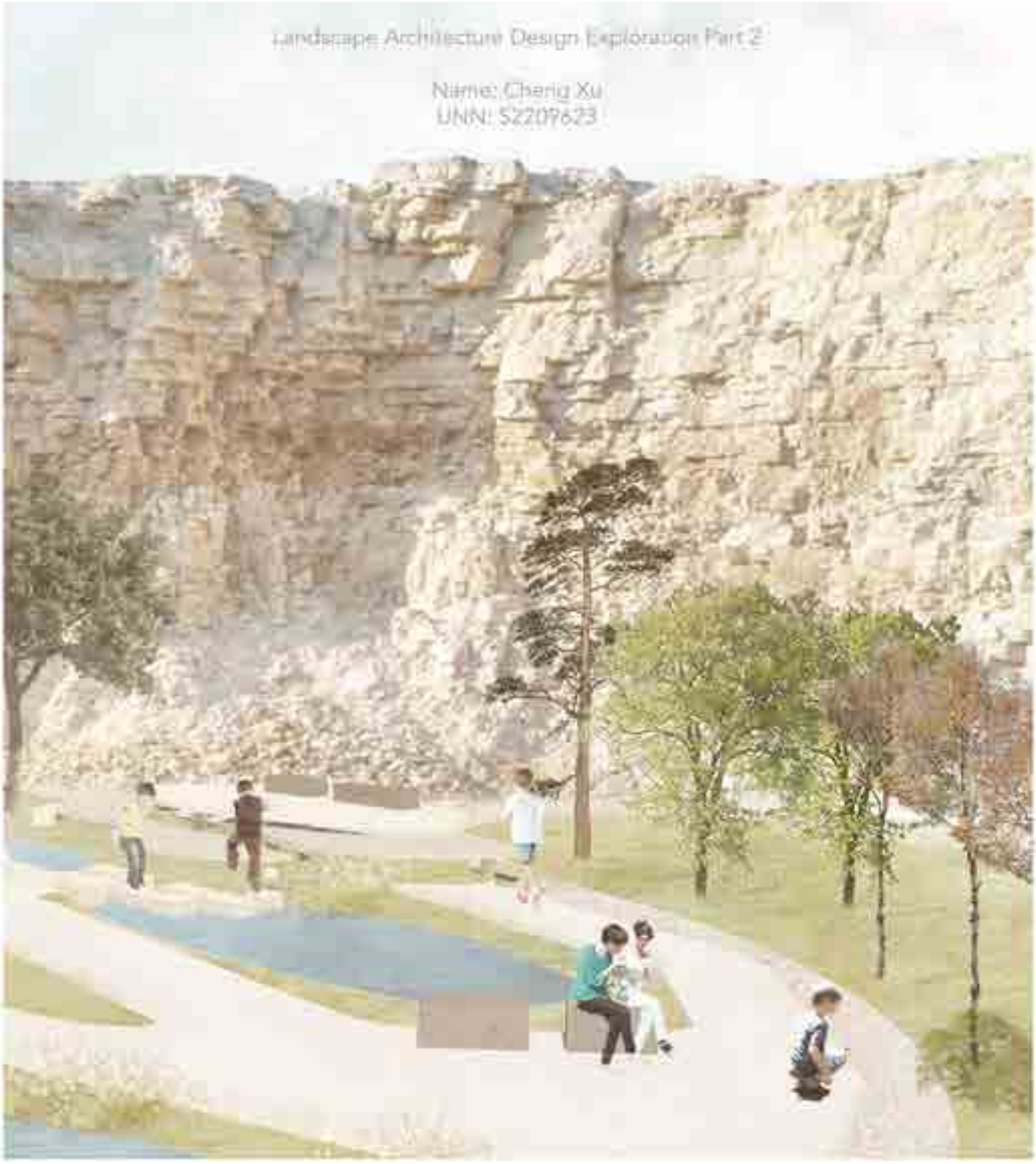
RECOVERY LENY QUARRY

—REVIVAL OF AN ABANDONED LANDSCAPE



CONTENTS

CONTENT

DESIGN STATEMENT

In the history and process of mining, humans have left many caves and traces. Limestone was mined, and the establishment of the quarry brought employment and income to the people, but also brought some problems. Over time, some quarries were abandoned. Quarries after the human extractions stopped and they started to recover, and a new topography that was not there before was created. This project takes abandoned landscapes as the lens. Ecological succession from very rocky surfaces to eventually trees. Quarries are fantastic places for wildlife, such as wild bees, butterflies, and small birds. Besides, these are rich in geological and cultural history.

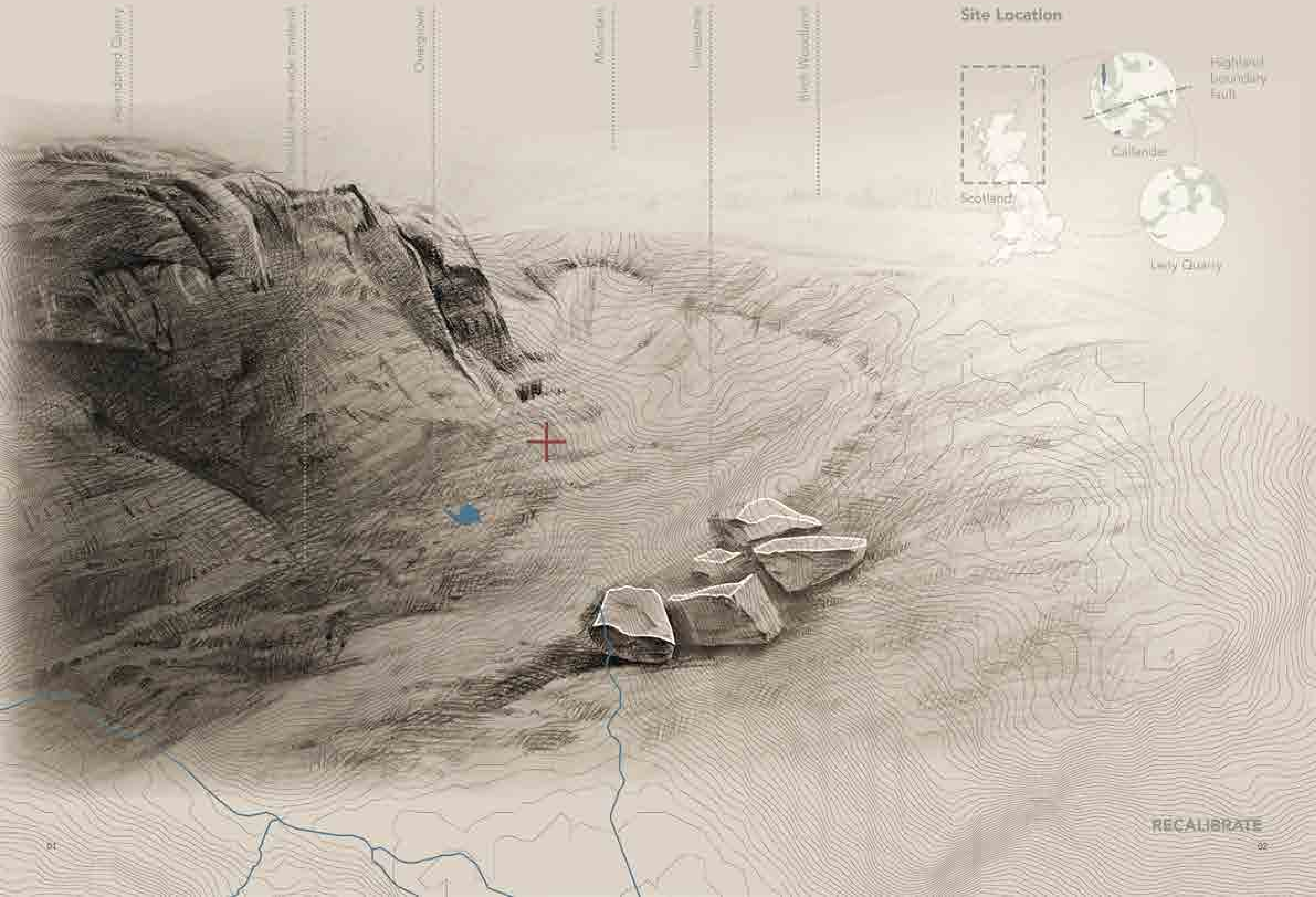
In the previous semester, the project considered five quarries near the Highlands boundary fault, demonstrating their range of status and conditions. They adapted to a series of socioenvironmental processes, all now in a state of abandonment. By analysing problems, proposing relevant strategies, and through a series of research, I found two interesting locations among the five quarries as potential design locations. The design proposal is to recover and rewild the limestone quarry to create ecological habitat for wildlife and promote economic and social sustainability. In addition, to express the hidden history of the site, revive the industrial site where people can experience the history and preserve the cultural and natural heritage.

This semester, I choose Leny Quarry as my site from the five quarries of the previous term. Due to its unique history, specific topography, and current conditions, it is also an important fossil discovery site, and many researchers come here to research rocks and fossils.

Leny Quarry was opened in about 1745 to work beds of grey limestone but was little used after the 1860s. The quarry is abandoned and currently in relative degradation. The area is rich in biodiversity, including broadleaved woodland and wetlands. Birds and small mammals occur here and are a distinctive part of the landscape.

The quarry is now facing many problems such as overgrown weeds, piled up gravel, and waterlogged roads, and if no action is taken, it will become more deserted, soil and rock erosion, and species are gradually declining.

My research aims to transform this abandoned limestone quarry through interventions that make the site more accessible, express and preserve the hidden history of the site, and design functional areas where people can experience history, providing enrichment for tourists and the scientific community. Experiences that drive economic and social development. At the same time, create an ecological habitat for various wildlife such as birds. Linking nature and people through the regeneration of the quarry.


