Carbon Management Plan 2025

Executive Summary

This Carbon management plan reviews the current performance against the University target to reduce carbon emissions and sets out a plan for carbon reduction up to 2030. The University target is to achieve net zero carbon emissions by 2030.

The University has invested significantly in energy efficiency and renewable energy since 2010. More recently the transition from gas for heating has become a priority. The Public Sector Decarbonisation Scheme (PSDS) has been incredibly important in facilitating this and a series of projects from rounds 2, 3a, and 3b have resulted in changes which will translate into savings of 3,500 tCO2. Further funding has just been secured from the PSDS3c round. This will enable the installation of a 3 MW ground source heat pump and further extend the district heating network on site, resulting in a further 1,000 tCO2 saving.

The plan projects how the University can reduce scope 1 & 2 emissions from just under 9,000 tCO2 in 2022/23 to around 2,000 tCO2 in 2030/31. Suggestions are made for how the gap to chieve zero emissions can be achieved. These include seeking further renewable energy opportunities both on site and near site potentially in partnership with others.

An initial estimate of scope 3 emissions is detailed in this plan. The figures suggest that scope 3 emissions could be over three times the amount of scope 1 and 2 emissions. Further work is required to verify the figures a working group has been established to do this and to develop a plan to address them.

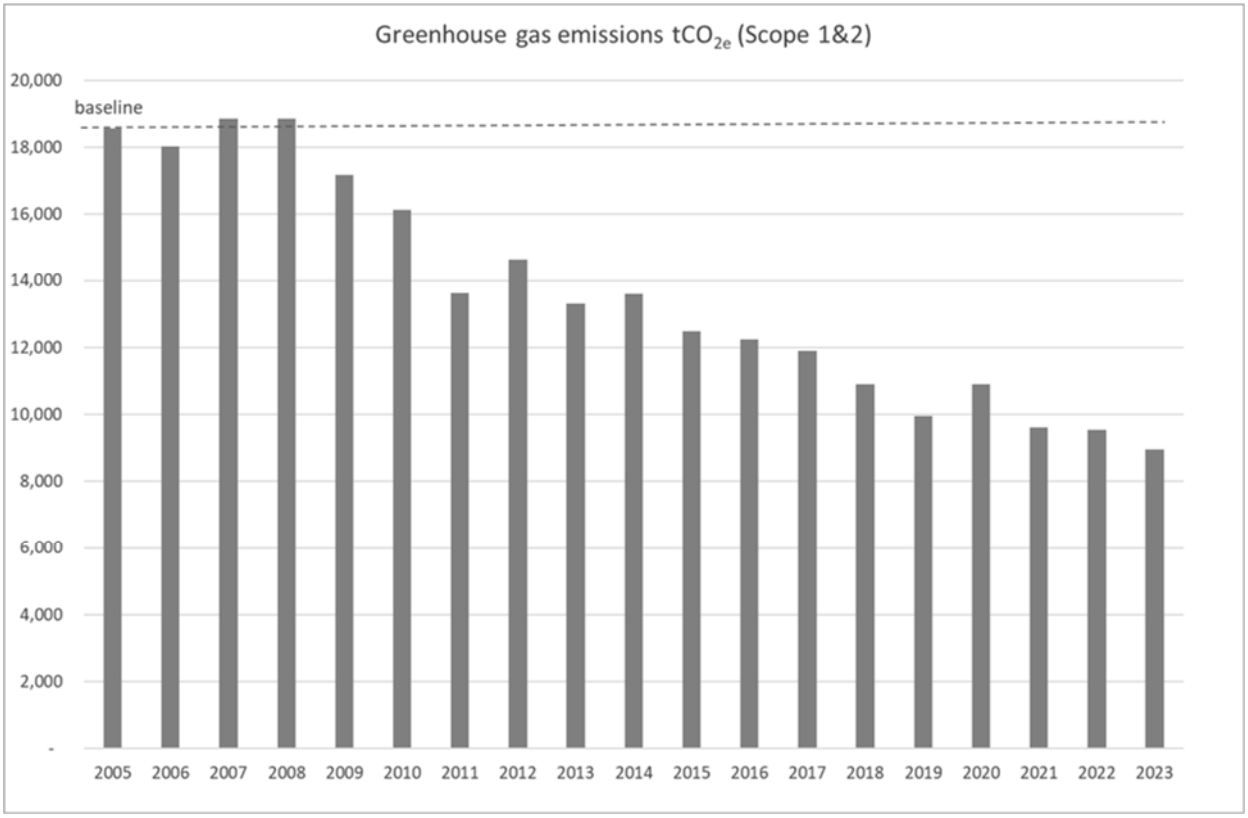
Recommendation to prioritise the following objectives:

