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BRACKNELL FOREST COUNCIL

Horseshoe Lake Country Park

FEASIBILITY STUDY
PROJECT REFERENCE: 5168554

OCTOBER 2018

Bracknell Forest Council

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01	Client Issue	BHJ	CP	SK	MQ	31/10/18
02	Client Issue	AY	CP	SK	MQ	06/11/18
03	Client Issue	AY	CP	SK	MQ	07/11/18

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INTRODUCTION & SITE

Introduction Feasibility Study

This feasibility report has been prepared for Bracknell Forest Council to outline a proposal for enhancing the recreational facilities at Horseshoe Lake near Sandhurst, removing the existing building and creating a new pavilion on the new site.

Site Address

Horseshoe Lake Activity Centre, Mill Lane, Sandhurst GU47 8JW

Background & Scope

Atkins were commissioned to provide a high-level feasibility report in July 2018 for Bracknell Forest Council, following the completion of an initial feasibility study by Ridge.

Report Objectives

This report will look to achieve the following;

- Clarify the brief, qualify and quantify the client's aspirations and spatial requirements through the production of draft accommodation area schedules.
- Investigate and evaluate the constraints and the potential of the site.
- Propose high level master-plan for re-development of the site.
- Identify potential development risks.
- Develop high-level costing for the layouts with associated site works.
- Provide a commentary and evaluation of the proposed design process, concluding with a single preferred option.

Project Team

- Client representative: Kamay Toor
- Project Manager: Vicky Malinova
- Quantity Surveyor: GLEEDS
- Lead Architect: Simon Kneafsey

Statutory Requirements

If the scheme were to progress beyond feasibility, it would have to comply with the CDM Regulations 2015, Building Control Regulations and will require a pre-planning and full planning application. Any planning submission should consider the site's designations Special Landscape Importance and Suitable Alternative National Green space (SANG). Refer to Site Considerations section.

Current Use

Horseshoe Lake Country Park is a 50-acre site which lies within the Blackwater Valley Area of Special Landscape Importance located approximately half a mile to the west of Sandhurst.

Horseshoe Lake is set in a series of former flooded gravel pits which have various purposes and facilities across the sites, for example nature reserves, power water sports and fishing. There are two public rights of way on the site which form part of the Blackwater Valley and Three Castles Walk network.

Current access to the site is via Mill Lane off Reading Road to the south, or Lower Sandhurst Road to the north. There is an access road on site, connecting a hard-standing parking area (for approximately 18 vehicles) and extending north to the centre of the site. There are high voltage power-lines running east to west overhead. Horseshoe Lake water-sports and activity centre is located on the site at present with parking for further vehicles, a water-sports yard, storage containers, mobile home and small existing visitors centre. To the west of the visitors centre is water front access and a pontoon extending into the lake.

The existing visitors centre is approximately 150 sqm comprising a single-storey timber clad building with pitched roof, providing a reception, shop and changing room for public use, as well as a separate office and kitchenette.

Bracknell Forest Council website describes the site as "an attractive setting in the Blackwater Valley and a popular venue for those who enjoy sailing, windsurfing, canoeing, birdwatching and walking. There is a bridleway to the northern site boundary and a clear hardcore path circumnavigating the lake, providing very pleasant views of the site and surrounding countryside. The site is home to a variety of wildlife and protected species."

The brief sets out the purpose and scope of the project along with the main requirements and outcomes for the building accommodation and site. This project brief has been developed with the client and stakeholders during the course of this study.

Proposed Use

The key proposals for the site outlined in the Horseshoe Lake Country Park Business Plan are as follows:

- Introduce the proposed new services, buildings and facilities sensitively to the existing provision;
- Improve the visual appeal of the site for visitors on arrival;
- Maximise opportunity for visitor views over the lake, to enhance the recreational experience;
- Enable convenient vehicle access and high-capacity parking for visitors

The facilities set out below are to be provided as part of the redevelopment of the site.

Visitors Centre Café

Situated close to the lake with uninterrupted views; this is aimed at being a key feature of the country park. The cafe area shall be open plan and flexible to accommodate other uses including hosting educational and social events.

Reception and Water-sports Provider

The reception will provide a service counter for the water-sports provider and their customers with an associated administration area and direct access to staff changing facilities.

Rangers and Staff Office

Office accommodation for up 12 staff fronted with a reception desk and small meeting room. In this feasibility we have opted to combine office and reception accommodation for Rangers and Water-sports provider in order to maximise open spaces.

Ancillary Accommodation

Internally accessed dry WCs to be provided as well as externally accessed wet WCs and showers. Separate WC and shower facilitates are provided for staff.

External Areas

- Client requirement to provide increased numbers of parking to allow for future expansion, including ability for vehicle charging
- A large outdoor children's play area for children aged 3-14 to offer a USP. To be situated close to the café facility;
- Enclosed rangers compound to accommodate additional equipment currently stored off-site;
- Enclosed water sports compound for existing water-sports provider;
- A picnic and BBQ area (possibly to be used for camping also);
- Events area suitable for large marquee with lake views.

In short this feasibility report aims to enhance the existing uses of the site and maximise opportunities for other activities.

Sustainability

The design of the new pavilion should minimise the adverse environmental effect of pollutants, reduce carbon emissions and waste and encourage biodiversity. The following items are being considered and will be discussed in further detail in later sections of this report:

- Renewable systems to provide hot water and heating to the visitor's centre; Water or ground source Heat Pumps or Biomass Boiler for example. Water and Ground Source Heat Pumps utilise the temperature of the water/ground as an exchange medium as these remain fairly constant. A biomass boiler would require associated green waste storage and treatment preparation areas.
- Green Extensive Roof, or Biodiverse Roof to provide carbon management and water stewardship; The aim of a Biodiverse roof is to replicate as far as is practical the ecological requirements for the local area.
- Renewable, low carbon building materials; such as timber products including Cross Laminated Timber (CLT), Glulam timber frame, and/or Structural Insulated Panels (SIPs).

To make the most of resources on site other sustainable measures, such as rainwater harvesting systems for flushing the toilets, could be considered at the next design stage.

Site Background

Horseshoe Lake is approximately 22 acres and is named for its horseshoe-shaped island. It is located about half a mile to the west of Sandhurst in the Blackwater Valley.

The Blackwater Valley stretches from Rowhill on the Hampshire and Surrey border, to Swallowfield in Berkshire. It has a varied landscape rich in wildlife.

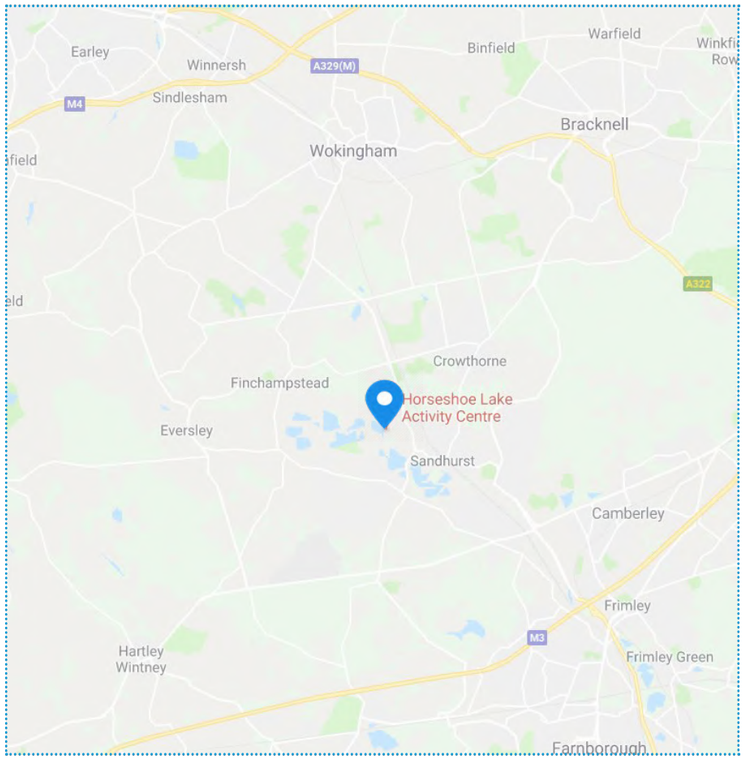
Horseshoe Lake originated as part of an extensive network of working gravel pits, which have since been flooded. The site is now a venue for dinghy sailing, windsurfing, canoeing, birdwatching and walking. A bridleway runs along the northern boundary and a clear path circumnavigates the lake.

The site is home to a wide variety of birds including waterfowl on the lake particularly during the winter and house martins, swallows and swifts during the summer. The barn owl, a protected species under the Wildlife and Countryside Act 1981 and also listed on the local Biodiversity Action Plan, is also known to inhabit the site.

