Proof of Evidence of
James Dodson - HydroGenesis

Home Farm, Kemnal Road, Chislehurst

Enquiry date 30th July 2024

James Dodson

I have a BSc in Geology and an MSc in Petroleum Geoscience both from the University of Manchester.

Experience

I have worked for various companies in the oil and gas sector, primarily in the geophysical data space.

I have strong experience with numerous data types including potential fields, seismic, hyperspectral, LiDAR and in integration of different data types, predictive analytics and data mining.

Through various roles in the oil and gas sector I have got to know a multitude of African and Middle Eastern ministries as well as IOCs and NOCs.

HydroGenesis was founded in 2020 by myself and my business partner with the ambition to help society work towards the net zero 2050 as the world transitions away from carbon-based energy sources.

HydroGenesis builds systems that allow year-round energy security using hydrogen as the energy carrier. We design, build and install bespoke hydrogen energy storage systems that generate hydrogen from renewable energy when there is excess, compress and store it for use at times when renewable energy is not available.

Statement of Truth

The evidence which I have prepared, as set out in this document and the appendices to it, is true and has been prepared in accordance with normal practice. I confirm that the opinions expressed are mine, and are true and professional opinions, irrespective of by whom I am instructed.

Instructions

I am formally instructed by Mr Alan and Mrs Pauline Selby, who are the owners of the appeal site.

I was instructed to provide technical energy advice regarding the design, building and installation of a hydrogen energy storage system at the appeal site, primarily to provide year-round renewable energy to a new dwelling (Vine House) with the potential to upscale to the rest of the Home Farm site.

1.0 Format of this Proof

This Proof evidence focuses on the generation and storage of energy and the HydroGenesis system.

In addition, I have included two appendices as follows:

1.1 **Appendix 1** is the Whole Lifecycle Carbon Assessment for Vine House and the Circular Economy Statement of the site;

1.2 **Appendix 2** considers the wider sustainability issues relating to the site and is summarised in the report provided by Ivan Ball of Bluesky Unlimited;

1.3 The sustainability and energy credentials of the development are not in dispute and the topic area does not form a reason for refusal, however, I have been asked to provide evidence at this appeal in support of the appellants' case that the proposed hydrogen system at Home Farm should be treated as very special circumstances.

1.4 As such, the general site energy evaluation work, such as the Whole Lifecycle Carbon Assessment and wider sustainability issues, which were written by Mr Ivan Ball of Bluesky Unlimited, are provided as appendices. The focus of this proof is on the hydrogen energy storage system, as such it is presented first, although it takes into account highly relevant information from the appendices.

2.0 Summary

2.1 The key sustainability findings for the proposed development at Home Farm can be summarised as;

- ❖ An exemplary new dwelling using best practice fabric standards and an innovative, potentially ground breaking method of storing energy for use in Vine House and potentially other buildings in the fullness of time;
- ❖ 100% reduction in carbon dioxide emissions of the new dwelling (Vine House) compared to the maximum permissible by the Building Regulations;
- ❖ All heating to the dwellings will be provided by renewable technologies (GSHP to Vine House and ASHPs to Polo Mews and the Bothy);
- ❖ The water use to each unit will achieve the enhanced standard required by the Building Regulations of 110 litres per person per day;
- ❖ A new Vineyard will provide for a sustainable future of farming on the estate;
- ❖ The impermeable area of the site will be reduced by 1,134 sqm as a result of the reorganisation of the roadways;
- ❖ High standards of environmental construction, including the development of a Site Waste Management Plan and other construction management principles;

2.3 Indeed, the development of Vine House achieves the planning policy requirement of net zero carbon on site. Achieving the policy on site is unusual and the vast majority of planning approvals rely upon payment of a carbon offset to compensate any residual carbon emissions.

2.4 The scheme at Home Farm proposes an elegant, innovative solution and whilst the new dwelling (Vine House) will be constructed using fabric efficiency standards currently defined as 'best practice' including the installation of triple glazed windows and doors, it is the installation of the HydroGenesis system, which makes the proposal unique and very special.

2.5 As a first in the region the house will use electricity generated on site by photovoltaic panels (directly) and through a hydrogen fuel cell. The hydrogen will be created on site using electricity generated by photovoltaic panels. The hydrogen store is capable of storing a much larger amount of energy than using a typical domestic battery system. The electricity generated by the fuel cell will power a ground source heat pump, which will provide all space heating and hot water to the house. Whilst a mains Grid connection will be provided it is anticipated that the house can operate **off-Grid.**

2.6 The system works as follows;

1. Energy source is a large solar array.
2. The solar energy will be directed to power different equipment, depending on needs and a basic hierarchy, to best utilise the energy produced –
    a) Primarily, solar energy will take the current load at any given time, including to the heat pump for any heating and hot water needs.

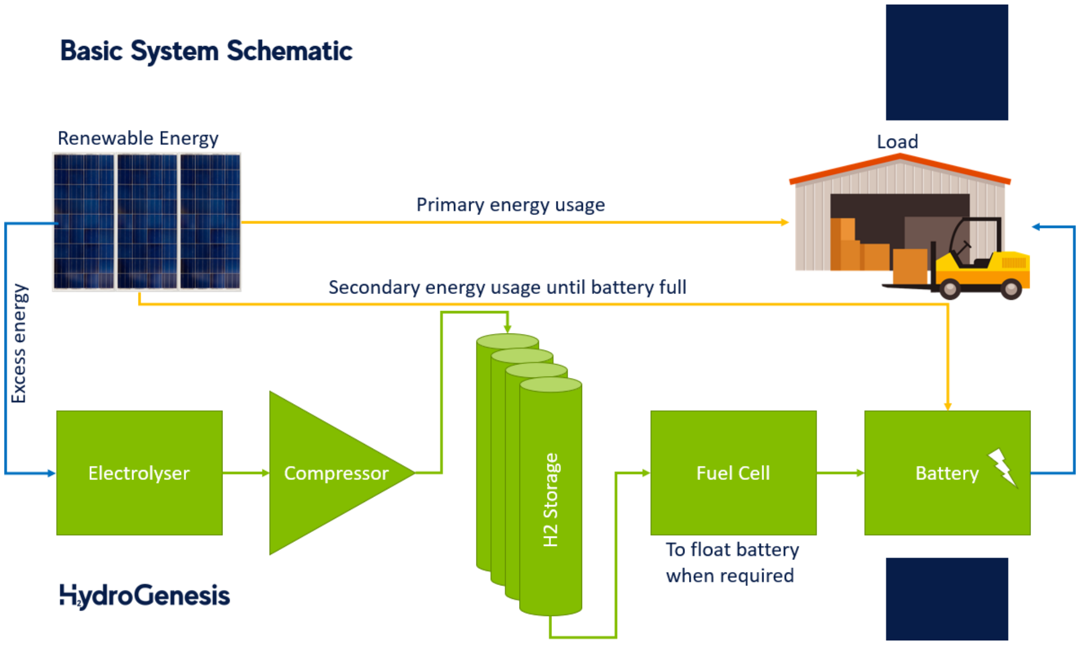
b) Any excess production will first charge a Li-Ion battery that is used to deal with load fluctuations as well as short term energy storage (i.e. overnight in the summer).

c) Secondary excess will be diverted to the electrolysers to produce hydrogen for the long term energy storage (for use when solar production isn't adequate over longer time periods, such as during the winter months).

d) Tertiary excess will power an immersion heater to top up the hot water.

e) Once the battery is charged, water is heated and hydrogen is full or the electrolysers cannot accept any more current, the solar energy will be diverted to the rest of the Home Farm site.

2.7



2.8 **The new house will achieve net zero carbon.**

2.9 In the fullness of time, it is anticipated that the existing houses and other buildings at the site can use a similar HydroGenesis system and use electricity generated by the fuel cell.

2.10 There will be no on-site carbon dioxide or nitrous oxide emissions associated with the dwellings.

2.11 **This proposal presents a unique opportunity for Bromley, which is unlikely to appear elsewhere.**

3.0 HydroGenesis

3.1 Buildings need energy but the problem is that solar and wind generation do not deliver year-round and the energy requirements within the buildings needs to be topped up either from a generator or from the National Grid. The former may be subject to future legislation depending on the fuel used and may not be feasible due to environment reasons whereas the latter can be problematic because if more energy is generated than can be used at a point in time and the energy cannot be stored then it needs to be sent back to the Grid.

3.2 Broadly, electricity sold back to the Grid is often sold for approximately 10% of the value that it is purchased for and there is often limited use for the energy as other solar arrays will also be overproducing.

3.3 If the excess electricity generated can be stored for when demand exceeds supply then this is way of ‘flattening’ the cost-of-energy curve and future proofing the system such that it can remain truly green.

