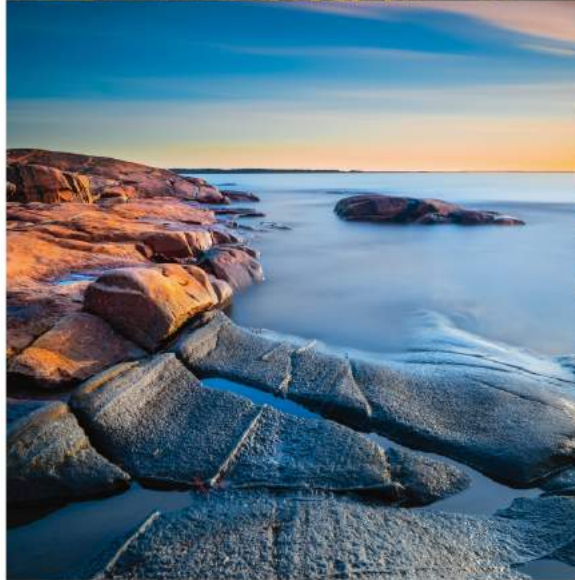




NIBE ENERGY SYSTEMS

Ground Source Heat Pump Proposal Huddersfield Giants

Proposal

Huddersfield Giants training facility to be provided with heating and hot water by a NIBE ground source heat pump system.

Key points to consider:

- Products
- Heating and hot water loads
- Ground conditions
- Mechanical installation
- Non-Domestic Renewable Heat Incentive

NIBE F1345 GSHP

24kW, 30kW, 40kW, 60kW - three phase

SCOP 4.6 – 5.0 @ EN 14825

Sound pressure level 1m 27 – 28dbA @ EN 11203

Twin Compressor – redundancy

NIBE Uplink compatible

Cascade options

Integral components

Brine & heating pumps 24kW & 30kW – variable speed PWM signal

Soft start

Control module inc programmer

Included with F1345

Indoor, outdoor, flow & return sensors

Particle filters

Brine pumps 40kW & 60kW supplied loose– variable speed PWM signal



 **NIBE**

NIBE F1345 GSHP

Dimensions 600x600x1800mm

Weight: 325-360kg (complete)

Without modules: 65kgs

Improved pipe connections

2" BSP Threaded connections

No need for flexi pipes on external side

Minimised risk of pipe damage

Separated brine connections



NIBE

NIBE VPB Hot Water Cylinders

NIBE VPB is a range of efficient water heaters designed for connection to several different heat sources including solar panels, a heat pump, gas or oil boiler

All three sizes are suitable for buildings with high hot water demand

To accommodate the needs of larger buildings, they can be connected in a series

The water heater is equipped with a copper finned coil (or two finned coils in the case of NIBE VPB 1000)

NIBE VPB water heaters are prepared for the use of immersion heaters

The water tank consists of a steel vessel, lined with copper corrosion protection

Insulation of polyurethane

Volume: 500, 750, 1000 litres



Heating Loads

Building m² – 1,600m

Estimated average heat loss 30W/m²

Peak heating load estimate – 48kW

Large gym area with minimal heating load (cooling requirement could be supplemented by a GSHP).

Large building with mixed use – detailed room by room analysis required to establish final heating load in kW and kWh.

Hot Water Loads

Hot water load based on 80 people showering over a short period four times per week.

80 people taking a 10L per minute shower for 5 minutes is 4,000L of hot water.

80 people taking a 10L per minute shower for 10 minutes is 8,000L of hot water.

TIME TAKEN TO HEAT CYLINDER	
CYLINDER CAPACITY	5000 ltrs
SPECIFIC HEAT CAPACITY	4.187 kJ/kg
TARGET TEMPERATURE	55 °C
INCOMING WATER TEMPERATURE	10 °C
HEAT SOURCE POWER	60 kW
EFFICIENCY	0.9
TIME TAKEN	291 minutes

Heating and Hot Water Loads



INSTALLER
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SUMMARY

Together, we have gone through the building conditions in order to select and size the most efficient heat pump solution based on your circumstances. The calculations are based on both facts and assumptions which means that small deviations from the final installation can occur.

Please give me a call if you have further questions or visit www.nibe.se to find out more about NIBE's heat pump solutions.

