FLODA31

Floda 31 by 8
Concept Report

June 2011

1.1 Introduction

by8 is a design collective consisting of students, alumni and staff from Unit 8 at the Bartlett School of architecture, UCL in London. The design collective were formed as we were invited by Floda 31 to design and build two small houses, Friggebodar, during the summer of 2011.

This report summarizes the main concepts developed during the winter and spring of 2011, and outlines the two different designs for the houses.

1.2 Brief

Friggebodar 2011: A live small buildings project

Friggebod: a small house of up to 15 square meters of floor space with a maximum of 3 meters to the gutter that can be erected on private land without the need for planning consent from the local authorities.

Project description
This project is to build two sustainable friggebodar for Floda31, an interdisciplinary research and design facility in Northern Sweden.

Brief
To design a friggebod that can house residents at Floda31. The friggebod should serve as a sustainable prototype, and should propose new ways of building with the climate in mind.
It could for example use unusual recycled materials, re-think traditional construction techniques, or use off-site manufacturing techniques to enable a faster and more efficient construction process.

Who
This is an interdisciplinary project and teams made up of more than one profession/area of knowledge are welcomed. We have invited The Bartlett School of Architecture, Unit 8 and Umeå School of Architecture (unit tbc) to make teams. Work will be supervised by tutors from both schools and Floda31.

Basic requirements and considerations
Each friggebod should have sleeping, working and eating space for two individuals. It should be able to generate it's own electricity and heating, and must be habitable all year round (temperatures range from -40C to +30C)

We would love it if each friggebod also had running water, cooking facility and food storage. Additionally it would be great to consider the friggebod as a place to look out for wildlife or watch the stars. An indoor/outdoor space could be added for camp fires or barbecues.

Keep in mind that there is no driveway, so access is on foot, bike, ski, snowmobile, dog sled or other. In winter there is heavy snow; two meters plus, and mid winter there won't be much light. In summer there are lots of mosquitoes, midges, horse flies and other flying insects and there won't be much dark. The locations for both friggebodar are on a hill (275m), ground is very rocky, lots of stones, but with a great view!

Local resources are wood, wood and more wood, and also some natural stone. There is a small stream and a well with drinking water in close by.

Expected results
The aim of the competition is threefold: Firstly, to allow students the chance to test their ideas against reality. The fast construction process combined with the stringent demands on quality needed to meet the harsh climate of Floda, will provide an excellent case study for the students, and an important learning experience in their careers as architects.

Secondly, it is an opportunity to create ties between the newly founded Umeå School of Architecture and The Bartlett School of Architecture, UCL, which is one of the leading schools in the world. This would help to reinforce Umeå university's status as an international university with links to some of the most influential universites around the world.

Thirdly, the small prototype houses will provide a great opportunity to showcase new and interesting ways of tackling the difficulties of building in an extreme environment, without any restrictions to the designers' creativity.

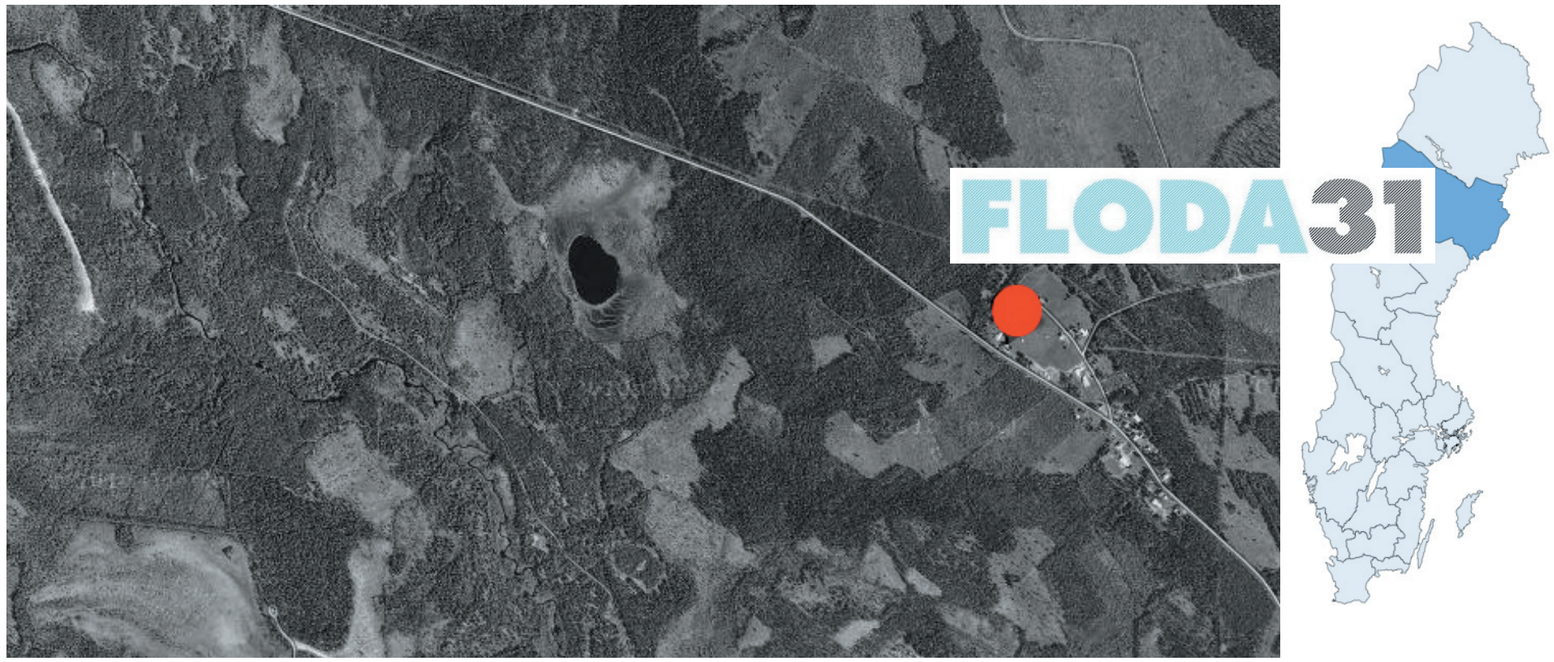
1.3 Location

The first written mention of Umeå is from the 14th century. The northern parts of Sweden, including the counties of Västerbotten and Norrbotten, were settled by Sami people before this time, though not necessarily in the city's exact location. Umeå in its first form was a parish with a wooden church and trade post located in the section of town now known as Backen (or Kyrkbacken). Its location near the coast and on a river was probably one of the reasons that people chose to settle there.

Umeå is situated on the inlet of the Gulf of Bothnia at the mouth of the Ume River, in the south of Västerbotten. Umeå is about 600 km north of Stockholm at 63°50 N 20°15 E and about 400 km south of the Arctic Circle. It is the largest city north of the Stockholm-Uppsala region, and is sometimes referred to as the regional centre of northern Sweden the city was built on the lands of the Sanda homestead as a compromise between Ön and Backen. The city was burned to the ground by marauding Russian troops in 1714 and 1720.

In June 1888 the whole of the eastern part of Umeå, the shipyards at Teg and the houses on Ön Island were devastated by a fire that began in the brewery close to Renmarksbäcken. About 2,300 of the city's 3,000 inhabitants were made homeless. When the city was rebuilt after the fire, wide avenues were laid out as fire protection and silver birch trees planted along them to prevent fires from spreading from one building to another.

Umeå soon became known around Sweden as the City of Birches



Floda 31 Botsmark Västerbotten

1.4 Climate

Climate change in Sweden
TEXT FROM WIKIPEDIA

Sweden has applied policy instruments and measures for climate change mitigation since 1980s. The instruments used include economic instruments (such as CO2 tax, subsidies, penalties), legislation, voluntary agreements and a dialogue between the state and business enterprise. The main instruments are described below:

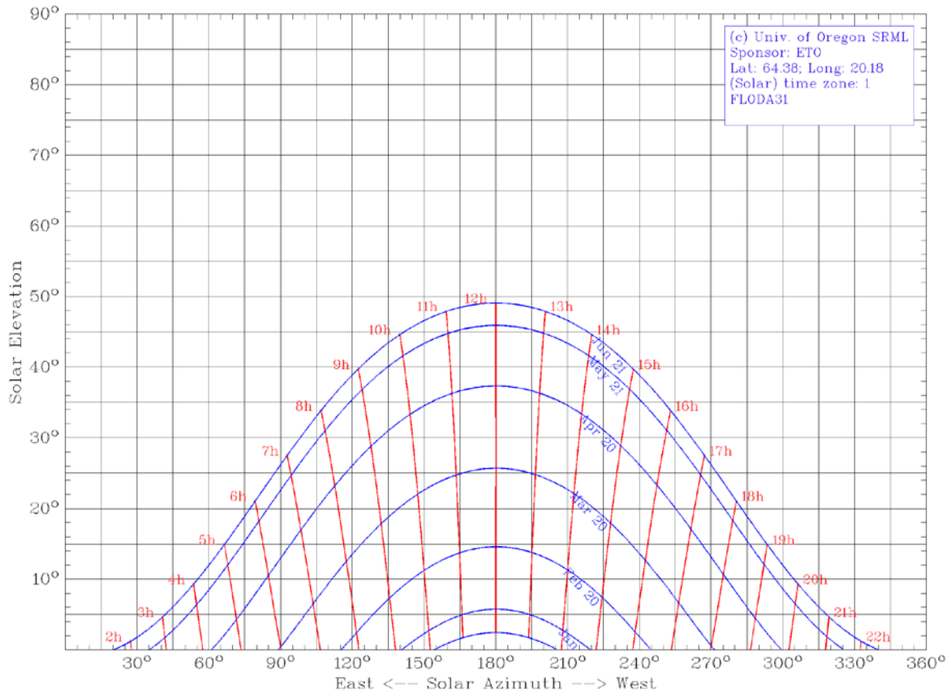
Carbon dioxide tax instrument
In Sweden, there are so far three different taxes levied on energy products (mainly fossil fuels), namely energy tax, sulphur tax and CO2 tax. Energy taxation has been used as a policy instrument ever since the oil crisis of the 1970s to support renewable energy and nuclear power. Energy tax was reduced by half in 1991 during the tax reform, simultaneously with the introduction of a CO2 tax on fossil fuels, with exceptions on ethanol, methanol, other biofuels, peat and wastes.

