THE UNIVERSITY of EDINBURGH

Sustainable Laboratories Steering Group (SLSG)

Tuesday 21st January 2020, 3pm

1.09 Balcony Room, Old Moray House

AGENDA

1	**Minute** To *approve* the minute of the previous meeting on 23 September 2019 and *raise* any matters arising	**A**
2	**Sustainable Labs Programme Plan Update** To *note* and *discuss* a report from the SRS Projects Coordinator	**B**
3	**2020-2025 Draft Plan** To *note* and *discuss* a paper from the SRS Projects Coordinator	**C**
4	**Lab Procurement - Equipment Re-use/Re-sale Process** To *note* the finalised paper as submitted to University Executive	**D**
5	**Consultant Report on Equipment in Swann Building** To *receive* a report from the SRS Projects Coordinator	**E**
6	**Freezer Fund Performance Summary** To *receive* a report from the SRS Projects Coordinator	**F**
7	**Non-recyclable Plastics** To *receive* an update from the SRS Projects Coordinator	**Verbal**
8	**Technician Commitment update** To *receive* an update from Laboratory Technician Val Gordon	**Verbal**
9	**Any Other Business** To *consider* any other matters from Group members.	**Verbal**

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UNIVERSITY OF EDINBURGH **A**

MINUTE OF A MEETING *of the Sustainable Laboratories Steering Group held in the Raeburn Room, Old College on Monday 23 September 2019.*

Members: Dave Gorman, (Convener), Director of Social Responsibility and Sustainability
Andrew Arnott, SRS Projects Coordinator
Rachael Barton, SRS Projects Coordinator
David Brown, Technical Services Manager, School of Chemistry
Michelle Brown, Deputy Director of Social Responsibility and Sustainability
Glen Cousquer, Joint Unions Green Rep
Dean Drobot, Head of Energy and Utilities Management
Joanne Dunne, Early Stage Researcher
Grant Ferguson, Director of Estates Operations
Kate Fitzpatrick, Waste & Recycling Manager
Simon Santamaria Garcia, Student Representative, School of Engineering
Val Gordon Technical Officer, Institute for Education, Teaching & Leadership
David Gray, Head of the School of Biological Sciences
Sharon Hannah, Bioquarter Campus Operations Manager
Yuner Huang, Early Stage Researcher
Angela Ingram, Service Manager, IGMM
David Jack, Energy & Utilities Operations Manager
Andy Kordiak, Laboratory & Medical Equipment & Consumables Team Manager
Julia Laidlaw, Estate Development Manager
Sandra Lawrie, Technical Services & Estates Manager, School of Biological Sciences
Chris Litwiniuk, Engagement Manager
Guy Lloyd-Jones, Forbes Chair of Organic Chemistry
Robert MacGregor, Energy Engineer, Utilities Management
Stewart McKay, Technical Services Manager, IGMM
Brian McTier, Easter Bush Campus Facilities and Services Manager
Lee Murphy, Genetics Core Manager
Thomas Reynolds, Chancellors Fellow in Civil Engineering
Candice Schmid, Occupational Hygiene and Projects Manager
Matthew Sharp, BVS Deputy Director - Business

Apologies: Michelle Brown; Grant Ferguson; David Gray; Brian McTeir; Kate Fitzpatrick; David Jack; Angela Ingram

1 Minute **A**

The Convener welcomed attendees to the fifteenth meeting of the Group. As this would be Sandra Lawrie's last meeting, members made a formal note of thanks. Sandra and the School of Biological Sciences had always been strong supporters of lab sustainability.

The minute of the meeting held on 27 May 2019 was approved as a correct record.

Actions carried forward

Action – AA to circulate the project plan for Ashworth.

Matters Arising

SLSG noted the excellent work on the Joseph Black fume cupboard upgrade by Premier (the main contractor) and the project team, with most of the work done out of hours and minimal disruption to the operation of the lab. The two double width cabinets had been especially challenging to upgrade. With the change in air flow, the impact on the whole area was expected to be significant. Review of the energy data to assess the success of the pilot had not yet taken place as controls connections were not fully complete. The intention was to roll this pilot out to other areas, particularly other teaching labs. It should be replicable in smaller areas, though there needed to be a minimum of five fume cupboards in the same room.

Members had been impressed by CSE SRS intern Jasmine Hussain's presentation, and supported her findings on the carbon footprint of the College and its engagement with SRS. Outcomes from the freezer internship had been mixed, with more support needed, as well as more direct interaction with users. On the LILLEE project, members felt there had been a lack of communication and follow up.

2 Sustainable Labs Programme Plan with RAG Status Update **B**

All activities were either at green status or grey (scheduled for future work).

Communications & Engagement

Estates had purchased meters for the energy monitoring project based in Ashworth and were arranging installation in late September or early October (depending on the electricians' availability). An engagement activity schedule had been agreed with the lab manager.

There were now nine teams actively taking part in the Lab Awards, six of which were new participants, with eight teams still accredited from last year.

The first stage of the LEAF tool pilot in Chemistry had concluded and findings were being written up.

The lab plastics project was drawing to an end. A survey to better understand purchasing, use and disposal of plastic items in UoE labs had received 225 responses. Analysis was currently being done, and the SRS Projects Coordinator - Laboratory Plastics was creating an action plan, guidance, and best practice documentation. SLSG discussed Lab Plastic Waste Day on 17th September. SRS had sent out information to all lab contacts, but there had been limited uptake.

Members discussed the potential impact of a plastics ban on UoE labs. It was anticipated that work on plastics across the University would only have a small impact on labs, as the focus would be on easy wins elsewhere, such as in catering, which did not have the same technical or Health and Safety issues. Work with labs would involve a consultation period to surface issues that had not yet been considered, and the focus would be on offering guidance and best practice.

SLSG discussed the importance of making contact with programme directors at Moray House, in order to feed in to teacher training and potentially run workshops with School of Education students.

Action – AA/DG to connect VG to Pete Higgins who was leading work in this area.

As the current Plan was in its final year, a workshop session would be held during this meeting to share ideas and agree basic principles for the ensuing plan, with a first draft

being submitted to the 25th November meeting and a final version for adoption planned early in 2020.

Since the Group last met there had been a major change in momentum within the University around climate change, with existing support and activities ramping up. At the University Executive Away Day on 13th June there had been three hours of discussion around climate change, resulting in a substantial list of actions, including recognition of business aviation as an issue needing to be addressed. A Travel and Aviation Working Group had been set up, chaired by Prof. Sandy Tudhope, the University's senior academic lead on climate and sustainability, and would report directly to the Principal. A commitment had been secured for academic courses on sustainability that any student could access, and this had been included in the curriculum reform process. The RELCO proposals, which had been paused, were now live again, and new building standards had been adopted, with a process planned to update these further. The Directors of Estates and SRS were preparing to report back on what needed to be done to upscale decarbonisation of heat and energy. In this context, SLSG should be framing an ambitious and stretching programme of work for the next Labs plan.

3 Hugh Robson Energy Monitoring Project Report **C**

This was an update to the HRB project results paper submitted at January's meeting, now including Phase 4 follow-up data. The original scope of the project, reported on in January, had seen a small increase in energy use over the monitoring period. The fourth phase, carried out in March, was designed to follow up and identify if there had been any long term impacts on energy consumption. It solely comprised data monitoring, with no additional engagement activity.

There had been a dramatic and unanticipated increase from September 2018 to March 2019 of 93%, though the per capita figure was much lower at 36.4%. The first period to September had seen a reduction in per capita energy use. The increase was most likely due to a change in research intensity, with a lot more masters and UG students coming in to labs, and potentially not taking as efficient an approach as permanent lab staff. Students also tended to feel that they did not have the authority to turn equipment off. The success of these projects depended on good local management, and it was recommended that turn off schedules be included in a lab member's job description.

The project did not have accurate figures for the number of lab users, as not all were using the swipe card access system. Outcomes from the project had demonstrated the difficulty of isolating variables in a real world scenario. SRS were taking these issues into account for the Ashworth project.

As engagement was with individual labs and energy data was at building level, there was a need for sub-metering to isolate areas, which was very expensive to install. Estates were currently looking to test the value of sub-metering and how it could feed in to performance and exception reporting. Much of the cost of new buildings was not taking into account whole life costing, with Estate Development Managers often deciding not to include additional metering due to the cost. Efforts were ongoing in Estates to include metering in Estate Development planning. It was important to have data at different levels in order to unpick what could be addressed through culture changes. To do a project looking at the energy consumption of a whole building would require a very different engagement strategy. Getting a measureable change was much easier from a small lab where variables could be isolated, but it was possible that SRS should be being more ambitious in this area.

4 LILEE Distribution Project

In the absence of the Design Informatics Research Software Engineer, the SRS Projects Coordinator updated SLSG on the project. Student internships were undertaken in June and July, and 50 LILEE devices were built. However, due to time constraints, only one LILEE device was deployed during the internships. The project had maintained a list of labs that expressed interest, and once ISG had completed set up of the new server for LILEE, more deployments could be initiated. Following the request from SLSG, the devices had now undergone a fire risk assessment and had been deemed safe. The project were interested in any further opportunities for funding or support to help manage the roll out of LILEE across the University.

A device had been in use at Roslin for the last few years for booking temperature-controlled shakers which had generated a good payback. The intention was to expand to other equipment, where these offered an equally attractive financial case.

Action – All members aware of any labs interested in trialling LILEE to contact Evan Morgan.

Action – JR to invite Evan Morgan to return and update the Group at November's meeting.

5 Lab Procurement - Equipment Re-use/Re-sale Process

The Equipment Reuse paper was currently with SRS for updating and reshaping, and was nearing a final draft. Next steps would depend on feedback from University Executive. Once signed off, it would appear on the SRS website, where others could link to it.

Action – AA to circulate the updated draft for information.

Action – DG to take the finalised paper on to University Executive.

6 Technician Commitment update

An overview of support, development and recognition for technicians was available on the University website at https://www.ed.ac.uk/technicians. The main highlights since the last meeting included improved engagement with professional registration. UoE was on track to achieve Employer Champion status. This was a reflection of the University's increased investment in its technicians, including securing funding to support professional registration for 80 technicians. A roadshow of events was planned, and the first newsletter was due to come out at the end of September.

Action – All members in lab management roles to encourage their technicians to look into registration.

Action – AA to follow up with SRS Comms on promoting Professional Registration and linking to the fund.

7 Sustainability Champions Network

The new network was a successor to the separate Energy and Waste Coordinator networks, with a broader remit. While waste and energy would remain key themes, the Sustainability Champions network would also cover other areas, such as sustainable travel. While there would be separate launch events for staff and students, the network itself would include both. This should make it easier for students to find out what was going on, be a part of it, and contribute their energy and ideas. The staff launch would take place from 10am – 1pm on 26 September, in room 1.06 at 50 George Square. 250 members had signed up to the network so far, and numbers would grow once students

started to sign up. Targets had not yet been set for the network as input from members would be sought to help define what success would look like.

8 SLSG Programme Plan 2020-2025 – Workshop session

Attendees divided into two groups, focused on either waste and procurement, or energy and climate, and reviewed the current position, its weaknesses and successes, and what lab activities might look like in these areas in 2024, as well as identifying any interim steps. The next workshop in November would look at how to get there in more detail.

Objectives set in 2016/17:

- 10% reduction in energy consumption
- Lab equipment sharing and reuse increased
- Reduce consumption of materials, especially hazardous materials
- Provision of support and training for lab technicians
- Adopt sustainable building design guidelines and Soft Landings (or similar approach)
- 100% of labs covered by Edinburgh Sustainability Awards teams
- By 2020 every building with labs will have a lab-based energy coordinator.

Waste & Procurement

- Packaging

The current position was at the beginning of the journey, with some pockets of improvement, and some reuse opportunities, but with a major issue around polystyrene. One aim would be a scheme or award system for suppliers, to be better able to praise good practice. The group identified that procurement hubs were being established and that SRS would actively engage with them on waste packaging.

- Equipment Reuse

Currently the amount of equipment being reused had increased and this area was on a good trajectory to 2024 when the group expected the reuse process to be formalised and in use. They would also expect to see an increase in equipment being shared on WARPIT or a similar platform.

- Lab plastics

Currently there was a lot of confusion on what could be done, and what substitutions could be made. By 2024 there should be clear labelling and guidance, with more streams for recycling negotiated with contractors, and universalised waste segregation on high volume items.

- Hazardous chemicals

Currently hazardous chemicals were only used in very small amounts, with solvent cleaning being carried out in Chemistry. By 2024 the group expected to see more substitutions and a reduction in the use of hazardous chemicals in teaching labs, in consultation with academics involved in teaching. Solvent substitutions in teaching was a good area for a potential living lab project. It also anticipated a centralised solvent cleaning service. Case studies featuring good practice should be available on the SRS website. With more Schools looking into adopting a chemical management system, that discussion should be reopened.

Energy & Climate

- Design standards

The group felt there had been missed opportunities with regard to the current design standards, and looked forward to a more coordinated approach, which would enable labs to consolidate equipment use (through projects like LILEE), and manage freezer space more efficiently. Smaller Estates projects were stretched for budget, and often had to cut these aspects. In 2024 there was expected to be a more holistic approach.

- Awards

More could be done to reach those who were currently reluctant to engage with SRS.

- Sustainable Campus Fund

Successful projects should be rolled out to other labs. By 2024 a new design standard should be in place, as well as increased capability for Schools to better manage and run their own spaces. There should be centralised chemical storage, linked in to best practice in terms of ventilation and energy efficiency.

- Behaviour change

There was an opportunity for sustainability champions to act as mentors for new lab users.

Outcomes from today's discussions would be written up and circulated in advance of the next meeting, which would focus on how to realise these aspirations for 2024.

