EARBA STORAGE

A GILKES ENERGY COMPANY

Earba Pumped Storage Hydro Scheme - EIA Report

Appendix 2.2: Sustainable Design Statement

Part 2 of 2

February 2024

Architectural Response

Landscape Strategy - Site Diagrams

The design intent aims to reduce the visual impact of the building on the shores of the loch, and allow it to settle into the landscape. This is addressed in both the architectural design approach, and the landscape design approach.

There are 3 primary aspects to the landscape design approach that aim to achieve this:

- Cut the building into the site to allow it to nestle lower into the topography;
- Adjust the topography around the “cut” to help screen the building and anchor it more naturally into the landscape, however accept that some of the building will be revealed behind the new landscape;
- Use considered tree planting around the site to help screen the building naturally.

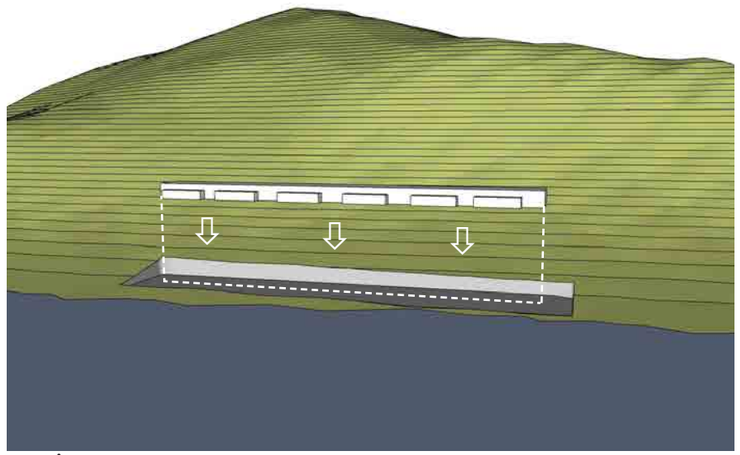
Views from across the loch will be more visible due to the higher vantage points of the terrain. However the aspiration is for the landscaped earthworks around the building to screen, or hide the building when viewed obliquely on approach along the loch from the north and south ends.

visualisation / photomontage of the view along the loch towards the completed powerhouse

01 Cut + Insert Building

cut into the site to help locate the building lower into the hillside to reduce the visual impact

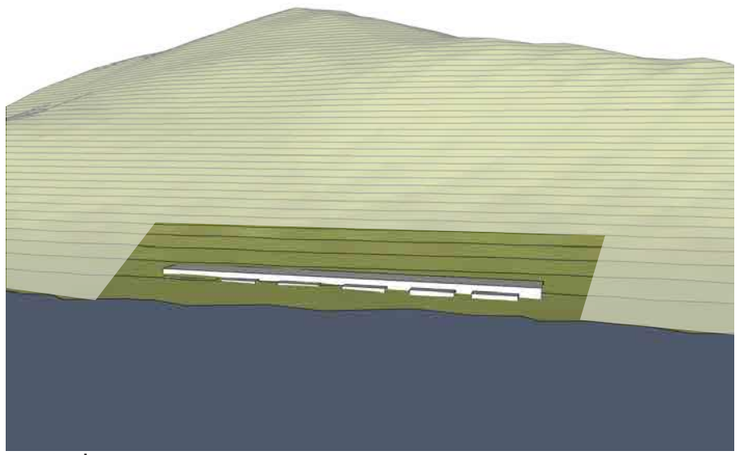
locate the building into the “cut” landscape



cut + insert

02 Topography

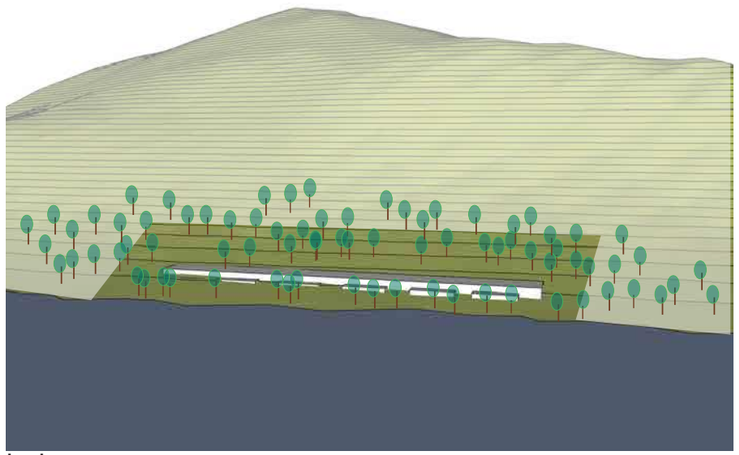
adjust the topography around the “cut” to help anchor the building more naturally into the landscape, however accept that some of the building will be revealed behind the new landscape



topography

03 Landscape

use trees / planting to provide more natural screening

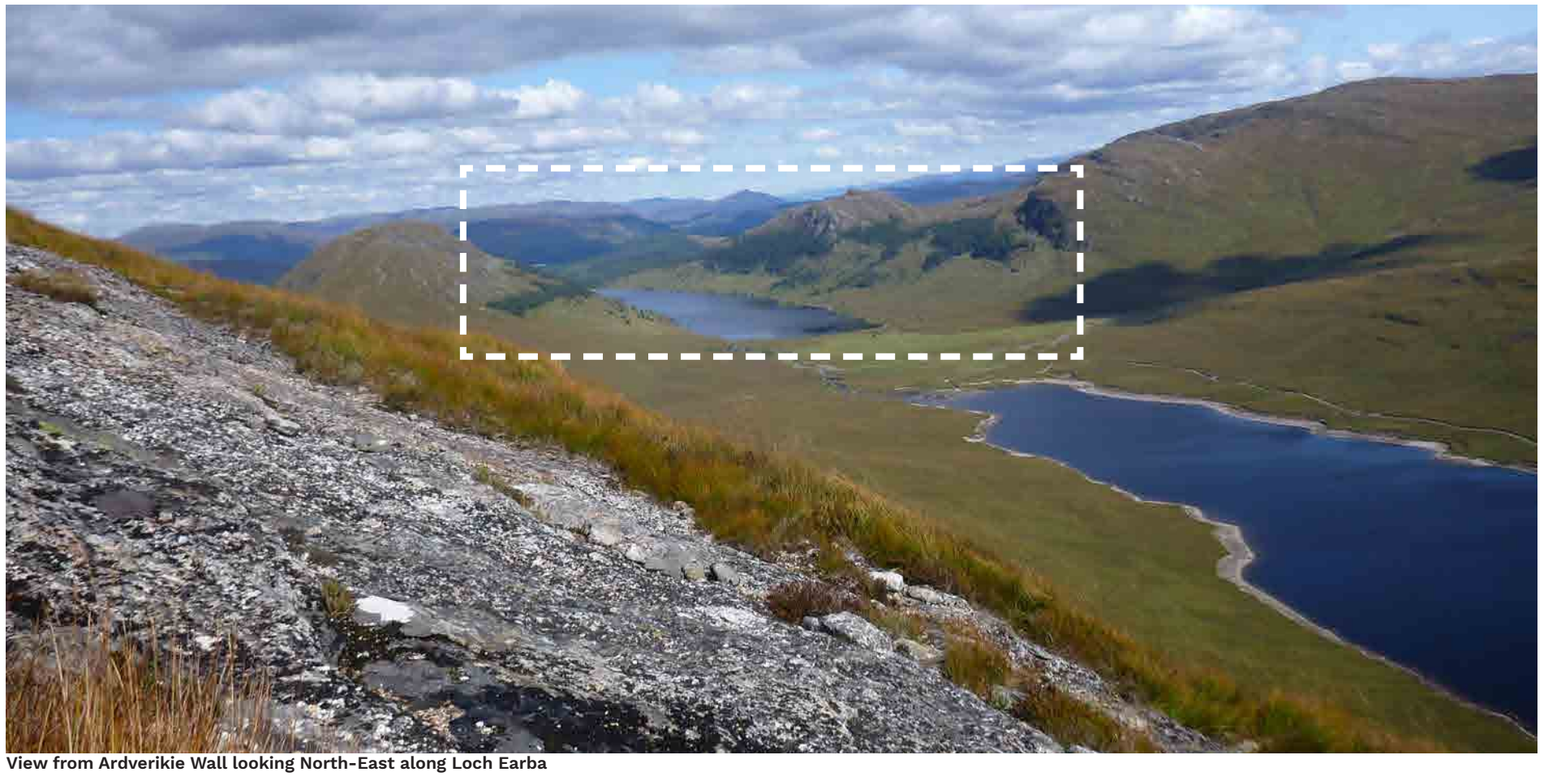


landscape

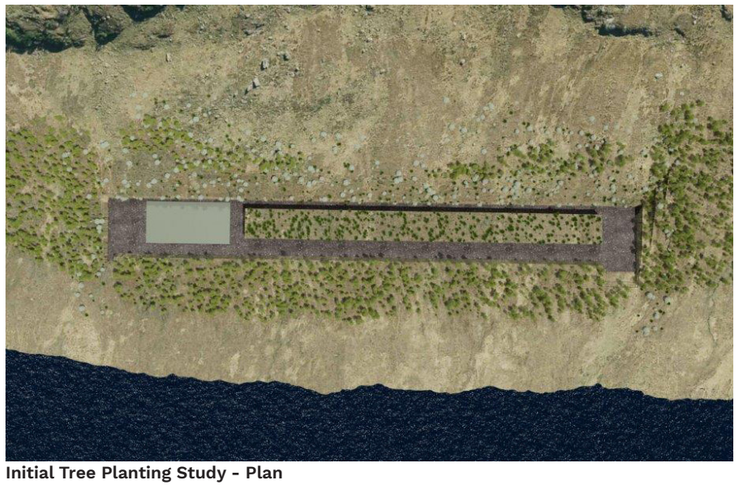
Planting + Screening

initial review

There are existing dense areas of tree growth around the loch, mostly towards the sloping terrain at the north eastern and north western end of the loch. Using a similar approach to tree planting, will help screen the building and integrate it better into the landscape. However the tree planting should feel natural, not structured. Initial studies have highlighted how a more structured approach to planting does not appear to sit comfortably in the landscape. This approach appears to emphasise the landscape intervention rather than integrate it (refer to initial sketch studies below).

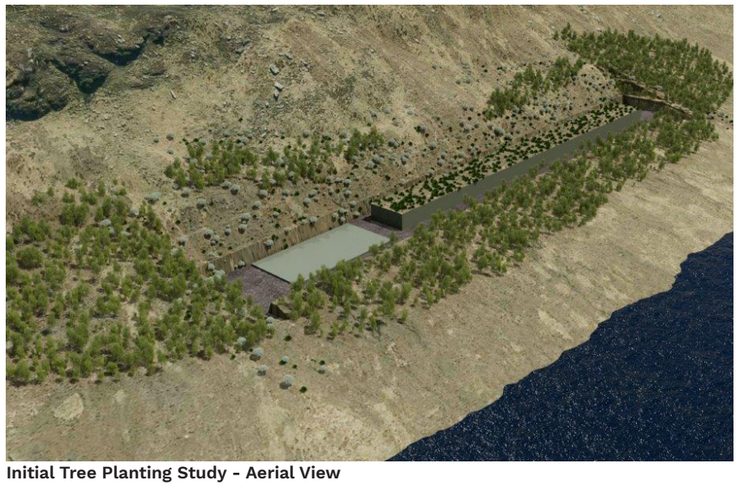


View from Ardverikie Wall looking North-East along Loch Earba



Initial Tree Planting Study - Plan

Initial Tree Planting Study - View From Loch



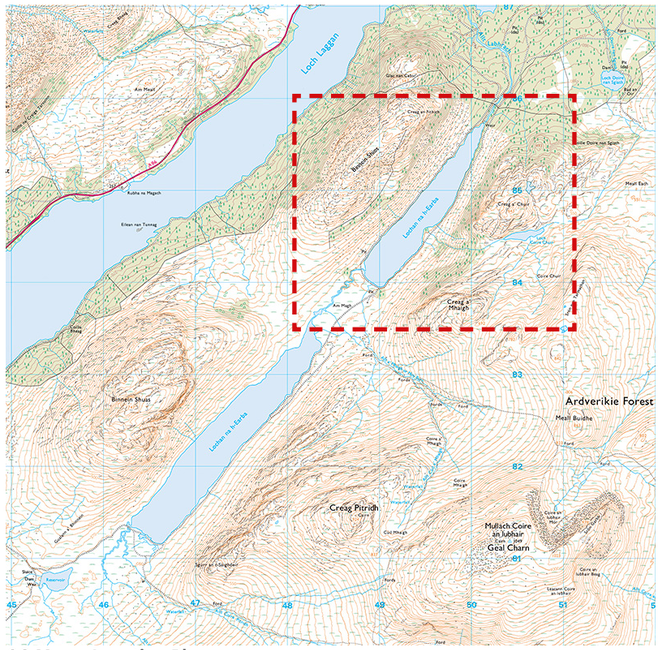
Initial Tree Planting Study - Aerial View

Planting + Screening

tree planting

The landscape design proposes tree planting around the site to help screen the building naturally. The tree planting shouldn't be too "rigid" but instead be spread across the site in clusters, more naturally, allowing parts of the building to be visible between gaps in the planting (similar to tree clusters at the north eastern and north western end of the loch).

view looking north along Loch Earba



OS Map - Location Plan
Copyright OS (Ordinance Survey)

view along lochside at northern end

view eastwards across Loch Earba at northern end

view eastwards across Loch Earba at northern end

Planting + Screening

tree planting

The landscape design proposes tree planting around the site to help screen the building naturally. The tree planting shouldn't be too "rigid" but instead be spread across the site in clusters, more naturally, allowing parts of the building to be visible between gaps in the planting (similar to tree clusters at the north eastern and north western end of the loch).