3.4 The **HydroGenStore** converts excess renewable energy into hydrogen which is compressed and stored for future re-electrification. ELVIS is the smart controller that monitors the energy flow, ensuring a safe and efficient operation.

3.5 Approximately 970,000 UK homes have solar panel installations (3.3%) with less than 10,000 of these having battery storage. For those homes that do benefit from a battery, generally they are only able to store sufficient electricity to meet one or two days of the home’s demand.

3.6 The HydroGenStore has the ability to store larger amounts of energy for year-round solar reliance.

3.7 When the sun is out, the photovoltaic panels generate electricity and send it to ones of three locations;

1. Directly powering the home or workspace;
2. Charging a Li-Ion battery or
3. Powering the electrolyser to generate hydrogen for the winter.

3.8 Whilst the initial installation of photovoltaic panels is high, over their 25 years lifespan, the electrical generation costs approximately 9p/kWh compared to a current cost from the Grid of circa 60p/kWh.

3.9 However, the amount of sunlight varies throughout the year and whilst generation from panels is high in the summer, the energy demand from the building will be low but high in the winter when the days are shorter with cloudier skies and reduced output from the panels.

3.10 The HydroGenStore helps 'flatten' the curve for energy costs by allowing energy generated in the summer to be used in the winter. By using hydrogen for energy storage, the HydroGenStore can provide economical long-duration energy with minimal rare earth minerals compared to big batteries.

3.11 By storing solar energy as hydrogen, it allows the proposed Vine House to operate completely off-grid as hydrogen can store significantly more energy than an equivalent battery (in cost and/or size and/or natural resource requirement). The hydrogen system will store ~11,000 kWh of renewable energy with 5,500 kWh usable output. This means the seasonal intermittency that is experienced at UK latitudes can be overcome, with solar overproduction in the summer, stored as hydrogen, for use in the winter, when solar production is low and unreliable.

3.12 When compared with battery storage the benefits of the HydroGenesis system become apparent;

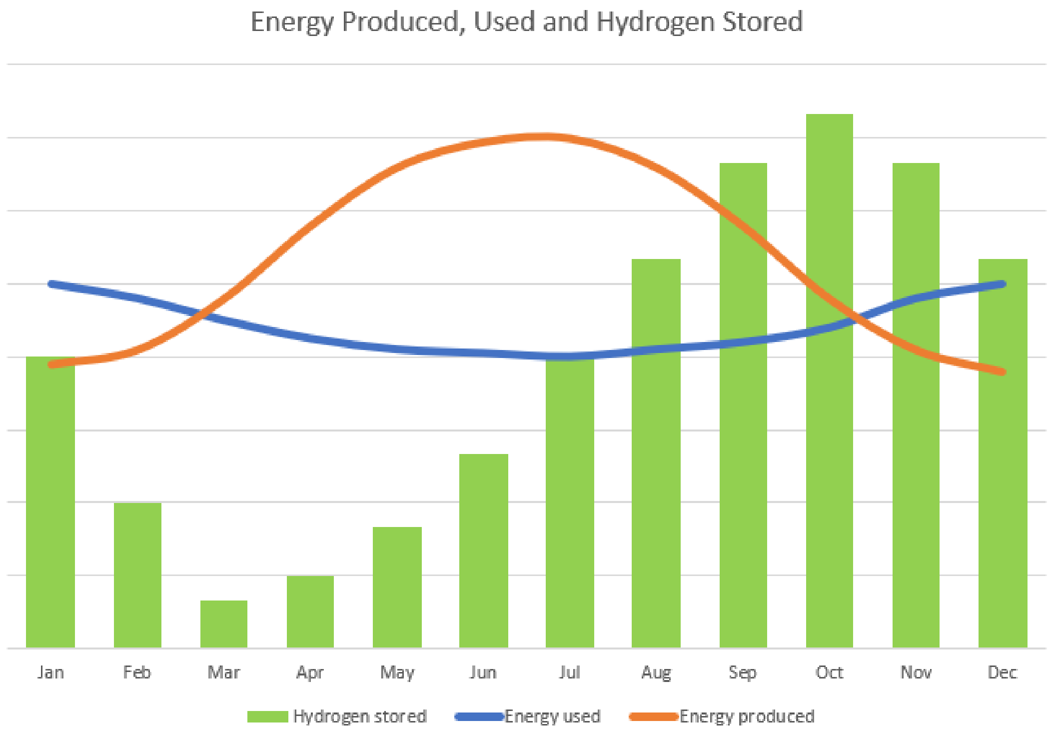
- A typical large domestic battery is ~20 kWh, though larger batteries can be obtained, of a similar size to the hydrogen system, however,
  - The primary benefit is that for the amount of energy stored, the hydrogen system is significantly less expensive than the equivalent battery, by a factor or between 5 and 10, depending on scale.
    - For the cost involved of the HydroGenesis system at Vine House, an equivalent battery system would have a capacity of approximately 750 kWh.
    - The cost for a battery system of equivalent storage capacity ~6,000 kWh, would be approximately 6/7 times the cost of the HydroGenesis system.
  - Batteries drain over time. They typically lose 3% of the stored energy per month, whereas the hydrogen system will not leak, therefore, no stored energy is lost so this is much better for long term storage.
  - Batteries last for a limited time, degrading in terms of storage capacity and charge holding ability over time.
  - Batteries are difficult/impossible to economically recycle, whereas the hydrogen system is predominantly made from steel that is readily recyclable and the component manufacturers are already planning on refurbishment services for their equipment.
  - Production of lithium batteries is energy intensive with a high carbon footprint, and their disposal is an environmental concern. Lithium at scale is often associated with resource depletion, ecological toxicity, and human health impacts, similarly with another Li-ion battery component, cobalt. A grid-scale hydrogen fuel cell solution has a far smaller environmental footprint than a battery storage facility of comparable scale and hydrogen fuel cells require no toxic chemicals, often associated with the manufacture of lithium-ion batteries.
  - There are no rare earth elements needed for the hydrogen system. The hydrogen system is largely assembled from stainless steel equipment. This equipment (the electrolysers

and fuel cells in particular) are manufactured at sites powered by renewable energy and are completely recyclable by the original manufacturers once worn out. The hydrogen system uses significantly less earth resources and energy than the equivalent battery.

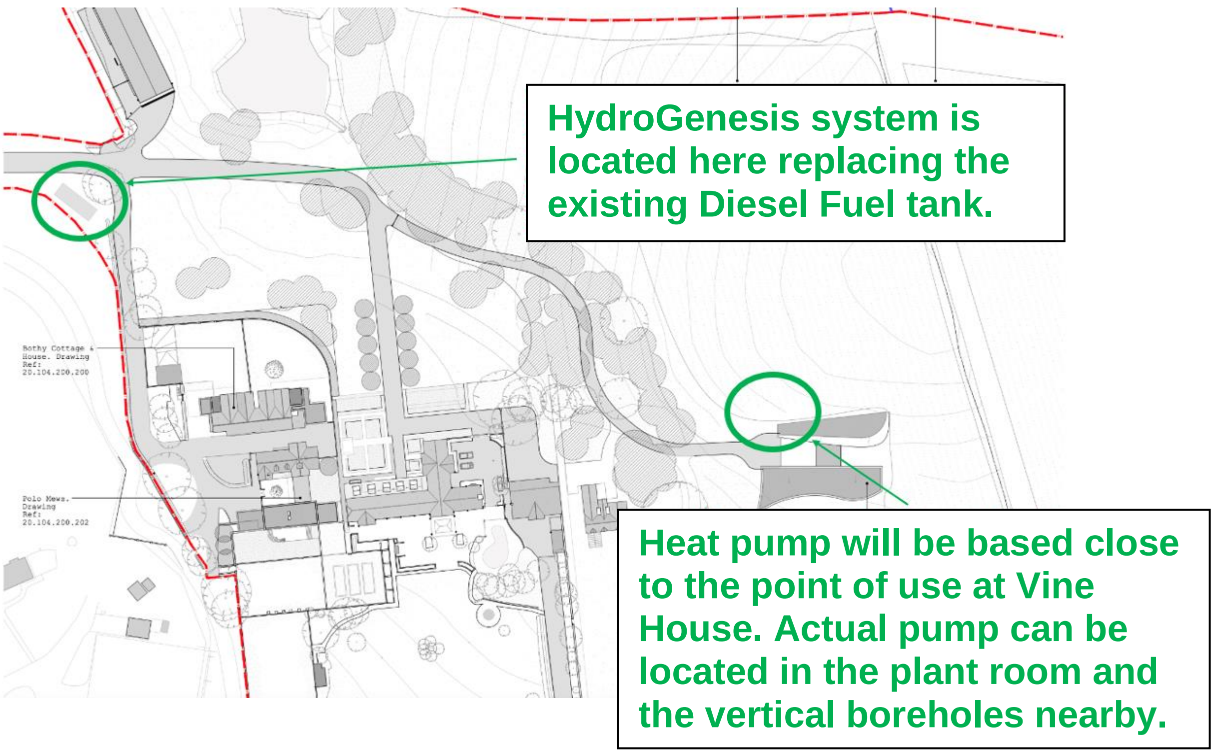
3.13 The amount of energy storage is based on the size and number of cylinders that have been proposed for the hydrogen system. Each kg of hydrogen is equivalent to 33 kWh of energy, and a total of 360 kg of hydrogen storage is proposed.