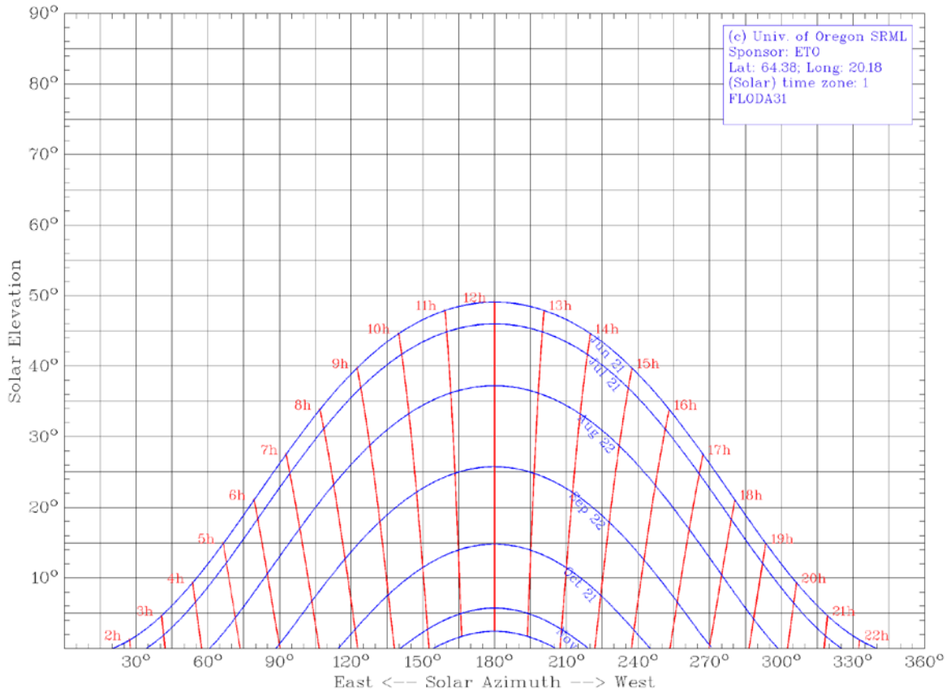
Renewable energy certificate system
As one part of the Government's long-term energy policy to reduce GHG emissions, the Swedish government introduced a voluntary international system for trading "green certificates", i.e. the renewable energy certificate system (RECS). With effect from 1 May 2003, RECS intends to encourage and increase the proportion of electricity produced from renewable energy sources. This will be done by payment of a levy in proportion to certain fraction of their electricity during the year. For example, during the first year (2003), users will be required to buy 7.4 per cent of the electricity generated from renewable sources

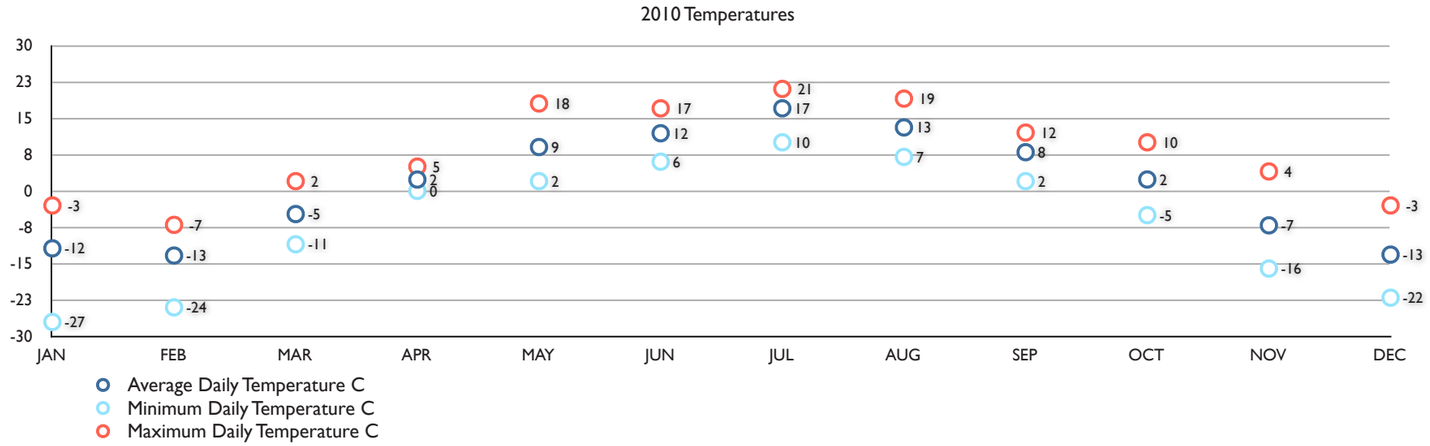
Renewable energy subsidies and continuous investment on R&D
Since 1991, Sweden started many programmes to encourage the use of renewable energy and new technology development, e.g. Energy Policy programme (Long and short term programs that focus on ways to increase the supply of renewable electricity, to reduce electricity consumption, and to promote energy efficiency), Green Certificate Scheme (Generators using solar, wind, biomass, geothermal, wave or small hydro are awarded one certificate for each MWh produced, and all consumers are obliged to buy enough certificates to cover a set proportion of their use).

International collaboration and carbon trading systems
Sweden also shows its leadership in international cooperation and competence on the climate change issues. Sweden actively took part in some international climate policy programs, such as Prototype Carbon Funds (PCF) and Activities Implemented Jointly (AIJ)

Public participations
Public participation is quite important in addressing climate change and its effects and developing adequate responses. Without the support of the public, it is impossible to implement a new policy instrument successfully. For example, one cannot anticipate that bio ethanol and bio diesel could be widely consumed without support and understanding from the general population. Therefore, information to raise the level of knowledge concerning the climate issue to the public is necessary.






2010 Temperatures
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JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
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-7 -13 -24
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5 2 0
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19 13 7
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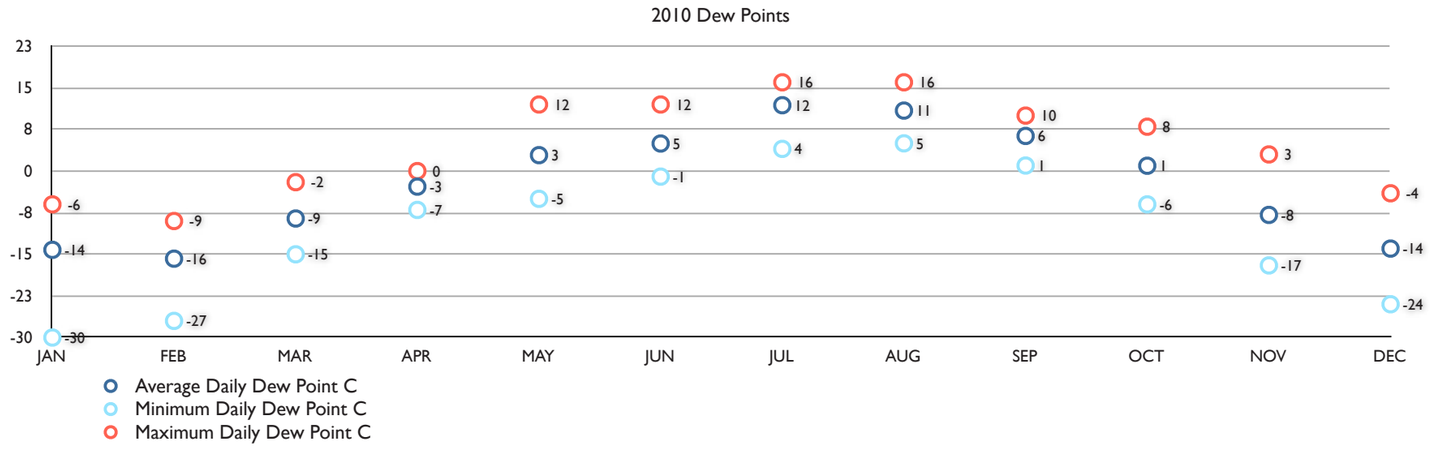
Average Daily Temperature C
Minimum Daily Temperature C
Maximum Daily Temperature C


2010 Dew Points
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JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
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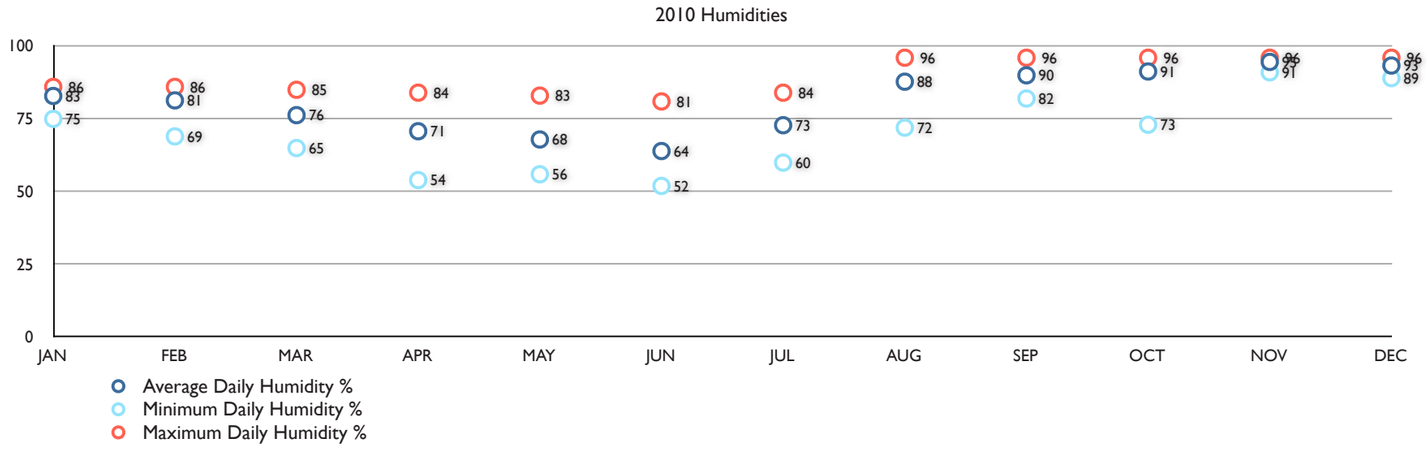
Average Daily Dew Point C
Minimum Daily Dew Point C
Maximum Daily Dew Point C