Overgrown
Mountain
Site Location
Scotland
Callander
Highland boundary fault
Leny Quarry

Existing Base Plan

This map shows the location of the site, the current state of the surrounding area, traffic and the site conditions.

SITE SCALE

SITE

Legend

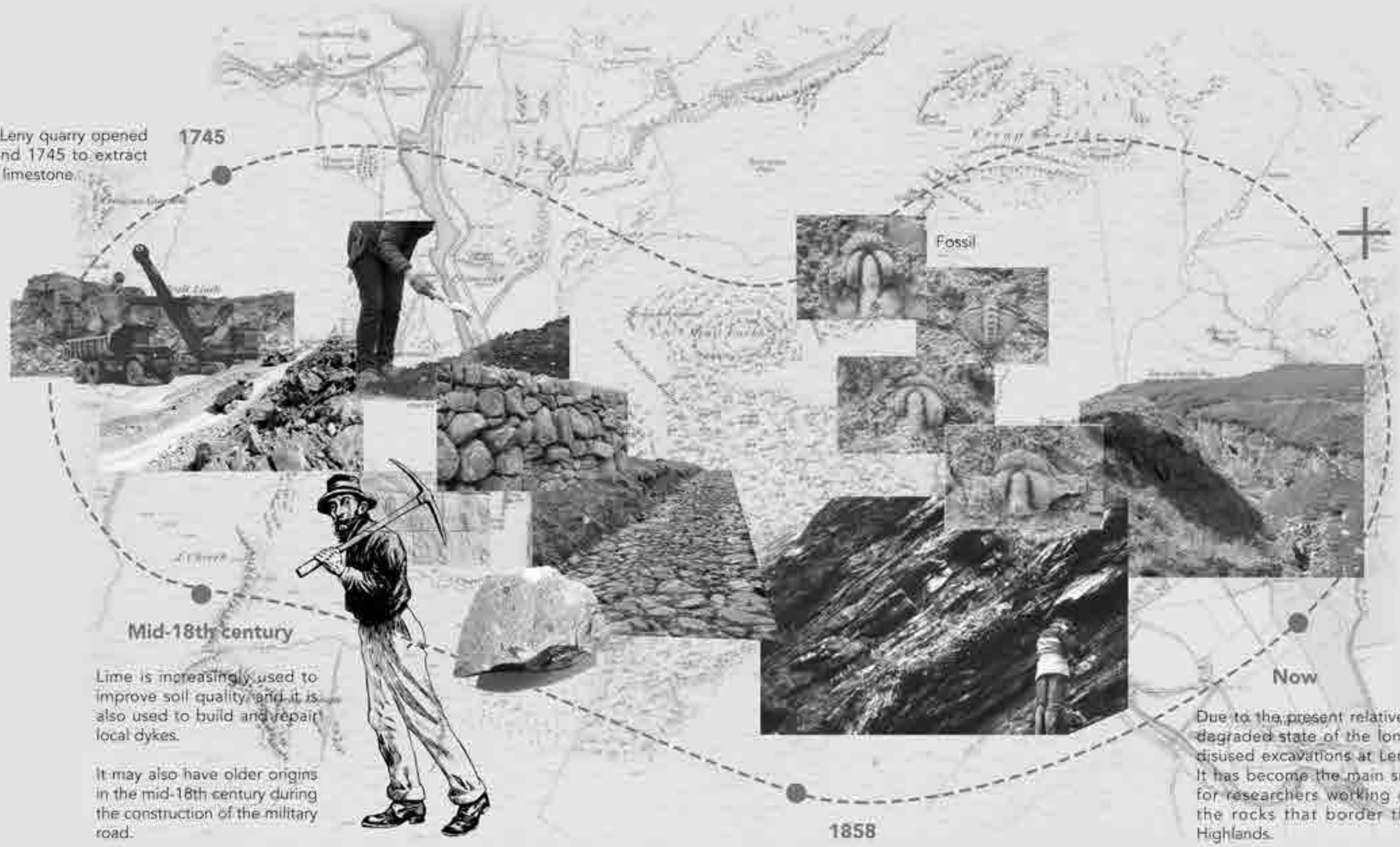
- Woodland
- Farmland
- Grassland
- Park
- Water
- Building
- Railway
- Road

N

0 100 300 700m

Historical Development

From 1745 to the present, through a series of images to express changes.

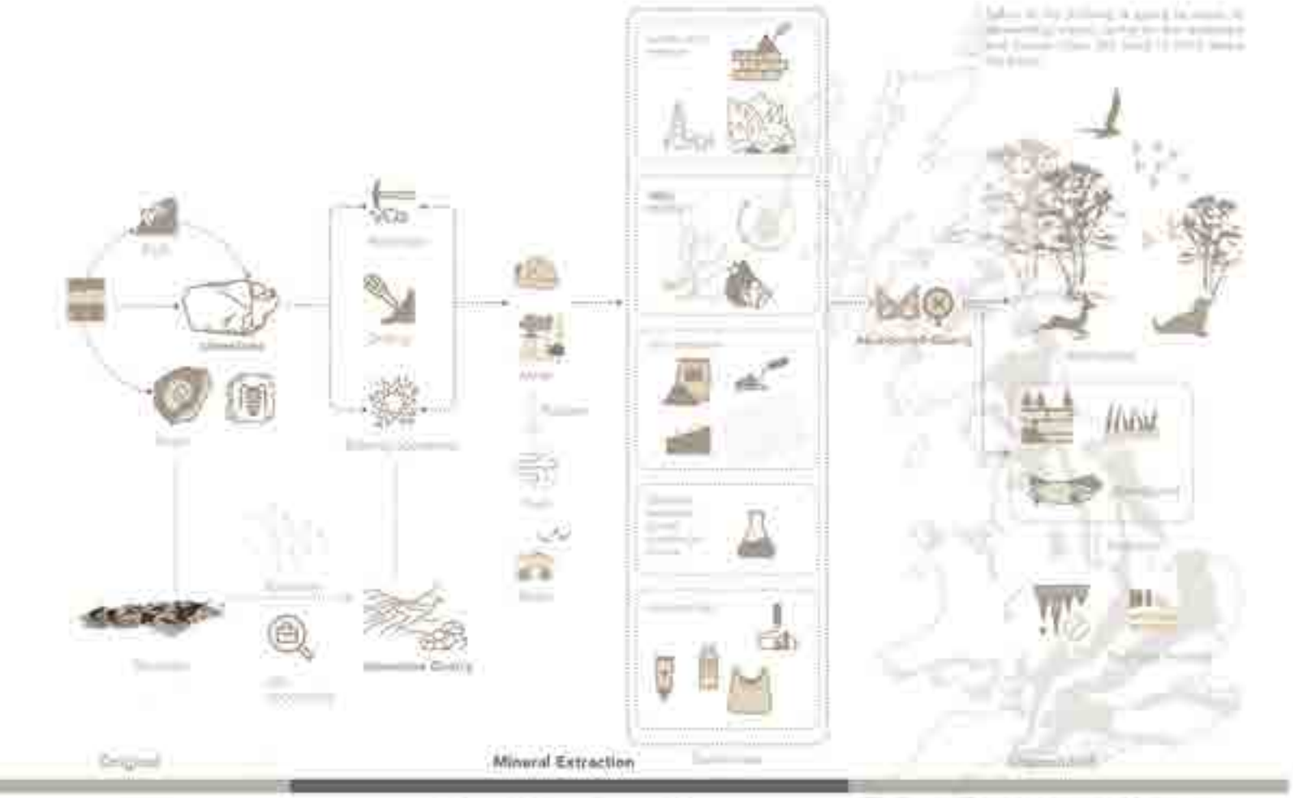


Fossil

Leny Quarry is the main locality for the Leny Limestone, the only unit along the Highland Boundary Fault that yields identifiable Cambrian fossils (Rushton, 1999). The most common fossils are trilobites and small specimens of brachiopods and sponge spicules (Fletcher, 2007).

Fossils give us helpful insight into the history of life on Earth. They can tell us where humans and life came from and how the environment has changed. In addition, fossils provide essential evidence for the evolution of animals and plants, showing that all species are related. Fossils can also be used to date rocks.

Limestone drawing



Different fossil models

Material: clay
Colour: grey

Trilobite

Trilobites are an essential group of fossils that evolved during the Cambrian Period and went extinct at the end of the Permian period around 250 million years ago.