Action – KF to get back to SM on autoclaved plastics query.

9 Any Other Business

There was an upcoming tender for life sciences consumables, with wording to be finalised over the next month.

Action – All members who would like to request elements to include in this (e.g. around conflict minerals or packaging) to contact Andy Kordiak.

***Post-meeting note**: The Life Science tender shall include the appropriate sustainability strategy measures agreed with Alexis Heeren in accordance with our Procurement Category Sustainability Strategy.*

There was an internal sustainability group within Procurement which may look to SLSG for input in order to make sustainable procurement more strategic and better integrated into existing processes.

Members discussed the possibility of organising a conference at which suppliers could present - a smaller version of the Lab Innovations conference recently held in Birmingham. UoE was also hoping to host a future S-Lab conference.

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B

Sustainable Labs Steering Group

21st January 2020

SLSG Programme Plan update (September 2019 – January 2020)

Description of paper

This document is intended to give an update on progress against the objectives of the 2017-20 Sustainable Laboratories Steering Group Programme, which was drawn up to provide a structured approach to improving sustainability within laboratories at the University of Edinburgh over that time period, with a view to achieving wider University goals such as the Zero by 2040 target within the Climate Strategy. A Gantt Chart using a traffic-light colouring system (Red/Amber/Green) has been used to communicate quickly and clearly the progress which has been or is being made. In general this is taken to mean: green = on track, amber = delayed or problematic, red = objective is in danger of not being met, and grey = action scheduled for future work. Further details on the progress against each individual action is included within a table. This document will be updated prior to each meeting of the Sustainable Laboratories Steering Group.

The purpose of this report is to report against progress in relation to activities with further thought on monitoring of outputs and outcomes to be considered. The outcome objectives of the 3 year plan are noted below:

Action requested

SLSG is asked to note the progress described in this paper and provide any advice or guidance for further improvement.

Background and context

At the October 2017 meeting of the SLSG this 2017-2020 programme plan was presented and approved. This report notes the progress against this 3-year plan.

Outcome objectives:

1. 10% reduction in energy consumption.
2. Lab equipment reuse and sharing increased
3. Reduced consumption of materials, especially hazardous materials.
4. Enable culture of sustainable working through provision of support and training for lab technicians.
5. Adoption and use of sustainable building design guidelines (incorporating labs) and Soft Landings or similar approach.
6. 100% of labs covered by Edinburgh Sustainability Awards teams
7. By 2020 every building with labs will have an energy coordinator who is lab-based.

RAG Progress Reporting

Communications and Engagement

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Promote use of the Sustainable Campus Fund	1. 10% reduction in energy consumption 3. Reduced consumption of materials, especially hazardous materials	• Robert MacGregor • Energy Office • Estates Small Works Team	• Emails sent promoting the fund • Verbal communications with colleagues, including via Sustainability Awards teams • 48% of funded SCF projects are lab projects	
Develop further sustainability communications materials for use by non-SRS staff including persuasive body of evidence to influence academics and lab users, as well as lists of recommended items of lab equipment (based on verified sustainability credentials)	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials. 6. 100% of labs covered by Edinburgh Sustainability Awards teams 7. By 2020 every building with labs will have an energy coordinator who is lab-based.	• Lab Users	• Research (living labs) into effective communication methods (e.g. energy monitoring) will feed into this • A processes for equipment re-sale/re-use has been approved and will be publicised shortly • The energy coordinator and waste coordinator networks have been wrapped up and replaced by Sustainability Champions network. • Best practice research and guidance for reducing lab plastics has been circulated	
Work with lab users/building managers to make use of improved energy data (when available) – e.g.	1. 10% reduction in energy consumption	• Energy Office • Lab Users	• Improved data has not yet been made available, but this is not yet considered to be delayed • Where short term localised energy monitoring projects have been undertaken (e.g. HRB, IGMM and Roger Land) the energy data has	

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
communicating the data, setting targets			been a useful communication and engagement tool • The energy monitoring project based in Ashworth commenced its baseline phase in early October and will support this outcome. An engagement activity schedule has been agreed with the lab manager	
Recognition of good practice via awards and/or other communications.	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials. 6. 100% of labs covered by Edinburgh Sustainability Awards teams	• Lab Users	• Nine teams actively took part in the Lab Awards in 2019-2020, with seven teams taking a break year and remaining accredited from last year • This includes five taking part in the Awards for the first time • 26 Buildings have lab awards teams (although not all teams cover a whole building) equating to around 52% of lab buildings participating or partially participating in the lab awards • The LEAF pilot will be running for a second year, with the SCRM Tissue Culture Awards team currently signed up to participate.	
Regular communications between SRS and SLSG/lab users (e.g. newsletter or emails)			• Established communications via Technicians' Group • Regular communications via contacts lists, e.g. lab and/or building managers • All SLSG are encouraged to sign up to SRS newsletter for departmental news and events • Further sustainability committee has been established on a campus-wide basis at Little France	

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
			• The publication of lab plastics guidance has generated new contacts and new activity, with some exciting pilot studies underway.	
SLSG meetings (strategic direction, project support and progress reporting)		• SLSG members	• Suitable scheduling of meetings is taking place • Attendance is good	
Share good management processes – e.g. equipment sharing	2. Lab equipment reuse and sharing increased	• Lab Users • SRS Comms • Waste Dept • Procurement Dept.	• Guidance on ventilation and cold storage good practice has been disseminated • Equipment reuse and resale process has now been approved and will be launched shortly • Promotion of equipment sharing is included within communications to Awards teams	
Peer learning of sustainable labs best practices (via awards, workshops, campus meetings) – including recruitment of awards teams and energy coordinators.	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials. 6. 100% of labs covered by Edinburgh Sustainability Awards teams 7. By 2020 every building with labs will have an energy coordinator who is lab-based.	• Lab Users	• Award Audits were carried out in November 2019. Peer auditing allowed teams to share experience and learnings with other labs. • Some awards teams are recruiting additional teams • 68% of lab buildings have Sustainability Champion, based on recent analysis, however it is currently unknown if these Energy Champions are lab based **Energy Coordinators were replaced with Sustainability Champions in September 2019**	

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Encourage and support organisation of a prestigious conference over video conferencing, potentially with support from The Wellcome Trust		• Lab Users • Academics • Funders	• No specific action has been taken on this yet • Potential to harmonise/merge with work on Business Travel pilots being conducted by SRS (Business Travel coordinator returns from leave in February) • Proposed for 2019-20 academic year	

Utilities, Waste and Carbon

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Support implementation of ventilation improvements in labs	1. 10% reduction in energy consumption.	• Health and Safety • Energy Office • Estates small works team	• Fume cupboards in 2 labs in Joseph Black Building have been converted to VAV with motion sensor controls for the sash, in the first phase of improvements • Post installation communications materials have been developed to provide guidance on correct fume hood use following the fume hood retrofit in the Joseph Black Building • Many practical projects are in development/implementation phases (e.g. Demand Based Ventilation, fume cupboard upgrades, ensuring efficient new fume cupboards in new labs, chemical store upgrades)	

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
			• Estates have a long list of projects which they intend to undertake, spending c.£2.5m annually. This includes some ventilation work, including on Swann Building, Joseph Black Building and Christina Miller Building.	
Develop targets of kWh/m2 for various space use categories	5. Adoption and use of sustainable building design guidelines (incorporating labs) and Soft Landings or similar approach.	• Estates Development • Estates Operations • Contractors (Cundalls and Henry Gun-Why)	• The ESME tool (used as a checklist for design teams in Estates Development and minor works projects) incorporates the following statement: • "Total CO2 emissions target should be less than 15kgCO2/m²/yr. for regulated energy (EPC rating A) in new build and 22kgCO2/m²/yr. in refurbishments. We expect that the equivalent of 20kgCO2/m²/yr. and 27kgCO2/m²/yr. respectively will be achieved without renewables."	
BMS/HVAC control sense checks programme extended to further lab spaces (incorporating checks of biohazard category activities)	1. 10% reduction in energy consumption.	• Energy Office (controls) • Lab Users	• Scheduled for action each summer 2018, 2019 and 2020 • Two buildings, Ashworth and Michael Swann, were reviewed in 2019, as one was unable to be completed in 2018. VT circuit checks showed appropriate settings.	
Engage with lab users on development and publication of	5. Adoption and use of sustainable building design guidelines (incorporating labs) and Soft Landings or similar approach.	• Lab Users	• Initial consultation phase complete (further consultation will be sought from lab users who are involved in projects trialling ESME)	

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
labs design guidelines			• The new design standard, ESME, is being phased into building projects, including those which are currently in early RIBA stages • SRS has involvement in the design meetings for four lab-containing building projects. The aim in these meetings is to ensure that sustainability is embedded within the design and planning process	

Living Labs projects

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Recruitment and implementation of student (paid) interns for freezer inventories and/or other laborious semi-skilled work.	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials.	• Lab Users	• Complete • Internship commenced on schedule on the 3rd July, and concluded on the 28th August • By the internship's conclusion, there had been little agreement to dispose of any samples. However there was interest in long term storage options, such as the Roslin freezer farm project • There were significant issues affecting the progress of the project, including little interest in freezer defrosting from labs, and labs were difficult to get in touch with. Ice scraping and filter/fin cleaning made up the majority of the practical work	

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
			• A final report was produced outlining the intern's recommendations and has been circulated	
Support lab-based 'living lab' sustainability projects (DNA, lighting, freezers)	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials.	• Lab Users • Estates	• Scheduled for action each summer 2018, 2019 and 2020 • Discussions have started around DNA storage • Long-term cold storage project (-60, -70 and -80) is ongoing (expected publication 2020) • Energy efficient equipment replacements (SCF) are being monitored for actual energy performance • An intern was recruited over summer 2019 to support improvements in freezer and sample management • A lab in Roslin is trialling multiple actions to reduce lab plastic waste	
Hazardous chemical substitution opportunities identification.	3. Reduced consumption of materials, especially hazardous materials.	• Lab Users	• Cancelled. • Preliminary meetings and conversations have been held with key individuals in Chemistry teaching, Chemistry research, and Chemistry health and safety. Materials and web links regarding possible avenues for investigation have been shared. • A re-assessment of this project concludes that Chemistry is following an appropriate appraisal process for its use of hazardous materials, and as such the potential benefits from spending time on this project may be low. It is thus recommended to drop this project now in favour of spending time on other projects which have a	

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
			more pressing need/opportunities for greater impacts.	

Technical Staff

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Work with Technicians' Support Steering Group to improve CPD, career development and community cohesion of technical staff.	4. Enable culture of sustainable working through provision of support and training for lab technicians.	• Technical Staff • Technical Managers • IAD • HR • Academics	• A number of local TechNet groups have now formed on different campuses • Recent events for technicians have been reasonably well attended • The Technician Support Steering Group has new members and new leadership and is active and positive. It has changed its name to Technician Steering Committee. • The University of Edinburgh has achieved Employer Champion status, awarded by the Science Council • Over 30 University of Edinburgh technicians took up the offer of having fees paid for their Professional Registration.	

Funders

Activity	Associated Outcome	Colleagues supporting	Comments	RAG
Work with funding bodies to influence their approach to sustainability.	1. 10% reduction in energy consumption. 2. Lab equipment reuse and sharing increased 3. Reduced consumption of materials, especially hazardous materials. 4. Enable culture of sustainable working through provision of support and training for lab technicians. 5. Adoption and use of sustainable building design guidelines (incorporating labs) and Soft Landings or similar approach.	• Lab Users	• SRS department personnel are involved in discussions with Wellcome Trust on a bilateral and multilateral (via the UK-wide Lab Efficiency Action Network) basis • Director or SRS is on a steering committee developing the UKRI approach to sustainability	

Resource implications
No resource implications are related to reporting on progress against this plan. Implementation of the plan will have wider resource implications, which have been detailed elsewhere.

Risk Management
No risks associated with reporting on progress against this plan. No items on the plan are currently at risk of failure (red graded).

Equality & Diversity
No foreseen impacts.

Next steps/implications
A further progress report will be provided at the next SLSG meeting by the SRS Project Coordinator – Labs (or appropriate substitute). During that time further actions will be taken towards the outcome objectives of the plan.

Consultation
This document has been reviewed by:
Director – SRS
Head of Programmes – SRS
Engagement Manager – SRS

Further information
Author and Presenter
Andrew Arnott SRS Projects Coordinator - Labs
Department for Social Responsibility and Sustainability
January 2020

Freedom of Information
This is an open paper.

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Sustainable Labs Steering Group

21st January 2020

SLSG Programme Plan proposal August 2020 – July 2025

Description of paper

This document is intended show the draft programme plan for 2020-2025, based on workshops held at previous SLSG meetings in September and November 2019.

Action requested

SLSG is asked to note the objectives, targets and actions described in this paper and provide any advice or guidance for further improvement.

Background and context

The existing SLSG programme plan runs to the end of July 2020. The SLSG were asked whether they believed there was value in continuing, and the response was that there is value in further SLSG activities continuing. This plan describes the proposed objectives, targets and actions.