Initial Tree Planting Study

Design Development - Clusters of Trees

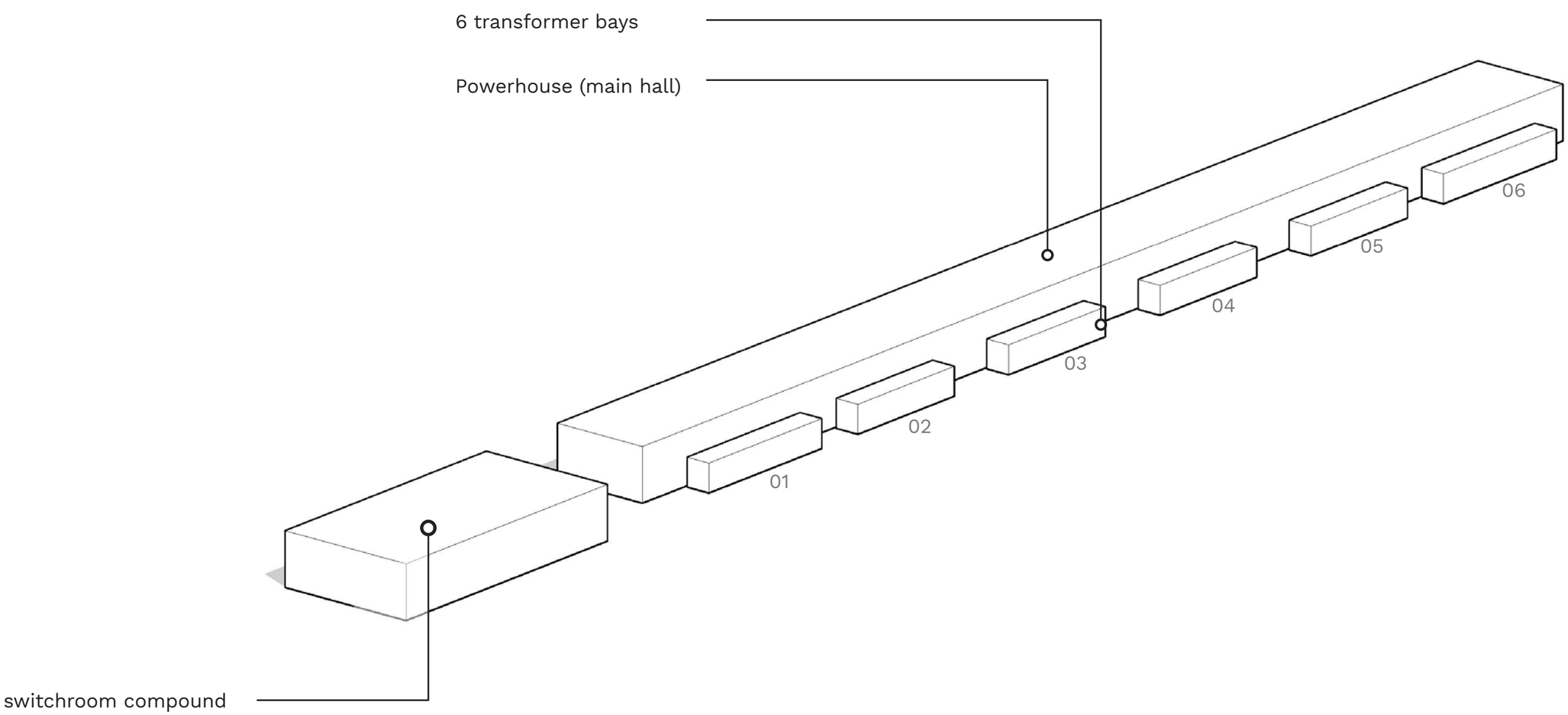
Proposed Tree Planting Approach

Building Form

volumes

The building also has to be as sympathetic as possible within its context. The form of the new building primarily has 2 elements to it:

The main Powerhouse Hall and the 6 transformer bays.



05: Proposed Development
Architectural Response

Building Diagram 01

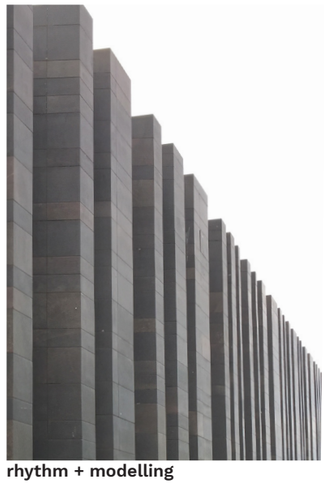
escarpments within the landscape

The design concept aims to reflect the rocky escarpments that rise and fall across the landscape, exposing the rock face amongst the greenery of the topography.

The elevations of the new building should reflect the site context. Gabions are proposed as the principal material for the building, utilising the rock excavated from the main civil engineering works, with green roofs proposed for the main powerhouse building and the associated transfomer bays.

context

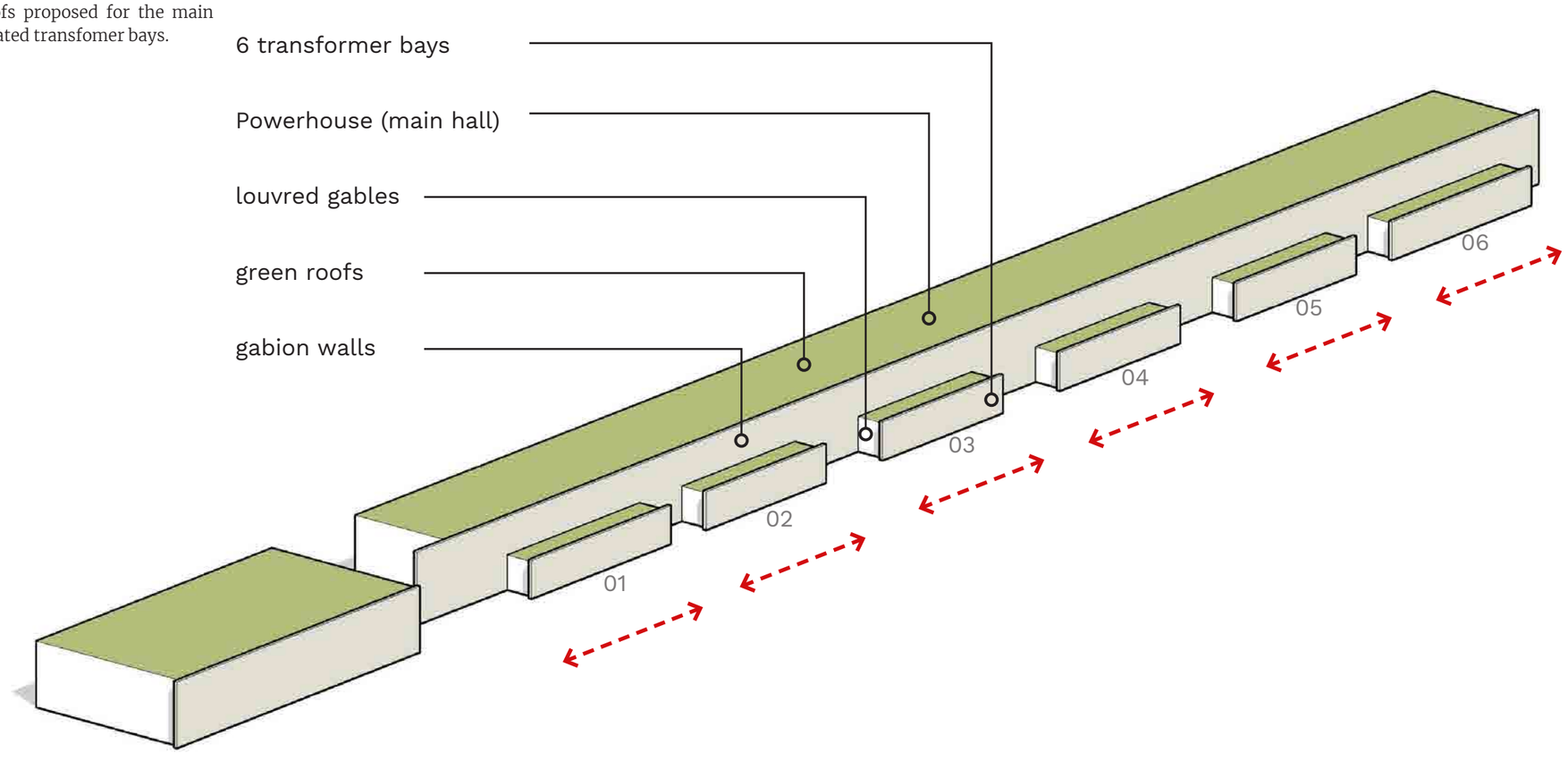
materiality



rhythm + modelling

green roofs

development



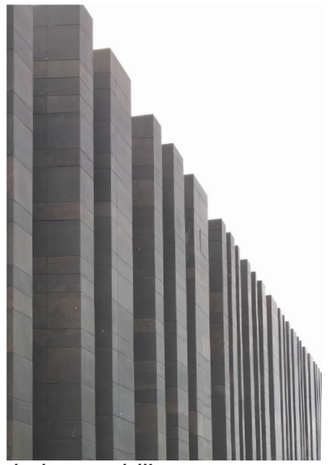
Building Diagram 02

escarpments within the landscape

The walls of the 6 transformer bays are manipulated slightly to create some subtle variation in their appearance, rather than having repetitive, flat elevations. Walls are angled slightly, and lengthened to provide variation along the length of the building to better reflect the site context.

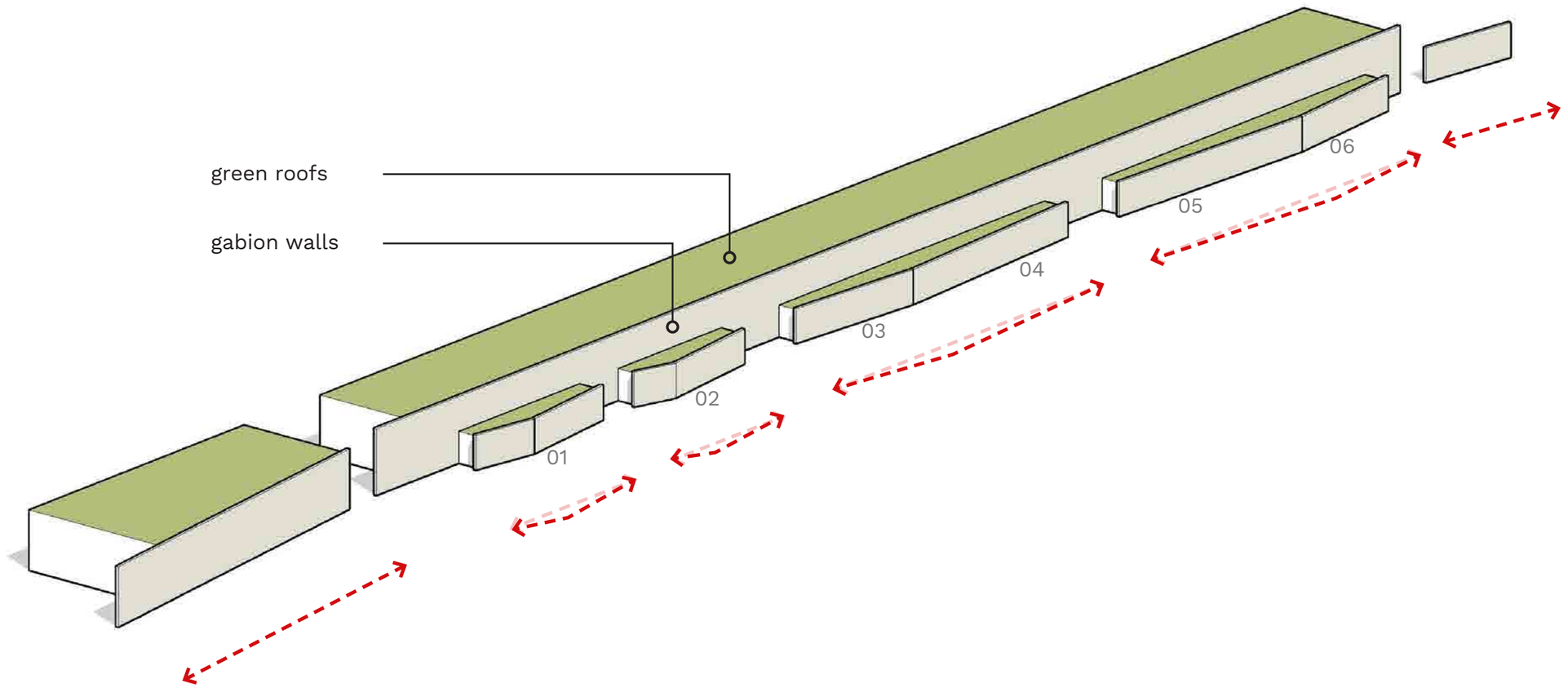

context


materiality


rhythm + modelling


green roofs


development



05: Proposed Development
Architectural Response

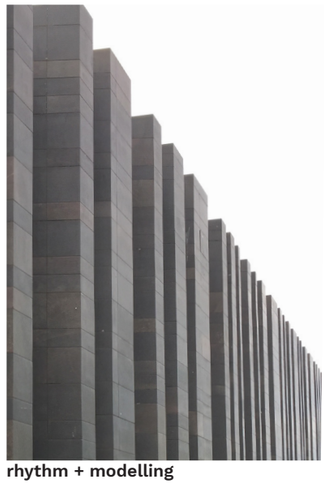
Building Diagram 03

escarpments within the landscape

The roofs of the transformer bays are also manipulated to reflect the uneven landscape, and the greenery that permeates between the grey rocky craggs.