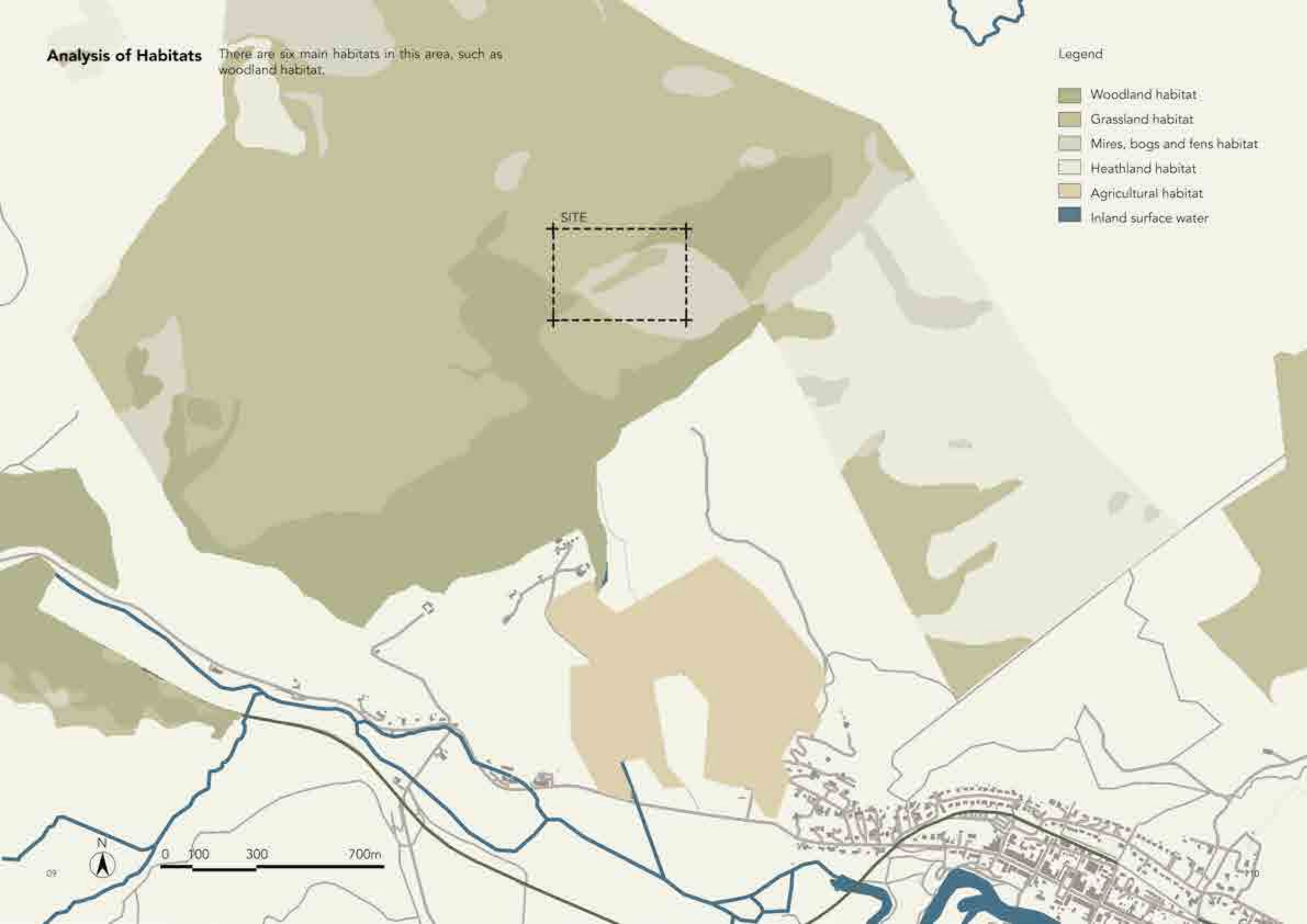
Brachiopod

Brachiopods are shellfish with two shells. Fossil brachiopods are usually preserved as only one shell.

Sponge spicule

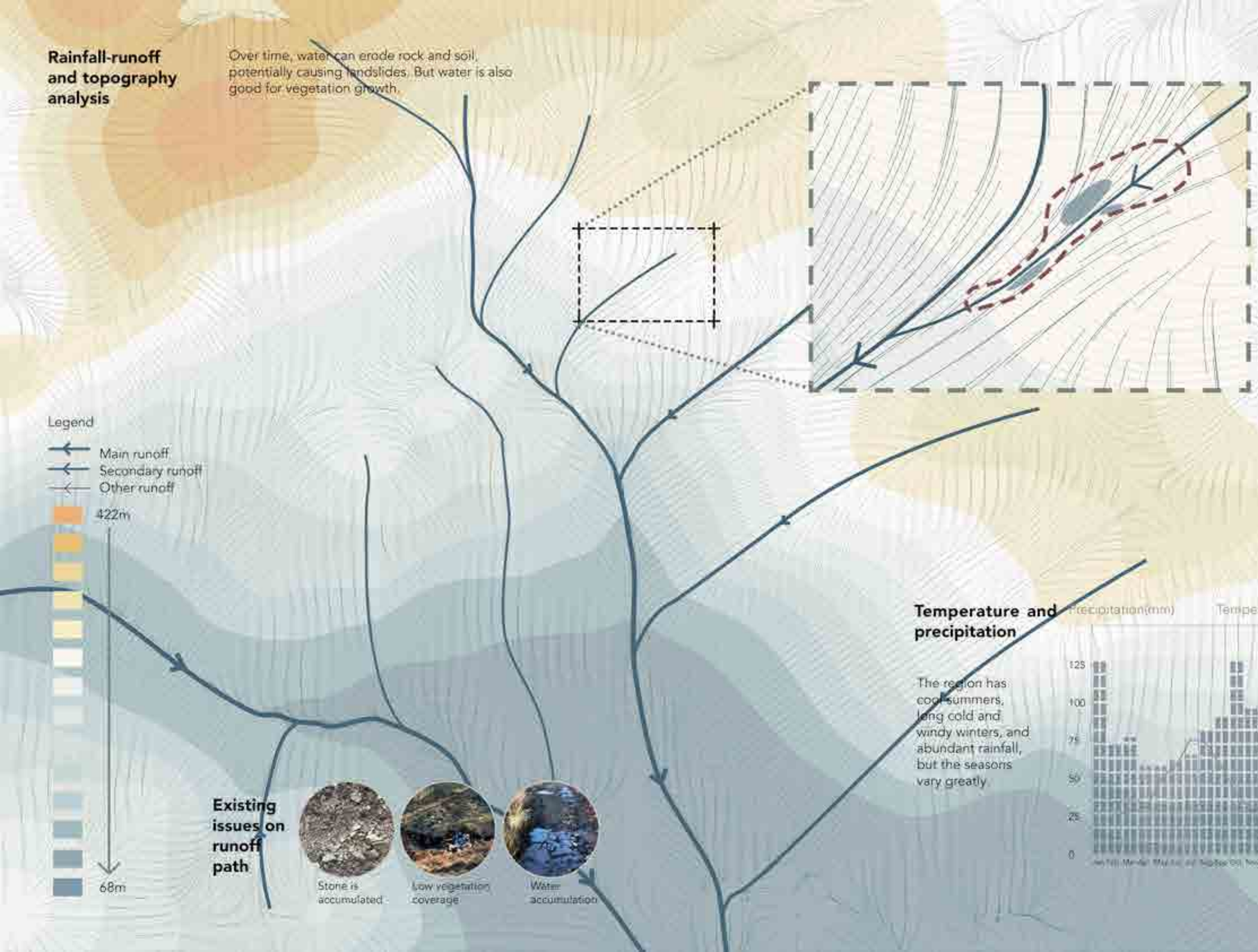
Analysis of Habitats

There are six main habitats in this area, such as woodland habitat.



Rainfall-runoff and topography analysis

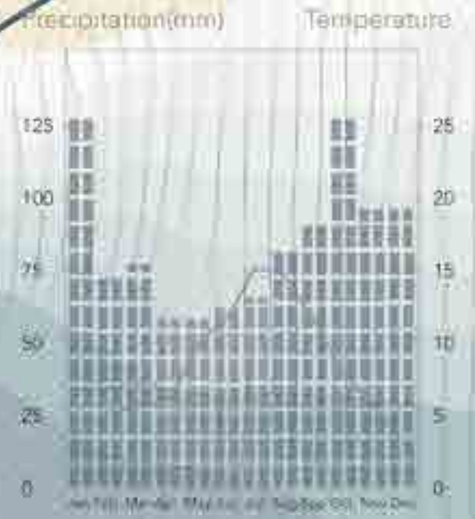
Over time, water can erode rock and soil, potentially causing landslides. But water is also good for vegetation growth.



Existing issues on runoff path

Temperature and precipitation

The region has cool summers, long cold and windy winters, and abundant rainfall, but the seasons vary greatly



Existing Base Plan

This map shows the Leny Quarry and surrounding environments.

Legend

- Quarry
- Cliff
- Planting bed
- Tree
- Grass
- Road

0 10 30 70m

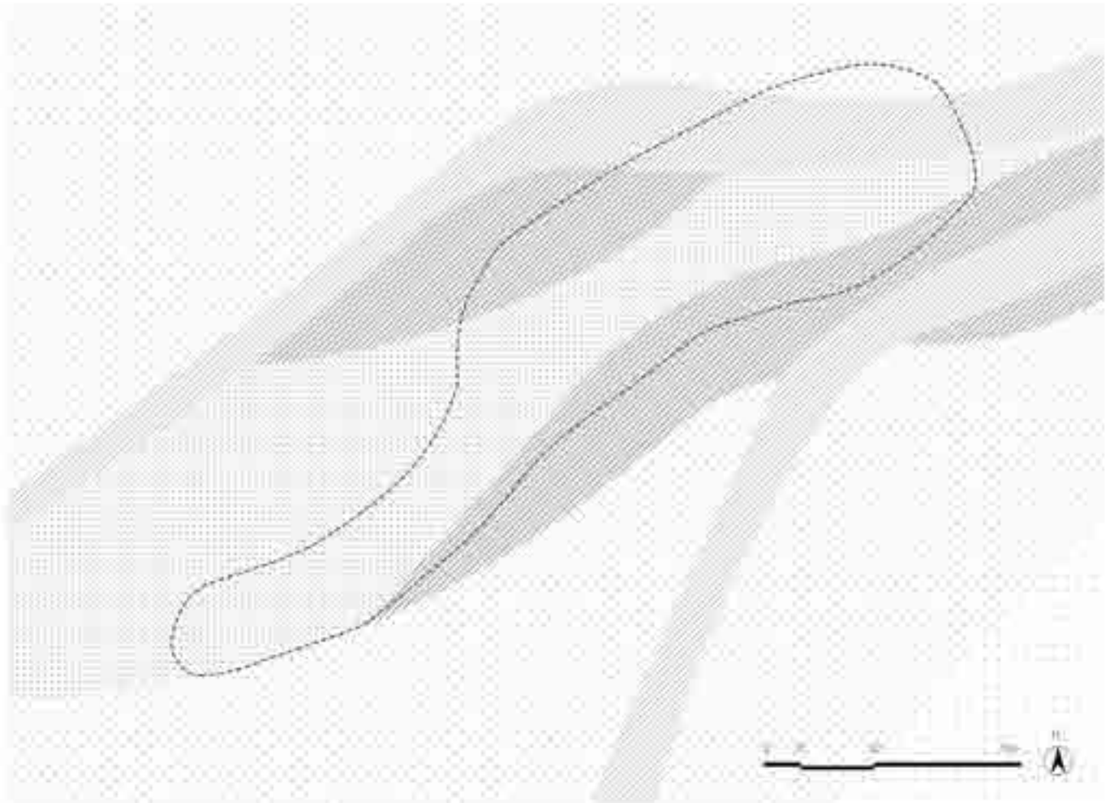
N

Geological map

This map shows
the main geology
of the quarry.