2010 Humidities
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JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
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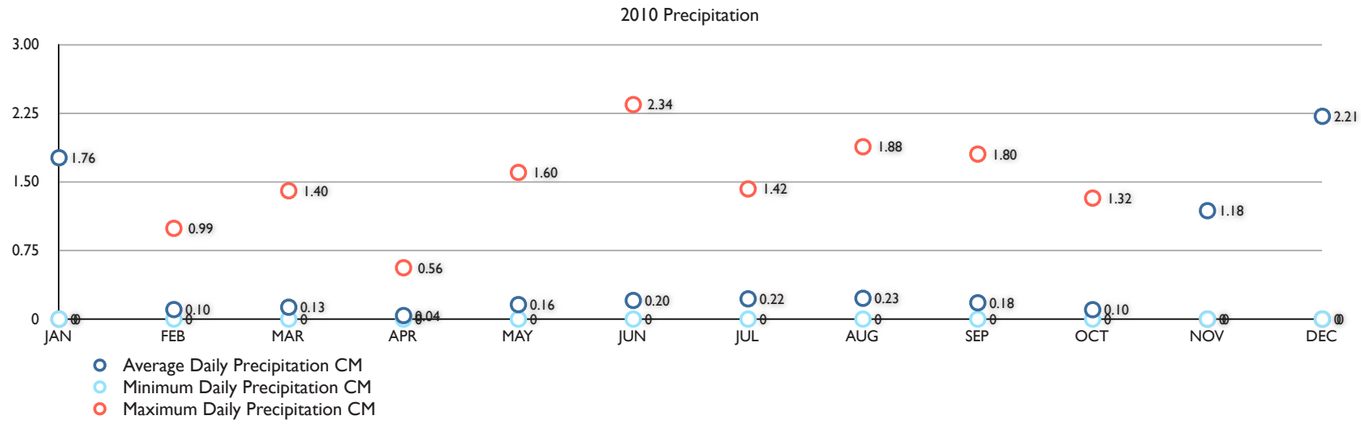
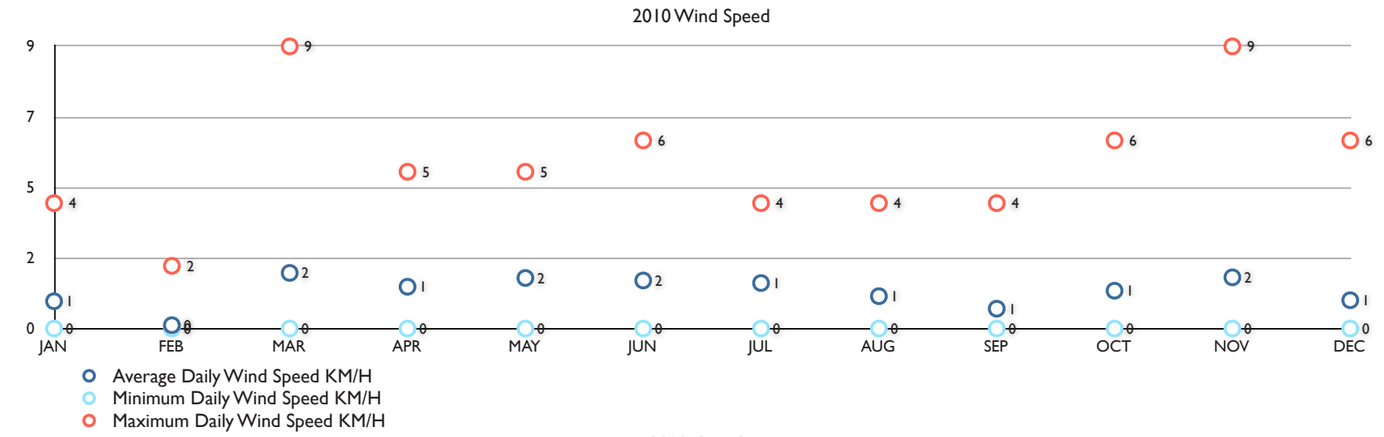
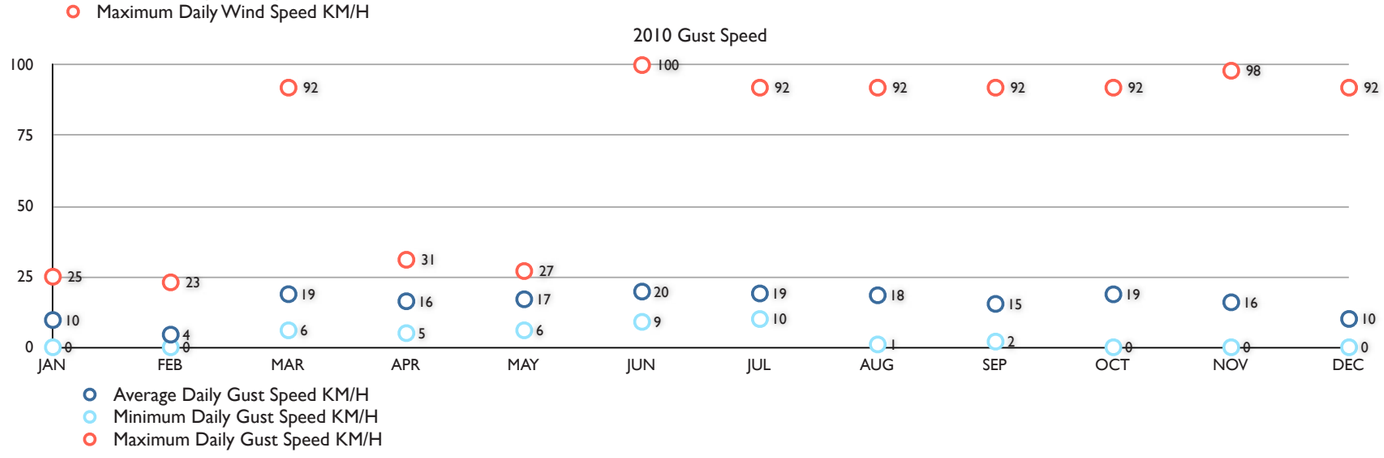
Average Daily Humidity %
Minimum Daily Humidity %
Maximum Daily Humidity %



November, December and January show massively inflated precipitation values of 34cm, 34cm and 45cm respectively... I assume this is because of snow.

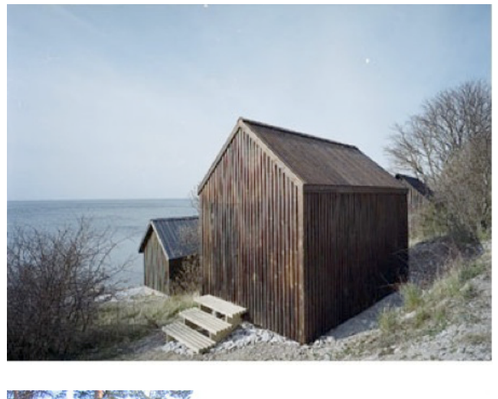


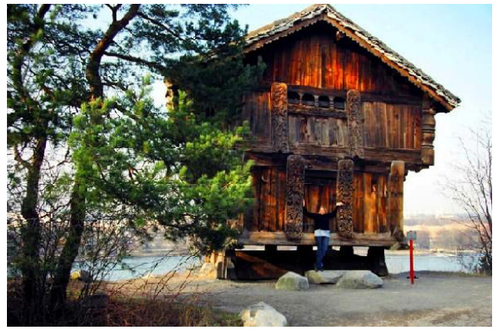


Elevation is 280m approx. Summer winds from South, Winter from North North West.

1.5 Vernacular References

Traditional Swedish architecture has been one of the key sources of inspiration. The sculptural qualities of the timber houses, particularily the 'Härbre' has fed a discussion about the Friggebod's relation to its context. In addition, the textural and sometimes graphic use of timber and paint has driven our discussions about materiality as well.





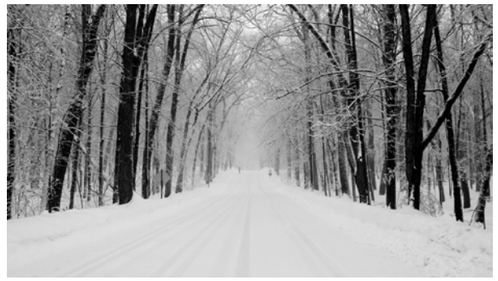
1.6 Modern References

In addition to the vernacular references, modern examples of small structures were also studied. We examined their sculptural potentials, their integration into the site, and their ability to change with the seasonal variations of their context.

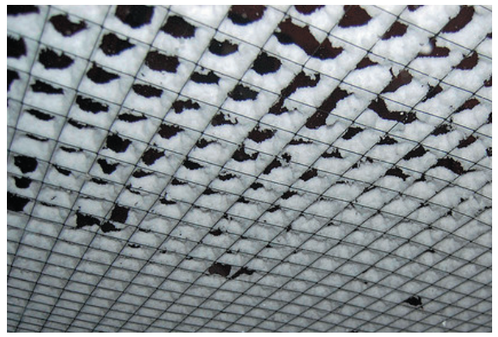
1.7 Materials

Our material palette is driven by the natural environments in which the building will sit. Forests, timber, ice and snow forms the overall inspiration. To achieve this we have been looking at timber treatments such as charring, tar impregnation, painting and scarring as potential techniques.





2.0 Environmental Strategies

Introduction

The general approach adopted by Floda31by8 is to see sustainability as an integral requirement of design and not just a unique requirement of the particular brief. It is important that 'sustainable' measures should not be viewed as an additional parameter challenging good design intent.

The brief requirement and aspiration is for the Friggebodar's to be capable 'off-grid', however it is understood that their siting, in close proximity to other 'grid-connected' houses, lend themselves to a hybridised solution. It is likely that the fluctuating energy production of any on-site micro-generation is compensated via, or 'moderated' by a connection to the grid and efficiency will be gained when several consumers are grouped together.

Importantly Floda31by8 is a group of designers who understand and appreciate the general principles of energy efficient and sustainable design but will require specific input from experts in the field as the project develops.

'Sustainability' is a broad term and the Friggebodar design will aim to address as many areas as possible, with specific focus on energy consumption / reliance / independence as well as responsibly sourced materials. Additionally it is understood that a key requirement of the Friggebodar is the ability of the designers to fabricate the structure on-site and the technologies utilised must accommodate those skill levels on-site within a constrained build schedule.

Embodied Energy

The key focus of the 'technical' elements of sustainable design are likely to focus on balancing the demand and on-site micro-generation of energy for use within the building on day-to-day basis. However it is is highly important to consider the 'embodied energy' of the materials which have been specified for the building. This refers to the energy required in the production, transportation and installation of materials used within the building fabric.

Use of recycled materials frequently offer the best levels of 'embodied energy' as the processing has already been accounted for in its previous life, however the aesthetic of the building form can be driven by the availability and type of these materials. Additionally the remote nature of the design team relative to the site will mean sourcing, re appropriation of such materials will be difficult to anticipate in advance.

The team proposes, where possible, to counter their physical remoteness by utilising production facilities local to the site, such as the high-tech facilities of the local timber yard, and a use of 3D CAD techniques to source, design and specify materials which can be manufactured locally and delivered direct to site.

The materials must additionally be 'sustainably' sourced, such as timber from managed forests, and a schedule of the specified materials will be documented throughout the design process.

Energy

The design challenges inherent in Floda's location are determined primarily by the climate and will naturally require a building enclosure which is warm and dry in the winter and well ventilated in the summer, but that may not benefit from obvious energy sources (such as sun) in those peak demanding periods.

Energy awareness

It will be important that energy production and consumption is sensibly managed on-site and the Friggebodar's occupants will need to be actively engaged in this relationship. Each Friggebodar will therefore be fitted with energy monitors which will be clearly and centrally positioned.

Reduced demand

The difficulties in unlimited energy production are both practical and economic and it will be necessary that the design minimises its consumption as much as possible. Suggested means are as follows:

- Good insulation levels to minimise heating requirements
- Good natural lighting to miminise artificial lighting requirements
- Low-energy lighting and appliances
- Minimal accessibility to energy demanding appliances, or access to battery appliances only eg. radios etc.
- Outdoor cooking opportunities, when appropriate to minimise heating requirments

Suggested micro-generation opportunities, to be considered further:

- *Biomass boilers - good for internal area and water heating via a 'back-boiler*
- *Solar water heating - good water heating ability, cheap and small areas required*
- *Photovoltaics - would require battery storage and diminished efficiency in winter when demands highest*
- *Wind Turbine - determinate on a good exposed location. May be subject to planning objections? Most effective when connected to multiple consumers*
- *Ground-source heat pumps - 'reverse refrigerant' concept, small energy input, large heat output*
- *Air-source heat pumps - reverse refrigerant' concept, potential to include within a hybridised version of external louvres*

