

Planning Comment Response Summary

71-73 Caversham Road Reading

Prepared for
S2 Caversham Ltd
19/12/2022

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1. INTRODUCTION

- 1.1 MEP Concepts is a dynamic building services, energy, and sustainability consultancy, dedicated to providing strategic and technical advice to clients through all phases of planning and development.
- 1.2 MEP Concepts has been appointed by S2 Caversham Ltd (the applicant) to prepare supplementary details to support their planning application associated with the new commercial and residential block located at 71-73 Caversham Road.
- 1.3 The key comments from the Element Energy review the report aims to address are the following:
 - Demonstrate compliance with Part L 2021 requirements;
 - Provide further details of Heating and Domestic hot water strategy to support the application of heat pumps on the scheme.
 - Detail provisions allowed for to enable potential connection to any future DHN.
 - Explore opportunities to incorporate closed-loop GSHP
- 1.4 MEP Concepts have carried out SAP and SBEM calculations using latest 2021 software to show compliance. This has been completed in TAS versions 9.5.4 for the commercial element and SAP 10 version 1.0.7.2.
- 1.5 MEP Concepts have additionally prepared a Stage 2 plant room layout detail with equipment and plant space allowance for future district heating network connection, a roof top plant layout showing a space provision for the proposed the ASHP and PV solution.
- 1.6 Any changes in specification required to achieve compliance with the Part L 2021 regulation over those identified in the submitted Energy Strategy produced by Hoare Lee, have been highlighted for incorporation into the final scheme strategy.

2. SITE DESCRIPTION

- 2.1 The 71-73 Caversham Rd development consists of a mixture of residential and commercial units. The commercial unit is located on the ground floor with 6 stories of residential apartments with a total of 29 apartments.
- 2.2 The site includes existing buildings to the left as show in the ground floor layout, figure 2.1 below. This is separated from the proposed new building by the a loading bay and car park area.

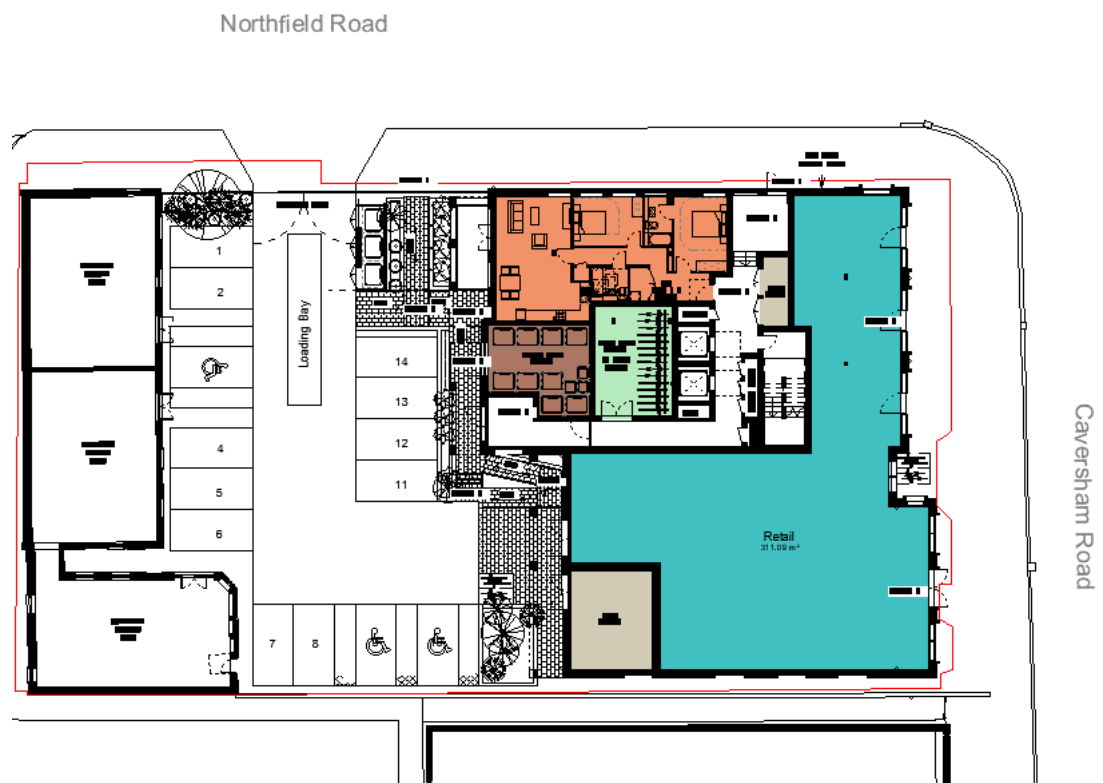


Figure 2.1 Ground Floor Layout

Drawing List

- 2.3 The calculations and analysis presented within this report have been based on the following architectural plans produced by JTP Studios.