Legend

- Red shale with limestone
- Black shale with limestone
- Grey sandstone
- Old red sandstone
- Felsite



Analysis of Animals

The area is rich in biodiversity, including broadleaved woodland and wetlands. Birds and small mammals occur here and are a distinctive part of the landscape. Quarries are fantastic places for wildlife, such as wild bees and butterflies and also some small birds.

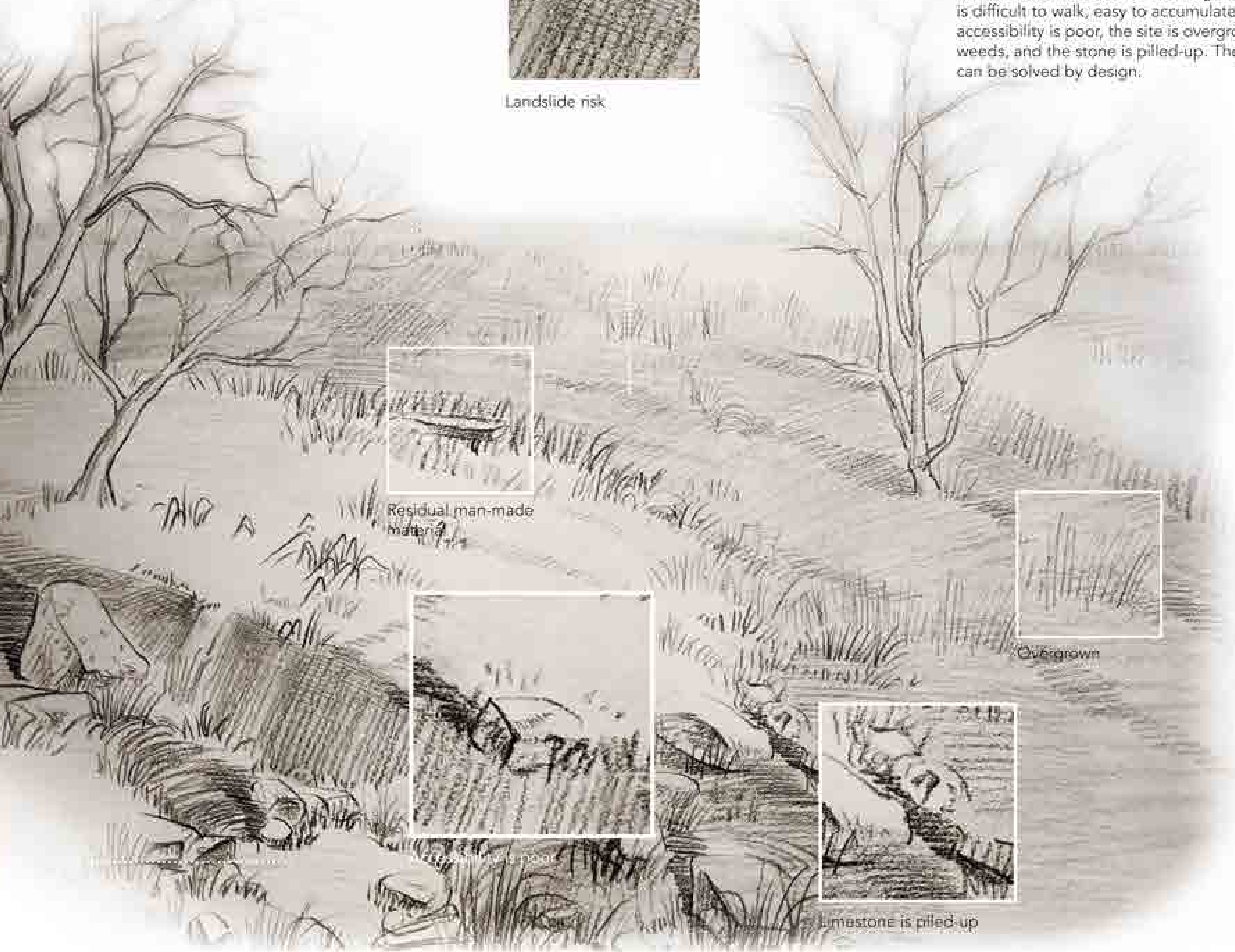
Human activities have an impact on local animals, and corresponding measures should be taken to protect them.

Problem

The quarry has geological significance, people come to see geology. Limestone quarries also have exceptional flora and fauna.

Through research, I found some problems. Lack of functional areas, lack of road signs, the road is difficult to walk, easy to accumulate water, the accessibility is poor, the site is overgrown with weeds, and the stone is pilled-up. These problems can be solved by design.

Landslide risk



Residual man-made material

Overgrown

Limestone is piled-up

Water accumulation

Case Study

Example of the Eden project

The Eden project is located in Cornwall, England. It is one of the series of commemorative projects for the British Millennium. Its construction mode is different from traditional botanical gardens. According to local social and economic development needs, the Eden project was built in an abandoned clay mine. The project brought life to a dilapidated clay pit 60 meters deep with no soil. Although the site selection conditions of poor natural conditions and inconvenient traffic conditions will affect the construction and development of the botanical garden, the Eden project is oriented by social needs to carry out the ecological restoration of abandoned land in the mode of building a botanical garden. The purpose of the Eden Project is to promote the strong connection between plants and people on an international scale and to encourage individual actions to support the conservation of species and realise the sustainable use of land.

Image source: https://www.edenproject.com/mission/our-origins

The Eden project highlights the relationship between man and nature. The focus of construction is ecological restoration and ecological construction. The two giant greenhouses at the bottom of the pit create a rainforest and Mediterranean environment biome, accommodating thousands of plants. Demonstrates the different ways humans have used plants, such as beer gardens, aroma gardens, and types of vegetation that characterise a region, such as South African gardens. Outdoor gardens line the pit floor and slopes, showcasing the native vegetation of the area.

Designers draw inspiration from nature for massive greenhouses and buildings. The construction and materials adhere to the concept of ecology, and the architecture and sculpture art closely revolve around the themes of sustainable development and environmental protection. The stage and education centre building and its surrounding facilities constitute the centre of the entire park. The tourist service centre is located at the edge of the mine pit, and the main activity area at the bottom can be reached through sightseeing vehicles or winding trails. The Eden project was completed and opened in March 2001. Its operation and development are in good shape, significantly impacting the regional economy and social benefits. With the help of rich entertainment activities and multi-level popular science education, the enduring attraction of the project is maintained. The construction concept centred on ecological protection, guided by public services, and pursued by social value has important enlightenment significance for the current construction of botanical gardens (Yin, 2016).

What we do to the planet is what we do to ourselves, so protecting the world is protecting ourselves. The project builds a relationship between the natural world and people, demonstrating the power of working together to benefit all living things. The planet can only be protected with a greater understanding to achieve environmental harmony and social equity.

Master plan of Eden project (Yin, 2016)

The Rites of Dionysus (Yin, 2016)

Image source: https://www.edenproject.com/mission/our-origins

Case Study

Example of Duisburg Nord

In the early 1970s, Germany's Ruhr area, especially the Emscher District, was one of Europe's largest steel manufacturing and coal mining centres. However, the decline of these heavy industries triggered an ecological and economic crisis, social change, and loss of cultural significance in the region. The remnants are chimneys, railways, polluted soil and industrial ruins (Stilgenbauer, 2005).

Duisburg Nord is widely regarded as one of the essential park projects of the past decade-economic revitalisation by transforming brownfields into ecologically restored public spaces and cultural resources. The design injects new ecological, economic, social and cultural dynamics into the old Ruhr industrial area through the reorganisation project. It generates the idea of an industrialised natural and cultural landscape. Guided by economic and aesthetic considerations, through a combination of conscious and unconscious design, the remnants of the former factory are integrated with innovative landscaping that incorporates the historical memory of the site, from a former pig iron production site that evolved into an industrial landscaped park. It offers visitors the opportunity to reuse industrial ruins (Hemmings, 2010).

The overall plan of the new landscape park (Stilgenbauer, 2005)

Image source: https://www.landschaftspark.de/

The designer retained the contaminated soil and isolated the highly toxic soil in the existing shelter for remediation through phytoremediation. Reduce ecological damage through a coordinated program of bioremediation and on-site material recovery.

Human engagement promotes the transformation of this place, and through the designer's design, the surrounding residents also participate, and the unique park type attracts more tourists. Due to unique new recreational opportunities and an unconventional look, the park has become a popular place for residents for many activities such as walking, biking, exploring hidden corners of the park, gatherings and hosting events. Memory is an important aspect of design, the rephrasing or understanding of the past. Visitors' memories may be triggered when looking at typical railroad ties. At the same time, the industrial wastelands form the backbone of the urban biodiversity in the central Ruhr area and are places for experiencing the environment and nature education. It has a high ecological value and not only helps to protect many endangered species, the landscape park contains a huge diversity of species, but also helps to protect the natural environment of the urbanisation of the Ruhr area. Transformation of a disused smelter into an urban oasis on a site of approximately 180 hectares north of Duisburg Nord. It not only satisfies historical protection, but also provides space for urban leisure.