Discussion

Summary of objectives and targets:

1. Good practice behaviours adopted across all labs
    a. TARGET 1: 100% of buildings with labs have at least one Lab Awards team by 2025
    b. TARGET 2: 100% of buildings with labs have a Sustainability Coordinator who works in or regularly with labs by 2025
    c. TARGET 3: Expand knowledge of good practice outwith key contacts and Sustainability Champions (as measured in biannual SRS staff and student surveys) by 2025
2. Funding is made available and used to support lab sustainability
    a. TARGET 4: Lab sustainability projects saving 500t CO2e annually implemented by 2025 (including ventilation/HVAC improvements in lab buildings)
3. Increase reuse of materials and equipment across uni labs
4. Eliminate avoidable lab plastic waste through increasing options and increasing awareness
    a. TARGET 5: Develop recycling/reuse streams for 10 new categories of lab plastic items by 2025
    b. TARGET 6: 100% of labs follow the best practices in relation to reducing lab plastic waste that are practicable in their lab

OBJECTIVE 1: Good practice behaviours are adopted across all labs

TARGET 1: 100% of buildings with labs have at least one Lab Awards team by 2025

Action	Responsible	Timescale
Schools mandate that all labs achieve at least Bronze in sustainability awards.	SRS and School management	July 2025
Lab-based PG students get amount of credits for working on a lab sustainability awards team (as part of their skills training outside of the curriculum)	SRS and School management	July 2025
Develop an e-learning course specifically focussed on sustainable labs (as a spin-off from Be Sustainable)	SRS	July 2021
Review the Awards processes making the awards more appealing / less burdensome for participants.	SRS	February 2022

TARGET 2: 100% of buildings with labs have a Sustainability Coordinator who works in or regularly with labs by 2025

Action	Responsible	Timescale
Increase number of contacts/labs undertaking pilots to demonstrate that good practices are compatible with science Case studies to include details to contact the participants. Including information on costs, staff time, buy-in from management and practicalities	SRS	1 case study published each year (ideally on different topics).
Colleges mandate that each school with labs has an appointed/nominated Sustainability Leader who heads up a committee of Sustainability Champions and coordinates sustainability actions across their college.	SRS and College management	First Schools declare their decision by July 2021 50% of Schools declared by July 2023 100% of Schools declared by July 2025

Sustainability Champions encouraged to work with neighbouring labs, helping to spread good practice and information	Lab Users, SRS	August 2020

TARGET 3: Expand knowledge of good practice outwith key contacts and Sustainability Champions (as measured in biannual SRS staff and student surveys) by 2025

Action	Responsible	Timescale
Publicise that the Sustainability Awards criteria is available to all lab users to inform good practice.	SRS	August 2020
Link communications about lab sustainability to academic research e.g. Horsfall Labs' work on complete life cycle analysis / Bio Technology and Circular Economy ('theme' within CSE) / Chemistry's work on global mineral scarcity/capacity	SRS with input from key academics and lab users	July 2022
Restrict procurement options/heavily promote better options	SRS and Procurement with input from lab users	July 2022
Undertake more face to face lab audits/advice visits to give targeted and personalised advice	SRS	3 new labs visited each year, with follow up advice and support provided where appropriate.
Identify the top 5 initiatives that labs are working on and develop into posters and other communications to prompt spread of good practice.	SRS	December 2020

OBJECTIVE 2: Cost effective lab sustainability improvement projects are identified, funded and implemented

TARGET 4: New lab sustainability projects implemented between August 2020 and July 2025 save 500t CO2e annually (including ventilation/HVAC improvements in lab buildings)

Action	Responsible	Timescale
Assess labs to optimise ventilation rates and controls, including night set-back	SRS, Estates, Lab users, H&S	ongoing
Lab users are trained in ventilation risk assessment	H&S, Estates, Lab users	Ongoing
Pilot projects funded for novel approaches such as LILEE	SRS, Lab users, Estates	2 more pilots by 2025
Identify replicable actions which are cost effective, impactful and broadly relevant across labs.	SRS, Lab users, Estates	By February 2021
Roll out replicable actions identified (e.g. drying ovens)	SRS, Lab users, Estates	By July 2022
Work on ensuring the Sustainable Campus Fund is available until 2025	SRS, Estates	2025

OBJECTIVE 3: Increase reuse of lab materials and equipment

Action	Responsible	Timescale
Identify any gaps in the departments/Schools which use Warpit, and target these to increase participation	SRS	July 2021
Raise awareness of Warpit with Lab managers/Stores/those with purchasing responsibilities	Procurement	July 2021
Provide greater clarity on what is and is not allowed on Warpit (e.g. plasticware and consumables can be included), processes and guidelines	SRS	December 2020
Provide more case studies of successful usage of WARPit, including savings.	SRS	March 2021
Adopt a policy requiring people to show evidence of trying to source from Warpit or 2nd hand before purchasing new equipment/resources.	Procurement	July 2022

Increase visibility of information about Warpit e.g. the main page of the Procurement website, clearly on SRS and Waste websites, and as a reminder box on SciQuest.	SRS, Waste and Procurement	July 2022

OBJECTIVE 4: Eliminate avoidable lab plastic waste

TARGET 5: Develop recycling/reuse streams for 10 new categories of lab plastic items by 2025

Action	Responsible	Timescale
Hold a workshop to bring suppliers and waste contractors together to share challenges on both sides, and to prompt development of new lab plastics waste streams.	Procurement Waste SRS	February 2020
Identify the most commonly used lab plastic items and confirm which plastic types they are.	SRS	December 2020

TARGET 6: 100% of labs follow the best practices in relation to reducing lab plastic waste that are practicable in their lab by 2025.

Action	Responsible	Timescale
Develop case studies on swapping to use glassware instead of plastic.	SRS	December 2020
Communicate to provide clarity on what can (and cannot) be recycled in a lab setting	SRS Waste Lab users	December 2020
Encourage lab users to switch to a limited number of plastics which can be recycled	SRS Procurement Lab users	July 2024
Work with labs to undertake trials/pilots to phase out non-recyclable / reusable plastics, and help designing experiments to reduce waste.	SRS Waste Lab users	2 labs undertake trials by July 2023
Share the findings of the trials/pilots	SRS	December 2023

Encourage labs to rethink the location of bins to consider allowing recycling bins in labs to facilitate ease of segregation	SRS Waste Lab users	July 2023

Resource implications
Implementation of the plan will have wider resource implications, for example draw-down on the Sustainable Campus Fund, but this has already been allocated.

Risk Management
Risks exist if lab ventilation is adjusted inappropriately, or if waste is segregated inappropriately, but for both of these actions advice will be sought from Health and Safety and Waste respectively.

Additional risk exists if this plan were not produced, or not implemented, as lab sustainability forms a key aspect of achieving many of the University of Edinburgh's sustainability targets, including the target of Zero Carbon by 2040. Without this plan it is doubtful whether appropriate scale or direction of action would be taken in relation to lab sustainability.

Equality & Diversity
No foreseen impacts.

Next steps/implications
Feedback from SLSG members will be incorporated into the next draft of this plan, which will subsequently be presented to SLSG at the next meeting.

Consultation
This document has been reviewed by:
Director – SRS
Deputy Director and Head of Programmes – SRS
Sustainability Innovation and Engagement Manager – SRS

Further information
Author and Presenter
Andrew Arnott and Rachael Barton SRS Projects Coordinators
Department for Social Responsibility and Sustainability
January 2020

Freedom of Information
This is an open paper.

THE UNIVERSITY of EDINBURGH

D

Sustainable Laboratories Steering Group

21st January 2020

Towards a Circular Economy: Equipment assets reuse and resale process

Description of paper

1. This paper presents a paper which was approved by the University Executive in September 2019 to adopt a new University process on selling unwanted equipment assets and formalises existing activities.
2. SLSG is asked to note the process and alert colleagues to it when appropriate.

All text below here is verbatim from the original paper to University Executive.

Action requested

3. University Executive is asked to *discuss* and *approve* the proposed process.

Recommendation

4. It is recommended that the University adopts this process, which will ensure that the end of life value of university assets is maximised and supports our desire to be a circular economy university.

Background and context

5. There is currently no existing unified process that incentivises schools and departments to consider the sale or donation of an asset when disposing of an unwanted asset. Some equipment that a school may no longer have use for may still have attributable value, and this value could be maximised by following the proposed process.

This paper proposes a new process for schools and departments to follow which will address this gap in our processes. The process will potentially help us to secure valuable funds, reduces costs associated with Waste Electronic and Electrical (WEEE) equipment, and supports the university's desire to achieve zero waste by 2030. Furthermore, it acts as a mechanism to potentially free up space in valuable locations such as laboratories.

Value in this process can be ascribed as monetary value, reputational value, social value or material value. This process will promote the following "priority cascade" of how unwanted equipment should be managed to extract the most value:

1. Trade-in against new equipment via a procurement process,
2. Reallocate within the University by selling or via donation,
3. Sell externally following this process managed by Procurement,
4. Donate to a suitable external body via the Waste Office,
5. Reuse in some other way via the Waste Office,
6. Follow the WEEE process via the Waste Office.

An extended version of this paper is available upon request, together with the process flow (Appendix 1), the FAQ document (Appendix 2) and the draft webpage (EASE log-in

required), can be found at:
https://www.edweb.ed.ac.uk/unpublished/sustainability/staff/advice/laboratories/selling-equipment-assets-faqs

Approval and Review

6. Extensive consultation has been undertaken with Legal Services, senior members of each of the Colleges; College Registrars for CMVM, CSE & CAHASS, Campus Managers, Director of Procurement, University Tax Advisor and University Insurance Advisor; Sustainable Laboratories Steering Group

Following approval of the process, a 3-year review will be undertaken jointly by SRS, Procurement and Estates.

Resource implications

7. This process will be implemented with existing resource and budgets. If widely adopted there could be a financial income from equipment sales in future, although the scale of this is hard to predict (likely small).

Risk Management

7. Procurement have already been selling unwanted equipment assets for a number of years, often liaising with Legal Services to mitigate risks. Our main risks and mitigation are identified in the FAQs produced to support this process (Appendix 1).

Equality & Diversity

8. No equality impacts are predicted in relation to the proposed process, therefore, no Equality Impact Assessment has been conducted.

Next steps & Communications

- The process will be promoted via a variety of media to University of Edinburgh staff by SRS, Waste and Procurement.
- The details of the process will be hosted on SRS website with links from Estates and Procurement.
- Shared filing system will be set up for SRS, Estates and Procurement, to record transactions and facilitate KPIs to be reported.
- KPIs and reporting routes jointly established by SRS, Estates and Procurement.

Further information

Authors
Andy Kordiak,
Equipment Procurement Manager/MVM,
Procurement Office incorporating
Printing Services

Kate Fitzpatrick, Waste Manager, Estates

Vanessa McCorquodale, Projects Coordinator, SRS

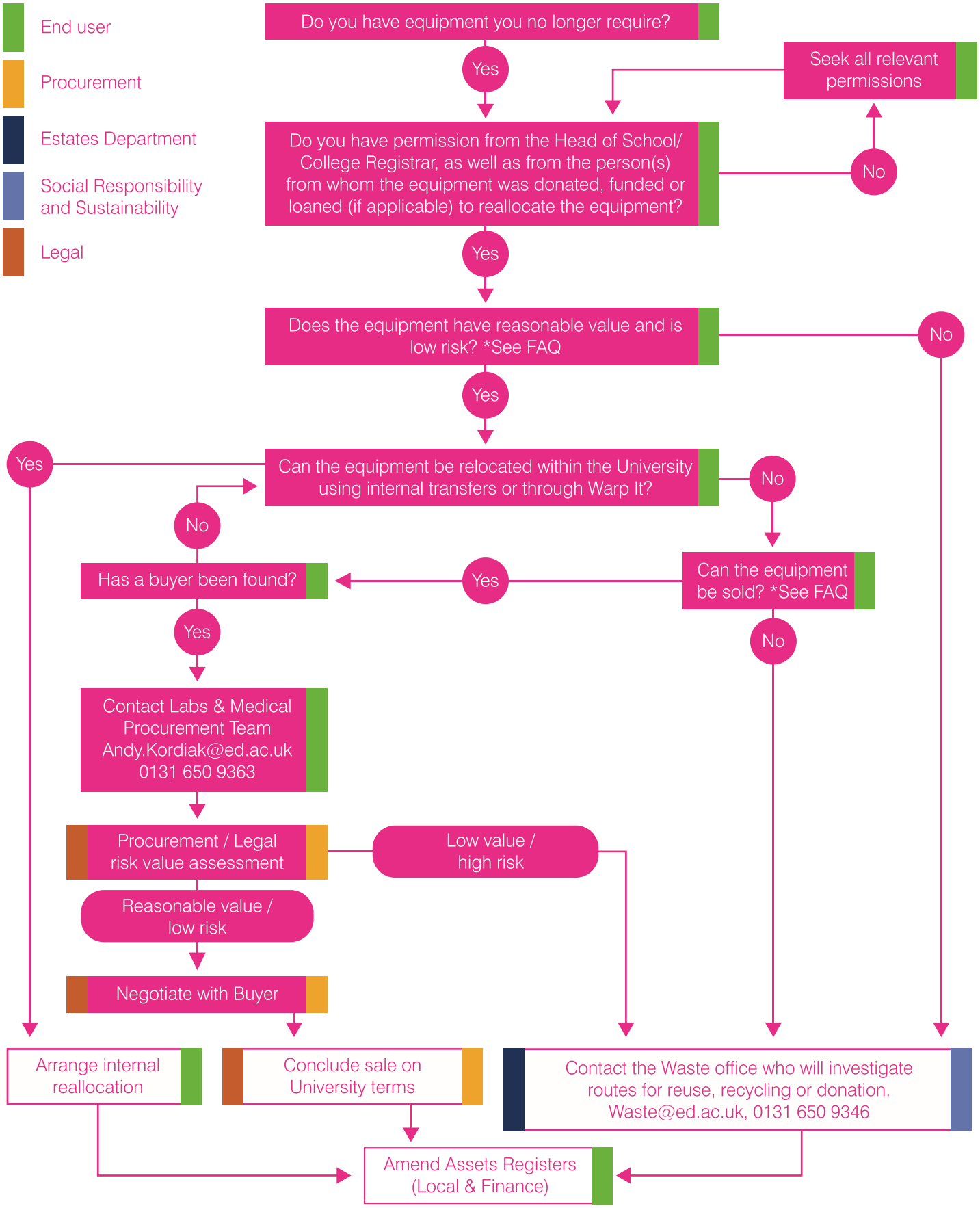
Presenter
Dave Gorman
Director of Social Responsibility & Sustainability

30th September 2019

Freedom of Information - This is an open paper

Appendix 1 – Process workflow

Reallocate or sell redundant equipment – release valuable funds!



