



University  
of Glasgow

# SUSTAINABILITY ANNUAL REPORT

2023-2024

WORLD  
CHANGING  
GLASGOW



# INTRODUCTION

As a world-leading university with a strong commitment to sustainability, Glasgow recognises that it has a duty to lead by example. In 2014, the university became the first UK university to commit to fully divesting from fossil fuels. In 2017, it signed the Sustainable Development Goals Accord, committing to combatting climate change and environmental degradation. And in 2019, it became the first Scottish university to declare a climate emergency.

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**In 2023, the Scotland Beyond Net Zero partnership was launched, founded by the Universities of Glasgow and Edinburgh,** bringing together world-class research and expertise from across Scotland in the name of climate action. This groundbreaking research collaboration to catalyse action and empower policy makers, organisations and industry to make informed change which will support communities across Scotland to take the action needed to achieve our ambitious targets.

**In 2024, The University of Glasgow launched a new research centre focused on supporting the global transition to sustainable, low-carbon energy systems.** The Glasgow Centre for Sustainable Energy brings together academics from across the University to find interdisciplinary new ways of delivering the radical reform of energy services and infrastructure required to reach net-zero.

**Early in 2024, we also planted of 20,000 trees across 11 hectares at Cochno Farm and Research Centre,** as part of its ongoing efforts to be a leading institution in sustainability. These actions have been recognised by the Times Higher Education Impact Rankings, where the University ranked 12th globally for the positive impact we have on the world.

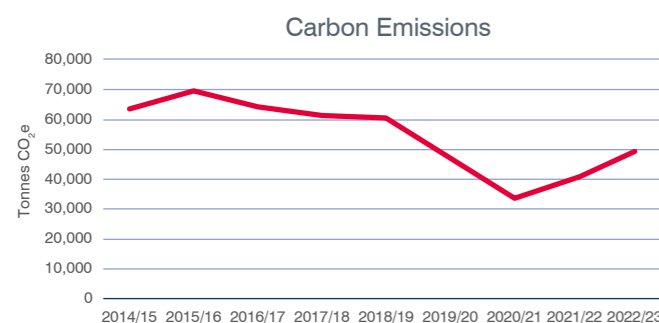
This report focuses on our business operations and the progress we continue to make towards environmental, social and economic sustainability.

# CARBON MANAGEMENT

## Our Aim

The University has committed to setting a Greenhouse Gas (GHG) reduction target that aligns with the United Nation's Environment Programme Emissions Gap Report. This is currently an average of 7.6% reduction in GHG emissions per year until 2031 where the University aims to have reduced emissions to 27,000 tonnes CO<sub>2</sub>e. The interim carbon reduction target laid out in our Carbon Management Plan is 47,000 tonnes CO<sub>2</sub>e by 2025/26.

## What we've achieved so far



In 2022-2023, UofG emissions totalled 49,780 tCO<sub>2</sub>e, which is an increase from 2021/22. However, it reflects the transition back to in-person activity on campus following COVID-19 and the renewal of indirect value-chain emissions (Scope 3 emissions) from commuting travel and water use. Crucially, total emissions have fallen since the pre-COVID levels shown in 2018-19 and are very close to meeting the interim carbon reduction target of 47,000 tonnes CO<sub>2</sub>e.

## Reducing carbon emissions

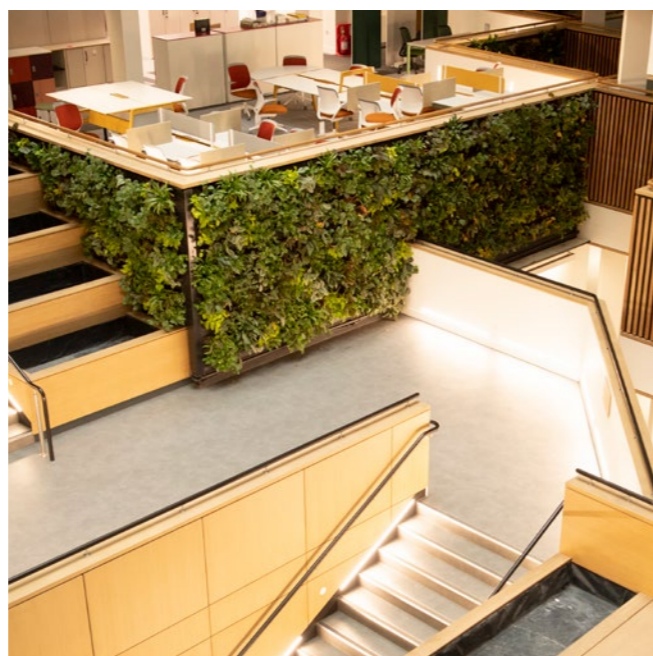
Our Glasgow Green strategy outlines the following actions which collectively will allow us to achieve a significant reduction in our carbon footprint:

1. Energy efficiency improvements involving heating, ventilation, air-conditioning (HVAC); lighting; insulation; and fabric improvements to specific buildings. These could reduce emissions by 4,200 tCO<sub>2</sub>e over ten years.
2. Installation of a Water Source Heat Pump (WSHP) at the Garscube Campus in 2025. This is projected to displace 2,375 tCO<sub>2</sub>e.
3. Installation of a WSHP at Gilmorehill in 2030 projected to displace 3,800 tCO<sub>2</sub>e.
4. Deployment of an Air Source Heat Pump in suitable standalone buildings. An Air Source Heat Pump was installed in Florentine House in June 2023.
5. Introduction of solar panels in suitable locations, with all new builds on campus have PV planned at initial stages.

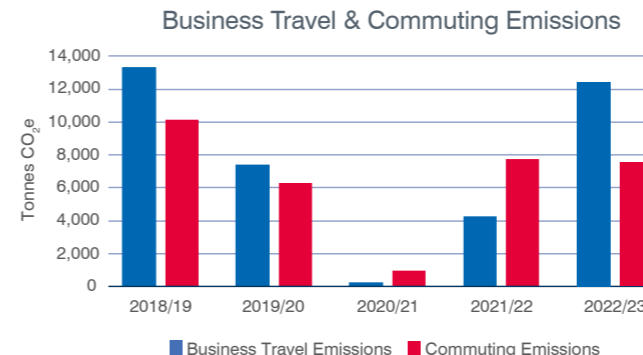
We are already generating electricity via our solar PV panels, in 2022-23 we generated 68,847 kilowatt hours of electricity, alongside the use of wood pellets for bioenergy.