context

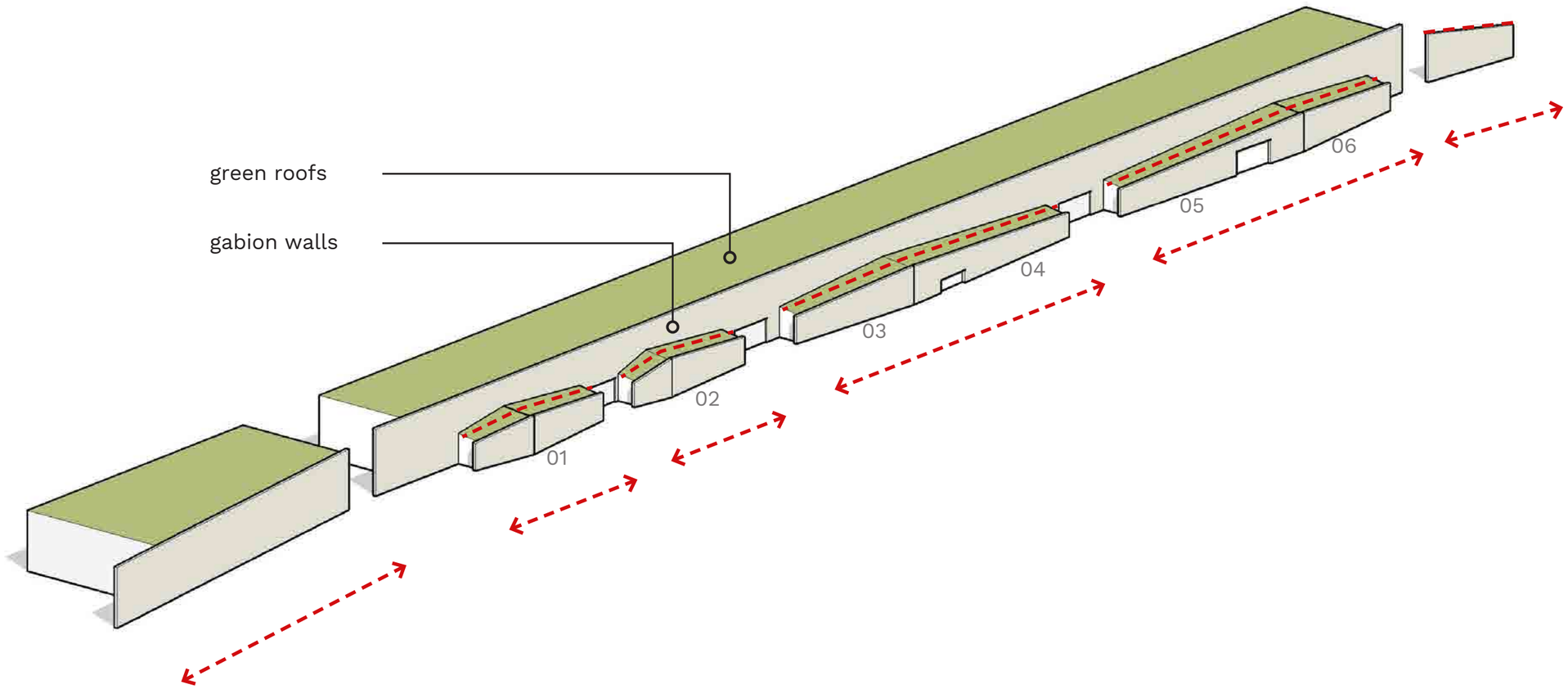
materiality



rhythm + modelling

green roofs

development



Building Diagram 04

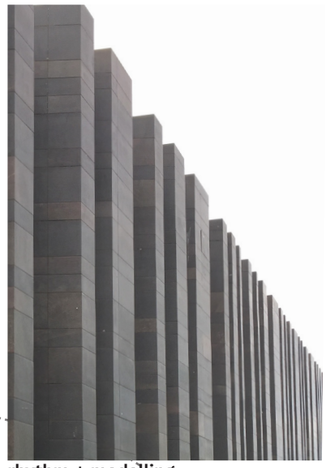
landscape

The building nestles low into the landscape.

The landscaped earthworks around the building are designed to reflect the landform and topography of the site and to reduce the visual impact of the building, which sits lower in the landscape.

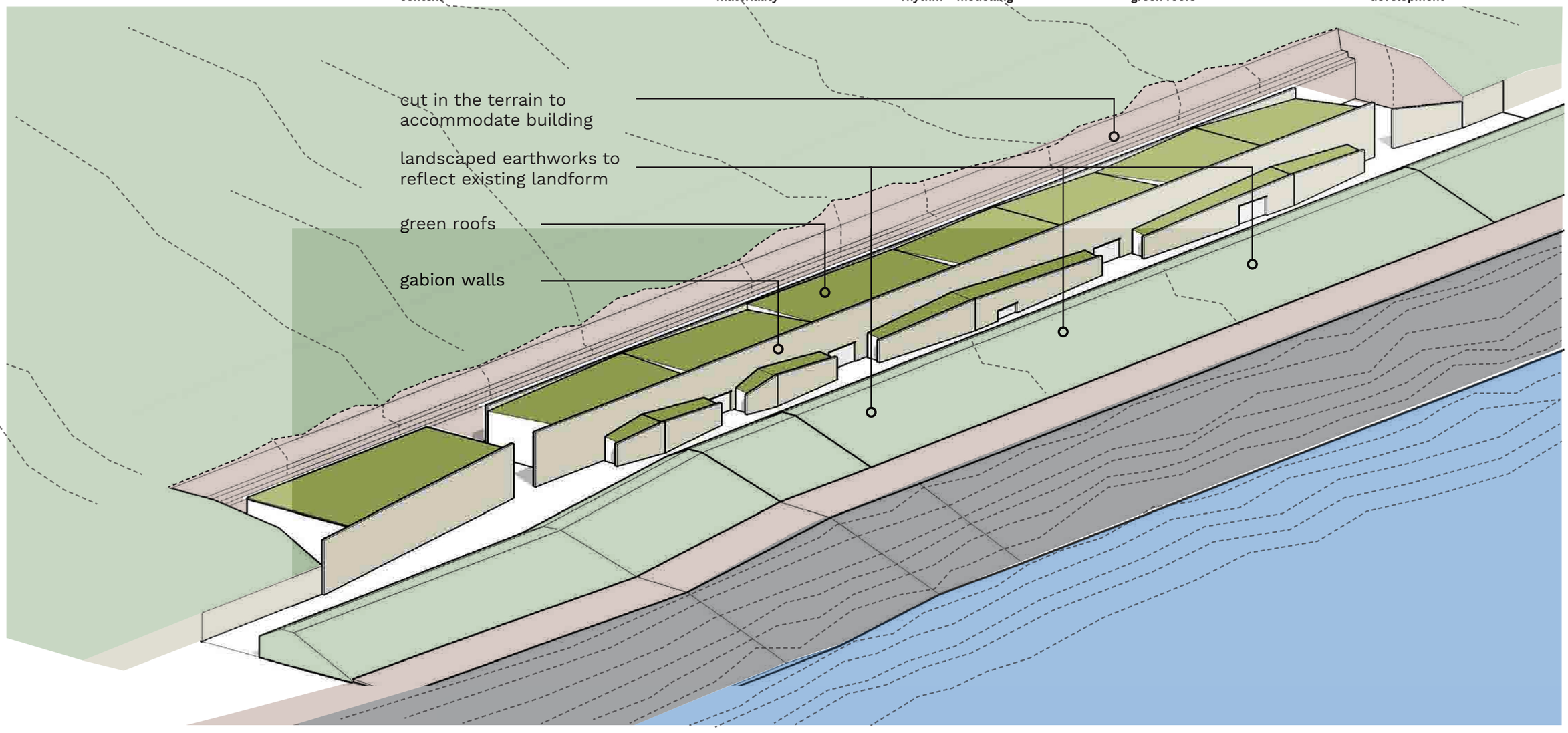

context


materiality


rhythm + modelling


green roofs


development



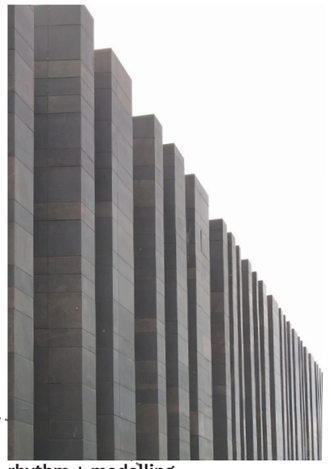
Building Diagram 05

planting

Tree planting is added (alongside the landscaped topography) to further reduce the visual impact of the building. The tree planting shouldn't be too "rigid" but instead be spread across the site in clusters, allowing parts of the building to be visible between gaps in the planting.

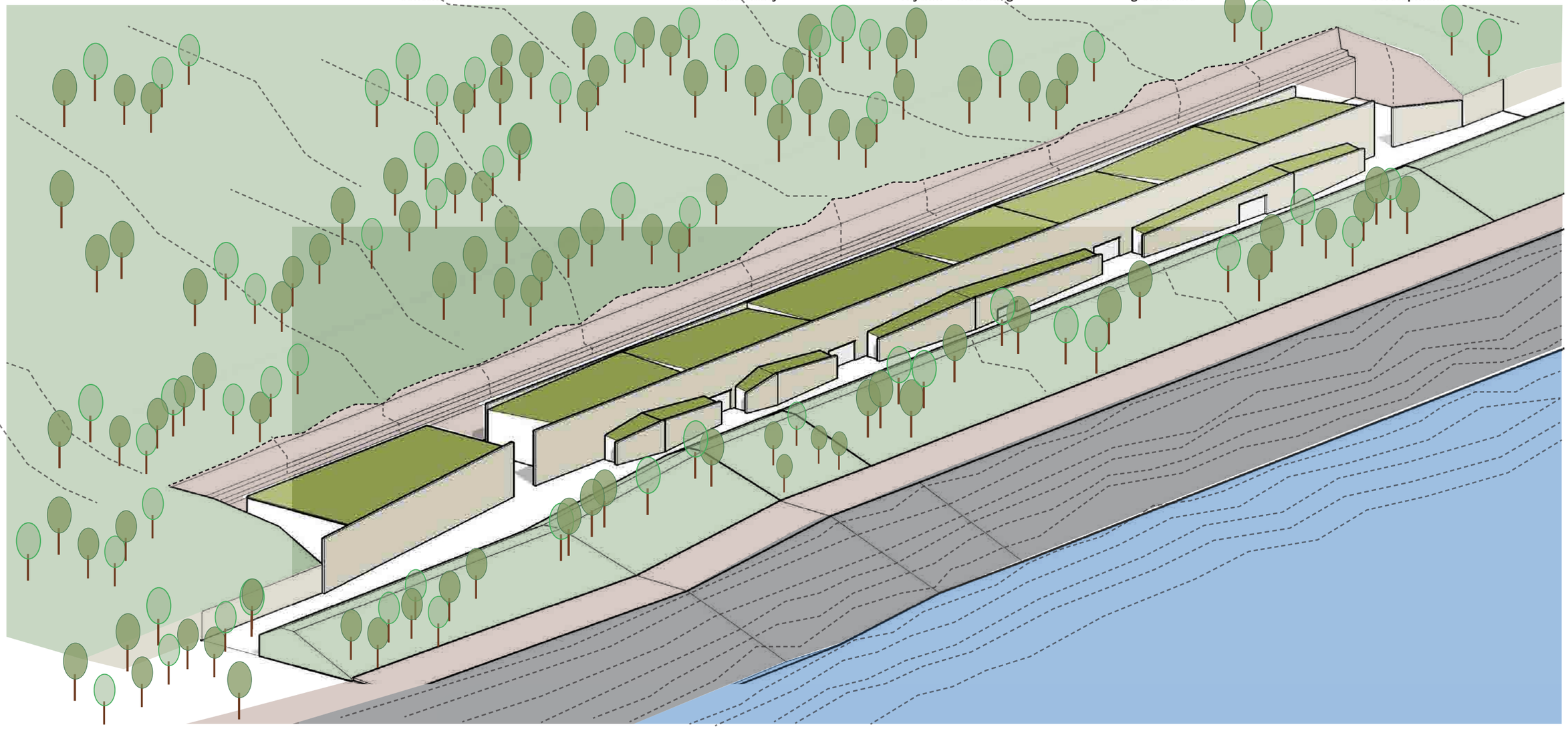

context


materiality


rhythm + modelling


green roofs

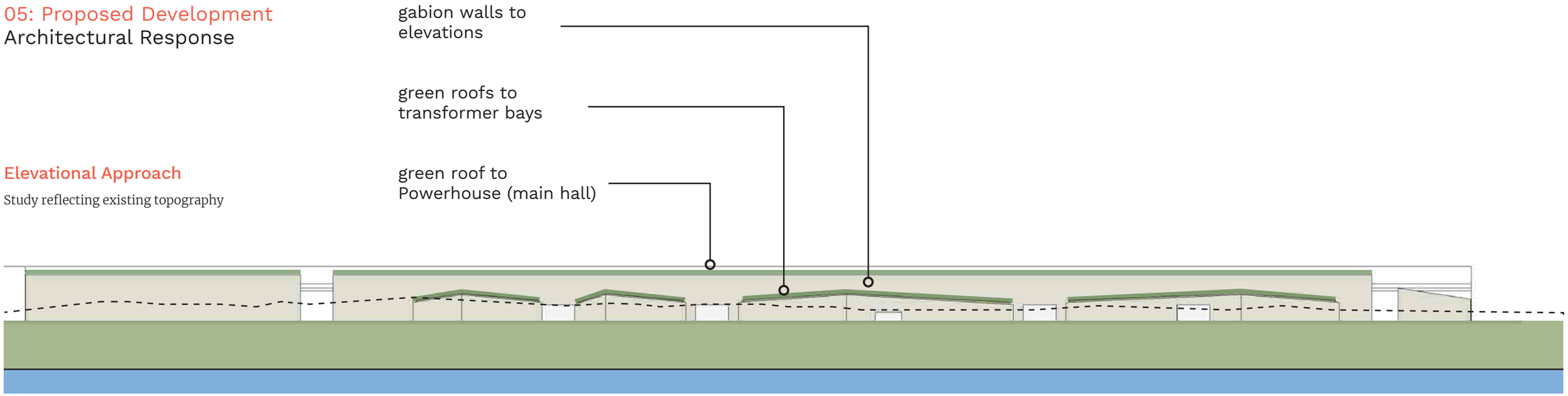

development



05: Proposed Development
Architectural Response

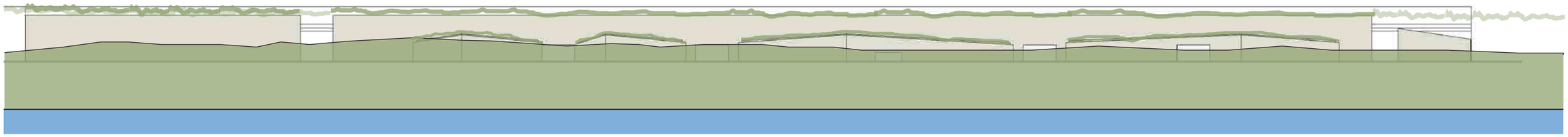
Elevational Approach

Study reflecting existing topography



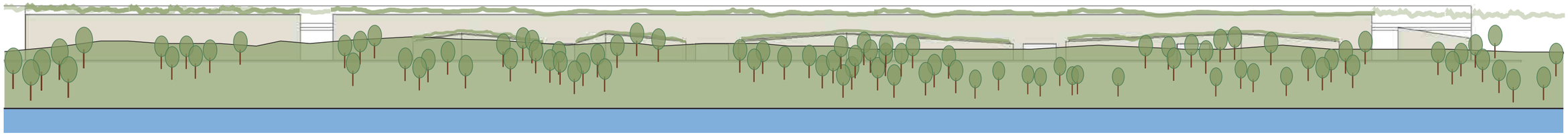
Building

The building is located into the recess in the landscape



Landscape

Landscaped earthworks are added to reflect the existing landform and wrap the topography around the building to help screen the building and integrate it into the landscape