Drawing No.	Drawing Name	Revision
01662_JTP_MP_PL_1102_	Ground Floor Plan	P3
01662_JTP_MP_PL_1103_	First Floor Plan	P3
01662_JTP_MP_PL_1104_	Second Floor Plan	P3
01662_JTP_MP_PL_1105_	Third Floor Plan	P2
01662_JTP_MP_PL_1106_	Fourth Floor Plan	P2
01662_JTP_MP_PL_1107_	Fifth Floor Plan	P2
01662_JTP_MP_EL_1206_	North Elevation	P3
01662_JTP_MP_EL_1207_	South Elevation	P3
01662_JTP_MP_EL_1208_	East Elevation	P2
01662_JTP_MP_EL_1209_	West Elevation	P2
01662_JTP_MP_EL_1210_	West Courtyard Elevation	P3
01662_JTP_MP_EL_1211_	East Courtyard Elevation	P2
01662_JTP_MP_EL_1213_	North Courtyard Elevation	P1
01662_JTP_MP_EL_1214_	South Courtyard Elevation	P1
01662_JTP_MP_SE_1300_	Section AA	P1
01662_JTP_MP_SE_1301_	Section BB	P2
01662_JTP_MP_SE_1302_	Section BB	P1

- 2.4 A block compliance method has been utilised to show compliance for the domestic proportion of the scheme, a breakdown of the unit types can be seen on the following list.

Unit Breakdown

Type	Area	Multiplier	Total Area
2B4P - GF	87	1	87
3B5P - MF	89.87	1	89.87
1B2P - MF	52.2	18	939.6
1B2P - MF/EF	51.99	1	51.99
2B4P - MF	74.86	2	149.72
2B4P - TF	74.86	2	149.72
1B2P - TF	52.2	4	208.8

3. BUILDING FABRIC

- 3.1 To achieve compliance against the 2021 building regulations, a number of the building fabric efficiencies have been improved over those identified in the submitted energy statement produced by Hoare Lee. These improvements will increase the level of anticipated savings identified in the aforementioned report over the Part L 2013 building regulations.
- 3.2 The following summarises the fabric performance used within the calculations noting where improvements over the submitted strategy have been made.

Domestic Fabric Performance

Element	U-Values (W/m ² .K)	Comment
External Wall	0.15	-
Ground Floor	0.11	Improved from 0.13
External Roof	0.11	Improved from 0.12
Glazing	1.2	Improved from 1.4 (G-value of 0.5)
Entrance Doors	2.2	-

Air Permeability Rate
3 m ³ /h.m2 @50 Pa

ACD's	Minimum PSI Value
E2 Lintel	(0.3 Ψ)
E3 Sill	(0.04Ψ)
E4 Jamb	(0.05 Ψ)
E5 Ground Floor	(0.16 Ψ)
E7 Party Floor within block of flats	(0.07)
E9 Balcony Between Dwellings	(0.07)
E10 Eaves (insulation at ceiling)	(0.06 Ψ)
E11 Eaves (insulation at rafter level)	(0.075 Ψ)
E12 Gable (insulation at ceiling)	(0.24 Ψ)
E13 Gable (Insulation at rafter level)	(0.24 Ψ)
E14 Flat Roof	(0.08 Ψ)
E16 Corner	(0.09 Ψ)
E17 Inverted Corner	(0.0 Ψ)
E18 Party Wall	(0.12 Ψ)
E20 Exposed Floor (normal)	(0.16 Ψ)
E21 Exposed Floor (inverted)	(0.16)

Fabric Efficiency

- 3.3 The following table highlights the dwellings fabric emissions measured against the notional target.

Total Area (m ²)	Total Target Fabric Emissions (kWh/yr.)	Total Dwelling Fabric Emissions (kWh/yr.)	% Improvement
1676.7	50906.5	50403	1%

Non-Domestic Fabric Performance

Element	U-Values (W/m ² .K)	Comment
External Wall	0.2	-
Ground Floor	0.15	-
External Roof	-	-
Glazing	1.6	(G-value of 0.5)
Entrance Doors	1.6	-

Air Permeability Rate
3 m ³ /h.m2 @50 Pa

- 3.4 Accredited Construction Details (ACD's) have been applied to the commercial assessment; these have been applied as default values.