Site Aims and Objectives

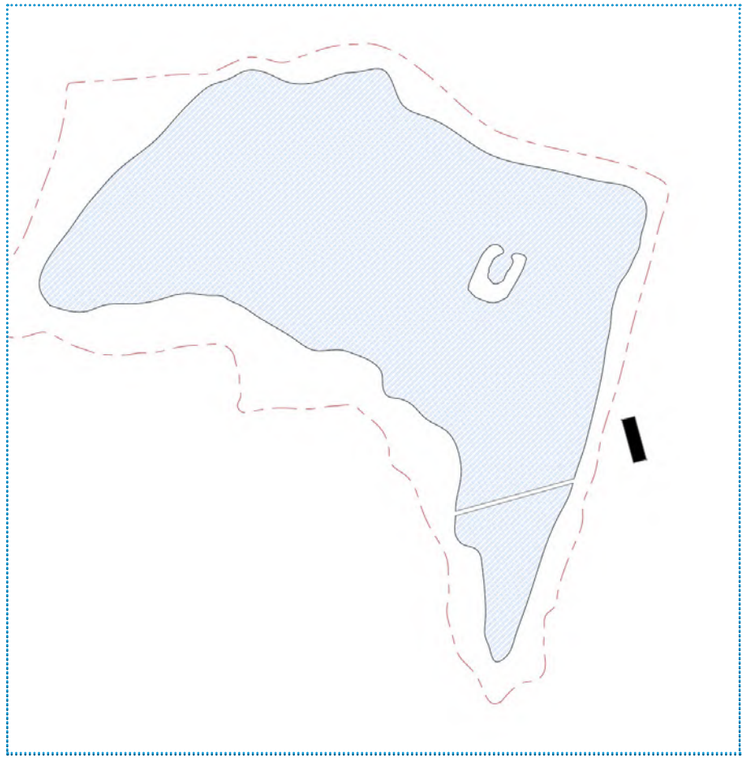
The previous feasibility study, produced by Ridge, documented Bracknell Forest Council's aims and visions as below;

"Fifty acres of Country Park in a beautiful lakeside setting with a café and seating for one hundred people. Water-sports activities combined with camping, BBQ areas and glorious walks. Featuring a bespoke play area for children aged three to fourteen with a perfect place to explore the Blackwater Valley and three castles walk. A truly fantastic venue to showcase the wonder of the Forest of Bracknell."



Bracknell Map

Extended Cycle/Walk Route Map



Horseshoe Lake Map

Lakeside Use and Access

There is currently a small stretch of sand along the water front. It is proposed that this is enhanced as part of the redevelopment of the site. At present there is no general access to the water; there is an existing pontoon, however, access is controlled.

Existing Accommodation

There is currently a small building on the site which is used for the water-sports operations. The current water sport providers have a one year extension to September 2019. It has been noted that it would be beneficial to continue trading during the construction process if possible.

Pylon/ Overhead High Voltage Power Cables

Overhead high voltage power cables run across the site supported on a pylon located towards the east boundary.

Car parking can be successfully accommodated below high voltage lines, however careful consideration will need to be given to the location of the water-sports equipment storage (sailing masts for example) and construction works adjacent to reduce the risk of electrocution.

In terms of clearance heights, this can be calculated when the height and voltage has been confirmed as well as maximum height of construction vehicles that will be required.

Some examples of things to be considered to manage risks include: the size and reach of any machinery or equipment to be used near the overhead line; the safe clearance distance needed between the wires and the machinery or equipment and any structures being erected; site conditions, e.g. undulating terrain may affect stability of plant etc. and defining routes of passageways using fences and erect gateway.

Footpaths

There are two public rights of way that cross the site which form part of the large Blackwater Valley and Three Castles Walk networks. The River Blackwater also runs close to the site which is managed by the Blackwater Valley Countryside Trust on behalf of the local authorities that border the Valley (Hampshire County Council, Surrey County Council and Bracknell Forest Borough Council).

Site Compound

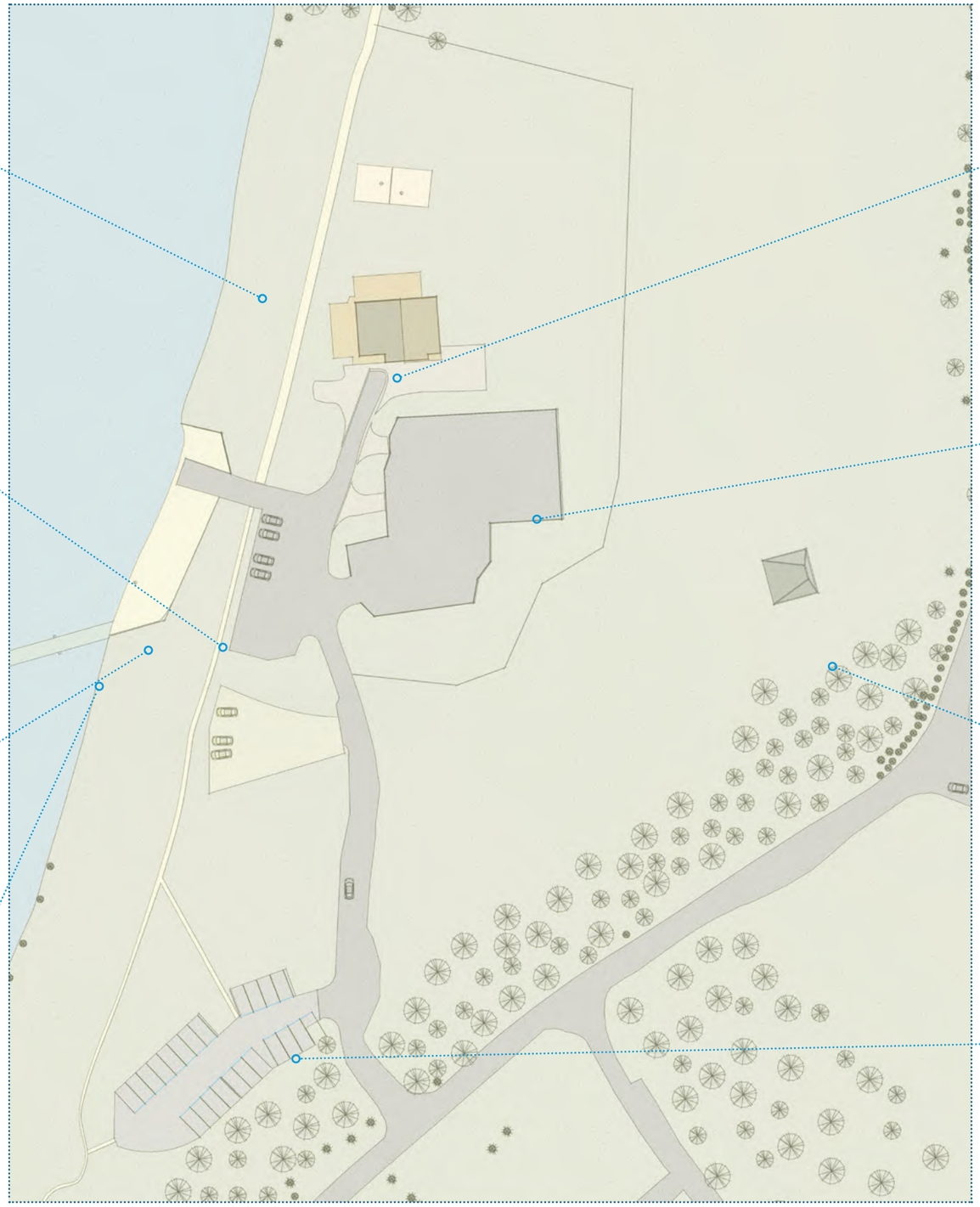
There is currently a large amount of storage on site number of store compounds on site; this should be minimised in redevelopment proposals, particularly in line with the planned scaling down of water-sports provision, in order to ensure the site maximises natural appeal and retains only income generating services.

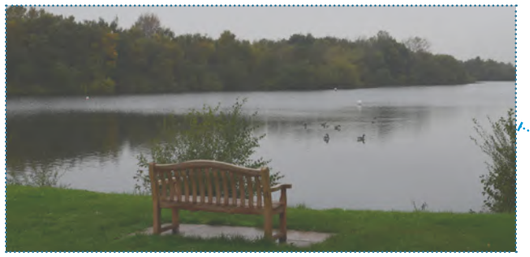
Pre-fabricated Construction

Pre-fabricated construction methods have been investigated in this feasibility report. 'Prefabrication' refers to assemblies that are manufactured off-site, under factory conditions and then transported to construction sites for incorporation into buildings. By using this type of construction less site interference is incurred, for example, to ongoing site operations (water-sports provider) and less construction activities take place in the vicinity of the overhead power lines. In addition off-site construction offers benefits such as reduced on site construction time and therefore more programme certainty as the process is unaffected by weather conditions. Also, the construction produces less waste due to controlled manufacturing conditions.

Existing Site Feasibility Study

Existing Site Plan





Lake Views

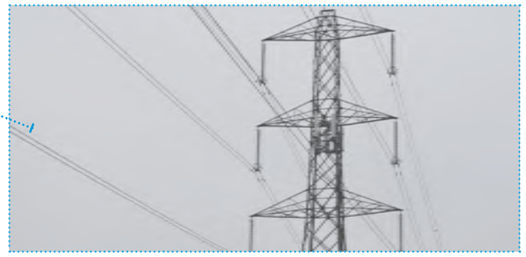
Footpath Through the Site

Sand Bank Along Water Front

Existing Pontoon

Existing Accommodation

Storage Compound



Pylon and Overhead Power Cables

South West Parking

Planning Consent

For the purposes of this feasibility report we have not undertaken any planning consultation. Design proposals have sympathetically considered the surrounding environment. It is recommended that pre-application engagement with the Local Authorities and relevant stakeholders is undertaken at the next stage.

Drainage & Sewerage

We understand the site is not connected to a municipal sewer and foul drainage for the existing visitors centre and is provided by below ground water treatment plant. Building Control Approval and local water authority approval will be required for any proposed below-ground drainage solutions.

Provision should be considered of a sustainable drainage system (SuDs) incorporating petrol/oil inceptors for the proposed parking and compound areas discharging to the existing water course.

At the next stages it would be prudent to consider further below-ground drainage investigations to assess the capacity of the existing water treatment plant and the potential for linking to the municipal connections.