Planting

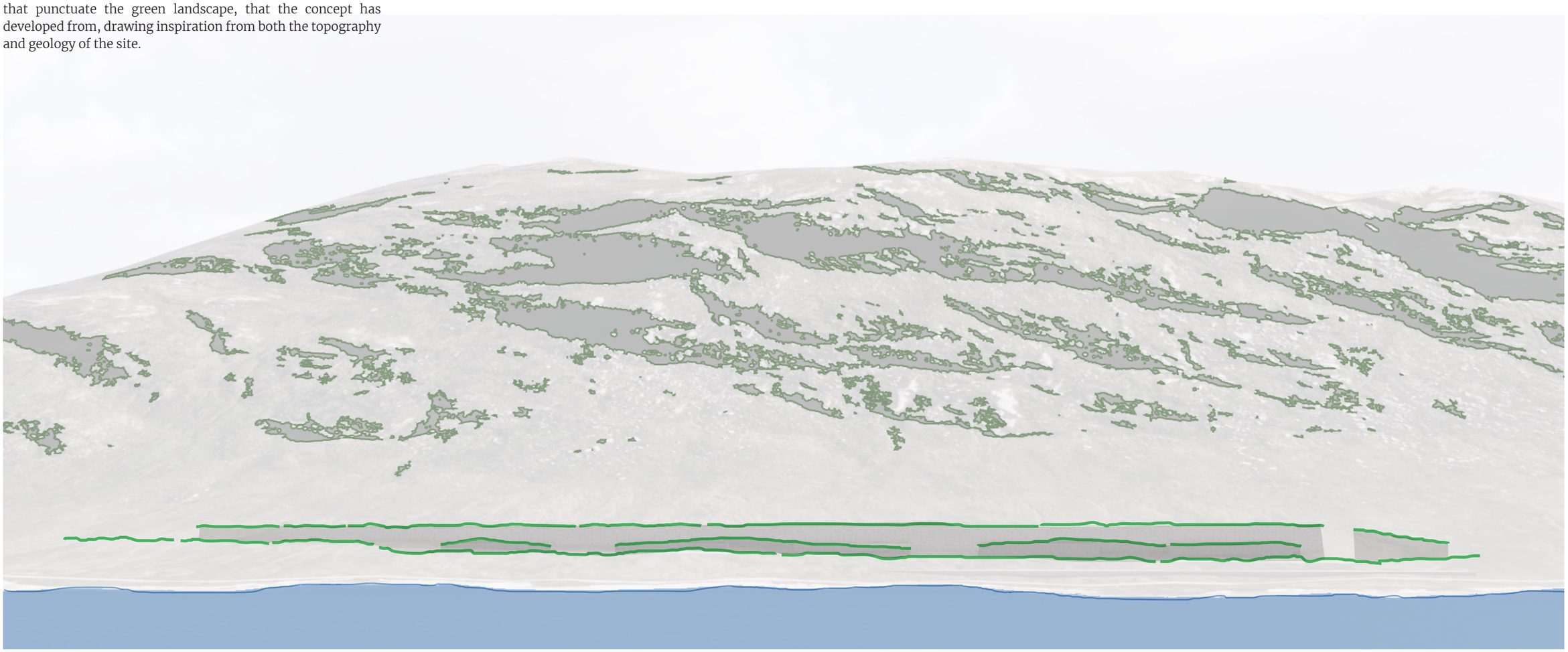
Tree planting is added to further help screen the building

Elevational Approach

Design Intent

The proposals should reflect the site context. The design approach will pursue a sustainable response using found materials, such as locally excavated rock in gabions, stone, grass roof, which are low carbon, low impact, net zero, renewable, biodiverse, and considers whole life carbon.

It is the abstract of loose rocks on the lower slopes of the mountain, set within the wider backdrop of larger rocky crags that punctuate the green landscape, that the concept has developed from, drawing inspiration from both the topography and geology of the site.



Elevational Approach

Visualisation / photomontage of the view looking across to the powerhouse

year 5 (planting still to be established)

Climate Emergency

UK & Regional Policy Response

In April 2019, Scotland became the first government in the world to declare a climate emergency and committed to reach net-zero emissions by 2045. In June 2019, the UK government subsequently passed legislation with a commitment to reach net-zero emissions by 2050.

The Scottish Government have committed to achieving the following carbon emissions reduction targets:

- 70% CO_2 reduction by 2030.
- 90% CO_2 reduction by 2040.
- Net-zero carbon by 2045.

As part of this process, new policies and targets are continually being put in place by the government to push new developments and existing buildings to move away from fossil-fuel based heating systems such as gas, oil, or LPG.

UK Buildings

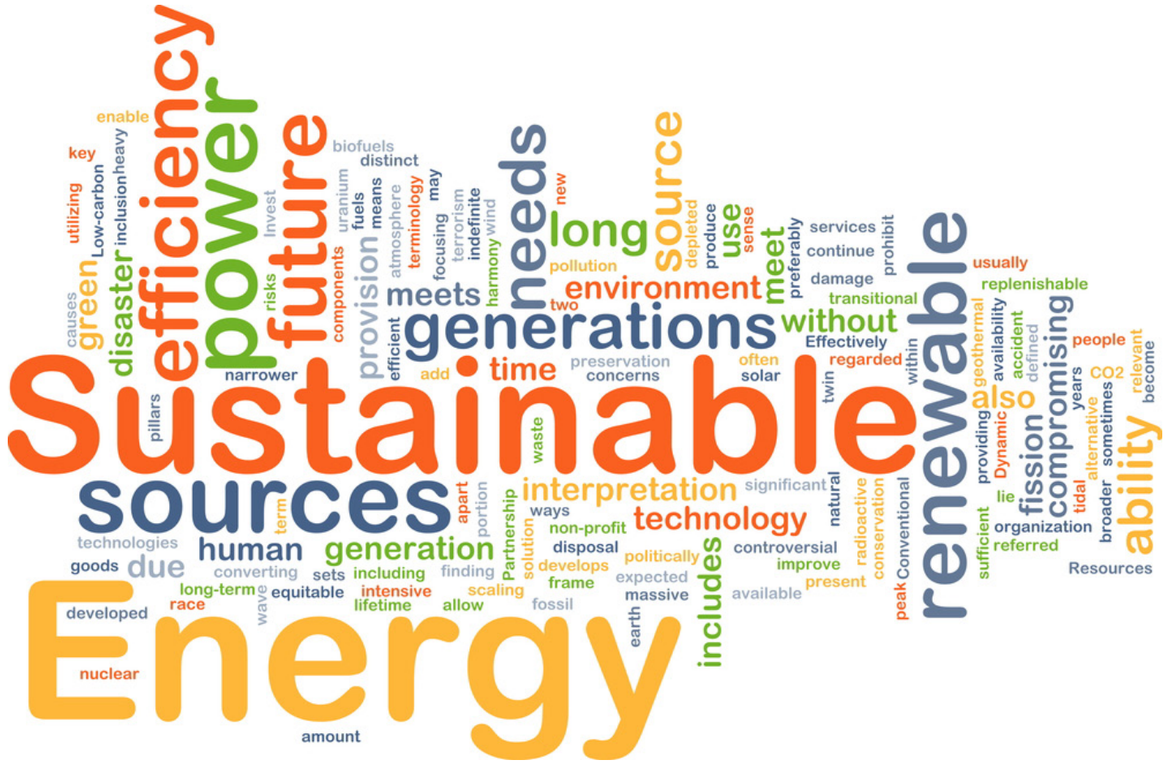
The Built Environment contributes to approximately 30% of the UK's total carbon footprint. The UK Government is committed through the Climate Change Act to reduce CO_2 emissions to 80% of 1990 levels by the year 2050 through a programme of CO_2 emission reductions.

To achieve this we should design buildings to be:

Zero energy / carbon in operation - The carbon dioxide produced as a result of the production and use of the energy from fossil fuels consumed for the day-to-day operation of buildings and infrastructure.

Zero embodied energy / carbon - The carbon dioxide produced from the energy used in the extraction, fabrication, and transportation from place of origin of the materials used in the construction, including recognised carbon offset schemes.

Climate Adaptable - How do we design, construct and renovate buildings, and infrastructure to maintain the desired performance in the event of climate change in future decades, for example if local temperatures continue to rise or rainfall increases.



Sustainability Strategy

Energy efficiency has been a consistent priority for the Scottish Government, with the ambition to eradicate fuel poverty, mitigate climate change, and grow the Scottish economy in an inclusive way, resulting in energy efficiency being designated as a national Infrastructure priority.

Buildings need to be warmer, greener and more efficient, and the Scottish Government has set out a Route Map that shows how this can be realised and proposes long term energy efficiency standards that buildings will need to achieve by 2040.

It is imperative that a sustainable design approach is integrated into the development of the project in line with the Scottish Governments ambitions and The Highland Council's 'Sustainable Design Guide' adopted in 2013. (Refer Appendix B).

Fundamentally the new powerhouse building is being designed to respond to the local landscape and climate, with the intention that the new powerhouse is resource efficient, flexible and adaptable to future climate.

The key areas that the design focuses on include:

- Character & Setting
- Materials
- Energy Efficiency
- Water use
- Construction Waste
- Minimising Construction Impact

Passive Design + Ventilation

Using rooflights to bring natural light deep into the building whilst recovering heat generated from turbines to provide space heating and hot water to occupied spaces

Green Roof

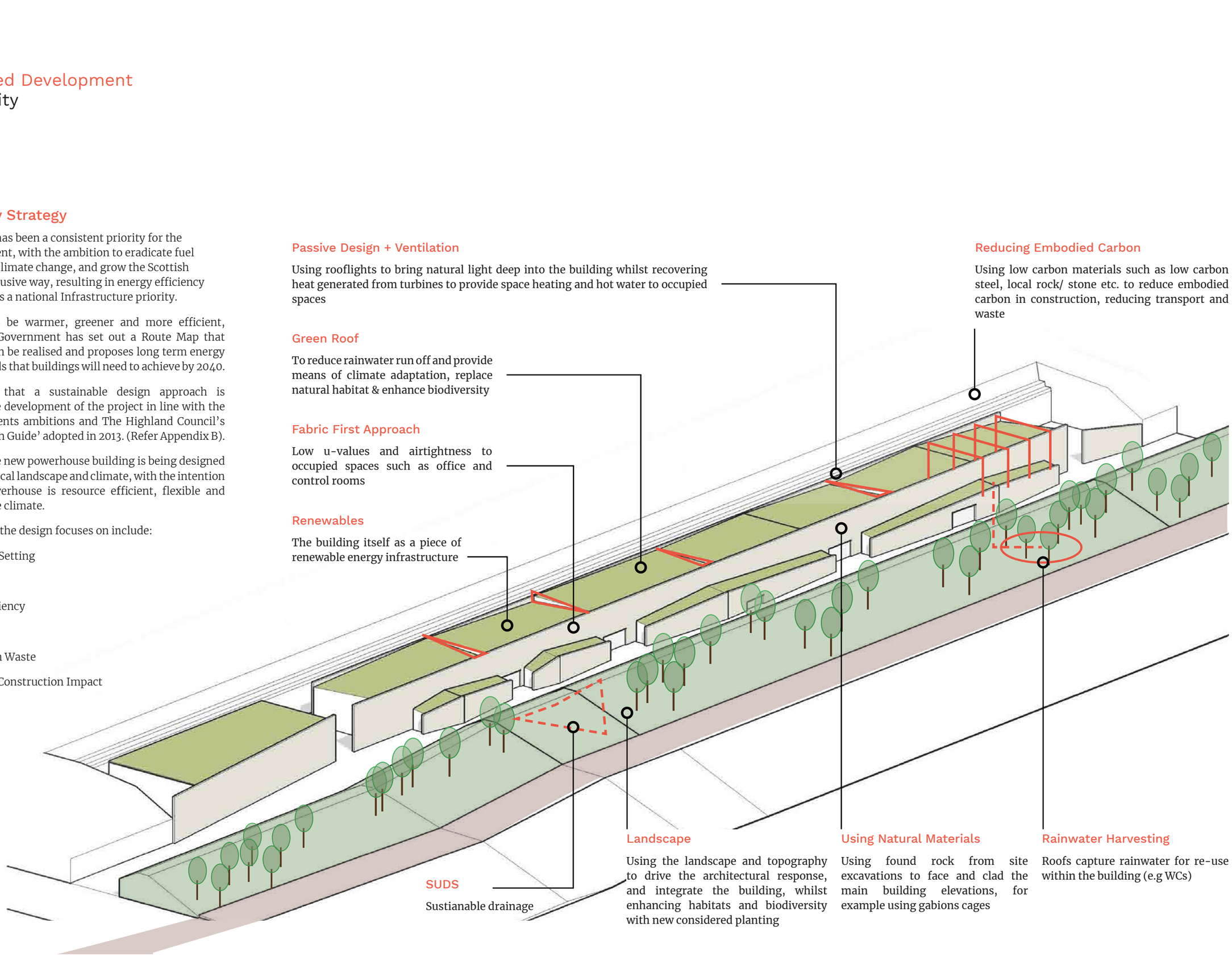
To reduce rainwater run off and provide means of climate adaptation, replace natural habitat & enhance biodiversity

Fabric First Approach

Low u-values and airtightness to occupied spaces such as office and control rooms

Renewables

The building itself as a piece of renewable energy infrastructure



Reducing Embodied Carbon

Using low carbon materials such as low carbon steel, local rock/ stone etc. to reduce embodied carbon in construction, reducing transport and waste

SUDS

Sustianable drainage

Landscape

Using the landscape and topography to drive the architectural response, and integrate the building, whilst enhancing habitats and biodiversity with new considered planting

Using Natural Materials

Using found rock from site excavations to face and clad the main building elevations, for example using gabions cages

Rainwater Harvesting

Roofs capture rainwater for re-use within the building (e.g WCs)

Consultation

Consultation

The proposals have been presented to, and discussed with The Highland Council.

A Meeting was held online on 08 November 2023 with Roddy Dowell (The Highland Council) where the concept and design development was presented. Feedback was received on 30 November, with further clarification received on 21 December.

There were 2 main issues raised:

1. How to better integrate the building into the landscape;
2. How to break up the long facade.

This feedback has been considered and the design has addressed these concerns.