Appendix 2 - FAQs

Selling equipment assets FAQs

Thinking of selling equipment you no longer need? Find out about: permissions, risks, health and safety, procurement & finance and logistics. Search this page for answers to frequently asked questions.

Flowchart

Equipment reallocation flowchart (1.17 MB PDF)

Priority/Hierarchy

What is the priority in reallocating or selling redundant equipment assets?

Priority cascade is:

1. Trade –in against a new equipment purchase, via Procurement process (Contact Procurement).
2. Reallocate within the University by selling to an internal Dept. or arrange a FOC transfer (Contact the Waste Office or Procurement).
3. Sell to an external organisation, following this process (Contact Procurement)
4. Donate to a suitable external body (Contact the Waste Office Estates).
5. Recycle or reuse in some other way (Contact the Waste Office Estates).
6. Follow the WEEE waste process (Contact the Waste Office Estates).

Permissions

It's my equipment, why do I need permission to sell it?

Many of our equipment assets have been funded by external organisations and the terms of the award of grants etc. may impose terms for the sale or disposal of assets. These terms may not always be obvious, and expectations of funders may change over time, so it is prudent to ensure permissions are secured before undertaking a selling or other disposal process.

The equipment was funded by an EU grant, can I still sell the equipment?

A sale should still be possible but it is vitally important that written permission is secured from the funding body.

Who has the authority to approve the sale of equipment?

The authority to sell equipment is determined by the Delegated Authority Schedule (DAS) which would normally be used for buying equipment. In most circumstances, Heads of School, College Registrars or Heads of College would give final approval. This assumes that all other checks such as authorisation from the funding body have been concluded and permission has been provided in writing.

Even for low-value sales, permission from Heads of School (or equivalent) should always be sought before the sale

Who makes all the arrangements?

The End User (the University of Edinburgh staff member currently in possession of the item and looking to sell it) must seek all permissions, complete all necessary paperwork required by Procurement to complete the sale. This is not a core Procurement task, therefore, the End User must be willing to fully assist with all the arrangement and paperwork as required of this process.

Support and advise will be given by various departments (Waste, Legal, Procurement) as shown by the colour coding on the flowchart for this process.

Who retains the proceeds of a sale?

Normally the proceeds would be accrued by the School or department that owns the equipment. The End User must ensure that they are the owner and The University holds title to the equipment to be sold. Funding bodies (original funders of the equipment) have been known to request a proportion of the proceeds to be returned to them.

Can land and or property be sold via this process?

No, all land and or property transactions must be undertaken by Estates.

Where do I record transactions?

If Procurement supports a sale, they will retain the contract documents. However, any adjustments to asset registers, whether at a local or at Corporate level must be updated by the End User. Procurement along with SRS and Estates will set up a shared filing location so that records of sales can be shared and referenced as appropriate.

Why will Procurement make the final decision on what is 'reasonable value' Shouldn't End Users decide that?

It is not intended that the End Users are excluded from this key decision. End Users are asked to make an early judgement on the value and risk of a sale, as shown in the flowchart. However, if we predict that a sale will not be value for money, if for example, we need to undertake extensive negotiations or risk mitigation actions,

then these actions may become resource inefficient and cost more than the value of the sale. In these circumstances, we will recommend the equipment is donated or disposed of via our WEEE contractor.

Risks

Why not use auction houses, eBay or third party recyclers that sell on our behalf?

Third party organisations would need to be formally appointed through a thorough vetting process, such as a formal procurement. The set-up of such a service would be resource intensive and the eventual value added by such work is predicted to be minimal and cannot, at this time, be given a high priority.

End users are not permitted to employ third-party recyclers or selling agents, whether real or virtual.

Could there be a risk of a conflict of interest when selling equipment?

Yes, Schools should ensure that all sales have COI declarations signed by the End User/seller. As part of the selling process End Users will be asked to complete a conflict of interest declaration, please follow this link. Conflict of Interest Policy with links to COI forms.

Is selling equipment a risk-free process?

No, it's not risk-free. The University is not 'in the business' of selling equipment assets but will do so to secure useful funds, where the value and risks are deemed appropriate. If there is any doubt about the equipment or the competence of the Buyer or Beneficiary, a sale should not go ahead.

What about product liability?

We have a duty of care towards the buyer and to the University and we can minimise risks by ensuring we sell equipment in accordance with this process, ensuring University of Edinburgh terms of contract are used.

If my sale is supported, how long will the process take?

Unfortunately, we cannot provide a guarantee on times to complete a sale. This is not a core service and as such cannot take priority over our core projects.

What if I cannot find anyone to buy or donate the equipment, will Estates, SRS or Procurement help me find a buyer?

No, Schools must seek and find their Buyers. Exceptionally, Procurement may help find a Buyer or Beneficiary internally. If a Buyer cannot be found, contact the Waste Office who will investigate routes for reuse/recycling.

Health & Safety

Should I have the equipment PAT tested before selling or donating?

Yes, it is strongly recommended that the equipment be PAT tested before selling or donating. As a minimum, the equipment should have been tested within the last 12 months. We would also recommend to the Buyer to PAT test equipment before they put the equipment into use at their own premises. Arrange PAT testing via the Estates Helpdesk.

Do I need to remove labels from equipment?

Yes, if these have been placed on the equipment when at the University; this includes our asset register labels, PAT test labels, or anything that identifies explicitly or implicitly with the University. However, do not remove original equipment labels that have been placed on the equipment by the manufacturer.

Does everything need to be decontaminated before selling?

Yes, we have a duty of care to ensure the equipment is free from biological and chemical contaminants that could cause harm. This extends to domestic fridges that may have traces of food or liquids. All equipment must be supplied with a signed decontamination certificate, signed by a competent person with knowledge of the equipment's recent and past use. See the Waste Office website for further information and a link to the Decommissioning Checklist.

Any maintenance manuals should be provided, along with copies of service records or test certificates where these are available.

Are there circumstances where equipment should not be sold?

Equipment cannot be sold if:

- permission from an appropriate authoriser has not been obtained,
- to minors (and should always be sold to someone in a position of responsibility and or authority),
- may need specialist skill to operate and or present a hazard (biological, chemical, electrical and non-ionising radiation or mechanical) should be carefully considered before sale,
- goods which are radioactive (radioactive sources, irradiators or similar) shall not be managed via this process (refer directly to the Health & Safety and to the Estates Waste Departments).

Procurement & Finance

Why is Procurement involved in selling equipment?

Procurement has extensive experience from buying high value, complex and high-risk equipment systems which are directly relevant to the selling process. We aim to add value to the process and help to ensure risks are understood and mitigated.

Do I need to charge VAT?

Yes, always initially assume that VAT will need to be charged. If a VAT zero-rated certificate is provided by the Buyer with an official purchase order, and the Buyer, the type of organisation they work for and the equipment meet all relevant criteria, then zero ratings could be accepted. Seek further advice from the Tax Office at TaxandVAT@ed.ac.uk in these circumstances.

Do I need to charge VAT if I am exporting equipment to Europe or beyond?

You must secure written evidence that the equipment has been exported overseas (out with the UK) and this must be held by the School for eight years in accordance with HMRC requirements. Care must be taken to ensure VAT zero ratings are not provided until shipping and/or executed export documents are provided. Seek further advice from the Tax Office at TaxandVAT@ed.ac.uk in these circumstances.

What if the Buyer does not pay the invoice?

We strongly recommend that we sell on an “Ex-Works” basis and invoices are paid, in full, prior to the equipment being collected by the Buyer or their logistics provider. This position should be considered as being The University’s starting point for all equipment selling transactions.

Can the University provide a warranty?

No, warranties cannot be offered. However, there may be circumstances where the Buyer rejects the goods and we may need to consider reimbursing payments. However, these circumstances are difficult to predict and would be managed on a case by case basis.

I’m disposing of IT equipment, does this process cover this?

No, there is a separate process for disposing of 'computer' IT equipment. For information about how to dispose of IT equipment see this page on the SRS website. IT related network equipment - 'non-computers' - could be sold through this process i.e. items which are not desktops, tablets or laptops.

Why is there no financial threshold rather than the statement 'reasonable' value?

From practical experience, we have found that a threshold may exclude some lower value transactions that could be low risk and may be processed without requiring undue resources. On the other hand, higher value transactions may, at first sight, seem viable then, after an initial assessment be found to be too high a risk or require

too many resources to undertake, making the transaction overall, poor value. Each sale should be looked at individually.

Logistics

What if I have a large item of equipment to sell like an MRI?

Where appropriate you may need to ask University professional colleagues for assistance to arrange for large equipment systems to be safely removed from a building. A 'Risk Assessment and Method Statement' (RAMS) along with permits to work, road closure permits etc. may be needed and approved by a Campus manager, Building manager, Health & Safety or Estates; Ideally, we would recommend that the Buyer’s logistics organisation has the responsibility to remove the equipment on a 'Turn Key basis', although this does not mean that the University can or should seek to transfer all responsibilities to the Buyer for a project of this nature.

When should the Buyer see or inspect the equipment?

Ideally, the Buyer should be encouraged to inspect the equipment on our premises so that they are fully aware of the condition of the equipment, it can be shown operating and they are fully aware of any logistical challenges in removing the equipment (especially important for larger items of equipment).

Should I arrange the dispatch and insurance of the equipment?

No, it is strongly recommended that logistics and insurance are arranged and paid for by the buyer. This significantly reduces University transit risks. However, each circumstance will be reviewed with Procurement and advice will be given as appropriate.

Do I need to provide a delivery note?

Depending on the exact terms of sale agreed with the buyer a “Handover” document will need to be provided to the buyer at equipment collection, confirming exactly what has been handed over, along with equipment names, subcomponents and serial numbers.

This document should be signed by the buyer or their logistics provider and then copied to Procurement.

We do not recommend delivery notes as we do not recommend that the University undertakes deliveries.

THE UNIVERSITY of EDINBURGH

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Sustainable Laboratories Steering Group

21st January 2020

Consultant report on equipment in Swann Building

Description of paper
This paper describes a report on the sustainability of laboratory equipment in the Swann Building. The report was written by Andy Evans of Green Light Laboratories, an independent consultant.

Action requested
SLSG is asked to note the report.

Recommendation
It is recommended that action is taken to follow the recommendations of the report.

Background and context
The Swann Building is a very busy laboratory building operated by the School of Biological Sciences, with a large amount of small to medium sized laboratory equipment. The report was commissioned to identify which items of equipment would be suitable for replacement (in financial and carbon terms).

Discussion

The report is attached as an appendix.

Of particular note:

1. The report recommends replacing 7 ULT freezers – the building manager is trying to identify the freezers suggested and then identify the owners.
2. The report recommends changing the fume cupboards from constant to variable air flow, and estimates an attractive payback period for this. This was passed to Estates. It may be part of the proposed works on ventilation in the Swann Building.
3. The microwave autoclave media bottle sterilisers seem like a good idea if there are people currently using benchtop autoclaves for media bottle sterilisation – asked the building manager to confirm if this is the case.
4. The following items should be replaced with efficient models (see report for recommendations) on a rolling replacement basis (i.e. There is not a strong enough financial case to warrant replacement before the equipment is broken)
    a. Minus 20 freezers
    b. Fridges
    c. Drying ovens
    d. Incubators
    e. Heater blocks
    f. Water baths
    g. Microbiological safety cabinets

Resource implications
The equipment replacements (other than fume cupboards) could be financed via the SCF, if the owners follow the report recommendations.
The upgrading of fume cupboard ventilation control from CAV to VAV may be possible to roll into a planned upgrade to Swann Building ventilation.

Risk Management
There are poor connections between SRS and most of the Swann Building's lab users. A couple of labs have recently joined the lab awards, but aside from those small groups the majority of lab users have been difficult to motivate into engaging with SRS activities. There is a risk that even the support of the SCF will not be enough to motivate the lab users to change equipment.

Equality & Diversity
No Equality and Diversity implications have been identified relating to this report.

Next steps/implications
It is recommended the building manager and SBS management make efforts to identify and engage with the owners of the equipment which was recommended for replacement.

Consultation
The following people have been consulted:

Deputy Director and Head of SRS Programmes.
Engagement Manager
Swann Building Manager
SBS Technical Services Manager.

Further information

Author	Presenter
Andrew Arnott	Project Coordinator - Labs
Engagement Team	Department for SRS
08/01/20	

Freedom of Information
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COOK DEBORAH

TABLE OF CONTENTS

Executive Summary

The audit identified a wide variety of projects which will significantly reduce the running costs in the Swann building of the University of Edinburgh which may also be applicable to other University sites. Regarding fume cupboards their loading, usage and air control systems highlighted the potential to reduce running costs by ≥70%. Significant savings may also be delivered by replacing the existing drying cabinets with more energy efficient, safer models. Regarding cold storage better practice and the procurement of sustainable units with precise temperature control will ensure running costs are minimized and contents protected. Better practice would deliver significant savings throughout the University and therefore it is recommended that all lab operators receive the appropriate training.

Introduction

Green Light Labs were contracted by the University to carry out a lab equipment audit for the Swann building over a 4 day period. The data from this audit has been compiled in an Excel spreadsheet which accompanies this report. Also, independent case studies have also been submitted with the report. These case studies are provided to support the findings and recommendations of this report.