1. Continue to improve the energy efficiency of operations on site.
2. Reduce gas usage on site by seeking funding for alternatives to gas boilers and CHP.
3. Continue to develop and improve the district heating network.
4. Continue to develop and improve the campus high voltage electricity system, including options for a SLES.
5. Explore the feasibility of more on and off-site generation including renewable energy options and identify funding opportunities for this.
6. Develop a strategy for electrifying the University vehicle fleet.
7. Develop a system for verifying and reporting reliable Scope 3 data, along with a plan for reducing emissions were possible.
8. Develop a Carbon Offset Strategy.

Carbon Progress

The University has a target to reduce its Carbon emissions to Net Zero by 2030/31 academic year. Since the implementation of carbon management planning in 2009 Scope 1 and 2 emissions have reduced steadily. They are now hovering around half the original 2005 baseline. Our carbon footprint has been restated for previous years in accordance with Government Greenhouse Gas reporting guidelines which take account of changes in our estate and also national conversion factors.

Figure 1: Scope 1 & 2 Carbon emissions



Note the years on x axis are for the University year, so 2005 represent August 2005 to July 2006.

The decrease in Carbon emissions reflects the significant investment the University has put into energy saving initiatives such as a large Combined Heat and Power unit in 2011, a new Biomass boiler in 2014, improvements to the district heating system, a solar farm in 2018 and continuous annual energy efficient refurbishments to the real estate. The successful Public Sector Decarbonisation project installed in 2022 enabled an extension to the solar farm, a large-scale Air Source Heat Pump for the district heating, new Building Management System for the district heating along with other improvements, LED lighting installations and a 1 MWh battery to help balance the University's private wire network. The full energy savings from these improvements have yet to transpire as the complexities of the changes take time to bed in. A further Public Sector Decarbonisation project completed in 2024 resulted in two large

aircraft hangars being fully insulated, with quick closing doors interlocked to a new heating system with improved control and a further installation of solar increasing on site capacity to over 2.3 MW. The most recent Planning Public Sector Decarbonisation project nearing completion has extended the district heating onto the residential part of the campus ad added a large thermal store to the Energy Centre. Planning is also underway for the installation this year of a large 3 MW Ground Source Heat Pump project funded through PSDS3C and a further extension to the district heating.

The emissions reported in the graph above are for scope 1 and 2 greenhouse gas emissions (excluding scope 3 electricity transmission and distribution emissions) including electricity, heating, process fuels and on-site vehicle fuels for the whole University estate but excluding activity at Shrivenham Campus which is managed by the MOD. Reporting years are from August to July. Other transport emissions and emissions associated with waste and water are not included at present although there are plans to include these within the footprint for future reports. Further information on the Carbon Management Plan can be found on the University website.

For SECR reporting purposes additional scope 3 emissions from business travel involving cars and motorbikes has been included. A breakdown of the emissions is detailed below. SECR data for 2023/2024