A CCTV survey is in progress. Results are outstanding and therefore we have assumed the existing plant will be considered a suitably sized sewage treatment to accommodate the additional visitors centre facilities.

Ground Conditions

Ground investigation surveys are currently being undertaken. The likely soil strata is alluvial and sands.

Further detailed site investigations are recommended at the next stage to aid appropriate design of footings, landscaping and drainage.

Archaeology and Contaminated Land

Site investigations with regards to archaeology and contaminated land have not been undertaken as part of this feasibility study. We understand that the site is located on a previous gravel pit with no evidence of former industrial activity.

Special Landscape Importance

The site lies within the Blackwater Valley Area of Special Landscape Importance, which is a designation within the Bracknell Forest Borough Local Plan which aims to protect the special landscape character of the area. The site supports a variety of wildlife and protected species. At the next stage the Bracknell Forest Council Biodiversity Action Plan 2012-2017 will need to be reviewed in detail. The site has also been designated a Suitable Alternative National Green space (SANG) with local plan policies recognising the area as a landscape feature and recreational resource. We recommend undertaking an environmental impact assessment at the next stage.

Highways

We have not carried out a highways assessment or consulted the highways authority regarding the anticipated increased vehicular movements to the site via Mill Lane. It is anticipated that alterations will be required to accommodate the increased traffic movement and appropriate directional signage, for example. We recommend that the next stage investigations include proceeding with a highway agency pre-application consultation to resolve any potential issues early in the planning process.

Civil Engineering - Drainage

The development requires surface water drainage from both the new building and car parking areas. It is likely that the building may be able to discharge directly into the lake, though the option for rainwater collection for grey water use could be considered.

Surface water drainage from the car park areas is likely to be by means of infiltration drainage, though this will depend on both the depth of alluvial material overlying the sands and the depth to the existing ground water. Attenuation of the water being discharged will need to be considered. Current considerations would be either:

- Stone filled trenches at the perimeter of the car park, or
- Attenuation within the subsurface materials along the aisles of the parking areas.

Foul water drainage is required to both staff and public facilities. It is not considered likely that the site is near to a suitable public sewer, provision therefore should be made for either the following:

- Septic tank storage, this will require maintenance to empty the tank on a frequent basis.
- On site, effluent treatment. Similar to a septic tank, but incorporates bio-digestors to reduce solid waste and to treat it within the confines of the tank. Water is discharged from the tank via infiltration drainage. To progress this solution we will need further discussion with the Environment Agency to determine their approval due to the proximity of the lake.

Electricity demand and Utilities

A load assessment of the electrical power requirements of the facility is based on a combination of BSRIA Rule Of Thumb and an estimate of specialist equipment likely to be installed, namely:

- Point of use water heaters serving hot water outlets in WC's and showers
- Café catering equipment (e.g coffee machine)
- Heat pump for space heating
- External lighting

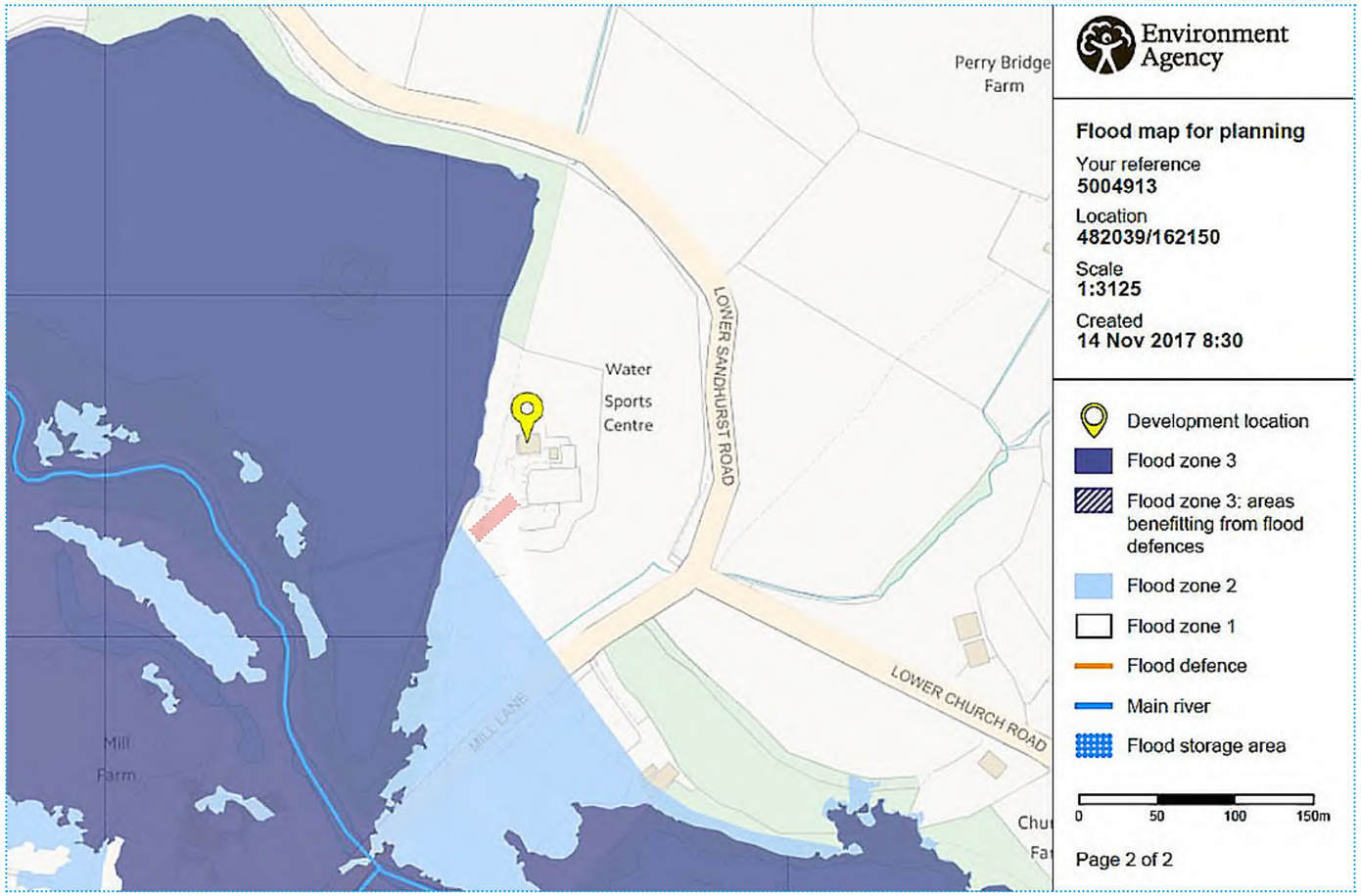
An electrical demand of 40.12kW is suggested for this facility. An enquiry is currently out for the Authorised Supply Capacity of electricity to this site.

The current site already benefits from a private water supply, and an assessment would be required to determine if this supply is viable for reuse within the proposed development.

Depending on the outcome of a more in depth energy review at the next design stage it is intended that a renewable source be utilised to provide hot water and heating to the proposed visitors centre. If this is not deemed viable the following would need to be considered:

Space heating would be provided using air conditioning cassette units, coupled to externally mounted heat pumps. A demand of 30kW is estimated for space heating of the facility.

Owing to the remote location of the site, it is envisaged that a gas supply would not be viable. Electricity would be proposed to meet all heating demands in the place of gas-fired appliances. An electricity supply of 45-50kVA would be required to the site.



Environmental Agency flood risk map - November 2017.

Flood Risk Assessment

The existing visitors centre is located in an Environmental Agency Flood Zone 1, part of the existing south west parking is in Flood Zone 2. It should be noted that the Environment Agency Flood Maps do not account for Climate change and current guidance may require a 25% increase in peak river flows to be incorporated in to the design (note: climate change guidance for planning is due to be updated in November). We would recommend that discussions with the local planning authority are carried out to determine the requirement for Flood Risk Assessment to be prepared in conjunction with any planning applications that may be progressed.

We recommend commissioning a flood risk assessment at the next design stage, considering fluvial (river), surface water and groundwater sources of flooding, particularly as the site is next to a water table and anecdotally the site can become wet during winter. The Flood Risk Assessment could be undertaken in two phases: scoping and detailed.

The positioning of the new proposed build can be seen to be remaining in Flood Zone 1. We do not currently know how water levels in the lake are controlled. Whilst it would appear that the development is not at risk of flood events, it would be prudent to raise the building such that the underside of the ground floor is above any potential flooding.

Saturated ground towards south west edge of existing car park.

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MASTERPLAN AND LANDSCAPE

Design Intent

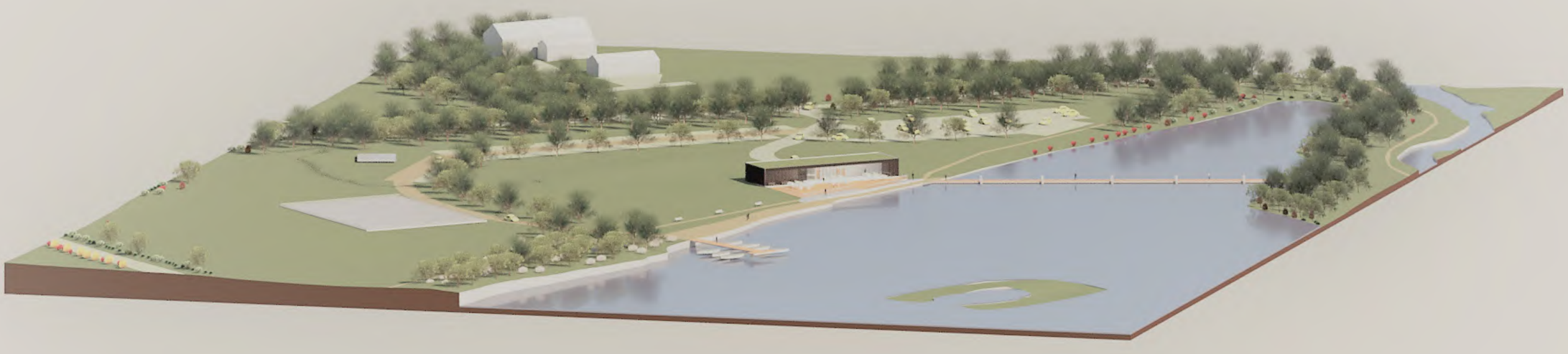
Horseshoe Lake is currently under-utilised. Redeveloping the site could transform the usage by reviving the services currently offered and introducing new facilities on site.