Best Regards

Neil Hope
NIBE UK

NIBE DIM SUMMARY

BUILDING PERFORMANCE

Energy need for heating	207630 kWh/year
- of which is hotwater	101628 kWh/year
Maintenance energy	2515 kWh/year
Power demand	59.6 kW

AFTER HEATPUMP INSTALLED

Energy to purchase	60607 kWh/year
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SAVINGS

Energy savings	149538 kWh/year
CO ₂ savings	13323 kg/year

CLIMATE CONDITIONS

Annual mean temperature	10.0 °C
Design outdoor temperature	-3.5 °C

BUILDING CONDITIONS

Room temperature	21.0 °C
Heating need stops at	15.5 °C
Supply temperature at DOT	45 °C
Return temperature at DOT	35 °C

2XNIBE F1345-60

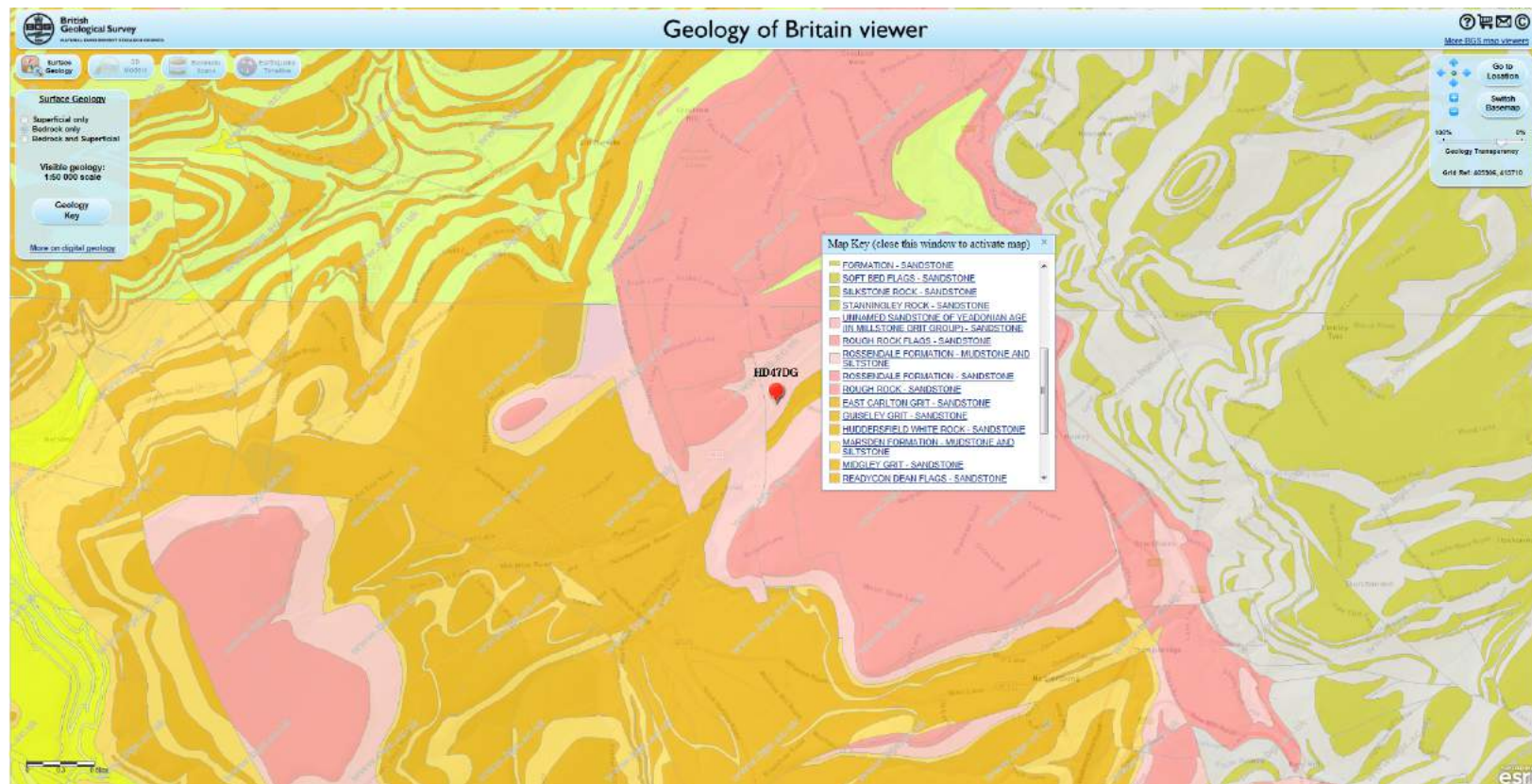
NIBE F1345-60	2 pcs
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HEATPUMP PERFORMANCE WITH 2XNIBE F1345-60