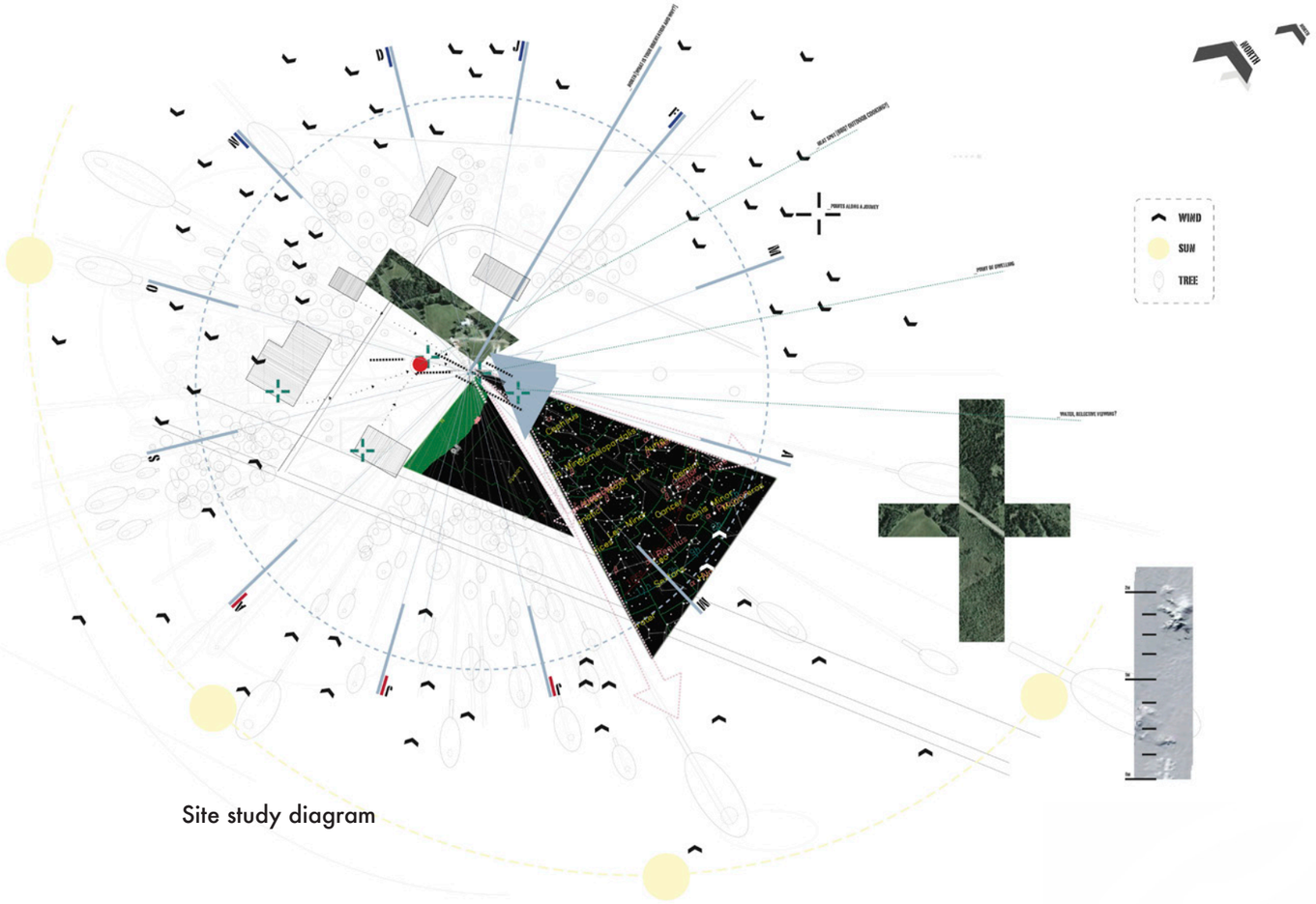
The preferred means of energy production is likely to be a combination of the above suggestions in order to benefit for each key advantage and compensate for the disadvantages.

Other services to consider:

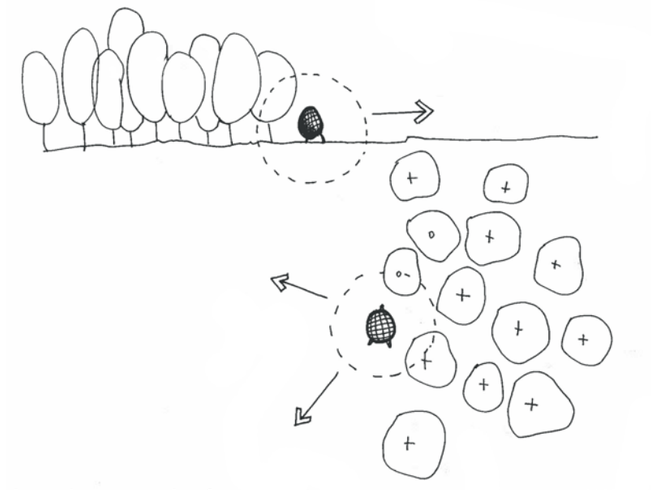
- Water provision - assumed as connected 'back-to-grid'
- Grey-water recycling a possibility however rain-water harvesting would likely require larger dedicated roof areas
- Reduced flush toilets - easy to implement

- Waste management - assuming WC provision within the Friggebodar
- Composting toilets - possibility, but main be a challenge in a cold climate and area demanding
- Sceptic tanks - practical and well tested

3.1 Orientation

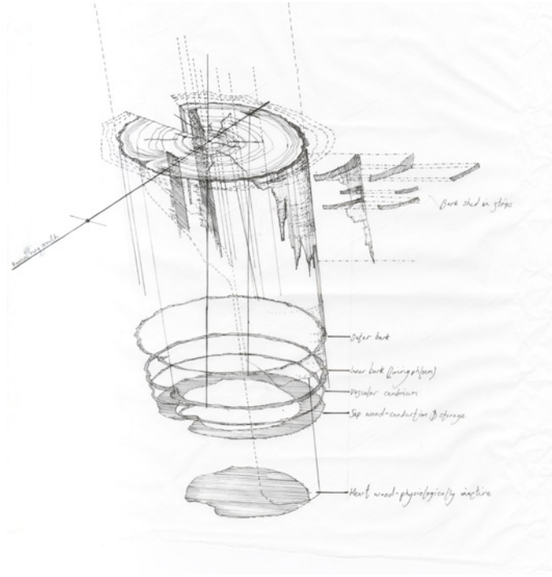


Site study diagram

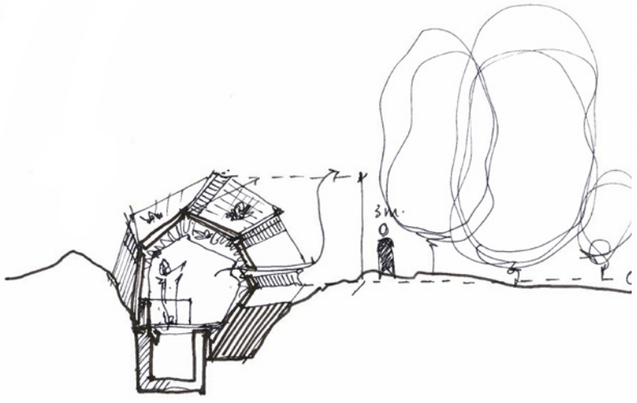


The relation to the forest

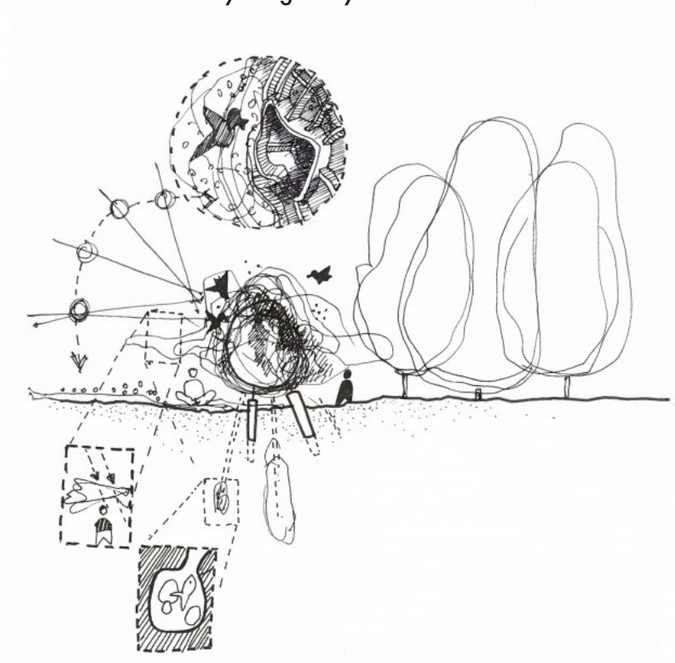
3.2 Building as a (birch)tree



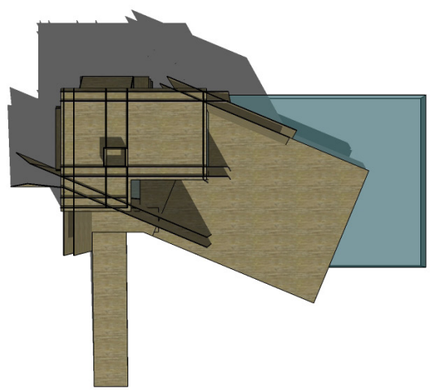
Birch bark layering study

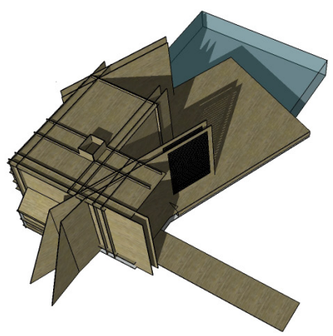


The building as tree

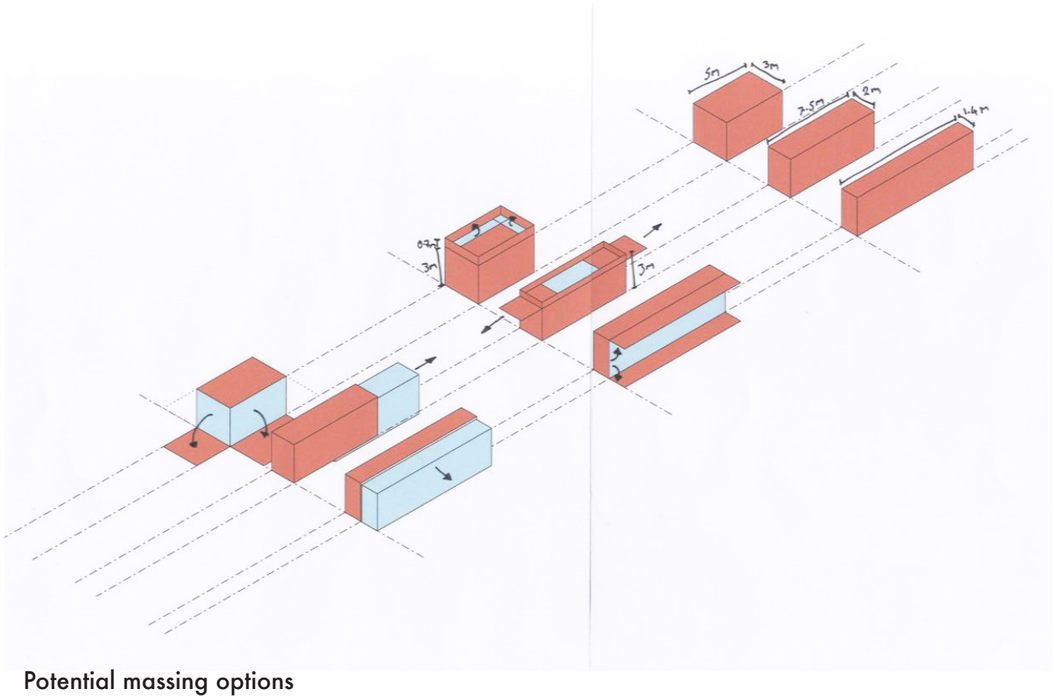


3.3 Massing options



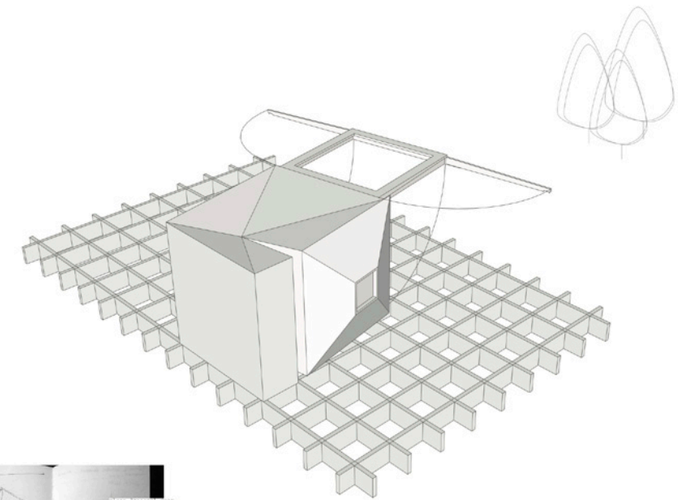


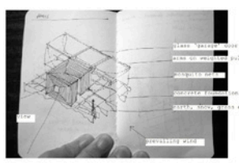
Initial 3d sketches of a broken up volume