The audit identified 426 items of equipment. For each equipment type surveyed a number of recommendations and actions have been suggested to assist the University of Edinburgh in both its immediate and long term commitments to reduce its running costs and carbon emissions. All potential projects and actions are summarized at the end of the report in tabular form. All running costs calculated are using the specific costs for water, carbon and electricity provided by the University. These costs are easily updated by altering the reference sheet found in the Excel file.

Cold storage – Controller Types

Before focusing on the four individual types of cold storage which follow, it is important to firstly highlight the different modes of temperature control and temperature display which exist. All modern ULT freezers now have a digital temperature controller and display. However, the other cold

storage units: freezers, fridges and fridge freezers will differ. To begin with the various forms of temperature control, defined in this study as how you 'set' the temperature, are summarized in figure 1.

Temperature Control	Description
Dial	A simple dial usually with a set of arbitrary numbers which represent no specific temperature. Sometimes dials may be positioned at the rear of the unit making adjustments difficult and increasing the chance of the dial being damaged.
Temperature Dial	Rarely seen, these dials have the temperature indicated on them and act as the temperature display.
Switch	The unit has two settings, typically high or low with no indication of actual temperature.
Light Select	A temperature is selected from a pre-determined set of temperatures which cannot be altered. Some Light Select controllers also serve as the temperature display. If this is the case the selected temperature will flash until the set temperature is reached.
Digital	The controller displays the set temperature, settable by the degree Celsius. Most digital controllers also serve as the temperature display. Digital controllers may also have features designed to protect sample security.

Figure 1. Cold storage temperature control technology.

Examples of these temperature controllers are shown in figures 2-5, many different forms of these controllers exist.

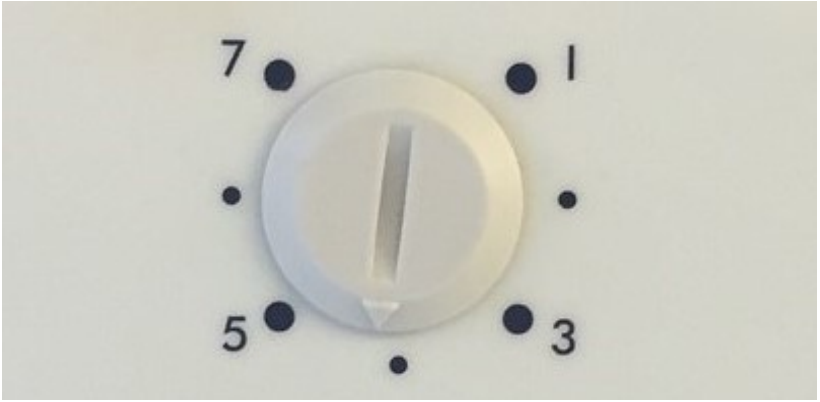


Figure 2. A dial temperature controller.

Figure 3. A switch temperature controller

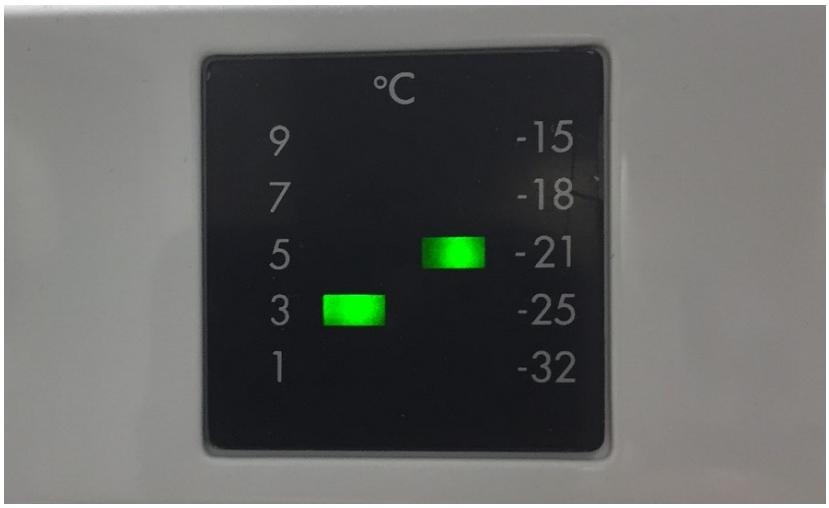


Figure 4. A light select temperature controller.

Figure 5. A digital temperature controller.

These temperature controllers may or may not serve as the temperature display. In the case of the digital controllers, if a unit was recorded as having a digital controller and digital display it would therefore be the same component. The different types of temperature display are summarized in figure 6.

Temperature Display	Description

Dial	A simple dial marked with degrees Celsius, or, with colours which do not indicate a specific temperature.
Light Select	A temperature is displayed from a preselected set of temperatures.
Digital	The temperature is displayed in degree Celsius. This may be as a separate display, sometimes externally attached instead of integral to the unit. The display may also be part of a digital controller

Figure 6. Temperature display options for cold storage.

We are therefore presented with a combination of temperature control types **and** temperature display types, figure 7 is a dial controller and dial display. Other examples of these combinations are shown in figures 8 & 9.

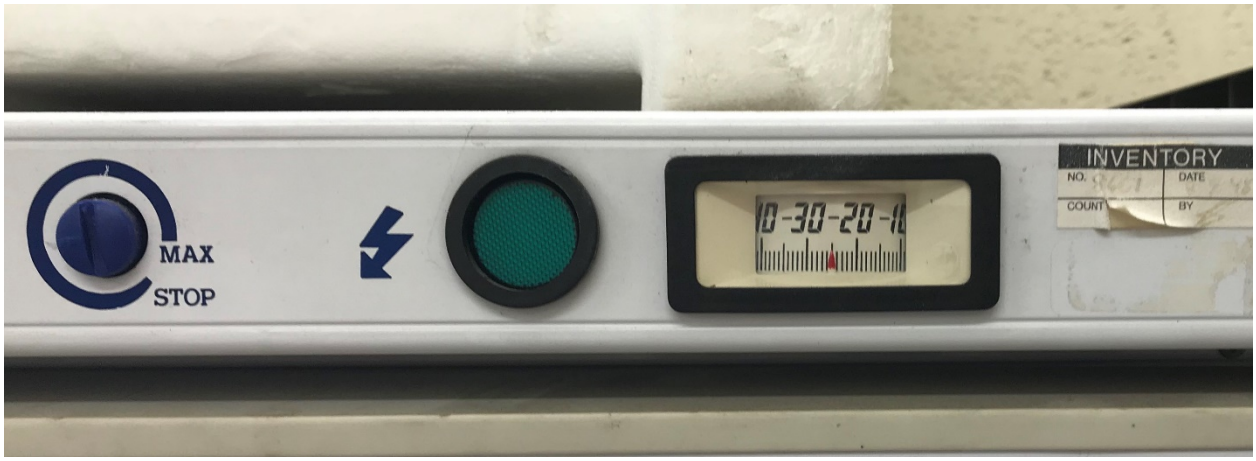


Figure 7. Dial temperature controller (left) with dial temperature display (right).

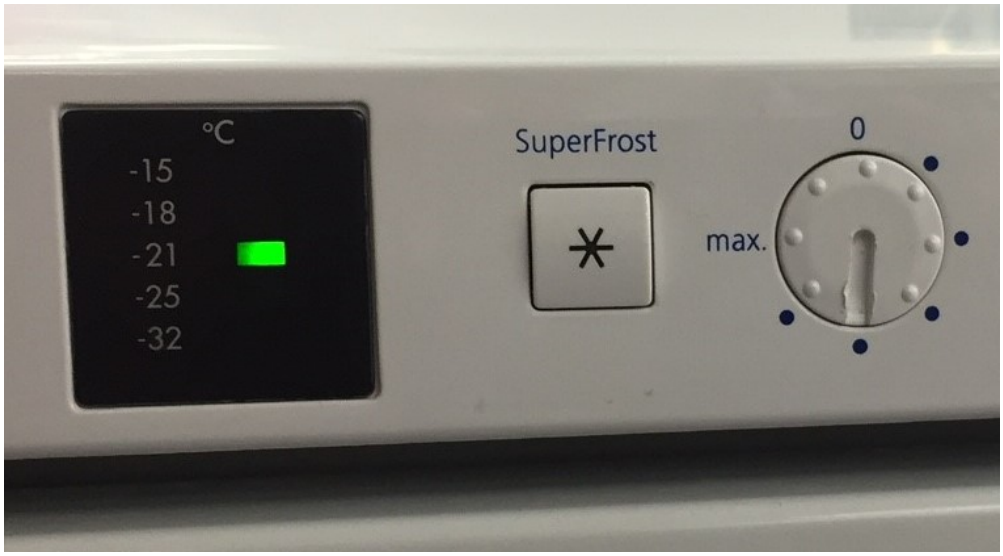


Figure 8. A dial controller with a light select display.

Figure 9. Dial controller with digital display.

By detailing these control and display types a greater understanding of the various types of units on site can be gained, and, how this impacts running costs

Freezers

Freezers were the most abundant of all lab equipment captured by the audit. In total data was collected on 177 units. When referring to freezers we are discussing units that typically have a recommended set point of -20C. When considering refrigerants, it is recommended that hydrocarbons (HC) are preferred to other refrigerant types (such as hydrofluorocarbons – HFC's and Chlorofluorocarbons – CFC's) as they are more energy efficient, readily available (cheaper servicing) and more environmentally friendly. CFC's already no longer used due to their ozone depletion and HFC's are to follow suit with due to their contribution to global warming. From 2015 to 2030 regulations are set to reduce the availability of HFC refrigerants by 79%. Meaning their availability and cost will rise dramatically. Servicing and repair of HFC units will become costly and may prompt end users to replace rather than repair.

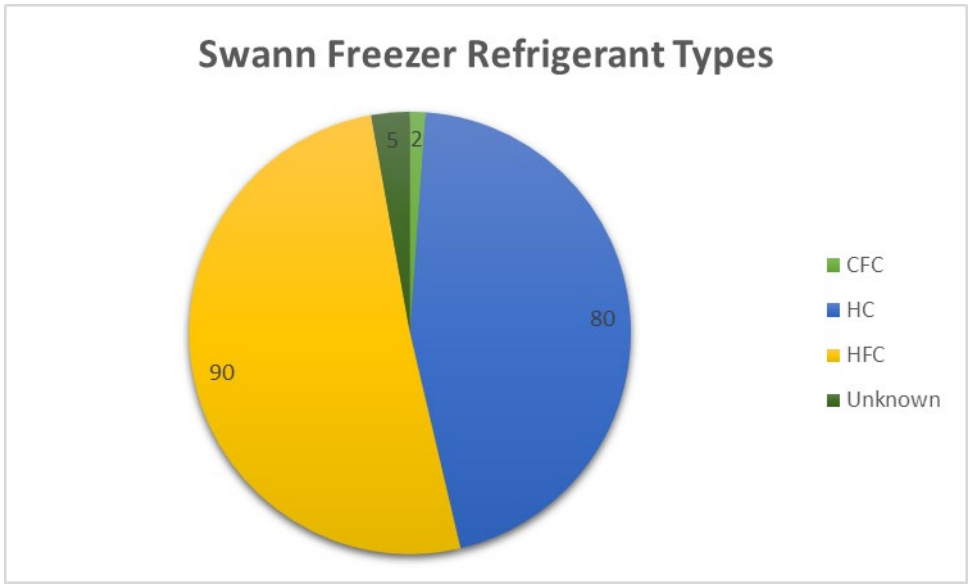


Figure 10 Refrigerant types used in freezers

From the data collected (figure 10) 51% of the Swann freezers were HFC refrigerant units. 45% of units were HC refrigerants, 2% were chlorofluorocarbons (CFCs) and 3% of units were unknown. From 2015 it was no longer legal to re-gas/top up CFC refrigerant units meaning faulty units should be replaced and disposed of in the appropriate manner. Being able to accurately set the freezer temperature is a simple means to maintain energy efficiency. The means by which the freezers in the Swann building control and display their temperature is summarized in figure 11.

Temperature Display Type	Temperature Control Type				
	Dial	Digital	Light Select	None	Grand Total
Dial	6				6
Digital	3	18			21
Light Select	8		1		9
None	134			7	141
Grand Total	151	18	1	7	177

Figure 11. Temperature control and display types used by the Swann freezers.

From the collected data 141 units (80%) had no means to accurately set and display their temperature. Of the 36 units where a temperature was displayed 24 units could be warmed up to save energy (figure 12). Please note one unit had two set temperatures (one for each compartment). Warming up these freezers to -20C would reduce energy consumption by **3-6%** per degree Celsius warmed up by, furthermore there would be a reduction in freezer heat output helping to reduce building HVAC costs. Of the 177 freezers audited 175 were accessible. For each of these units an estimation was made on the amount of freezer capacity being used (figure 13).