Energy delivered	207630 kWh/year
Energy supplied	59601 kWh/year
Supplementary energy, net	0 kWh/year
Supplementary energy, total	0 kWh/year
Energy for heating circulation pump	1006 kWh/year
Hotwater not produced by heatpump	0 kWh/year
Energy coverage	100 %
Annual heating factor, net	3.5
Annual heating factor, total	3.4
Fixed or floating condensing	Floating
Heat capacity at DOT	59.6 kW
Power input at DOT	16.1 kW
Recommended supplementary power	0.0 kW
Power coverage	100 %



Ground Conditions - Boreholes



Ground Conditions - Boreholes

ROCK COLLECTOR

Active borehole depth	2012	m
Specific energy extraction	75	kWh/m
Specific power extraction	42	W/m
Lambda rock	2.3	W/mK
Incoming brine temperature, mean	2.0	°C

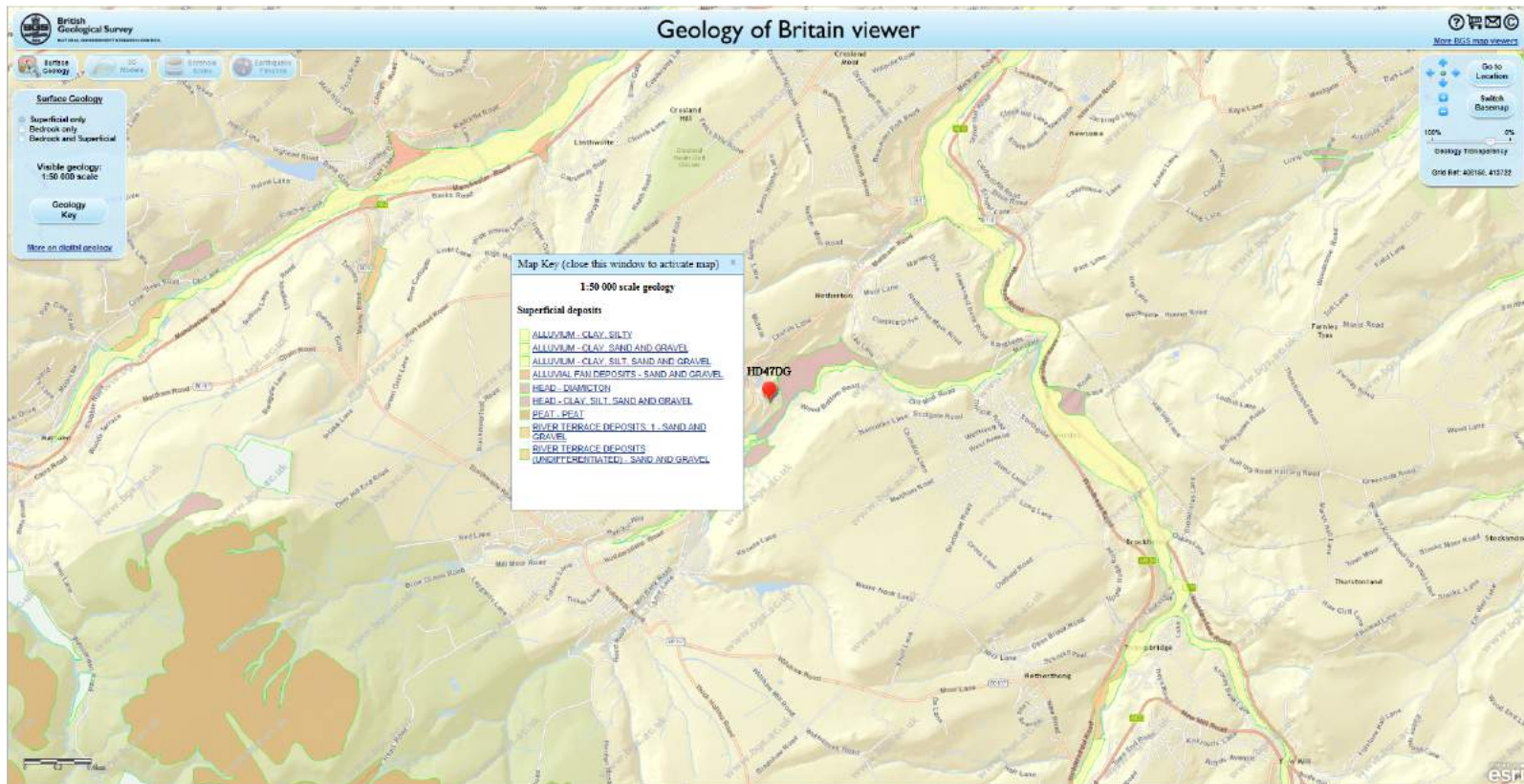
BGS viewer indicates a mix of sandstone and mudstone. Thermal conductivity of 2.3W/mK assumed as per MIS 3005 Appendix C