47,000t  
**CO<sub>2</sub>e**  
by 2025/26

27,000t  
**CO<sub>2</sub>e**  
by 2031



## BUSINESS TRAVEL AND COMMUTING EMISSIONS



The University of Glasgow is committed to reducing its carbon footprint from commuting and business travel and making it easier for staff and students to travel sustainably. One of the challenges to increasing public transport use is the cost and quality of some services. Parking fees and the associated cost of driving are often cheaper than public transport fares.

Emissions associated with business travel are now close to pre-COVID levels, 7 per cent below the 2018-19 total. We have seen a stabilisation of commuting emissions, as a greater equilibrium is reached post-COVID with regard to flexible working and staff travel plans, with a 3 per cent reduction from 2022-23.

The University provides guidance to staff with regard to business travel, and ensures that guidance and policies on reducing carbon emissions from business travel are proportionate, fair, and equitable, seeking to redress existing inequalities within the sector (eg. by gender, career stage,

global inequalities of opportunity, caring responsibilities, disability and other protected characteristics). We also support and promote the use of alternative means of disseminating research and interact with peers, collaborators and stakeholder, such as social media, including advice on how to gather and evaluate social media "reach". The University also seeks to obtain discounts for low-carbon travel where possible, through the bulk purchasing of season and other tickets from travel providers and developing sustainability discount agreements with, eg NextBike, ScotRail with the University's travel agent providing lower carbon travel options at the time of travel requests. We also advocate for changes in travel patterns throughout the higher education sector, in collaboration with other HEIs and funding bodies, eg. ensuring advice and support for grant application budgets seeking to include sustainable travel.

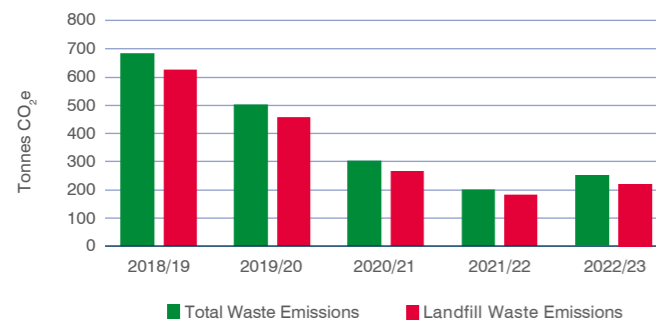
The University also encourages active travel by offering the Cycle to Work scheme allowing staff to obtain a bike for a discount, and various free incentives such as the Bike repair stations, storage lockers, training and routes, showers and bike parking.

## LOW CARBON ENERGY USE

The University tracks the use of low carbon energy sources across the estate, and is published in our report to the Sustainable Scotland Network. In 22/23, the university overall energy use increased by around 1%, from 506,490 Gigajoules to 511,280 Gigajoules, whereas our renewable electricity production increased from 194 to 248 Gigajoules, an increase of over 25%.

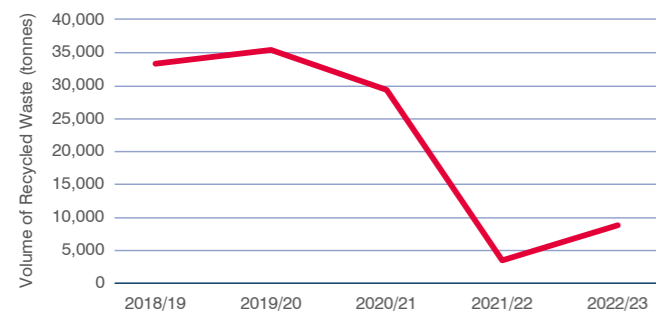
# WASTE AND RECYCLING

Total Emissions from Waste



The volume of waste produced across the University is tracked and reported annually in our report to the Sustainable Scotland Network, with waste tracked by type (food, landfill, recycling, construction etc...). In 2022-23 we produced 254 tonnes of CO<sub>2</sub>e emissions associated with our waste, a 26% increase from 2021-22. While we have seen an increase in the last year, our waste emissions are significantly lower than 2018-19 levels, and a step change in the volumes going to landfill. The emissions from waste sent to landfill proportional to total waste emissions has decreased over the last year from 92% to 87%. This indicates that we are recycling a relatively higher volume waste than last year. It is important we continue to monitor waste production closely and push forward with recycling plans and initiatives to encourage behaviour change.

Total Volume of Waste Recycled



We have seen changes in the total volume of waste recycled, with the overall trend downward. Due to the significant campus redevelopment activity that has been taking place in previous years, the total volumes are heavily influenced by the scale and type of construction activity taking place on campus.

The University has been working hard to change the way it collects, sorts, and recycles its waste. Our Waste Management Strategy and Action Plan 2022-27<sup>1</sup> sets out our policy toward the collective responsibility for the management of waste across all our campus locations, and to ensure that the waste hierarchy of 'reduce, reuse and recycle' is promoted and practised. As part of our annual Climate Reporting obligations, we monitor and record the volume of waste

<sup>1</sup> View online: Waste Management Strategy & Action Plan (non-hazardous waste) (2022-2027)

landfilled and recycled. The Strategy and Action Plan commits the University to continually improve the way it manages waste and will also help us to ensure that we achieve and maintain legal compliance. The associated action plan provides a detailed description of the steps that we will take in the next 12 months to improve waste management on campus. We will undertake to update the action plan on an annual basis.

## Spotlight on: Eco-Hub

The Eco-Hub is a social space that promotes sustainability on the UofG campus. We act as a meeting point for staff, students and the wider community to come together to discuss and build a sustainable world. We provide services to help address the cost of living and the climate crisis. Everyone, including students, staff members and the wider public, are welcome to the Eco-Hub, whether you want to access its services, or come to specific events. We hope that these services can help staff and students reduce their everyday environmental impacts, reduce the need to spend money on campus and help to address staff and student food insecurity. We aim to be an explicitly anti-oppressive space, particularly welcoming groups who have faced marginalisation from traditional environmentalism.

The Eco-Hub has coffee and tea facilities, as well as a community fridge with free food available for everyone. We have a permanent clothes and homeware swap-shop and a collection of educational resources on the environment. The Eco-Hub hosts bike repair sessions and practical workshops such as clothing repair and sustainable crafting. We host GUEST's Student2Student Essentials where all incoming students are encouraged to take home pre-loved kitchenware and homeware for FREE! Items include cutlery, pans, plates, food containers, stationary, and bedding.

