

Building Report

October 2006



Dalby Forest Centre
Visitors Centre, Low Dalby Village

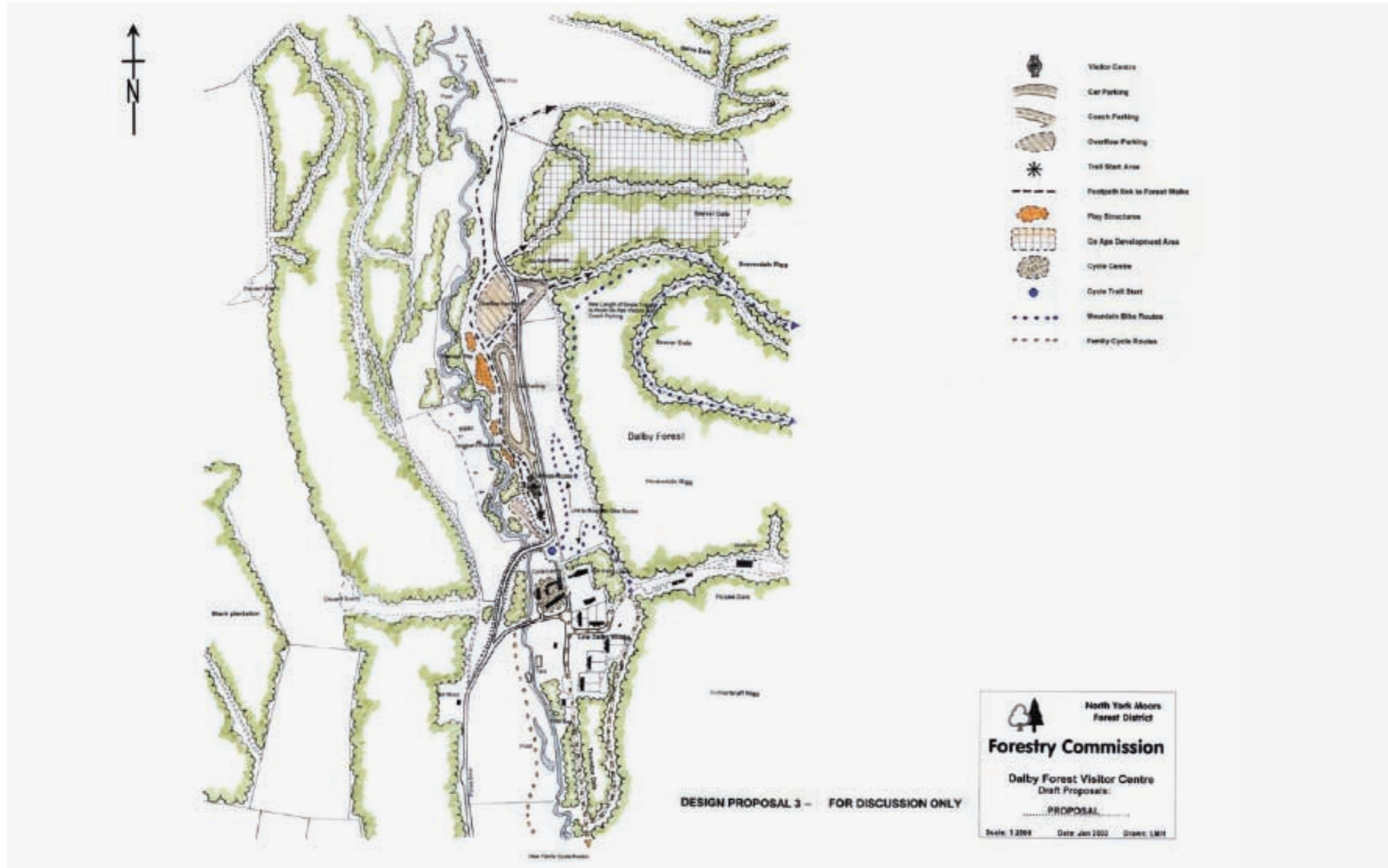
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Overall plan of Dalby Valley

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1. Background

Dalby Forest is managed by the Forestry Commission and is the largest forest in Yorkshire. It receives around 300,000 visits per year making it a key visitor attraction in Ryedale and the North York Moors National Park. Visitor facilities at Dalby have developed organically over a period of more than 40 years starting with the opening up of the Forest Drive as a through route in 1960, then opening of a 'museum' in Dalby Village, creation of Staindale Lake, toilets, picnic areas and way marked trails.