4. HVAC AND LIGHTING SYSTEM

4.1 This section summarises the regulated services included within the schemes strategy.

Heating Plant

System Ref	Description	Efficiency	Controls / Comments
Domestic Heating	Community Air Source Heat Pump	300%	Flat rate charging, Programmer and TRV's
Non-Domestic Heating	Air Source Heat Pump	400%	Parallel

Hot Water Plant

System Ref	Description	Efficiency	Controls / Comments
Domestic Hot Water	Community Air Source Heat Pump (ASHP)	300%	Insulated primary pipework, water heating timed separately, summer immersion.
Non-Domestic	Direct Electric	100%	Parallel

Cooling Plant

System Ref	Description	Efficiency	Controls / Comments
Non-Domestic	Air Source Heat Pump	500%	Parallel

Ventilation Plant

System Ref	Description	Efficiency (Specific Fan Power)	Controls / Comments
Domestic Ventilation	Mechanical Ventilation Heat Recovery (MVHR)	1 Wet Room - 0.47 W. l/s 2 Wet Room - 0.5 W. l/s	-
Non-Domestic	Mechanical Ventilation Heat Recovery (MVHR)	1.6 W. l/s	-

Lighting

System Ref	Description	Power (W)	Efficiency (Lamp Lumens/Circuit Watt)	Controls / Comments
Domestic Lighting	LED Lighting	10	75	Manual Switching
Non-Domestic (Main Lighting)	LED Lighting	-	110	Manual Switching
Non-Domestic (Display Lighting)	LED Lighting	-	95	Manual Switching

Power Factor Correction

Power Factor Correction	Area Served
<0.9	Non-Domestic
N/A	Domestic

5. GSHP TECHNOLOGY

- 5.1 The energy statement review undertaken by Element Energy on the 28th of October 2022 requested that further investigation into the use of GSHP on the scheme. As part of the Energy Strategy submitted by Hoare Lea, a feasibility assessment was undertaken which concluded the following:
- 5.2 *While GSHP typically offer better efficiencies than ASHP, the capacity will be limited by the number and depth of the boreholes. Additionally, an annual balance between heating and cooling demand is generally recommended in order to 'recharge' the ground in the summer by pumping heat back to the ground when the heat pumps are running in cooling mode.*
- 5.3 *Installation of a ground energy system would require a high capital cost and would have an impact on the construction programme. The lack of a cooling demand to provide adequate recharge serves as an additional barrier to the implementation of GSHP on this scheme. For these reasons, this technology has not been proposed for the scheme.*
- 5.4 This document aims to provide further clarity on the feasibility of the inclusion of GSHP solutions on the proposed site. The following available solutions have been reviewed in regards to its technical viability:
- Closed Loop;
 - Standing Column (Closed Loop).
- 5.5 Provisional heating, hot water and cooling loads have been generated to allow an estimate of the number of boreholes needed for each option to be assessed. The following assessments and conclusions have been based upon the preliminary heating loads and typical GSHP capacities in areas with favourable ground conditions.
- 5.6 A typical closed loop borehole system goes through numerous design iterations as the scheme is refined and the detailed input parameters become available. As schemes are implemented the design work continues throughout the installation phase so that the actual geology confirmed by drilling can be taken into account.
- 5.7 Commonly, thermal response testing is completed on representative boreholes. Lab testing of grout samples and in-situ measurements of the ground temperature all allow the models to be calibrated, allowing the design to be refined.
- 5.8 This preliminary design is based on an early estimate of the heating, domestic hot water and cooling loads predicted for the scheme and provides an outline of the likely scale and nature of a closed loop GSH&C borehole scheme.

Closed Loop Systems

- 5.9 Multiple boreholes drilled to a depth and in an array design to maximise the heat recovery and rejection of heat without dropping fluid temperatures below -3 degrees centigrade or exceeding 25 degrees centigrade [typical ranges]. Within the boreholes a pair of 40mm plastic pipes are installed joined by a u-bend at the base which transmit a glycol based carrier fluid up and down boreholes. The boreholes are backfilled with a low permeability grout designed

to prevent groundwater movement up/down boreholes, to maximise the movement of warmth into/out of the loops and to contain any minor leaks from the loops.

- 5.10 The preliminary closed loop borehole design indicates around 47 closed loop boreholes drilled to 200 metres depth, spaced 10 metres apart could be needed to service the anticipated heating and hot water load of circa 400kW.
- 5.11 Based on figure 5.1 below which illustrates that the maximum no. of boreholes that could be incorporated into the foot print of the scheme, including within the proposed building footprint which and further technical complications, is circa 15.