1. Landscape

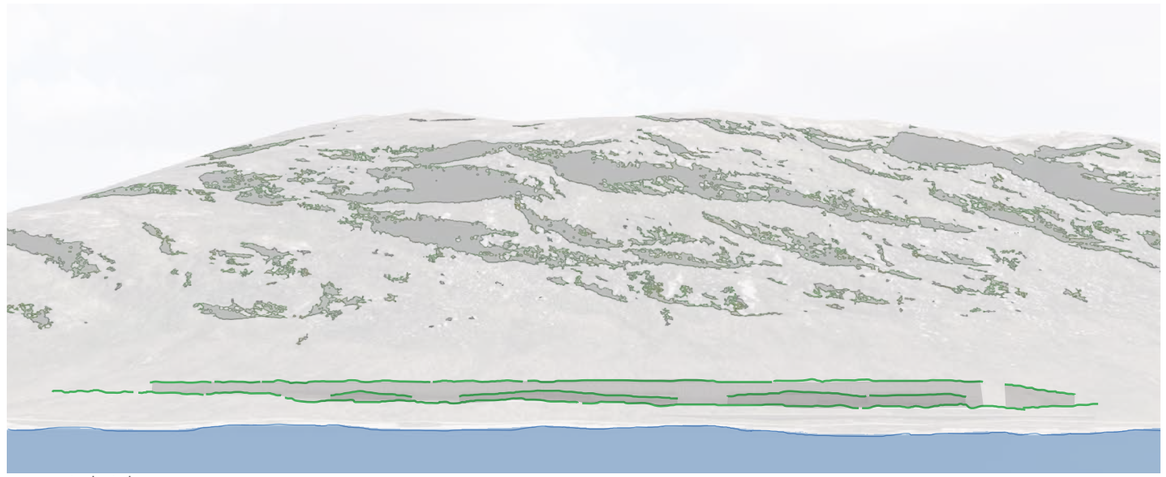
The overall proposals aim to minimise the extent of any "cut"into the landscape, whilst balancing this with the optimal location for the powerhouse on the banks of the loch, in order to carry out only the excavations that are necessary for the project.

Nonetheless, landscaped earthworks around the building are proposed to reflect the landform and topography of the site, rising and falling, to reduce the visual impact of the building, which sits lower in the landscape. Tree planting and Green Roofs are also proposed alongside the new landform design, to better integrate the building into the landscape.

2. Facade

The length of the facade can be modelled and broken down visually using the gabion baskets to reduce the visual impact of the surface area and create more interesting areas of depth, light and shade that better reflect the rocky terrain. In addition, the 6 transformer bays also help to break up the facade, providing further areas of depth, and are manipulated to better reflect the context.

The powerhouse building and surrounding landform and planting areas would be further developed through detailed design stage with the aim of reducing the overall impact of the building in the landscape as far as possible and achieving a design which would contribute a positive feature as part of the wider landscape context.



concept sketch

view looking across to powerhouse
year 5 (planting still to be established)

Dams, Tunnel Portals and Access Tracks

5.3 The Lower Earba Dams

5.3.1 The two dams at Loch Earba would have an estimated maximum height above existing ground level of 24 m, up to a level of 376m AoD. These two new dams would create a reservoir capable of storing approximately 62 million cubic metres of water. Both dam sites are different in terms of topography and setting. The northern dam site known as Shios is at a much narrower point in the Earba valley on the edge of an area of forest and surrounded by scattered mature pine and deciduous trees. The southern dam site known as Shuas sits at a much wider point in the valley, surrounded by open craggy hillsides and moorland, with the watershed for the catchment located only a short distance to the south. Consideration, provided below, has been given to how the potential impacts of the proposed structures can be minimised to help set both dams within the general landscape context.

5.3.2 Both dams would comprise earth or rock-fill with a concrete or asphalt face to the upstream (or reservoir) side. It is anticipated that the downstream side of the lower dams would be vegetated, and would therefore appear as a grassy / heathery slope, similar in type to the surrounding vegetation. The steepness of the downstream face on the proposed dams would be engineered so that it is possible to cover this front face with a stable layer of vegetated peaty soil.

5.3.3 The north-eastern Shios Dam is in a more developed setting where existing small intake and weir structures are already present, and this dam would also require more infrastructure in the form of a spillway and valve house. The existing hydro intake which is located at the Shios Dam site would also be reconfigured. This would mean that new screens and gates to replace the existing hydro works would be required on a new structure downstream of the Shios Dam.

5.3.4 The Shios Dam would be an earthfill or rockfill dam with a nominal gradient of approximately 1:3 to the upstream and downstream faces. The upstream face would incorporate an impermeable membrane – either concrete or asphalt. The downstream face of the dam would require a section of concrete spillway but would otherwise be topsoiled and vegetated to match the surrounding areas. There is some flexibility in the final design of the profile of the dam to alter it to improve its setting in the landscape.

Figure 19
View looking south from Shios Dam, existing intake visible to the left

Figure 20
View looking north west along the proposed Shios dam centreline to Binnein Shios

5.3.5 The Shuas Dam at the southern end of the valley would be of a similar construction to Shuas Dam but a less complex structure with no spillway or valve house required and would therefore appear as a simple, flat-topped and grass fronted embankment on its downstream side. This would fit well with the less developed landscape context at this end of the reservoir leading to it forming a less noticeable feature within the wider moorland landscape to the west. There is some flexibility in the final design of the profile of the dam to alter it to improve its setting in the landscape.

5.3.6 The vista at the southern end of Loch Earba is dramatic when looking north along the valley so the simple structure of the Shuas Dam is important,. Pedestrial access along the top of the dam would allow the long vistas along the Earba Glen and loch to be enjoyed whilst walking across this structure.

5.3.7 The area of grassland separating the existing Earba lochs would become permanently inundated by the Earba reservoir. In order to break up the linearity of the reservoir margins, peninsula areas landscaped with trees, similar to that existing on the south shore of the existing north Earba Loch, would be created at the north and south sides of the reservoir. This is seen as an important measure to retain the 'two' lochs setting of Earba and it will go some way to avoid long linear features that can appear at the side of reservoir margins.

Figure 21
Shuas Dam from the proposed access track to Leamhain

Figure 22
View towards the proposed Shuas Dam from new access track

Figure 23
The twin lochs of Earba from the north

Figure 24 B
Visualisation / photomontage view from Beinn a' Chlachair summit looking to Shuas Dam (year 15 post completion)

Figure 24 A
Visualisation / photomontage of view from Earba lochside showing the proposed track and peninsulas

5.4 The Upper Leamhain Dam

5.4.1 The upper reservoir is at the site of an existing hill loch called Loch a' Bhealaich Leamhain which is situated within a coire, enclosed on three sides by steep mountain slopes. The upper dam would be located just below the existing outlet of Loch Leamhain.

5.4.2 The loch is a feature of views from stalkers paths around it's perimeter and is also seen in some views obtained by walkers descending the eastern flank of Beinn a' Chlachair. Views up towards the coire are also obtained from Loch Pattack area, to the east from where a stalkers' path ascends towards the loch. However, the loch itself is hidden by landform from this area.

5.4.3 The upper dam would have an estimated maximum height above existing ground level of 75 m and a crest length of around 1000 m. This would raise the level of the loch from its existing level of 635m AOD to a maximum level of 710m AOD.

5.4.4 The Leamhain Dam would be constructed just below the outflow of Loch a' Bhealaich Leamhain to create a reservoir capable of storing approximately 55 million cubic metres of water. It would comprise a rock-fill dam with a concrete face to the upstream side. The downstream face would consist of locally won rock fill placed to avoid colour variations or linear features. The Leamhain Dam would have a face which is steeper than the proposed lower reservoir dams and this means that placing soil or vegetation on its front face (as is proposed with the lower dams) would be challenging. However, the use of local stone would allow it to weather over time to appear similar in tone and texture to the surrounding scree areas on the steep slopes of the corrie. There is some potential for moss or other vegetation to grow on the dam which would further soften its appearance and where this occurred. it would be left rather than removed for any dam maintenance or safety reasons.

5.4.5 Following on from the approach at the Shuas Dam, the dramatic and remote upland landscape at Loch Leamhain means that the approach of simple structures would be followed. This means minimising hand railing and engineered features wherever possible. The project would require the upper dam to have a small valve house, but this would be built into the dam as much as possible and clad with stone from the same borrow pit that provided the dam rock fill. A narrow rip rap and grass spillway would be required along the toe of the dam, but it would be much smaller than that required at the lower Shios Dam and be aligned to the side of the structure avoiding a prominent central feature on the dam crest.

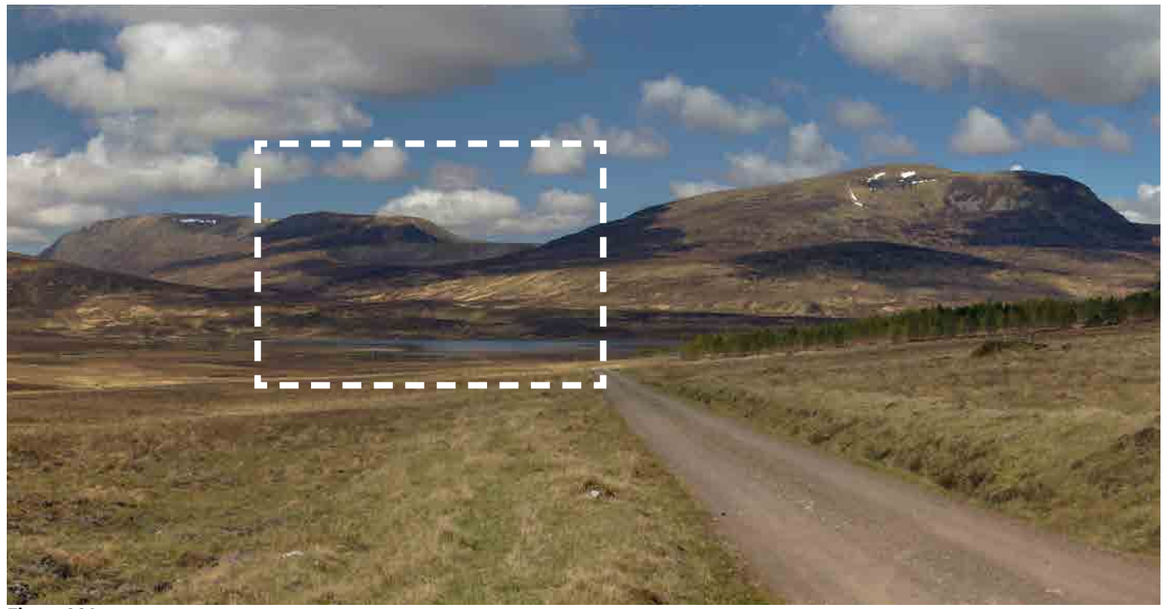


Figure 26A
Visualisation / photomontage of the proposed Leamhain dam from the East

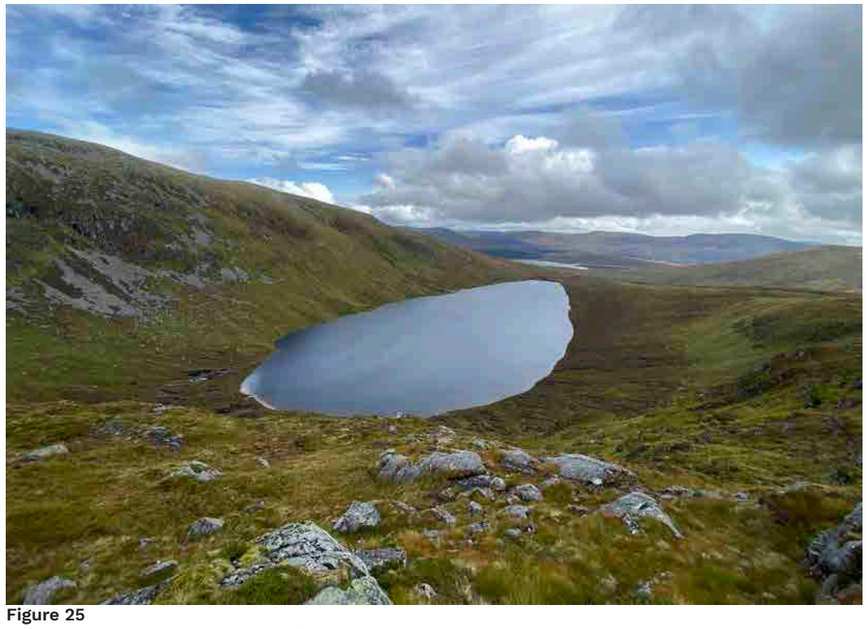


Figure 25
Loch Leamhain approaching from Earba

Figure 26
Visualisation / photomontage of the Leamhain dam viewed from the east (year 15)

5.5 Overarching principles in the Dam Design

5.5.1 Despite the considerable size of the proposed dam structures, the potential impact of these water retaining structures can be kept to a minimum by ensuring that the design reflects the landscape. This can be done by using an approach where the structures are kept as simple as possible with clean lines, avoiding metallic additions or peripheral structures which can introduce a sense of human scale giving a cluttered impression drawing the eye. The following principles have been developed, with experience on other large hydro projects, to help tie the dams into the landscape setting, this includes:

1. As far as possible health and safety features would be integral in the dam design to avoid the need for features such as railings and fencing. Elements such as a rubble faced wall on the downstream side of the dam as edge protection and concrete wave wall on the upstream side would tie these features into the respective dam faces and help to minimise their impact.

2. The Leamhain Dam rock fill material would be sourced from local borrow pits in the reservoir inundation area whilst the Earba dams material would be obtained from the local tunnel spoil. The use of local rock, particularly on the upper Leamhain dam, would ensure that the tones and colours would tie in with those of the adjacent landscape. There are areas of scree and bare rock on the surrounding mountain slopes at Leamhain which the rockfill face will appear similar to, particularly after the dam has had an opportunity to weather over time. Where technically feasible, stone would be mixed to provide an overall consistent tone on the outside face of the dam, to avoid a striped appearance; and

3. The need for additional structures and buildings would be minimised to keep the area in which the dams sit as uncluttered as possible. Features such as those associated with power supply and welfare facilities, and the valve houses (to provide compensation flow and draw down) would be semi buried where possible and clad with local stone. For safety reasons a spillway is required on the Shios and Leamhain Dams for natural flood passage, whilst noting the Shios spillway is larger than the Leamhain structure. This would be designed as a simple structure, designing out the requirement for features such as railings as far as possible. Landform would also be used to minimise the visual influence of these structures.

5.6 Other Important aspects to the scheme design

5.6.1 Upper control works

5.6.2 At the NW end of Loch Leamhain up to three intakes would feed up to three headrace tunnels carrying water between the upper and lower reservoirs.

5.6.3 The intakes would be reinforced concrete structures almost always below the reservoir operational low water level. A shaft would connect each tunnel to the surface, approximately 200m back from the intake screens. These shafts would contain hydraulic gates for the isolation of the tunnels. The associated gatehouses would be semi-buried, set into the hillside and clad with local stone. Access would be taken from the downslope side facing the Leamhain Reservoir which means they would be well screened from Coire Pitridh and the popular walking route to the west of this location.