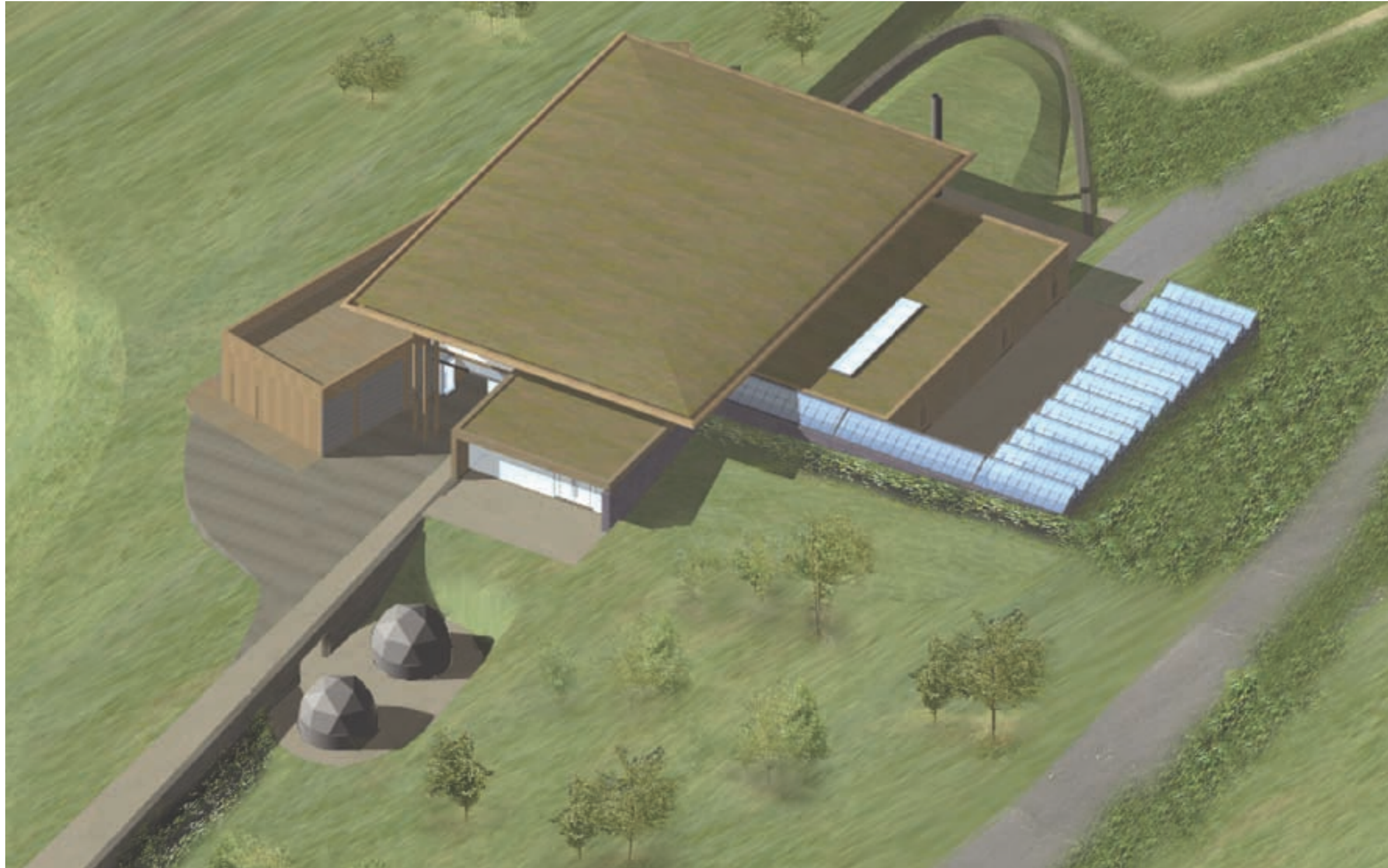
Historically facilities at Dalby has been geared to provide for the 'day visitor'. At Cropton forest a few miles to the west however, the area has been developed for 'residential' visitors with an FC managed forest cabin site at Keldy and campsites at Spiers House catering for 80000 bed nights per year, as well as a number of non-FC outdoor pursuit centres.

For much of the last 40 years the focus at Dalby has been on the Forest Drive as a scenic route to Scarborough and informal recreation. This has been in addition to the main economic use of the forest as a timber resource.

In the last few years the emphasis has changed; visitors revenues now exceed those from timber and the forest is pivotal to the local tourism sector attracting and capturing visitors and encouraging economic activity.

At Dalby mountain biking is a growth attraction and forest concerts have been introduced. A high rope course called 'Go-Ape' could soon be in place. This is all part of the phased plan for the development of the existing facilities at Dalby.

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View of Architype scheme

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2. The Project

The purpose of the project is to improve and develop the forest as a regional centre of excellence for sustainable economic activity. It is expected that Low Dalby will become a service hub for the wider exploration of the National park and will become a regional centre for cycling and other outdoor leisure activities.

The Dalby project consisted of 3 phases.

Phase 1: Renovation and refurbishment of existing buildings at Low Dalby to provide a Cycle centre and area for business use. The creation of permanent car parking facilities.

Phase 2: Building of a new visitors centre to replace some facilities displaced from the refurbished cycle centre buildings. This includes community facilities, a restaurant, shop and exhibition areas.

Phase 3: The next phase involves the implementation of the wider cycle infrastructure, trails, walks and 'Go-Ape' facilities.

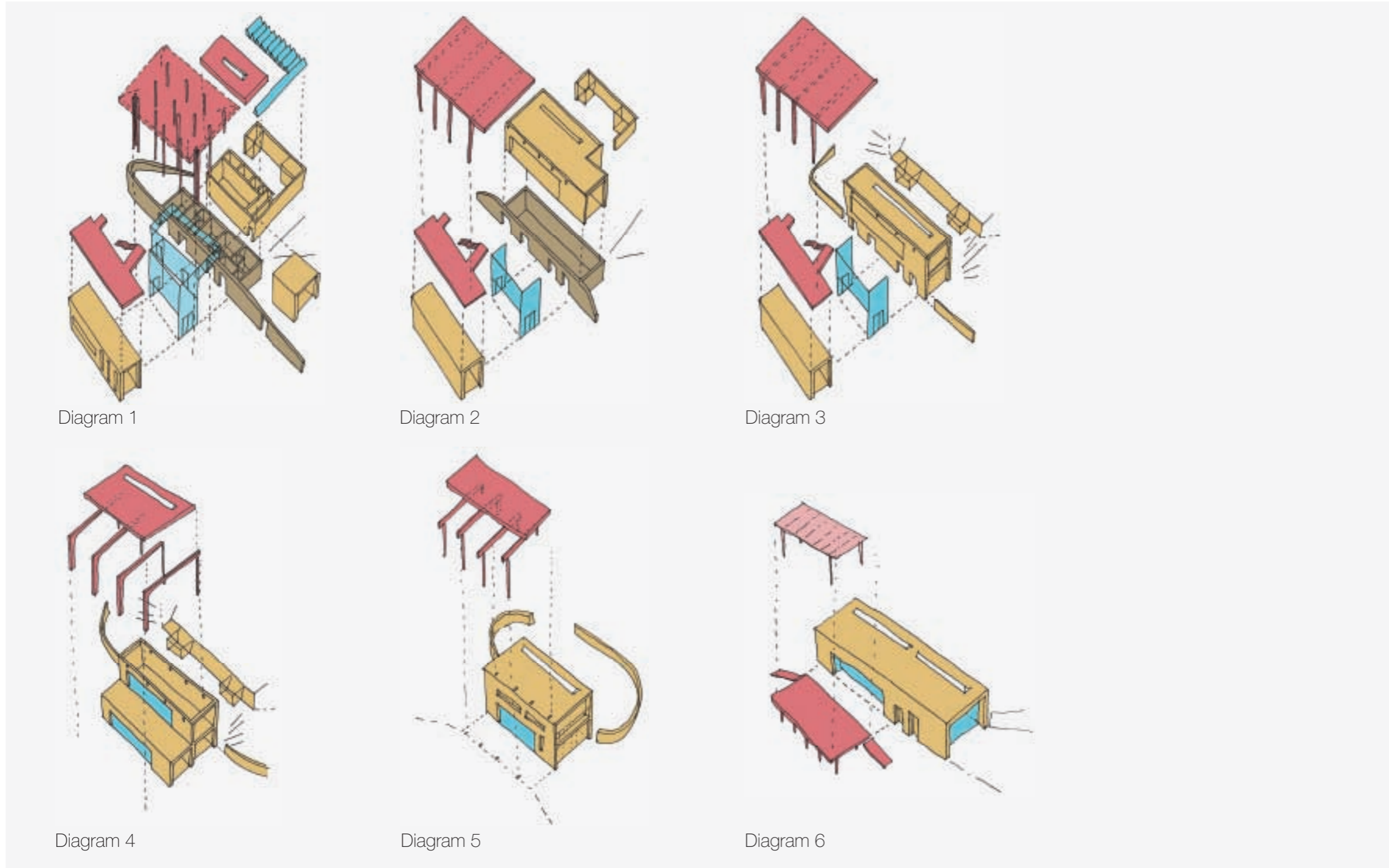
A previous 'competition' winning scheme by Architype Architects had already undergone planning and the concept and layout of the visitor centre had been established. A revised scheme was based on the initial ideas suggested within this scheme. This previous scheme was deemed to be too costly and complicated and some rationalisation was required to meet the clients fixed budget of 2.1 million.