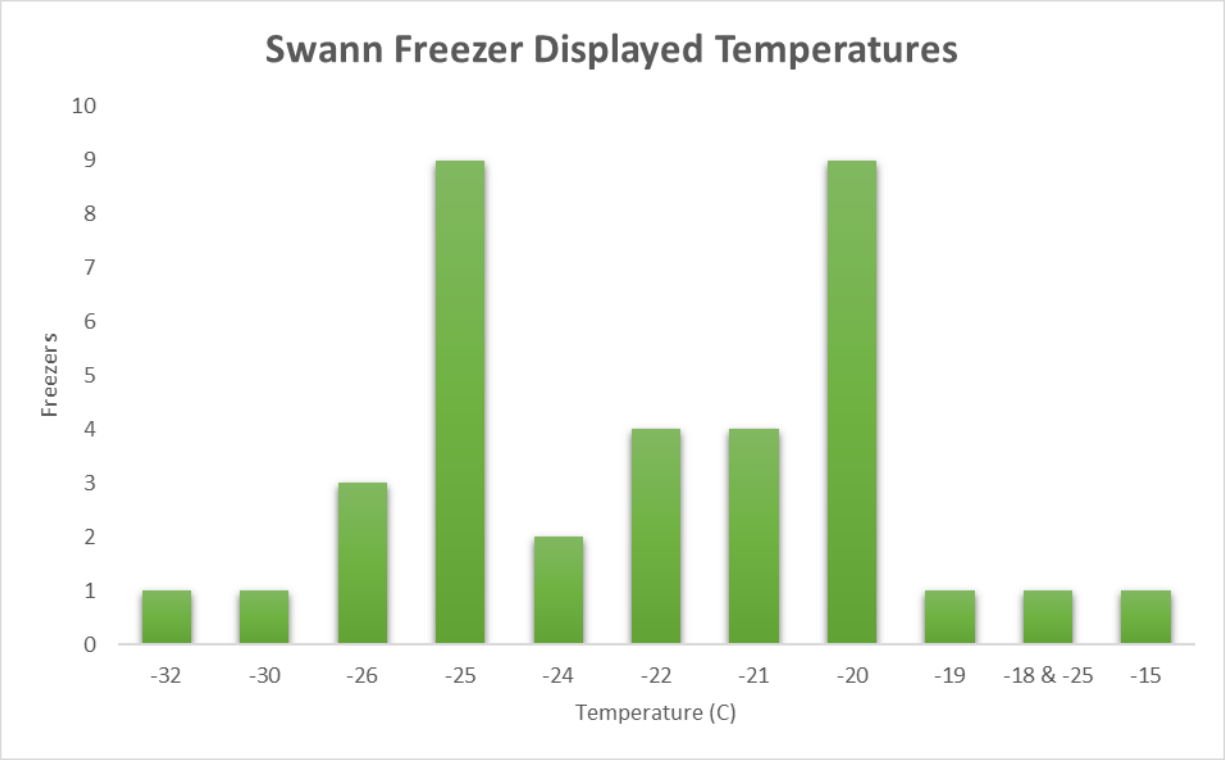


Figure 12. Swann freezer displayed temperatures.

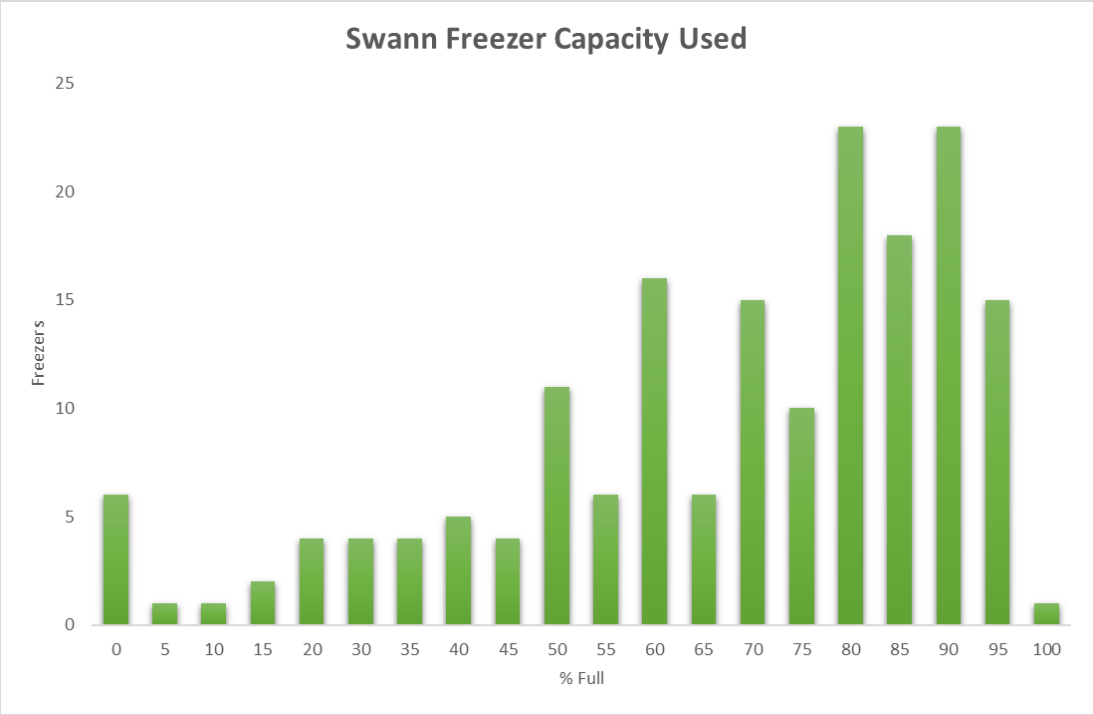
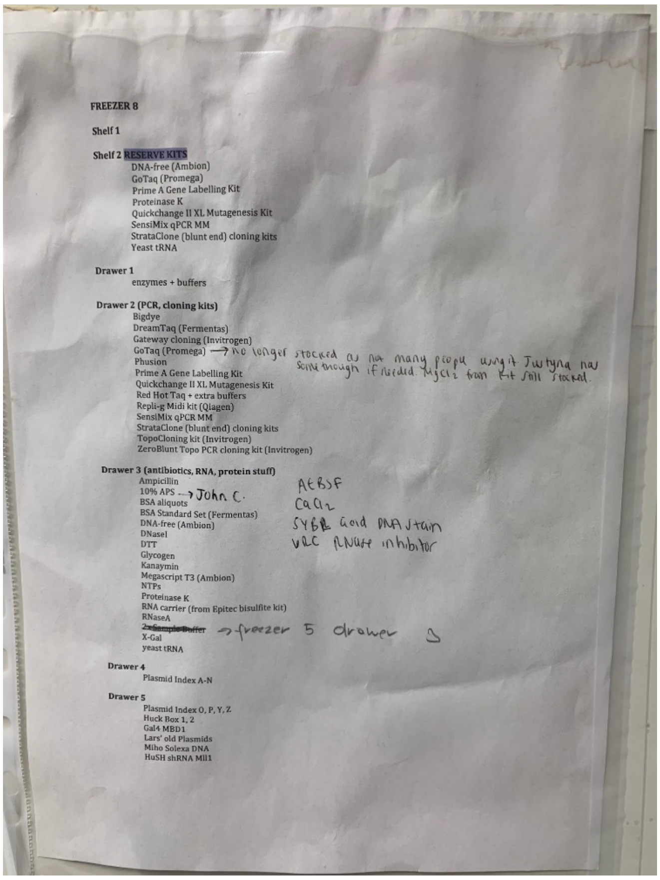


Figure 13. Percentage of freezer space occupied.

Of the 175 accessible freezers 127 (73%) were ≥60% full. Furthermore, 90 units (51%) were ≥75% full. With the majority of the audited freezers approaching full keeping an inventory would help to ensure that units are organized with contents easier to locate. One way to keep freezer capacity available is to have an inventory. When end users leave or are no longer in need of certain contents an inventory is a simple way to free up valuable capacity.

A freezer inventory may be simple whereby it is either indicated which sections of the freezer are owned by a particular researcher or what is located in each section (figure 14). Other inventory systems are far more complex with each sample accounted for, each with its specific location recorded. During the audit it was noted whether a unit had any sort of inventory on the front or side of the unit. There may be other inventory documents or systems used by groups, however, they were not included in the audit.



FREEZER 8

Shelf 1

Shelf 2 RESERVE KITS
DNA-free (Ambion)
GoTaq (Promega)
Prime A Gene Labelling Kit
Proteinase K
Quickchange II XL Mutagenesis Kit
SensiMix qPCR MM
StrataClone (blunt end) cloning kits
Yeast tRNA

Drawer 1
enzymes + buffers

Drawer 2 (PCR, cloning kits)
Bigdye
DreamTaq (Fermentas)
Gateway cloning (Invitrogen)
GoTaq (Promega)
Phusion
Prime A Gene Labelling Kit
Quickchange II XL Mutagenesis Kit
Red Hot Taq + extra buffers
Repli-g Midi kit (Qiagen)
SensiMix qPCR MM
StrataClone (blunt end) cloning kits
TopoCloning kit (Invitrogen)
ZeroBlunt Topo PCR cloning kit (Invitrogen)

Drawer 3 (antibiotics, RNA, protein stuff)
Ampicillin
10% APS
BSA aliquots
BSA Standard Set (Fermentas)
DNA-free (Ambion)
DNaseI
DTT
Glycogen
Kanaymin
Megascript T3 (Ambion)
NTPs
Proteinase K
RNA carrier (from Epitec bisulfite kit)
RNaseA
~~2x Sample Buffer~~
X-Gal
yeast tRNA

Drawer 4
Plasmid Index A-N

Drawer 5
Plasmid Index O, P, Y, Z
Huck Box 1, 2
Gal4 MBD1
Lars' old Plasmids
Miho Solexa DNA
HuSH shRNA Mll1

Figure 14. Freezer inventory used by FZ146.

From the data collected (Figure 15) it was found that 72% of the freezers had no inventory. As such a large proportion of freezers were approaching full capacity an inventory for these units would help end users manage the contents, subsequently reducing the likelihood of further freezers being purchased to meet storage requirements. Furthermore, an inventory facilitates the locating of the contents by the end user which reduces door opening times. This in turn reduces energy consumption, associated HVAC costs and ensures that the contents of the freezer remain cold.

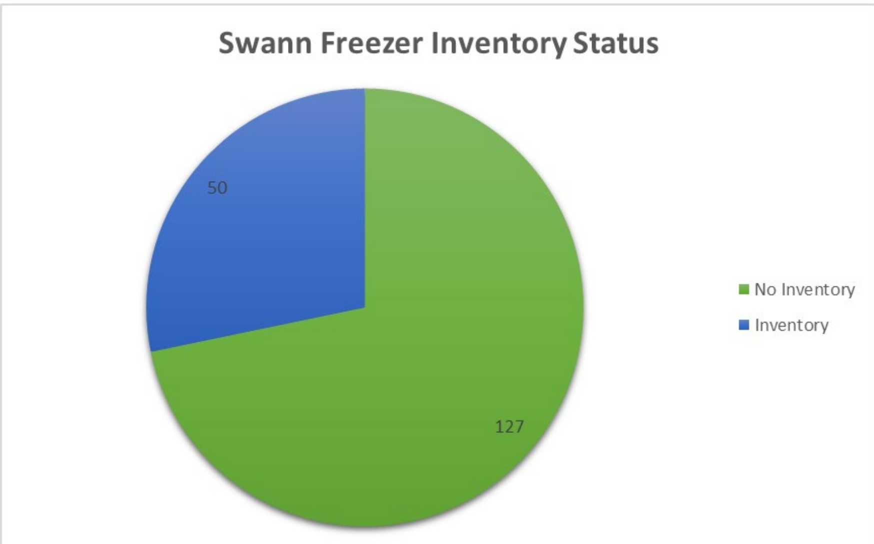


Figure 15. Inventory status of Swann freezers.

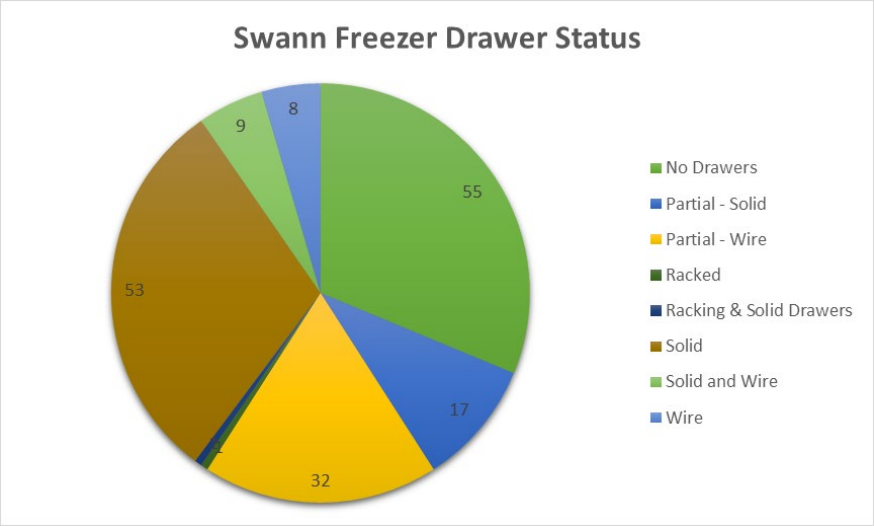


Figure 16. Status of Swann freezer drawers.

Alongside a freezer inventory, drawers are a simple means to help keep contents organized and contained inside the unit (on occasion loose samples will fall out of a freezer when the door is opened). The accessible 175 freezers had their drawer status recorded (figure 16)

From the collected data, 30% of the audited freezers had solid drawers with a further 10% of freezers being partially filled with solid drawers. These are preferable to wire drawers which are found in 22% of units when the fully and partially units are combined. Solid drawers are preferred to wire drawers as they retain the cold air following a door opening and prevent it being displaced the warmer, ambient air. Being able to retain temperature following a door opening has a positive effect on content viability and energy efficiency. Unfortunately, it was found that the greatest number of freezers (31%) had no drawers whatsoever.

