

Stroud District Council: Water Source Heat Pump Projects at Port Mill and Ebley Mill

Wednesday 27 April 2022

Summary

The design, installation and commissioning of water source heat pumps at two Grade II* listed sites, former woollen mills, in Stroud District council were delivered from March 2019 to December 2021. The aim of the project was primarily to reduce direct carbon emissions from two of the council's major buildings, as well as remove the reliance on heating the buildings from burning fossil fuels and to sustain the economic life of the historic buildings.

Leader of Stroud District Council, Cllr Doina Cornell, said "One of our three main priorities in the new Council Plan is environment and climate change, with an objective of protecting our environment, and leading the district to carbon neutrality in 2030. This new way of heating these buildings is an important step towards meeting that target."

Our problem

Halfway between the town of Stroud and the village of Chalford, Brimscombe Port Mill sits within the former Brimscombe canal port that is undergoing a major redevelopment as a part of the [Cotswold Canals Connected project](#). The aim of the [port's redevelopment](#), which includes reinstatement of the Stroud water canal together with the historic canal basin, is to create a sustainable mixed use community, servicing the needs of both existing and future residents that puts "the heart back into Brimscombe". The former woollen mill will be the only building retained as a part of this redevelopment and will form a prominent landmark within the completed scheme.

Ebley Mill and Brimscombe Port Mill are two buildings occupied as offices, whilst the site at Ebley Mill also serves as the Stroud District Council's main administrative headquarters. Both sites are Grade II* listed, previously heated by mains gas which resulted in a large carbon footprint for both properties. Given the council's [2030 Net Zero target](#) for council's operations, this project was conceived to primarily decarbonise two major buildings within the council's stock, remove the reliance on heating the buildings from burning fossil fuels, reduce fuel costs and to sustain the economic life of the historic buildings.



Photo of Cllr Doina Cornell, Leader of Stroud District Council, at the Ebley Mill water source heat pump.

Overview

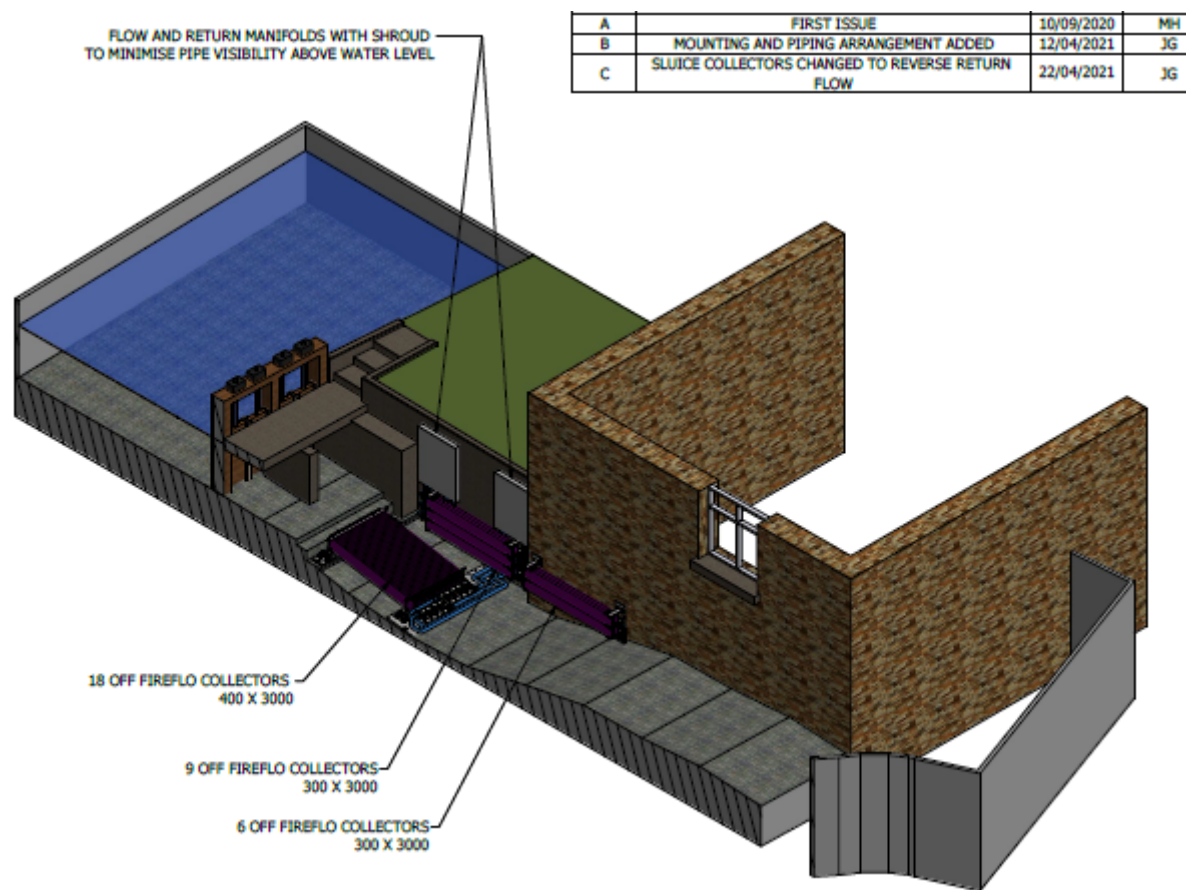
Both sites required a solution to the replacement space and domestic water heating system for different reasons. The existing gas boiler plant for the Brimscombe Port Mill was located in a building due for demolition and although only some seven years old, a new suitable housing would be required should the boilers be salvaged and re-located. Meanwhile, the boilers at Ebley Mill dated back to the building's conversion to offices in 1989 and replacement gas boilers or alternative fuel sources for the space heating needed to be considered.