We are a practical outlet to contribute towards the university's sustainability goals as well as your own personal goals; it can be time-consuming or inconvenient to make sustainable changes in your personal life, but our hub makes it easy, sociable and cost-saving. Taking small practical sustainable actions can be a great way to combat your climate anxiety. The Eco-Hub is a great way to meet like minded folks and learn more in a comfortable environment, and connect with sustainability-oriented groups in Glasgow and find out how they are facilitating climate action and empowering communities.

## Chemical Waste

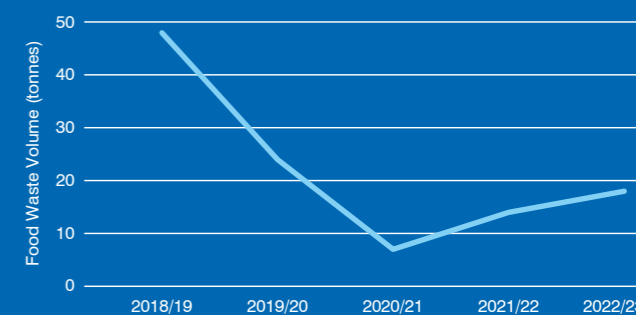
The University's Safety and Environmental Protection Service (SEPS) department provides guidance and training on occupational health and safety and environmental legislative compliance matters across the University. SEPS provide full instructions to staff and students on the proper disposal of chemical waste from laboratory operations to prevent harmful contamination of waterways and aquatic ecosystems from pesticides, biocides, and mercaptans, as well as other flammable, corrosive, poisonous and radioactive substances. Instructions outline how to properly identify, segregate, and contain chemical waste in accordance with the University's 'Zero to Drain Policy', where all chemical waste is disposed via the University's approved chemical waste contractor so far as is reasonably practical.

# PLASTICS WASTE

The University has a single-use plastics free campus policy and has implemented several initiatives to fulfil this aim. Our Waste Management Strategy and Action Plan 2022-27 set out a clear trajectory toward the reduction of plastic waste. Our policy is toward the collective responsibility for the management of waste across all our campus locations, and to ensure that the waste hierarchy of 'reduce, reuse and recycle' is promoted and practised across all waste stream, including plastic waste. Our catering outlets and our hospitality operations now use compostable packaging and tableware, and we have increased the number of dedicated bins for compostable waste across Campus. We also work to minimize single-use plastics in packaging and supply chains, working closely with the GU Heritage gift shop to promote sales of Keep Cups. We also work hard to ensure disposable cups go into the correct waste stream after they leave the university.

# SUSTAINABLE FOOD

Volume of Recycled Food Waste

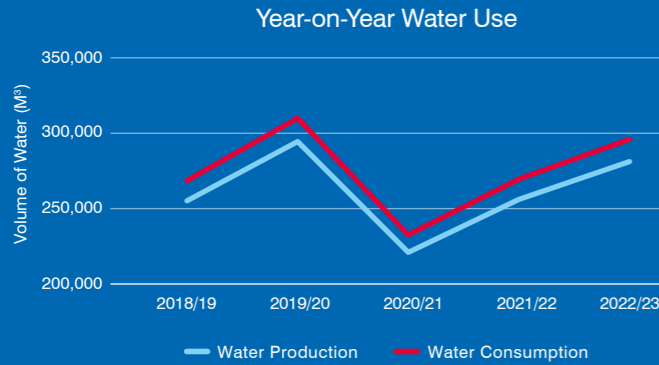


The volume of food waste that the University recycles is tracked and has fallen since 2018-19, though there has been a small increase from 2021-22. The increases over the last two years can be explained by the return of in-person working and teaching to campus. This means that the University is becoming more efficient in its food consumption. However, the decrease in food waste over the years does not capture the amount of food that is wasted but not split from general waste to landfill and mixed recycling. The University must therefore continue to manage food efficiently but also maintain efforts to 'close-the-loop' by doing our best to ensure food is placed into the correct waste streams. Our Catering team is leading on this by developing a waste audit procedure to identify any major waste issues; by improving chefs' knowledge of the amount of waste produced; and by providing support for the Eco-Hub project.



# WATER

## Water consumption and production

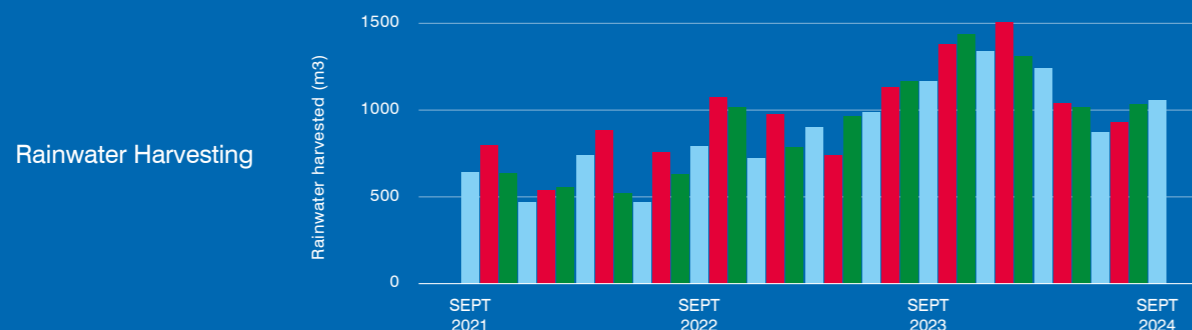


We actively measure the total volume of water used in the university that is taken from mains supply and other sources. Our water consumption has increased by around 10 per cent from 2021-22. This is largely due to the expansion of campus development and new buildings coming on stream, and an increase in students/staff. Water consumption per person has increased/decreased by around 2 per cent over the last year. The University is taking steps to reduce our levels of water consumption and wastewater. Our Design Standards Document specifies that we prioritise low water use appliances in our buildings' showers, WCs and taps. Our design teams also aim to prioritise the use of water saving technologies such as self-closing taps, check meters for new water tanks to detect leaks, non-refrigerated plumbed-in drinking water fountains, low flush toilets, and low flow rate hand wash taps and showers.

We have also promoted water consciousness through the installation of 50 free-to-use sustainable water fountains in buildings around campus to encourage the use of reusable water bottles. The fountains are sustainable because they are not chilled and are run on the domestic water supply. This means that they are not plugged into the electricity to chill the water or require deliveries of plastic water barrels. Furthermore, the fountains de-incentivise the purchase of single-use plastic bottles and cups by providing ample access to water on campus.