3.14 The proposed ‘minimum’ solar array is 32 kW. At the Home Farm location, based on historical solar production and at optimum tilt and angle, an anticipated 29,235 kWh of energy will be generated per year, with a large amount of excess solar energy available to generate hydrogen for the winter months as well as contribute to providing power for the rest of the Home Farm site.

3.15



3.16 The following drawing shows the anticipated location of the HydroGenesis system and the heat pump for Vine House.



3.17 Electric vehicles can be charged via the hydrogen fuel cell, into battery float and then through a car charger.

3.18 The HydroGenesis system uses water for the electrolysis process.

3.19 In order to fill the 360 kg hydrogen tanks, 3,456 litres of water is required. This is the yearly requirement and for comparison is a similar quantity to approximately 44 bathtubs or 576 flushes of a water saving toilet. The average occupancy of homes in the UK is 2.37 persons and based on the enhanced water efficiency standard set by the Building Regulations of 110 litres per person per day; the HydroGenesis system uses the equivalent of 9.5 litres per day, so less than 4% of a 2.37 person household water usage per day. It is proposed to target water neutrality for the system.

3.20 The surface system at Home Farm, including a number of storage options and, where feasible rain water will be used to supply the HydroGenesis system. It would pass through a filter and electrolyte added. It is then pressurised to 4 bar before being input into the electrolyser.

3.21 When the hydrogen is used to generate electricity, the only byproduct is heat and pure water as vapour.

3.22 **It is understood that no other UK dwelling uses hydrogen technology in this way and so the proposal is a first of its kind.**

3.23 A project in Gateshead (the Hydrogen House) aimed to show how the hydrogen homes of the future will work. This used hydrogen imported from elsewhere rather than generated on site and much larger projects aimed at proving this as a way forward are being scrapped due to being unfeasible –

- Hydrogen is difficult to transport, hence it is proposed to produce it on site.
- Hydrogen production on a large scale is unfeasible due to the amount of wind and solar energy that would be required to generate it. Similarly, blue hydrogen production through natural gas reformation combined with CCS is not moving ahead, due to costs and a lack of understanding of storing and monitoring CO_2 in the subsurface.

3.24 As an aside, the 'Walkie Talkie' building in London, does include rooftop solar (~30,000 kWh per year) and a 300kW hydrogen fuel cell system in the basement. However, there is no on-site hydrogen production, as proposed at Home Farm. The hydrogen required for the Walkie Talkie building is transported in from elsewhere and ironically, is likely to be from steam methane reformation of natural gas, a highly polluting process.

3.25 The Home Farm system is a significant improvement on this as the hydrogen is produced on site via electrolysers, with no polluting by-products, only hydrogen, oxygen and a small amount of heat are given off.

4.0 Comments from London Borough of Bromley

4.1 Comment from Lee Gullick – London Borough of Bromley Carbon Programme Manager (Email from Katie Ryde to Jessica Lai – 21st Dec 2022)

4.2 *"it's really pleasing to see a Bromley resident taking a leap forward with a credible sustainable design, that I personally think is very sympathetic to its surroundings and well thought out. I suspect this net zero design will also cost significantly more than the usual designs that we see, which to me demonstrates conviction behind it.*

Yes this is on Green Belt but since the footprint and volume of the proposed buildings won't increase then hopefully this is treated as a positive.

My only query is how the GLA will treat the solar proposition (i.e., not having solar on the rooftop) – the roof of the new building Vine House will be a green roof with the solar installation being located away from the house. Given the layout of the site I think this is acceptable because the design allows for maximising both solar and biodiversity and SUDS potential.

As the application stands, no carbon offsetting payment would be required since the design achieves net zero emissions"

4.3 Comments within the Officer Report – Jessica Lai – 31st August 2023

4.4 *6.1.15 The proposed new dwelling would incorporate a hydrogen plant and ground source heat pump to achieve net zero carbon, being the first of its kind. However, it should be noted that new major development is required to achieve carbon zero. As such this element of the proposal would not be afforded any specific additional weight in support of the proposal as a whole.*

6.1.16 Hydrogen is one of many renewable energy options which is available in the market for any willing users. As such, generating renewable energy to address climate change and meeting the development plan requirements is not regarded as very special circumstances for a new dwelling in the Green Belt. Furthermore, carbon zero homes which address fuel poverty and climate change do exist in this borough such as the Council's affordable housing scheme at Brindley Way. Whilst addressing climate change is supported, this does not override the Green Belt polices and should not be used as a precedent to introduce new building in the Green Belt.

6.1.27 The submitted planning statement states that the following cumulative benefits arising from the proposed development would represent a case of very special circumstances and outweigh the harm in Green Belt. The key planning considerations and officers view in relation the suggested very special circumstances are tabled below and the relevant sections of this report:

	Suggested very special circumstances (VSC)	***Officers' view***
1	*Borough first in relation to sustainable and energy that would contribute towards achieving net caron zero targets.*	*The completed Council's affordable housing scheme at Brindley Way is a recent approved development which achieved net zero carbon, utilising solar panel and air source heat pumps. Hydrogen is one of the on-site renewable energy measures/options available in the market. This proposal would achieve net zero-carbon as required by the London Plan and this should not be afforded additional weight in support of the proposal that would clearly and demonstrably outweigh the harm to the Green Belt.*

5.0 **Responses to Officer Report and Brindley Way**

5.1 It was very pleasing to see that the London Borough of Bromley Carbon Programme Manager (Lee Gullick) acknowledged that the Home Farm proposal showed 'a leap forward with a credible sustainable design' and that they also understood that the cost implications of such a system suggest real conviction. Both of these statements are true, with the owners of the Home Farm site being in the position to be able to finance such a exemplar, something that will benefit the UK house building market in the future. It is however very disappointing these comments were not contained or summarised within the officers report and were only shared as part of the appeal process.

5.2 Within the Officer Report, there are a number of comments that show a lack of understanding of the hydrogen energy storage, the commitment involved in installing a system of this kind and the implications of renewable energy on the wider energy system. These are addressed, below.

5.3 It is stated in the Officer Report that 'Hydrogen is one of many renewable energy options which is available in the market for any willing users'. We are aware that hydrogen ready boilers and some limited hydrogen cooking appliances do exists for consumers, however, this is not comparable to the HydroGenesis system that is proposed to be installed at Home Farm, which is not currently available in the market as such and we are unaware of any other comparable systems in the UK.

5.4 The hydrogen system at Home Farm will store excess solar energy for use in periods of limited solar production by generating hydrogen on site through an electrolyser, storing it and generating electricity when required via a fuel cell. As far as we are aware, all other hydrogen products on the market require an external source for their hydrogen; one which is likely to require significant emission of carbon. There is no hydrogen grid, so hydrogen tanks would have to be transported to the site. This hydrogen is highly likely to be generated in a very carbon intensive process (according to the EIA, less than 1% of global hydrogen is generated by low-emission methods) – natural gas reformation, which emits an order of magnitude more CO2 than it generates as H2.

5.5 The Council has suggested the proposal at Home Farm is not extraordinary and that their own development of 25 apartments and maisonettes at Brindley Way, Burnt Ash Lane, Bromley achieves the same standard.

5.6 Indeed, both the Brindley Way scheme and the proposals for Vine House achieve net zero carbon but both do so in a completely different way and cannot be regarded as comparable. In short, Brindley Way is dependent on importing energy from the National Grid at times when the solar panels are unable to produce sufficient energy, whereas Vine House will be entirely capable of supplying the whole of its own energy needs from entirely renewable sources on the site, without the need to import energy -a genuinely zero carbon development.

5.7 Brindley Way proposes good standards of insulation with air source heat pumps providing space heating and hot water to the units and the installation of photovoltaic panels offset any residual emissions.

5.8 However, whilst the calculation equates to net zero by generating a surplus in the summer which is equal to the energy imported from the Grid, the site would nevertheless be subject to importing significant flows of energy into the site during the winter period and from the site during the summer. This is because the photovoltaic panels maximise their output during the summer when the solar radiation is highest but the output can be negligible during the winter when electricity generation is lowest but demand for heat from the heat pumps is highest. Over the year the development can be regarded as ‘net zero’ but this is only because the Grid can take up the slack and accept electricity during the summer (from the PV) and provide it to the heat pumps during the winter (when there is little electrical output from the PV).As Mr Ball confirms, almost 60% of energy provided by the Grid is generated using fossil fuels.