Key proposals for the scheme include:

- Relocating the visitor centre next to the water front enhancing the connection to and views out over the lake.
- Rerouteing the existing pedestrian routes to the water front, blending the path and raised veranda. Creating a feature to outside seating, forming an integrated extension of the existing walk/cycle path route.
- Utilising site lines: orientating accommodation to address lake and have visual impact on arrival
- Integrating use of Energy/Natural Resources on site
- Expanding the car park and relocating over-flow parking to the west of the site, away from the lake. Proposal of 63 'Hard' Car-parking spaces extending the area of the existing South West Car park. Further proposal of an additional 76 'Soft' over flow parking spaces to the South East of the site.
- Creating a secondary access route separated from the lake and pedestrians; connecting the site entrance to the new storage compound, new jetty and events marquee area
- Using planting and soil bunds, separate the services and vehicle areas from visitor activity zones

The precedent images on pages 22 and 23 indicate the over arching approach taken with the landscape design, which has been to utilise a soft and natural (yet robust) material palette to be in-keeping with the natural surroundings.

The proximity of the proposed building to the overhead power lines has been considered throughout the design process. Currently a minimum distance of approximately 13m is shown between the building and centreline of the cables overhead.

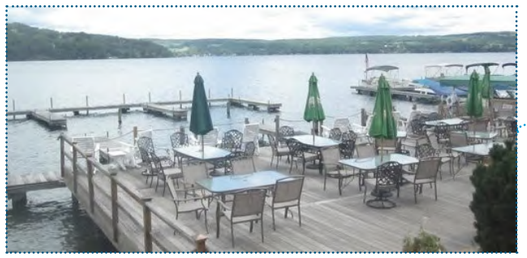


Proposed Build within site context showing landscape screening and building relationship to lake.

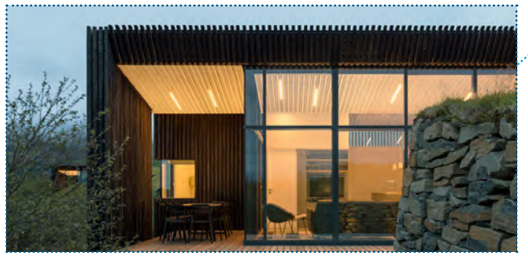
Proposed Site Organisation Feasibility Study

Man-made beach extension

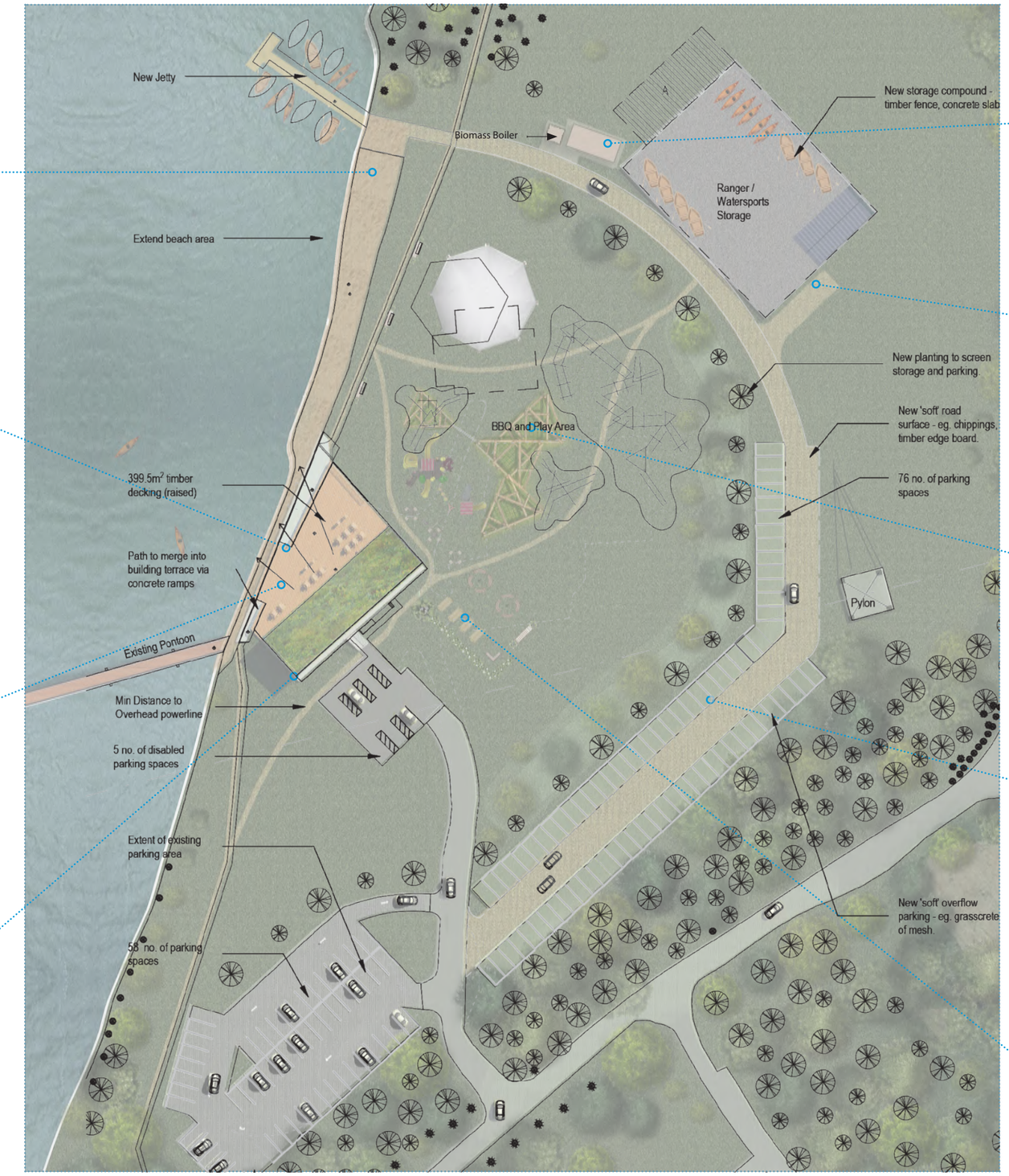
Blended Landscape



Outdoor seating overlooking water



Vertical timber cladding



Outdoor showers to match timber cladding

Fencing to match timber cladding

Nature inspired timber play equipment

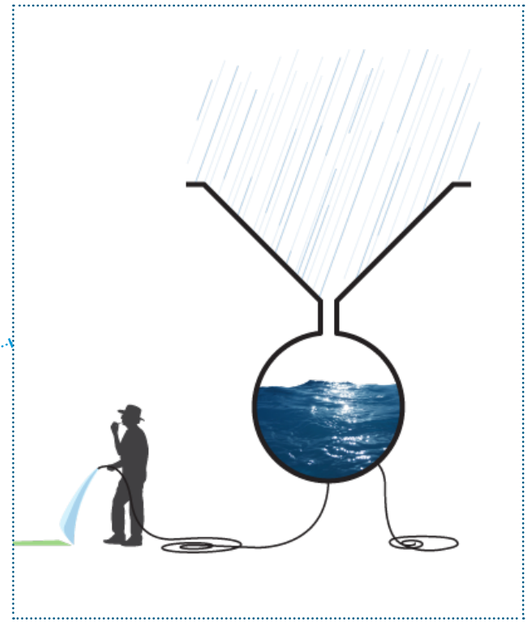
'Soft' overflow parking

Picnic benches and BBQ area

Proposed Site Environmental Design Feasibility Study

Biodiverse Roof
Coed y Brenin Visitor Centre
-Architype

Glulam Timber Frame
StructureCraft



Rainwater Harvesting for toilets

Water-source heat pump

Pk Arkitektar Cottage

House NM - Studio Ecoarch

Mexico High School Campus - Taller Veinticuatro

Farnsworth House - Ludwig Mies van der Rohe

Qunli Stormwater Wetland Park

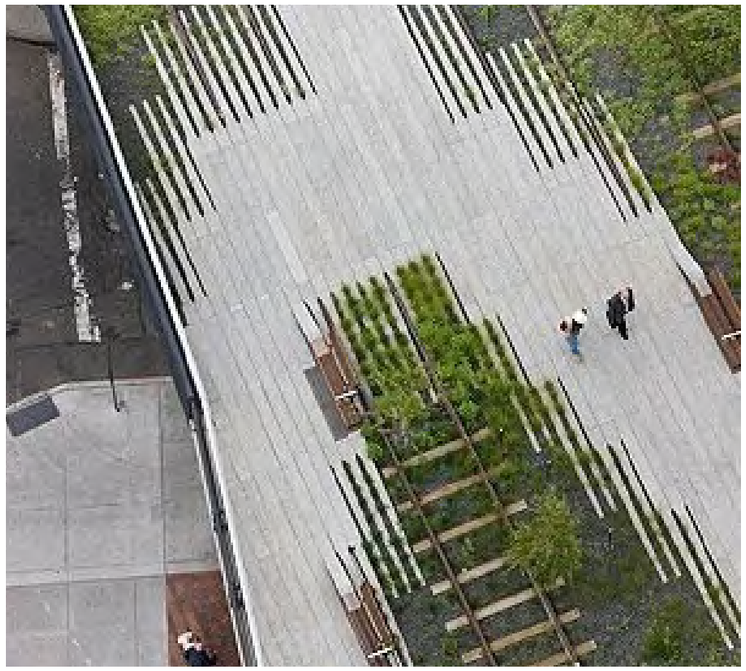
Cotswold Water Park

House NM - Studio Ecoarch

Cotswold Water Park

Naust V Koreo Kolab Architects

Hyde and Hyde - Cliff House



The High Line - Diller Scofidio + Renfro

Nature Inspired Playgrounds

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BUILDING DESIGN APPRAISAL

Design Intent

The new visitors centre at Horseshoe Lake will be located between lake views to the front and a backdrop of trees and soft landscape. The building design has prioritised a sympathetic design approach to building form and materiality, aligning itself to the surrounding context.