Figure 2: SECR report

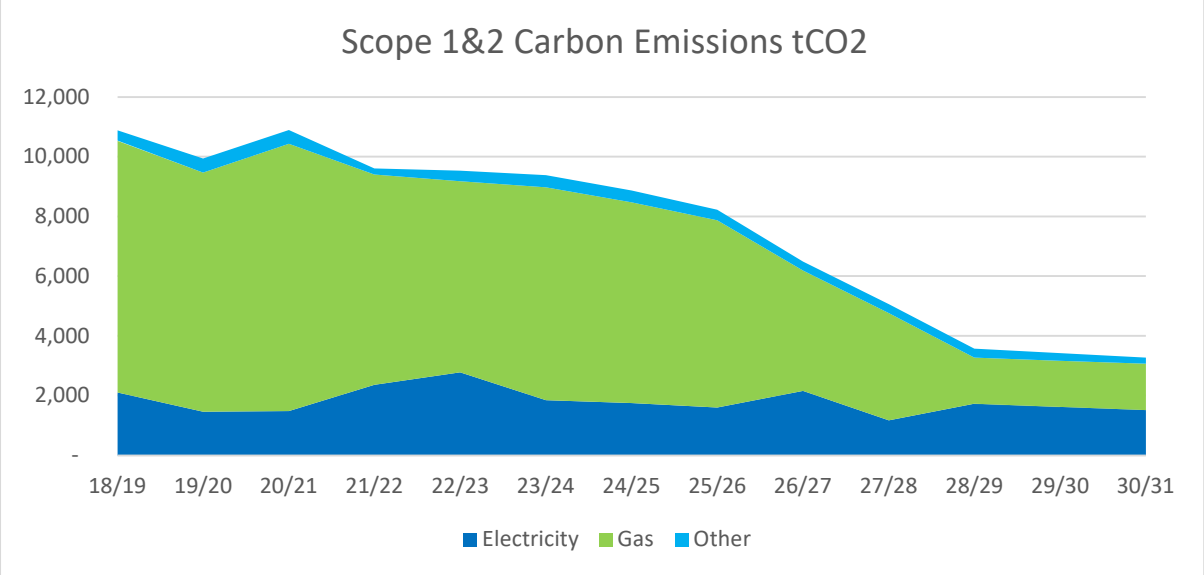
	Energy Purchased kWh		tCO_{2e}				
Fuel Type	**2023/24**	**2022/23**	**Sc 1**	**Sc 2**	**Sc 3**	**2023/24**	**2022/23**
Gas	36,802,100	34,815,330	6,731	0	0	6,731	6,417
Electricity	10,010,900	13,345,446	0	2,073	183	2,256	3,003
Biomass	958,740	1,636,900	11	0	0	11	18
Gas Oil	151,485	406,128	39	0	0	39	106
Aviation Turbine	518,414	462,583	129	0	0	129	115
Diesel	243,401	282,550	58	0	0	58	68
Aviation Spi	96,040	150,099	23	0	0	23	36
Petrol	14,209	14,205	3	0	0	3	3
Burning Oil	15,333	31,003	4	0	0	4	8
LPG	1,501	0	0	0	0	0	0
Sub-Total	**48,812,122**	51,144,244	**6,998**	**2,073**	**183**	**9,254**	9,772
Business Tr (rental/employee owned vehicles where fuel is purchased)	448,045	405,771	0	0	120	120	109
Total Gross tCO_{2e}			**6,998**	**2,073**	**304**	**9,374**	9,880

Notes:

1. The Intensity Ratio in 2023/24 for all emissions reported in Figure 2 is 4.27 tCO2e/£100,000 turnover. In 2022/23 it was 4.49 tCO2e/£100,000 on the same basis.
2. Numbers shown in the table above are rounded to the nearest whole number or tenth.
3. The methodology used follows the UK Government Environmental Reporting Guidelines. The University has an energy management system certified to ISO50001. Data from invoices is used unless this relies on estimates otherwise the University has extensive automatic meter reading and manual reading processes. Where no data is not available, estimates have been used in a few very minor instances amounting to less than 0.3% of the total. These estimates are based on existing data. The reporting period is August 2023 to July 2024. Government greenhouse gas emission factors for 2023 have been used.
4. The University generates more than half of its electricity from an on-site gas fuelled CHP with an output of 1.4 MW and also a 1.45 MW solar farm (with 0.9 MW solar farm just installed) and other smaller roof mounted PV systems. The output of the CHP in 2023/2024 was 7,616,771 kWh consuming 21,001,228 kWh of gas, and the output of the solar installations was 1,522,414 kWh. Note this means the overall consumption of electricity was 19,150,085 kWh.
5. More detailed information on the progress of the University towards reducing its greenhouse gas emissions and other aspects of environmental performance can be found in the annual environmental report on the website www.cranfield.ac.uk.