### Water recycling and reuse

Additionally, our Design Teams prioritise water recycling through the implementation of rainwater harvesting systems for use in the flushing of buildings' toilets and urinals as well as for gardening and landscaping use.



Rainwater harvesting systems are used in our James McCune Smith (JMS), Advanced Research Centre (ARC) and Sir Michael Stoker buildings, and the volume tracked and re-used as "grey" water to offset the need to use water from the main for toilet flushing etc. Since April 2021, we have harvested over 36,000m³ of water for re-use on the estate, equivalent to flushing well over 200,000 toilets.

### Wastewater treatment and discharge

All the University's wastewater is treated by Scottish Water as is all wastewater across Scotland. The process/policy to treat wastewater is as follows:

Stage 1: Removal of litter, wood and plastic.

Stage 2: Removal of stones and grit.

Stage 3: Removal of sludge for treatment until it is made harmless. It is then used to improve soil health for plant growth or for burning to generate electricity.

Stage 4: Cleaning of wastewater tanks by benign bacteria to remove harmful chemicals and waste.

Stage 5: The wastewater is stirred and allowed to rest before being poured back into rivers or the sea.

Treating our wastewater in this process prevents polluted water from entering our water system. It also protects our marine environment and aquatic ecosystems from harmful waste.

Our design standard also ensures designers refer to the compliance notes in both the BREEAM Ene 02 – Energy Monitoring and Wat 02 – Water Monitoring requirements in the current version of the BREEAM UK New Construction (Non-Domestic Technical Manual). The University require our design teams to identify key impacts and risks of future climate change and propose adaptation solutions – with a focus on river and surface water flood risk, including contributions of the site's flood risk to other places, as well as flows onto the site. The design of drainage systems and groundworks should take into account the possibility of increased maximum run-off rates, increased risk of flooding and rising groundwater levels.

The BREEAM assessments are based upon criteria that define the environmental impact of a project and have undergone extensive research in their development. For example, with regard to pollution, an assessment of measures taken to limit the main pollutants (other than CO<sub>2</sub>) that inflict damage upon the atmosphere, land or local watercourses.

# SUSTAINABLE PROCUREMENT

The University procures all goods and services with high ethical standards, focusing on social, economic and environmental considerations by applying principles of sustainable procurement. This follows the Public Contract (Scotland) 2015 regulations, the Procurement Reform Act 2014, and the Procurement (Scotland) Regulation 2016.

The University of Glasgow Procurement Office has implemented the Advanced Procurement of University and Colleges (APUC) Supply Chain Code of Conduct. This focuses on the organisations and its Suppliers responsibilities in social, ethical, economic and environmental areas across the Supply Chain. The University Procurement Strategy is committed to delivering our Sustainability Objectives, which include identifying modern slavery risks within our Supply Chain.

The University's Procurement Office has received various accreditations including being the first higher education institution globally to receive the Chartered Institute of Procurement and Supply (CIPS) Sustainable Procurement Review GOLD Award.

# ETHICAL INVESTMENT

The University of Glasgow is committed to socially responsible investment. As part of this commitment, the University has put in place a policy on Socially Responsible Investment.

Since coming into force, the policy has been reviewed annually to ensure it continues to be applicable to the University's annual accounts, and presently has remained unchanged. Ethical Investment reports too are produced and published annually.

The University's investments are monitored by the Investment Advisory Committee (IAC), a sub-committee of the Finance Committee. The student body is represented on the Finance Committee by the President of the SRC, and provisions within the policy allow for student and staff representation with respect to investments via student bodies, trade unions or IAC structure.





### Spotlight on: Cochno Farm

The University of Glasgow held a ceremony to mark the planting of 20,000 trees across 11 hectares at Cochno Farm and Research Centre, as part of its ongoing efforts to be a leading institution in sustainability.

Among the 20,000 trees planted are various natives species, including Scotch Pine, Silver Birch, Downy Birch, Rowan, English Oak, Sessile Oak, Hawthorn, Black Alder, and Goat Willow.

### Alien Species Impact Reduction

Our policy is for the University's Grounds and Gardens team to prioritise the removal of invasive and alien plant species. They use an external contractor to spray and remove Japanese Knotweed and Giant Hogweed, as well as the biannual spray of Impatiens Balsamina at the Garscube campus. Our Safety and Environmental Protection Service also set out policy toward assessing risks of working with biological agents and hazards. Animal and plant health laws basically define animal pathogens and pests and plant pathogens and pests as harmful to the environment or economy.

Surrounded by a rich variety of aquatic and terrestrial habitats, the University's Scottish Centre for Ecology and the Natural Environment (SCENE) field station gives researchers unique opportunities for studying and the conservation of a broad range of species and ecological communities. With Loch Lomond on one side and the Dubh Loch on the other side, plus mountains and moorlands with broadleaf and coniferous ancient oak woodlands is part of the rare temperate rainforest ecosystem with a wealth of biodiversity set in protected University land. The Eurasian hedgehog is on

the International Union for Conservation of Nature (IUCN) Red List for British Mammals, as such it is imperative that we protect these and all endangered species team of dedicated staff and students have signed up to the UK nation-wide Hedgehog Friendly Campus Campaign, striving to make the University sites accessible and welcoming environments to the Eurasian Hedgehogs.

The University's Estates team also works closely with the SSPCA, RSPB and the Glasgow Peregrine Project to ensure the protection of the peregrine falcons who nest annually in the University's Gilbert Scott tower.

Peregrine Falcons are a highly protected species under The Wildlife and Countryside Act, and across the UK, they are increasingly using historic buildings to raise their young. The University installed cameras in the nesting area at the top of the Gilbert Scott Tower and discovered earlier this year that the falcons had hatched several chicks. This allows for regular monitoring of the falcons and their young, with the Gilbert Scott Tower being the only closely monitored Peregrine Falcon nest in Glasgow.

A campaign was launched earlier this year to name the adult falcons, one male and one female, with university staff and students invited to submit suggestions. The names 'Bonnie' and 'Clyde' were chosen from the wide variety of creative submissions. The falcons have been issued with staff ID cards to celebrate their new names.

Both the young chicks have recently fledged, swooping in and around the Gilbert Scott Tower and the Quadrangles as they grow accustomed to their new wings.

## BIODIVERSITY

The University of Glasgow has committed to an ongoing responsibility to protect and enhance biodiversity throughout our campuses and local communities. We improve the biodiversity capabilities of our estate by continuing to annually review our Biodiversity Strategy and Action Plan (2022-2027). Throughout our campuses, staff from the Estates Directorate and the Biodiversity Working Group work together to help support the sustainable use of natural habitats. We continue to recognise the importance of trees in the townscapes of university buildings and the imperative to protect and support biodiversity in university forested areas.