With these issues in mind, White design produced proposals which were resubmitted to the Planning Council and were accepted.

The Client had set out that the new building must:

1. Diversify and improve the economy of the area
2. Be a sustainable development
3. Promote healthy and active lifestyles
4. Provide lifelong learning
5. Provide a quality provision
6. Use FSC and sustainable timber in a innovative way
7. Extend the visitor season
8. Provide fun and enjoyment
9. Develop and realise the long term vision of the FC

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Simplification diagrams

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3. Rationalization

The Architype scheme was a complicated scheme made from various architectural and structural elements. This approach invariably results in higher construction cost. The sketches to the left formed a series of architectural 'moves' which attempted to rationalise the scheme without losing the architectural quality and concept. By reducing and simplifying the building elements the scheme became more cost effective.

Drawing 1 shows the current scheme exploded into its component architectural and structural parts.

Drawing 2 shows the first 'wave' of simplification. This included a reduction to the lower earth retaining structures, reduction in the glass curtain walling by rationalizing the cafe building so it sits over the earth structure below and the simplification of the floating roof.

Drawing 3 removed the buried building by replacing this structure (combined with the cafe building above) into a single ground bearing building with a reduced area of around 850sqm. This also removed the yard earthworks and retaining structure replacing them with timber screening and planting.

Drawing 4 'collected' the separate building elements together to form a single building with a single structural frame of around 850sqm. The covered terrace and floating roof is supported by the same structural framework as the main building whilst still providing sheltered, open air dining with views to the river etc.

Drawing 5 shows the original concept in a single building solution at around 650sqm. All the facilities are housed within a 2 storey extrusion. Adjacent to this is a sheltered open area covered by a raised uninsulated timber roof element. This solution allowed for the building to be easily prefabricated and with a small amount of earthworks have less impact on the existing landscape.

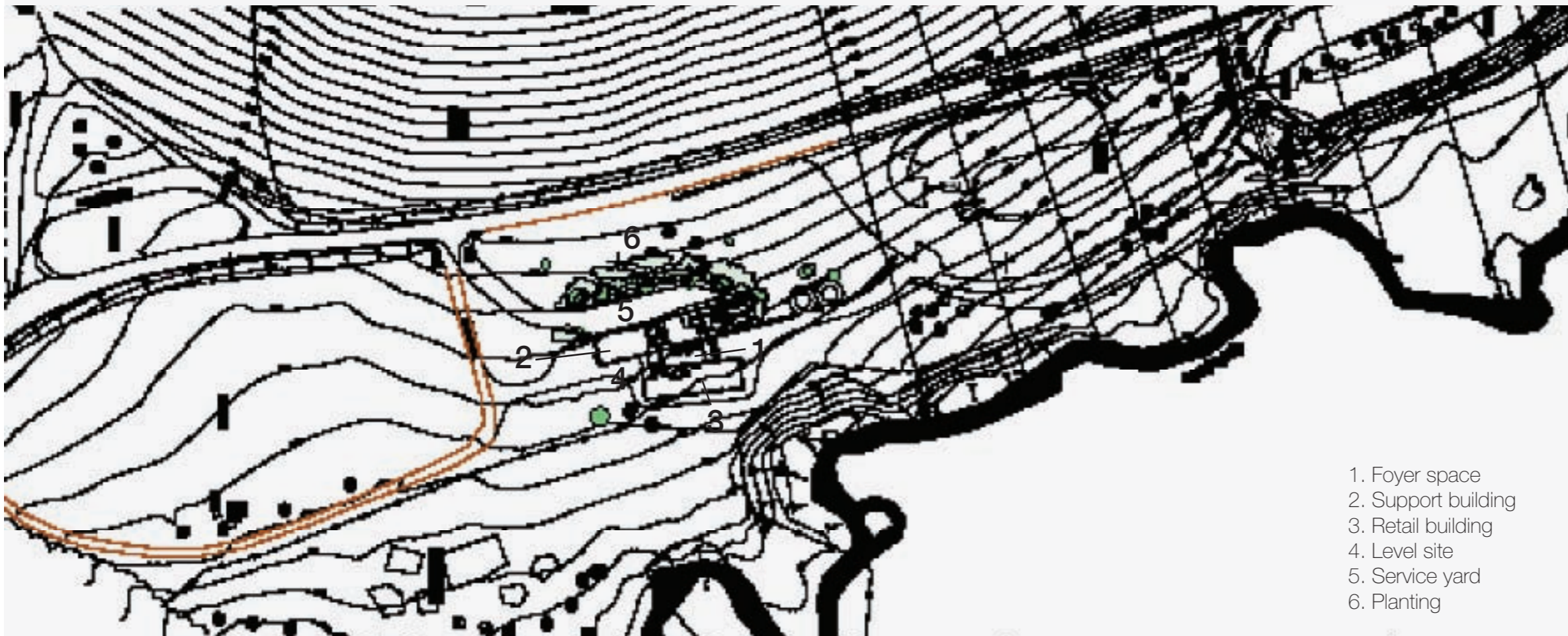
Drawing 6 is the original concept in its simplest form at around 650sqm. All the facilities are housed within a generous specified single storey extruded timber construction and form a very modest but higher quality building.