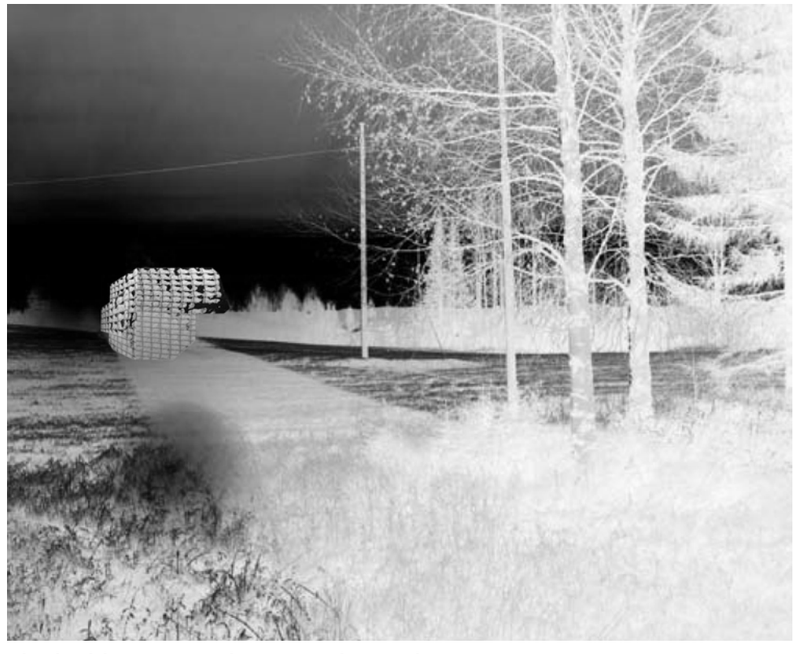
Potential massing options

3.4 Seasonally Responsive





Extending the skin through opening screens/canopies



The building covered in snow during the winter

4.1 Strategic Site Plan

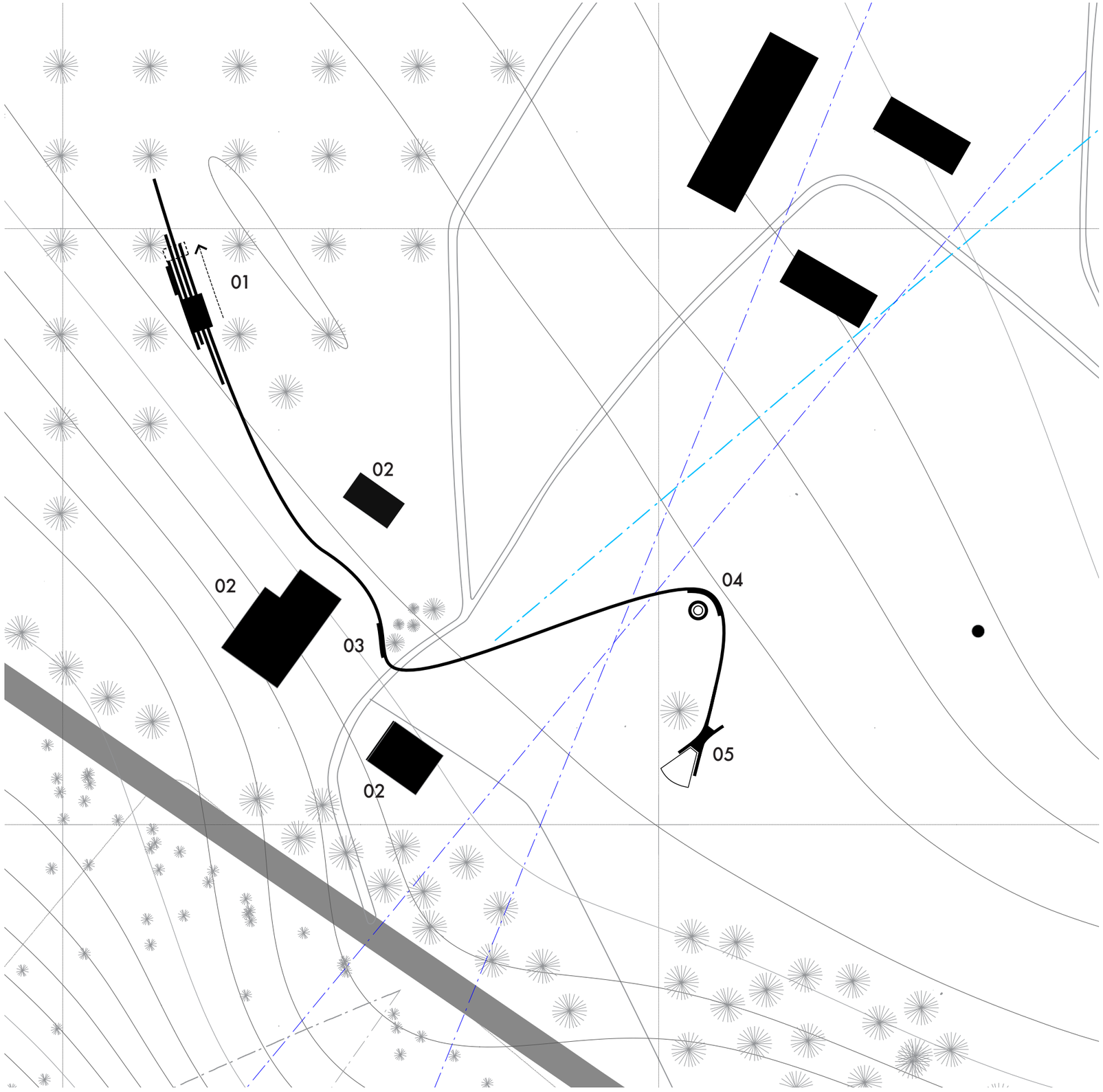
Based on the recent decision to allow for both Friggebodar to be designed by the same team, we took the opportunity to think about the relationship between the two houses, as well as their relation to the rest of the site.

We decided to create a landscape link based on a singe line, which would connect both houses visually and offer opportunities for outdoor activity along the way. The 'line' could be a step in the landscape, a low wall, a line of planting, and much more. We realise that the only way to decide on this is to work together with Floda on site to determine what can be done, and where.

Therefore, the siteplan should only be seen as a strategic diagram that shows the potentials of the concept, and possible activities that could add to the experience of Floda 31 as a whole.

Key:

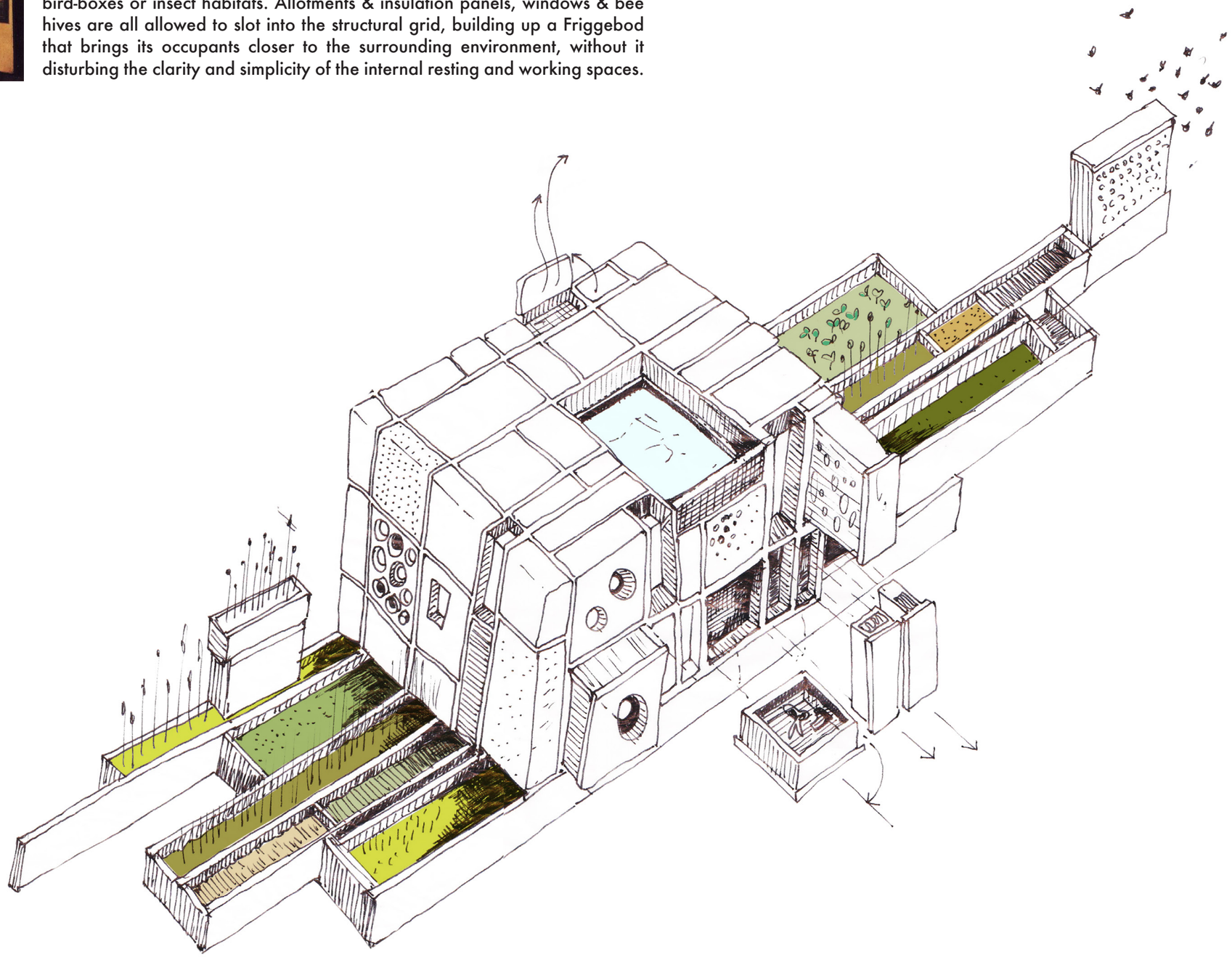
01 Forest house
02 Existing buildings
03 Bench/seating
04 Barbeque and seating
05 Field house



4.2 The Forest Site

CABINET OF CURIOSITIES

An inverted cabinet of curiosities: concealed on the inside, but for small viewing opportunities, the walls of the Friggebod hold artefacts and eco-systems of the forest environment. Drawers with seasonal planters, compartments with bird-boxes or insect habitats. Allotments & insulation panels, windows & bee hives are all allowed to slot into the structural grid, building up a Friggebod that brings its occupants closer to the surrounding environment, without it disturbing the clarity and simplicity of the internal resting and working spaces.



01 HABITAT

A habitat for insects and small animals, portions of the external wall will be assigned to panels containing broken bricks, tiles, etc stratified to create a hospitable environment for these forest creatures. Our approach to environmental sustainability has at its heart education. Although the building will be energy-efficient, the environmental aspect comes from proximity and familiarity; rejoining the forest from the relative protection of the Friggebod.