The buildings' locations immediately adjoining the main river over which the council have ownership led to the proposal to harness the latent heat from the river. In brief, heat pumps work by pumping heat from a cooler 'source' to a warmer 'sink', which is the buildings' heating systems. A refrigerant absorbs heat which causes it to evaporate. The subsequent compression of the now gaseous refrigerant causes it to condense and release its heat

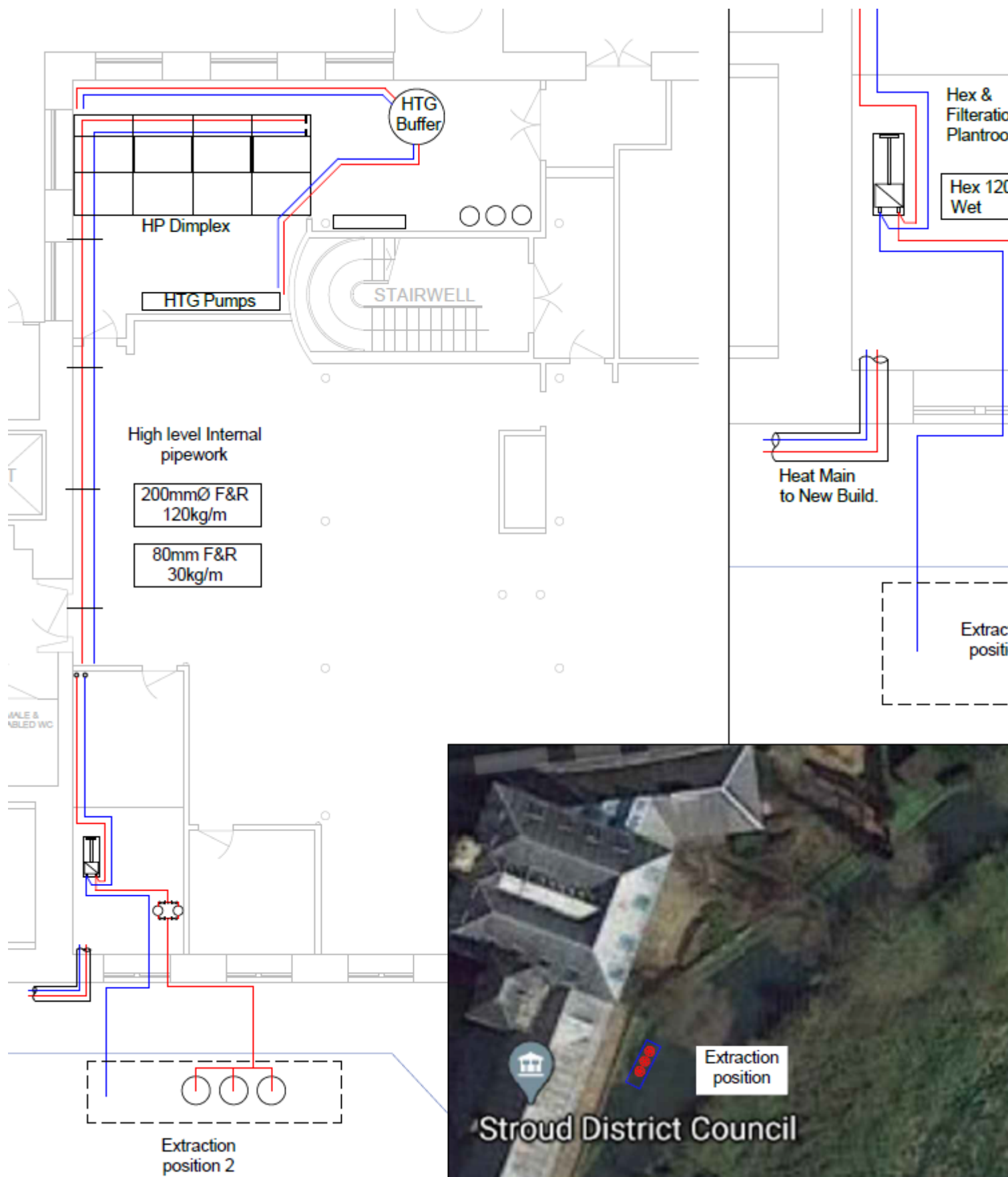
Whilst alternative space-heating options were [considered](#), ultimately with immediately adjacent water, water-source heat pumps were considered the most suitable replacement. For example, the listing designation of both Mills meant that we could not accommodate external condensers, whilst both sites have physical limitations when considering biomass. Water-source heat pumps were also preferable in this instance as the provision of ground-source collectors risked compromising the new infrastructure and upcoming redevelopment of the Brimscombe Port Mill basin. Equally, the majority of buildings on site were still in occupation. The availability of funding for this technology was a further catalyst to promoting the projects.

Logistically, the feasibility study showed that both locations' connections between heat pumps and external river collectors was relatively short whilst the only partial occupation of ground floor spaces enabled the formation of internal plant rooms housing the new heat pumps. The relatively limited alterations meant that neither Listed

Building Consent nor Planning approval was required.



Brimscombe Port



Timeline / project progress

- Renewable First, a local energy consultancy based at Brimscombe Port Mill, was appointed to complete the initial feasibility studies in March 2019 at a cost of £6200.
- The schemes were procured through an open tender process in June 2020 and, following a quality and cost evaluation of tenders, the successful contractor, the Cotswold Energy Group, was appointed in December of that year.
- Work suitably commenced at both buildings in April 2021 after the end of the heating season.
- The heating from the new sources at both sites was achieved by November 2021 and the commissioning and completion of works was achieved by December 2021.
- The initial feedback from the design team and building occupants is very positive with good distribution of heating and very few problems with the commissioning and running of the plant.
- The project provided a very practicable solution to the future heating of the buildings and coupled with successful applications to the Office of Gas and Electricity Markets (Ofgem) Renewal Heat Incentive (RHI) scheme ensured a satisfactory return on the capital investment projected to be within the 20 year period of eligible RHI payments. An expert was employed by the contractor to make an application to Ofgem and it was incumbent on the client to provide detailed supporting information at different stages in order to meet critical deadlines.
- A formal debrief and evaluation will take place in December 2022