Our campuses at Garscube, Dumfries and Cochno Farm cover vast sways of woodlands and historic parklands, offering conservation and protection to natural specimens. The University is keen to further promote this, ensuring sustainable planting is observed by providing guidelines for specific species to cultivate in a variety of local ecosystems. Along University Gardens, Oakfield Avenue and the Principal's Lodgings, native plant species to support biodiversity have been re-cultivated, with a variety of shrubs including rose bushes and wildflower gardens to support natural habitats in urban environments.

### Spotlight on: Reviving Scotland's Peatlands: A nature-based solution for climate resilience and hazard mitigation

Peatland restoration (PR), considered a "nature-based solution (NBS)", has been prioritised by the Scottish Government. However, there's a dearth of scientific evidence on how to implement peatland restorations effectively, their contributions to Scotland's broader climate change mitigation strategies, and their role in mitigating cascading hazards. Key questions remain unanswered, including the anthropogenic drivers of change and the tipping points in ecosystem functions related to hazard mitigation in Scottish peatlands, and how these functions will change under future climate change and restoration strategies scenarios.

This initiative aims to delve into peatland functions, human-induced changes, and the potential of restoration strategies amidst future climate scenarios. Kickstarted in July 2023 with support from the National Centre for Resilience, the study has been exploring the relationship between water table depths, greenhouse gas emissions, and hydrological response in Scottish peatlands. Using satellite imagery and Geographic Information Systems provides early promising insights, underscoring the diverse benefits of peatland restoration.



## OUR STUDENTS' COMMITMENT TO SUSTAINABILITY

Glasgow University Environmental Sustainability Team (GUEST) is a student-led team within the Estates Directorate providing project-based work placement opportunities to students in areas such as biodiversity, sustainable food, sustainable travel, communications, and student/community engagement. These projects not only play a vital role in the ongoing promotion of sustainability on campus, but also provide an opportunity for students to develop both professionally and personally, while contributing to the everyday functioning of the University. GUEST also offers the opportunity for interns to work on its projects on a voluntary basis. GUEST were once again heavily involved with promoting partnerships for sustainability across global audiences delivering a number of important sessions for students and staff.

# ANNEX A:

## University of Glasgow Design Standards extracts

The aim of the University of Glasgow Design Standards Document is to reflect good industry standards and practice and to acknowledge the drivers behind the University's aims to create a sustainable campus. The document should act as key reference material for any new build, refurbishment or development and is written for University of Glasgow staff, contractors, architects, design teams and consultants.

**Note: These design standards are currently being updated and therefore the information contained in this document relates to the standards in place prior to Summer 2024, and should not be interpreted as current design policy. Excerpts are included here relevant to the Times Higher Education Sustainable Development Goals Impact Ranking.**

The UofG Sustainability Strategy, overall goals are outlined below:

- 1 Embedding a whole-of-institution approach to Sustainability
- 2 Building knowledge and sharing best practice
- 3 Becoming a positive force in the market place
- 4 Respecting the Environment
- 5 The University's impact on people and communities

The University of Glasgow is committed to reducing its environmental impact and improving the local environment. The University seeks to promote sustainable development and advance best practice alongside the highest standards of design, environmental sustainability and construction. These aims are clearly set out within the University's Sustainability Strategy and Action Plan which designers must refer to from the beginning and during the design process to ensure that the University's buildings help to deliver their sustainability goals.

The University's sustainability strategy is to 'Become a world-class, world-changing University where collective responsibility is taken to ensure we undertake our work in an ethical and sustainable manner; our staff and students will be empowered and have a clear understanding of the role they will need to play in order to bring about progressive change'. The University also have duties placed upon them under the Climate Change (Scotland) Act 2009. The approach in relation to reporting progress in relation to these duties are reported in the Public-Sector Climate Change Reporting Duty Return/ Designers must consider these duties during the design stage and beyond, which are described within the Government Guidance 'Public Bodies Climate Change Duties: Putting them into Practice'.

### General Policies and Standards

- > The Building (Scotland) Regulations Non-Domestic Technical Handbook
- > Relevant documentation contained in Appendix B of the Scottish Building Regulations.
- > BREEAM Green Guide to Specification
- > BREEAM UK New Construction (Non-Domestic Technical Manual)
- > BRE Sustainability Check List
- > Public Bodies Climate Change Duties: Putting them into Practice'.
- > <http://www.gov.scot/resource/doc/340746/0113071.pdf>
- > Scottish Funding Council - Sustainable Development Guidance Circular
- > Waste Scotland Regulations
- > Gilmorehill Campus Development Framework
- > UofG Sustainability Strategy and Action Plan
- > UofG Biodiversity Policy and Action Plan
- > UofG BIM Strategy
- > UofG Metering Strategy
- > UofG Strategic Travel Plan
- > UofG Carbon Management Plan
- > Biodiversity Duty under the Nature Conservation (Scotland) Act 2004
- > Biodiversity Duty Reporting under the Wildlife and Natural Environment (Scotland) Act 2011
- > <http://www.wrap.org.uk>
- > UofG Cycling Strategy
- > UofG Climate Change Adaption Plan
- > UofG Waste Management Strategy
- > UofG Energy Strategy

Building and engineering services designs should be based on established methods of sustainable construction and whole life costing principles, minimising energy consumption, carbon emissions and incorporate low and zero carbon technologies where practicable. Feasibility studies for low and zero carbon technologies should also take into account the impact of future electricity grid decarbonisation. The process for Life Cycle Costing will commence at RIBA Stage 1 of the design process and must be considered during any Value Engineering exercise. Refer to BREEAM Credit Reference - Man 02 - Life Cycle Cost and Service Life Planning.

### Water Efficiency

The supply of water (collection, purification and pumping) along with subsequent treatment of waste water all contribute to its increasing cost and associated carbon emissions.

#### Selection of Low Water Use Appliances

To minimise primary energy consumption, low water use appliances should be selected for showers, WCs and taps throughout the building. The following technologies should be considered.

