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FACILITIES MANAGEMENT LTD

Environment Agency
Lutra House
Dodd Way Off Seedlee Road
Walton Summit Centre
Bamber Bridge
Preston PR5 8BX

9 January 2023

Dear Sir

Heat Network at Hillhouse Enterprise Zone

We write in support of the effort and commitment shown by Sesona Ltd in seeking to progress the development of an Energy Recovery Centre (ERC) at Hillhouse International Business Park. The ERC project has a secured local electricity grid connection with the district network operator, but also offers the opportunity for a heat network to serve the existing commercial users at Hillhouse International Business Park.

In conjunction with Wyre Council Economic Development Team and Lancashire Enterprise Partnerships, NPL Group are driving forward the regeneration of the Hillhouse International business park in line with the agreed master plan.

Hillhouse International business park became an Enterprise Zone (EZ) in 2016, designated by Central Government, with the ambition of growing employment on the site from the current 1,650 jobs to over 3,000 by 2035. The EZ offers a key strategic growth area for the county of Lancashire with unrivalled space and scale which is ideally situated for an ERC.

Within the vicinity of Sesona's ERC are multiple users of heat. At this early stage of development there is a continued commitment between parties, including Vitrex PLC and AGC Chemicals Europe Ltd to continue dialogue. Conclusions have identified that the heat generated from the ERC could provide a source of energy for local users. However, due to the consenting and construction timescales, this letter of intent is a reasonable commitment to make until further certainty of the project is delivered.

If planning permission and Environment Agency permits are granted, we understand that the new facility can be constructed to be CHP-enabled, meaning the ERC will include all necessary heat export infrastructure within the site boundary of the new facility. This would enable the construction of a heat network in a straightforward manner to offtake users.

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To realise the opportunity, NPL and Sesona will continue close communication with commercial users to progress the assessment of heat offtake opportunities within Hillhouse EZ and where appropriate, action to enable delivery. Clearly having heat sources within the vicinity of planned NPL development would provide opportunities for the provision of a low-carbon heat network.

This letter is a demonstration of our ongoing support and commitment to the collective goal of developing a heat network in the NPL enterprise zone.

Yours faithfully

MARK O'BRIEN
Managing Director – Thornton Facilities Management
NPL Group Director

FICHTNER

Consulting Engineers Limited

Thornton Energy Recovery Centre

Sesona Hill House Ltd

CHP Assessment for EP Application

ENGINEERING + CONSULTING

Document approval

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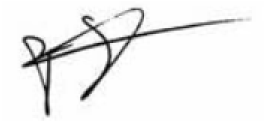
Checked by:	James Sturman		Lead Consultant	16/01/2023

Document revision record

Revision no	Date	Details of revisions	Prepared by	Checked by
0.0	22/12/2022	First issue to client	VBT	JRS
1	16/01/2023	Update Applicant details	VBT	JRS

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1 Introduction

1.1 Background

This combined heat and power (CHP) assessment has been undertaken to support the Environmental Permit (EP) application for the Thornton Energy Recovery Centre (the Facility). The Facility is being developed by Sesona Hill House Ltd (Sesona). The purpose of this CHP assessment is to identify potential heat users for heat generated from the Facility and assess the viability of implementing a CHP scheme.

The government's CHP strategy, as set out under Article 14 of the Energy Efficiency Directive, requires a cost-benefit analysis of CHP opportunities to be carried out for certain types of waste incineration and combustion facilities. Therefore, to demonstrate best available techniques with regards to energy efficiency, the Environment Agency's CHP-Ready Guidance requires the use of heat in a CHP arrangement to be assessed from a technical and economic perspective. It is a requirement of the Environmental Permitting Regulations that the Facility achieves the relevant Best Available Technique requirements for the export of heat to local users.

The Facility will be located at the Hillhouse Business Park, Thornton-Cleveleys, Lancashire, approximately 2.6 km east of Cleveleys, 2.9 km west of Stalmine, 3.9 km south of Fleetwood and 8.2 km northeast of Blackpool.

The Facility will comprise a twin-line waste incineration plant to incinerate pre-processed refuse derived fuel (RDF) / solid recovered fuel (SRF) (herein referred to collectively as 'RDF', for simplicity). Assuming a design NCV of 10.11 MJ/kg, the Facility will process approximately 100,000 tonnes of waste per year (at a design capacity of 6.33 tph per line, and assuming 7,900 hours availability). However, the Facility will be capable of processing waste with a range of NCVs. The maximum throughput for the Facility will be up to 120,000 tpa of RDF.

1.2 Objective

The principal objectives of this study are as follows.

1. Prepare a CHP Assessment in line with the Environment Agency (EA) guidance on cost-benefit assessment (CBA) for combustion installations, which will support an Environmental Permit (EP) application.
2. Provide a technical description of the proposed Facility and heat export infrastructure.
3. Calculate heat demands based on identified heat consumers and assess the feasibility of connecting identified heat consumers to the network.
4. Based on the heat loads anticipated for the outline solution identified, calculate relevant energy efficiency measures to demonstrate legislative compliance.
5. Produce a drawing of the provisional pipe routing from the Facility to the likely heat consumers.
6. Conduct an economic assessment feeding into the CBA as required under Article 14 of the Energy Efficiency Directive.
7. Produce a CHP-Ready Assessment as required under the EA CHP-Ready guidance, including a clear statement on best available techniques (BAT), combined heat and power (CHP) envelope and the CHP-Ready Assessment form.

2 Conclusions and Recommendations

2.1 Technical Solution

1. The Facility will have a gross electrical output of approximately 9.28 MW_e, (when operating in fully condensing mode), with a parasitic load of 1.5 MW_e. Therefore, the Facility will export approximately 7.8 MW_e to the local electricity distribution network.
2. Simultaneously, the Facility is designed with capability to export up to 20 MW_{th} of heat to local consumers. The maximum heat capacity will be subject to the demands of the heat consumers and confirmed during the detailed design stage.
3. Heat extraction from the Organic Rankine Cycle (ORC) turbine/generator set will be transferred to a closed hot water circuit via a series of condensing heat exchangers and supplied to consumers through a pre-insulated buried hot water pipeline network. Having delivered the heat, the water will be returned to the Facility for reheating, then recirculated. The technology for providing this heat network is well proven and highly efficient.
4. The Facility turbine design will be optimised to maximise electrical efficiency while allowing for the possibility of a heat export capacity of 20 MW_{th}. On this basis, the Facility will be able to supply the full heat network demand independently and therefore the heat consumers will be provided with a stable heat supply throughout the year.

2.2 Potential Heat Consumers

1. A review of the potential heat demand within a 15 km radius of the Facility has been undertaken in accordance with the requirements set out in section 2 of the Environment Agency's (EA) draft Article 14 guidance. Within this radius, physical constraints imposed by local infrastructure has a significant impact on the viability of consumer connection. There are a number of physical constraints (rivers and railways) which present significant challenges to exporting heat to certain heat users. Therefore, the identification of existing heat demands has focused on nearby industrial and commercial users. Connection of large consumers close to the Facility is generally more financially viable than exporting heat to multiple smaller consumers at further distances.
2. Heat consumers have been identified using publicly available data in the National Comprehensive Assessment, heat mapping tools and satellite imagery. Identified existing local heat consumers include many industrial estates located nearby surrounding the Facility.
3. To secure the most economically viable heat network, Fichtner has attempted to identify consumers that provide the maximum return and carbon savings for minimum cost. Acceptable consumers are assessed on the basis of the length of the physical pipe connection and associated complexity of connection routings. The following proposed developments have been considered as potential heat users in the identified heat network:
   a. Hillhouse Technology Enterprise Zone: The location of the Facility within Hillhouse Business Park, which is identified as an Enterprise Zone within the Wyre Local Plan (February 2019), provides an excellent opportunity for heat generated by the Facility to be used by new and existing businesses within the Business Park, located to the southeast of the town of Fleetwood and on the western banks of the River Wyre Estuary. The heat demand of the Hillhouse Technology Enterprise Zone is estimated to be 19,500 MWh per year.
   b. Visual assessment: Red Marsh Industrial Estate, Haven Cala Gran Holiday Park and Farmer Parrs Animal World have been identified from satellite imagery and aerial photography, as potential heat consumers surrounding the Facility. The estimated heat demand for these heat users is 8,712 MWh per year.

2.3 Heat Network Profile

1. The heat demand of preferred heat consumers has been estimated based on generic heat demand profiles. The average and diversified peak heat demand of the proposed heat network has been estimated to be 3.65 MW_{th} (average) and 7.69 MW_{th} (peak) respectively, with an annual heat demand of 31,957 MWh per year.
2. A heat demand profile has been developed to assess diurnal and seasonal variation in heat demand for the proposed heat network. The heat demand profile indicates that base and peak loads can be met by the Facility. Detailed techno-economic modelling will be undertaken when there is a better understanding of consumer heat demands.

2.4 Economic assessment

1. An analysis of costs and revenues associated with the construction and operation of the proposed district heating network has been carried out. The results of this analysis has been uploaded into the EA's CBA template. The CBA takes account of heat supply system capital and operating costs, heat sales revenue and lost electrical revenue as a result of diverting energy to the heat network.
2. The results of the CBA indicate that the estimated £8.7 million capital investment will not be offset by heat sales revenue. The nominal project internal rate of return (before financing and tax) over 30 years is projected as 12.9%, with a net present value (NPV) of -£1.82 million.
3. The detailed economic feasibility of the scheme will be reassessed in the future when consumer heat demands are confirmed. Following reassessment, a final decision will be made on connecting the development.
4. As construction of a district heating network is currently not economically feasible, the Facility will be built to be CHP-Ready. A decision on progressing with the district heating network will be taken once the economic feasibility has been confirmed. As such, the Facility will meet the requirements of best available technology (BAT) tests outlined in the EA CHP Ready Guidance.

2.5 Energy efficiency measures

1. To qualify as technically feasible under the draft Article 14 guidance, the consumer heat demand must be sufficient to achieve high efficiency cogeneration, equivalent to at least 10% savings in primary energy usage compared to the separate generation of heat and power. When exporting heat to the proposed heat network, the Facility will achieve a primary energy saving (PES) of 10.71%, which meets the technical feasibility threshold defined in the draft Article 14 guidance.
2. To be considered '*Good Quality*' CHP under the CHPQA scheme, the quantity of heat exported to a heat network must be sufficient to achieve a Quality Index (QI) of at least 105 at the design stage (reducing to 100 at the operational stage). Changes to CHPQA guidance in December 2018 mean that the maximum QI score which could be achieved by the proposed heat network would be 94.6. On this basis, the proposed heat network would not qualify as *Good Quality* CHP. The efficiency criteria set out in the latest CHPQA guidance means that it is unlikely that any current or future energy recovery facility wanting to provide CHP will be able to achieve '*Good Quality*' status.

2.6 CHP-Ready Assessment

3. A CHP-Ready Assessment has been carried out as part of this Heat Plan and the completed CHP-Ready Assessment form is provided in Appendix E. As the economic case for the proposed heat network is not economically viable, constructing the Facility as CHP-Ready is considered to represent BAT.
4. As CHP-Ready, the Facility will be designed to be ready, with minimum modification, to supply heat in the future. Given the uncertainty of future heat loads, the initial electrical efficiency of a CHP-Ready facility (before any opportunities for the supply of heat are realised) should be no less than that of the equivalent non-CHP-Ready facility. The Facility will include heat capacity designed to facilitate heat export in the future, and safeguarded space on site to house CHP equipment.
5. To satisfy the third BAT test (see section 3.1) on an ongoing basis, Sesona is committed to carrying out periodic reviews of opportunities for the supply of heat to realise CHP.

2.7 Action Plan

1. A proposed action plan for the implementation of the district heating network to ensure that the identified heat demand can be secured is provided in section 7.

3 Legislative Requirements

3.1 CHP-Ready Guidance

In February 2013, the EA produced guidance titled '*CHP Ready Guidance for Combustion and Energy from Waste Power Plants*'[1]. This guidance applies to the following facilities, which will be regulated under the Environmental Permitting (England and Wales) Regulations 2016:

- new combustion power plants (referred to as power plants) with a gross rated thermal input of 50 MW or more; and
- new EfW plants with a throughput of more than 3 tonnes per hour of non-hazardous waste or 10 tonnes per day of hazardous waste.

The Facility will be regulated as a waste incineration facility with a throughput of more than 3 tonnes per hour. Therefore, the requirements of the CHP-Ready (combined heat and power-ready) guidance will apply.

The EA requires developers to demonstrate best available techniques (BAT) for a number of criteria, including energy efficiency. One of the principal ways of improving energy efficiency is through the use of CHP, for which three BAT tests exist. The first test involves considering and identifying opportunities for the immediate use of heat off-site. Where this is not technically or economically possible, the second test involves ensuring that the plant is built to be CHP-Ready. The third test involves carrying out periodic reviews to determine whether the situation has changed and if there are opportunities for heat use off site.