Case Study

Example of a Chelsea flower garden 2017: THE M&G GARDEN

The 2017 RHS Chelsea Flower Show focuses on natural landscapes, natural stone, relaxed planting and industrial structures (Cosgrove, 2017). This garden takes inspiration from Malta's unique Mediterranean landscape, simulating an abandoned quarry in Malta, reminiscent of an abandoned quarry that nature began to reclaim. It is a limestone quarry with exposed walls, scattered stones and a monolithic limestone structure with internal metal supports. The gardens include limestone columns of varying heights, showing how the stone has been quarried over time.

The garden features edge vegetation, some places where people often try to tidy up but where plants grow well, such as where a wall meets the ground (Cosgrove, 2017). The design is diverse, with various plants growing from the gaps in the limestone pillars, dividing the site into different areas. Filled with native Maltese flowers, the garden aims to highlight the fragility of the country's natural landscape and resources. Embodying nature's ability to recover, even if it is very limited, only specific plants can survive in that rugged land.

Designer James Basson believes quarries should not be beautiful but display nakedness and cruelty. Humans need to act to preserve the beautiful environment and fragile ecosystems; people and nature respond over time to protect the balance. The design has many values, demonstrating the diversity and sustainability of the ecosystem. People can only affect nature, not control it. The M&G Garden is a good example. Nature always comes back; it always takes over.

Image source: https://frustratedgardener.com/2017/05/23/chelsea-flower-show-2017-best-in-show-the-mg-garden/

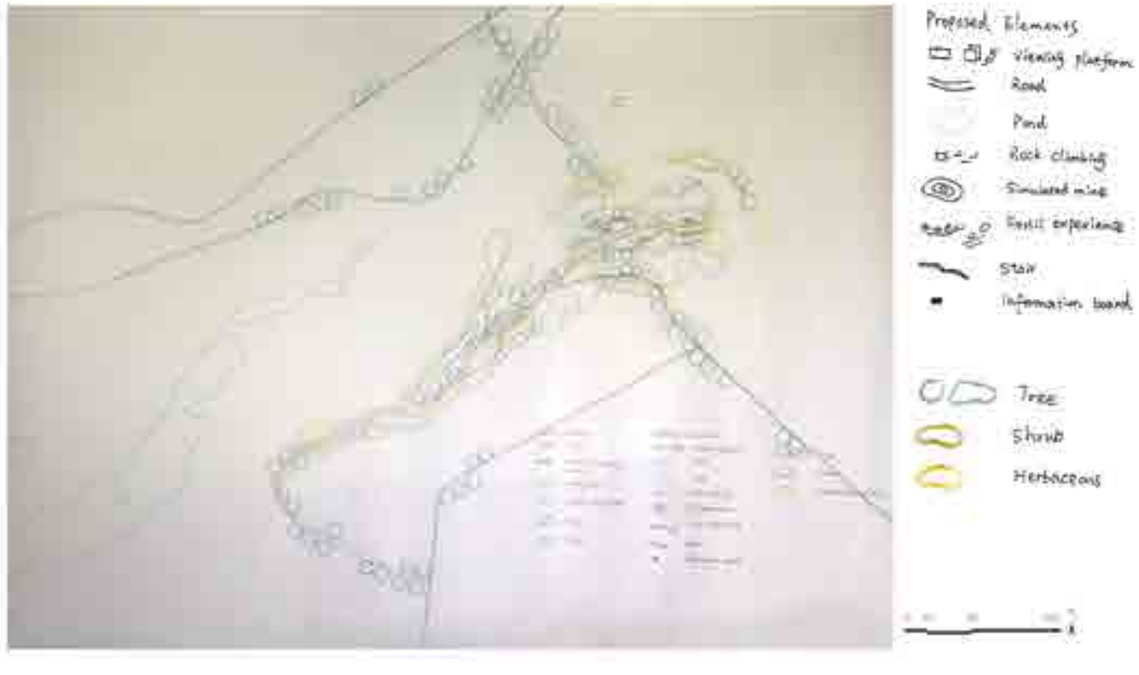
Inventory

These drawings show what I keep, remove, and add.

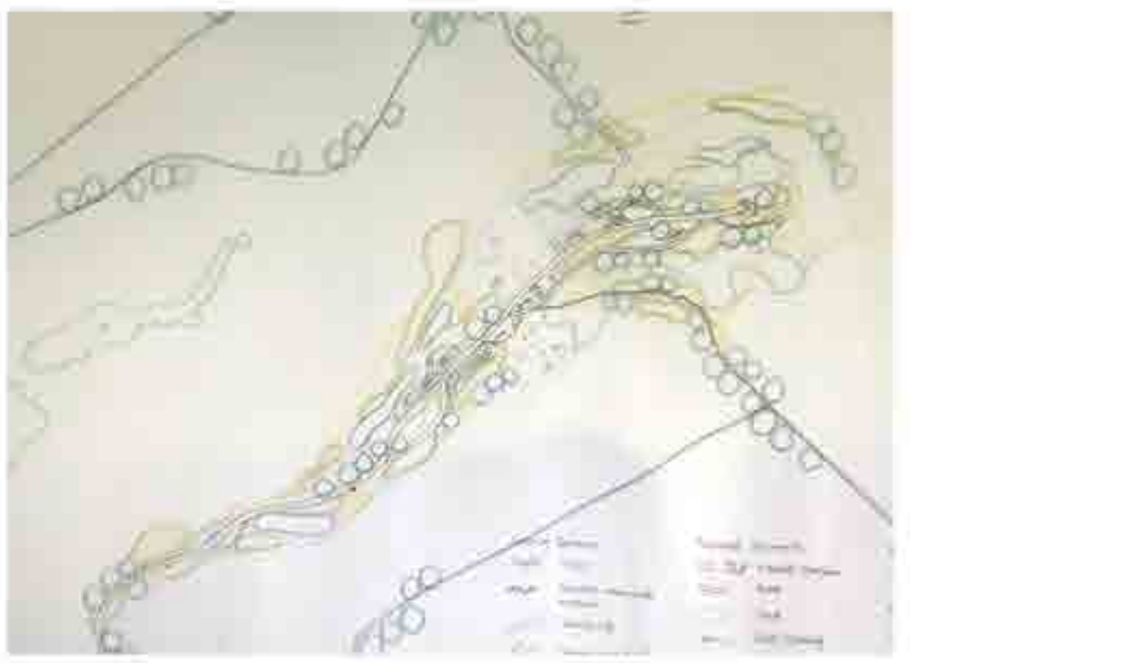
Existing

Proposed roads and functional areas

Proposed plants



Zoom in on proposed base map



Proposed Base Plan

There is a historical connection between the quarry and the surrounding town of Callander. This map shows the proposed base map, conducive to biodiversity protection, for people to experience and protect the site. There are markers made of limestone along the way to guide people.

SITE

Legend

- Proposed tree
- Proposed shrub
- Existing tree
- Grass
- Water
- Main road
- Pedestrian road
- Hiking trail

1. Woodland area
2. Car park
3. Lake
4. Limestone marker
5. Picnic area
6. Viewing platform
7. Wildflower area
8. Farm
9. Entrance plaza

N

0 100 300 700m

Callander

Proposed Base Plan

I want to keep mountains, mounds of limestone, cliff, some of the path networks, and some of the vegetation. These have human cultural value, the physical rock value, and the kind of biodiversity value to people.

SITE

AREA 2

AREA 1

Legend

- Proposed tree
- Proposed shrub
- Existing tree
- Grass
- Main road
- Pedestrian road
- Hiking trail
- 1 Leny quarry
- 2 Woodland area
- 3 Car park
- 4 Picnic area
- 5 Limestone marker

0 20 60 140m N

Proposed Base Plan

I add some functional areas, paths, ponds, and new vegetation. I use different colours to show different plants. I want to design a habitat that can link to other habitats.

After redesigning, people can experience this abandoned landscape, including the geology of the fossils and the geological history.

Legend

1. Simulated mine
2. Information board
3. Rock climbing
4. Fossil experience
5. Residual man-made material
6. Workshop
7. Ramp
8. Viewing platform
9. Pond
10. Cliff

Tree
Shrub
Herbaceous plant
Surrounding tree
Surrounding shrub
Surrounding herbaceous plant
Surrounding grass

Area 1: Rock experience area

Area 1 is mainly an experience area for people, including rock climbing, fossil experience, workshops, display of residual man-made materials, and simulated mines, where people can have a unique experience.

Legend

- Rock climbing
- Simulated mine
- Information board
- Research platform
- Fossil hunting trail
- Residual man-made material
- Workshop

Area 2: Nature activity area

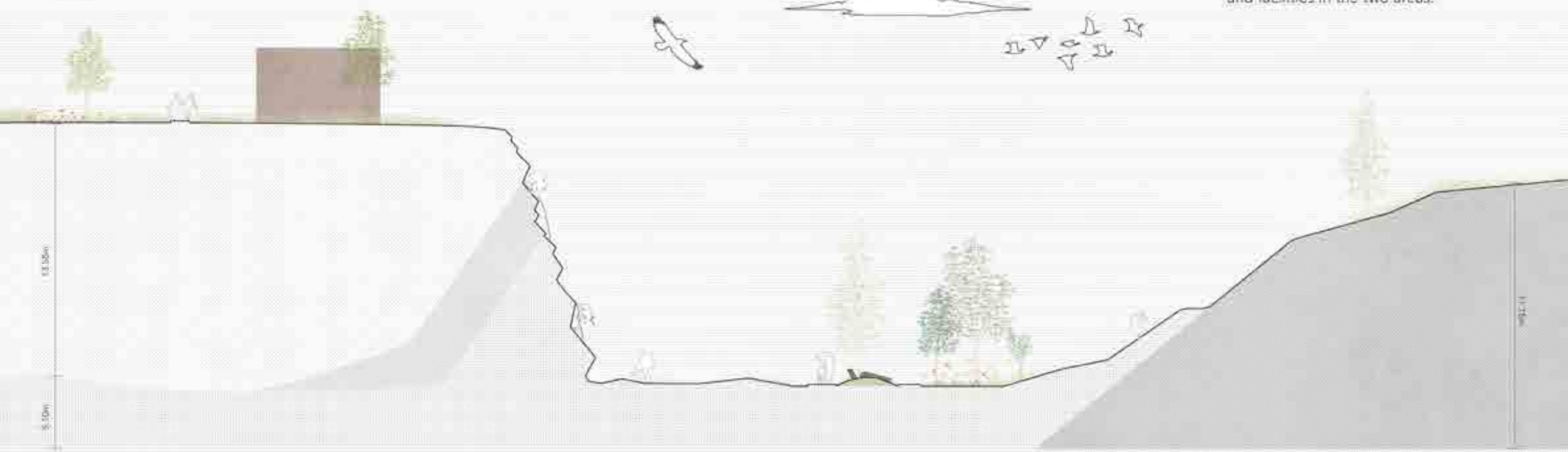
Area 2 shows some activity areas, including viewing platforms, water platforms, blocks, ponds, and seating areas. People can interact with water and nature.