- > A check meter should be installed where any new water tank is being installed for leak detection
- > Taps should be self-closing. Timed-flow (e.g. percussion) taps and flow regulators should be used on all wash hand basin taps with an operating period of 5- 7 seconds and a maximum flow rate of 2 l/min, excepting cold water services required for specific agreed purposes.
- > Plumbed-in drinking water fountains must be considered in appropriate locations in all buildings, and locations clearly marked on developed layouts. These should be connected to the internal drainage system, be non-refrigerated, have a swan neck tap for bottle filling and a bubble to drink directly from (no plastic cups).
- > Wash hand basin taps in individual accommodation to have a maximum flow rate of 2 l/min.
- > Toilets should be low flush toilets.
- > Urinals should have automatic flush controls installed
- > All hot water piping should be adequately insulated.
- > Instantaneous electric showers are preferred. Where cylinder fed showers are used, shower flow rates to be limited to 6l/min using in-line flow restrictors which cannot be overridden to higher flow rates
- > Cleaning: all dish washers, washing machines, and driers should be "A", "AA" or "AAA" rated as appropriate.
- > Rainwater harvesting should be considered for use in the buildings grey water system in the flushing of urinals and toilets, or collection for gardening / landscaping use.

Further information regarding water efficiency is found in the University of Glasgow Sustainability Action Plan and the Estates and Operations chapter of this report. Refer to BREEAM Credit Reference - Wat 02 - Water Monitoring. Designers must also refer to the compliance notes in both the BREEAM Ene 02 - Energy Monitoring and Wat 02 - Water Monitoring requirements in the current version of the BREEAM UK New Construction (Non-Domestic Technical Manual). Water consumption requirements for sanitary-ware must comply with the requirements for water usage listed in Wat 01 - Water Consumption (Performance Level 3) of the current version of the BREEAM UK New Construction (Non-Domestic Technical Manual) to achieve an BREEAM excellent rating.

#### Use of rainwater collection for WCs

The potential for incorporation of gravity fed rainwater collection and supply of recycled rainwater systems should be investigated to provide water supply to WCs within buildings.

#### Use of rainwater collection for Irrigation

The potential for incorporation of gravity fed rainwater collection and supply of recycled rainwater systems should be investigated to provide water for irrigation of planting around building.

#### Use of brown roofs

The potential for Brown Roofs should be considered to increase biodiverse habitats across the campus. A brown roof aims to re-instate habitat conducive to local species on the roof. These species would include plants, insects and birds.

#### Use of blue roofs

The potential for Blue Roofs should be investigated to increase storage and attenuate run off. A blue roof is one that is designed to retain water above the waterproofing membrane. A blue roof deliberately retains some or all of the water either temporarily or permanently.

#### Use of green roofs

The potential for Green Roofs should be considered as a means to promote biodiversity. Each green roof can introduce a piece of nature, and on some buildings a recreational space can be created for staff and students to enjoy.

### Materials and Waste

#### Materials Efficiency

A materials efficiency and functional adaptability workshop should be carried out at RIBA Stage 1 in accordance with the new BREEAM 2014 Time-Barred credits, the targets set for the project will be reviewed at every key design stage and the methodology for meeting these targets will be integrated into the Stage reports. The Materials efficiency strategy will explore the following options:

- > The use of Circular Economy Principles
- > Specification of Sustainable Timber
- > Use of Environmentally Friendly building materials, Green Guide A rated Materials
- > Use of Inert Materials
- > Use of Materials with Recycled Content
- > Use of Materials with Low VOC content
- > Site won recycled materials
- > Recycling of demolitions
- > Recycling of Architectural Salvage items

## Waste Reduction, Re-use and Recycling

The University policy aims to reduce waste that is sent to a landfill. This means minimising waste where possible throughout the campus. i.e. reducing packaging, using take back schemes or re-using materials. Where this does not happen efforts should be made to recycle materials where possible. The University aims to reduce waste that is sent to a landfill. This means minimising waste where possible throughout the campus. i.e. reducing packaging, using take back schemes or re-using materials. Where this is does not happen efforts should be made to recycle materials where possible. Designers and Contractors must adhere to the waste hierarchy as stipulated below.

The University have a WARPit asset reuse protocol which must be considered during the design, building decanting and occupation process. Designers must ensure the provision of adequate facilities for the storage and collection of other wastes (e.g. chemical, clinical, radioactive and other hazardous wastes such as waste oils). Designers must work closely with the client team during the briefing stage of the project to develop systems which meet the requirements of the Universities FM team in terms of movement and collection of waste. The following options should be investigated:

- > Material efficient design
- > Design for circular economy
- > Application of principles of clean design
- > Standardisation of components
- > Prefabrication of building elements
- > Design for disassembly
- > Design for functional adaptability
- > Use of Revit/ BIM to minimise waste and primary materials usage

### External Recycling and Waste Points

The University of Glasgow also has a clear hierarchy of waste segregation in relation to the WRAP waste streams plus hazardous waste (clinical and chemical). The requirement for adequate and secure space for storing specialist waste (chemical, clinical, radioactive, WEEE etc.) must be considered where appropriate. Refer to BREEAM Credit Reference - Wst 03 - Operational Waste. The University of Glasgow would also like to see the introduction of green composting spaces so food waste can be recycled and re-used for landscaping maintenance. Refer to BREEAM Credit Reference – Wst 03 - Operational Waste. Refer to UOG-DOC-42-1 for the existing waste disposal, waste & recycle bin locations and the recycle bin locations. Refer to BREEAM Credit Reference - Wst 03 - Operational Waste.

### Internal Recycling and Waste Strategy

Each building will implement an internal Recycling and Waste Strategy. Details below shall be included as a minimum;

- > Pairs of General Waste and Dry Mixed Recyclables should be provided at convenient locations for staff and students throughout the buildings. These locations should be clearly demonstrated on developed layouts.
- > There will be no provision of waste paper bins at individual desks.
- > Food waste bins to be provided at all Hospitality Services locations (both front and back of house).
- > Each general waste store must be physically separate from the dedicated recyclable materials store in accordance with the BREEAM criteria for each credit.
- > Plumbed in drinking water fountains must be provided in appropriate locations in all buildings (See also Section 9.2.3).
- > Banks of microwaves may help reduce food waste and help staff save money.