5.6.4 Lower Control Works

5.6.5 The lower control works on the shore of Loch Earba would need to accommodate flows into and from the powerhouse, depending on whether the scheme is operating in pumping or generating mode. The lower control works would comprise up to six concrete inlet / outlet structures positioned at the end of the tailrace tunnels. These structures would house the necessary screen arrangements and be shaped to smoothly channel the water in and out of the Earba Reservoir at low velocities. The lower control works, and associated tunnels would be below the Earba Reservoir minimum water level, but the top part of the structures would be visible when the Earba Reservoir was at minimum operating level.

5.6.6 The tailrace tunnels linked to the lower control works would be provided with hydraulic gates for isolation of the tunnels from the reservoir during some maintenance activities. The gates would be connected to the ground surface by shafts, each with a gatehouse above it to house the operating mechanisms for the gates. The gate houses for these isolation points would be completely buried and the only visible component would be a surface access hatch flush with formed ground level.

Figure 27
The semi buried Glendoe Welfare building

Figure 28
The Maldie powerhouse with only the front face visible

5.6.7 Tunnel portals

5.6.8 There would be three access tunnel portals associated with the Proposed Development. Two access portals would be located at the powerhouse in the rock cutting behind the main building and would provide access to the tunnel network and underground bifurcations. The third, upper access would provide an entrance to the low-pressure tunnel network at approximately 600m level and this adit would be located part way up the Leamhain access track. This would be the most prominent of the adits. All three portals would be approximately 5.5m tall by 4m wide. On completion of construction these tunnels would be infrequently used and therefore the tunnel portals would be designed to be inconspicuous in the landscape with landform and vegetation reinstated around them. Any required signage would be kept to a minimum and carefully sited to avoid prominence. Once construction is complete a robust gate to block the entrance of all portals would be the likely final finish. The upper adit would likely be similar in appearance to the Dinorwig adits shown in Figure 29 & 30.

5.6.9 Surge Shafts

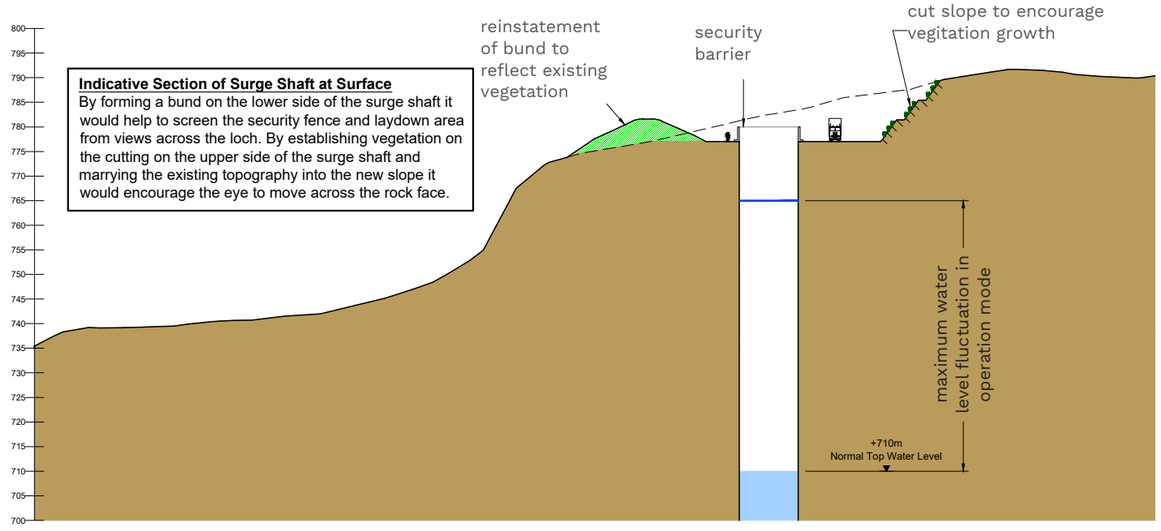
5.6.10 Three surge shafts are required for the operation of The Proposed Development these are required to regulate surges of water within the tunnel system during operation. Each surge shaft would be up to 15m diameter at the surface.

5.6.11 The shafts would surface on the western shoulder of Coire Pitridh. The shafts would require the creation of a levelled area resulting in creation of cut slopes and would be potentially visible on the horizon in views from the Beinn Shuas and the top of the Munro Coire Pitridh.

5.6.12 A wall approximately 2.5m high would also be required around the shaft for safety and security reasons. It is proposed that material excavated to create the levelled area would be used to create a bunded landscape to the lower side of the shaft which would help to screen the safety barrier or wall from the wider area. This would also help to hide any operational vehicles that would be parked in the surge shaft area. Vegetation would be encouraged to re-establish on cut slopes with the aim that the eye would skim over the shaft area with no built or human scale features intruding into views from the surrounding hill tops.

Figure 29
Dinorwig tunnel adit

Figure 30
A further Dinorwig tunnel adit



5.6.15 Access Tracks

5.6.16 Access to the site would initially follow existing tracks and then require new tracks. The existing tracks would require widening prior to commencement of the main construction works. All track works would be designed to minimise adverse impacts on local features such as habitat and trees that contribute to the character of the area. Where this is not possible, consideration would be given to replacement of key features to help tie-in the road alignment to the surrounding landscape.

5.6.17 The access track to the upper reservoir works would be routed across open hillside and consequently a high standard of design is required to ensure that the landscape impact of this is minimised. The alignment of the tracks to both the Leamhain dam and surge shafts has been carefully considered to follow the contours of the landscape and minimise earthworks and obtrusive switchbacks. Careful removal of the vegetated peat layer prior to construction would be important to ensuring that the edges of the new track would re-establish and marry in with adjacent vegetation.

5.6.18 Where tracks traverse the hillside, slopes would be carefully graded to tie into the surrounding landscape and reinstated with vegetated peat to prevent erosion. Where cuttings are in bare rock these may be left where they would appear similar to existing areas of crag. It is proposed that vegetated peat would be used to create bunded landform on the lower side of the tracks to reduce the visibility of these when viewed from the wider landscape. This would also assist in health and safety where a steep drop is present and reduce need for obtrusive barriers.

5.6.19 Micrositing of the track has been undertaken to avoid areas of deeper peat as much as possible, but in the small areas where it is not possible to avoid deep peat, the use of floating tracks would be explored.

5.6.20 New permanent tracks would be necessary to replace sections that would become inundated by the new Earba reservoir and the approach set out above would apply for these routes which contour the slope along the majority of the alignment. Where possible permanent tracks would be reduced in width from 2 way to one way road width after completion of construction.

5.6.21 With the exception of the initial section of track at Moy at the site entrance, the project's tracks would be surfaced with local crushed stone which is anticipated to have a similar colour and tone to existing tracks and exposed rock in the landscape

5.6.22 A number of paths and tracks are required to maintain recreational and Estate access during construction. A new landrover track would be constructed along the north shore of Loch Earba. During operation of the Proposed Development, this track would become part of a circular cycling/walking route around Loch Earba. It would also be used by the Estate for land management purposes. A mountain footpath would be constructed from this track up to the base of the Binnein Shuas cliffs to improve access for climbers. Both the landrover track and footpath would be constructed to the highest of standards with reuse of vegetation to dress the sides of the small tracks and paths.

5.6.23 The proposed widths of the access tracks are shown in the table adjacent.

Track Section	Construction Period Detail	Operation Period Detail
A86 Junction through main compound	Width, cut or floating,	Retained complete
Main Compound to Loch Earba	8m cut / floated in small sections	Retained complete
South side of Eraba Reservoir	8m wide	Reduced to 4m with passing places
North side of Earba Reservoir	3m wide	3m wide landrover track
Adjacent to the Pitridh Aqueduct	4m wide	Reduced to 3m wide
Powerhouse to Leamhain Dam	8m wide	Reduce to 4m with passing places
Leamhain track to surge shafts	6m wide	Reduce to 4m with passing places
Leamhain track to tunnel adit	6m wide	Reduce to 4m with passing places
Leamhain track to Leamhain intake	6m wide	Reduce to 4m with passing places

Figure 30A
Twin lane construction haul road reinstated to 3m wide

Figure 30B
Track to small dam works reduced in scale following completion

5.6.24 The Pitridh Diversion Channel / Aqueduct

5.6.25 A new diversion channel containing a number of intakes would pick up flows from four watercourses including the Allt Coire Pitridh and Allt Corie a' Chlachair to divert them around the Shuas Dam into the Earba Reservoir.

5.6.26 The intakes would be low profile reinforced concrete structures surrounded in natural rock armour to minimise the visible concrete as much as possible.

5.6.27 The aqueduct would be an open trapezoidal channel, relatively small initially increasing in size to approximately 2m wide (base), 3m deep and 8m wide at the top. The channel would be lined with natural rock armour and vegetation encouraged on the side slopes. A central trough would be formed so that even in low flows there would be the appearance of a water surface rather than it being lost within a wide rocky channel.

Shuas Aqueduct

5.6.28 Whilst the majority of flows from the Allt Coire Pitridh and Allt Coire a' Chlachair would be diverted to the Earba Reservoir via the Pitridh Aqueduct diversion, nevertheless, compensation flow and local catchment rainfall runoff would still collect at the Shuas Dam. A buried pipeline hidden from view would transfer this water to the small reservoir to the west of the Shuas area, which in turn drains to the Abhainn Ghuilbinn.

Junction with the A86 and new bridge

5.6.29 A new junction would be built to access the site from the A86 trunk road. This would be designed to a standard agreed with Transport Scotland.

5.6.30 The new bridge would be in keeping with existing large forestry and Estate bridges such as the one that crosses the Pattack.

5.6.31 A landform bund planted with native woodland species in this area would screen or filter views of the bridge and new entrance area from local properties at Tòrgulbin and Luiblea as well as acting as a noise barrier. This would be designed to tie into the top of an existing alluvial slope.

Drawdown

5.6.32 Drawdown areas would be visible around the reservoirs when water is low. This would be likely to appear peaty at first and would erode over time to areas of rock and stony beach, similar to other hydroelectric reservoirs within the wider area. Drawdown areas would be up to 70 m vertically and approximately100 m horizontally on the upper reservoir, and 40m to 150m horizontally and 21 m vertically on the lower reservoir when drawn down to their lowest level.

5.6.33 As a general rule, the slopes within the inundation zones are steep. This reduces the horizontal extent of drawdown but makes it difficult to mitigate its appearance. Around the upper reservoir, drawdown would be expected to develop a similar appearance in terms of tones and texture to existing scree areas which surround the loch. Around the lower reservoir, trees would be planted and encouraged to grow in selected areas on the lower side of the access tracks which would filter views and soften the appearance of the drawdown areas. The greatest extent of drawdown around the lower reservoir would be on the shallowest slopes, focussed within the area between the two existing lochs where the peninsulas would be formed. The shallower slopes in this area may give opportunities to create small landform modifications such as pools holding back water, or small artificial islands which could be planted with riparian species. These could help to visually break up the extent of the drawdown areas. Consideration of measures such as this would be taken during the detailed design phase.

Figure 31
Example channel lined with rock

Figure 32
Channel water is lost in boulders - this would be avoided where possible

5.7 Sustainability of the Project

5.7.1 Within the Scoping Response there was a clear requirement for the Developer to demonstrate within the Design Statement that the Proposed Development is entirely sustainable. It was recommended that the three pillars of sustainable development are shown to be working in tandem with each other, Social, Environmental and Economic.

5.7.2 The Earba project is a complex and large project with many sustainability issues requiring to be addressed. Essentially the core purpose of the Proposed Development is to provide large scale long duration energy storage for the grid to increase the overall volume and efficiency of clean renewable green energy. As the Proposed Development evolves, the design and construction stages must embrace the fundamental purpose of the project and have sustainability at the centre of the ideas taken forward and methods used. A high-level summary of the key measures to achieve overall sustainability is provided below. Where there is more detail within the EIA the specific chapters have been referenced. The Highland Council have produced detailed guidance on how a sustainable design approach can be achieved. This guidance includes a checklist for Developers and this has been completed for the Earba project and is contained in Appendix B.

Social Sustainability

5.7.3 Social sustainability is considered to be understanding and then managing the impact of the project, both positive and negative, on people.

5.7.4 This means that the Proposed Development's communication and engagement with stakeholders, including the local population, is crucial.

5.7.5 The project has looked to engage with Stakeholders through workshops at a number of points in the preparation of the planning submission. It is hoped that these workshops have enabled discussion on how to address any negative impacts and where possible create positive impacts. The workshops have in the main been focused on specific issues and involved the Stakeholder(s) that will lead the review of this matter in the planning process.

5.7.6 The Proposed Development has undertaken community consultations throughout the planning phase and there is a commitment to continue this should the project move forward from planning into construction with a specific community liaison strategy. This will take the form of regular updates, attendance at community council meetings and further presentations, at a local level, before key stages of the project.

5.7.7 The Proposed Development will bring the positive impact of well-paid skilled jobs both in the medium-term during construction and longer term with the operation of the pumped hydro station. There is more detail of this within the Socio-economic and Tourism Chapter of the EIA. With long term full time skilled positions there is usually the added benefit that these jobs bring families into the local area. This increase in population, with a wide age range, can be to the benefit of local schools, businesses and community groups.

5.7.8 Engaging with local business and utilising them in the planning stage of the Proposed Development whenever possible has has been the approach to date. If the Proposed Development moves to construction stage, then more local services will be required. This will bring a positive impact to the working population of the surrounding area.

5.7.9 The Proposed Development has committed to become involved in sustainable local community benefit projects that adhere to the developer's values. This will help the Proposed Development provide a positive impact on the wellbeing of the local population.

5.7.10 Finally, the Proposed Development recognises that enjoying the outdoors brings great pleasure to a large number of people. It is therefore important that the social well-being of visitors to the area is not reduced, or impacted negatively, by limiting or stopping access. The Proposed Development has committed to diverting all paths that cross the site so that access to the local Munros will not be restricted. Furthermore, cycling/walking alongside loch Earba will make use of a new Lochside route. This is all set out in more detail in the Recreation and Access Chapter of the EIA.

Environmental Sustainability

5.7.11 The design of the Proposed Development has been revised and refined taking account of environmental factors following the extensive site surveys that have been undertaken. The EIAR chapter on Consideration of Alternatives and Design Evolution provides further details on this process.

5.7.12 As discussed earlier within this Design Statement, energy storage projects are essential to achieving our national net zero targets. The scale of the proposed development means that this project would make a very significant contribution to the net zero target at a national scale. Ultimately helping the nation get closer to a sustainable electricity system by reducing fossil fuel generation, which is harmful to the environment.