3.2 Energy Efficiency Directive

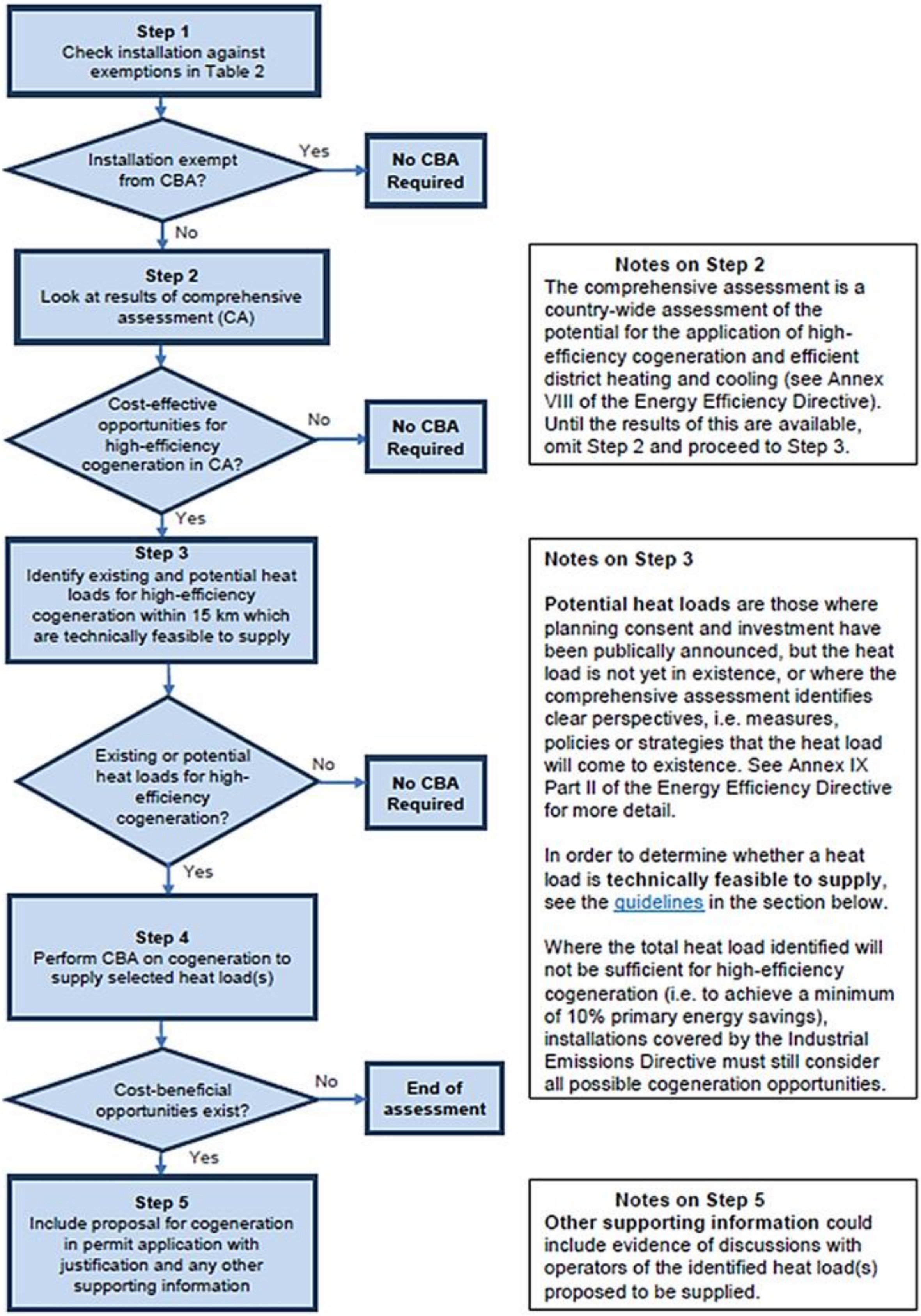
From 21 March 2015, operators of certain types of combustion installations are required to carry out a cost benefit assessment (CBA) of opportunities for CHP when applying for an Environmental Permit (EP). This is a requirement under Article 14 of the Energy Efficiency Directive and applies to a number of combustion installation types. As a new electricity generation installation with a total aggregated net thermal input of more than 20 MW_{th}, the Facility will be classified as an installation type 14.5(a).

In April 2015, the EA issued draft guidance on completing the CBA, entitled '*Draft guidance on completing cost-benefit assessments for installations under Article 14 of the Energy Efficiency Directive*'[2]. Figure 1 describes the process that must be followed for type 14.5(a) and 14.5(b) installations.

[1] CHP Ready Guidance for Combustion and Energy from Waste Power Plants v1.0, February 2013

[2] Draft guidance on completing cost-benefit assessments for installations under Article 14 of the Energy Efficiency Directive, V0.9 April 2015

Figure 1: CBA methodology for type 14.5(a) and 14.5(b) installations



4 Description of the Facility Technology

4.1 The Facility

The main activities associated with the Facility will be the combustion of RDF, operation of thermal oil boilers, generation of electricity using an Organic Rankine Cycle (ORC) turbine/generator set, and the potential to export heat subject to commercial and economic viability.

The Facility includes a waste reception hall, two waste incineration lines, two thermal oil boilers, ORC turbine/generator, flue gas treatment, stack, on-site facilities for the treatment or storage of residues and wastewater, and systems for controlling operation of the waste incineration plant and recording and monitoring conditions.

In addition to the main elements described, the Facility will also include weighbridges, water, auxiliary fuel and air supply systems, external hardstanding areas for vehicle manoeuvring, access roads and car parking, transformers, substation, offices, workshop and staff welfare facilities.

The nominal waste processing capacity of the Facility will be 100,000 tonnes per annum, assuming an estimated availability of around 7,900 hours per annum and an NCV of 10.11 MJ/kg. This equates to an hourly processing capacity of 12.66 tonnes per hour of RDF.

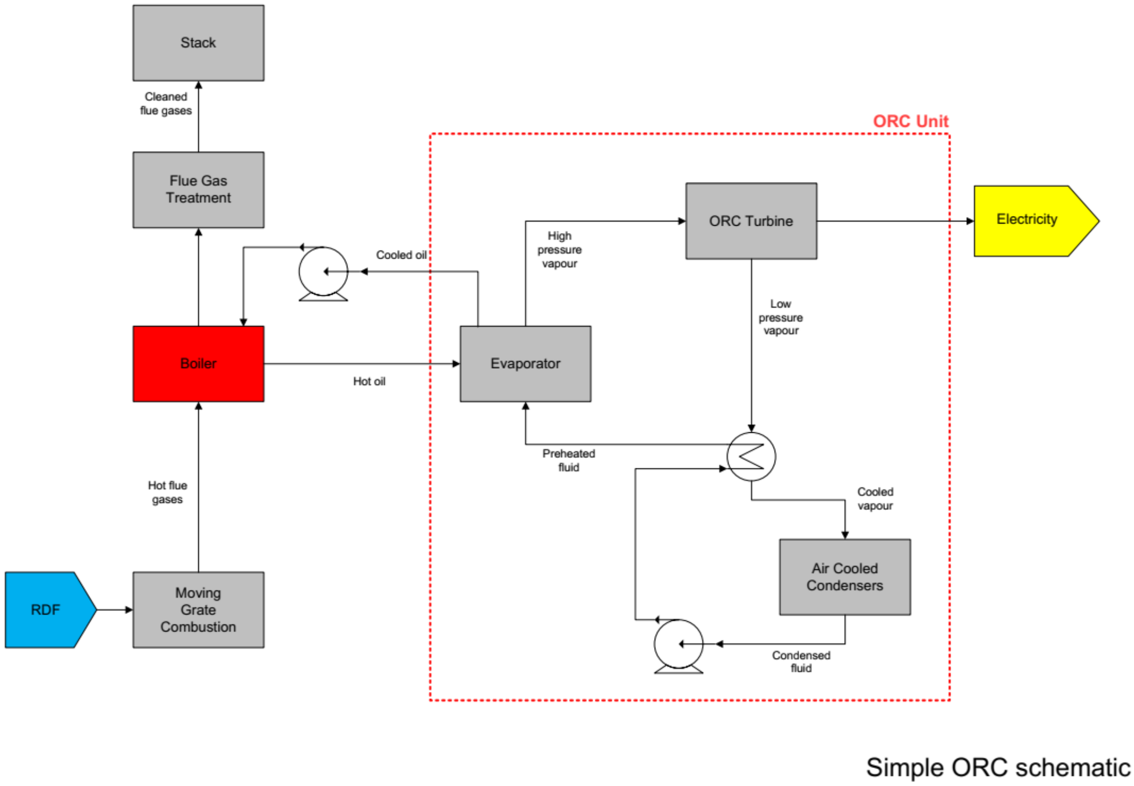
The Facility will provide a net electrical export of 7.8 MW_e, based on a gross electrical output of 9.28 MW_e, (when operating in fully condensing mode), and a parasitic load of 1.5 MW_e. Simultaneously, the Facility will be designed to export up to 20 MW_{th} of heat to local consumers. The maximum heat capacity will be confirmed during the detailed design stage and will be set as a minimum load to meet the requirements of the heat consumers identified. Based on the heat network identified within this heat plan, the average heat load is expected to be 3.65 $MW_{th.}$ With a peak demand of 7.69 $MW_{th.}$.

At the time of writing this report, there are no formal agreements in place for the export of heat from the Facility.

4.1.1 Combustion Process

Figure 2 is an indicative schematic of the combustion process that will be used in the Facility.

Figure 2: Process schematic



4.1.2 Energy Recovery

The energy generation process would produce electricity and low-temperature heat through a closed thermodynamic cycle which follows the principle of the ORC. The low-temperature heat is discharged through a set of water fan coils.

In the ORC process, which is designed as a closed cycle, the organic working medium is preheated in a regenerator, then heated and vaporized through a heat exchanger within the thermal oil loop. The generated vapor is expanded in a turbine that drives an electric generator. After leaving the turbine, the organic working medium (still in the vapor phase) passes through the regenerator that is used to pre-heat the organic liquid before vaporizing, therefore, increasing the electric efficiency through internal heat recovery.

The organic vapor then condenses by discharging low-temperature heat to the atmosphere through an ACC and/or blast coolers. After the ACC, the working medium is pumped back to the pressure level required (for turbine operation) by the working fluid pump and then preheated by an internal heat exchanger within the regenerator.

4.1.3 Details of Input Waste

Table 1: Expected Facility input waste characteristics

Parameter	Unit	Value
Nominal waste throughput	tph	12.66
Proposed NCV	MJ/kg	10.11

Parameter	Unit	Value
Proposed GCV	MJ/kg	11.12

5 Heat Demand Investigation

5.1 Wider Heat Export Opportunities

5.1.1 The National Comprehensive Assessment

A report titled 'Opportunity areas for district heating networks in the UK: National Comprehensive Assessment (the NCA) of the potential for efficient heating and cooling'[3], dated September 2021 (herein referred to as the 2021 report), was published by Arup on behalf of The Department for Business, Energy and Industrial Strategy (BEIS). The 2021 report is an update on the original 2016 report, which was prepared when the UK was still a Member State of the European Union. The 2016 report was produced to fulfil the requirement (under the Energy Efficiency Directive 2012/27/EU on energy efficiency) of all EU Member States to undertake an NCA to establish the technical and socially cost-effective potential for high-efficiency cogeneration. The 2021 report also sets out information pertaining to heat policy development in the UK. Due to the low resolution of the data, the results of the NCA can be considered an overview only.

The heat consumption in 2020 and estimated consumption in 2050 by non-domestic and domestic sectors for the northwest of England, as extracted from the NCA, is presented in Table 2. This shows that:

1. heat consumption is greatest in the domestic sector; and
2. the estimated heat consumption in 2020 is lower than in 2050.

The energy projections in the 2021 report take account of climate change policies where funding has been agreed and where decisions on policy design are sufficiently advanced to allow robust estimates of policy impacts to be made, including measures such as building regulations.

Table 2: Heat consumption in the northwest of the UK

Sector	2020 Consumption (TWh/year)	2050 Projected (TWh/year)
Non-domestic	9.8	-
Domestic	43.9	-
Total	53.7	59.6

Source: *National Comprehensive Assessment of the Potential for Combined Heat and Power and District Heating and Cooling in the UK, Arup, September 2021*

Current space cooling consumption data is detailed in Table 3. Forecasts of cooling demand to 2050 were not presented in the 2021 report. BEIS is currently developing the evidence base for cooling in the UK, as part of a separate study. Given the paucity of available data on energy consumption for cooling, these figures are estimates based on consumption indicators, building types and floor areas. For this reason, they should be considered as indicative only.

[3] Opportunity areas for district heating networks in the UK, Sep 2021

Table 3: Spatial cooling in the northwest of the UK

Sector	2020 Consumption (TWh/year)
Non-domestic	5.2
Domestic	No assumed domestic cooling
Total	5.2

Source: *National Comprehensive Assessment of the Potential for Combined Heat and Power and District Heating and Cooling in the UK, Arup, September 2021*

Heating and cooling consumption data presented in the 2021 report should be considered an overview only due to the low resolution of the data. For example, the data does not specify the locations of heat and cooling demands within each region.