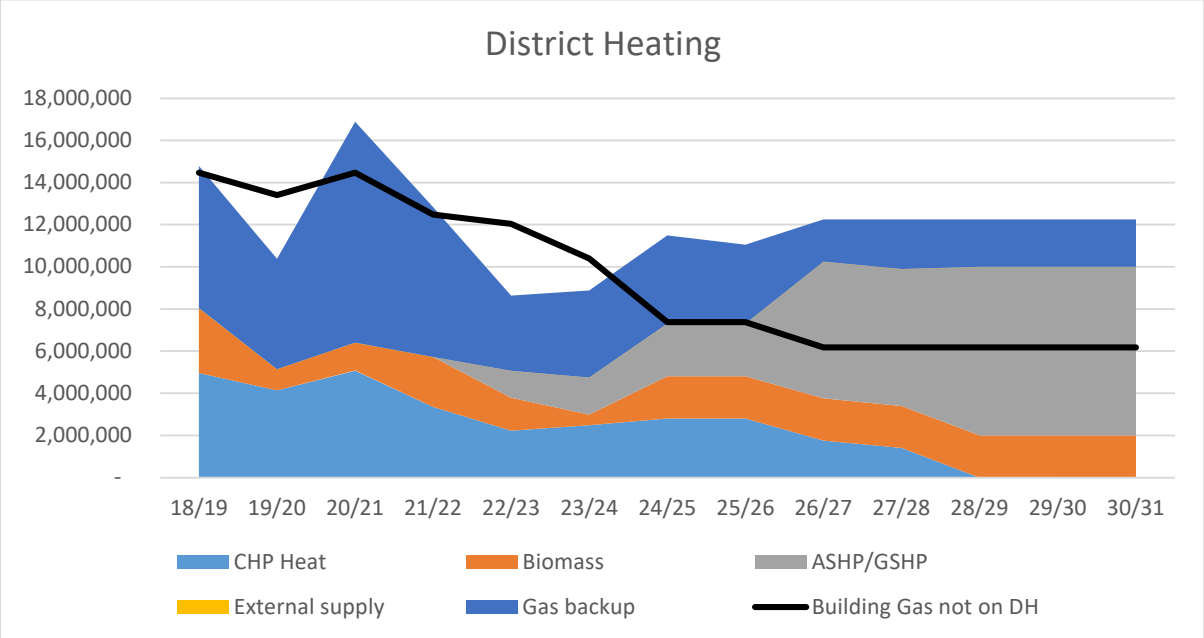
Meeting the 2030 Carbon Target

Graph 1: Projection of Scope 1 & 2 emissions



This graph above shows the carbon progress over the last 5 years and the current projection to 2030. In 2023/24 carbon emissions from gas consumption on site is clearly still dominant. Over the period 2022 to 2027 the potential impact of the PSDS projects can be seen with overall Scope 1 & 2 CO2 emissions reducing from 9,500 tCO2 to 5,500 tCO2. PSDS projects to date have seen the district heating network updated with air source heat pumps, improved buildings controls, LED lighting, extra solar installations, battery storage (PSDS2), insulation of the two largest buildings onsite (PSDS3a), thermal storage and the expansion of the heat network to the residential estate (PSDS3b), and 3 MW ground source heat pump with further expansion of district heating (PSDS3c) planned for summer 2025. This reduction in CO2 is mainly through the reduction in gas usage switching from gas for heating to heat pumps. The consequent increase in consumption of electricity is compensated for by increased electricity from solar (assuming connection to nearby solar farm being developed) and a steadily decreasing carbon factor for electricity imported from the grid.