5.9 This forms part of a greater issue with increased renewable energy generation in the UK, as high solar days are likely to be country wide – therefore the grid is receiving a large amount of energy from numerous solar installations at the same time, when there is less requirement. There have been numerous days in the past few years where we have had a significant excess of renewable energy in the country, with no use for it.

5.10 Although developments such as Brindley Way are classed as net zero by calculation, they are reliant on the Grid during periods of low solar production, so there is a clear reliance on fossil fuels. Currently, the UK grid is still heavily reliant on burning natural gas and coincidentally, when Brindley Way is in need of grid support, this is also likely to be when the UK grid is burning more natural gas.

5.11 This is also an inefficient system in terms of cost as the electricity sold back to the Grid from the PV production (during the summer) is purchased by the energy company for approximately a tenth of the cost than it is bought for from the energy company.

5.12 This ability to generate all its own energy is what sets the energy system at Vine House apart and makes it an important part of the Very Special Circumstances required to justify this development in the Green Belt. To be truly net zero (or "Real Zero" as Mr Ball calls it), and have no fossil fuel reliance, year round, enough renewable energy needs to be generated at site, but also stored in sufficient quantities to cover all energy needs throughout the year, even during long periods of poor weather and low solar generation in the winter months. The HydroGenesis system will do this and therefore allow Vine House to be truly net zero and have zero reliance on the grid and therefore fossil fuels.

5.13 The usual method for storage is using battery solutions but these have significant disadvantages which are set out in more detail in section 3, but the principal issue is that most normal batteries have only sufficient capacity to store enough energy for the home's demand for one or two days. It is therefore necessary for the industry to develop a superior method for providing longer term storage of electricity that stores significantly higher amounts of energy, seasonally.

5.14 This is why the HydroGenesis system is so innovative and cannot in any way be regarded as comparable to the scheme at Brindley Way.

5.15 The Vine House system can certainly be considered an exemplar for how new housing developments could be built in the future, with localised seasonal energy storage, minimising pressure on the National Grid and promoting a true net zero agenda.

James Dodson

Appendix 1 – Whole Lifecycle Carbon Assessment and Circular Economy Statement

Whole Lifecycle Carbon Assessment

Vine House, Home Farm, Kemnal Lane, Chislehurst

Prepared by Ivan Ball

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23rd January 2023

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Executive Summary

This Whole Lifecycle Carbon Assessment (WLC) has been prepared in support of the construction of a new dwelling on land at Home Farm, Kemnal Lane, Chislehurst. Throughout this document the dwelling will be referred to as Vine House.

Further studies will be conducted at the post-planning stage when the design will be detailed but the following assessment has been prepared based on the information currently available.

The 60-year WLC analysis estimates Total Global Warming Potential (GWP) of the house, including operational energy and water to be **1,006,693** kg CO2e for Assessment 1 (current carbon factor for electricity) and **553,528** kg CO2e for Assessment 2 (future carbon factors for electricity following de-carbonisation of the Grid over lifetime of development).

The 60-year material embodied carbon for the scheme is estimated to be **274,578** kg CO2e (for Modules - A1-A5, B1-B5, C1-C4, D), which equates to rate of **820** kg CO2e/m^2.

The Module A1-A5 material upfront embodied carbon for the scheme is estimated to be **169,395** kg CO2e, which equates to a rate of **506** kg CO2e/m^2.

The development is therefore within the GLA (Current) Benchmark of 750 to 850 kg CO2e/m^2.

The Module B-C (excluding B6 & B7) GWP for the development is estimated to be **117,873 kg CO2e**, which equates to a rate of **352 kg CO2e/m^2**.

The development is therefore below the GLA (upper) benchmark is 400 CO2e/m^2.

The following specification items have assisted in helping to reduce the Module A1-A5 upfront embodied carbon:

- Use of Blended Cement in Concrete Items, instead of Portland Cement;
- Use of rammed earth for external walls instead of traditional cavity wall construction;
- Use of Mineral Wool insulation instead of PIR Insulation
- Use of a ‘Green Roof’ for Roof Covering

1.0 Introduction

This Assessment has been commissioned by Mr & Mrs Selby and provides a WLC Assessment in support of a planning application for the construction of a single dwelling for their own occupation on land at Home Farm, Kemnal Lane, Chislehurst.

The site is located in Chislehurst, which is to the east of Bromley and approximately 25km from Central London. To the north of the site is Kemnal Park Cemetery and Memorial Gardens, to the southwest is Foxbury Manor and to the south and southeast are University College London Sports Ground and Chislehurst School for Girls respectively.

The site extends to 8.3 hectares and is accessed off Kemnal Road, which is privately owned.

The planning application also proposes demolition, extension and refurbishment of other buildings within the site but it is the construction of a new dwelling, which are prompted the need for a WLC and therefore this assessment just considers the new dwelling.

The WLC is defined as assessing;

'those carbon emissions resulting from the construction and the use of a building over its entire life, including its demolition and disposal.'

WLC assessments are required for all referrable developments and in accordance with the Greater London Authority (GLA) guidance this assessment considers both the embodied carbon emissions (i.e. the emissions from material extraction, manufacture and transport, construction and the emissions associated with maintenance, repair and replacement as well as dismantling, demolition and consequentially disposal of materials) as well as the operational carbon emissions from both regulated and unregulated energy use. As buildings become more energy efficient, with continuing improvements to building fabric and the use of low-carbon and renewable technologies so the embodied carbon of the materials within the buildings and the construction processes forms an increasing percentage of the total emissions associated with the development.

The WLC Assessment is based on the completed 'GLA Whole Life Carbon Assessment Template'.

The report has been prepared by Ivan Ball of Bluesky Unlimited who are sustainability consultants.

2.0 Methodology and Assumptions

2.1 Methodology

The Life Cycle Assessment considers the following building elements:

- **Substructure;**
- **Superstructure - f**loors, external walls, external doors and windows and roof;
- **Finishes;**
- **Fittings** - furnishings & equipment;
- **Services (MEP)** and
- **External Works.**

The study has been carried out for the following LCA Modules:

- **A1-A3:** Product Stage;
- **A4-A5:** Construction Stage;
- **B1-B5:** Use, replacement and maintenance;
- **C1-C4:** End of life;
- **D2-D4:** Benefits beyond the system boundary.

Models

Life Cycle Assessment (LCA) is the leading standard in clearly identifying optimum strategies for reducing environmental impacts. This report presents the results of the LCA completed for the proposed development that has been used to calculate the buildings' Global Warming Potential (GWP).

Two models were built and were assessed separately.

Assessment 1 is based on the current carbon emissions factors for the electricity Grid and,

Assessment 2 is based on the expected de-carbonisation of the electricity Grid over the lifetime of the development (60 years).

2.2 Assumptions

The assumptions made in relation to maintenance, repair and replacement cycles are extracted from the default database for each material and component used in the model. A detailed indication of the time frame that was assumed for the maintenance, repair and replacement of all primary building elements is given in the GLA WLC Template spreadsheet.

No Environmental Product Declarations (EPDs) were used at this stage because the exact specification of the elements has not been agreed but the default database in eTool has been used to inform the assessment. More detailed analysis can be carried out at the technical design stage.

The data for the CO_2 associated with the regulated and unregulated operational energy has been extracted from the SAP 10 Carbon Emissions Reporting Spreadsheet.

The operational carbon estimate includes the carbon emissions associated with the operational energy consumption of the development. This has been calculated for a lifecycle of 60 years based on the assumption that the annual operation energy consumption will remain the same throughout the life cycle of the project.

3.0 Construction Specification

Substructure and superstructure (floor slab and retaining walls)

All concrete elements in the business-as-usual model have been specified as 40MPa, no recycled content was added to this model. In the improved scenario all concrete elements e.g., foundations, ground floor slab and retaining walls were optimised.

External walls and windows

All external walls are to be made of rammed earth (except retaining structures). All windows and glazed doors will consist of aluminium frames with double-glazed units.

Roof

The roof of the house will consist of an engineering timber structure with a green roof over a single ply membrane.

Internal walls and doors

All internal partitions are assumed to be metal studwork with plasterboard finish. All internal doors are assumed to be pre-finished timber with steel ironmongery.

Internal Finishes

All internal finishes are assumed to be plasterboard drylining, scrimmed and painted. The architraves and skirting boards are formed in medium density fibreboard (MDF) and painted.

Fittings and furnishing

It is assumed that the kitchens units are constructed from (MDF).

Building services

The house will benefit from a ground source heat pump, which will provide all space heating and hot water to the dwelling. Electricity to the house is to be provided via a ground-mounted photovoltaic array. Energy will be stored as hydrogen via fuel cell. When electricity is required for the heat pump or other uses within the house the fuel cell with generated electricity from stored hydrogen. The regulated emissions from the house are designed to be zero carbon.