02 MATERIALS

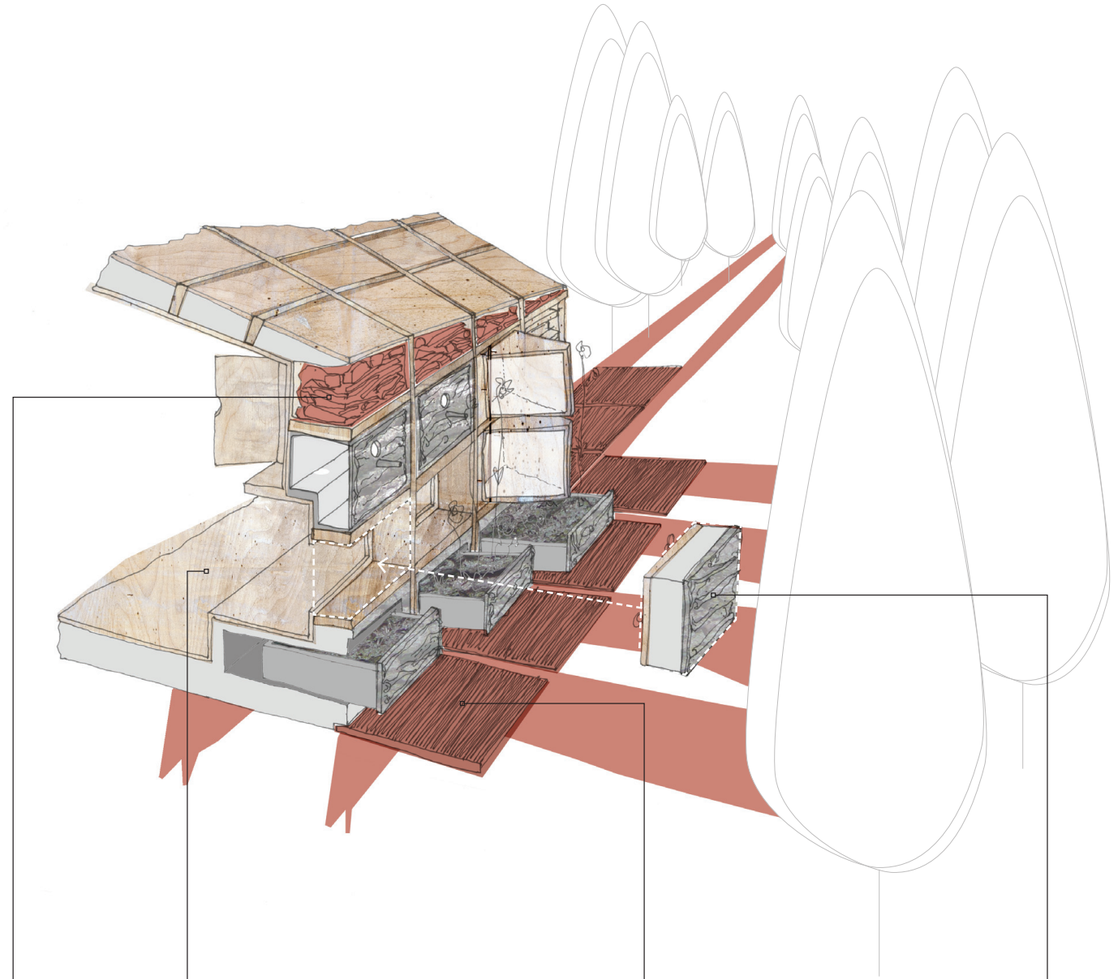
Internally, the finish is clean and clear and materially pure. Timber is used throughout and provides a visual and mental contract to the emphatically busy and vibrant external materiality. Storage is built into surfaces, while behind cupboards or indeed just built into the wall are viewing holes through to the environment built into the wall, as well as larger windows aimed at trees in the forest, or the other Friggebod, in the field.

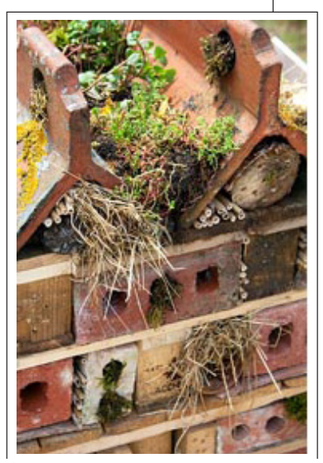
03 PLANTING

The proximity to the immediate environment provides us with the perfect opportunity to encourage small-scale vegetable growing. The grid structure of the Friggebod extends out into the ground and through the trees and can hold allotment boxes and fire-pits and bee hives, amongst other things.

04 SEASONAL

Opportunities within the structural grid allow for windows and storage opportunities, but primarily the design of the grid falls forms around programmatic need. Grid spacing will allow for two or three different panel sizes. They can be swapped and just left out, for more air circulation during the summer. During the winter, they can all be plugged, sealing the Friggebod against the gales and snow drifts.





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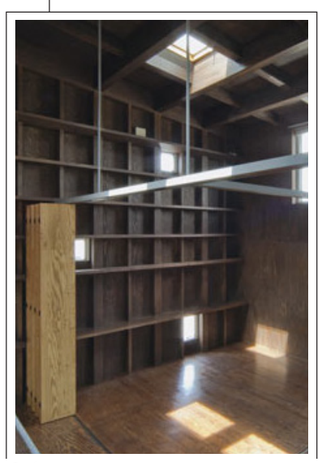
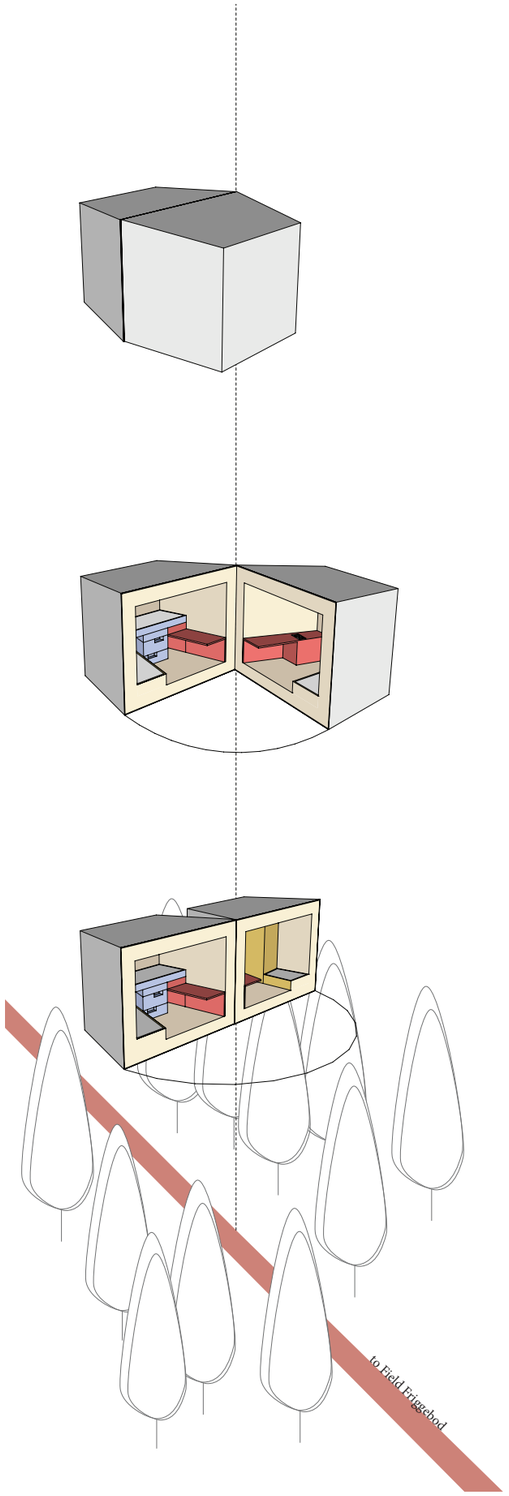
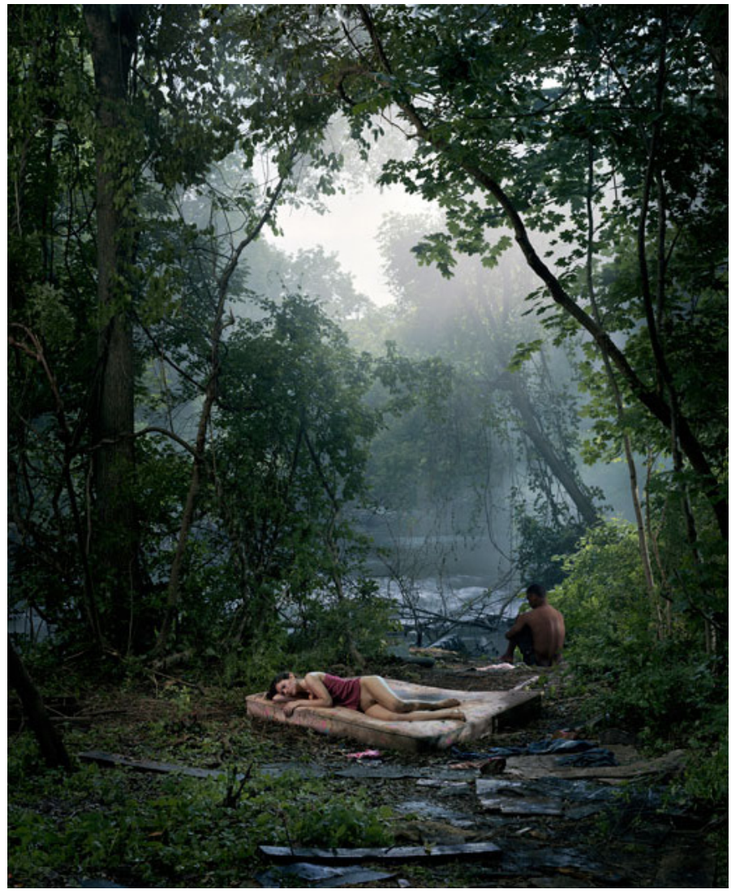


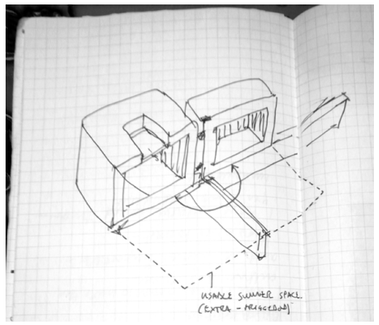
04

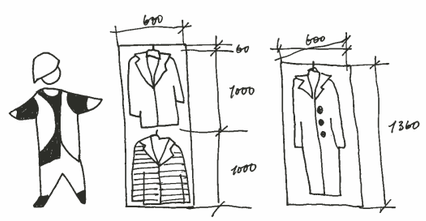


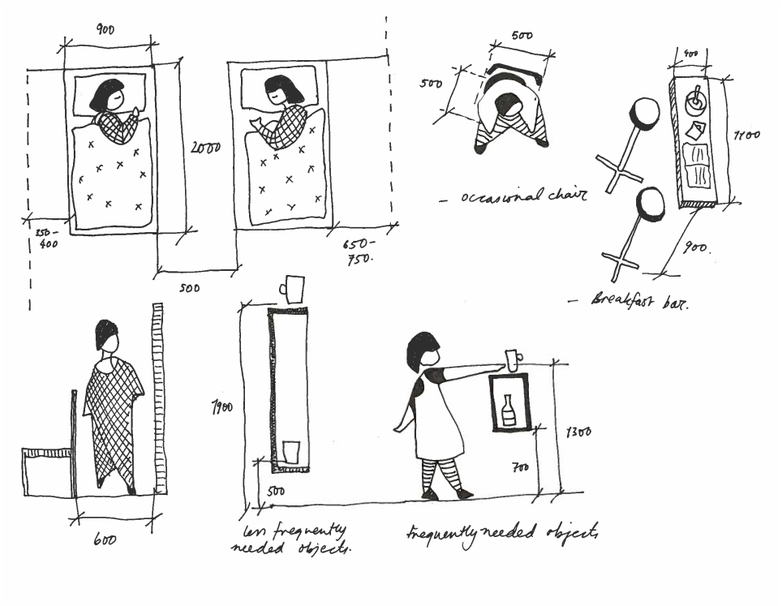


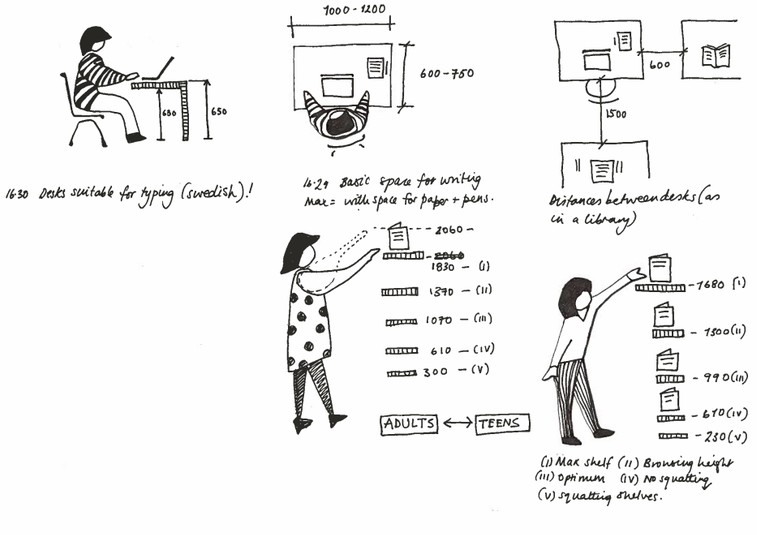
FOREST CLEARING

In the clearing, researchers seasonally open and close their Friggebod to vary their interaction with the surrounding nature. When open, the exposed parts of the Forest Friggebod are oriented towards the Field Friggebod, visible through gaps in the trees. When closed, it is the entrance which is oriented towards the Field Friggebod, enhancing the sense of community, despite the seclusion.