Graph 2: Projection of fuel mix for district heating

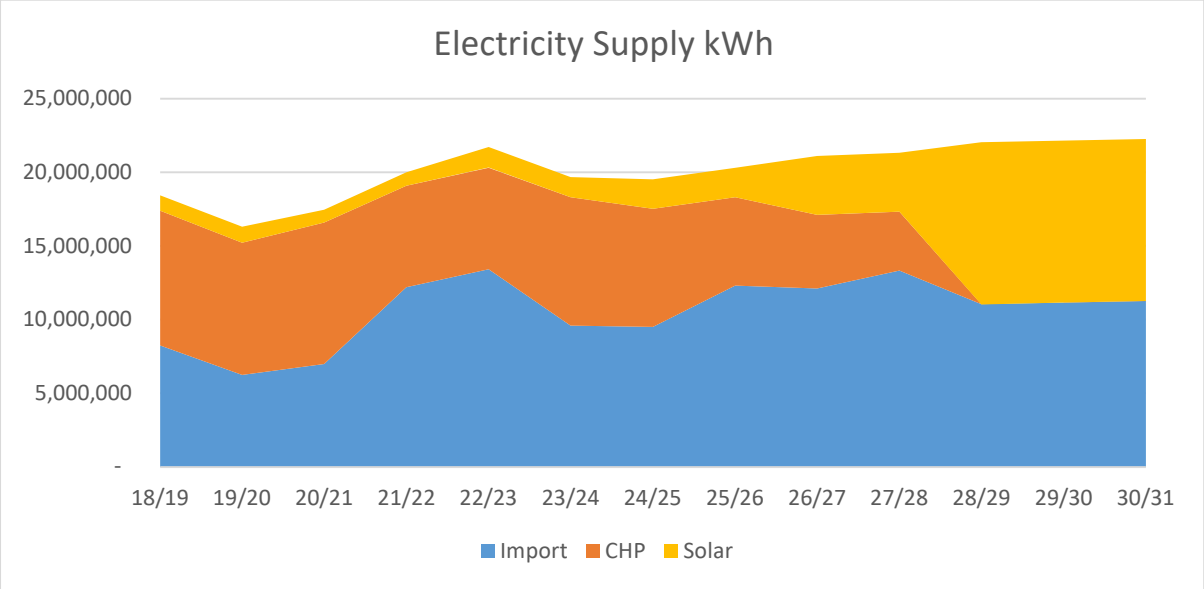


The district heating projection to 2030 shows the impact of heat pumps (on the district heating). At the same time the gas fired CHP generator is retired. Last year's projection included for a local low carbon heat network based in Milton Keynes, which would have enabled buildings not already on the CU district heating to be decarbonised. This heat network is no longer progressing in the same way and is unlikely to be an option. The remaining buildings still reliant on gas boilers for heating (mainly on the residential campus) will now need an alternative solution.

Throughout the period it is assumed that energy efficiency measures are sufficient to cap overall demand for heat and power against a continuing increase in floor area and activity.

It is evident that the projection does not achieve zero carbon emissions. This is because of the buildings still reliant on gas heating and remaining but reducing emissions associated with electricity import and other emissions. The “other” emissions in the graph are largely from the use of vehicles on site. To achieve net zero emissions further action must be taken to address buildings still reliant on gas heating, vehicle emissions, reduce electricity import and offset any remaining emissions.

Graph 2: Projection of electricity supply



To facilitate more renewable electricity the University high voltage electricity network needs to be developed to provide more storage and demand management. This would also help counter the current constraints which limit export and import of electricity. The potential for a Smart Local Energy System is currently being discussed which could potentially expand the University’s network and allow energy trading with neighbours. A community owned project or third party developer could help to facilitate this. Other financing options should also be explored.

A wind turbine project would potentially provide cheaper electricity than solar and provide capacity at the right time of year for heat pump operation. Obviously, the constraints of the airport make this difficult on site. But potential sites in the neighbourhood could be investigated provided the connecting cable is not too long. With the current electricity market regime, the direct connection of a generator such as a wind turbine or solar farm “behind the meter” is key to finding an affordable solution.

The migration of the onsite vehicle fleet from largely diesel with some petrol vans and cars to electric vehicles needs to be planned. The the University research aircraft are currently trialling low carbon fuels.

The planting of trees is underway at the Silsoe College Farm Site “College Wood” will cover over 90 ha and involve the planting of 120,000 trees over the next two years. This will provide a carbon “inset” to help offset remaining emissions.

Scope 3 Carbon

Scope 3 emissions are notoriously difficult to quantify as they represent the indirect carbon emissions incurred by third parties providing materials and services to the University. In most cases it is not possible to acquire the precise data but it is possible to use industry norms and factors for these emission based on spend. The University is a member of SUPC (Southern Universities Buying Consortium) which has undertaken an analysis of Cranfield Universities spend and the associated scope 3 emission based on industry averages.

Emissions						
	Tonnes CO2e 22/23	**Tonnes CO2e 21/22**	**Tonnes CO2e 20/21**	**Tonnes CO2e* 19/20**	**Change CO2e from previous year**	**Change % from previous year**
Business services	14,443	10,130	5,959	12,113	4,313	42.6%
Paper products	72	117	173	496	- 45	-38.5%
Other manufactured products	920	2,381	554	942	- 1,461	-61.4%
Manufactured fuels, chemicals and glasses	111	765	90	2,424	- 654	-85.5%
Food and catering	726	334	168	1,225	392	117.4%
Construction	540	2,004	11,934	40,142	- 1,464	-73.1%
Information and communication technologies	7,677	8,506	8,194	1,256	- 829	-9.7%
Waste and water	189	445	214	416	- 256	-57.5%
Medical and precision instruments	2,541	5,300	11,182	87	- 2,759	-52.1%
Other procurement	1,149	1,349	462	7,131	- 200	-14.8%
Unclassified	524	775	4,599	286	- 251	-32.4%
Total	29,892	32,105	43,529	66,518	- 2,213	-6.9%
* Uncoded spend data was not included prior to 20/21						

This table does not include Business Travel which this year SUPC calculate would be an additional 14,980 tCO2 compared with 16,200 tCO2 the previous year. Commuter travel emissions are not included.