The proposed building form has been simplified to better suit the natural landscape with a linear footprint and simple flat roof. The horizontal planes of the water line, raised veranda and flat roof are juxtaposed with the introduction of vertical timber cladding.

The general arrangement is divided between front and back of house, enabling the front of the pavilion to open on to a large veranda, maximising visitor seating with views over the lake.

The veranda and building use primarily timber elements, creating a natural aesthetic sympathetic to the surrounding trees.

Spatial Arrangement

The main drivers behind the building layout have been to maximise open plan area, promoting flexibility of internal spaces and creating a sense of openness and transparency.

The following list identifies some of the key moves made to generate the proposed arrangement:

- In the previous design by Ridge the cafe area had been disproportionally reduced in size. Combining Kitchen and Cafe areas accommodates functional flexibility and more area for internal seating. Catering proposals will need to be rationalised to suit, for example focusing on coffee shop style delivery.
- Detaching the meeting room from the office allowing access from the public area promotes shared use.
- Locating ancillary spaces at the rear of the plan allows the front to be kept more open, maintaining visual links through cafe, office and meeting accommodation. A large reception desk, catering for staff and water-sports provider, divides the office accommodation from the remaining open area.
- Separate wet facilities, and access to, from main internal areas; differentiating from cafe/events visitors from water-sports participants.

Materiality

The natural material palette proposes timber as the primary material; particularly externally. The building facade and raised veranda will be timber clad, blending with concrete elements connecting to the landscape and building interior. Internally timber walls, ceiling, furniture and structure will be exposed timber, with a contrasting concrete floor.

Glazing will be maximised to better connect the building to the surrounding landscape. Glazed corners and instances in the facade allow views through the building from the outside.

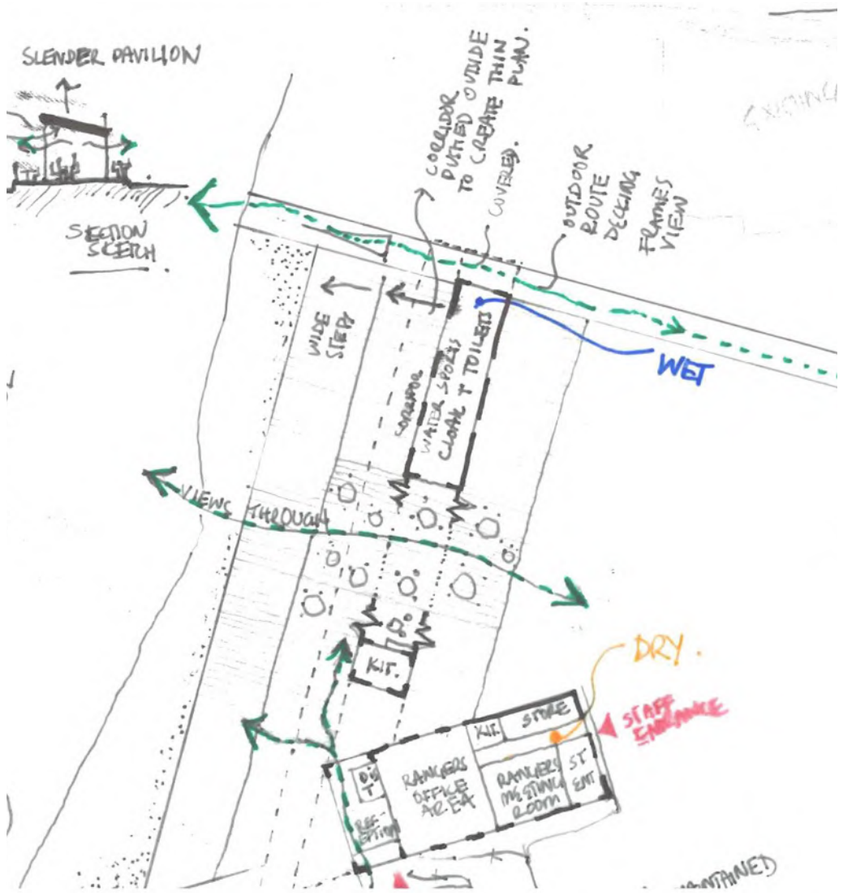
The natural material palette utilises robust materials which can be easily replaced and maintained. The linear form and traditional structure would allow for future expansion if required.

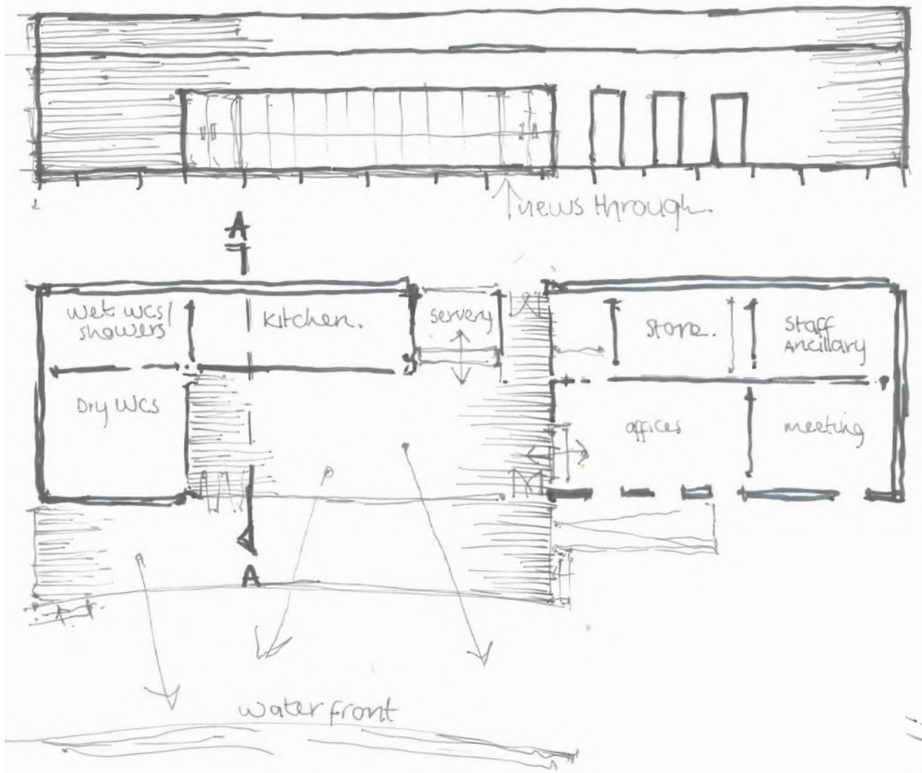
Internally services, like the structure, will be exposed for example lighting and electrical conduits and finished in galvanised steel.

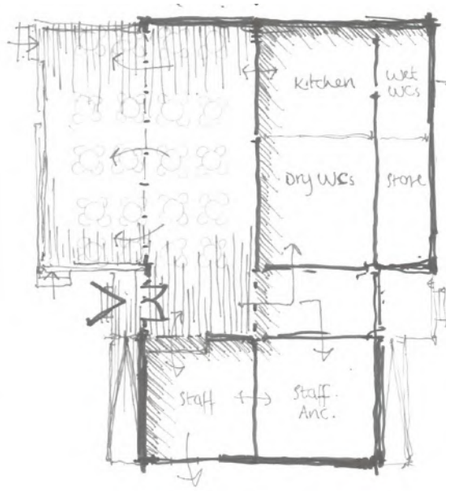
The meeting room will have a glazed partition, maintaining views and openness across the length of the building and visually linking the meeting room with the cafe for larger events.

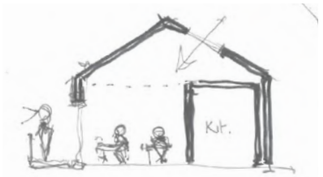
The visuals included on pages 32 and 33 show differing options for the timber cladding.