External works

The external landscaping includes porous surface to the driveway to the house will it is assumed will include concrete paved footpaths and a timber deck on the southern side of the house. A number of new trees are proposed as part of the planting plan.

The planning drawings for the house have been used in order to allow a Design Stage Bill of Quantities to be prepared.

The quantities for the main elements are estimated as follows;

Building Element	Area/Length	Thickness/Area	Volume
	m^2/m	m/m^2	m^3
Foundations	111.7m	0.6 x 0.6	40.20
Floor Slab	335.0 m^2	0.150 m	50.25
Screed to Slab	335.0 m^2	0.075 m	25.13
Concrete Retaining Walls	105.5 m^2	0.35 m	36.60
Rammed Earth Walls	237.5 m^2	0.30 m	71.25
Roof Structure	335.0 m^2	0.30 m	100.50
Roof Covering	335.0 m^2	0.30 m	100.50
Internal Partitions	93.0 m	0.13 m	12.09
Internal Doors	25.2 m^2	0.44 m	11.09
Windows	111.26 m^2		

4.0 WLC Reduction Strategies

This section describes the approach which has been taken with various elements of the construction.

Approach

Lean design principles and sustainable strategies have been considered in order to minimise the use of material and waste, and with it minimising the carbon footprint of the scheme, as follows:

- Reduced excavation: avoiding the use of basement, minimising the soil volume taken off-site and also minimising increased concrete volume required.
- Utilising crushed material salvaged from the demolition works (elsewhere on the site) will be assessed to utilise it as base material below the access drive.
- Prefabrication: considering prefabricated modules where feasible will be part of the strategy for minimising quantities of materials used.
- All timber is to be procured from approved FSC or PEFC certified sources or similar.

5.0 Results

5.1 60-Year WLC Carbon Impact – GWP Overview

The breakdown of the 60-year WLCCA is as follows;

Building Element Category	Assessment 1		Assessment 2	
	kg CO2e		kg CO2e	
60-Year Total Embodied Emissions (A1-A5, B1-B5, C1-C4, D)	274,578	27%	224,852	41%
60-Year Operational Energy (B6)	620,068	62%	278,374	50%
60-Year Operational Energy (B7)	112,047	11%	50,302	9%
Totals	**1,006,693**		**553,528**	

The 60-year WLC analysis found the Total Global Warming Potential of the development including operational energy and water for Assessment 1 (current carbon factors) to be **1,006,693 kg CO2e** and for Assessment 2 (future carbon factors) to be **553,528 kg CO2e**.

5.2 60-Year WLC Carbon Impact – Material GWP Overview

Building Element Category	Global Warming Potential	GWP/m^2	%
	kg CO2e		
Substructure	46,783	139.65	17.04
Superstructure: Roof	9,233	27.56	3.36
Superstructure: External walls	72,675	216.94	26.47
Superstructure: Windows and ext. doors	8,489	25.34	3.09
Superstructure: Internals walls and partitions	36,612	109.29	13.33
Superstructure: Internal doors	(988)	(2.95)	-0.35
Finishes	9,722	29.02	3.54
Fittings, furnishings and equipment	583	1.74	0.21
Services	5,253	15.68	1.91
External Works	86,216	257.36	31.40
Total	**274,578**		

The 60-year WLC material embodied carbon is **274,578 kg CO2e**, which equates to 820 kg CO2e /m^2.

5.3 60-Year WLC Carbon Impact – Material GWP (Assessment 1 v Assessment 2)

Building Element Category	Assessment 1 GWP	Assessment 2 GWP
	kg $CO2e/m^2$	kg $CO2e/m^2$
Substructure	139.65	127.76
Superstructure: Roof	27.56	19.46
Superstructure: External walls	216.94	205.68
Superstructure: Windows and ext. doors	25.34	18.54
Superstructure: Internals walls and partitions	109.29	92.55
Superstructure: Internal doors	(2.95)	(5.44)
Finishes	29.02	20.64
Fittings, furnishings and equipment	1.74	1.56
Services	15.68	12.70
External Works	257.36	177.75

5.4 Module A1-A5 Carbon Impact – Material GWP Overview

Building Element Category	Global Warming Potential	GWP/m^2	%
	kg CO2e		
Substructure	38,879	116.06	22.95
Superstructure: Roof	3,446	10.29	2.03
Superstructure: External walls	65,348	195.07	38.58
Superstructure: Windows and ext. doors	4,021	12.00	2.37
Superstructure: Internals walls and partitions	25,614	76.46	15.12
Superstructure: Internal doors	(2,626)	(7.84)	-1.55
Finishes	3,939	11.76	2.33
Fittings, furnishings and equipment	169	0.50	0.10
Services	1,519	4.53	0.90
External Works	29,086	86.82	17.17
Total	**169,395**		

The 60-year Module A1-A5 material embodied carbon is estimated to be **169,395 kg CO2e**, which equates to 506 kg $CO2e/m^2$.

5.5 Module A1-A5 Carbon Impact – Material GWP (Assessment 1 v Assessment 2)

Building Element Category	Assessment 1 GWP	Assessment 2 GWP
	kg $CO2e/m^2$	kg $CO2e/m^2$
Substructure	116.06	116.06
Superstructure: Roof	10.29	10.29
Superstructure: External walls	195.07	195.07
Superstructure: Windows and ext. doors	12.00	12.00
Superstructure: Internals walls and partitions	76.46	76.46
Superstructure: Internal doors	(7.84)	(7.84)
Finishes	11.76	11.76
Fittings, furnishings and equipment	0.50	0.50
Services	4.53	4.53
External Works	86.82	86.82

6.0 Benchmark Assessment

6.1 Module A1-A5 Benchmark: Development v London Plan Benchmark

The 60-year Module A1-A5 material embodied carbon is estimated to be **169,395 kg CO_2e**, which equates to a rate of **506 CO_2e/m^2.**

The GLA benchmark range is 750 to 850 kg CO_2e/m^2.

The assessment embodied carbon is within the targeted range.

6.2 Module B-C (except B6 & B7)

Module B represents use, replacement and maintenance and Module C represents end of life. Modules B6 and B7 have not been included because the London Plan benchmark excludes them.

The Module B-C (excluding B6 & B7) GWP for the development is estimated to be **117,873 kg CO_2e**, which equates to a rate of **352 kg CO_2e/m^2**.

The GLA (upper) benchmark is 400 CO_2e/m^2.

The assessment is within the targeted range.

7.0 Opportunities to Reduce WLC Emissions

The following elements have assisted in reducing the Module A1-A5 embodied carbon;

- Use of blended cement in concrete instead of Portland Cement;
- Use of mineral wool in lieu of PIR insulation;

In addition, the following elements should be considered at the detailed working drawing and specification stage to further reduce the Module A1-A5 embodied carbon.

Building Element Category	Specification to be Considered
Foundations	Spread foundation (50% fly ash)
Ground Floor	Precast concrete beams
Internal Partitions	Metal studs

Circular Economy Statement

Home Farm, Chislehurst

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23rd January 2023

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Executive Summary

The built environment is the largest user of materials and generator of waste. The GLA Circular Economy Primer states that in London, '*the sector consumers 400 million tonnes of material each year and accounts for 54% of waste.'*

Waste is defined as anything that is discarded. A **circular economy** is one where materials are retained in use for as long as possible and are then re-used or recycled, leaving a minimum of residual waste.

A key way of achieving this is through incorporating circular economy principles into the design of developments.

The purpose of this Circular Economy Statement is to demonstrate that the proposed development at Home Farm has considered circular economy principles to minimise embodied carbon, maximise the value extracted from materials and prioritising the reuse and recycling of materials.

The statement considers the following;

- ❖ How demand for materials should be minimised;
- ❖ How secondary materials can be used;
- ❖ How new materials are being specified to enable their reuse;
- ❖ How construction waste will be minimised and how and where the waste will be managed in accordance with the waste hierarchy;
- ❖ How the proposal's design and construction will enable building materials, components and products to be disassembled and re-used at the end of their useful life and
- ❖ Adequate storage space to support recycling and re-use.

Key Commitments

Broad objectives for Circular Economy aspirations have been set. At the detailed working drawing design and pre-construction stage, workshops should be held to develop and investigate circular economy objectives with specific metrics (design team, contractor, suppliers, and facility managers).

Site analysis, in the form of detailed pre-demolition / pre-refurbishment audits, should be undertaken.

Circular Economy opportunities should be monitored throughout the design and construction process.

On completion, success against objectives will be reviewed and an analysis should be undertaken on lessons learnt (whole design team, contractor and relevant supply chains).