Further work is required to verify this analysis and add to it. The figures highlight the importance of addressing Scope 3 emissions. The scale dwarfs current Scope 1 and 2 emissions. Further work is required to ensure the accuracy of the data. A detailed plan

needs to be developed to work with the supply chain to reduce emissions and also to develop a strategy for carbon offsets where this is not possible in the time frames required.

Action Plan

Action delivered last year or not progressed

Task	Description	Who	Progress
Deliver PSDS3b project	District heating extended to residential state	Development team/GE	Delivered March 2025
Negotiate contract with local heat network	Work with developers of new heat network to ensure cost effective low carbon heat supply	GE/ Developer/ Contracts	No longer viable
Develop options for tree planting	Explore opportunities for tree planting	GE/Forest of Marston vale	Large planting at Silsoe in progress

The following actions new and ongoing are proposed to progress the Carbon Management Plan in the near term.

Task	Description	Who	When
Deliver PSDS3c project	Install 3 MW Ground Source Heat Pump and further extend district heating	Development team/GE	By March 2026
Negotiate contract with local solar farm developer	Work with developers of new solar farm to ensure cost effective zero carbon electricity	GE/ Developer/ Contracts	Ongoing
Explore feasibility of further renewable energy projects	Work with others to explore technical and financial options for further renewable energy capacity, including storage and SLES	GE/ Consultant/ Partners	Ongoing
Review options for EVs	Look at University vehicle fleet and explore potential to convert to EVs	GE	Ongoing
Develop options for tree planting	Explore opportunities for tree planting	GE/Forest of Marston vale	Ongoing
Develop Scope 3 reporting and planning	Set up working group to gather data for Scope 3 reporting and develop strategy for reducing emissions	GE/GF	Ongoing – Woking group established
Develop a Carbon Offset Strategy	Draft a Carbon Offset Strategy for consultation	GE/GF	March 2026
Decarbonise remaining uses of gas	Explore funding for decarbonising remaining buildings with gas heating	GE/CD	Ongoing

Conclusions and Recommendations

Progress towards the University's 2030 target has seemingly stalled over the last few years. However, the impact of Covid and major construction works on the district heating and key buildings has masked big improvements in heating efficiency which will translate to carbon savings as normal operation returns. There are further works planned this year to install a large-scale ground source heat pump. This along with current negotiations to access low carbon heat and zero carbon electricity from local suppliers takes the University close to its target but there is still a gap. Further work needs to be carried out to close gap through greater energy efficiency and identifying further renewable energy potential on or near to site.

There are still significant opportunities for further energy efficiency improvements and renewable energy developments. Continued investment in these measures will contribute to the target being achieved. The loss of the possible Milton Keynes Heat Network connection reopens to need to seek further funding to de-carbonise buildings not yet on the district heating.

Scope 3 emissions are very significant and larger than Scope 1 and 2 emissions combined. The data needs further scrutiny and more analysis to understand fully the challenges and opportunities. Further engagement with the supply chain is needed to see where emissions can be reduced, and a Carbon offsetting strategy developed.

Recommendation to prioritise the following objectives:

1. Continue to improve the energy efficiency of operations on site.
2. Reduce gas usage on site by seeking funding for alternatives to gas boilers and CHP.
3. Continue to develop and improve the district heating network.
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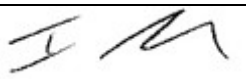
Signature	
Name	Ian Sibbald
Title	University Director of Finance

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2017/18	New format for ISO 50001	Gareth Ellis	Apr 2018
2017/18v2	Verification of Tasks added to Action Plan	Gareth Ellis	Jun 2018
2018/19	Annual Update	Gareth Ellis	Mar 2019
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2020/21	Annual Update	Gareth Ellis	Jan 2021
2021/22	Annual Update	Gareth Ellis	Apr 2022
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