Legend

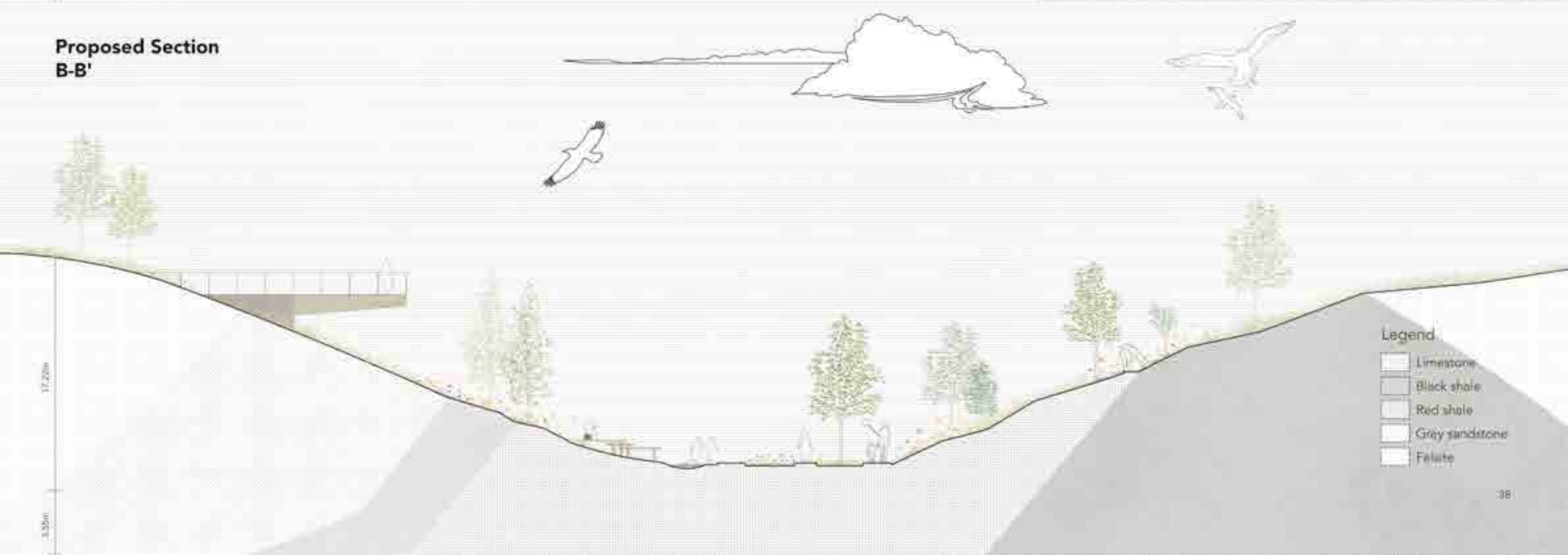
1. Observation desk
2. Viewing platform
3. Block
4. Bench
5. Pond
6. Seating area
7. Ramp

Proposed Section
A-A'

The two sections show the vegetation, topography, types of human activities and facilities in the two areas.



Proposed Section
B-B'



Dynamic System

The timeline of development.

5 years — With continuous development and change, the variety of plants is rich and the biodiversity is improved.

30 years — People will become more active.

80 years

Dynamic System

5 years

30 years

80 years

Aerial View

This is a wireframe diagram where I identify all important species and show the relationship between animal and plant species and the dynamics

Golden eagle

Red kite

Sparrowhawk

Red deer

Red deer carcasses provide an important food source for pine martens and birds

Limestone

Fossil

White-throated dipper

Human

The abandoned limestone quarry has been designed to add a lot of activity space for tourists and researchers such as fossil hunting trails and research platforms, where people can observe the behaviour of wild animals and fossils in the formation, which increases the interest of tourists and attracts more people to come

Pine marten

Pine marten predation helps conservation as it controls red squirrel populations

Red squirrel

Mountain hare

Animal

Human activities impact local animals and measures should be taken to protect their biodiversity gradually increases as food sources and habitats increase

Pine needles and seeds

Oak seed

Tree

Many plants have been added, and the trees are constantly growing, providing food and habitat for the animals

Orange tip

Wild bee

The main food of red grouse includes needles and cones of pines, some parts of birch, shrubs, grasses and berries

Red grouse

Pine, oak, and birch trees make up the red grouse's staple food and habitat

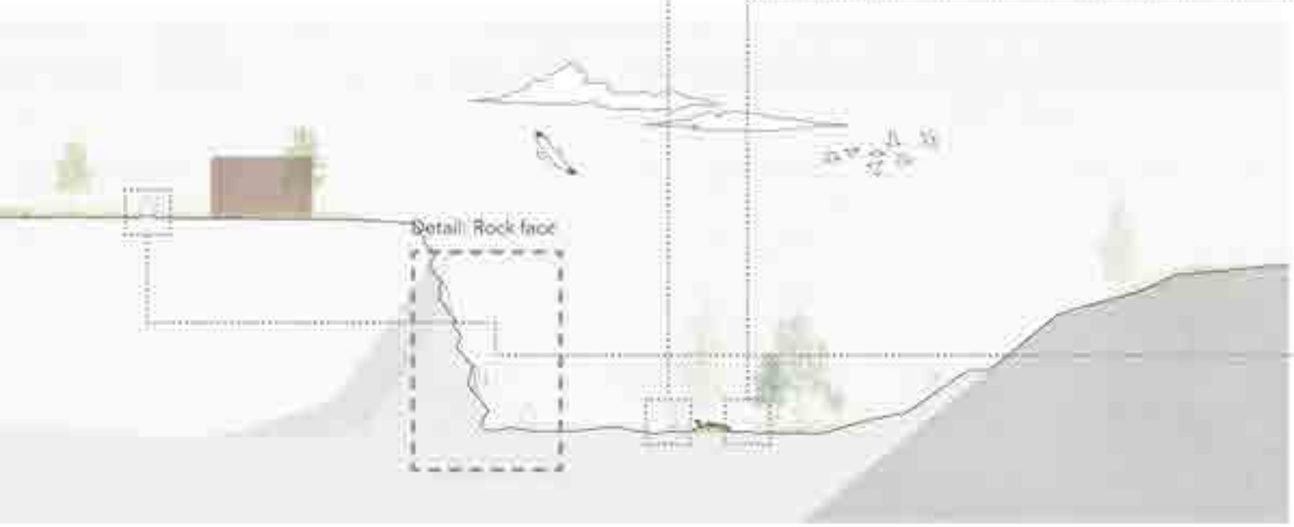
Aerial View

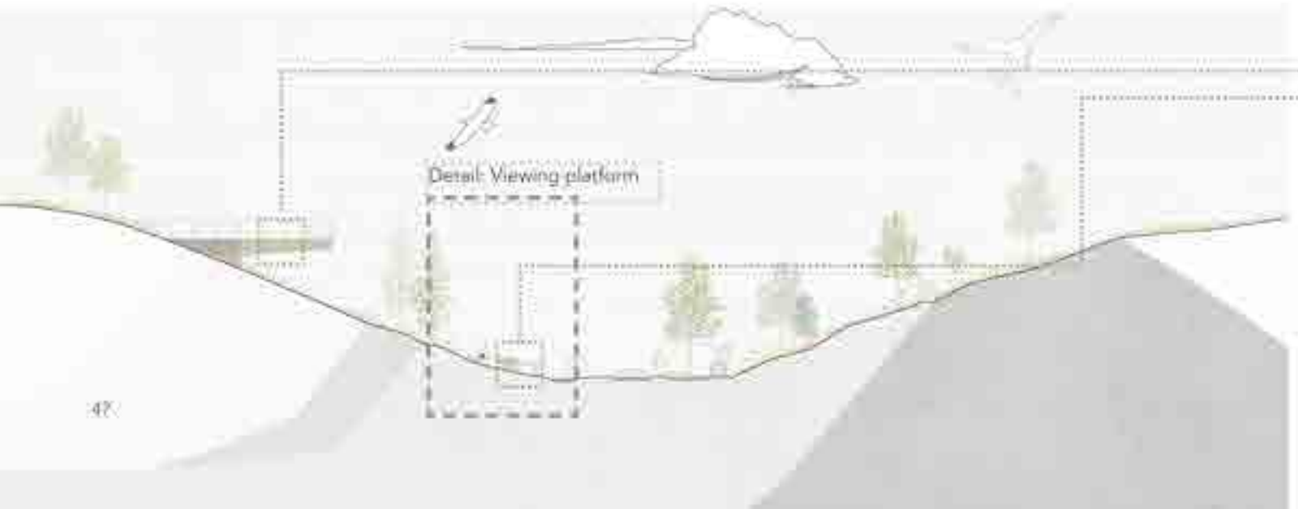
I choose a view that allows us to see where interventions are. It has a broad perspective that shows most of my designs. Through the difference in light, shade, and colour, people can understand the foreground and distant background, as well as the interior of the quarry. People can see this area and all the new trees, water, materials, and new activities.