5.7.13 Whilst the loss of habitat has been reduced wherever possible, there remains an unavoidable area of habitat loss. Therefore, to mitigate this loss a significant compensatory package would be provided to achieve a Biodiversity Net Gain across the site in accordance with agreed parameters with the relevant Stakeholders. The details of this are provided in the Outline Biodiversity Enhancement and Management Plan (BEMP) at Appendix 8.6 of the EIAR and include:

- Peatland restoration
- Native tree planting
- Habitat improvement through reduction in deer density
- Aquatic habitat enhancements
- Management of invasive species (rhododendron and bracken)
- Species specific habitat measures for protected species

5.7.14 The Proposed Development will have a powerhouse building with a number of sustainable features as described above in the powerhouse section.

5.7.15 The Proposed Development has also demonstrated that it will maximise the reuse of excavated material emphasising a sustainable approach to the construction process. Amongst many positives that this sustainable approach will take include limiting the importing of material to site and avoiding disposal of material off site. The full mass balance workings are provided in the EIAR Proposed Development Chapter.

5.7.16 In addition to the mass balance, the Proposed Development has also minimised its proposed overall footprint by utilising areas of the site that will be inundated by the proposed reservoirs for the location of temporary compounds, borrow pits or laydown areas. This means that wherever possible, ground that will not be disturbed by the operation of the scheme will also not be temporarily impacted by the construction process.

Economic sustainability

5.7.17 Economic sustainability can be demonstrated by providing long term employment within an industry that is at the forefront of achieving Net Zero. The longevity of hydro installations means that generations of people would have careers within the Proposed Development.

5.7.18 Referring to the Socioeconomic Chapter of the EIAR, the socioeconomic impact during construction and operation of the Proposed Development was assessed as having beneficial effects for the regional economy.

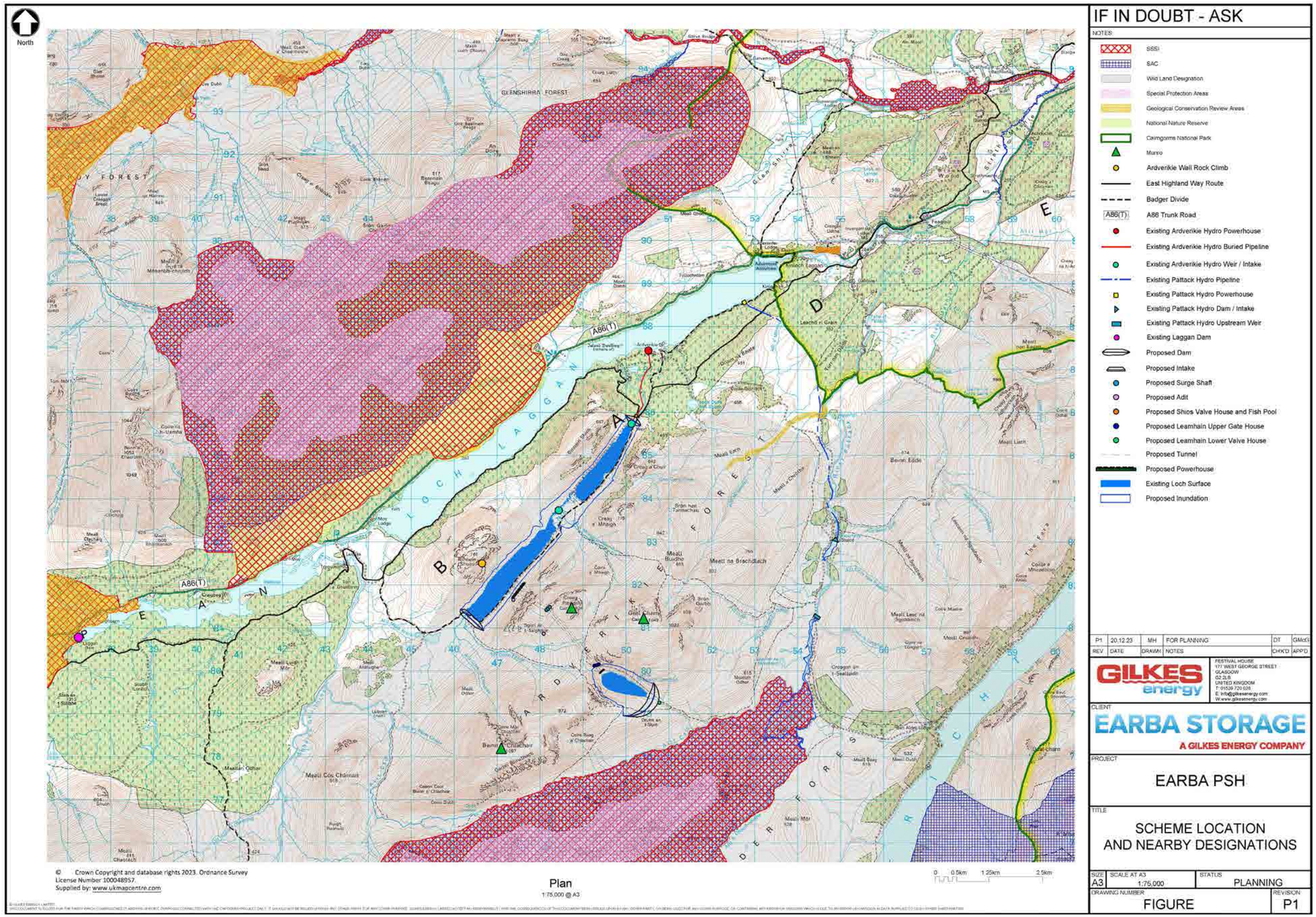
Summary

5.7.19 It is considered that given the above the project can class itself as achieving sustainable status.

xx
Appendices

Appendix A

Scheme Location and Nearby Designations



IF IN DOUBT - ASK

NOTES:

- SSSI
- SAC
- Wild Land Designation
- Special Protection Areas
- Geological Conservation Review Areas
- National Nature Reserve
- Cairngorms National Park
- Munro
- Ardverikie Wall Rock Climb
- East Highland Way Route
- Badger Divide
- A86 Trunk Road
- Existing Ardverikie Hydro Powerhouse
- Existing Ardverikie Hydro Buried Pipeline
- Existing Ardverikie Hydro Weir / Intake
- Existing Pattack Hydro Pipeline
- Existing Pattack Hydro Powerhouse
- Existing Pattack Hydro Dam / Intake
- Existing Pattack Hydro Upstream Weir
- Existing Laggan Dam
- Proposed Dam
- Proposed Intake
- Proposed Surge Shaft
- Proposed Adit
- Proposed Shios Valve House and Fish Pool
- Proposed Leamhain Upper Gate House
- Proposed Leamhain Lower Valve House
- Proposed Tunnel
- Proposed Powerhouse
- Existing Loch Surface
- Proposed Inundation

REV	DATE	DRAWN	NOTES	CHK'D	APP'D
P1	20.12.23	MH	FOR PLANNING	DT	GMcG

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CLIENT: EARBA STORAGE
A GILKES ENERGY COMPANY

PROJECT: EARBA PSH

TITLE: SCHEME LOCATION AND NEARBY DESIGNATIONS

SIZE	SCALE AT A3	STATUS
A3	1:75,000	PLANNING

DRAWING NUMBER: FIGURE
REVISION: P1

Appendix B

The Highland Council Sustainable Design Checklist

Sustainable Design Issue	Points Achieved	Response
The Highland Council Sustainable Design Checklist		
Sustainable Design Issue	**Points Achieved**	**Response**
1. Layout, scale, proportion, materials, construction and finishing Will the appearance of the development be visually appropriate, complementing local character whilst reinforcing local distinctiveness (e.g. materials, road pattern etc) and be clearly integrated with the wider community? A. Building materials and colour complement local character B. Site layout, building style and scale enhance local character C. Roof-scapes visually respect the local context (allowing for low carbon technologies where appropriate) D. Continuity of local building details such as simple and uncomplicated design of roofs, dormers, windows and doors E. Potential for personalisation by prospective residents F. Contemporary approach which reflects the local vernacular where appropriate.	A-C & F achieved. E not applicable to this development.	The design intent of the proposed powerhouse is to deliver a building which is set into the hillside in order to minimise visual impact. This means that it does not protrude from the valley side which would break the extensive views looking up and down the loch. By minimising the width of the building, whilst still meeting the requirements of the hydroelectric plant and associated equipment, the powerhouse can be lowered in the landscape without introducing challenging earthworks profiles into the construction. To aid the design, the building can be lengthened so that ancillary equipment is sited at the ends of the main turbine hall, limiting width and assisting with the concept of setting the powerhouse into the hill. Travel to the powerhouse by vehicle would be along the new access road from the A86(T). There would be access along the front of the building and to a laydown area at the south gable of the building. The transformers would be located at ground level on the loch side of the building, and must be as close to the top of the turbine shafts as possible. The turbine hall is located at ground level, and it is from here that the turbine shafts would be accessed. Also at ground level would be the main entrance and control room with first floor providing accommodation for meeting rooms and break areas above the control room. The switch gear and other electrical equipment would be spread over ground and first floor. As discussed above, the powerhouse would be located in a vast U shaped valley, so despite the long length of the building (500m) it would appear small in comparison to the surrounding corbets and munro mountains, with a similar scale to the exposed rock face of the crags. Building materials are described in more detail in Section 4 below. The concept is to reflect the surrounding exposed rock on the hillside and use excavated stone from the site works to achieve this. By using local rock it is envisaged this would help blend the building into the surrounding landscape. The roof would be a green roof with low profile pitches that step up and down to reflect the rock profile in the wider landscape. The layout, scale and proportion of the building is primarily driven by the functional requirements of the project. However materials, construction and finishing are visually appropriate, and reflect the site context and local character. The design approach pursues a sustainable response using found materials, such as locally excavated rock to be used in gabions, and a grass roof, which are low carbon, low impact, renewable, biodiverse, and considers whole life carbon.
2. Landscaping Has a landscaping scheme been drawn up for the site which ensures that: A. Landscape forms the context for the development B. The development integrates into or enhances the present landscape character C. Green spaces are provided for public/private and site boundaries (including tree and shrub planting) D. Public open space and recreational provision is given as required E. Safeguards green networks within the site, and establishment of green network features that link into the wider green network	Within the application documentation it has been demonstrated that the criteria A-E have been met.	A set out in section 1 above the design intent is that the building nestles into the hillside and avoids protruding from the valley sides. Whilst this will predominantly be achieved by placing the building in a cutting, the use of landscaping and planting will also be crucial in achieving the design approach. The Proposed Development sits within an undeveloped open valley hillside as detailed in Chapter 2: The Proposed Development of the EIA Report. Landscape forms the context for the development. The design seeks to let the powerhouse nestle into the hillside and integrate into the landscape, providing a visual link between the built elements and the natural landscape in terms of shape, scale, colour, material and texture. Compensatory planting would be undertaken should any woodland be removed as part of the construction of the Proposed Development. Further details of this are set out in the EIA Report, Chapter 9: Forestry.

Sustainable Design Issue	Points Achieved	Response
3. Cultural heritage Are the culturally and archaeologically important features on the site and their settings known, and how will these be affected by the development?	This has been achieved - Please refer to Chapter 16 of the EIAR which covers Cultural Heritage	A comprehensive survey of culturally and archaeologically important features within the boundary of the Proposed Development has been undertaken. This is documented in Chapter 16 (Cultural Heritage) of the EIA Report . With the application of mitigation measures the assessment concluded that there would be no significant effects on cultural heritage features as a result of the Proposed PSH Development.
4. Materials Which materials are from secondary or recycled sources, have low embodied energy, and are from sustainable and/or local sources? A. Roof B. External walls C. Internal walls (including separating walls) D. Upper and ground floors (including separating floors) E. Windows	THC stipulate that at least 3 out of the 5 key elements listed to the left shall achieve a Green Guide rating of A+ to D. The target of the Proposed Development is to better this for the key elements of the powerhouse building. The Proposed Development confirms that all timber to be used in the construction process shall be from sustainable sources and FSC or PEFC certified.	Where possible materials for the building structure would be from recycled or secondary sources - a good example of this is the use of tunnel spoil in the gabion baskets which will provide the cladding for the powerhouse. A: Roof – a sedum / green roof is proposed to visually integrate the building with the landscape. Other benefits include rainwater attenuation and enhancements to bio-diversity. It is also considered that this type of roof could attenuate noise and vibration from the turbines, as well as improve the overall roof insulation. It is considered that a Green Guide rating of A can be achieved for the roof. B. External walls – Concrete external walls will be required in any section that is backfilled or around certain electrical equipment. Elsewhere the steel frame will be clad. Gabion baskets filled with rock excavated from the site will form the outer wall facing where external walls are visible. Some areas (like the office accommodation) will require composite cladding with non combustible insulation core behind the gabion baskets to achieve U-values. It is considered that a Green Guide rating of B can be achieved for the external walls. Concrete would be produced by using site won tunnel spoil for aggregate and site won sand. C. Internal walls – Given the nature of the building it is likely that many of the internal walls would be formed with concrete. Non-load bearing walls would likely be lightweight framed with plasterboard. It is considered that a Green Guide rating of A can be achieved for the internal walls. Concrete would be produced by using site won tunnel spoil for aggregate and site won sand. D. Upper and Ground floors – In this type of large hydroelectric powerhouse the floors will be required to be reinforced concrete. It is considered that a Green Guide rating of B can be achieved for the floors. Concrete would be produced by using site won tunnel spoil for aggregate and site won sand. E. Windows – There will be minimal windows to the building, and light emission in such a remote area needs to be considered. It is considered that a Green Guide rating of A can be achieved for the windows. All timber used to form the substructure and superstructure of the building during the construction phase (i.e. formwork, framing, etc) would be from FSC/PEFC sources.
5. Natural heritage Has an assessment been made of the site's ecology and will the ecological value of the site be protected or recreated to equal quality and or enhanced?	An assessment has been undertaken and strategy produced by an ecologist to protect or recreate existing ecological value.	Detailed site surveys of the site ecology have been carried out. Following a detailed assessment, the ecological value of the site has been determined and a proposal has been drafted to achieve an overall Biodiversity Net Gain as a result of the reinstatement and restoration schemes that form part of the Proposed Development. Please refer to the following chapters in the EIA Report: Chapter 8: Terrestrial Ecology, Chapter 10: Ornithology and Chapter 11: Aquatic Ecology. Please refer to Appendix 8.6: Outline Biodiversity Enhancement and Management Plan (OBEMP) for details of enhancement proposals.