After client discussion option 3 was adopted.

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Section through building



Site plan

- 1. Foyer space
- 2. Support building
- 3. Retail building
- 4. Level site
- 5. Service yard
- 6. Planting

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4. The Built Scheme

The built scheme was both smaller in area and more appropriate to the sensitive nature of the site than the original proposal. It was designed to minimise the impact on the valley and focus upon sustainability both during its construction and operation.

The building was designed around a double height foyer which links together all the facilities (1). On one side of this foyer is a two storey support building (2) and on the other a single story retail building (3). The two buildings are angled to form a welcoming space and are positioned to represent a pair of 'open arms' into which visitors from the main car park are focused.

The existing sloping site was modified to provide a level area to site the building upon (4). This intervention was kept to a minimum by using a 'cut and fill' technique, moving the minimum amount of soil possible. This also ensured no soil was transported to land fill and therefore reduced the number of lorries leaving the site and the associated noise and disturbance.

The building was designed to 'nestle' into the existing landscape rather than being 'buried' within it.

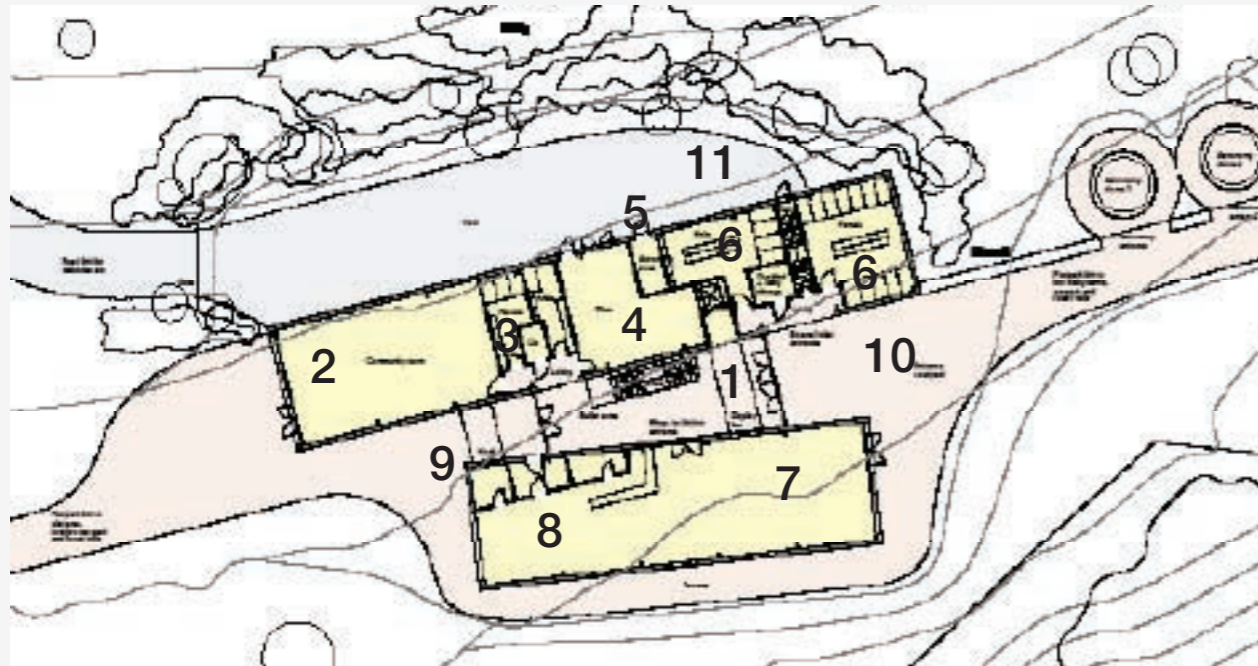
It is our belief that once the building is no longer required, the physical footprint it leaves behind should be negligible. A rear service yard (5) was to be provided for deliveries, bins and rangers vehicles. It was created by forming a 'hollow' in the existing landscape using planted reinforced banking (6). No concrete or permanent structures of any kind were used to form this natural retaining wall. The building is screened from the high level road by planting (6). Parapet roofs ensure flat roof fabric is not visible

The top edge and outer slope are landscaped to give a natural security and visual barrier. The yard is screened by the use of a 3 tier landscaping scheme.