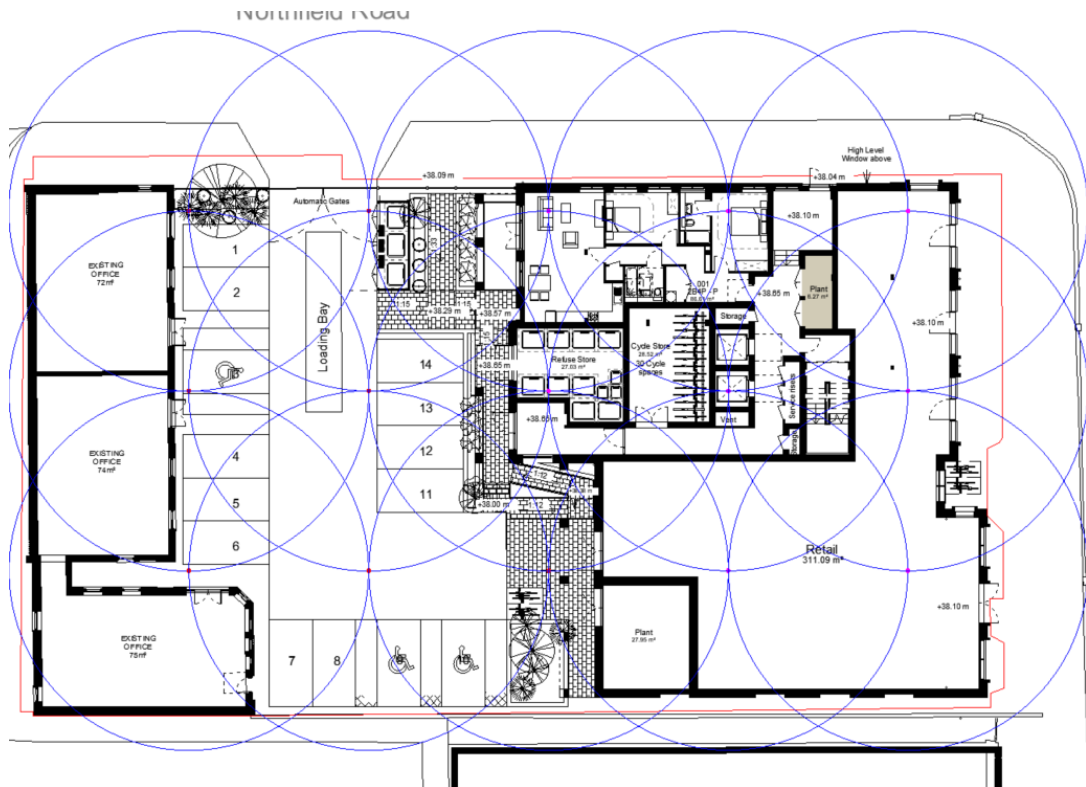


Figure 5.1 Illustration of potential bore hole locations for closed loop array

- 5.12 With the space constraints of the site, it is not possible to incorporate the necessary no. of borehole to meet the full heating and domestic hot water requirements. While there is the option of introducing GSHP to provide part of the heating/hot water requirement this would complicate the heating installation and associated controls which has the potential to lead to issues with controllability and efficiency of the scheme as a result.

Standing Column Systems

- 5.13 Standing columns are similar to closed loop boreholes whereby a glycol based fluid is circulate up and down boreholes [number arrived at to meet the heat recovery/rejection needs of the scheme]. The difference is each borehole is lined with normally a welded, water-tight, steel tube from top to bottom that contains the fluid. A conductor or injection pipe extends down the middle of the steel tube drawing or injecting water in/out of the borehole. No fluid is lost

or drawn from the environment, thus it is a 'closed loop' variant; the steel pipe acts as a heat exchanger with the ground.

- 5.14 The preliminary standing column borehole design indicates around 13 boreholes drilled to 175 metres depth, spaced 20 metres apart could be needed to service the anticipated heating and hot water load of circa 400kW.
- 5.15 Based on figure 5.2 below which illustrates that the maximum no. of boreholes that could be incorporated into the foot print of the scheme, including within the proposed building footprint which and further technical complications, is circa 6.