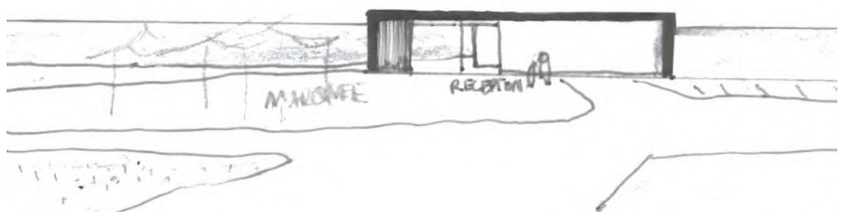
Farnsworth House - Ludwig Mies van der Rohe

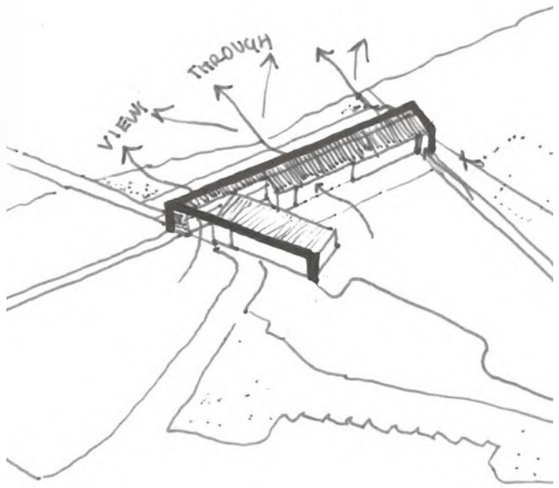












Design process and iterations exploring building arrangement/orientation and lake views.

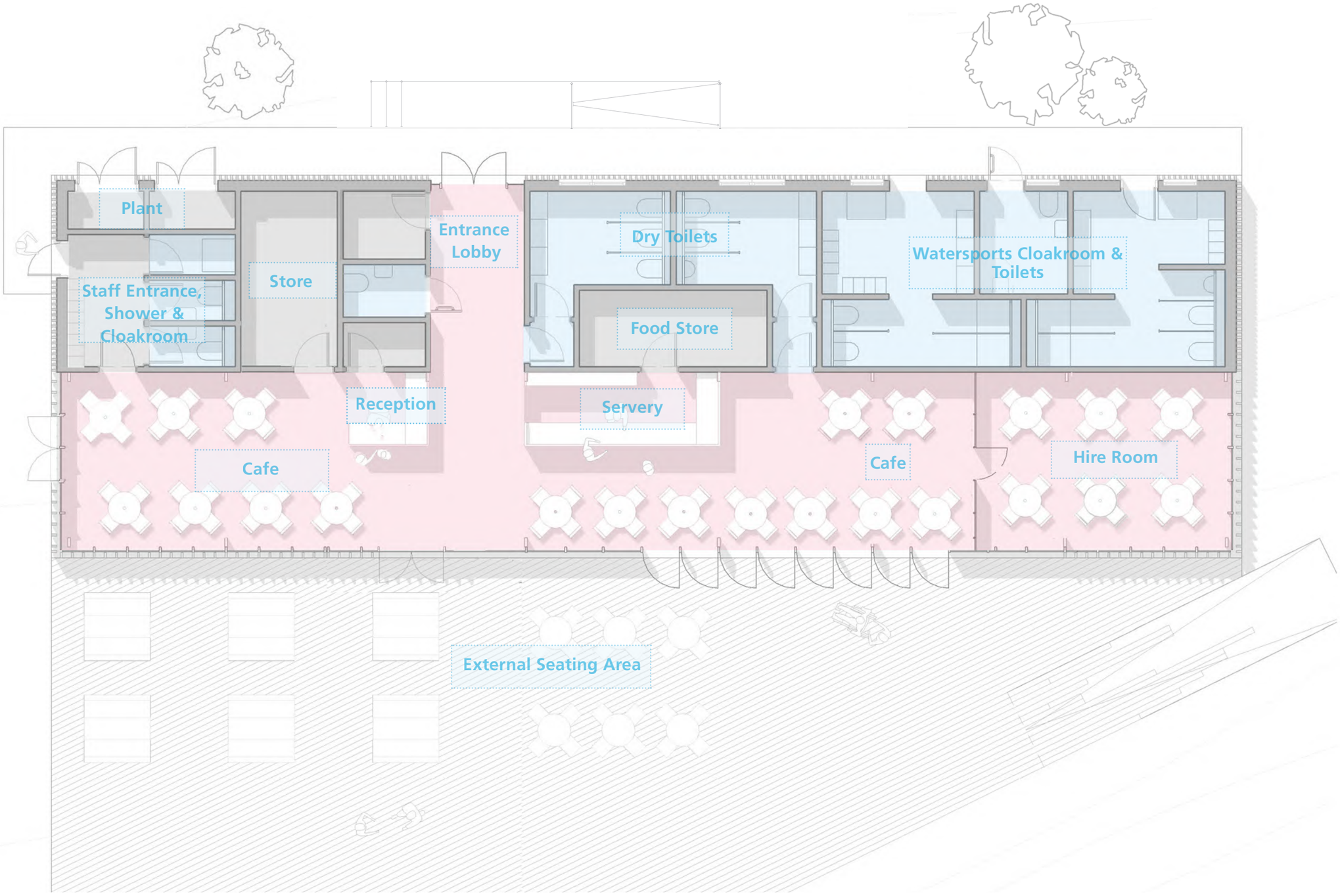
Accommodation Schedule Feasibility Study

The accommodation schedule below compares the current proposed option to 2no superseded Ridge options. Some rooms have been omitted or combined since the initial proposal (Ridge Opt 1) to maximise efficiencies in accommodation and reduce the area overall. There has been a slight increase in area since Ridge's Option 3 was completed, which facilitates a more cohesive and open arrangement;

- Uplifting the overall sanitary area to allow wet and dry WCs/showers to be accessed separately
- Combining the kitchen and cafe areas to increase flexibility of the space
- Dividing accommodation in to front of house and back of house to maximise the openness inside the pavilion and views out

Refer to Appendix B for scale plan and room names and areas.

Room Name	Ridge Opt 3 (Post-VE) m2	Ridge Opt 1 (Pre-VE) m2	Atkins Proposal m2	Atkins Comments
Café and Servery	60	97	119	Combine areas - change catering provision to coffee shop style only - prep/serving area to be located within cafe area, food selection limited to sandwiches, soup etc. Additional area resulted from the removal of rangers office.
Kitchen	40	49		
Food Store	0	0	11	Store added due to merging of food prep and café areas
Community	0	95	0	Omitted. Café and meeting room to be multi-functional
Rangers Office	50	63	0	Reception desk used as separation from café space. Watersports office combined
Rangers Meeting Room	23	34	20	Utilise as multi-functional space for staff and events. Glazed partitions to identify with 'open'/public areas
Rangers Kitchenette	4	4	0	Area incorporated in to rangers office
Watersports Office	8	8	0	Area incorporated in to rangers office
Watersports Store	0	0	3	Secure store added due to merging of offices
Store	15	15	14	-
Staff entrance, shower and cloakroom	20	70	14	1no shower, 2no WCs and cloakroom
Disabled Toilet	4	4	3	-
Dry Toilets	45	38	25	Area uplift needed - Split provision - wet/dry; wet accessed externally. Dry used by café
Watersports Cloakroom and Toilets		51	50	
2 Bedroom Flat	0	61	0	Omitted
Cleaners Store	0	0	4	
Circulation Approx	10	55	23	Integrate with open (café) space.
Reception	10	52	24	Integrate with open (café) space.
Stair/lift	0	26	0	N/A
Total	289	722	310	
Decking	80	88	270*	*Revised figure for cost plan - site plan showing additional area


Plant
Staff Entrance, Shower & Cloakroom
Store
Entrance Lobby
Dry Toilets
Food Store
Watersports Cloakroom & Toilets
Reception
Servery
Cafe
Cafe
Hire Room
External Seating Area

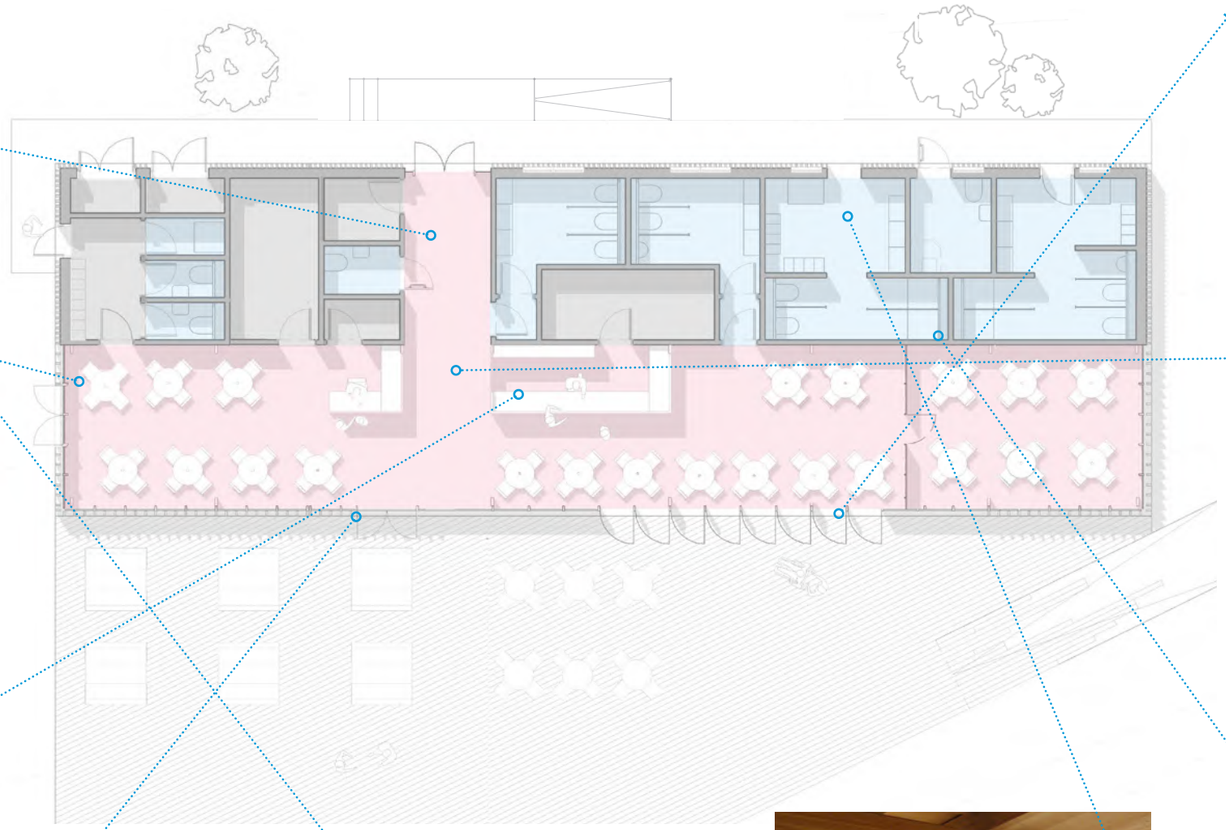
Internal Precedent Studies Feasibility Study