5.1.2 UK CHP Development Map

The BEIS UK CHP Development Map[4] geographically represents heat demand across various sectors in England, Scotland, Wales and Northern Ireland. A search of heat users within a 15 km radius of the Facility was carried out, as shown in Table 4. Figure 3 shows the region surrounding the Facility presented with coloured contour areas, with each colour band representing a range of heat demand density values. The 15 km radius indicated by the red circle in Figure 3 represents the straight-line distance from the Facility, which is different to the pipe distance shown in Table 5.

The data considers the entire regional area over which the search area extends. If a search radius extends marginally into a particular region, the data for the entire region will be included in the results table. Consequently, the heat demand may be overestimated.

With the exception of public buildings, the heat map is produced entirely without access to the meter readings or energy bills of individual premises. Therefore, results should be taken as estimates only.

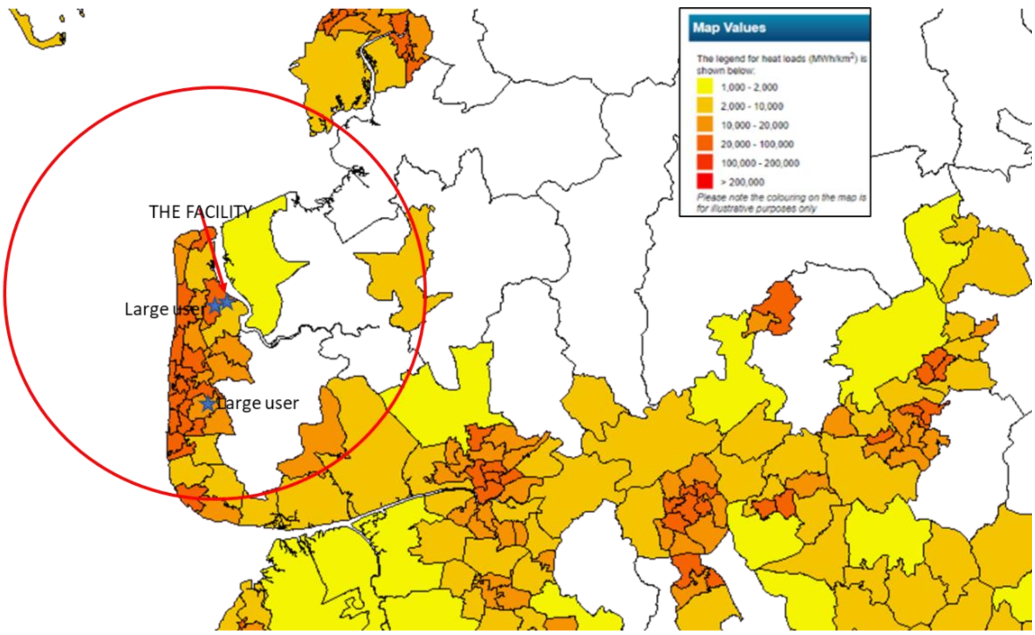
[4] http://chptools.decc.gov.uk/developmentmap/

Table 4: Heat demand within 15 km of the Facility from UK CHP Development Map

Sector	Heat demand	
	Proportion (%)	MWh/year
Communications and transport	0.17	3,791
Commercial offices	1.41	30,649
Domestic	70.16	1,520,646
Education	1.54	33,306
Government buildings	0.28	6,041
Hotels	0.73	15,767
Large industrial	17.55	380,271
Health	0.26	5,616
Other	0.14	2,974
Small industrial	4.99	108,089
Prisons	-	-
Retail	1.15	25,009
Sport and leisure	0.21	4,444
Warehouses	0.13	2,809
District heating	1.29	27,890
Total heat load in area	**100.00**	2,167,302

Source: UK CHP Development Map

Figure 3: Local heat demand density



Source: UK CHP Development Map

The heat demand in the area surrounding the Facility is predominantly sourced from the domestic sector. In most cases, existing domestic buildings are unsuitable for inclusion in a heat network.

This is because the costs associated with replacing existing heating infrastructure and connecting multiple smaller heat consumers to a network is generally considered too exorbitant.

To secure the most economically viable heat network, Fichtner has limited identification to potential heat consumers (such as industrial and commercial consumers) which will provide the maximum return and carbon savings for the minimum cost.

Section 5.1.4 consider potential heat users that would provide the maximum benefit in terms of revenue and carbon savings.

5.1.3 Large Heat Consumers

Three large heat consumers (with a point heat demand greater than 5 MW_{th}) were identified within 15 km of the Facility using the BEIS UK CHP Development Map[5] tool, as shown in Table 5 and Figure 3.

Table 5: Large heat consumers

Site	Heat demand (MWh/year)	Pipe length distance from the Facility (km)	Postcode
Victrex Plc (Hillhouse Technology Enterprise Zone)	53,950	1	FY5 4QD
AGC Chemicals Europe Ltd (Hillhouse Technology Enterprise Zone)	24,579	1.2	FY5 4QD
Blackpool Victoria Hospital	20,465	11	FY3 8NR

Hillhouse Technology Enterprise Zone has been considered as a potential heat user and its heat demand has been included within the list of potential heat users in section 5.1.4.

However, the location of Blackpool Victoria Hospital at a pipe length distance of 11 km is likely to require a prohibitively expensive pipe network connection. Therefore, it has not been considered within this report.

5.1.4 Identified Potential Heat Users

The Facility is well located for potential heat users with extensive industrial energy demand existing within the local area. The following new and existing opportunities have been identified to be potential heat customers and are in surrounding areas at a reasonable distance from the Facility to enable a heat connection.

Engagement with potential developers is a key aspect to delivering a district heating scheme. Development proposals are currently at various stages within the planning process and may therefore be subject to change.

5.1.4.1 Hillhouse Technology Enterprise Zone

The location of the Facility within Hillhouse Business Park, which is identified as an Enterprise Zone within the Wyre Local Plan (February 2019), provides an excellent opportunity for heat generated by the Facility to be used by new and existing businesses within the Business Park, located to the south east of the town of Fleetwood and on the western banks of the River Wyre Estuary.

[5] http://chptools.decc.gov.uk/developmentmap/

In November 2015, the UK government announced that Hillhouse International Business Park would be designated as one of 26 new or extended Enterprise Zones across the UK. The majority of the Hillhouse Business Park is owned by NPL Group, a major developer that has significant experience in regeneration; including major energy and waste, residential, industrial, commercial and retail development throughout the UK. NPL, in partnership with Wyre Council, the Lancashire Economic Partnership (LEP) and Blackpool, Fylde and Wyre Prosperity Board commissioned consultants Mott McDonald to produce a masterplan that will cover the Enterprise Zone until 2041. The masterplan has been developed at the embryonic stage of the Enterprise Zone status period, to serve as a framework for the development of the site over its 25-year lifespan.

Appendix C shows a letter of commitment from NPL to developing a heat network at the Hillhouse Enterprise Zone. To realise the opportunity, NPL and Sesona will continue close communication with commercial users to progress the assessment of heat offtake opportunities within Hillhouse Enterprise Zone and where appropriate, actions to enable delivery.

Appendix B sets out the use class and floorspace yields, as well as the likely phasing of the commencement of operations on each plot within the Enterprise Zone. Floorspace yields are estimated from average development densities and storeys and thus should be seen as indicative only. Actual floorspace yields for plots may vary significantly, depending on the landholders' end needs, any plot-specific constraints, car parking requirements and open storage.

Table 6 shows estimated annual heat demand for the potential heat users within Hillhouse Technology Enterprise Zone, and Figure 4 shows their location.

Table 6: Potential heat users –Hillhouse Technology Enterprise Zone

Map Reference[6]	Building name	Estimated heat load at point of use (MWh/year)
1	B	653
2	C1	141
3	C2	141
4	D	1,473
5	E	2,803
6	F	932
7	G	481
8	H	2,242
9	I	2,613
10	J	1,893
11	L	1,265
12	M	1692
13	O	388
14	P	1,099
15	Q	118
16	R	174
17	S	544

[6] Appendix A Pipe Route drawing

Map Reference[6]	Building name	Estimated heat load at point of use (MWh/year)
18	U	816
	Total	**19,468**

Figure 4: Hillhouse Technology Enterprise Zone -masterplan

Source: IBI Group

Source: https://hillhouseez.com/wp-content/uploads/2019/02/Hillhouse_EZ_Masterplan_Nov_2018.pdf

5.1.4.2 Visual Assessment

From review of satellite imagery and aerial photography, additional potential heat consumers have been identified in the area surrounding the Facility, and are listed in Table 7. The locations of these heat consumers relative to the Facility are shown in Appendix A. Connecting these users would not require any rail, river or major road crossing and there would be no disruption to residential areas.

The list presented in Table 7 includes low-grade industrial uses, retail, manufacturing and warehousing. It is also likely that additional heat users would be identified during the detailed design phase. In summary, there is a potential heat demand of approximately 8,712 MWh/year.

Table 7: Potential heat users – visual assessment

Map Reference[7]	Business Name/Description	Estimated heat load at point of use (MWh/year)
19	Red Marsh Industrial Estate	1,780
20	Haven Cala Gran Holiday Park	5,760
21	Farmer Parrs Animal World	1,173
	Total	**8,712**

Each potential user's heat consumption has been estimated using the method outlined in section 5.2. Following detailed design and a granting of planning permission and an Environmental Permit for the Facility, individual potential heat consumers will be contacted to properly assess their heat demand.

5.2 Estimated Overall Heat Load

When estimating heat consumer demands, calculations are based on benchmark figures from the Chartered Institution of Building Services Engineers (CIBSE) Guide F (Energy Efficiency in Buildings). This document provides good practice benchmark figures based on energy performance of existing buildings.

In the CIBSE Guide, heat loads are expressed in terms of kWh per square metre of floor space per year of fossil fuel use (where natural gas is typically assumed). Based on estimates of floor areas and an assessment of the development type, it is then possible to estimate annual energy usage. Converting natural gas use to actual heat loads (which can be provided by a hot water distribution system) requires an assumption of gas-fired boiler efficiency. An efficiency of 80% is assumed, based on industry norms.

As shown in Table 8, heat consumers identified in section 5.1.4 have a total annual heat consumption of 28,180 MWh. To account for pipe losses and diversification, the actual annual Facility heat export is calculated as 31,243 MWh. It should be noted that for large heating systems, individual peak loads tend to not occur simultaneously. Therefore, due to the diversity of demand the network peak demand is not the sum of the individual peak loads.

Table 8: Heat network identified heat users

Map Reference[8]	Business name/description	Estimated heat load at point of use (MWh/year)
Hillhouse Technology Enterprise Zone		
1	B	653
2	C1	141

[7] Appendix A Pipe Route drawing

[8] Appendix A Pipe Route drawing

Map Reference[8]	Business name/description	Estimated heat load at point of use (MWh/year)
3	C2	141
4	D	1,473
5	E	2,803
6	F	932
7	G	481
8	H	2,242
9	I	2,613
10	J	1,893
11	L	1,265
12	M	1692
13	O	388
14	P	1,099
15	Q	118
16	R	174
17	S	544
18	U	816
Other identified heat users		
19	Red Marsh Industrial Estate	1,780
20	Haven Cala Gran Holiday Park	5,760
21	Farmer Parrs Animal World	1,173
Total		**28,180**

6 Heat Network Technical Solution

6.1 Heat Network Profile

A generic heat demand profile has been developed to model the seasonal and diurnal variation in heat demand for the proposed heat network. By integrating the estimated annual heat energy demands (in MWh) across the year, the annual average and peak heat demands (in MW_{th}) has been estimated.

Daily and seasonal variation in heat demand is typical for heat networks serving different types of industrial, commercial and office consumers. Increasing the number and type of consumers connected to a network diversifies heat demand and helps to reduce the impact of the peak demand of any individual consumer, as it is less likely that multiple peak demands will coincide. In calculating the diversified heat demand, a diversity factor of 0.95 for summer and 0.90 for winter have been assumed, in accordance with CIBSE AM12[9].

The heat network profile for the proposed heat network shown in Figure 5 illustrates the variation in heat demand during a typical day in the summer and winter seasons. The profile represents heat demand at the point of use, and therefore does not include network heat losses.