Sustainable Design Issue	Points Achieved	Response
6. Enhancing wildlife Will there be: A. No net loss in relation to habitats and species? B. A mixture of locally occurring species specified for planting and landscaping schemes? C. Any new links between habitats within the site or links to habitats outside the development boundary? D. An increase in important or sensitive habitats identified in the Local Biodiversity Action Plan (LBAP), either by creating or restoring ecological value (as assessed by an ecologist), or support for a species identified in the LBAP?	It is considered that A-D achieved would be achieved	Please refer to the following EIAR Chapters: Chapter 8:Terrestrial Ecology, Chapter 10: Ornithology, Chapter 11: Aquatic Ecology Biodiversity proposals, including habitat creation and restoration, are detailed in Appendix 8.6 the Outline Biodiversity Enhancement and Management Plan (OBEMP)
7. Energy efficiency What steps have been taken towards reducing CO2 emissions through energy-efficient design for the Proposed Development? A. Minimising energy demand for the site through orientation and maximising passive solar gain B. Maximising the thermal efficiency of individual buildings through thermal mass, insulation, natural shelter, and appropriate glazing C. Minimising demand for water heating, space heating and cooling, lighting and power in individual dwellings through efficient equipment and controls.	It is considered that A-C would be achieved.	A key requirement of the detailed design stage will be to maximise the energy efficiency of the powerhouse building and also the smaller unmanned structures such as the valve house(s) or gate house(s). The Design intent of the Proposed Development is to exceed the minimum requirements for thermal performance stated in the Building (Scotland) Regulations 2004 and the Energy Performance of Buildings (Scotland) Regulations 2008. The energy performance will assess the whole building with a focus on reducing energy demand and associated greenhouse gas emissions. The orientation of the building is primarily dictated by the site and operational requirements. However, where possible glazing will look to maximise passive solar gain. The design must also consider minimising light omission at night in this remote landscape, so the use of black out blinds can be implemented in areas with lighting during the night. The building would be designed to benefit from the heat produced by the turbines and the transformers where possible, and this heat could be used to provide heating to some or all of the building. Further measures to improve the energy efficiency of the building by minimising heat loss would include: - High volume of good quality insulation within the building fabric - Excellent air-tightness - Use of concrete walls and floors providing thermal mass. - Efficient glazing - Low energy fittings, PIR control and environmental sensors
8. Renewable energy Has the energy demand for the development been calculated to determine: A. The amount of low or zero carbon technology e.g. wind, solar, hydro, photovoltaic (PV), Combined Heat and Power (CHP) that is practicable to meet the extant Building Standards CO2 emissions reduction target. B. The % of total site energy demand that will be produced from on-site renewable energy technologies. C. Meeting the remaining energy demand efficiently, e.g. non-renewable or waste powered district heating and cooling.	It is proposed that A-C will be achieved by a combination of on-site low or zero carbon technologies (LZCT) and any other appropriate measures.	The final selection of electrical and mechanical equipment along with the building services arrangement will only be finalised at detailed design stage. It is at this point that the energy demand of the powerhouse building can be calculated accurately. Zero carbon technologies which can be utilised within the building or external to the building will be adopted so that the Building Standards CO2 emissions reduction target can be met. This may also be achieved by a combination of other suitable methods. At detailed design the evaluation of total site energy demand that can be provided by zero carbon technologies will be finalised. This will meet the requirements of the following: Scottish Building Standards, Climate Change (Scotland) Act, Scottish Planning Policy, and A Low Carbon Building Standards Strategy for Scotland.

Sustainable Design Issue	Points Achieved	Response
9. Foul wastewater treatment Will the development be connected to the public sewer; if not has a sustainable waste water treatment system been designed to avoid unacceptable damage to the water environment?	Foul drainage will be collected and then treated using a suitable system prior to return to Loch Earba	The site is not located in proximity to the existing waste water network, therefore a suitable on site system will be required. The detailed design of this system will be submitted to SEPA for approval prior to the commencement of construction.
10. Flooding What measures have been taken to ensure that the development will: A. Be free from significant risk of flooding; B. Not add to the area of land that requires flood prevention measures; and C. Not affect the ability of the functional floodplain to store or move flood waters?	It is considered that A-C would be achieved.	The powerhouse will sit above the TWL of the lower reservoir and therefore be free from flooding risk. The Proposed Development will add greater attenuation to flood flows and therefore reduce risk of flooding in the downstream catchment. It should also be noted that the downstream catchment is heavily influenced by the Laggan Dam and reservoir.
11. Surface water runoff Which of the following localised strategies for ensuring that runoff from the finished development does not exceed runoff from the previously undeveloped site have been proposed and designed in accordance with the SUDS Manual C697 published by CIRIA: A. Prevention of runoff at source – through simple design measures on individual buildings (e.g.; minimising paved areas) to allow water to return to the natural drainage system as near to the source as possible and not to contribute to runoff. B. Source control of runoff rate/volume - through control of the rate/volume of runoff generated close to source e.g.: rainwater harvesting systems, green roofs and individual soakaways for buildings. C. Site control of water management – water is managed from several areas e.g.: roofs and parking areas into one large soakaway or device such as an infiltration basin. This incorporates enhancing biodiversity and amenity, and is sized to allow incorporation of further developments in future.	It is considered that A-C would be achieved.	Where possible the new tracks have been designed to minimise the number of water crossings. However, within the Proposed Development site there are a number of small burns that feed the catchment of Loch Earba. There will be an interface with some of these small natural ditches as the new access tracks are constructed. When a water crossing does occur the burns would be diverted under the track by means of a culvert. Drainage ditches would collect rainfall runoff from the proposed access track and include regular discharge points to ensure existing surface water flow paths are maintained. The Proposed Development will utilise Sustainable Drainage Systems (SuDS) to provide both attenuation and treatment of hillside runoff before it is fed back into the existing drainage system. Please refer to 12: Geology, Soils and Water of the EIA Report for further details. There would be a number of drainage channels around the powerhouse building that would channel water to Loch Earba. The extensive landscaping features around the powerhouse, which provide screening, would also provide some reduction in water flows during heavy rainfall. The green roof of the powerhouse, being grasses, will provide some rainwater attenuation before the flow is transferred to the roof drainage system which will direct the water, through a SuDS system, onwards to Loch Earba.
12. Water conservation How will the development sustainably meet the required water demands including through the use of: A. Water efficient appliances such as dual flush toilets, aerating taps, and water efficient white goods; B. Rainwater collection for reuse; C. Green roofs.	A-C achieved.	A mains feed of potable water to the powerhouse, or any other parts of the site, is not considered feasible. The site is located some distance from the existing mains water supply. Therefore a local water source would need to be provided to the powerhouse site. It is likely that this could be from either one of the following (or a combination): - Rainwater harvesting - Loch Earba - From groundwater (i.e. a borehole) - Or the least likely option by import of potable water The detailed design of the powerhouse building services will incorporate tried and tested water saving measures wherever possible, this may include items such as dual-flush WC's, aerated taps, and grey water for WC's.

Sustainable Design Issue	Points Achieved	Response
13. Waste and recycling Has suitably screened space been made available for the storage of waste and recyclables in or around each building including: A. Space for sorting and storing recyclable materials; B. Space for general waste storage; C. Space for composting organic kitchen and garden waste?	A-C achieved.	During construction enclosed areas for storage of waste would be provided on site. Material in these areas would then be sorted and removed from site as required. Furthermore during the construction phase the Principal Contractor would have contractual obligations to conform to the agreed Waste Management Plan. Finally, the Principal Contractor would be required to sign up to the Considerate Constructors Scheme to further ensure that the handling and management of waste is done in an appropriate manner. During the operation of the development waste would be sorted and organised into appropriate containers for onward recycling. It is typical that operators of a large generating station such as the Proposed Development would have a waste management plan which would include for regular removal of waste to a suitable recycling centre . At the time of writing there are a number of companies in Inverness that can undertake waste management/recycling contracts that would be appropriate for the Proposed Developments needs.
14. Site management How will development of the site be undertaken in a manner which minimises disturbance to neighbouring properties and the environment including addressing: A. Noise pollution B. Light pollution C. Air pollution D. Construction waste E. Surface water run-off F. Soil handling G. Protection of trees H. Traffic movements I. Access	There would be contractual obligations to follow the mitigation in the EIAR and also a process of revieing and monitoring performance against agreed methos statements and wate management plans. It would also be expected that The Considerate Contractors Scheme would be adopted and implemented to minimise noise, light and air pollution.	Site Surveys have been undertaken at the site of the Proposed Development and these categorise the ecology through out the site. This is detailed within the following EIAR chapters: Chapter 2: The Proposed Development, Chapter 8: Terrestrial Ecology, Chapter 9: Forestry, Chapter 12: Geology, Soils and Water, Chapter 17: Transport & Access, and Chapter 18: Noise and Vibration. The chapters listed above provide the proposed protection and mitigation measures. During the construction works site activities have the potential to impact the environment. This risk must be addressed during the planning phase and the Principal Contract would have contractual obligations placed upon them so that best practice procedures for prevention of pollution are in place and maintained. Please refer to Appendix 2.3 – Outline Construction Environmental Management Document (CEMD) for further details. In addition to this a Construction phase Waste Management Plan will set out how surplus materials will be both stored and disposed off. It is crucial that the storage of waste is undertaken in such a way that there is no risk of contamination from this part of the works. The following documents also provide information on site management: - Appendix 2.4 - Mass Balance Strategy and Borrow Pit Plan, - Appendix 12.2 – Peat Management Plan (PMP), and - Appendix 18.4 – Draft Construction Noise & Vibration Management Plan (CNVMP). At the end of the construction stage site management would still be required to monitor the performance of the permanent works. This would include the performance of operational site lighting which would be designed to minimise light pollution across the loch to wildlife receptors.

Sustainable Design Issue	Points Achieved	Response
15. Transport How does the development proposal make a positive contribution towards the improvement of the sustainable transport network by: A. Reducing car dependency; B. Promoting sustainable transport modes; C. Creating or linking to existing sustainable travel modes including the core path network, safe routes to schools and workplaces by cycle, pedestrian or public transport; D. Reducing the need to travel; demonstrated through a Transport Assessment where transport impacts are considered to be significant.	It is considered that A & D are achieved. B & C not applicable to this development	Increased traffic, including Heavy Goods Vehicles (HGVs) on the nearby A86(T) would be expected during the construction period. To minimise vehicles travelling to and from site a key part of the Proposed Developments mass balance strategy is that site won rock will be processed for dam rock fill, concrete aggregate and for the stone filled gabions. Winning as much material on site as possible and minimising the import of materials wills reduce vehicle movements on the A86(T). A Transport Assessment, which includes an outline Construction Traffic Management Plan (CTMP) and an Abnormal Loads Management Plan is covered in Chapter 17 Transport and Access of the EIAR. The Proposed Development is fully within the Ardverikie Estate and there are no public roads, or routes that lead to schools, workplaces or other public facilities within the site. There are a number of popular walking routes, see Section 16 below for more information on access to recreational routes. The public would be encouraged to continue using the established walking and cycling routes within Ardverikie Estate during the operation of the scheme and new tracks would be created around Loch Earba to replace those lost to the inundation area.
16. Pedestrians and cyclists How close is the development to existing public transport networks? What provision is made for secure cycle storage in new buildings and at associated local facilities including transport hubs?	The nearest public transport to the Proposed Development is available 6 miles from the entrance to the site in Tulloch, where there is a train station. It is understood that no other forms of public transport are available in the vicinity of the site. The Badger Divide informal Long Distance Cycle Route passes through the site boundary and will be diverted	The closest train station is located in the nearby settlement of Tulloch, where there is a service to Fort William or Glasgow. The site and associated workers camp would not be within walking distance of this nearby train station, but it would be a short journey which could be provided for site staff who would be encouraged to utilise public transport where possible. The site could be accessible by bike, from the A86(T) once operational but the elevation of the site may mean that at winter time this becomes more challenging. The area is popular for hill walking with the presence of various popular mountain summits including the three Munros of Beinn a' Chlachair, Geal Chàrn & Creag Pitridh. Two informal mountain walking/cycling routes cross the site. The Badger Divide is an off-road cycle route that uses the track to the south side of Loch Earba and the East Highland Way is a long distance walking route which follows the south side of Loch Laggan (but would cross the project's main access track at Moy).
17. Efficient use of land and existing buildings How does the design ensure that: A. Disturbance to soils is minimised for example through minimising required earthworks. B. Where appropriate demolition materials will be re-used on-site, rather than transported off-site as waste materials. C. Existing redundant and derelict buildings are sympathetically converted and/or restored where appropriate with a bat survey and mitigation plan carried out if necessary	A and B are achieved. It is considered that C is not applicable.	The size of the building has been dictated by the expected geology and the likely electrical and mechanical equipment that will be contained within the powerhouse. Expected construction methodology (and operational scenarios) define the required access and construction areas. Where possible, land occupied during the construction phase would be located within the inundation areas - this much reduces the impact on habitats as these inundation areas form part of the permanent works. The powerhouse will be screened with landscape earthworks and planting which will provide habitat along with visual softening. As discussed above, a key commitment is that all rock excavated as part of the Proposed Development would be reused on site as follows: to form the dams at either end of Loch Earba; to provide concrete aggregate; to provide rock for the gabion cladding and retaining walls.

Sustainable Design Issue	Points Achieved	Response
18. Design for flexibility Has flexibility been designed into all units to provide adaptability to changing needs? A. Has design to Lifetime Homes Standards been adopted? B. Has infrastructure been installed to allow for home working, e.g. telephone / WiFi for all developments? C. Does building structure and position allow for future extension? D. Have construction techniques been used which enable internal walls to be easily removed or repositioned to create new spaces?	A & B are only required for residential developments. C & D achieved.	It is considered a possibility that some variation or change to the building would be required within it's lifetime. The current design of the powerhouse building has been developed to meet all the space requirements including area for future expansion. The building by its nature, with large laydown between shafts, offers space to provide for future adaptations.
19. Private amenity space Is there provision for private amenity space e.g.: private garden, balcony, roof terrace or patio, or a communal garden/courtyard which is easily accessible for occupants of designated properties, and does the size and type of area provided allow for: A. All occupants to sit outside at once; B. Safe access by those using wheelchairs or mobility aids; C. Growing fruit or vegetables; D. Composting of kitchen and garden waste; E. Drying washing	It is considered that this is Not Applicable to this development	It would be important to restrict public access to the powerhouse. This could be achieved by a series of measures such as discrete fencing and appropriate signage.
20. Accessibility of community facilities How far in miles is the development from the following facilities? A. Healthy facilities such as a surgery or pharmacy; B. Education facilities such as a crèche, primary and secondary schools; C. Shop; D. Bank, Post Office or cash machine; K. E. Leisure facilities such as a community centre or indoor sports facility.	It is considered that this is Not Applicable to this development	

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