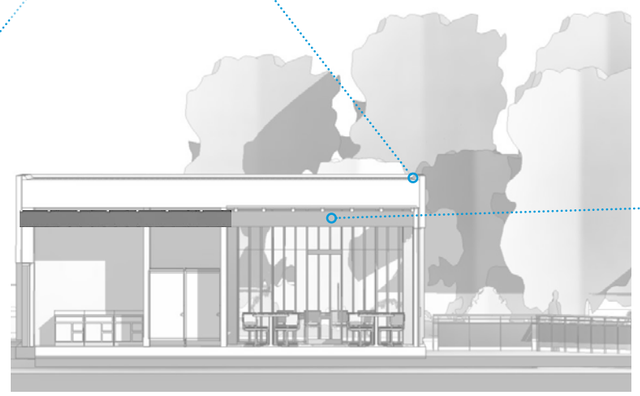
Exposed services, galvanised steel finishes
MOSSpods

Hidden green roof
Green Roof Edge Detail - Arkitektar

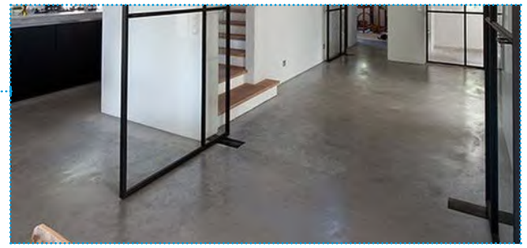
Open food prep/servicing area
Jury Cafe - Biasol Design Studio

Timber screening
Hyde and Hyde - Cliff House





Glazed wall with large openings



Robust concrete floor

Exposed timber finishes

Exposed timber Frame
Wood Innovation Design Centre - Michael Green Architecture

Whiterock Finish to wet/ hygienic areas

Internal Visual - Cafe Feasibility Study

External Visual - Lake Views Feasibility Study

External Visual - Main Facade Feasibility Study

MEP Design - Thermal Energy Requirements

The proposed visitor centre at Horseshoe Lake will require heating for both the interior space and the showers. As a rule, low carbon heat sources perform better when the heat loads are of a steady nature, rather than loads that are very variable in nature over a short duration.

The space heat load can be kept at a more continuous output via the use of thermal mass within the building and potentially through the incorporation of underfloor heating in a high thermal mass floor. Additionally, thermal buffer storage is key to enabling fluctuating loads to be met by a steady output heat supply. This is especially relevant to providing sufficient hot water to service the showers, which may require the majority of showers to be running at the same time but where this will happen relatively occasionally. Understanding the nature and profiles of the opening hours and typical shower requirements will be key to developing a suitable and cost-effective heating system.

MEP Design - Thermal Capacity

An early estimation of space heating capacity has been set at 30kW

The shower load is currently unknown but could be considerably higher than the space heating load. For example, a typical high performance electric shower requires around 9-10kW of energy. Some recreational showers provide higher flow rates than this and may require in the region of 12-15kW of thermal energy depending on how cold the incoming water temperature is. For five simultaneous showers this represents potentially 75kW of thermal energy. However as hot water can be stored in tanks the energy can be 'charged up' over a period that is longer than the showers operate for, and therefore reduce the thermal heating capacity required. Our outline estimate is that around 20kW of heat capacity would be required for showers, combined with appropriate hot water storage.

As for the showers, it may be possible to also store heat for the heating system during periods of lower demand. For example, to continue to run the low carbon heat source overnight and store surplus heat in a thermal store and also to maintain a minimum temperature in the building even when not occupied. If this approach were to be taken then the building would benefit from adequate levels of insulation including the provision of thermal curtains, which could be closed at night, for the extensive glazed frontage.

When storage and diversification of load is considered we anticipate that a peak diversified thermal load in the region of 40-50kW could be expected.

MEP Design - Heating Options

There are several low carbon heating options that could be incorporated into the development, a high-level summary is provided below:

Biomass

A biomass boiler could provide the base load of the heating system, fuelled by either wood chip or pellet. For the size of system indicated previously, a pellet boiler would likely be most suitable. The storage of fuel, fuel density and consistency and fuel feed system are generally preferred for smaller boiler capacities. The boiler would produce airborne emissions, and although this shouldn't be an issue in a large open area, must still be considered. Availability of fuel, storage and deliveries needs to also be fully considered. Biomass boilers of this size are supported by the Government under the Renewable Heat Incentive (RHI) which provides a revenue stream based on metered heat consumption.

Atkins understand that there have also been considerations of using non-wood derived biomass grown on site as a fuel source. However, we consider that this would impose a considerable ongoing commitment to the operations of the site as well as tying in the heating system to a very specific fuel stream. Additionally, as a general rule biomass boilers operate better with fuel of a fairly consistent nature, with respect to moisture content, energy content and physical properties, and large variations in fuel characteristics invariably leads to maintenance issues and poor boiler operation. We therefore would suggest that, based on the limited information available, on site grown fuel is not a preferred option for this scale of biomass plant.

Heat Pumps

Heat pumps operate by moving heat from one area to another, using a compression-evaporation cycle that circulates a working fluid around a circuit. When the fluid is compressed it heats up and when it is expanded it cools down. This is similar, but in reverse, to how a common fridge works. A fridge uses a heat pump to cool the inside of the fridge, and then dissipates the heat that is absorbed from within the fridge via a heat exchange at the rear of the fridge. A heat pump transfers heat from one medium to another, where the output heat is typically for heating a building or heating water and the input heat sources maybe the air, ground or a water body.

For a single unit of electricity used to drive a heat pump, several units of heat can be transferred from the heat source to the heating output. The system efficiency is known as the Coefficient of Performance or CoP and can be as high as 300-400% for a space heating based heat pump system. That means that 1 unit of electricity can deliver 3 or 4 units of heat. Heat pumps are considered a key component to help the UK meet its carbon targets especially when coupled with a low carbon electricity supply. They are currently supported by the RHI providing a index linked revenue stream for a 20 year period.

There are three main types of heat pump system that could be used at the centre, these fall into the following categories:

- Ground Source (GSHP)
- Water source (WSHP)
- Air Source (ASHP)

Ground Source heat pumps can either draw heat from horizontal plastic pipe work laid into trenches or from vertical boreholes drilled up to 200m into the ground. The horizontal collector method is usually lower cost but requires a suitable area to install the collector pipe work. The area required will depend on the heat pump capacity and the ground conditions which affect the heat transfer rate and yield that can be achieved. Vertical borehole collector systems tend to be more expensive, however they do provide a more constant heat source. As for the horizontal collector system, ground characteristics will affect the performance of a vertical collector heat pump system.

Water Source heat pumps draw heat from a water body either via a closed loop collector system, similar to a horizontal ground source collector, or via physically extracting water from the source, passing it across a heat exchange unit, abstracting heat from the water, then returning the water to its original source at a suitable discharge location. Both systems have their relative pros and cons, however for the scale of system relevant to the Horseshoe Lake, a closed loop system is considered to be preferable for a number of reasons including that it is less complicated in terms of water treatment/management and environmental permitting requirements. There have been a small proportion of WSHP's that experience freezing of the water that is in contact with the collector loop. However, occurrences of this situation have been attributed to the collector pipe work being too densely packed for the associated level of thermal energy extraction and local water source conditions. A full collector design analysis would be required to ensure that the collector is suitable for all lake and heat pump operational conditions.

Air Source Heat Pumps draw heat from the air and are the simplest heat pump system to install. However, they are also the lowest performing of the different heat pump systems as they are not as efficient at drawing heat from the air as heat pumps that draw heat from the ground or water, additionally the air temperature is very low in times of peak heat demand further reducing the efficiency.

Recommendations

Atkins recommend that a WSHP system is fully considered for the development as the lake represents a large thermal resource and is adjacent to the Centre. WSHP currently receive a fairly high level of support from the RHI. Details of the lake depth, collector system and ancillary pipe work will need to be established to confirm the viability of such a system. There are several such systems that operate successfully in the UK to draw reference from. An installed Water Source Heat Pump system of the estimated capacity for the facility including the collector system and storage could be expected to be in the region of £80,000. Maintenance would be expected to be minimal, and WSHPs currently receive relatively high government support via the RHI, which means that ongoing operational costs are low.

We also suggest that a Ground Source heat pump system is investigated, in case the WSHP lake-based collector system is deemed complicated to integrate with the overall recreational requirements of the lake. As the installation of the heat collector system in the lake may necessitate a permanent no-go or barriered area to prevent access by lake users.