APPENDIX C: Values for thermal conductivity

Table C1

	Type of rock	Thermal conductivity (/W/mK)		
		Min	Max	Recommended
Unconsolidated rock	Sand, dry	0.3	0.8	0.4
	Gravel, dry	0.4	0.5	0.4
	Peat, soft lignite	0.2	0.7	0.4
	Clay/silt, dry	0.4	1.0	0.5
	Clay/silt, water saturated	0.9	2.3	1.7
	Gravel, water saturated	1.6	2.0	1.8
	Claystone, siltstone	1.1	3.5	2.2
	Sand, water saturated	1.5	4.0	2.4
Solid Sediments	Hard coal	0.3	0.6	0.4
	Gypsum	1.3	2.8	1.6
	Marl	1.5	3.5	2.1
	Sandstone	1.3	5.1	2.3
	Conglomerates	1.3	5.1	2.3
	Limestone	2.5	4.0	2.8
	Dolomite	2.8	4.3	3.2
	Anhydrite	1.5	7.7	4.1
	Salt	5.3	6.4	5.4

Ground Conditions – Horizontal Array



Ground Conditions – Horizontal Array

SURFACE SOIL COLLECTOR

Hose length	5287 m
Specific energy extraction	29 kWh/m
Specific power extraction	17 W/m
Thermal conductivity, soil	1.7 W/mK
Incoming brine temperature, mean	3.0 °C

BGS viewer does not specify exact soil type but nearby indicates a mix of clay, silt, sand and gravel. Thermal conductivity of 1.7W/mK assumed as per MIS 3005 Appendix C

APPENDIX C: Values for thermal conductivity

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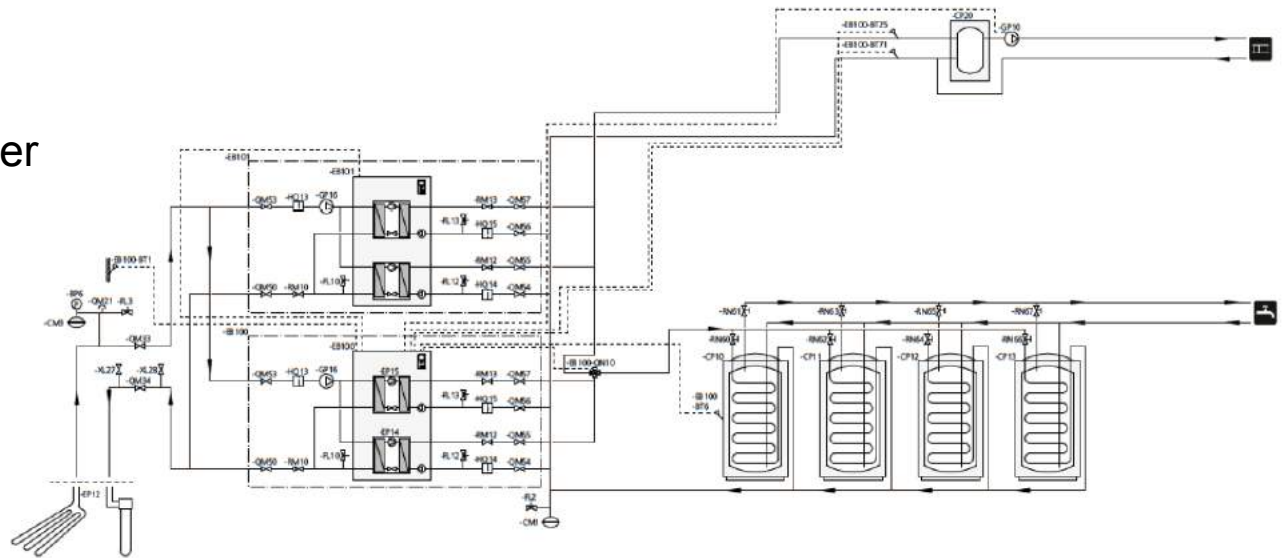
Mechanical Installation

2x F1345 60kW GSHP providing heating and hot water

1x F1345 60kW dedicated to hot water production

1x F1345 60kW dedicated to heating

Both available for heating once hot water satisfied.