Materials Schedule

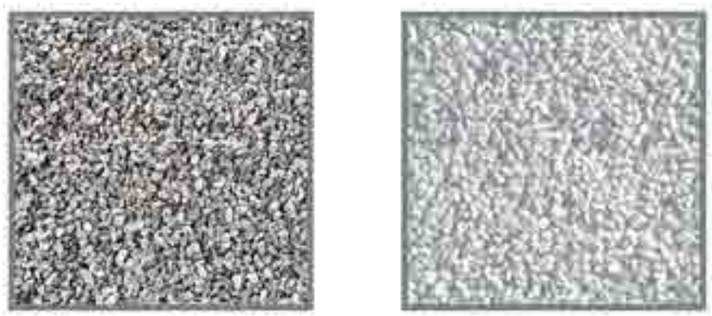
1. Pavement materials: Limestone is mainly used for the main roads and pedestrian roads, and gravel is used for hiking trails.

2. Seats and information boards are made of limestone and wood. Use the limestone material of the site and some felled wood for reduced cost, high durability and easy maintenance.



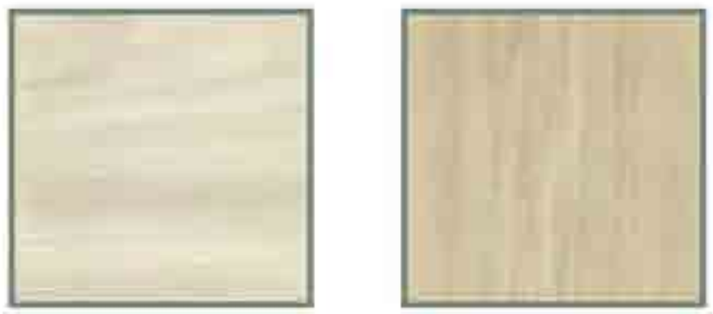


Different types of limestone



Other materials

I choose some materials which may be matches the colour of the limestone.



Oak timber

Beech timber

Detail Drawing

Cairn
Scale 1:20

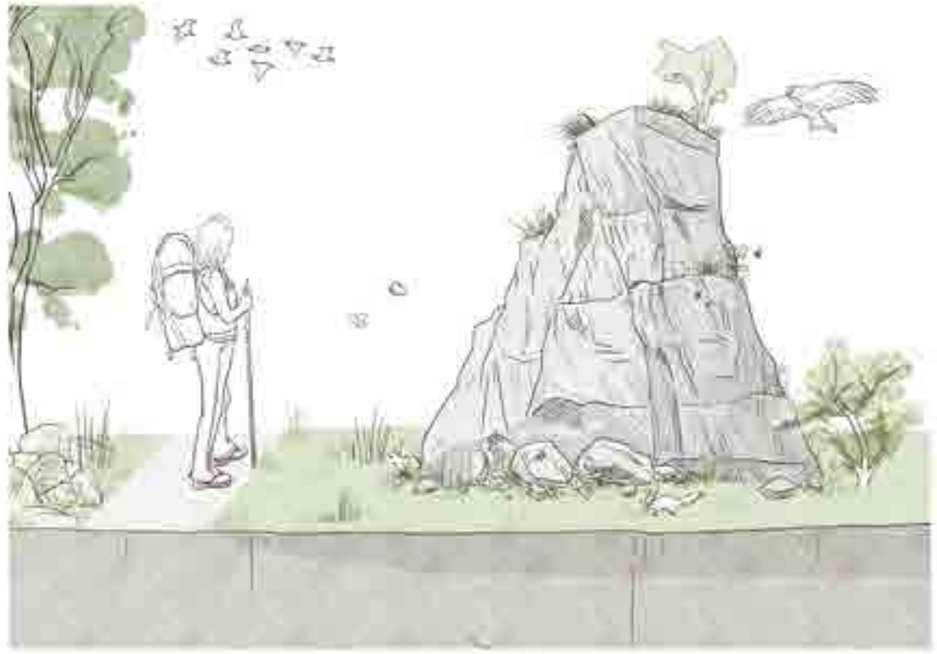
More-than-human communities

This drawing shows limestone cairns, how way finders might be designed, and what more-than-human communities can live in them.

It represents the animals and the small-scale plants in reality. These spaces in between can provide habitat.

People can carry a stone on their journey and have a very clear memory of doing that. It is a way of connecting people to places as well.

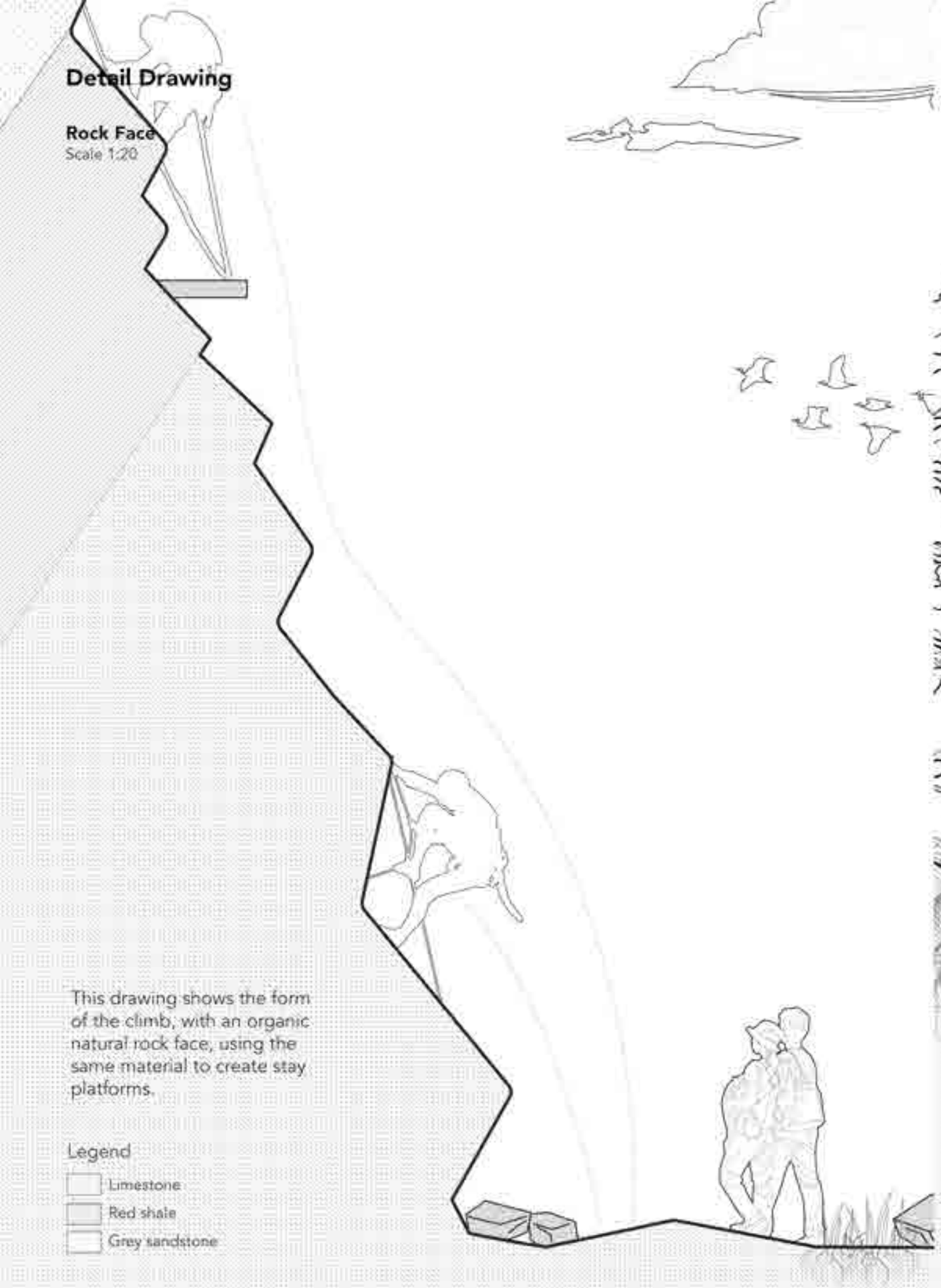
Limestone marker



Old version

Detail Drawing

Rock Face
Scale 1:20



This drawing shows the form of the climb, with an organic natural rock face, using the same material to create stay platforms.

Legend

- Limestone
- Red shale
- Grey sandstone

Detail Drawing

Viewing Platform
Scale 1:20

This drawing shows how people interact with water, the qualities of the materials, real topography, and the proposed plants.