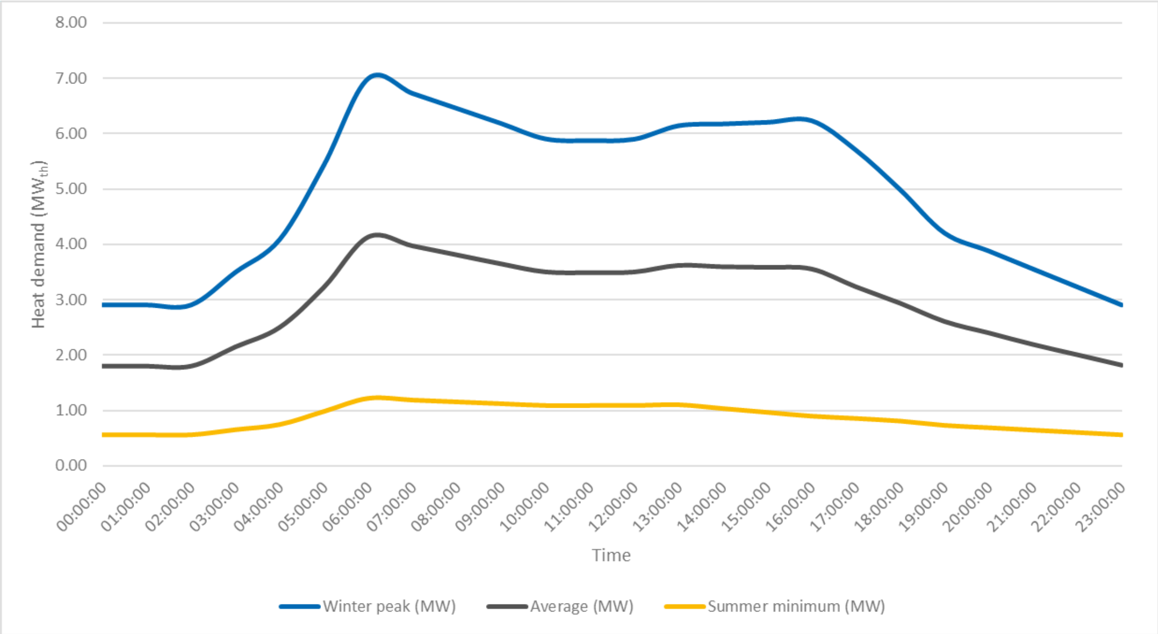
The total annual heat export, and average and peak instantaneous network values are projected in Table 9.

Table 9: Proposed heat network demand

Annual Heat Load (MWh)		Average heat demand (MW_{th})		Peak heat demand (MW_{th})		
At point of use	At the Facility (accounting for pipe losses)	At point of use	At the Facility (accounting for pipe losses)	Peak winter value	After applying diversity factor	At the Facility (diversified with pipe losses)
28,180	31,957	3.22	3.65	7.76	7.26	7.69

[9] CIBSE AM12 Combined Heat and Power for Buildings, 2013

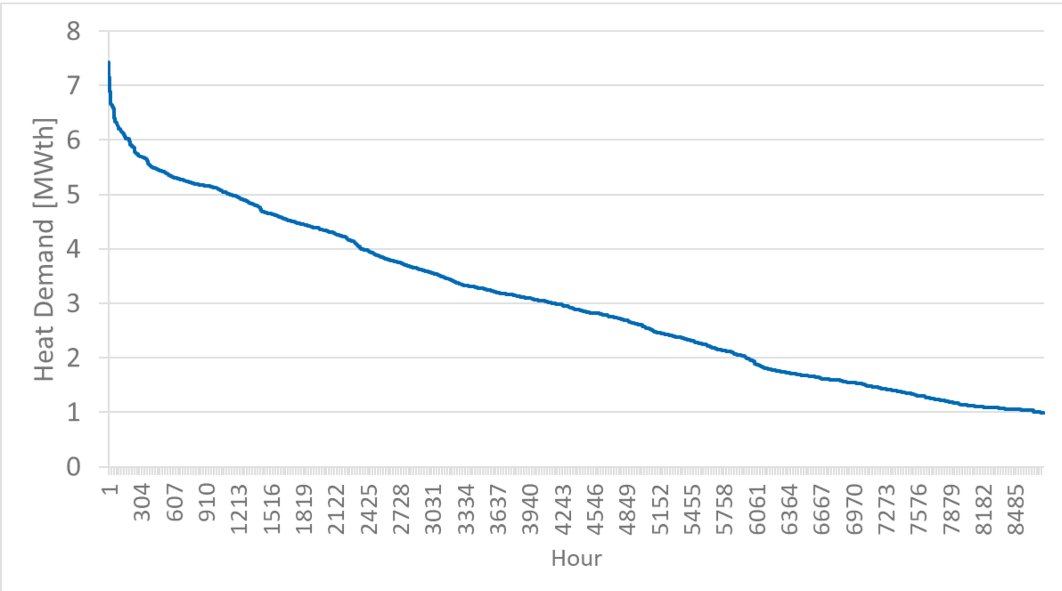
Figure 5: Heat network profile



6.1.1 Heat Load Duration Curve

The heat load duration curve showing the instantaneous heat demand for the proposed heat network, arranged in order of decreasing magnitude, across the year is provided in Figure 6. As detailed information on heat loads is not available at this stage, the heat load duration curve has been developed on the basis of instantaneous heat demand at each hour of the day for each month; therefore, it does not account for diversity or heat losses.

Figure 6: Heat load duration curve



6.2 Heat Network Design

As a conventional heat network, heat distribution between the Facility and the identified heat consumers is likely to use buried pipework. Pre-insulated steel pipes are typically used to supply pressurised hot water flow to the consumer, and to carry returning cooler water. Where pipe diameters are small, two pipes may be integrated side-by-side within a single insulated sleeve. For larger heat demands, large bore pipes could be installed as a single insulated run. Pipe technology is well proven and can provide a heat distribution system with a minimum 30-year design life. Additional pipe work can be added retrospectively, and it is reasonably straightforward to add pipe branches to serve new developments.

Modern heat-insulated piping technology enables hot water to be transported large distances without significant losses. Where local topography creates geographical challenges, heat exchangers and additional pumping systems can be installed to create pressure breaks, enabling the network to be extended.

Heat delivery arriving at a heat consumer's premises usually terminates using a secondary heat exchanger. The heat exchanger is typically arranged to supply heat to a tertiary heating circuit upstream of any local boiler plant. The water in the tertiary circuit is boosted to the temperature required to satisfy the heating needs of the building.

Water is pumped continuously around the system. Pumps are operated with 100% standby capacity to maintain heat in the event of a pump fault. Pumps are likely to utilise variable speed drives to minimise energy usage.

The following conservative design criteria relating to a typical hot water network have been used to size heat transmission pipe diameters. Where possible, the flow temperature will be reduced to minimise heat losses. Flow and return temperatures presented in Table 10 have been selected on the likely requirements of identified consumers.

Table 10: District heating network design criteria

Parameter	Value
Water supply temperature to consumer	100°C
Water return temperature from consumer	60°C
Distance between flow and return pipes	150 mm
Soil temperature	10°C
Depth of soil covering	600 mm

Using the above design criteria, the primary hot water transmission pipe size has been calculated as DN200 (250mm diameter), reducing along the length of the pipe network to DN25 (25mm diameter) at the consumer located farthest from the Facility.

This is an indicative figure and will be subject to heat demand verification and subsequent network design. Assuming the difference between flow and return temperatures remains constant, it may be possible to reduce the flow temperature in line with the CIBSE Code of Practice without impacting the pipe size and thereby reduce system energy losses.

6.3 Back-up Heat Sources

The Facility has been designed to achieve an availability of 90.18% (i.e. 7,900 hours per year). During periods of routine maintenance or unplanned outages the Facility will not be operating, however heat consumers will still require heat. Therefore, a back-up source of heat is required to meet the needs of the heat consumers during periods of Facility downtime.

At the heat network scale under consideration, the standby plant will likely comprise oil or gas-fired hot water heaters (boilers) with a separate dedicated stack. Back-up boilers are typically designed to ensure the peak heat export capacity can be met but also provide sufficient turndown to supply smaller summer loads with reasonable efficiency.

If the majority of heat consumers were to retrofit connections to storage and distribution warehousing, it is possible that existing heating/cooling infrastructure could be retained as back up. Subject to detailed heat demand modelling, once heat consumers are known with more certainty, opportunities for installing thermal stores may also be considered to lessen reliance on the back-up plant by storing excess heat generated during off-peak periods for use during times of peak heat demand.

6.4 Considerations for Pipe Route

At the present time, a definitive fixed route has not been established for the connections between the Facility and potential heat users.

Planning permission, easements and Highways Licenses will need to be obtained for access, construction, and maintenance of any pipeline infrastructure. There is a significant financial implication for obtaining such easements, and these would only be progressed once the relevant consents have been granted for the Facility and heat supply agreements have been signed with the heat users. Traffic management requirements will need to be agreed prior to obtaining the necessary Highways Licenses granting permission to install the pipework. An indicative projected timetable for the development of the heat export scheme is provided in section 10.1.

To facilitate the projected timetable, discussions with potential heat users will be required which, if successful, would result in a heat supply agreement and undertaking design of the any heat export infrastructure.

7 Energy efficiency calculations

7.1 Heat and power export

The Z ratio, which is the ratio of reduction in power export for a given increase in heat export, can be used to calculate the effect of variations in heat export on the electrical output of the Facility. A value of 8.0 was obtained following the approach set out in CHPQA Guidance Note 28[10], assuming heat extraction at a pressure of 1.5 bar(a), which is considered sufficient to meet the requirements of the potential heat consumers identified for the Facility. Heat and power export has been modelled across different load cases and the results are presented in Table 11. The maximum heat export capacity from the Facility is 20 MW_{th}.

Table 11: Heat and power export from the Facility

Load case	Heat export at turbine (MW_{th})	Gross power generated (MW_e)	Net power exported (MW_e)	Z ratio
1. No heat export	-	9.28	7.78	N/A
2. Proposed network heat load (see section 6.1)	3.57	8.84	7.34	8.01
3. Maximum heat export capacity from the Facility	20.00	6.79	5.29	8.01

Table 11 indicate that for the heat consumers identified in section 5.2, load case 2 corresponding to an average heat export of 3.57 MW_{th} will result in a net electrical power export from the Facility of 7.34 MW_e.

7.2 CHPQA Quality Index

CHPQA is an energy efficiency best practice programme initiative by the UK Government. CHPQA aims to monitor, assess and improve the quality of CHP in the UK. In order to prove that a plant is a 'Good Quality' CHP plant, a QI of at least 105 must be achieved at the design, specification, tendering and approval stages. Under normal operating conditions (i.e. when the scheme is operational) the QI threshold drops to 100. The QI for CHP schemes is a function of their heat efficiency and power efficiency according to the following formula:

$$QI = X\eta_{power} + Y\eta_{heat}$$

where: η_{power} = power efficiency; and

η_{heat} = heat efficiency.

The power efficiency within the formula is calculated using the gross electrical output and is based on the gross calorific value of the input fuel. The heat efficiency is also based on the gross calorific value of the input fuel. The coefficients X and Y are defined by CHPQA based on the total gross electrical capacity of the scheme and the fuel / technology type used.

In December 2018, the Government released a revised CHPQA Standard Issue 7. The document sets out revisions to the design and implementation of the CHPQA scheme. These revisions are intended

[10] CHPQA Guidance Note 28, 2007

to ensure schemes which receive Government support are supplying significant quantities of heat and delivering intended energy savings. The following X and Y coefficients apply to the Facility:

- X value = 370; and
- Y value = 120.

The QI and efficiency values (based on a gross calorific value of 10.11 MJ/kg from Table 1) have been calculated in accordance with CHPQA methodology for various load cases and the results are presented in Table 12.

Table 12: QI and efficiency calculations

Load case	Gross power efficiency (%)	Heat efficiency (%)	Overall efficiency (%)	CHPQA QI
1. No heat export	23.74	0.00	23.74	87.8
2. Proposed network heat load (see Section 6.1)	22.60	9.12	31.73	94.6
3. Maximum heat export capacity	17.36	51.15	68.51	125.6

The results indicate that the Facility will not achieve a QI score in excess of the '*Good Quality*' CHP threshold (QI of 105 at the design stage) for the average heat load exported to the proposed heat network. The highly onerous efficiency criteria set out in the latest CHPQA guidance, most notably the underpinning requirement to achieve an overall efficiency (NCV basis) of at least 70%, means that an average heat export of 9.1 MW_{th} would be required for a heat network to achieve Good Quality status. It is clear that the design proposed for heat recovery is capable of supplying this quantity of heat at the assumed conditions required by the local network.

8 Heat network economic assessment

8.1 Fiscal support

The following fiscal incentives are available to energy generation projects and impact the feasibility of delivering a district heating network.

8.1.1 Capacity Market for electricity supplied by the Facility

Under the Capacity Market, subsidies are paid to electricity generators (and large electricity consumers who can offer demand-side response) to ensure long-term energy security for the UK. Capacity Agreements are awarded in a competitive auction and new plants (such as the Facility) are eligible for contracts lasting up to 15 years. Based on the eligibility criteria of the mechanism, the Facility will be eligible for Capacity Market support. Since support is based on electrical generation capacity (which would reduce when operating in CHP mode), these payments will act to disincentivise heat export. Therefore, Capacity Market support has not been included within the economic assessment.

8.1.2 Renewable Heat Incentive

The Renewable Heat Incentive (RHI) was created by the Government to promote the deployment of heat generated from renewable sources. However, no funding announcements have been published for the RHI post March 2022. Therefore, it is unlikely the Facility will receive incentives under the RHI.