### Construction Waste Management Plan

Contractors should develop a construction waste management plan. Waste from the demolition of buildings must be recycled or reused during the new build construction. Key waste streams should be identified at the start of the project and measures implemented to reduce these wastes. Good storage facilities for raw materials to minimise damage should be provided during construction works. During construction, every effort should be made to capture recyclable materials including wood, inert brick, rubble, soil, tarmac with a view to reusing and recycling these. Clear and accessible space for waste segregation should be provided and on large projects, targets should be set with the aim of minimising waste production on each project. Waste from the demolition of buildings must be recycled or reused during the new build construction. Certain other waste streams including WEEE (Waste Electrical and Electronic Equipment) or Special Waste require special treatment and segregation and allowances should be made for this in Contractors' 'Prelims'. Refer to BREEAM Credit Reference - Wst 01 -Construction Waste Management Plan to find out more about securing BREEAM credits. Waste streams arising during construction should be measured and compared with established benchmarks (e.g. the BRE SMARTWaste web-based tool at [www.smartwaste.co.uk](http://www.smartwaste.co.uk)). WRAP contains useful information on how to manage waste - <http://www.wrap.org.uk/construction/>.

## Land Use and Biodiversity

### Protection of Existing Ecological Features

Designers and Contractors must ensure the protection of existing flora and fauna habitats on and adjacent to the project sites, and seek to enhance biodiversity where possible. A BREEAM qualified ecologist should be appointed to assess the existing ecology of each site at RIBA Stage 1 and make recommendations to introduce features and planting schemes which will enhance the existing ecology on site and promote biodiversity. A BREEAM Ecology report will be developed at RIBA Stage 2 outlining the methods necessary to enhance the existing ecology. The following options should be investigated:

- > Phase 1 Habitat Survey
- > Protection of Existing Ecological Features
- > Enhancing Biodiversity
- > Integration with Landscaping Designers
- > Selection of plant species within the building which promote Wellbeing

- > Selection of planting and landscaping measures designed to enhance the microclimate adjacent to buildings and to mitigate urban heat island effects
- > Consideration of green roofs and green walls
- > Consideration of roof terraces and balconies
- > Provision of Ecological Enhancement and mitigation measures

### Biodiversity

Green Space around the University should enhance wellbeing, and provide habitats that encourage biodiversity and help with climate change adaptation. Designers must protect the proposed green spaces where possible during the design process. New developments designed with a floor area greater than 1,000 m<sup>2</sup> will require a biodiversity checklist to be completed, where applicable, under the legalisation of the Nature Conservation (Scotland) Act 2004. This requirement will highlight details of how the development will seek to protect existing habitats and species and an outline of mitigation, enhancement or compensation strategies. Refer to BREEAM Credit Reference - Le 05 - Long Term Impact on Biodiversity to find out more about securing BREEAM credits. Each new building should have a biodiversity action plan. A designer should be appointed for the compiling and implementation of the plan and should consult with the University regarding the approved list of plants, trees, species and landscaping preferences. This Biodiversity Action Plan must seek to explore opportunity for building specific biodiversity measures as well as general landscaping measures. The University of Glasgow aims to promote Green roofs that are fit for purpose, accessible and can be used by staff and students. Mixed landscaped areas are also desired which contain grass and plants to improve biodiversity and with consideration given to incorporating beehives and the potential for community gardens. Designers should refer to the University of Glasgow Biodiversity Strategy and Action Plan and Campus Development Framework. Early consultation with the estates team in regards to landscaping plans and plant species must be undertaken at RIBA Stage 1.

### 10.2.9 Adaption to Climate Change

Adaptation to climate change means anticipating the adverse effects of climate change and taking appropriate action to prevent or minimise the damage they can cause, or taking advantage of opportunities that may arise. It has been shown that well planned, early adaptation action saves money and lives later. The University is a founding partner of Climate Ready Clyde (<http://climatereadyclyde.org.uk>), which is a cross-sector initiative funded by the Scottish Government and 12 member organisations to create a shared vision, strategy and action plan for an adapting Glasgow City Region.

In addition to our legal duty under the Climate Change (Scotland) Act 2009, the University want to ensure that our estate and buildings continues to operate as a high performing asset over their lifetime. Over the lifetime of the buildings currently being developed, Glasgow City Region's climate is expected to be different from the present, meaning the assets need to function in a changing climate. Therefore, the University require our design teams to identify key impacts and risks of future climate change and propose adaptation solutions. The University has already conducted a high level screening of its project in conjunction with the regional adaptation partnership, Climate Ready Clyde, which could be used as a starting point for this discussion and is available upon request.

Whilst the assessment is expected to be comprehensive, key areas of focus should assess:

- > changes in heating and cooling demand, overheating risks and minimising demand for artificial cooling (e.g. through use of natural ventilation).
- > the impacts on landscaping and green infrastructure, ensuring it is suitable for the lifetime of the building, with appropriate asset management plans.
- > risks of more intense and frequent storm damage, wind, moisture and driving rain.
- > river and surface water flood risk, including contributions of the site's flood risk to other places, as well as flows onto the site.

This should include a comparison of the whole-life costs and benefits of an un-adapted vs. an adapted design. Applicants should propose a method to undertake the assessment (such as those outlined in the RIBA Green Overlay), and use appropriate data including UK Climate Projections and SEPA flood maps which include an uplift for climate change, and supporting data such as CIBSE Weather Data files for future years. The design team must liaise with the Climate Change Specialists to demonstrate clearly how the building will cope (or be adapted to cope) in so far as it is practicable with the effects of climate change (UKCIP 'medium-high emission scenario' average UK temperature will rise by up to 3.5°C by 2080). The design of drainage systems and below-ground works should take into account the possibility of increased maximum run-off rates, increased risk of flooding and rising groundwater levels. The University has identified the following climate risks for its estate (see also Climate Change Adaptation Plan):

### Built Environment

- > risk to our estate from flooding
- > risks to building fabric from moisture, wind and driving rain
- > specific risks to historic environment, with respect to the above
- > increased use of green spaces due to warmer weather
- > increased maintenance requirements of green space due to warmer weather
- > opportunity to reduce heating demand to buildings and the need for increased cooling demand in buildings from rising temperatures.

### Natural Environment

- > risk to species and habitats due to inability to respond to changing climatic conditions.
- > risk of land management practices exacerbating flood risk.



### University Community

- > risk to health and wellbeing from high temperatures
- > risk to health from changes in air quality
- > risk to business operations from water scarcity

A detailed Adaption to climate change report should be developed at RIBA Stage 2 which outlines how the building design will help to mitigate these risks. Design Teams should make reference to the Climate Ready Clyde 'Climate Risk Screening Toolkit'

### Energy Efficiency

Mechanical and Electrical plant will be selected to optimise energy efficiency and utilise options for heat recovery and free cooling throughout the building. A Building Energy management system will be developed with close co-operation with the clients FM team. Intelligent lighting controls will be selected for each individual space in accordance with how the space is utilised and discussions with the relevant user groups. The design team must ensure that the mechanical and electrical services design and installations shall focus on producing a functional, flexible and energy efficient building by utilising best practice in order to provide the following:

- > Robust and resilient engineering systems
- > Good comfort conditions for the occupants
- > Installations which require relatively low maintenance
- > Systems which have relatively low straightforward operational procedures
- > Systems which are as energy efficient as possible and minimise carbon emissions.