1.0 Introduction

This report has been commissioned by Mr. and Mrs. A Selby and provides a Circular Economy Statement in support of;

An application for planning permission for the partial demolition and replacement extensions of existing locally Listed Buildings, a new viticultural enterprise, new solar & hydrogen energy plant, a new single storey dwelling & landscape enhancement to a small-scale family farm on Green Belt land at Home Farm, Kemnal Road, Chislehurst, BR7 6LY.

The site is located in Chislehurst, which is to the east of Bromley and approximately 25km from Central London. To the north of the site is Kemnal Park Cemetery and Memorial Gardens, to the southwest is Foxbury Manor and to the south and southeast are University College London Sports Ground and Chislehurst School for Girls respectively.

The site extends to 8.3 hectares and is accessed off Kemnal Road, which is privately owned.

This Statement describes the methodology used in assessing the development and has considered the following;

- minimise embodied carbon;
- operate with a circular economy;
- maximising the value extracted from materials; and,
- prioritising the reuse and recycling of materials.

The aim of circular economy is to create buildings that are high quality, flexible and pay attention to the building lifespan, through appropriate construction methods and the use of attractive, robust materials which weather and mature well.

Improve resource efficiency to keep products and materials at their highest value for as long as possible and promote waste avoidance and minimisation.

The report has been prepared by Ivan Ball of Bluesky Unlimited who are sustainability consultants.

2.0 Policy and Guidance

2.1 National Planning Policy Framework

The new National Planning Policy Framework (NPPF) was published in July 2021 and sets out the Government's planning policies for England. The NPPF provides a framework for achieving sustainable development, which is summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

The NPPF suggests the planning system has three overarching objectives, of which the environmental objective is;

'to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resource prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy'.

2.2 Regional Policy

The policy framework is provided by The London Plan, adopted in March 2021.

London Plan

Policy SI7 Reducing Waste and supporting the Circular Economy.

A Resource conservation, waste reduction, increases in material re-use and recycling, and reductions in waste going for disposal will be achieved by the Mayor, waste planning authorities and industry working in collaboration to:

1) promote a more circular economy that improves resource efficiency and innovation to keep products and materials at their highest use for as long as possible;

2) encourage waste minimisation and waste prevention through the reuse of materials and using fewer resources in the production and distribution of products;

3) ensure that there is zero biodegradable or recyclable waste to landfill by 2026.

4) meet or exceed the municipal waste recycling target of 65 per cent by 2030.

5) meet or exceed the targets for each of the following waste and material streams:

a) construction and demolition – 95 per cent reuse/recycling/recovery

b) excavation – 95 per cent beneficial use

6) design developments with adequate, flexible, and easily accessible storage space and collection systems that support, as a minimum, the separate collection of dry recyclables (at least card, paper, mixed plastics, metals, glass) and food.

B Referable applications should promote circular economy outcomes and aim to be net zero-waste. A Circular Economy Statement should be submitted, to demonstrate:

1) *how all materials arising from demolition and remediation works will be re-used and/or recycled.*
2) *how the proposal's design and construction will reduce material demands and enable building materials, components and products to be disassembled and re-used at the end of their useful life.*
3) *opportunities for managing as much waste as possible on site.*
4) *adequate and easily accessible storage space and collection systems to support recycling and re-use.*
5) *How much waste the proposal is expected to generate, and how and where the waste will be managed in accordance with the waste hierarchy.*
6) *How performance will be monitored and reported.*

C Development Plans that apply circular economy principles and set local lower thresholds for the application of Circular Economy Statements for development proposals are supported.

2.3 London Plan Guidance: Circular Economy Statements, published in March 2022

The Guidance explains how to prepare a Circular Economy Statement to comply with Policy SI 7, including the information that must be submitted under Policy SI 7(B). It also includes guidance on how the design of new buildings, and prioritising the reuse and retrofit of existing structures, can promote Circular Economy outcomes.

2.4 Other Guidance and Documents

- 'Designing for a Circularity - Primer' by GLA, October 2019.
- 'Circular Economy Guidance for Construction Clients' by UK Green Building Council (UKGBC), April 2019.
- 'Circular Economy in Cities: Project Guide' by Ellen Macarthur Foundation, March 2019.
- 'BS 8001:2017 – Framework for Implementing the Principles of the Circular Economy' by British Standards Institution, May 2017.

3.0 Targets

Short-term Targets – Demolition and Construction Phase

1. The contractor will commission a pre-demolition report.
2. In co-operation with a waste specialist, the contractor will estimate the predicted volumes of waste to achieve the minimum targets of 95% of construction and demolition waste to be reused, recycled and/or recovered and 95% of excavation waste to have a beneficial use.
3. In co-operation with a waste specialist, the contractor will define how demolition and remediation waste will be reused and/ or recycled, whether segregation and reprocessing will be performed on site or in material recovery facilities. Decide whether to crush hardcore materials on site and use them as aggregate, and whether to recycle any timber, plastics, plasterboard, insulation, ceramics and packaging for segregation and reprocess
4. The new house and extensions will follow the best practice principles with the intention of minimising waste first before reuse, recycling and disposal.
5. The contractor will monitor all excavation, construction and demolition waste.

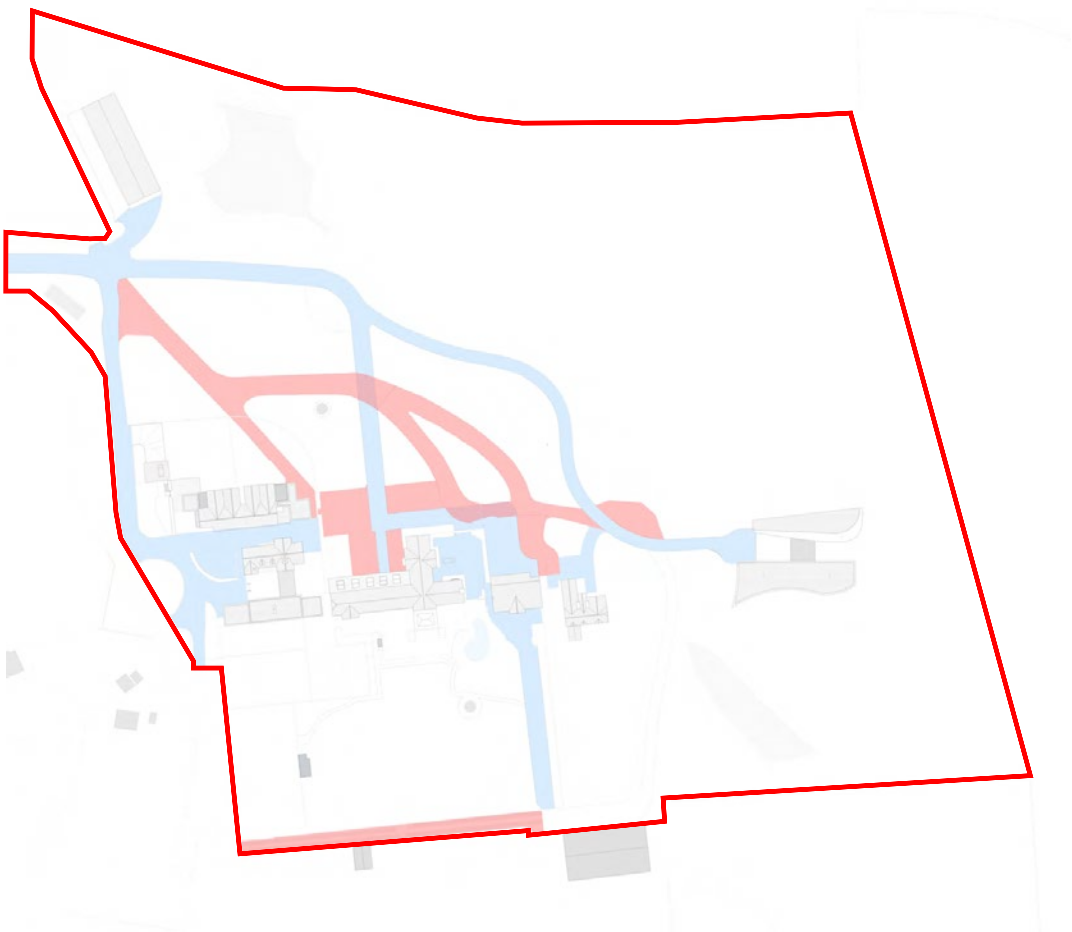
Medium-term Targets - Operational Phase

1. In co-operation with the design team, the contractor will ensure the provision of adequately designed and easily accessible storage spaces that provide the necessary equipment for the separate collection of dry recyclables and food. The waste hierarchy will be supported by the design and the location of bin stores.

4.0 Approach

The existing area of hardstanding on site is approximately 5,149 sqm. The overall masterplan for the site has been developed to rationalise the road infrastructure and therefore reduce the area of hardstanding.