Mechanical Installation – Cooling Option

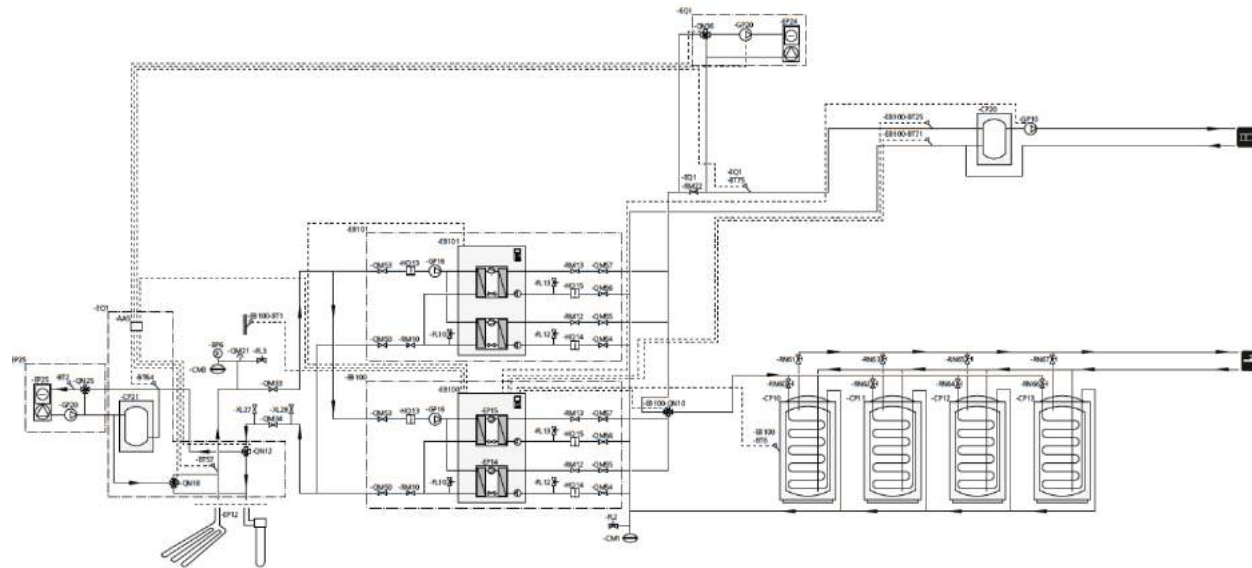
2x F1345 60kW GSHP providing heating and hot water

1x F1345 60kW dedicated to hot water production

1x F1345 60kW dedicated to heating

Both available for heating once hot water satisfied.

Active cooling possible using compressors and cold circuit in borehole



Non-Domestic Renewable Heat Incentive

<https://www.ofgem.gov.uk/environmental-programmes/non-domestic-renewable-heat-incentive-rhi>

- You must be the owner of the installation, or where there are several owners you must have permission to act for the other owners.
- The plant must be an eligible renewable heat technology type and size.
- No public grants can be used to fund any part of the installation unless it has been repaid (see our Guidance for the exceptions to this).

Non-Domestic Renewable Heat Incentive

Tariffs

Water/Ground-source heat pumps	Ground-source heat pumps & Water-source heat pumps	All capacities Tier 1	8.95 p/kWh
		All capacities Tier 2	2.67 p/kWh

Payments

Payments paid quarterly over 20 year period based on metered heat generated.

Non-Domestic Renewable Heat Incentive

Example Calculation - 120kW system (Quarter One)

Worked Example F (using standard metering Calculation 1):

System type: Ground Source Heat Pump Capacity 120 kWth

Tariff rate as of July 2016: Tier 1 - £0.0895. (8.95 pence)

Tier 2 - £0.0267 (2.67 pence)

Tier threshold = 1,314 hours x 120 kWth = 157,680 kWth

Quarter One

Submitted data: amount of heat generated by eligible installation in quarter = 44,500 kWth

In this quarter the Heat Generated by the Eligible Installation (kWth) [HGBI] is all below the tier threshold, so the Tier1 tariff applies to the entire output.

Payment = Tariff Level x (HGBI) = 0.0895 x 44,500 = £3,982.75



ENERGY FOR LIFE