To provide backup in periods of heat pump maintenance and to assist with extreme peak demands, it is also recommended that either conventional gas or electric boiler heating is also installed. Where main gas is not available then LPG based boilers may be suitable. Such a system may only provide less than 10% of the overall heat across the year but will help to optimise the capacity and therefore cost of any low carbon system to meet the majority of the heat demand.

Case Study

A Country Estate in the UK recently installed a 90kW Water Source Heat Pump system and are happy with the performance. This system represents around double the capacity that we anticipate would be required for the Horseshoe Lake recreational facility.

Other considerations

If heat pump technology is to be adopted at Horseshoe lake, then this will represent a lower load than conventional electric heating due to its improved efficiency or CoP, however if the backup heating is electrical then there must be sufficient electrical capacity for this under peak load conditions. Using mains gas or LPG would reduce the overall electrical capacity requirement.

In future, the client may wish to install electric vehicle charging at the Lake car park. If so this will need due consideration in terms of the available electrical capacity as it can represent very high electrical loads, especially when rapid charging is facilitated.

To fully compare the potential low carbon heat systems, it is recommended that whole life costing is undertaken during the next study phase. This would account for CAPEX, fuel costs, maintenance and plant replacement, and available grants/subsidies such as the Renewable Heat Incentive (RHI). This is important in the evaluation of low carbon energy systems, as they tend to have a higher CAPEX associated then conventional heating systems, however this expenditure is recovered over a period of time, providing lower future operational costs.

Structural Design - Superstructure

The proposed building at Horseshoe Lake is a single storey structure of approximate dimensions 35m x 10m. The height to eaves is considered to be a minimum of 3.5m.

The building encompasses a large open plan area for approximately half of the footprint, the remaining portion being divided into smaller areas for stores, WC (public and private use). The footprint and dimensions guide the building towards a framed structural solution, the frames themselves being provided at regular centres along the length of the building. We have considered that a total between 8 and 11 frames should be explored (8 frames at 5m centres, 11 frames at 3.5m centres). The final frame centres should be coordinated with the glazing units that are likely to be provided across the length of the building overlooking the lake.

A framed solution should be explored in either structural steelwork, structural timber or concrete. Two options for the frames could be developed:

- Portal frame action, whereby the frames are stable within their own plane or
- Post and truss roof.

Common to both options will be the requirement to incorporate bracing between the frames along the length of the building. Within the rear wall this may incorporated into the wall finishes, however facing the lake, the bracing could take the form of tensile wires/rods and central annulus.

Structural Design - Foundations

An initial intrusive site investigation is being progressed to determine if the likely soil strata is:

- Alluvial material overlying
- Sands, Sands/gravels.

The depths or competency of these materials are not known, however we would consider that the alluvial material could be unsuitable to found in and would therefore consider that the building will need a piled foundation. Piles are likely to be relatively short bearing in the sand material, sufficiently deep to preclude any ground water influence. Screw piles or driven precast concrete are likely to be suitable.

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COSTS, RISKS AND
PROGRAMME

Cost

The order of cost estimate by Gleeds accompanies this report, and identifies a total project cost of £2,319,000. This is based on the construction of the new visitor centre and associated landscape works to enhance site facilities and uses. Please see the extract from Gleeds' report overleaf, for a summary cost break down.

Please refer to the cost report for full details (see Appendix D).

If required, there are options to reduce the project costs which will need to be considered in detail, which could include developing the landscape in phases - the new jetty and beach extension have been excluded from the cost and shown as optional items.

The client budget is understood to exclude both FF&E and a Cat B fit-out. Please note the cost plan includes works considered to be within the remit of a Cat B fit-out, such as lighting and internal finishes , however, FF&E has been excluded from the cost and shown as an optional item.

Risk

A project risk register accompanies this high-level feasibility; please refer to Appendix C for a full understanding of the risks anticipated at this stage and their mitigations. The key risks are as follows:

- Inability to agree satisfactory proposals within available budget
- Planning Conditions and objections being raised.
- Possible increase in flood risk due to climate change forecasting.
- Ecology – Habitat protection which may hinder development.
- Confirmation of pylon/power line distance requirements
- Additional considerations required due to Special Landscape Importance and Suitable Alternative National Green space (SANG) location

Due to the high-level stage of the project an allowance of 10% has been made in the cost plan for this element and a costed risk register will be provided at the next design stage. It is expected that the risks will reduce as more information is known about the site.

Programme

Please refer to Appendix E for full details of the programme. The standard programme has been used to calculate the project duration, but there are options to streamline this. The main option to do so would be to seek delegated approval for the chief officer to award the contract, which could reduce the programme by 2-3 months. There are also possibilities for design to proceed in parallel with some internal BFC sign off processes.

At this stage, the project is anticipated to be procured via a Design & Build route and the programme reflects this. This is, however, subject to review and approval in the procurement plan and the programme will be revised to reflect this accordingly.

A period of 6 months has been allowed, through to March 2019, following sign off of this feasibility report to gain project approval and funding. This is currently based on estimates provided by BFC.

The time allowed against the construction duration is currently an estimate from the Building Cost Information Service (BCIS) based on data of similar projects in a similar location. The construction period would be subject to confirmation by the successful contractor at tender stage.

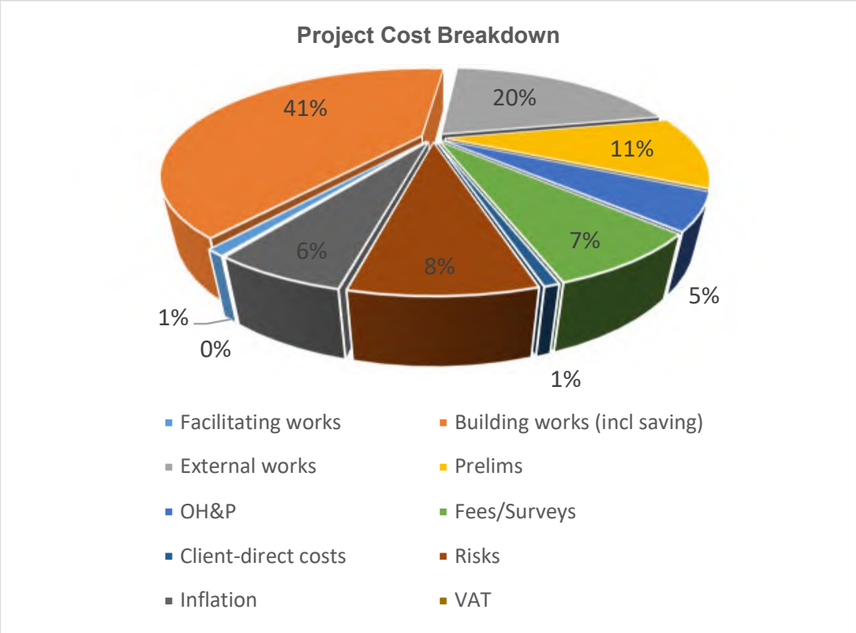
The majority of the above will be reviewed upon instruction to proceed and a revised programme provided for agreement and a streamlined programme can be investigated upon instruction.

Cost Plan Summary Page Feasibility Study

Estimate base date: 4Q 2018

Location: Bracknell

Gross internal area (GIA): 340m² (note target GIA is 310m2 – see Appendix C)



Optional Items (not included in Cost Estimate):

Description	Net £	Gross £*
Green roof (extra over)	£26,000	£39,000
Polished concrete floor (extra over)	£24,000	£36,000
New jetty	£17,000	£26,000
Beach extension (incl fencing)	£33,000	£49,000
BBQ & play area (incl play bark)	£105,000	£158,000
Loose FF&E	£50,000	£58,000

*Estimated total addition to Project Cost Estimate inclusive of % oncosts

Description	Total £	£/m2 GIA	% of Total
Facilitating works	20,000	59	1.0%
Substructure	92,000	271	4.5%
Superstructure	414,000	1,218	20.4%
Internal finishes	75,000	221	3.7%
Fittings, furnishings and equipment	50,000	147	2.5%
Services	269,000	791	13.3%
External works	437,000	1,285	21.5%
Subtotal	1,357,000	3,991	66.8%
Main contractor's pre-construction services fee	30,000	88	1.5%
Main contractor's preliminaries (say 41 weeks @ £5,000/wk)	205,000	603	10.1%
Main contractor's overheads and profit - 7.00%	112,000	329	5.5%
(Anticipated saving for 30m2 GIA reduction)	(150,000)	(441)	(7.4%)
Construction Cost Estimate (excluding fees and risks)	**1,554,000**	**4,571**	**76.6%**
Professional Fees - 5.51%	86,000	253	4.2%
BFC C&M Fees - 2.00%	32,000	94	1.6%
Specialist surveys (non-core discipline costs etc)	40,000	118	2.0%
Planning Fees	2,000	6	0.1%
Loose FF&E - Excluded	Excluded	-	-
ICT costs - Allowance	15,000	44	0.7%
Client's other costs - Excluded (unless stated)	Excluded	-	-
Design and construction risk allowance - 10.00%	173,000	509	8.5%
Client's other risks - Excluded (to be advised)	Excluded	-	-
Inflation estimate to construction mid-point (3Q 2020) – 6.7%	128,000	376	6.3%
VAT assessment	Excluded	-	-
Project Cost Estimate (note Exclusions)	**2,030,000**	**5,971**	**100.0%**

Project number: OXCM0246 / Version: 04 / Date: 05 Nov 18

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APPENDIX

Appendix A
Risk Register

Appendix B
Gleeds Cost Plan

Appendix C
Programme

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