8.1.3 Contracts for Difference

Contracts for Difference (CfD) replaced the Renewables Obligation (RO) as the mechanism by which the Government has supported low carbon power generation. Launched in 2014, there have been four rounds aimed at incentivising investment in renewable energy. CfD incentivises investment by providing project developers with protection from volatile wholesale prices while protecting consumers from paying increased support costs when electricity prices are high. CfD de-risks investments by guaranteeing a fixed price (the Strike Price) for electricity over a 15-year period.

The fourth CfD allocation round (AR4) was executed on 13th December 2021, with deadline for bids on 14th January 2022, and is now closed. The Government has moved to annual CfD allocation rounds (instead of every two years) with allocation round 5 (AR5) scheduled for March 2023. As of December 2022, the Government has not decided on technologies that will be eligible to participate in the AR5.

Based on AR4's budget allocation, we would not expect that energy from waste with CHP will be considered high priority for AR5. On this basis, for the purpose of this assessment, we have assumed that the Facility will not receive support under the CfD mechanism.

8.1.4 Green Heat Networks Fund

The GHNF is a three-year £288 million capital grant fund to support the commercialisation and construction of new low and zero carbon heat networks and the retrofitting and expansion of existing heat networks. The GHNF is open to organisations in the public or private sectors in England.

1. The GHNF opened to applicants in March 2022, Round 4 is open to applications until 24 February 2023. There will be a series of quarterly application rounds until the scheme closes in 2025.
2. Minimum project eligibility metrics include:

a. 100 g CO_2e/kWh thermal energy delivered to consumers; and
b. minimum demand of 2 GWh/year for urban networks.

3. The GHNF will fund up to 50% of a project's total combined commercialisation and construction costs (with an upper limit of £1 million for commercialisation).
4. The GHNF will provide support for accessing heat sources such as capturing waste heat from an industrial process, energy from waste, wastewater, low carbon generation such as energy centres and low-carbon generation and support for primary heat network distribution including distribution pipework for transmission and distribution of low-carbon heating and cooling.

Whether the Facility would be eligible for GHNF will need to be investigated in more detail when planning consent and an EP have been secured for the Facility. For the purposes of this assessment, it has been assumed that the Facility will not be eligible for the GHNF.

8.2 Technical feasibility

Step 3 of the CBA methodology[11] (as shown in Figure 1 in section 3.1) requires identification of existing and proposed heat loads which are technically feasible. The draft Article 14 guidance states that the following factors should be taken into account when determining the technical feasibility of a scheme classified as a type 14.5(a) installation.

1. **The compatibility of the heat source(s) and load(s) in terms of temperature and load profiles**

   The CHP scheme has been developed on the basis of delivering heat at typical district heating conditions (refer to section 6.2). It is reasonable to assume identified potential heat consumers can utilise hot water at the design conditions. Therefore, the heat source and heat load are considered to be compatible. Verification of consumer requirements (in terms of hot water temperature and load profiles) will be confirmed in future design reviews prior to the implementation of the heat network.

2. **Whether thermal stores or other techniques can be used to match heat source(s) and load(s) which will otherwise have incompatible load profiles**

   Conventional thermal stores or back-up boilers (as detailed in section 6.3) are likely to be included in the CHP scheme to ensure continuity of supply. The specific arrangement will be selected when there is greater certainty on defined heat loads.

3. **Whether there is enough demand for heat to allow high-efficiency cogeneration**

   High-efficiency cogeneration is cogeneration which achieves at least 10% savings in primary energy usage compared to the separate generation of heat and power. Primary energy saving (PES) is calculated in the following section.

8.2.1 Primary energy saving

To be considered high-efficiency cogeneration, the scheme must achieve at least 10% savings in primary energy usage compared to the separate generation of heat and power. PES has been calculated in accordance with European Commission Delegated Regulation (EU) 2015/2402 of 12 October 2015 Annex II part (b), using the following assumptions.

4. Annual nominal throughput capacity of 10,000 tonnes per year based on an NCV of 10.11 MJ/kg.

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[11] '*Draft guidance on completing cost-benefit assessments for installations under Article 14 of the Energy Efficiency Directive*'

5. Nominal gross electrical power output (expected capacity in fully condensing mode) of 9.28 MW_e.
6. Parasitic load of 1.5 MW_e.
7. Z ratio of 8.0.
8. Efficiency reference values for the separate production of heat and electricity have been taken as 80% and 25% respectively as defined in Commission Delegated Regulation (EU) 2015/2402 of 12 October 2015[12].]

When operating in Load case 2 (Table 11) with a heat export of 3.57 MW_{th}, the Facility will achieve a PES of 10.71%. This is in excess of the technical feasibility threshold defined in the draft Article 14 guidance. On this basis, the Facility will qualify as a high-efficiency cogeneration operation when operating in CHP mode.

8.3 Results of cost benefit analysis

A CBA has been carried out on the selected heat load, in accordance with section 3 of the draft Article 14 guidance. The CBA uses an Excel template, '*Environment Agency Article 14 CBA Template.xlsx*' provided by the EA, with inputs updated to correspond with the specifics of this heat plan.

The CBA model considers:

1. the revenue streams (heat sales);
2. the cost streams for the heat supply infrastructure (construction and operational, including back-up plant); and
3. the lost electricity sales revenue, over the lifetime of the scheme.

The following assumptions have been made:

1. The heat export infrastructure required to export heat from the Facility to identified consumers is estimated to have a capital cost of £12.3 million, split over a two-year construction programme.
2. The heat station will cost approx. £2.0 million, split over a two-year construction programme.
3. Back-up boilers will be provided to meet the peak heat demand, at a cost of approximately £0.7 million.
4. Operational costs have been estimated based on similar sized projects.
5. Heat sales revenue will be £45/MWh, current price and index linked for inflation in CBA.
6. Electricity sales revenue will be £56/MWh[13], current price and index linked for inflation in CBA.
7. Standby boiler fuel costs will be £25/MWh[14], current price and index linked for inflation in CBA.
8. Standby boiler(s) will supply 11.4% of annual heat exported.

The results of the CBA indicate that both the nominal project internal rate of return and net present value (before financing and tax) over 30 years are 6 % and -£7.57 million respectively. Therefore, the proposed heat network does not yield an economically viable scheme in its current configuration. Model inputs and key outputs are presented in Appendix D .

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12 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32015R2402

13 https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2019

Updated using values from Annex M for 2026, Wholesale baseload price, 'reference scenario' tab

14 https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2019

Updated using values from Annex M for 2026, retail prices, industrial sector, 'reference scenario' tab

9 CHP-Ready BAT Assessment

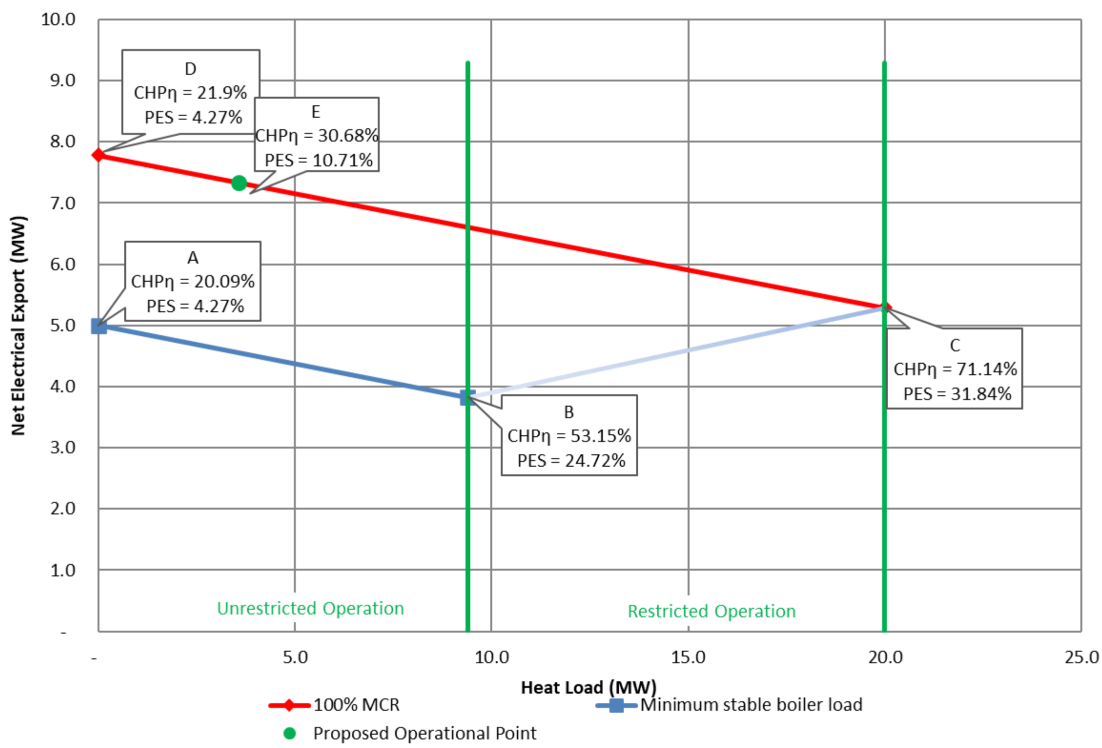
This report includes a CHP-Ready Assessment which considers the requirements of the EA's CHP-Ready Guidance, refer to Appendix E.

The 'CHP envelope' as outlined under requirement 2 of the CHP-Ready guidance, which identifies the potential operational range of a new plant where it could be technically feasible to operate electrical power generation with heat generation, is provided in Figure 7.

The points defining the CHP envelope are as follows:

- A: minimum stable load (with no heat extraction).
- B: minimum stable load (with maximum heat extraction).
- Line A to B: minimum electrical power output for any given heat load (corresponds to the minimum stable plant load).
- C: 100% load (with maximum heat extraction).
- D: 100% load (with no heat extraction).
- Line D to C: maximum electrical power output for any given heat load (corresponds to 100% plant load).
- E: proposed operational point of the Facility, based on the proposed heat network.
- Unrestricted operation: if a selected heat load is located in this region, the Facility will have the ability to operate at any load between minimum stable plant load and 100% plant load whilst maintaining the selected heat load.
- Restricted operation: if a selected heat load is located in this region, the Facility will not have the ability to operate over its full operational range without a reduction in heat load.

Figure 7: Graphical representation of CHP envelope for proposed heat network



The proposed operational point (point E) represents the annual average heat demand of 3.57 MW_{th} exported to the proposed heat network detailed in section 5. It considers the heat losses and pressure drop in the pipe network. Therefore, it corresponds to the annual average heat demand predicted for export from the Facility. The operational range for the Facility will ultimately be subject to the required hot water flow temperature and final turbine selection, which will be subject to detailed design.

10 Action Plan

It is feasible to export heat from the Facility to potential heat users, and further to the identified heat consumers, additional heat consumers may be identified through development of the Hillhouse Technology Enterprise Zone.

In order to build the Facility as CHP-Ready from the outset, and realise the full energy export potential of the Facility, an action plan will be implemented. The aim of the action plan is to ensure that the Facility can expand as a CHP facility by maintaining momentum with key stakeholders in the development process.

The action plan will be structured and have well defined objectives, involving all relevant local stakeholders and will be supported at the highest levels by Sesona. The action plan will identify the strategic phases required for the heat network development. Potential heat users are more likely to engage in the process if they know that there is a realistic prospect of a connection. Therefore, it is proposed that the action plan is implemented alongside the construction program. The following project development phases are suggested.

Initial Phase

1. Follow up initial heat load plan and research with a detailed heat load survey when more information is available from potential users.
2. Engage with the local authority.
3. Agree annual progress targets with the EA and review annually.
4. Build a detailed database of potential heat users.
5. Target buildings identified as potential heat users.
6. Carry out heat use surveys at targeted heat users.
7. Verify seasonal heat demand over time.
8. Develop pipe routing options and / or phases.
9. Size and configure the required infrastructure.
10. Confirm technical viability.
11. Develop capital cost estimates.
12. Develop cost estimates for operation and maintenance.
13. Assess economic viability.
14. Establish a carbon saving benchmark.
15. Draw up a project master plan.
16. Set up a joint working group with stakeholders.
17. Develop a marketing strategy.

Intermediate Phase

1. Undertake detailed negotiations with heat users.
2. Finalise initial heat demand.
3. Finalise sizing of infrastructure.
4. Discuss pipe routing options with the local highway authority.
5. Finalise pipe routing.
6. Tender for initial infrastructure.
7. Sign heads of terms for heat supply agreements with Energy Services Company (ESCO).
8. Install initial infrastructure.

9. Sign heat supply agreement with an ESCO.
10. Commission the heat network.

Final Phase

1. Market the scheme.
2. Expand the scheme by adding heat users if possible.
3. Expand the scheme by developing on existing infrastructure or connecting additional heat sources if possible.

Based on the potential heat users identified in section 5, the Facility will be CHP-enabled and subject to detailed design will be able to supply up to 20 MW_{th}.

In order to achieve CHP status, the scope of the proposed heat network needs to be well defined and technically assessed to demonstrate deliverability. Potential users will need to be approached so that there is a high degree of certainty regarding heat sales. The economic viability of the heat network will then need to be confirmed.