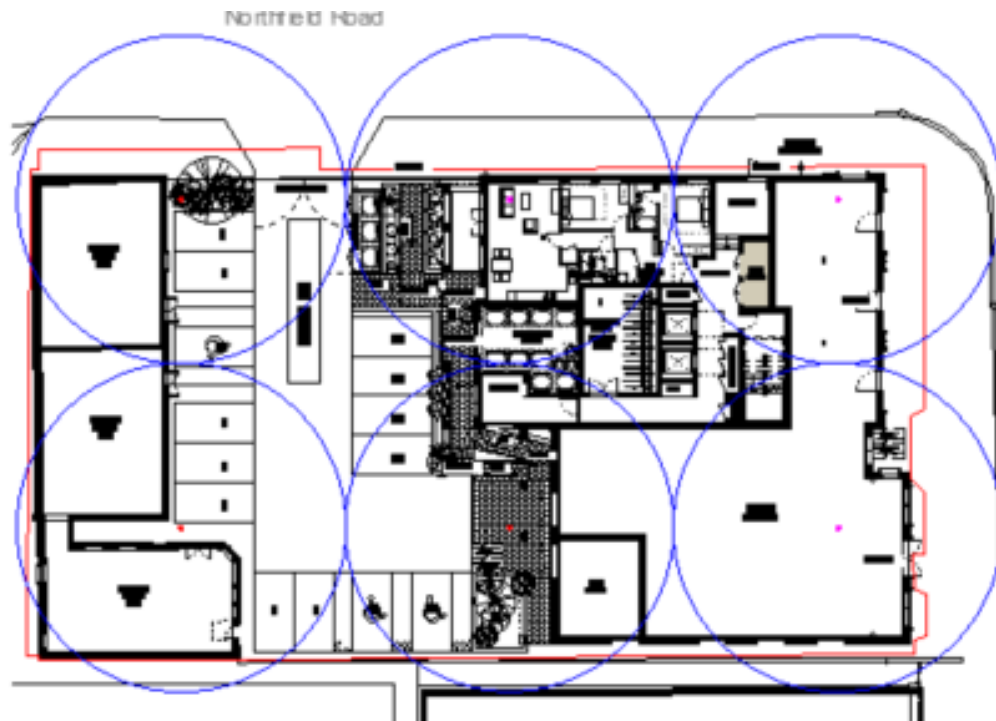


Figure 5.2 Illustration of potential bore hole locations for standing column array

- 5.16 With the space constraints of the site, it is not possible to incorporate the necessary no. of borehole to meet the full heating and domestic hot water requirements.

Summary

- 5.17 Based on the preliminary loads identified for the scheme the incorporate of GSHP would be technically unviable due to the limited footprint of the scheme. Where more detailed load assessments or incorporation of cooling to the scheme occurs the viability may change however it is noted that this is unlikely to significantly change the overall viability.

6. BUILDING REGULATIONS COMPLIANCE

- 6.1 Following the inclusions of all fabrics and system efficiencies stated, the associated dwelling emissions and primary energy can be seen in the following tables. This shows a compliance against 2021 building regulations, with a 54% improvement for domestic, and a 0.3% improvement on the non-domestic portion of the development.

Domestic Emissions & Primary Energy

- 6.2 The following demonstrates the block compliance for the domestic proportion of the scheme in line with the SAP assessment guidance for residential blocks. It is noted that whilst a number of units do not meet the target criteria, as demonstrated in the associated SAP worksheet, when assessed as a whole building, compliance is achieved.

Total Area (m ²)	Total Target Emissions (Kg CO ₂ /Annum)	Total Dwelling Emissions (Kg CO ₂ /Annum)	% Improvement
1676.7	14242.50	6587.01	54%

Total Area (m ²)	Total Target Primary Energy (kWh/annum)	Total Dwelling Primary Energy (kWh/annum)	% Improvement
1676.7	30194.22	30009.78	1%

Non-Domestic Emissions & Primary Energy

Total Area (m ²)	Total Target Emissions (Kg CO ₂ /Annum)	Total Dwelling Emissions (Kg CO ₂ /Annum)	% Improvement
324	1,150.2	1,146.96	0.3%

Total Area (m ²)	Total Target Primary Energy (kWh/annum)	Total Dwelling Primary Energy (kWh/annum)	% Improvement
324	12,655.44	12,531.84	1%

Site Wide Emissions & Primary Energy

Total Area (m ²)	Total Target Emissions (Kg CO ₂ /Annum)	Total Dwelling Emissions (Kg CO ₂ /Annum)	% Improvement
2,000.7	15,392.7	7,733.97	50%

Total Area (m ²)	Total Target Primary Energy (kWh/annum)	Total Dwelling Primary Energy (kWh/annum)	% Improvement
2,000.7	42,849.66	42,541.62	1%

APPENDIX I – MEP PLANT LOCATIONS

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P22978.MEP.001 - MEP Plant Locations – Ground Floor Layout	18