshop, where a first direction for the design was proposed. In these models, emphasis was put on the tactile quality of different materials found in extraction landscapes, manipulating them into different compositions. This has been a key moment for the translation of the research into the design. Up to this point, the research remained very theoretical, the implications and role an architectural design could achieve were still very vague. The actual fabrication of models and hands-on experience of materials was paramount to the understanding how the landscape could inform the architecture and include infrastructure and landscape.

The research clarified that landscapes of extraction are operated through a complex logic in which landscape is transformed into a mathematical optimalization. This is also evident in the former Ağaçli coal fields, where different extractive practices have exerted pressure on the landscape, changing the topology. The research provided an understanding of the landscape which was used in the design. Remediating these territories requires a collaborative approach involving various disciplines

(Mining, engineering, (landscape) architecture, planning, biology, water management, forest management). The relevance of the project lies in the way the landscape is interpreted from a spatial perspective, providing a method for understanding the landscape.

Firstly, the project provides a spatial framework in which multiple disciplines can practice their knowledge on the scale of the landscape. Designing landscapes of extraction not solely based on mathematical rules of yield and production, but also incorporating and legitimating the soil they exploit. This informs the finer grained architectural proposals. The designed objects highlight aspects of the remediation where architecture can provide meaning and enhance these landscape transformations through different scales and methods.

The proposed method of investigation by the Borders Graduation Studio was used as a fundament for the proposed methodology during the rest of the project. Especially the different mappings of survey, system and things through which the territory was analyzed provided a field of knowledge for the development of the design topic. Through drawing speculative maps, relationships were further projected on the territory questioning the architectural limits of these contexts. During the design phase, these maps were used as a repository to be consulted at different times. The more theoretical context of the essay was useful to place the role of extraction landscapes in the current debate on soil and architecture.

In retrospect, the further translation and elaboration of the research in the MSc4 design phase could have been more focused on the experimenting and testing different architectural interventions instead of detangling the complexity of extraction landscapes. The amount of information and scale of these landscapes are infinite and the investigation into one sole type of extraction already bears enough depth for numerous design proposals. It therefore took a considerable effort and time before the final agency and fundament of the design proposal was achieved. At this point, the help of the studio mentors must be mentioned. The critical and reflective discussions which were held in the studio helped push the project forward every time again. Especially the reflection on the reasoning behind the project helped translate the performed

research into architectural expression. The dynamics of these extractive landscapes which shift the balance between economy and ecology, producing deteriorated ecosystems influencing the territory far beyond the actual location of extraction. The research also clarified that in order to design architectural objects in (former) these complex landscapes of extraction, the rules and restrictions had to be designed first. Solving the complexity of these landscapes from just an architectural perspective is impossible.
The architecture would have to be focused on the spatial framework of the design. The architectural translation into objects can only highlight certain aspects or a landscape in transition. By designing these objects as gestures which provide direction and reflect on the current logic, the impact of architecture can culminate into larger scales and disciplines.

Academic and social value

Throughout the development of the research, it became clear that the collection of data, both theoretical and practical, was difficult to collect. Most of the relevant information produced by local researchers and businesses is written in the Turkish language and not easily accessible through the regular databases. Also, the access to the former Ağaçli coal fields site is partly restricted due to the ongoing land operations at the site. This challenge was partially resolved by translating Turkish papers, websites and research reports into English, which in turn sometimes produced complications due to translation misinterpretations and inaccuracies. Other data was gathered though open-access platforms which provided, while sometimes underdeveloped, interesting insights. The open-access data sometimes lacked precision in terms of topography, governance, flora, fauna, but this could often be complemented by local research papers and news websites. The partial absence of site-specific data shifted the project into a design which focuses more on providing a strategy for the remediation of former extraction landscapes, which could be implemented elsewhere. The architecture focuses on the impact objects could produce within this strategy. Throughout the development of the project, the complexity of extraction landscapes became more and more apparent. The design thereby focuses on specific areas of extraction modes and remediation of landscapes.

The findings of these studies are valuable in their expertise, but the project could benefit from the involvement of different disciplines. In particular the complex legal and governance issues have not been developed up to their full potential due to time constraints. These lines of inquiry could benefit from experts in the field. The scientific field of soil is currently developing rapidly, revaluating the ecological and urban potential of this the ground beneath our feet. Thinking of extraction landscapes not solely as landscapes of production, but also as landscapes of maintenance, the project takes position within the debate on soil. Generating strategies not purely based on economic, capitalist and mathematical common sense, the project experiments with alternative approaches, attempting to produce imaginative perspectives.

Scientific value and transferability

Not all the proposed architectural objects are directly interchangeable to other locations of extraction. The performed research highlighted that there are numerous reasons to excavate and extract a landscape. These landscapes all bear their own topology, geology and morphology. To remediate these landscapes requires comprehensive knowledge of the local site condition. The project can be seen as a strategy where the architectural object are expressions of different scales and temporalities within the strategy. The scientific field of soil is currently developing rapidly, revaluating the ecological and urban potential of this the ground beneath our feet. Thinking of extraction landscapes not solely as landscapes of production, but also as landscapes of maintenance, the project takes position within the debate on soil. The research can provide valuable insights into the current logic and status of extraction landscapes. Generating strategies not purely based on economic, capitalist and mathematical common sense, the project experiments with alternative approaches, producing imaginative perspectives.

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