The main objective will be to produce buildings which in overall terms have low maintenance requirements as a result of minimising the installation of building services and maximise the use of passive design measures and the benefits of the site in terms of orientation and layout.

### Low and Zero Carbon Technologies

The design team must ensure that low and zero carbon technologies are investigated in detail at RIBA Stage 2 in conjunction with the development of passive design and energy efficiency strategies incorporated to reduce the demand for energy. Low zero carbon feasibility studies must be undertaken in accordance with best practice and BRE guidance in addition to taking into account the University design developments in relation to site-wide decentralised energy provision.

In the UK, the operation of buildings accounts for approximately 50% of our primary energy use, and hence CO2 production, whilst extraction and production of building materials account for approximately a further 10% of primary energy use. In addition, natural environments are damaged and the extraction of materials and release of toxic chemicals through some production processes pose health risks. The Building Research Environmental Assessment Method (BREEAM) is the world's leading system for assessing the range of environmental impacts associated with buildings. The BREEAM assessment method exists to help determine the environmental qualities of building projects. BREEAM awards 'credits' for meeting different environmental targets. These are summarised on a certificate which the client can display in the building or use in publicity material. For some building types a summary of performance is expressed as a single rating of Fair, Good, Very Good, or Excellent, Outstanding based on the distribution of credits. As well as raising awareness of the impact buildings have on the environment; the scheme also encourages environmental improvement in the building being assessed.

Each building, either existing or new build, is assessed against a set of environmental performance criteria set by the BRE and awarded 'credits' based on their level of performance. The performance is then rated as Pass, Good, Very Good, Excellent or Outstanding. Assessment takes place in two stages; the first at a reasonably early stage when design is not fixed and recommendations are made, with the final assessment on the final design, preconstruction. Post Construction Review is now mandatory for all BREEAM Assessments requiring the BREEAM Assessor to be involved throughout the construction process checking the progress in relation to compliance throughout the construction.

The assessments are based upon criteria that define the environmental impact of a project and have undergone extensive research in their development. These may be briefly defined as follows:

**Management** - An assessment of the Client commitment to management of the environmental impact of the project/organisation during construction or operation.

**Health and Wellbeing** - An assessment of the risks posed to occupant health and comfort in the design or operation of the building.

**Energy** - This assessment primarily measures the energy efficiency of the project and measures taken to minimise energy use (i.e. CO<sub>2</sub> production).

**Transport** - An analysis is made of the location of the project so that the environmental impact due to the production of CO<sub>2</sub> and other pollutants from commuter transport may be assessed.

**Water Consumption** - There is an associated degree of financial and environmental cost to maintaining our water supply, while consumption in the UK is outgrowing storage/supply capacity despite the amount of rainfall we receive in this country.

**Materials** - Primarily an assessment of the embodied environmental impact of the project due to material specification.

**Land Use and Ecology** - At a local level a building project directly impacts upon the ecology that it displaces. An assessment of the degree to which a project detracts from or improves the local environment is provided.

**Pollution** - An assessment of measures taken to limit the main pollutants (other than CO<sub>2</sub>) that inflict damage upon the atmosphere, land or local watercourses.

### Soft Landscaping

The ARUP/ LUC Strategy recognises the importance of trees in the townscape of the West End and the University areas. It consequently accommodates both linear/avenue tree planting along corridors and large specimen trees in more open and informal locations where they can grow to become landmark features. Refer to BREEAM Credit Reference - Le 05 - Long Term Impact on Biodiversity to find out more about securing BREEAM credits. Ornamental plantings should be focused in high profile and passive amenity areas where people can enjoy the sensory benefits of planting from close quarters (e.g. adjacent to seating and along paths seating).

SuD's/Rain Gardens provide soft areas subject to varying levels of inundation and these provide opportunities for wet grassland, marginal and potentially aquatic plantings. Such areas will also provide sites for native tree planting including willows and alder, valuable for biodiversity. Refer to BREEAM Credit Reference - Pol 3 - surface Water Run Off to find out more about securing BREEAM credits. Whilst Glasgow has a relatively wet climate, when dry periods occur they see the heavy use of available amenity grass, especially south facing slopes eg Botanic Gardens and parts of Kelvingrove Park. Amenity grass areas should be incorporated within the main spaces (University Square; University Place (East End) and Dumbarton Place) where they can complement the hard landscape areas. Wildflower grasslands should also be incorporated into the design. Research should be carried out on native species of plants and trees for any new proposal. Below are examples from the ARUP/ LUC Stage 3 Report. Planting must be approved by the University to save any abortive work in the future.

### Specimen Feature Trees

#### Tree species to be from the following selection:

Oak (*Quercus* spp.), Horse Chestnut (*Aesculus hippocastanum*), Sweet Chestnut (*Castanea sativa*), Beech (*Fagus sylvatica*), Lime (*Tilia* spp.), Maple (*Acer* spp.), Plane (*Platanus x acerifolia*), Tulip tree (*Liriodendron tulipifera*), Pine (*Pinus sylvestris*), Cedar (*Cedrus deodara*).

### Small Specimen Feature Trees

#### Tree species to be from the following selection:

Lime (*Tilia* spp.), Maple (*Acer* spp.), Plane (*Platanus x acerifolia*), Tulip tree (*Liriodendron tulipifera*), Pine (*Pinus sylvestris*), Cedar (*Cedrus deodara*).

### Avenue/ Street Trees

#### Tree species to be from the following selection:

Lime (*Tilia x europea*), Plane (*Platanus x acerifolia*), Maple (*Acer* spp.), Hornbeam (*Carpinus betulus*), Cherry (*Prunus* spp.), Turkish Hazel (*Corylus colurna*), Birch (*Betula* spp.).

### SUDS Trees

#### Tree species to be from the following selection:

Willow (*Salix* spp.), Alder (*Alnus* spp.), Poplar (*Populus* spp.), Birch (*Betula* spp.), Rowan (*Sorbus* spp.), Swamp Cypress (*Taxodium distichum*), Dawn Redwood (*Metasequoia glyptostroboides*).