Constructing a detailed and reliable database of potential heat users is a key activity. This will need to be revisited and updated at least every two years so that new developments can be added, and existing developments can be updated. Change in building ownership and use can affect the potential to be a heat consumer. Boiler age will be tracked so that the potential heat users can be targeted when they are already considering investing in a new heating system.

10.1 Implementation Timescale

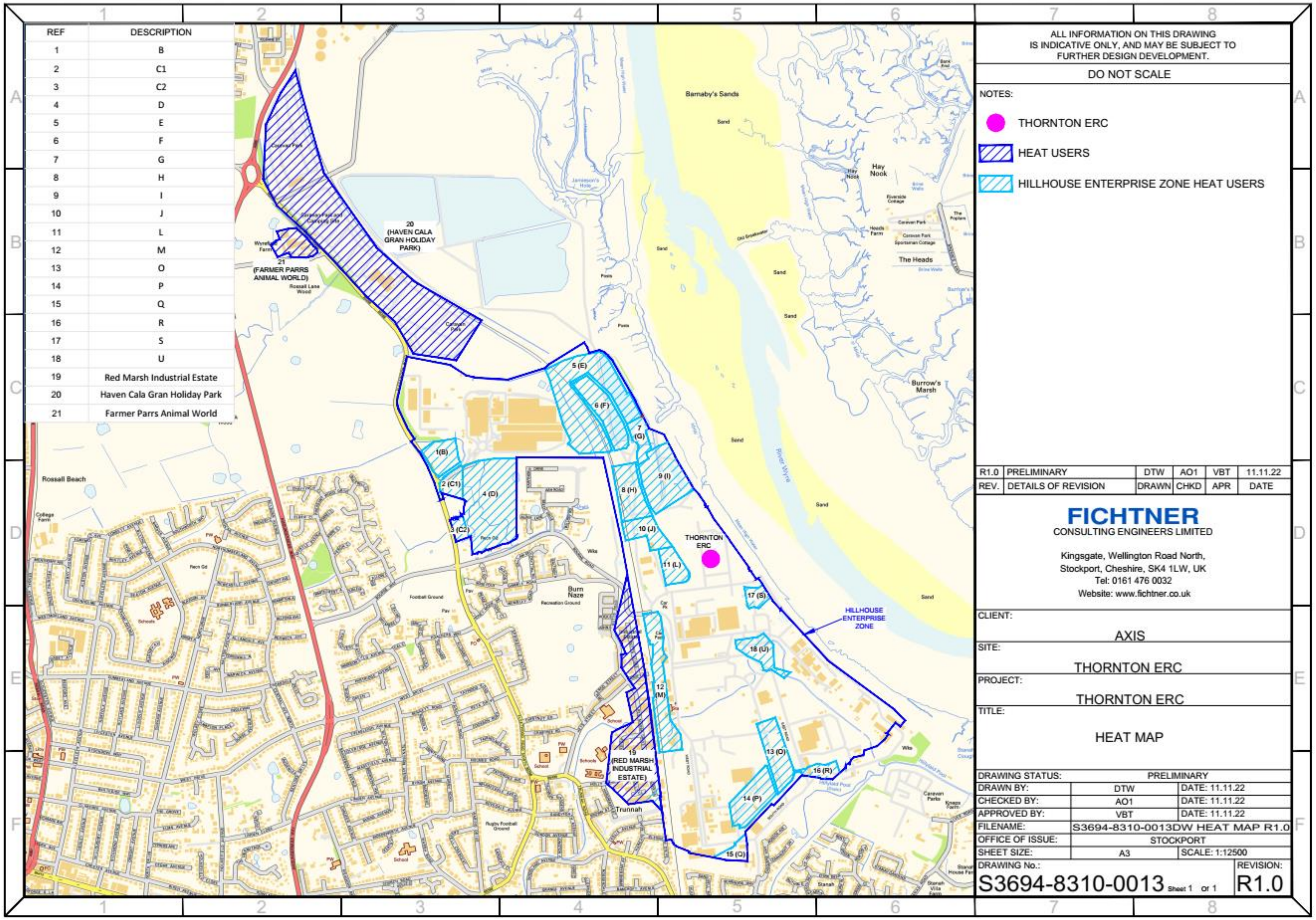
The table below gives an indicative timetable for the programme for constructing the Facility and heat network. The start of the construction of the heat system is dependent on the viability of the system and the location of heat users. Until a core of heat users have been identified and contracted to take heat, pipeline installation is unlikely to commence.

Table 13: Implementation programme

Description	Schedule
Obtain consents for the Facility	Day 1
Start of construction of the Facility	9 months
Submit planning application for heat mains	18 months
Start of commissioning of the Facility	30 months
Completion of negotiation for heat supply contracts	30 months
Take Over of the Facility	36 months
Completion of construction of the heat system	52 months
Testing & commissioning of the heat network	53 months
Start-up of the heat supply	54 months

Appendices

A Heat Users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1 | B
2 | C1
3 | C2
4 | D
5 | E
6 | F
7 | G
8 | H
9 | I
10 | J
11 | L
12 | M
13 | O
14 | P
15 | Q
16 | R
17 | S
18 | U
19 | Red Marsh Industrial Estate
20 | Haven Cala Gran Holiday Park
21 | Farmer Parrs Animal World
ALL INFORMATION ON THIS DRAWING IS INDICATIVE ONLY, AND MAY BE SUBJECT TO FURTHER DESIGN DEVELOPMENT.
DO NOT SCALE
NOTES:
THORNTON ERC
HEAT USERS
HILLHOUSE ENTERPRISE ZONE HEAT USERS
R1.0 | PRELIMINARY | DTW | AO1 | VBT | 11.11.22
REV. | DETAILS OF REVISION | DRAWN | CHKD | APR | DATE
FICHTNER
CONSULTING ENGINEERS LIMITED
Kingsgate, Wellington Road North, Stockport, Cheshire, SK4 1LW, UK
Tel: 0161 476 0032
Website: www.fichtner.co.uk
CLIENT: AXIS
SITE: THORNTON ERC
PROJECT: THORNTON ERC
TITLE: HEAT MAP
DRAWING STATUS: PRELIMINARY
DRAWN BY: DTW DATE: 11.11.22
CHECKED BY: AO1 DATE: 11.11.22
APPROVED BY: VBT DATE: 11.11.22
FILENAME: S3694-8310-0013DW HEAT MAP R1.0
OFFICE OF ISSUE: STOCKPORT
SHEET SIZE: A3 SCALE: 1:12500
DRAWING No.: S3694-8310-0013 Sheet 1 of 1
REVISION: R1.0
20 (HAVEN CALA GRAN HOLIDAY PARK)
21 (FARMER PARRS ANIMAL WORLD)
19 (RED MARSH INDUSTRIAL ESTATE)
THORNTON ERC
HILLHOUSE ENTERPRISE ZONE
Barnaby's Sands
Rossall Beach
Burn Naze
Trunnah

B Hillhouse Technology Enterprise Zone Masterplan

Figure 2: Masterplan plots

Source: IBI Group

Table 2: Indicative floorspace yield by plot and use class and by phase

Plot	Site Area (sqm)	Uses	Potential Storeys	Potential Floorspace (sqm)	Potential Unit Ranges (sqm)	Comments	Phase
A	4492	Sui Generis (energy Generation)				Extant planning permission for energy generation scheme on part of the site, has not yet come forward	1
B	16860	B1, B2, B8, C1	3	6740	500-2000	Business or budget hotel	1
C1	8600	C1/ C3	3	TBC	50-80 rooms or 24 dwellings	budget hotel or residential	1
C2	8500	C1/ C3	3	TBC	50-80 rooms or 24 dwellings	budget hotel or residential	1
D	76680	C3			200-250 dwellings		1
E	72342	B2	1	17360	1000-10000	larger manufacturing units	3
		B8	1	11570	2000-8000	warehousing or open storage	3
F	24050	B2, B8	1	9620	200-2000		2
G	10214	B1	2	4090	50-500		2
		A1, A3, D1, D2,C1	2	1500	50-200	Central Hub: mix of uses in integrated Hub, not necessarily distinct units	2
H	27740	B2	1	6660	500-3000		2
		B8	1	4440	1000-4440		2
I	36251	B1	2	4350	50-1000	some may be other B class	3
		B1	2	4350	50-1000	laboratory/tech spaces	3
		B1	1	2900	50-1000	light industrial units	2
		B2	1	7250	200-2000		2
J	17412	B2	1	6960	200-2000		1
K	66790	Sui generis	1			Proposed Hillhouse Thermal Plant	1
L	11618	B2	1	4650	200-2000		1
M	33627	B1	2	2690	50-1000		1
		B2	1	4040	200-2000		1
		B8	1	2690	500-2690		2
		D2	2	1080	50-200		2
		Sui generis (Emergency Services)				assume approximately 30% of site area for emergency services	2
N	129980	Power station				Wyre Power	1
O	24467	Power storage					1
		B2, B8	1	4000	200-1000	remainder of site, not power storage area	2
P	24644	B1, B8	2	2960	50-500		2

C Letter of Support for Hillhouse Technology Enterprise Zone

D CBA Inputs and Key Outputs

INPUTS

Version Jan 2015

Scenario Choice (dropdown box)	**1**	Power generator (Heat Source) same fuel amount

Key

2	Participant to define
2	Regulatory prescribed
2	Calculated
2	Prescribed - but possibility to change if make a case

Technical solution features	
Heat carrying medium (hot water, steam or other) (dropdown box)	Hot water
Total length of supply pipework (kms)	8.87
Peak heat demand from Heat User(s) (MWth)	7.61
Annual quantity of heat supplied from the Heat Source(s) to Heat User(s) (MWh)	*Lines 49 & 79*
DCF Model Parameters	
Discount rate (pre-tax pre-financing) (%) - 17% suggested rate	17%
Project lifespan (yrs)	30
Exceptional shorter lifespan (yrs)	0

Cost and revenue streams

Construction costs and build up of operating costs and revenues during construction phase		% operating costs and revenues during construction phase	Heat Supply Infrastructure - used in Scenarios 1, 2, 3 and 5	Heat Station - used in Scenarios 1, 2 and 3	Standby boilers (only if needed for Scenarios 1, 2 and 3)	Industrial CHP - used in Scenario 4 *
Project asset lifespan (yrs)			30	30	30	20
Exceptional reason for shorter lifespan of Heat Supply Infrastructure, Standby Boiler and/ or Heat Station (yrs)						
Construction length before system operational and at steady state (yrs)	2					
Number of years to build			2	2	2	0
		% (ONLY IF APPLICABLE)	£m	£m	£m	£m
Year 1 costs (£m) and build up of operating costs and revenues (%)		0%	6.157404869	1.005777294	0.336305234	
Year 2 costs (£m) and build up of operating costs and revenues (%)		0%	6.157404869	1.005777294	0.336305234	
Year 3 costs (£m) and build up of operating costs and revenues (%)						
Year 4 costs (£m) and build up of operating costs and revenues (%)						
Year 5 costs (£m) and build up of operating costs and revenues (%)						

Non-power related operations	
OPEX for full steady state Heat Supply Infrastructure on price basis of first year of operations (partial or steady state) (£m)	0.1
OPEX for full steady state Heat Station on price basis of first year of operations (partial or steady state) (£m)	0.1
OPEX for full steady state Standby Boilers on price basis of first year of operations (partial or steady state) (£m)	0.0
OPEX for full steady state Industrial CHP on price basis of first year of operations (partial or steady state) (£m) *	
Additional equivalent OPEX to pay for a major Industrial CHP overall spread over the life of the asset (£m) on price basis of first year of operations (partial or steady state) (£m) *	
Other 1 - Participant to define (£m)	
Other 2 - Participant to define (£m)	
Total non-power related operations	**0.2**
Annual inflation for all non-power related OPEX from first year of operations (full or partial) (%)	2.0%

Unit Energy Prices, Energy Balance, Fuel Related Operational costs and Revenue Stream