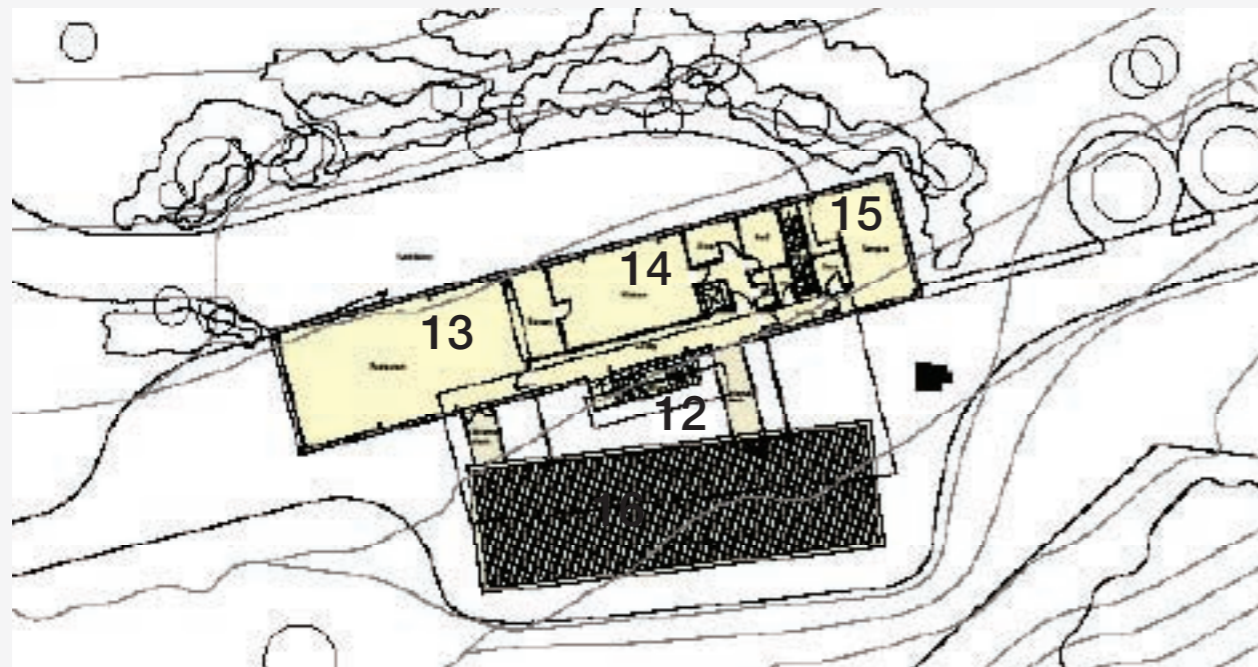
Tier 1 is the semi-mature trees which break up the buildings roof line. Tier 2 is made up of large bushes and shrubs which mask the yard and prevent pedestrian access. Tier 3 consists of small feature planting which add visual interest, colour and habitat.

Plant species and layout reflect the natural planting found elsewhere in the valley to ensure it is in keeping with the existing landscape. This newly planted zone provides new natural habitats for birds, butterflies and other wildlife that the building footprint disperses.

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Ground Floor



First Floor

1. Foyer space
2. Community room
3. WC's
4. Plant
5. Astronomy store
6. Public WC's
7. Exhibition
8. Shop
9. Kiosk
10. Arrival courtyard
11. Service yard

12. Stairs and bridge
13. Restaurant
14. Kitchen and staff
15. Office
16. Covered terrace

Building floor plans

4.1 Building Layout

The Ground floor has the main public entrance facing the carpark area (1), from here all facilities can be accessed. The Community room (2) with its own wc's (3) is located to the rear. The Plant room (4) is located centrally and the astronomy storage (5) is accessed from the rear service yard (11). Also accessed from this yard is the service stair to the first floor. Public Wc's (6) are accessed from the arrival courtyard (10) through a separate external lobby. The shop (8) and exhibition area (9) are directly off the foyer. A kiosk (9) operates separately and is accessed from outside the rear doors which lead onto the pathways into the forest.

The first floor is accessed by the public via the main foyer staircase and lift (12) onto a upper balcony. There is a bridge link across to the covered terrace (16). To the rear is the restaurant with its own bridge to the covered terrace. Kitchens, stores and staff facilities (14) are accessed by a separate service stair as are the office facilities (15).

By controlling access from the foyer space, all facilities can be operated separately when desired for evening events or during quite periods.

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Screw piles and steel frame



Structural Insulated Panels



Gluelaminated timber structure



Reception desk - Smiles Plastics recycled mobile phone sheets



The building is clad in larch, grown and milled in the surrounding forest

5. Construction and Materials

The construction of the building uses the latest building techniques to enhance quality, sustainability and construction speed.

The building sits on steel screw pile foundations, which reduce the amount of site excavation work needed and can be easily removed and recycled in the long term if required. The main structure of the building is constructed using a pre-made glue-laminated timber frame and pre-made timber wall, floor and roof units that were delivered to site ready for erection. This semi-prefabricated solution reduced time on site, site traffic and in turn overall disruption.