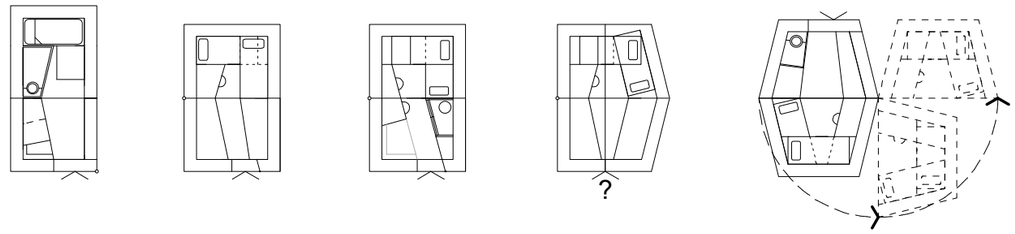


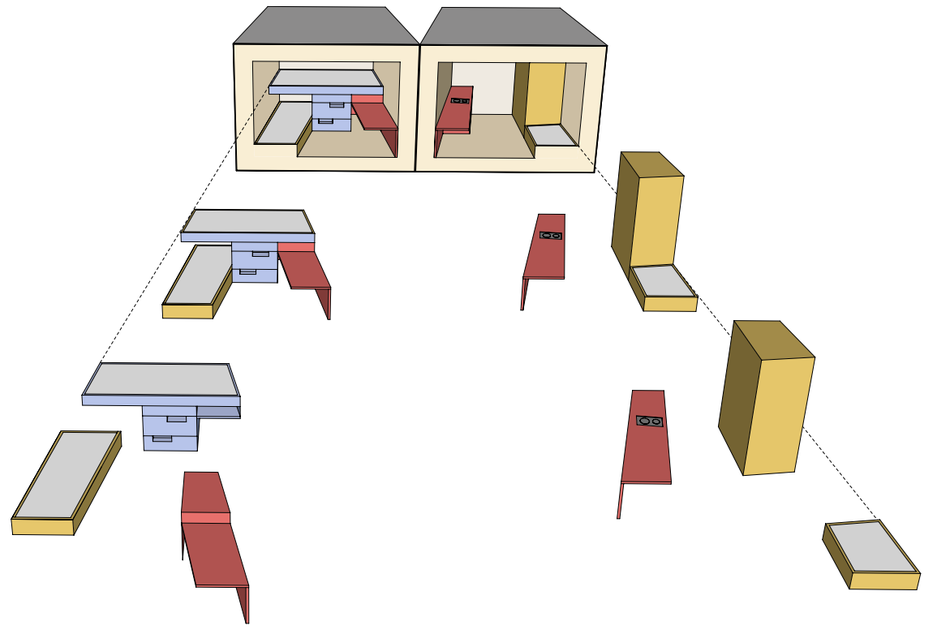




GENERAL ARRANGEMENT

The 3m height and 15sqm plan area are deformed away from the ultimately rational cuboid, to a form which provides more space in the middle of the Friggebod, with furniture around the edges - sleeping at one end, living at the other. Then, broken in half and allowed to open through 180 degrees, the area of the living space can be expanded in the summer months, provding a useful outdoors area between the sleeping half of the Figeebod and the living half.





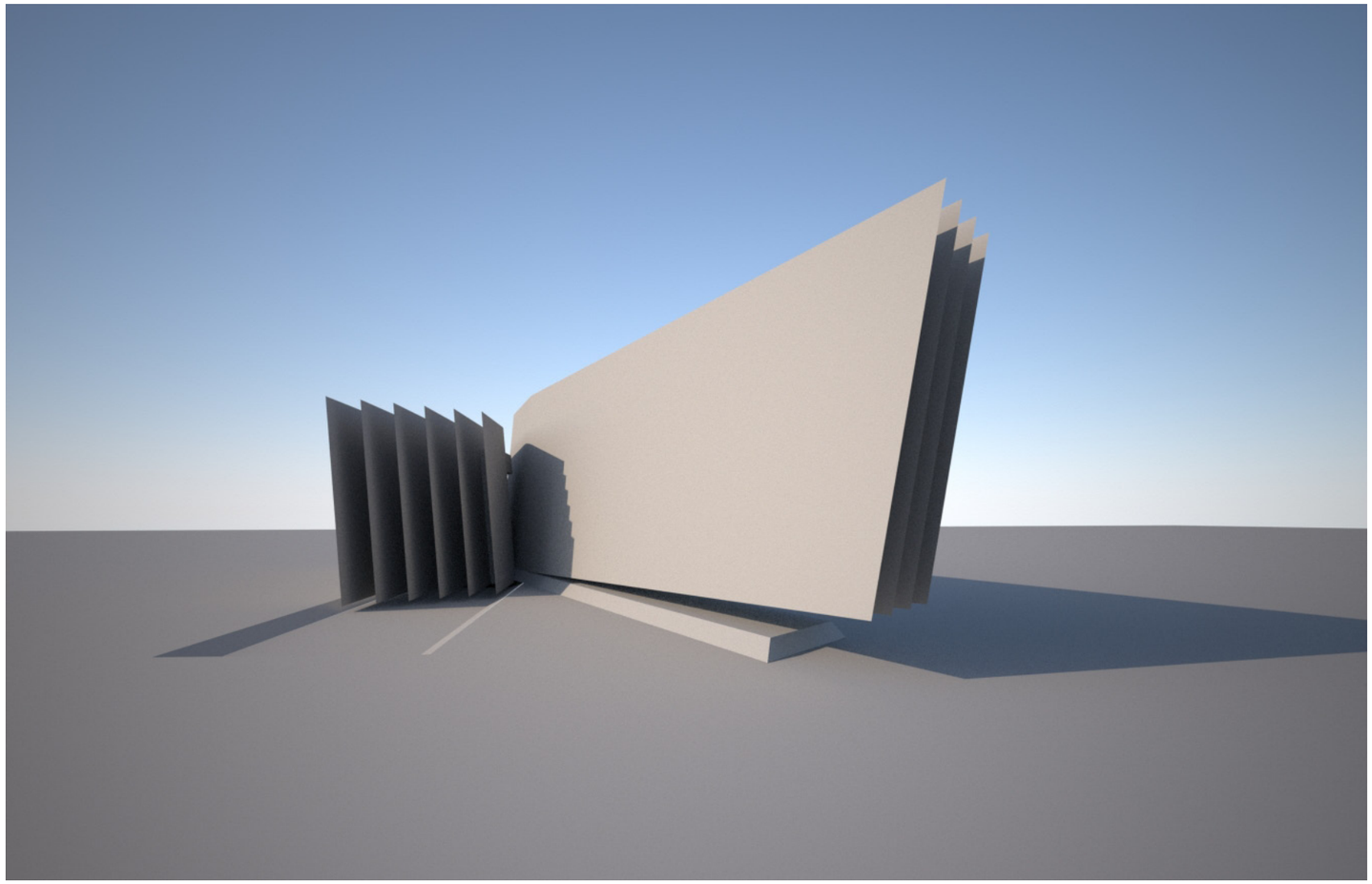
4.3 The Field Site

The Field Site design is less advanced than the Forest Site, due to the late inclusion of it as part of our design scope. We therefore only show the beginnings of this design on the following pages, and will work towards completing this in the coming weeks.

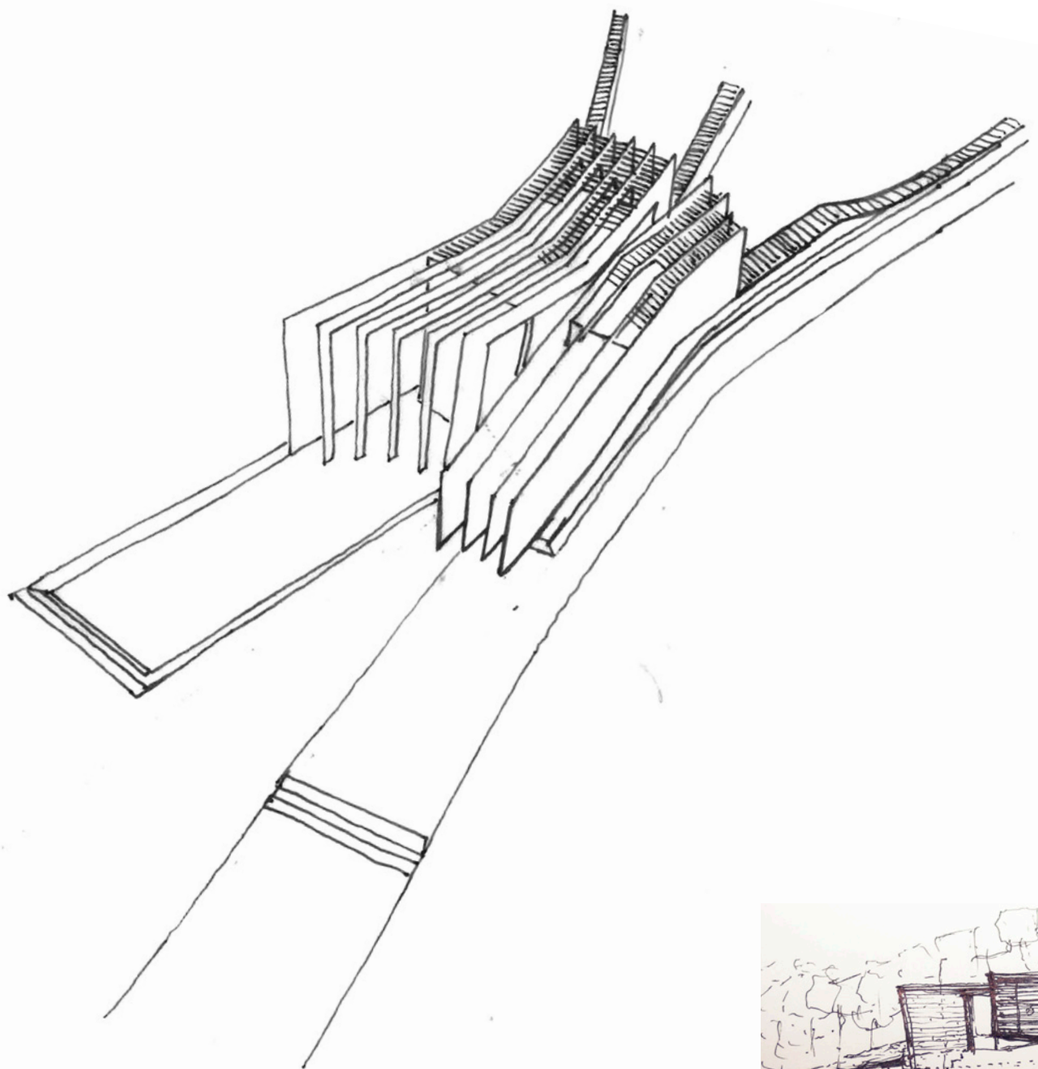
The main idea with the Field site is the concept of a split house, allowing for a sense of privacy for the two expected occupants, while at the same time allowing nature to exist in close relationship with the building.