	Scenario used	1 Power generator (Heat Source) same fuel amount	2 Power generator (Heat Source) same electrical output	3 Industrial installation (Heat Source) - use waste heat	4 Industrial installation (Heat Source) - CHP set to thermal input	5 District heating (Heat User)
Heat sale price (£/ MWh) at first year of operations (partial or full)	45.00	45.00	50.00	50.00		
Annual quantity of heat supplied from the Heat Source(s) to Heat User(s) at steady state (MWh)	31,243	31,243	1,000,000	250,000		
Equivalent heat sales if first year of operations is steady state (£ m)	1.4					
Heat sale price inflation from first year of operations (full or partial) (% per year)	2.0%	2.0%	3.0%	3.0%		
Percentage of heat supplied by Standby Boiler (if relevant)	11%	11%	20%	20%		
'Lost' electricity sale price (£/ MWh) at first year of operations	56.00	56.00				
Z-ratio (commonly in the range 3.5 - 8.5)	8.01	8.01				
Power generation lost at steady state (MWh)	3,454	3,454				
Equivalent 'lost' revenue from power generation if first year of operations is steady state (£ m)	0.19					
Electricity sale price inflation from first year of operations (full or partial) (% per year)	2.0%	2.0%				
Industrial CHP electricity sale price (£/ MWh) at first year of operations (full or partial)	0.00				110.00	
Industrial CHP electrical generation in steady state (MWh)	0				* 285,714	
Equivalent revenue from power generation if first year of operations is steady state (£ m)	0.00					
Industrial CHP electricity price inflation from first year of operations (full or partial) (% per year)	0.0%				2.0%	
Fuel price for larger power generator/ CHP at first year of operations (full or partial) (£ / MWh)	0.00		40.00		40.00	
Z-ratio (commonly in the range 3.5 - 8.5)	0		3.50			
Power efficiency in cogeneration mode (%)	0		30%			
Additional fuel required per year for larger power generator / CHP in steady state (MWh)	0		761,905		* 300,000	
Equivalent additional fuel costs if first year of operations is steady state (£ m)	0.00					
Fuel price inflation from first year of operations (full or partial) (% per year)	0.0%		3.0%		5.0%	

Fuel price for Standby Boiler at first year of operations (£ / MWh)	25.00	25.00	40.00	40.00		
Boiler efficiency of Standby Boiler (%)	80%	80%	80%	80%		
Additional fuel required per year for Standby Boiler in steady state (MWh)	4,452	4,452	250,000	62,500		
Equivalent additional fuel costs if first year of operations is steady state (£m)	0.11					
Fuel price inflation for Standby Boiler from first year of operations (full or partial) (% per year)	2.00%	2.0%	3.0%	3.0%		
Heat purchase price (£/ MWh) at first year of operations (partial or full)	0.00					35.00
Annual quantity of heat supplied from the Heat Source(s) to Heat User(s) at steady state (MWh)	0					200,000
Equivalent cost of heat purchased if first year of operations is steady state (£ m)	0.0					
Heat purchase price inflation from first year of operations (full or partial) (% per year)	0.0%					3.0%
Fuel price (£ / MWh) at first year of operations (partial or full)	0.00					40.00
Boiler efficiency of district heating plant	0%					80%
Fuel avoided per year in steady state (MWh)	0					250,000
Equivalent fuel savings if first year of operations is steady state (£m)	0.0					
Fuel price inflation from first year of operations (full or partial) (% per year)	0.0%					4.0%
Fiscal benefits (£m) in first year of operations assuming it is at steady state **	0.00	0.00	2.50		2.50	
Fiscal benefits inflation rate from first year of opeations (full or partial) (%) **	0.0%		1.0%		1.0%	

* In the case of Industrial CHP a separate model template is available for typical indicative CAPEX, non-power related OPEX, additional equivalent OPEX to pay for a major overall, MWh of electricity generated in the steady state and the additional fuel required.

** Operator only needs to enter a value for fiscal benefits (£m) and the annual fiscal benefit inflation rate (%) if the NPV without fiscal benefits is negative at the specified discount rate

OUTPUTS

Nominal Project IRR (before financing and tax) over 32 years	6.0%
Nominal NPV (before financing and tax) (£m) over 32 years	-7.57

E CHP-R Assessment Form

#	Description	Units	Notes / Instructions
Requirement 1: Plant, Plant location and Potential heat loads			
1.1	Plant name		Thornton Energy Recovery Facility
1.2	Plant description		The main activities associated with the operation of the Facility will be the combustion of RDF, operation of thermal oil boilers, generation of electricity using an Organic Rankine Cycle (ORC) turbine, and the potential to export heat subject to commercial and economic viability. The Facility includes two waste incineration lines, waste reception hall, two thermal oil boilers, ORC turbine/generator set, turbine hall, on-site facilities for the treatment or storage of residues and waste water, flue gas treatment, stack, boilers, devices and systems for controlling operation of the waste incineration plant and recording and monitoring conditions. The Facility will also include weighbridges, water, auxiliary fuel and air supply systems, site fencing and security barriers, external hardstanding areas for vehicle manoeuvring, internal access roads and car parking, transformers, grid connection compound, firewater storage tanks, offices, workshop, stores and staff welfare facilities. The Facility has been designed to export power to the National Grid. The Facility will generate approximately 9.28 MW_e of electricity in full condensing mode. The Facility will have a parasitic load of 1.5 MW_e. Therefore, the net power export capacity of the Facility is 7.78 MW_e. In addition to generating power, the Facility has been designed to be capable of exporting up to 20 MW_{th} heat to local heat users. The maximum heat capacity will be subject to the requirements of the heat consumers and confirmed during detailed design stage. At the time of writing this report, there are no formal agreements in place for the export of heat from the Facility. The power exported may fluctuate as fuel quality fluctuates, and if heat is exported from the Facility to local heat users in the future. The nominal capacity of the Facility is 12.66 tonnes/hour of fuel with an Net Calorific Value (NCV) of 10.11 MJ/kg. The expected average availability is 7,900 hours per annum, which is regarded as typical for an energy from waste plant in the UK. Therefore, the nominal capacity for the installation is 100,00 tonnes/annum. The actual annual throughput will vary depending on the plant's

#	Description	Units	Notes / Instructions
			availability and the NCV of the waste delivered to the Facility.
1.3	Plant location (Postcode / Grid Ref)		The site is located at the Hillhouse Business Park, Thornton-Cleveleys, Lancashire, approximately 2.6km east of Cleveleys, 2.9km west of Stalmine, 3.9km south of Fleetwood and 8.2 km northeast of Blackpool. The site is centred approximately on National Grid Reference: SD345438 / SD3458243833
1.4	Factors influencing selection of plant location		The site was identified as being suitable for industrial redevelopment and given the nature of the surrounding land uses, the proposed use was considered appropriate. The site is located within the Hillhouse Technology Enterprise Zone, and there are planning policies in place which allocate the site as suitable for large scale built waste management facilities. The site is previously developed land and consists largely of hardstanding, there are no major environmental constraints on the site in relation to the proposed use and there are opportunities to provide heat from the proposed development to nearby facilities. The planning application confirms the need for an Energy Recovery Facility in the area and selected the site as a suitable site for such purposes.
1.5	Operation of plant		
a)	Proposed operational plant load	%	100
b)	Thermal input at proposed operational plant load	MW	35.55
c)	Net electrical output at proposed operational plant load	MW	7.78
d)	Net electrical efficiency at proposed operational plant load	%	21.90%
e)	Maximum plant load	%	100
f)	Thermal input at maximum plant load	MW	35.55
g)	Net electrical output at maximum plant load	MW	7.78
h)	Net electrical efficiency at maximum plant load	%	21.90%
i)	Minimum stable plant load	%	70%
j)	Thermal input at minimum stable plant load	MW	24.88
k)	Net electrical output at minimum stable plant load	MW	3.83

#	Description	Units	Notes / Instructions
l)	Net electrical efficiency at minimum stable plant load	%	15.37%
1.6	Identified potential heat loads		
			Details of the identified heat loads are in Sections 5. Following consumer screening and accounting for network heat losses and consumer diversity, potential consumers were identified with an average heat load of 3.57 $MW_{th.}$ and a peak load of 7.61 MW_{th} for the proposed heat network. The estimated heat use of the identified network is 31,243 MWh/year.
1.7	Selected heat load(s)		
a)	Category (e.g. industrial / district heating)		District heating
b)	Maximum heat load extraction required	MW	The average and diversified peak heat demand of the proposed heat network has been calculated to be 3.57 MW_{th} and 7.61 MW_{th} respectively.
1.8	Export and return requirements of heat load		
a)	Description of heat load extraction		Network to supply hot water at typical district heating temperatures (approximately 110°C) via turbine heat extractions at approximately 1.5 bar(a).
b)	Description of heat load profile		The heat load profile is variable due to mixed use developments (primarily industrial and commercial). A detailed heat load profile can be found in section 6.1 of the Heat Plan. The consumer heat load and profile are subject to verification.
c)	Export pressure	bar a	10
d)	Export temperature	°C	110
e)	Export flow	t/h	163 (nominal case)
f)	Return pressure	bar a	3
g)	Return temperature	°C	70
h)	Return flow	t/h	163 (nominal case)
Requirement 2: Identification of CHP Envelope			
2.0	Comparative efficiency of a standalone boiler for supplying the heat load	% LHV	85%
2.1	Heat extraction at 100% plant load		

#	Description	Units	Notes / Instructions
a)	Maximum heat load extraction at 100% plant load	MW	20.00
b)	Maximum heat extraction export flow at 100% plant load	t/h	Assuming heat extraction at 1.5 bar(a), export flow rate would be: 5.4 t/h
c)	CHP mode net electrical output at 100% plant load	MW	5.29
d)	CHP mode net electrical efficiency at 100% plant load	%	14.88%
e)	CHP mode net CHP efficiency at 100% plant load	%	71.14%
f)	Reduction in primary energy usage for CHP mode at 100% plant load	%	31.84%
2.2	Heat extraction at minimum stable plant load		
a)	Maximum heat load extraction at minimum stable plant load	MW	9.40
b)	Maximum heat extraction export flow at minimum stable plant load	t/h	Assuming heat extraction at 1.5 bar(a), export flow rate would be: 2.54 t/hr
c)	CHP mode net electrical output at minimum stable plant load	MW	3.83
d)	CHP mode net electrical efficiency at minimum stable plant load	%	15.37%
e)	CHP mode net CHP efficiency at minimum stable plant load	%	53.15%
f)	Reduction in primary energy usage for CHP mode at minimum stable plant load	%	24.72%
2.3	Can the plant supply the selected identified potential heat load (i.e.is the identified potential heat load within the 'CHP envelope')?		Yes, but not deemed 'Good Quality' CHP as detailed in section 7 of the Heat Plan.
Requirement 3: Operation of the Plant with the Selected Identified Heat Load			
3.1	Proposed operation of plant with CHP		
a)	CHP mode net electrical output at proposed operational plant load	MW	7.34
b)	CHP mode net electrical efficiency at proposed operational plant load	%	20.64%
c)	CHP mode net CHP efficiency at proposed operational plant load	%	30.68%

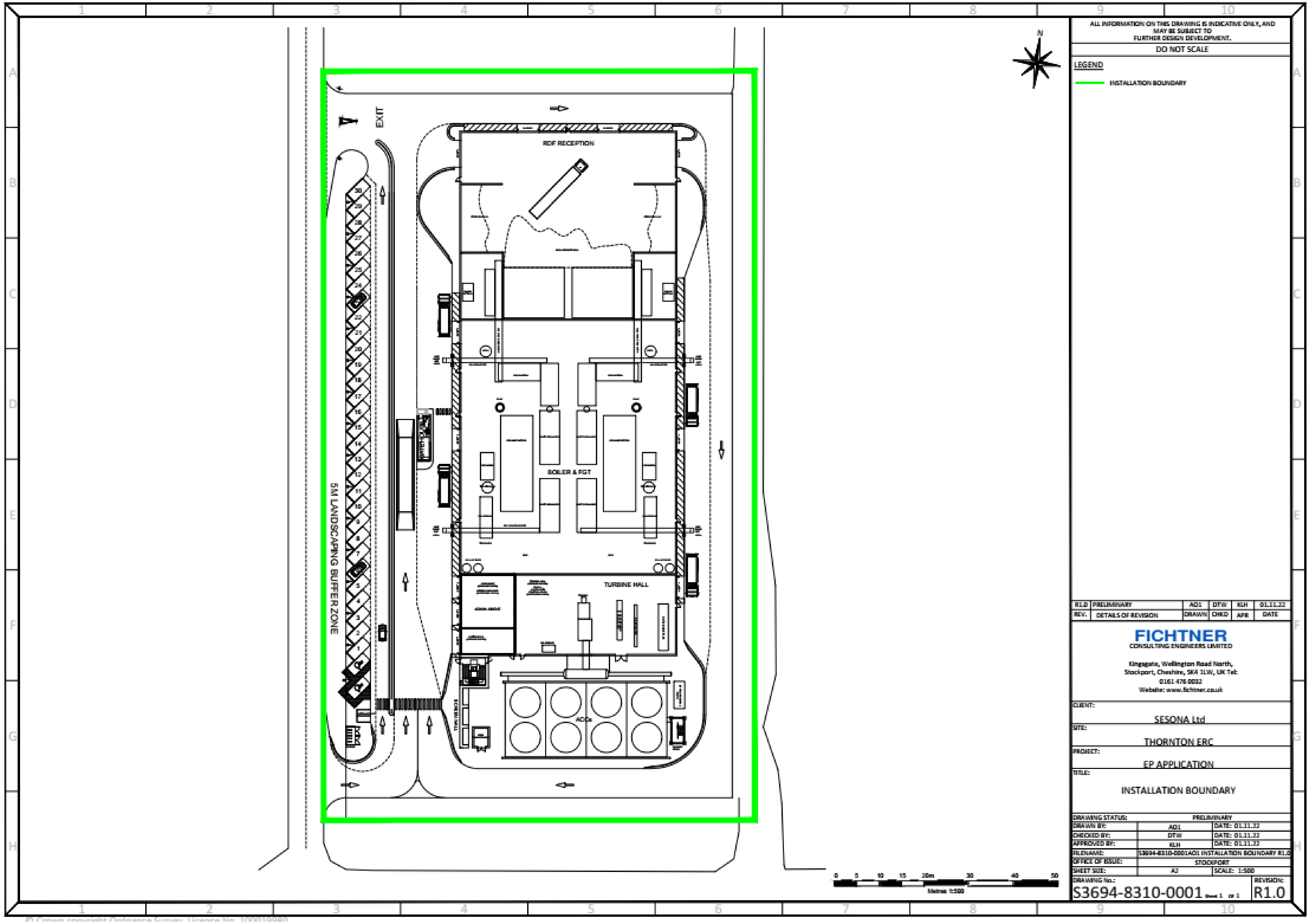
#	Description	Units	Notes / Instructions
d)	Reduction in net electrical output for CHP mode at proposed operational plant load	MW	0.45
e)	Reduction in net electrical efficiency for CHP mode at proposed operational plant load	%	1.25%
f)	Reduction in primary energy usage for CHP mode at proposed operational plant load	%	10.71%
g)	Z ratio		8.01
Requirement 4: Technical provisions and space requirements			
4.1	Description of likely suitable extraction points		Heat for the district heating system could be supplied via a heat flow extraction from low pressure turbine bleed at approximately 1.5 bar(a). Full details are provided in section 4.1.2 of the Heat Plan.
4.2	Description of potential options which could be incorporated in the plant, should a CHP opportunity be realised outside the 'CHP envelope'		The CHP opportunity lies within the CHP envelope.
4.3	Description of how the future costs and burdens associated with supplying the identified heat load / potential CHP opportunity have been minimised through the implementation of an appropriate CHP-R design		If the scheme were to be implemented, space will be allocated for the CHP equipment within or in the area adjacent to the turbine hall to avoid the cost of building a dedicated heat station at a later date. The turbine design will be selected to maximise electrical efficiency while allowing for the option of heat export to be implemented in the future. This is in line with the EA CHP-Ready Guidance which states that the initial electrical efficiency of a CHP-R plant (before any opportunities for the supply of heat are realised) should be no less than that of the equivalent non-CHP-R plant.
4.4	Provision of site layout of the plant, indicating available space which could be made available for CHP-R		Detailed design of the Facility has not been undertaken at this stage. However, space will be left available on site for heat export infrastructure. Please see the site layout in Appendix F. The heat network will (likely) include low pressure vapour extraction piping, control and shutoff valves, heat exchangers, district heating supply and return lines, district heating circulation pumps, condensate fluid return piping (to the condensate tank), control and instrumentation / electrical connections, an expansion tank for pressurisation of the district heating pipe network and heat metering. If necessary, a back-up boiler will be located at a suitable location within the installation boundary for ease of connection to the primary hot water circuit.