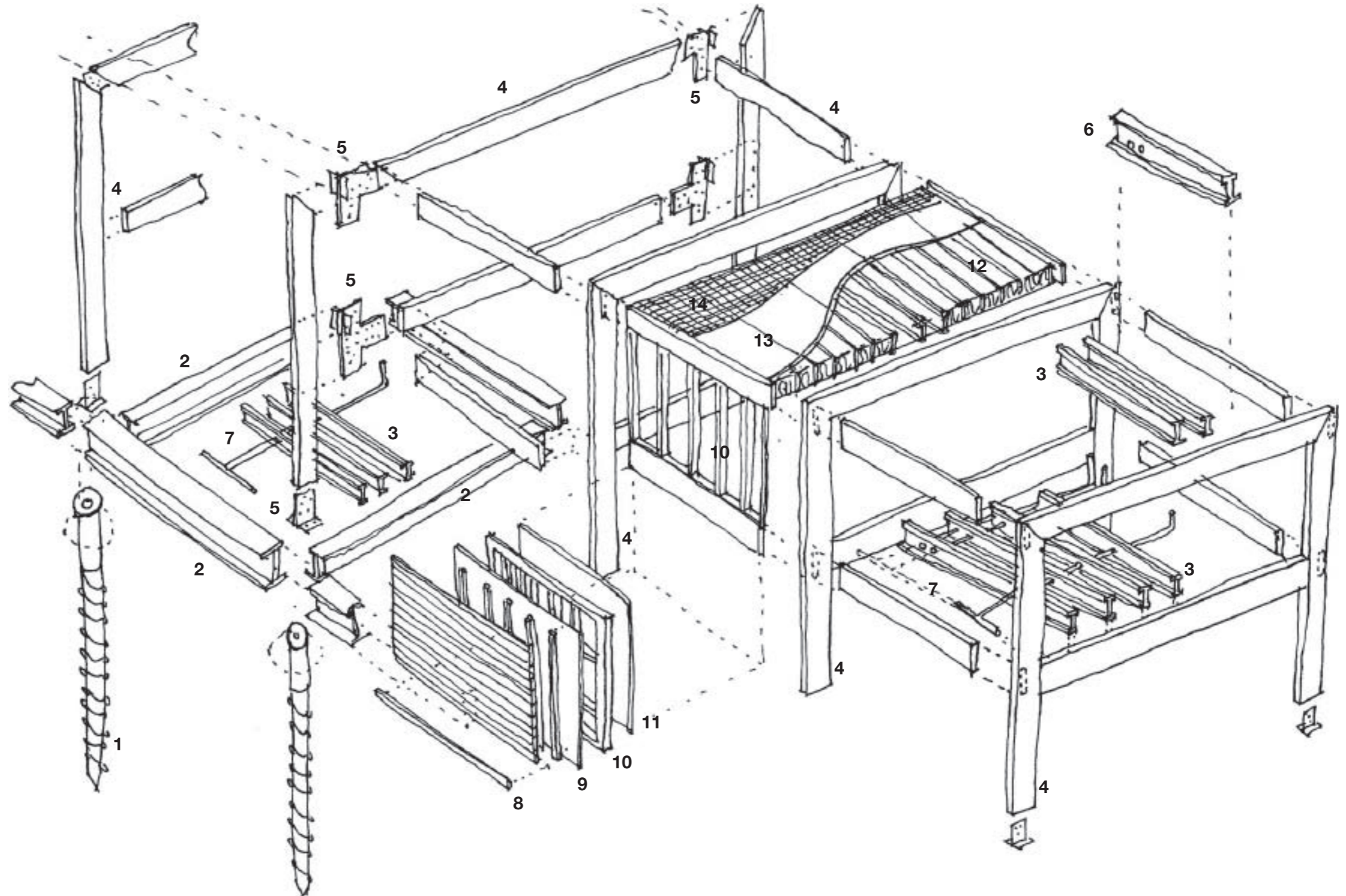
The building is clad in larch grown and milled in the surrounding forest.

The extensive use of timber enables the embodied energy and energy expended during construction to be dramatically reduced over that of a typical concrete and masonry building. Timber is also a truly renewable material and by sourcing a considerable amount from the local area this not only reduced the building's embodied energy but also enabled the support of local businesses.

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Structural diagram

1. Metal screw piles
2. Metal sub frame
3. Joisted floor
4. Glulam frame
5. Metal frame connectors
6. Timber 'I' beams
7. Service void and route
8. External cladding
9. Battens on weatherboard
10. Wall panel
11. Internal finish
12. Insulation zone
13. Plywood roof deck
14. Roof covering



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5.1. Structure

Various structural design issues had to be resolved early on in the design process to ensure an integrated and cohesive design. In discussion with Halcrow, it was decided that the following structural solutions were to be focused upon.

1. Metal screw piles. (1)
2. Metal ring beam with structural insulated suspended floor panels. (2)
3. Glulam frame, with structural insulated floors and roof panels. (3,4,5,6)
4. Prefabricated structural insulated wall panels. (8,9,10,11)

Screw piles (1) were considered as they are easy to install without needing heavy machinery and can be 'retracted' at the end of the building life to be recycled. These are therefore extremely sustainable and they also met the requirement to 'touch the site lightly'.

The Ground floor proved to be the most complicated element of the building as it is the building's interface with the site. Traditionally a concrete slab is the easiest method of grounding a building, however this solution

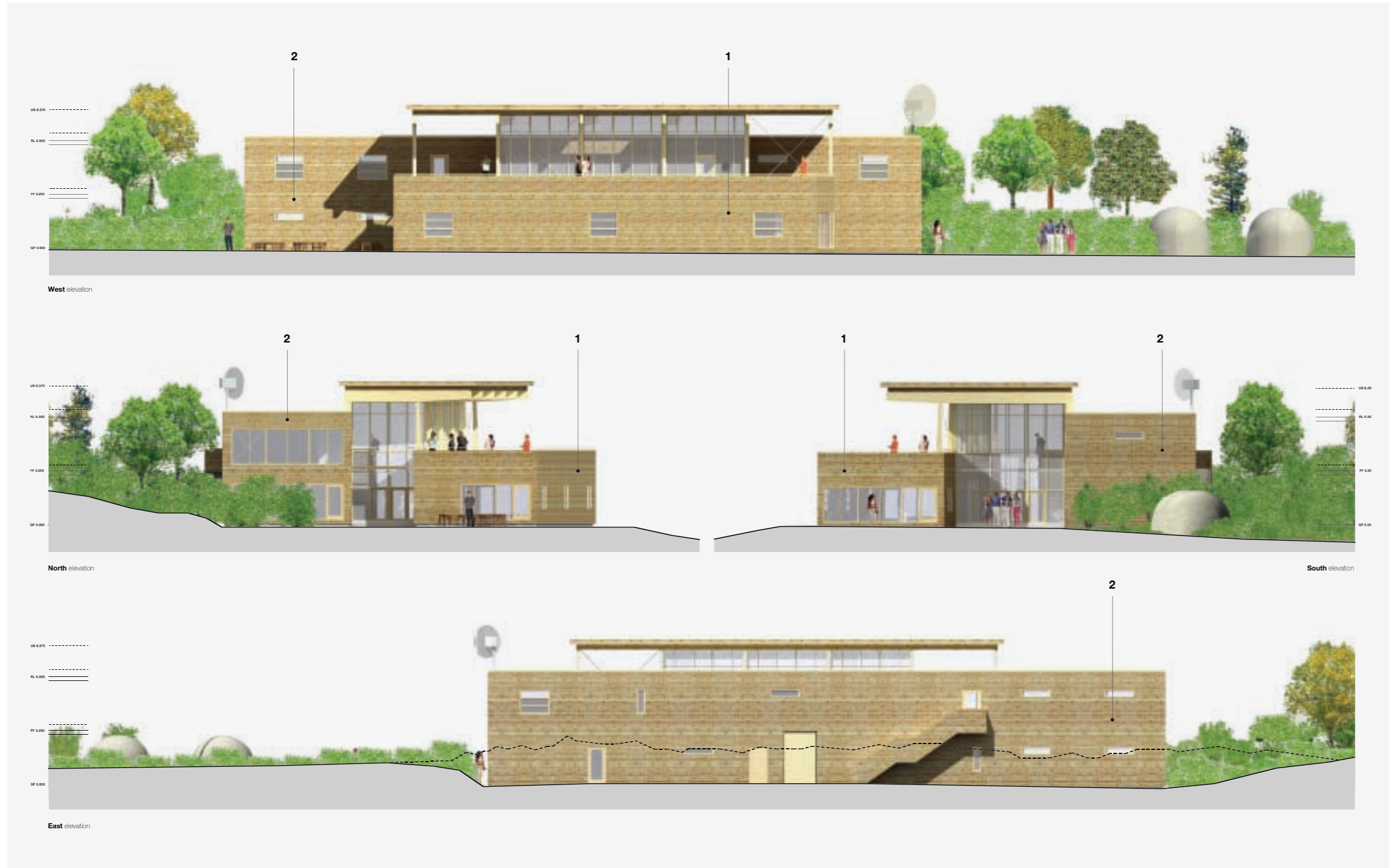
requires the delivery to site of tonnes of concrete and time to allow the material to harden. It is also difficult (however not impossible) to recycle.