Pinus sylvestris

Betula pendula

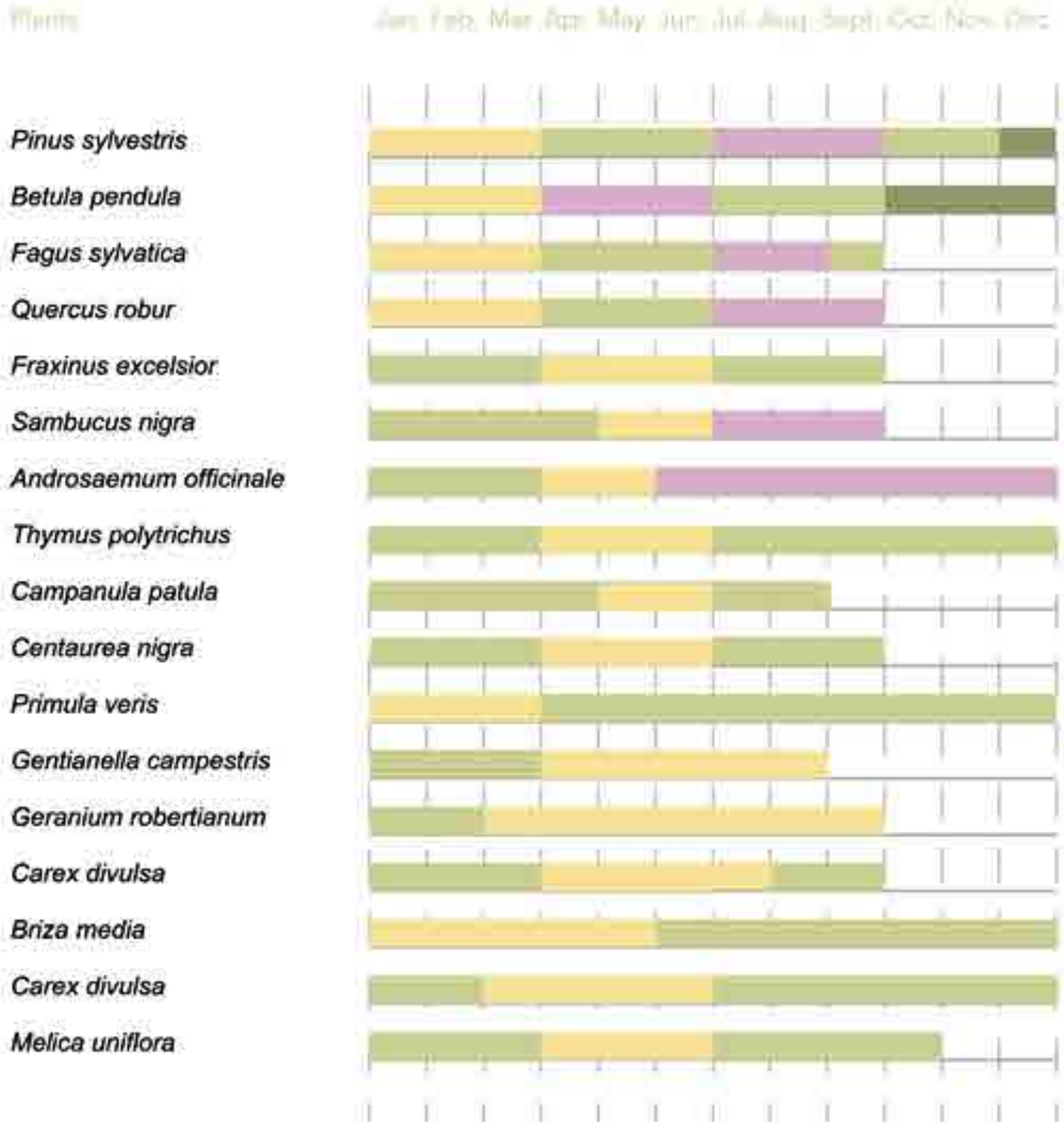
Fagus sylvatica

Proposed Plant

I want to take a combination of tree fruits, shrubs, herbaceous perennials, annual biennials and grasses.

Plant Calendar

This is a plant calendar showing the ornamental nature of different plants in different months, divided into four kinds, stem, flower, foliage and fruit interest.



Legend

Stem
Foliage interest
Flower
Fruit

Information source: https://www.rhs.org.uk/

Visualisation

Main road-cairn

Location	Around the quarry
Activity type	Walk, bird watching, rock observation.
Material	Limestone
Advantage	People can get a unique experience.

Visualisation

Picnic area

Location	Around the quarry
Activity type	Picnic, leisure, playing
Advantage	People can enjoy family activities

Visualisation

Hiking trail

Location	Around the quarry
Activity type	Walk
Advantage	People can come into a very wooded area and then experience a wide view of the quarry.

Visualisation

Viewing platform

Location	Inside the quarry
Activity type	Walk, leisure
Advantage	The quarry gives people a feeling of enclosure. People can interact with water and nature.

Visualisation

Research platform

Location	Inside the quarry
Activity type	Research, study
Advantage	A place for researchers to settle.

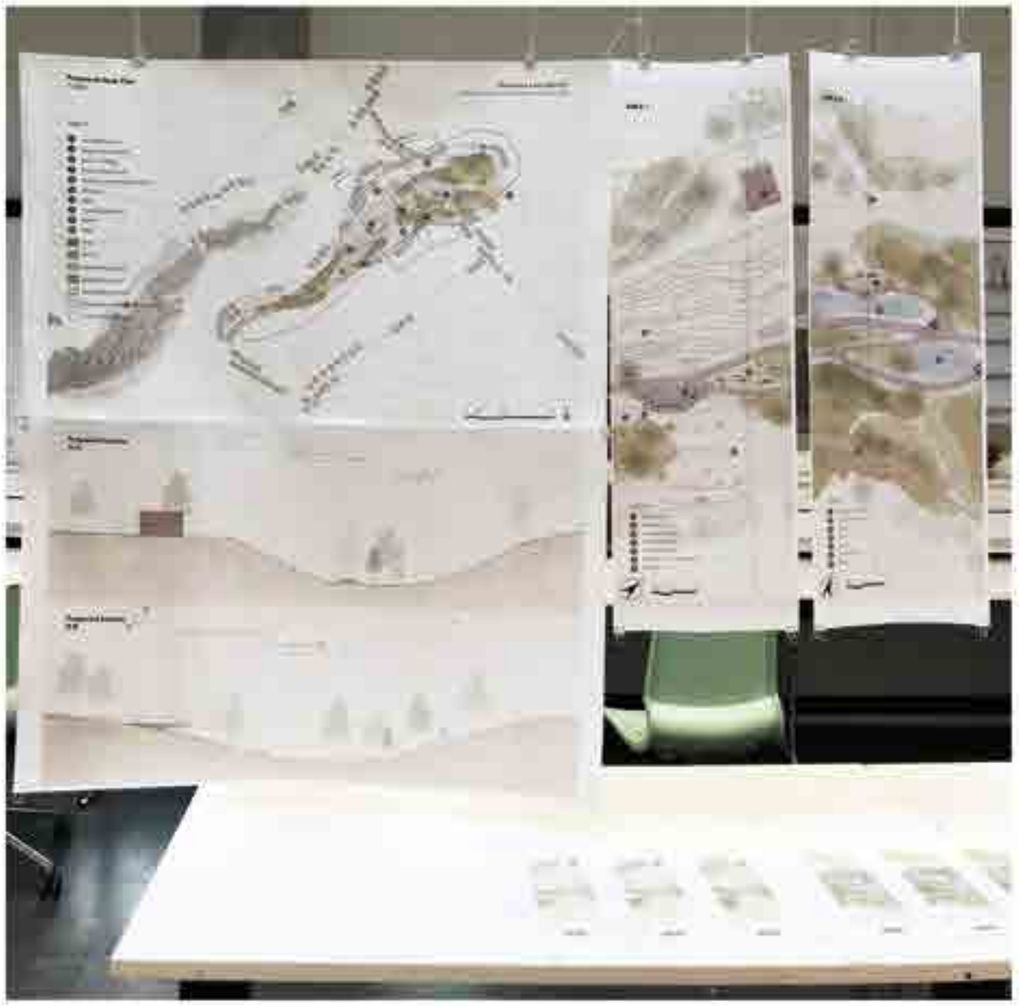
Visualisation

Fossil hunting trail

Location	Inside the quarry
Activity type	Walk, observe
Advantage	People can observe rocks, fossils and specific wildlife trails.

Curation

Interim Review



Final Review

Folded Leaflet

Bibliography

Baczynska, E. et al. (2018) The landscape attractiveness of abandoned quarries. Geoheritage. [Online] 10 (2), 271–285.

Biddau, G. M. et al. (2020) Abandoned landscape project design. City, territory and architecture. [Online] 7 (1), 1–17.

Cosgrove, S. (2017) Natural look and relaxed planting back at Chelsea. Horticulture week. 4–.

Fletcher, T. P. & Rushton, A. W. A. (2007) The Cambrian fauna of the Leny Limestone, Perthshire, Scotland. Earth and environmental science transactions of the Royal Society of Edinburgh. [Online] 98 (2), 199–218.

Hemmings, S. & Kagel, M. (2010) Memory Gardens: Aesthetic Education and Political Emancipation in the 'Landschaftspark Duisburg-Nord'. German studies review. 33 (2), 243–261.

Hu, W. (2017) 'Discussion on Reformation Design and Reuse of Industrial Wastelands Take the Landschaftspark Duisburg Nord Designed by Peter Latz as an Example', in PROCEEDINGS OF THE 2ND INTERNATIONAL CONFERENCE ON CONTEMPORARY EDUCATION, SOCIAL SCIENCES AND HUMANITIES (ICCESSH 2017). 2017 PARIS: Atlantis Press. pp. 500–503.

Landschaftspark (2023) Landschaftspark Duisburg-Nord. Available at: https://www.landschaftspark.de/ (Accessed: 27 March 2023).

Stilgenbauer, J. (2005) Landschaftspark Duisburg Nord - Duisburg, Germany (Latz. Places (Cambridge, Mass.). 17 (3), 6–9.

The eden project (2023) Eden's mission. Available at: https://www.edenproject.com/mission/our-origins (Accessed: 1 April 2023).

The Frustrated gardener (2017) CHELSEA FLOWER SHOW 2017: BEST IN SHOW – THE M&G GARDEN. Available at: https://frustratedgardener.com/2017/05/23/chelsea-flower-show-2017-best-in-show-the-mg-garden/ (Accessed: 25 March 2023).

Yin, H. & Xing, Y. (2016) Inspiration in Eden Project Innovative Thinking in the Planning and Construction of Botanic Garden. Landscape Architecture. [Online] (9), 44–51.

Zheng, X. (2015) INTERPRETATION ON DUISBURG-NORD LANDSCAPE PARK THROUGH THE LENS OF 'BROWN EARTH-WORK'. LANDSCAPE ARCHITECTURE FRONTIERS. 3 (6), .

Master in landscape architecture: Academic portfolio