#	Description	Units	Notes / Instructions
Requirement 5: Integration of CHP and carbon capture			
5.1	Is the plant required to be CCR?		No
5.2	Export and return requirements identified for carbon capture		
	100% plant load		
a)	Heat load extraction for carbon capture at 100% plant load	MW	N/A
b)	Description of heat export (e.g. steam / hot water)		N/A
c)	Export pressure	bar a	N/A
d)	Export temperature	°C	N/A
e)	Export flow	t/h	N/A
f)	Return pressure	bar a	N/A
g)	Return temperature	°C	N/A
h)	Return flow	t/h	N/A
i)	Likely suitable extraction points		N/A
	Minimum stable plant load		
j)	Heat load extraction for carbon capture at minimum stable plant load	MW	N/A
k)	Description of heat export (e.g. steam / hot water)		N/A
l)	Export pressure	bar a	N/A
m)	Export temperature	°C	N/A
n)	Export flow	t/h	N/A
o)	Return pressure	bar a	N/A
p)	Return temperature	°C	N/A
q)	Return flow	t/h	N/A
r)	Likely suitable extraction points		N/A
5.3	Operation of plant with carbon capture (without CHP)		
a)	Maximum plant load with carbon capture	%	N/A
b)	Carbon capture mode thermal input at maximum plant load	MW	N/A
c)	Carbon capture mode net electrical output at maximum plant load	MW	N/A

#	Description	Units	Notes / Instructions
d)	Carbon capture mode net electrical efficiency at maximum plant load	%	N/A
e)	Minimum stable plant load with CCS	%	N/A
f)	Carbon capture mode CCS thermal input at minimum stable plant load	MW	N/A
g)	Carbon capture mode net electrical output at minimum stable plant load	MW	N/A
h)	Carbon capture mode net electrical efficiency at minimum stable plant load	%	N/A
5.4	Heat extraction for CHP at 100% plant load with carbon capture		
a)	Maximum heat load extraction at 100% plant load with carbon capture [H]	MW	N/A
b)	Maximum heat extraction export flow at 100% plant load with carbon capture	t/h	N/A
c)	Carbon capture and CHP mode net electrical output at 100% plant load	MW	N/A
d)	Carbon capture and CHP mode net electrical efficiency at 100% plant load	%	N/A
e)	Carbon capture and CHP mode net CHP efficiency at 100% plant load	%	N/A
f)	Reduction in primary energy usage for carbon capture and CHP mode at 100% plant load	%	N/A
5.5	Heat extraction at minimum stable plant load with carbon capture		
a)	Maximum heat load extraction at minimum stable plant load with carbon capture	MW	N/A
b)	Maximum heat extraction export flow at minimum stable plant load with carbon capture	t/h	N/A
c)	Carbon capture and CHP mode net electrical output at minimum stable plant load	MW	N/A

#	Description	Units	Notes / Instructions
d)	Carbon capture and CHP mode net electrical efficiency at minimum stable plant load	%	N/A
e)	Carbon capture and CHP mode net CHP efficiency at minimum stable plant load	%	N/A
f)	reduction in primary energy usage for carbon capture and CHP mode at minimum stable plant load	%	N/A
5.6	Can the plant with carbon capture supply the selected identified potential heat load (i.e. is the identified potential heat load within the 'CHP and carbon capture envelope')?		N/A
5.7	Description of potential options which could be incorporated in the plant for useful integration of any realised CHP system and carbon capture system		N/A
Requirement 6: Economics of CHP-R			
6.1	Economic assessment of CHP-R		In order to assess the economic feasibility of the CHP scheme (as required under Article 14 of the Energy Efficiency Directive) a cost benefit assessment has been carried out in accordance with the draft Article 14 guidance. The results of the CBA indicate an internal rate of return of 12.9 % and a net present value of -£1.82 million. The proposed heat network will not yield an economically viable scheme in its current configuration. The economic feasibility of the scheme will be reassessed in the future when there is a better understanding of heat demands and considering any subsidies that support the export of heat.
BAT assessment			
	Is the new plant a CHP plant at the outset (i.e. are there economically viable CHP opportunities at the outset)?		No
	If not, is the new plant a CHP-R plant at the outset?		Yes
	Once the new plant is CHP-R, is it BAT?		Yes

F Site Installation Boundary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LEGEND
INSTALLATION BOUNDARY
N
EXIT
RDF RECEPTION
BOILER & FGT
TURBINE HALL
ACCs
5M LANDSCAPING BUFFER ZONE
R1.0 PRELIMINARY AO1 DTW KLH 01.11.22
REV. DETAILS OF REVISION DRAWN CHKD APR DATE
FICHTNER
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Website: www.fichtner.co.uk
CLIENT: SESONA Ltd
SITE: THORNTON ERC
PROJECT: EP APPLICATION
TITLE: INSTALLATION BOUNDARY
DRAWING STATUS: PRELIMINARY
DRAWN BY: AO1 DATE: 01.11.22
CHECKED BY: DTW DATE: 01.11.22
APPROVED BY: KLH DATE: 01.11.22
FILENAME: S3694-8310-0001AO1 INSTALLATION BOUNDARY R1.0
OFFICE OF ISSUE: STOCKPORT
SHEET SIZE: A3 SCALE: 1:500
DRAWING No.: S3694-8310-0001 Sheet 1 of 1
REVISION: R1.0
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2	C1
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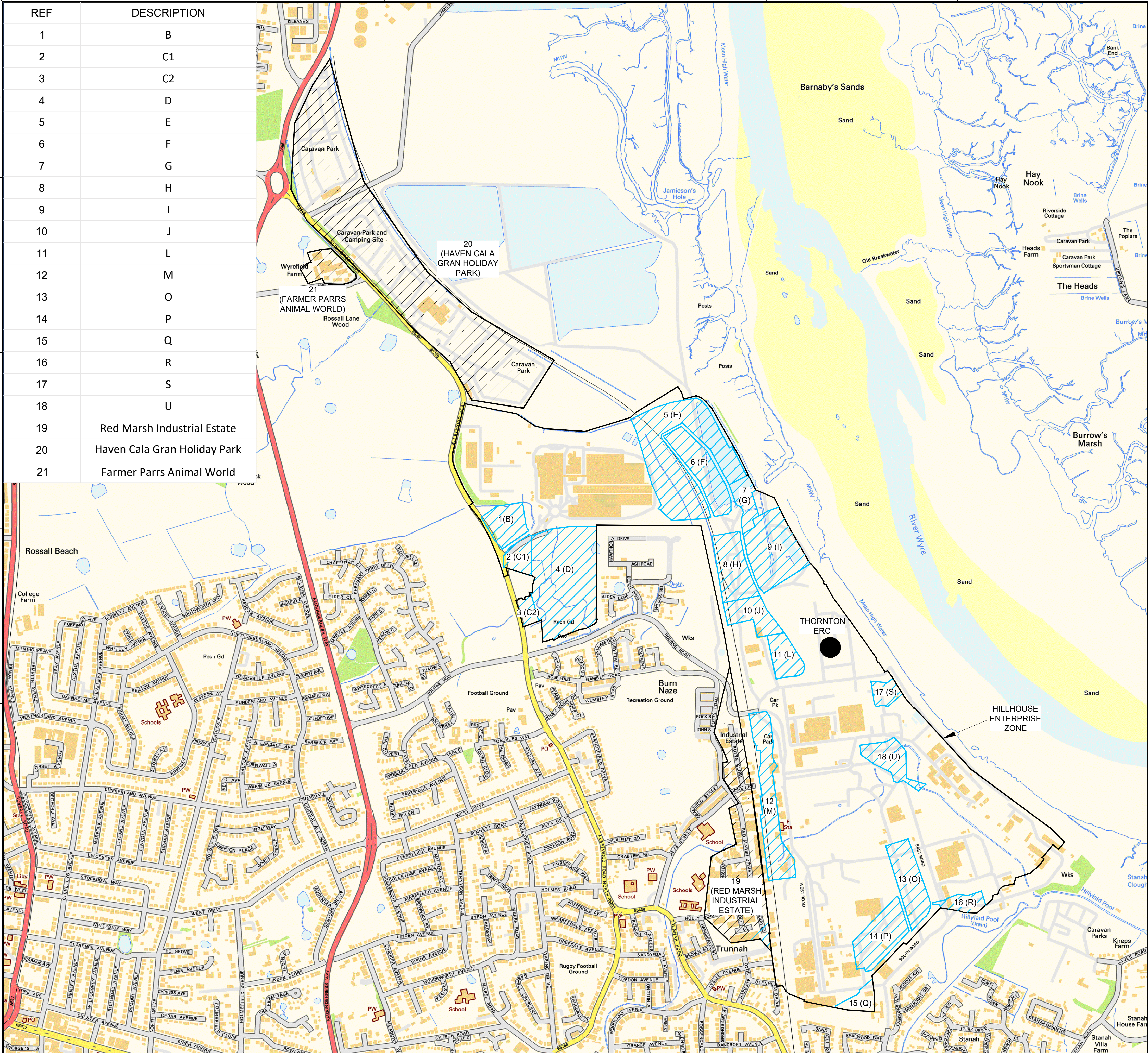
10	J
11	L
12	M
13	O
14	P
15	Q
16	R
17	S
18	U
19	Red Marsh Industrial Estate
20	Haven Cala Gran Holiday Park
21	Farmer Parrs Animal World



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NOTES:

- ● THORNTON ERC
- HEAT USERS
- HILLHOUSE ENTERPRISE ZONE HEAT USERS

REV.	DETAILS OF REVISION	DRAWN	CHKD	APR	DATE
R2.0	PRELIMINARY	DTW	AO1	VBT	25.01.23
R1.0	PRELIMINARY	DTW	AO1	VBT	11.11.22

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SITE: THORNTON ERC

PROJECT: THORNTON ERC

TITLE: HEAT MAP

DRAWING STATUS:	PRELIMINARY	
DRAWN BY:	DTW	DATE: 11.11.22
CHECKED BY:	AO1	DATE: 11.11.22
APPROVED BY:	VBT	DATE: 11.11.22
FILENAME:	S3694-8310-0013DW HEAT MAP R2.0	
OFFICE OF ISSUE:	STOCKPORT	
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REVISION: R2.0