The diagram below shows the proposed road network in blue and the demolished road network and hardstandings in red.



The proposed area of hardstanding is 4,015 sqm and therefore the reduction equates to 1,134 sqm, which is an overall reduction of 22%.

The proposal also includes reducing the area of built form across the site. The approach is therefore to demolish any inappropriate parts of the built form and to recycling any material where appropriate.

The materials from hardstandings and hard materials from buildings that is appropriate will be crushed and retained on site for reuse.

5.0 Principles

The principles employed in this Statement are as follows;

- Building in layers - ensuring that different parts of the new house are accessible and can be maintained and replaced where necessary;
- Designing out waste - ensuring that waste reduction is planned in from project inception to completion, including consideration of standardised components, modular build and re-use of secondary products and materials;
- Designing for longevity – creating the new house to meet defined long-term needs, while being durable, resilient or able to cope with environmental change. It will require little modification / no replacement of parts, due to its layout, generous proportions and proposed technologies;
- Designing for adaptability or flexibility – to meet the needs of the present but with consideration of how those needs might change in the future, and to enable change in the form of periodic remodelling and reconfiguration, including alterations or replacement of non-structural parts;
- Design for assembly, disassembly and recoverability – future proofing the new house by designing products and services to be assembled, deconstructed and reused or recycled on a part-by-part basis;
- Selecting materials - any new material specified in the development will aim to be low impact materials with little or no adverse effect on either the environment or on human health throughout its lifecycle. Recognise and encourage the use of recycled content and secondary aggregates, thereby reducing the demand for virgin material and optimising material efficiency in construction.

6.0 Site Specific Proposals

6.1 Designing Out Waste

Minimising Material Use

A design approach will be adopted that focuses on material resource efficiency so that less material is used in the design (lean design), and / or less waste is produced in the construction process, without compromising the design concept. For waste reduction, minimisation of excavation, simplification and standardisation of materials and components and dimensional co-ordination have been considered.

The development will aim to 'design out' waste through the consideration of material specification, such as maximising use of existing materials, and implement construction techniques that prevent and minimise waste generation.

When selecting and designing components the following will be applied where feasible:

- Design out the need for the component or material;
- Use reclaimed material over new and remanufactured components over new, where possible;
- Use products with labels such as Cradle to Cradle (C2C);
- Select products that can be remanufactured or reused at end of first life;
- Use materials with recycled content;
- Select products that are designed for disassembly;
- Select materials that can be recycled or composted at end of life; and,
- Consider leasing short lived components.

When applying the above, complete transparency and visibility throughout the supply chain will be encouraged. Early engagement with the contractor and partnering within the supply chain will be required.

Waste Hierarchy

The design team will use the Waste Hierarchy, to optimise reuse, recycling and recovery opportunities in order to minimise waste.

The contractor, once appointed, will be responsible for implementing the principles within the Waste Management Strategy and the Site Waste Management Plan (SWMP) during the construction phase of the development.

Estimated Waste from Construction

At the current stage of the project there is no detailed bill of quantities for materials. Therefore, assumptions on the likely quantity of waste to arise have been made based on the building use schedule, and using typical construction waste composition data (DEFRA, 2009). Therefore, estimations at present, do not account for measures that should be incorporated to reduce waste produced during construction, for example through design and procurement.

6.2 Reuse and Recovery

Site Analysis and Potential for Reuse

A site analysis including a pre-demolition audit will be carried out to determine opportunities for reusing existing materials and / or components. The existing materials (including hardstandings) on site will be reviewed to determine if they meet the required functionality of the new building design or externals.

Where no such opportunities exist, good practice measures will be taken in the demolition to ensure maximum recovery of materials through recycling. All elements from the deconstruction phase that cannot be reused on site will be sent to organisations for onward use where feasible.

Site Waste Management

A Waste Management Strategy will be prepared, which will confirm that the hierarchy of waste management will accord with national policy requirements. The waste management methods will include preparation for reuse and material recovery. The scale of the site does not lend itself to store large quantities of materials and 'just in time' deliveries will be scheduled.

A strategy should be put in place to minimise the space taken by storage of new materials. Frequently used items will be placed in easy to access areas, which will increase efficiency and minimise wastage due to damage.

Options also include using waste materials found on site and recycling / recovering them into an alternative form that can be used for any construction purposes (for example crushing concrete for road construction material). By recycling onsite, carbon emissions associated with the proposed development are also reduced, rather than materials being taken away from the site.

Reusable packing solutions with key product manufacturers will be explored at the earliest opportunity. Solutions may include flat pallets, bulk bags, steel stillages and returnable cable drums.

Operational Waste

Waste reduction during the operational phase will also been considered. The applicants will occupy the new house and are committed to a sustainable development where operational waste is minimised and recycling is maximised.

6.3 Whole Life Carbon and Material Resource Efficiency

End-of-life strategy had been considered in the initial design of the building and will continue to be considered as the design is developed.

A Whole Life Cycle Carbon Emissions (WLC) assessment has been produced by Bluesky Unlimited, with the aim to improve the overall environmental impact. The initial findings and early recommendations have been included in the standalone report in support of the planning application. Once a full detailed building model is available, a full WLC assessment will be undertaken.

6.4 Designing for Longevity

The proposed development seeks to design with durability and longevity in mind to ensure the built asset allows for challenging climatic conditions.

Vulnerable elements of the proposed development will be protected from damage. Protection measures will be incorporated to reduce damage to the building’s fabric or materials in case of accidental or malicious damage occurring. The proposed development will seek to incorporate measures to mitigate the impact of extreme weather conditions arising from climate change over the lifespan of the assets.

6.5 Design for Off-Site Construction

Offsite construction and manufacturing will also be considered, where feasible. The benefits of offsite factory production in the construction industry are well documented and include the potential to considerably reduce waste especially when factory manufactured elements and components are used extensively.

Its application also has the potential to significantly change the operations onsite, reducing the number of trades and site activities and changing the construction process into one of a rapid assembly of parts that can provide many environmental, commercial and social benefits, including:

- Reduced construction related transport movements;
- Improved workmanship quality and reducing on site errors and re-work, which themselves cause considerable on-site waste, delay and disruption; and,
- Reduced construction timescales and improved programmes.

6.6 Standardisation or Modularisation

The proposed development will consider designing and construction methods by applying, where feasible, standardised elements or modular designs for materials and products that enable a reduction in construction waste and easier reuse in next life.

Elements will seek to use standardised design formats to enable future reuse, e.g. reducing bespoke cutting of materials as this can make replacements difficult to obtain.

6.7 Designing for Assembly, Disassembly and Recoverability

A materials inventory will be created for the development, which will include a detailed breakdown of all the building elements and includes the constituents of each product and material and the ability for each material to be reused and/or recycled.

Where feasible, components that are likely to have a shorter lifespan will either be made of biological materials or designed to be returned to the manufacturer.

Unnecessary toxic treatments and finishes will be avoided where possible. In addition, finishes that can contaminate the substrate in a way that they are no longer reusable will be avoided unless they serve a specific purpose.

Consideration to designing the building systems and components in layers to enable the ability to remove, adjust or replace of some elements is feasible, particularly for areas where different components have different life spans and maintenance needs.

Materials will be fixed mechanically where feasible and use reversable fixings to allow for future reuse.

Permanent fixing of products, such as by glue and cement mortar, will be avoided where feasible, to enable end of life deconstruction and salvage of building elements. Fixings will be easily accessible, where possible, for disassembly.

No fixtures or fittings will be glued down wherever feasible to ease future disassembly and recovery.

6.8 Designing for Adaptability or Flexibility

The proposed development will seek to avoid unnecessary materials use, cost and disruption arising from the need for future adaptation works. These changes could be required as a result of changing functional demands and to maximise the ability to reclaim and reuse materials at final demolition in line with the principles of a circular economy.

Designing for adaptability and flexibility has been considered in the design to ensure the built asset can cope with a diversity of scenarios, e.g. flexible planning, location of cores and generous floor to ceiling heights. The proposed development has been designed to promote ease of access.

The development will seek to utilise zoning within the mechanical and electrical design to allow for future changes in layout.

7.0 Conclusion

The purpose of this Circular Economy statement is to demonstrate that the proposed development at Home Farm, Kemnal Road, Chislehurst has considered the circular economy principles to minimise embodied carbon and operate within a circular economy, maximising the value extracted from materials and prioritising the reuse and recycling of materials.

The statement has considered the following and is compliant with the planning policies:

- How demand for materials should be minimised;
- How secondary materials can be used;
- How new materials should be specified to enable their reuse;
- How construction waste should be minimised and how and where the waste will be managed in accordance with the waste hierarchy;
- How design and construction should enable building materials, components and products to be disassembled and re-used at the end of their useful life and
- Provision of storage space to support recycling and re-use.