Another factor which will contribute to unit efficiency and lifespan is the condition of the unit (figure 17)

Freezer Condition	Effect	Number of Units
Icing	Reduction in storage space, impediment of inner doors, difficulty in finding and removing samples result in longer door openings and damage to drawers.	71 (63%)
Spacing	Items stored on top and/or around the unit do not allow the unit to cool itself effectively and may hinder safe access to contents.	26 (50%)
Handle	The handle is damaged, broken or absent. This can hinder safe and easy access of samples and increases the chance of the door being fully closed and sealed.	2 (5%)
Seal	Through damage, dirt or icing the door will not shut properly and the unit loses its capacity to effectively retain its temperature.	1 (%)

Figure 17. Condition of Swann freezers.

The data collected highlighted that icing was the main factor which would have a negative effect on the lifespan and efficiency of the freezers. 71% of units had icing of varying degrees which was

reducing the available space inside the unit, hinder access (figure 18) and can cause damage to the drawers.

Figure 18. Icing reducing freezer space, access to contents is impeded and there is potential for damage to the unit (see top bar bent by the ice buildup). The absence of drawers also facilitates ice buildup.

Freezer Recommendations and Actions

1. **Procurement Policy** – Specifications could be developed to ensure that any new freezers bought have a clear and simple means to control and display (digital) their temperature and come with solid drawers & HC refrigerants as standard. A framework agreement could be explored to ensure that only the more sustainable options are purchased by end users. This framework agreement must also guarantee no time delay in ordering and delivery compared to existing methods so that end users face no delays when buying the sustainable options.
2. **Behavioral Change** – The following actions would have a positive impact upon running costs:
    - Units are regularly de-iced to maximize available capacity and reduce damage to freezers.
    - Where temperature is displayed, units may be warmed up. However, this may require 'fine tuning' on many units as the basic dial used to control temperature is arbitrary and without a degree Celsius indication.
    - Units are labelled with a best practice guide to help reduce the poor conditions (particularly icing) observed. Following such a guide has a payback of under 2 weeks.
    - Alongside each guide this each unit will have an inventory, allowing contents to be managed and door openings to be minimized.
    - Best practice/sustainable practice may also be included in staff inductions/training.

Fridges

In total data was collected on 114 fridges. When referring to fridges we are discussing units that typically have a recommended set point of 4C. When considering refrigerants, as detailed in the freezer section of this report, HC refrigerants are the preferred option.

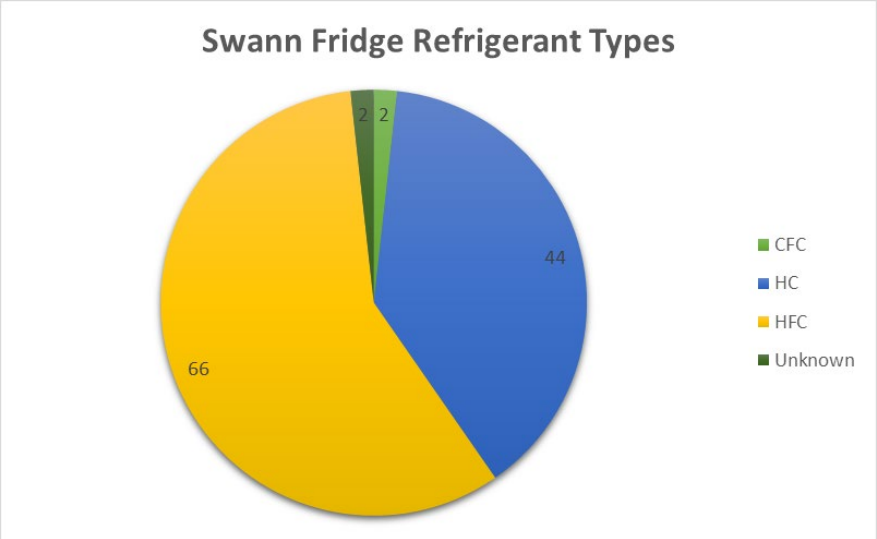


Figure 19. Fridge refrigerant types.

From the data collected (figure 19) 38% of the audited freezers were HC refrigerant units. 58% of units were HFC refrigerants, 2% were CFC refrigerant and 2% were unknown. Being able to accurately set the fridge temperature is a simple means to maintain energy efficiency. The means by which the fridges control and display their temperature is summarized in figure 20.

Temperature Display Type	Temperature Control Type			
	Dial	Digital	None	Grand Total
Dial	1			1
Digital	1	9		10
External Digital			1	1
None	101		1	102
Grand Total	103	9	2	114

Figure 20. Temperature control and display types used by the audited fridges.

Of the 114 fridges 89% (102) had no means by which they could accurately set and display their temperature. Of the 11 units which did display a temperature one could be warmed up to 4C to reduce energy consumption.

An estimation of the fridge capacity used was made (figure 21). Of the 114 units, 80 (70%) were ≥50% full. Furthermore, 57 units (50%) were ≥65% full.

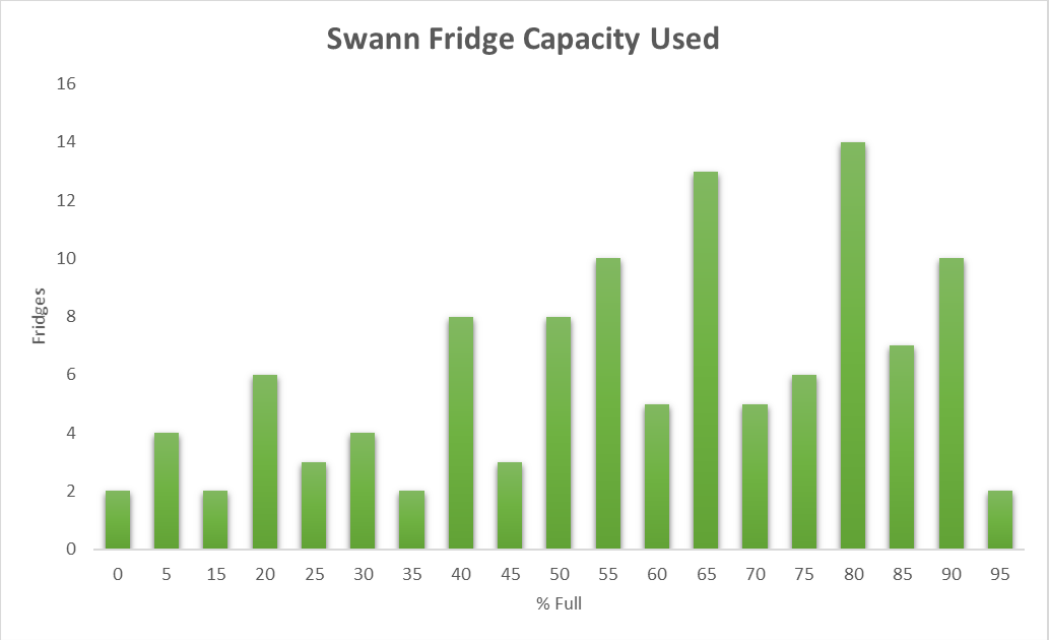


Figure 21. Percentage of Swann fridge space occupied.

One way to keep fridge capacity available is to have an inventory. Doing so would help to ensure that units are organized with contents easier to locate. When end users leave or are no longer in need of certain contents an inventory is a simple way to free up capacity.

A fridge inventory may be simple whereby it is indicated which sections of the freezer are owned by a particular researcher. Other inventory systems are far more complex with each sample accounted for with its specific location recorded. During the audit it was noted whether a unit had any sort of inventory on the front or side of the unit. There may be other inventory documents or systems used by groups, however, they were not included in the audit.

From the data collected (Figure 22) it was found that 89% of the audited fridges had no inventory.

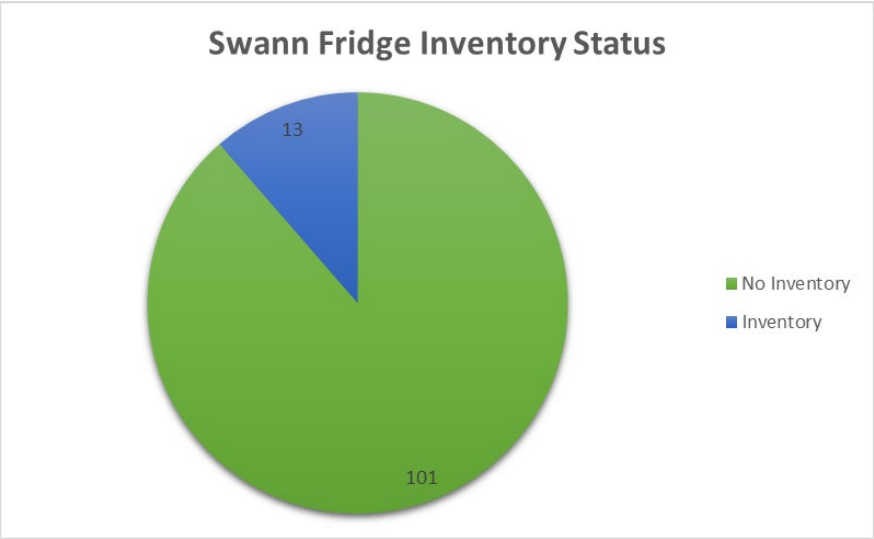


Figure 22. Inventory status of audited fridges.

Another factor which will contribute to unit efficiency and lifespan is the condition of the unit. The condition of the fridges is shown in figure 23.

Fridge Condition	Effect	Number of Units
Spacing	Items stored on top and/or around the unit do not allow the unit to cool itself effectively and may hinder safe access to contents.	10 (29%)
Icing	Reduction in storage space, impediment of inner doors, difficulty in finding and removing samples result in longer door openings and damage to drawers.	4 (3%)

Figure 23. Condition of audited fridges.

Fridge Recommendations and Actions

1. **Procurement Policy** – Specifications could be developed to ensure that any new fridges bought have a clear and simple means to control and display (digital) their temperature and come with HC refrigerants as standard. A framework agreement could be explored to ensure that only the more sustainable options are purchased by end users. As with the freezers, this framework must be easy to use, fast to deliver.
2. **Behavioral Change** – The following actions would have a positive impact upon running costs:
    - Where temperature is displayed, units may be warmed up. However, this may require 'fine tuning' as the basic dial used to control temperature is arbitrary and without a degree Celsius indication.
    - Units are labelled with a best practice guide to promote continued good practice. Following such a guide has a payback of under 2 weeks.
    - Alongside each guide each would have an inventory, allowing contents to be managed and door openings to be minimized.
    - Best practice/sustainable practice may also be included in staff inductions/training.

Fridge freezers

The audit captured data on 3 fridge freezers, all were accessible during the audit (figure 24). When referring to fridge freezers we are discussing units that typically have a recommended set points of 4C for the fridge compartment and -20C for the freezer compartment. When considering refrigerants, as detailed in the freezer section of this report, HC refrigerants are the preferred option.

Unit	Inventory?	% Full	FD Temp. Control	FD Controller Setting	FD Display Type	Drawers	Refg. Type	Conditions?
FF1	Yes	Fridge 85%, Freezer 75%	Temperature Dial	3C (Fridge) -20C (freezer)	Temperature Dial	Yes, Solid	CFC	Top spacing
FF2	Yes	Fridge 60%, Freezer 90%	Dial	4.5/5	None	Yes, Solid	HC	Top spacing
FF3	No	Fridge 80%, Freezer 50%	Temperature Dial	4C (Fridge) -20C (freezer)	Temperature Dial	Yes, Some Solid	CFC	Iced

Figure 24. Swann building fridge freezers.

Fridge Freezer Recommendations and Actions

1. **Procurement Policy** – Specifications could be developed to ensure that wherever possible fridge freezers are not bought unless absolutely necessary. Like fridge and freezers if any new fridge freezers were to be bought they must have a clear and simple means to control and display (digital) their temperature and come with solid drawers and HC refrigerants as standard. A framework agreement could be explored to ensure that only the more sustainable options are purchased by end users.

2. **Behavioral Change** – The following actions would have a positive impact upon running costs:
    - Units are labelled with a best practice guide to reduce the icing and spacing issues observed. Following such a guide has a payback of under 2 weeks.
    - Alongside this each guide would have an inventory allowing contents to be managed and door openings to be minimized.
    - Best practice/sustainable practice may also be included in staff inductions/training.

ULT freezers

Ultra-Low Temperature (ULT) freezers are used for the long term storage of a variety of samples. Over the last decade there has been a considerable focus on ULT freezers due to their running costs and the value of their contents. The audit captured data on 34 ULT freezers. When referring to ULT freezers we are discussing units that typically have a recommended set points of -80C, however over recent years many organizations have warmed to -75C or -70C. When considering refrigerants, as detailed in the freezer section of this report, HC refrigerants are the preferred option.

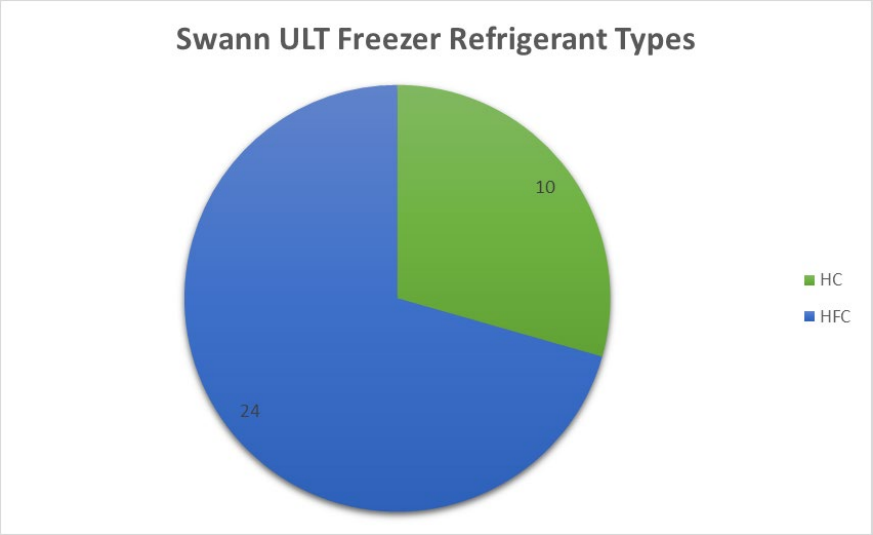


Figure 25. Refrigerant types used by the audited ULT freezers

From the data collected (figure 25) 29% of the ULT freezers were HC refrigerant, 71% were HFC refrigerant.