A metal support frame (2) bolted to the tops of the Screw piles allowed the rapid, dry erection of the ground floor supporting structure. On this framework, which will be partially buried below the ground, an all timber enclosure was erected.

The upper timber structure consists of a main glulam frame (4), with structural, insulated panel floor and roof elements (3,6). By using a hi-tech structural panel system (6) less timber is used and more insulation is incorporated.

Using these 'dry' construction techniques time on site was reduced over a traditional masonry building. As much of the timber as possible was sourced locally, however some of the 'hi-tech' timber products had to be sourced nationally.

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Elevation Drawings

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6. Sustainability

Our aim was to make sure the building was naturally energy efficient by considering such issues as its location, materials, insulation and the window sizes and orientation.

This building has been designed to maximize natural ventilation and natural lighting to make it as energy efficient as possible. Renewable technologies have also been incorporated to help reduce the impact the building has on local resources.

The naturally ventilated atrium not only provides an impressive foyer and meeting place but also allows all connected spaces to be naturally ventilated by the use of automatic high level opening windows. The tall foyer space uses the 'stack effect' (hot air naturally rising) to pull cool air in through the lower windows during hot summer days.

The building is also constructed to be thermally efficient. The pre-insulated timber panels come in widths that allow for higher levels of insulation than conventional masonry construction, providing the building with a 'super insulated' external envelope. This extra insulation reduces heat loss and in turn means lower energy consumption.

The installation of a photo voltaic 'thin film' array in the atrium, as well as a micro wind turbine on the roof, provide renewable energy supplies for the building's electricity requirements.

A biomass boiler, run on the waste wood chip produced by a local saw mill, provides the heating for the building as part of a carbon neutral process.

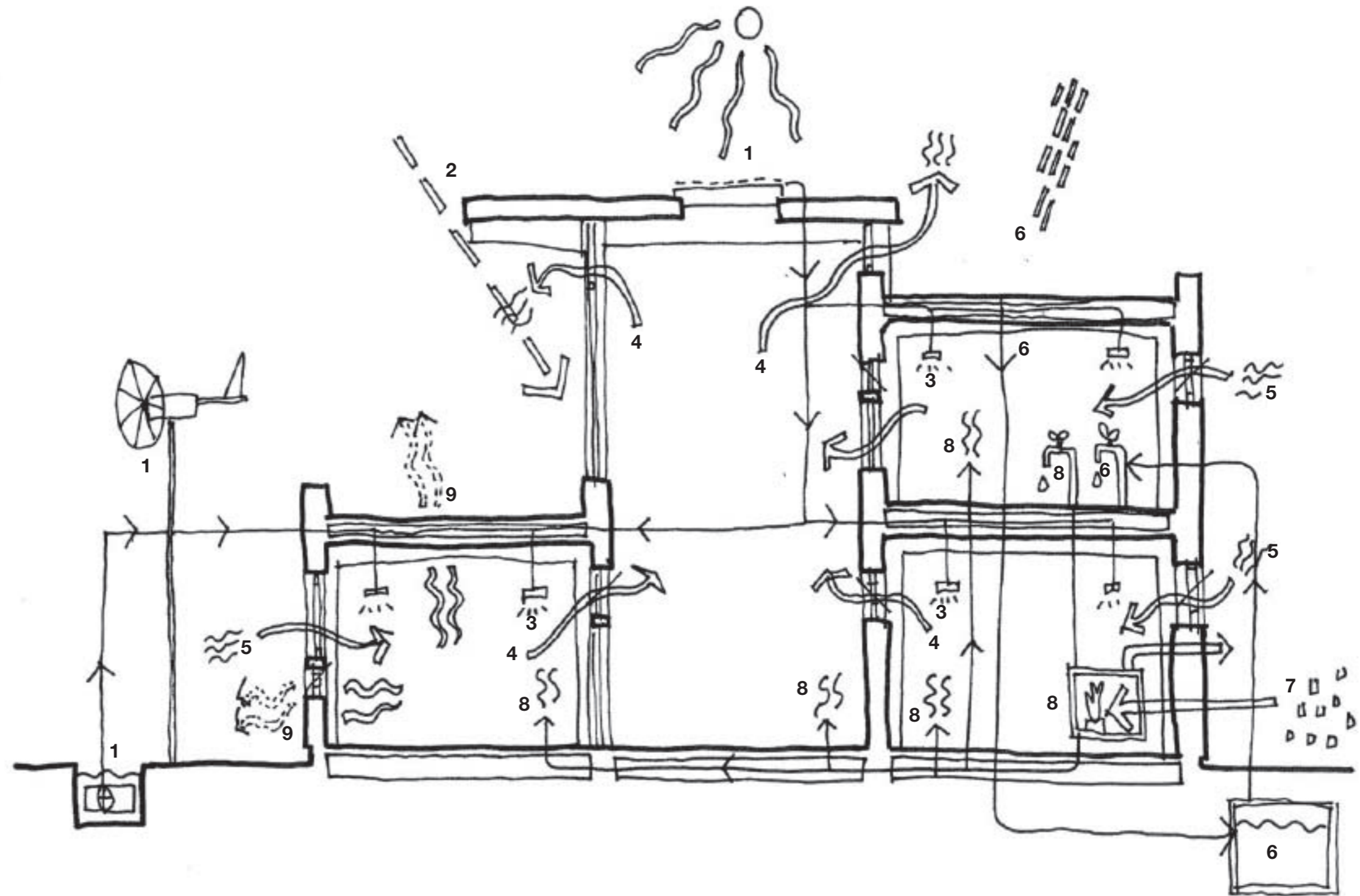
Rainwater harvesting is another major resource saving device installed to dramatically reduce the volume of water taken from the village well supply. The roof to the atrium and the support building is covered with an inert single ply roof membrane off which rainwater can be collected. This water is used to flush the large number of public conveniences on site.