Appendix 2 – Report from Ivan Ball – Bluesky Unlimited

Sustainability Summary Report
Ivan Ball – Bluesky Unlimited

Home Farm, Kemnal Road, Chislehurst

Enquiry date 30th July 2024

Ivan Ball – Bluesky Unlimited

I have a BSc in Building with a specialism in Residential Development from Nottingham Trent University (formally Trent Polytechnic), I am a Member of the Chartered Institute of Building and has successfully undertaken the professional examinations of the Royal Institution of Chartered Surveyors (Building Surveying).

In addition, I was a licenced Code for Sustainable Homes and an EcoHomes assessor until the schemes were revoked and I was also a BREEAM Domestic Refurbishment Assessor.

Experience

I have been in the development industry for the past 40 years and have worked with Charles Church, Cala and Laing Homes and from 1996 to 2006 was a Director of Linden Homes based in Caterham, Surrey. Initially as Technical Director and Design Director of the South East regional company from 2004 to 2006 I was Group Director of Sustainable Communities and developed the Group's policies on sustainability and energy.

From 1997 to 2006 I was also Project Director responsible for the development of the former Caterham Barracks, Surrey, from 2001-2006 of the former Queen Elizabeth Barracks, Guildford and 2003-2005 the former Holmethorpe Quarry, Surrey. The Caterham Barracks development is multi award winning including a European Planning Award and ODPM award for Sustainable Communities. Accolades also include site visits from both the (then) Duke of Edinburgh and King Charles (then the Prince of Wales).

As well as a good understanding of the technical issues relating to energy efficiency and renewable technologies, I also have considerable experience in developing mixed use, mixed tenure development schemes. I have been involved in the creation of three Community Development Trusts and was a Trustee for six years with the Caterham Barracks Community Trust.

I established Bluesky Unlimited in 2006, to provide sustainability and energy services to the development industry. During the past 18 years the business works on average on between 60-80 schemes per year ranging from one-off bespoke dwellings for individual clients to the company's largest scheme to date, for 1,000 dwellings and various community and commercial buildings.

Bluesky Unlimited were appointed by the applicants to prepare the Sustainability and Energy Statement, Whole Lifecycle Carbon Assessment and Circular Economy Statement for the proposed development at Home Farm, Kemnal Road, Chislehurst.

Statement of Truth

The report which I have prepared, as set out in this document, is true and has been prepared in accordance with normal practice. I confirm that the opinions expressed are mine, and are true and professional opinions, irrespective of by whom I am instructed.

Instructions

I am formally instructed by Mr Alan and Mrs Pauline Selby, who are the owners of the appeal site.

I was instructed to provide technical energy advice regarding installations at the appeal site to include the reconfiguration of existing development and the creation of a new dwelling (Vine House).

1.0 Summary

1.1 The key sustainability findings for the proposed development at Home Farm can be summarised as;

1.1.1 An exemplary new dwelling using best practice fabric standards and an innovative, potentially ground breaking method of storing energy for use in Vine House and potential other buildings in the fullness of time power;

1.1.2 100% reduction in carbon dioxide emissions of the new dwelling (Vine House) compared to the maximum permissible by the Building Regulations;

1.1.3 All heating to the dwellings will be provided by renewable technologies (GSHP to Vine House and ASHPs to Polo Mews and the Bothy);

1.1.4 The water use to each unit will achieve the enhanced standard required by the Building Regulations of 110 litres per person per day;

1.1.5 The impermeable area of the site will be reduced as a result of the reorganisation of the roadways;

1.1.6 High standards of environmental construction, including the development of a Site Waste Management Plan and other construction management principles;

1.1.7 Secured by Design principles will be followed;

1.1.8 All dwellings will be built in accordance with Part M4(1) of the Building Regulations. This requirement is applicable to the new dwelling (Vine House) only but will equally be applied to the existing reconfigured dwellings and provide them with better access for less able occupiers and visitors.

1.2 The sustainability and energy credentials of the development are not in dispute and the topic area does not form a reason for refusal.

1.3 A Whole Lifecycle Carbon Assessment and Circular Economy Statement have been prepared and form part of the application documentation. These are attached as Appendix 1 to the Proof of Evidence from James Dodson of HydroGenesis.

1.4 The proposal for the construction of the new dwelling (Vine House) includes the use of rammed earth walls. The material for these will be comprised of the arisings from other parts of the site and the intention is for no fill to need to be removed from the site.

2.0 Sustainability Proposals

2.1 The following section of this report considers the wider sustainability aspects of the proposal.

2.2 Climate Change

2.2.1 Peak run off rates will be less for the developed site than it was for the pre-development site;

2.2.2 In appropriate areas the use of porous surfaces will be implemented. The area of impermeable surfacing will be reduced as a result of the rationalisation of the road network within the site, which results in a reduction in surface water runoff. Currently surface water runoff from the Polo Mews area is discharged to a series of private combined sewers before discharging into the foul sewer network. The proposals include retrofitting SuDS and propose to incorporate a new dedicated surface water network for the Polo Mews area. All surface water will be attenuated and treated using SuDS (sustainable urban drainage systems). This includes the installation of a geo-cellular storage tank;

2.2.3 Green roofs will be installed in specific locations including to the roof of the new dwelling (Vine House).

2.3 Accessibility and Security

2.3.1 Whilst the site is privately owned and not generally accessible to the public there is an existing public right of way which runs north to south across the fields in the eastern part of the site. This right of way will be maintained and under the proposal will be bordered on both sides by the new vineyard. It is proposed to erect some information boards along the footpath explaining the development of the vineyard and develop an informal picnic area for the wider community at the southern end of the right of way together with a picnic shelter and a community meadow with fruit trees;

2.3.2 The existing homes and Vine House will be built in accordance with Part M4(1) of the Building Regulations**.** This requirement is applicable to the new dwelling (Vine House) only but will equally be applied to the existing reconfigured dwellings and provide them with better access for less able occupiers and visitors;

2.3.3 Secured by Design principles will be followed. The Designing Out Crime Officer has confirmed he will not be requesting a SBD condition but has confirmed he is able to work with the applicant at the detailed design stage to advise on how best to apply SBD principles.

2.4 Resources

2.4.1 The proposals will target 90% of demolition material to be recycled (by volume) and reused on site where feasible;

2.4.2 All materials in buildings will be A+, A or B rated according to The Green Guide to Specification, unless deemed impractical or otherwise prescribed. The Green Guide to Specification is published by the Building Research Establishment (BRE) and assesses building materials and components in terms of their environmental impact across their entire life cycle – from 'cradle to grave'. The data is set out as an A+ to E ranking system, where A+ represents the best environmental performance/ least environmental impact;

2.4.3 All insulation materials will have zero-ozone depleting potential;

2.4.4 All timber for basic construction elements will be obtained from appropriately certified legal sources. In addition, 80% of the total timber used within the buildings will be procured from sustainably certified forests. This does not mean 20% will come from unsustainable sources but rather than the supplier of some components may not be able to provide appropriate certification for every item.

2.5 Buildings

2.5.1 The design of the extensions to the existing dwellings and the design of the new dwelling (Vine House) minimises the northerly aspects and maximises the windows openings towards the south. The size of the openings has been optimised to balance winter solar gain with summer overheating;

2.5.2 The new dwelling (Vine House) will achieve fabric efficiency standards currently representing 'best practice' including the installation of triple-glazed windows and doors;

2.5.3 The new dwelling will use electricity either generated by photovoltaic panels or through the hydrogen fuel cell. The new house will therefore achieve **REAL ZERO CARBON** for regulated emissions. Real zero carbon produces no emissions whereas net zero simply cancels out emissions. Any buildings drawing electricity from the Grid will be producing emissions because the Grid currently uses fossils fuels to generate approximately 58% of its electricity (2022);

2.5.4 It is anticipated that the HydroGenesis system can be rolled out at some future time to provide clean, zero emissions electricity to the existing buildings;

2.5.5 The new dwelling (Vine House) will benefit from a ground source heat pump, which will provide all space heating and hot water to the house;

2.5.6 All white goods will achieve the highest energy efficiency rating for the appliance in question;

2.5.7 100% of internal lighting is to be energy efficient;

2.5.8 The completed building fabric for the new dwelling will to achieve air leakage rates of no greater than 3.0 $m^3/hr/m^2$;

2.5.9 Sanitary fittings will be selected that minimise the consumption of mains water and all dwellings will achieve a water efficiency target of 110 l/p/d.

2.6 Construction Process and Site Management

2.6.1 Waste arising from site will be monitored and segregated into at least five waste streams for recycling throughout the construction period;

2.6.2 All temporary timber (site hoardings, formwork, and scaffold boards) will be from FSC, CSA, SFI or PEFC sources, or re-used timber.

Ivan Ball