Stakeholders

- Planning and decision making - following the feasibility study a business case was approved by the council's [Strategic Director of Resources](#), before approval to progress was sought from the local authority's political members at Full Council. There was member interest in both the robustness of the procurement process and officer's measures to mitigate risks before the project gained cross-party support. The council thereby agreed to fund the works to the value of £1.385m where the cost of heat pumps was £700k and alterations to existing heating systems were £234k.
- Environmental approval - the schemes required detailed consent from the Environment Agency for works within the river and an external audit was required to support the application to Ofgem. Renewables First were employed to gain consent as the client had little expertise in such, whilst Renewables First were experienced in applications to and negotiations with the Environment Agency
- Occupants and users - those in the buildings were required to vacate spaces and/or use alternative spaces for short periods throughout the contract works. The buildings were under occupied during the installation works due to the pandemic and mainly took place during the summer months, minimising disruption.
- Cost - Initial calculation of return on investment (ROI) at tender stage confirmed a return within 20 years. A review has not been completed on the final account which includes £200k costs for works by the Distribution Network Operator, upgrades to controls and provision for future EV charging on site. The increased gas costs would be factored into such a recalculation.

Whole systems approach

- The project has a significant impact on extending the economic life of both buildings that have considerable prominence within the council's building portfolio.
- Encouraging too is the staff and tenant adoption of the changes to the method of heat generation and further shows the intent of the district council in reducing carbon emissions wherever it can directly have influence.
- The comfort levels for occupants is enhanced and the buildings will suffer less from peaks and troughs in internal temperatures. Wasteful 'lead in' periods will also be avoided in raising buildings' temperatures to comfortable levels.
- The return to the council's investments through the RHI scheme coupled with unforeseen escalating fuel costs make the project all the more viable both in financial terms, public relations and for fuel certainty.
- This project has encouraged others to consider doing similar projects, with communications both locally and further afield with clients and building owners.

Impact

The projected life of the plant is some 25 years and will therefore have a considerable impact on the council's estate over that period. Although the heat pumps have been running for some 4 months, the initial performance has yet to be reported but will likely be published by November 2022 . It is anticipated that the heat pumps will make carbon savings in the order of 100 to 160 tonnes each year (based on feasibility studies). In light of the recent energy crisis, actual cost savings are due to be calculated.

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- The project was undertaken in the middle of the COVID-19 pandemic resulting in some materials supply delays and the interruption of programmes where contractor's operatives were isolating due to illness. However, the government's work from home policy during this time meant that internal spaces could be worked on more easily during the non-heating season (April to September), further avoiding any delays to the 'heat on' dates.
- Early engagement with consenting authorities, especially the Environment Agency was required to ensure works could be substantially completed before space heating was required.
- Applying to the Ofgem renewable heat incentive (RHI) scheme was not straightforward. A lack of clarity around the application process and timeline made meeting short and critical information deadlines difficult. Although staff capacity and time was planned in, unanticipated circumstances meant requesting team support and information at short notice.
- Both buildings required an upgrade to their mains electricity supplies and the extent of the upgrade and early engagement with the District Network Operator (Western Power Distribution) was required to ensure their works could be accommodated within the programme. At Ebley Mill there was a requirement for a replacement larger capacity transformer whilst at Brimscombe Port, a new connection agreement was required. Regular communications were diarized with the DNO and considerable client and consultant's time was required to avoid unnecessary delays and ensure a quick turnaround of information required by them.
- There has been a very positive response from publicity of the completed schemes generating interest in the technology from a number of groups/organisations. For example; in [Stroud News](#), and [two](#) articles in the [Stroud Times](#)
- It is obvious from discussions with members of the community, contractors and business owners amongst others that few people are aware of such options to harness water to heat any buildings let alone historic, large, typically draughty mill buildings. Early on during the scoping of the projects, there were voiced concerns that the technology may not be feasible without further enhancements to the fabric of the buildings. The heat loss calculations, air permeability tests and the comfort levels derived from the completed schemes have happily proved otherwise.
- Publicity therefore will improve knowledge, encourage innovation and provide confidence to owners considering options for their buildings.

Contact details

- Brian McGough MRICS, Building Programmes Manager, Property Services, Stroud District Council — brian.mcgough@stroud.gov.uk