The split works in two ways: the northern split is facing the direction of the prevailing winds, and is aimed at collecting snow during the winter. This will work as a visual feature, as well as help to increase the thermal properties of the building envelope.

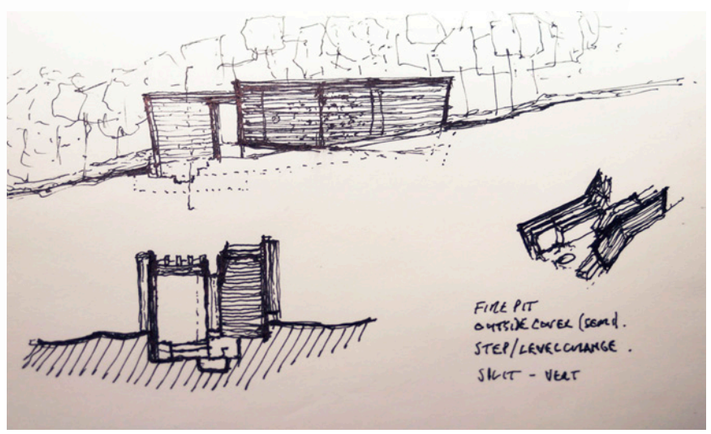
The southern split is creating a shelter from the winds, and offers a protected outdoor area for use throughout the year.

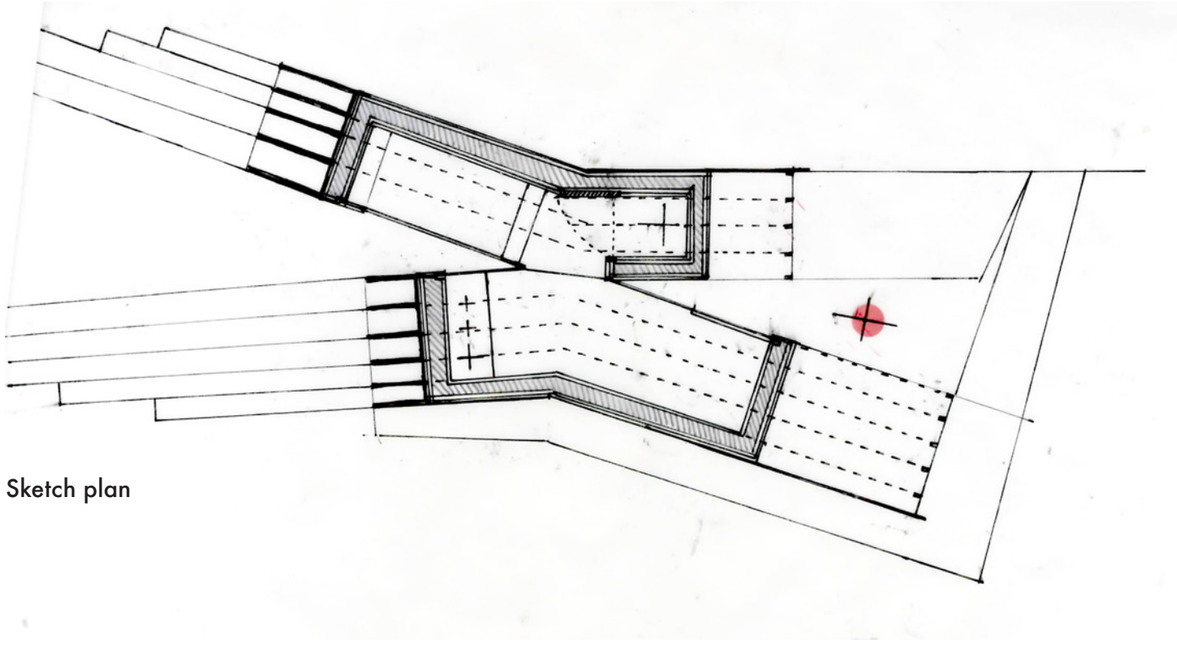


Early concept render of the split walls

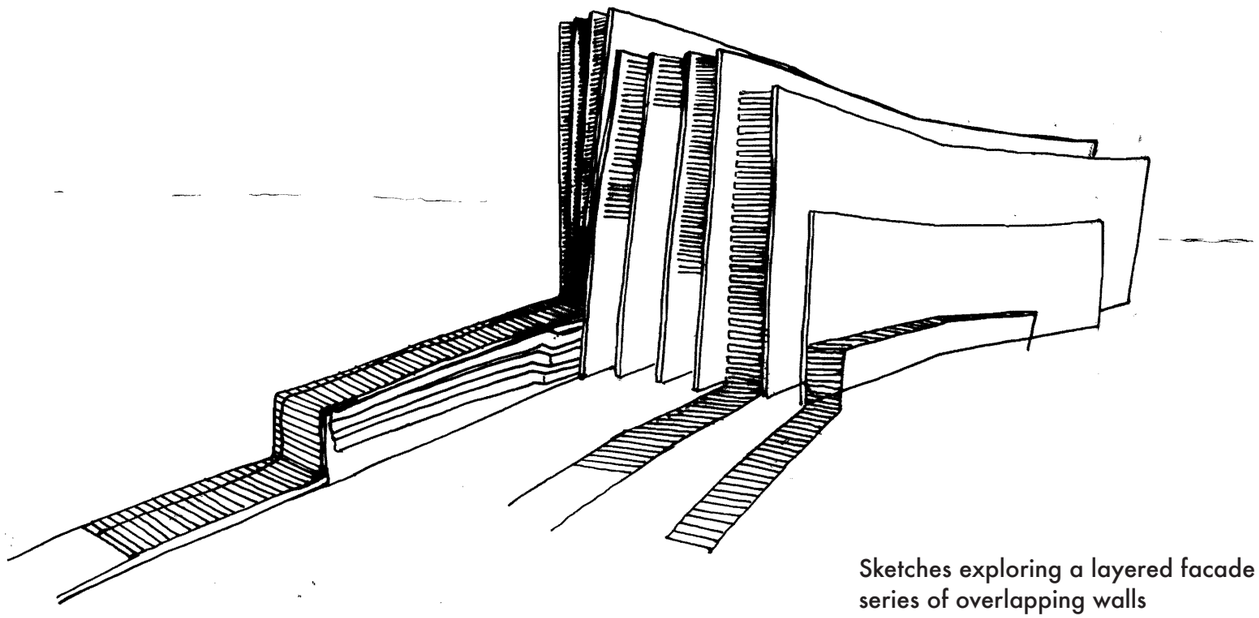


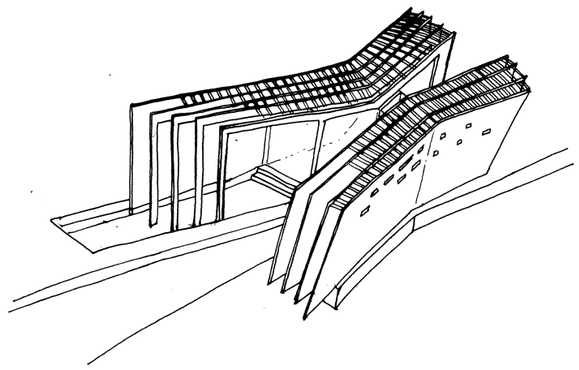
Concept sketch of how the building extends into the landscape



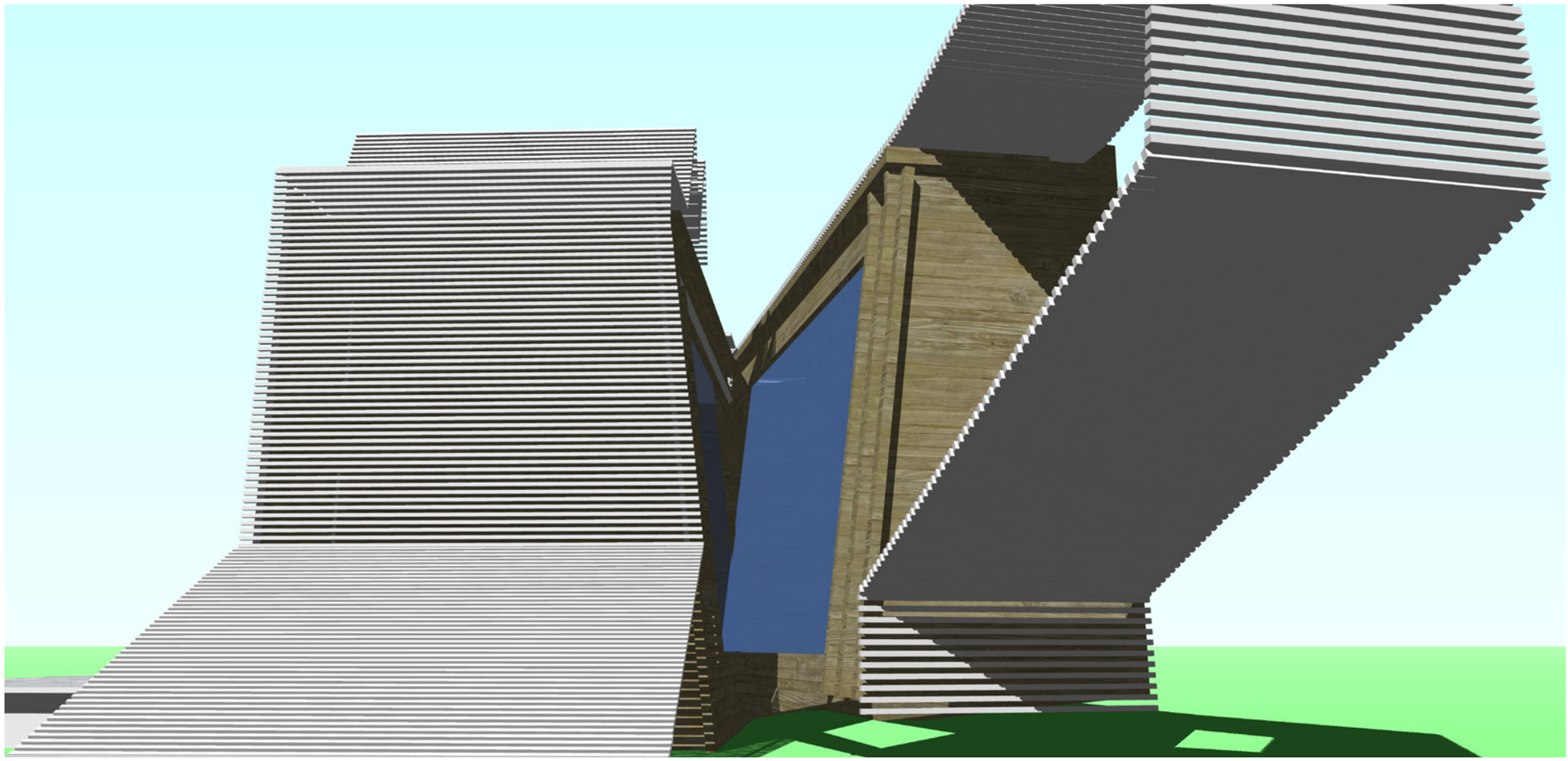


Sketch plan





Sketches exploring a layered facade made up of a series of overlapping walls



Concept render of the cladding and glazed opening