The overall impact on the local and wider environment is reduced compared to a traditional solution. By using timber construction and 'touching the ground lightly' a truly sustainable development is created. This reduced impact is not only applicable to the building but also to the impact on the village, wildlife and the visitors experience during the schemes construction and throughout its lifetime. Ultimately the building is designed to be recycled at the end of its life, leaving behind a minimal footprint.

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Structural diagram

1. Electricity generated by PV's, wind turbine & hydro turbine
2. Solar shading
3. Electric daylight controlled lights
4. Hot air vented out
5. Fresh air drawn in
6. Rainwater collected from roof and used to flush wc's
7. Biomass fuel In
8. Biomass boiler provides space heating and hot water
9. High insulation levels provides energy efficient fabric



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6.1. Services

It was intended that the building services offer the greatest amount of sustainable and renewable systems that the budget could meet.

The stage D report prepared by Halcrow confirmed which systems would be the most appropriate. Within this report there were 2 options proposed regarding the heating system. Taking planning issues and knowledge of the clients wishes, they assumed that option A (Biomass boiler (8)) would be perceived to be the most appropriate option.

This was based on two main issues.

1. The disturbance of the ground caused by the installation of 'ground source' pipe work would be contrary to the 'touching the ground lightly' vision. Even though the Biomass boiler requires storage, the freestanding container could be incorporated into the plant room.

2. The forestry Commission is in the business of providing timber and timber products and the opportunity to 'join up' some of its production ability to make wood chip is a valuable asset. The ability to produce wood chips out of waste thinnings from Dalby forest to power the building presents a powerful solution.

The building is also energy efficient and draws on renewable energy. Both a 'thin film' PV array and a micro wind turbine are employed (1). While these systems provide a contribution to energy load, they do not provide all the energy required for the building. Visually and ethically though, they present the most visible advert of the Forestry Commissions' commitment to renewables.

The use of the lightweight, highly insulated envelope produces a highly energy efficient structure (9). However without any real thermal mass, a BMS controlled natural ventilation system was critical to prevent over heating in summer (4,5). Therefore a fully automated nat-vent system is utilized in conjunction with motorized windows.

Rainwater is collected from the roof to reduce the reliance on the village water supply (6). Foul waste is treated in an on site sewage treatment system, and once processed it is discharged locally into the Dalby beck.

These systems all enable the building to be truly 'green' and represent the Forestry Commission's commitment to sustainability.

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Sewage treatment tanks



Biomass boiler



Recycled plastic cubicle doors



Thin-film photo voltaic array on roof light

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7. Data and specification

Building U-values

Wall panels 0.17 w/m²k

Floor panels 0.21 w/m²k

Roof panels 0.21 w/m²k

Micro Wind Turbine

Manufacturers: Renewable Devices
& Solar Technologies

Model: Swift

Size: 1.5KW

Natural Ventilation:

Automatic BMS controlled window system

Supplier: Nobbs & Jones

Type: York DDC Bacnet Control system
with PC, OWS software

Sewage Treatment Plant

Manufacturers: Condor

Type: 3 tank self contained treatment
plant,

Capacity: EA compliant ammonia discharge
Max peak use of 2,000 visitors
a day

Biomass Boiler

Manufacturers: Talbotts

Model: BDC2 100KW

Grey Water Collection System

Manufacturers: Stormsaver Ltd.

Model: Monsoon rainwater collection
system

Capacity: Underground tank 7500 litres
Header tank 709 litres

Water Heater/Solar Package

Manufacturers: Viessmann Ltd

Model: Solar SCS05 c/w Vitisol 200 D20
collector divicon set, Vitocell B300-
300 litre twin coil and unvented kit.

Type: Gas Room Sealed Water Heater

Photovoltaic System

Manufacturers: Solar Technologies

Type: Glass/Glass photovoltaic within
sealed double glazed unit

Size: 1.1KW

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8. Summary

The Dalby Forest Visitor Centre project offered White Design an exciting opportunity to deliver a contemporary, innovative and beautiful building set in a magnificent wooded valley with spectacular views of the surrounding forest and river.

The building was designed to minimise the impact on the valley and focus upon sustainability both during its construction and operation.

One of the main considerations of the design was to minimise the impact on the valley topography. The building is designed to sit lightly in the existing landscape and its orientation along the natural sight lines of the valley minimise its visual impact as well as its physical impact. It is our belief that once the building is no longer required, the physical footprint it leaves behind should be negligible.

The construction of the building uses latest building techniques to enhance quality, sustainability and construction speed. The extensive use of timber enables the embodied energy and energy expended during construction to be dramatically reduced over that of a typical concrete and masonry building. Timber is also a truly renewable material and by sourcing a considerable

amount from the local area this not only reduced the building's embodied energy but also enabled the support of local businesses.

This building has been designed to maximize natural ventilation and natural lighting to make it as energy efficient as possible. Renewable technologies have also been incorporated to help reduce the impact the building has on local resources.

The completed building, we believe, fulfils the clients brief to deliver a sustainable, modern timber visitors centre.