The colder the freezer set temperature, the higher the energy consumption. Therefore the warming up of ULT freezers presents a simple means to reduce energy consumption. The savings in energy consumption will vary from between 2-4% per degree Celsius warmed up by. This figure varies between every model of freezer and is also dependent on the condition of the unit and the mode it is set to.

From the data collected (figure 26) from the audit the greatest number of units were set to -80C.

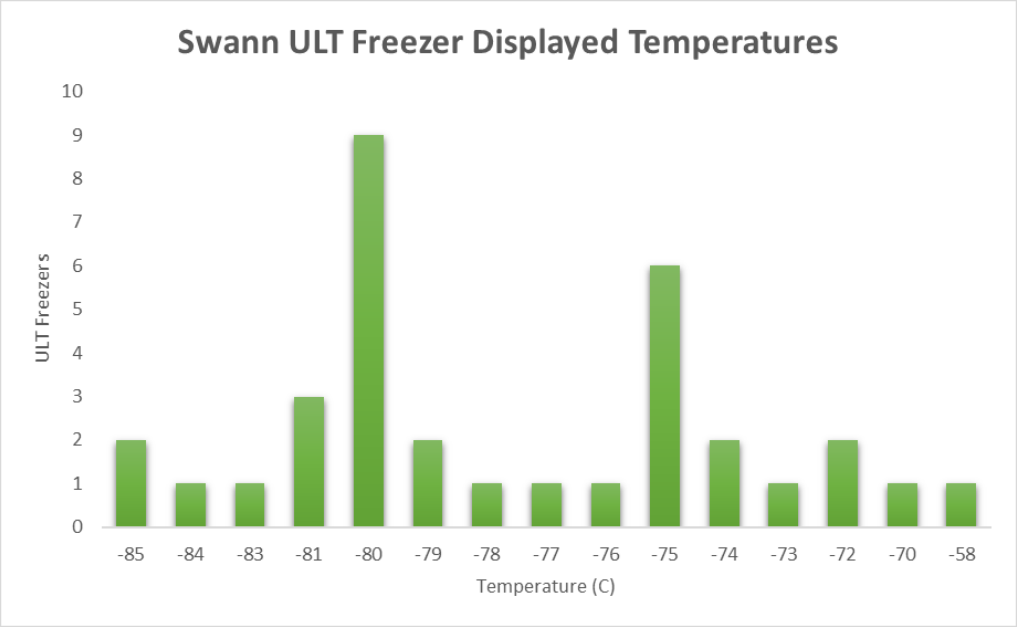


Figure 26. Displayed ULT freezer temperatures in the Swann building

Seven units were colder than -80C and could be warmed up to -80C save on energy consumption and HVAC. If considered most units could be warmed up to -70C. It would be advisable that -70C should be the warmest set point for ULT freezers as a door opening of less than one minute can result in a temperature rise of ≥ 10C. This would mean that if a unit was warmer than -70C a door opening would result in internal temperatures rising past -60C. Temperature stability within a ULT freezer will vary between models and manufacturers. However, the amount of unoccupied space inside the freezer will also have an effect on temperature stability.

Of the ULT freezers 68% were ≥50% full (figure 27), furthermore 41% of units were ≥75% full. As freezers fill one way to maximize space and help to keep the unit organized is to use racking (usually stainless steel or aluminium).

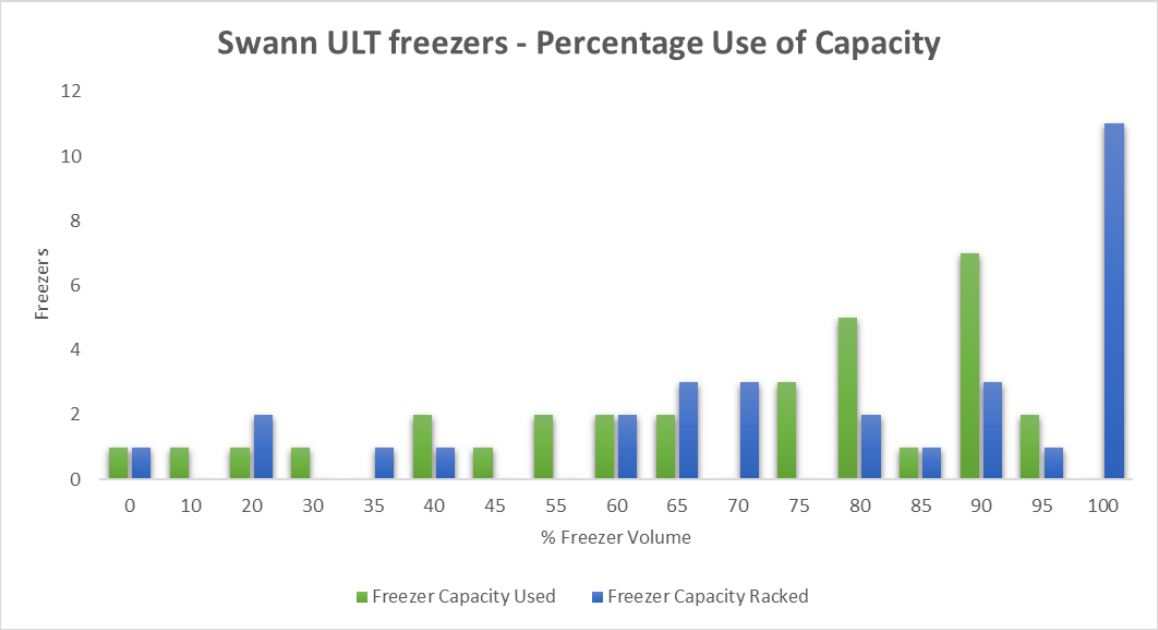


Figure 27. Percentages of Swann ULT freezer capacity used and racked.

Of the 31 accessible ULT freezers, 84% of units had ≥60% of their capacity racked. Furthermore 58% of units were ≥80% racked. The racking in a freezer will help the temperature stability of the freezer whilst helping to keep the unit organized. Both of these factors can reduce door opening times and the impact of the door opening. Another means to keep a unit organized is to have an inventory. When looking at how full the ULT freezers were it was estimated that 77% of units were ≥55% full. Furthermore, 58% of units were ≥75% full

A ULT freezer inventory may be simple whereby it is indicated which sections of the freezer are owned by a particular researcher (figure 28). Other inventory systems are far more complex with each sample accounted for with its specific location recorded. During the audit it was noted whether a unit had any sort of inventory on the front or side of the unit. There may be other inventory documents or systems used by groups, however, they were not included in the audit.

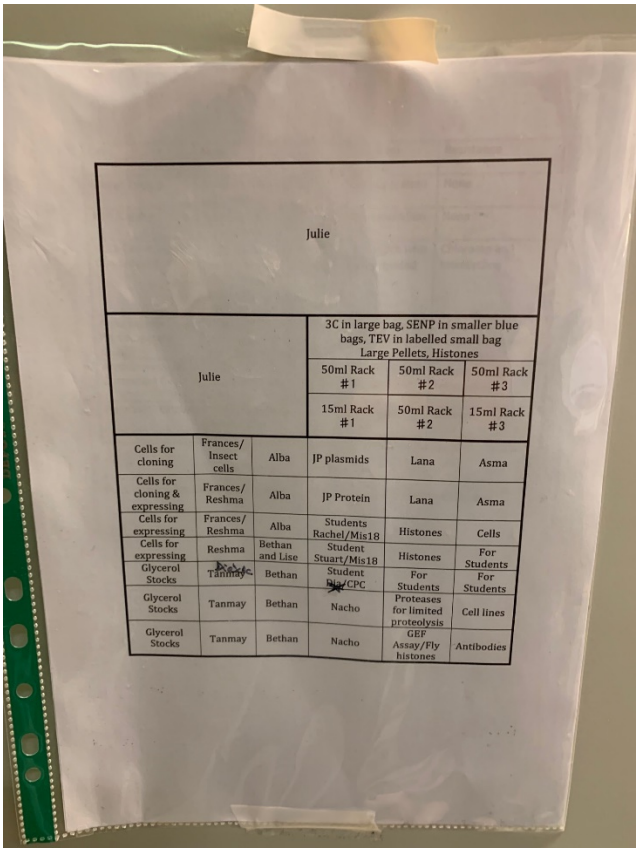


Figure 28. ULT freezer inventory.

From the data collected (figure 29) 35% of ULT freezers did not have an inventory. By managing the contents of ULT freezers valuable space is made available for samples. This reduces the need for extra freezers to provide further valuable capacity. Another factor which can affect the available capacity in a ULT freezer is its condition. The audit captured the condition of the ULT freezers (figure 30).

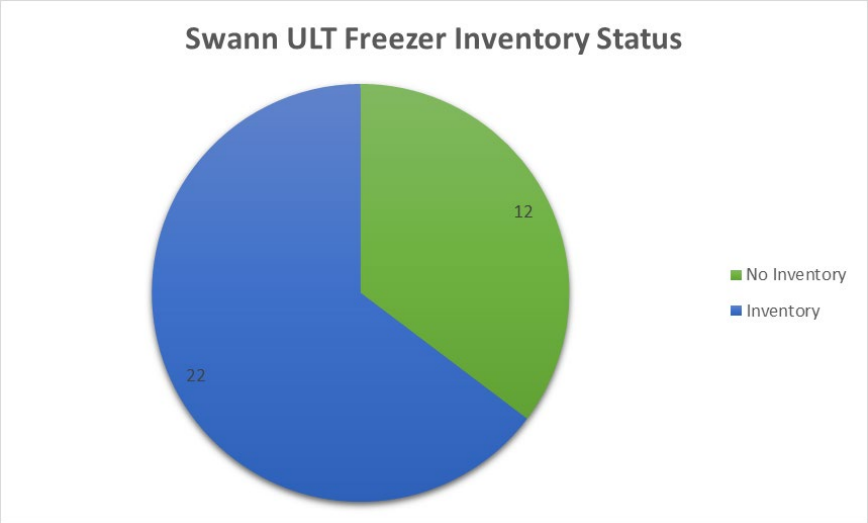


Figure 29. Inventory status of the audited Swann ULT freezers.

ULT Freezer Condition	Effect	Number of Units
Icing	Reduction in storage space, impediment of inner doors, difficulty in finding and removing samples result in longer door openings and damage to racking.	8 (24%)
Spacing	Items stored on top and/or around the unit do not allow the unit to cool itself effectively and may hinder safe access to contents.	8 (24%)
Filter	A dirty or absent filter compromises compressor function, making them work harder to maintain temperarure, increases the likelihood of unit failure.	17 (50%)
Handle	The handle is damaged, broken or absent. This can hinder safe and easy access of samples and increases the chance of the door being fully closed and sealed.	2 (5%)

Figure 30. The condition of the audited ULT freezers.

All of the conditions listed in figure 30 will have a negative effect upon the energy efficiency of the ULT freezer. Of the conditions observed the filter was the most common being observed in 50% of the units (figure 31). Keeping the filter clean and present will be instrumental in ensuring that the ULT freezers have the longest possible lifespan and the most energy efficient operation. Icing and spacing issues were also observed in nearly a quarter of the audited units.

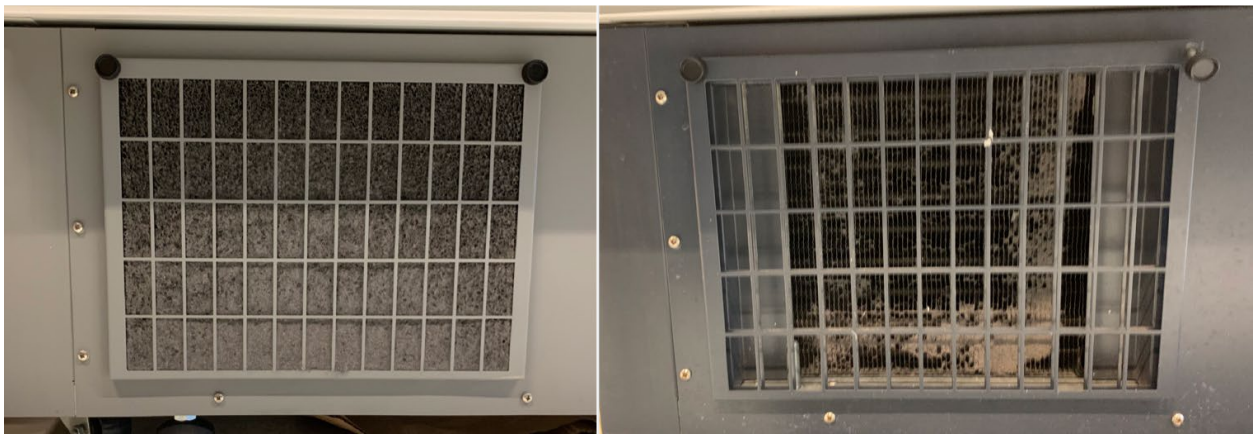


Figure 31. Dirty or absent filters impede heat exchange in ULT freezers, increasing their energy consumption and place a greater demand upon compressors.

ULT Freezer Recommendations and Actions

1. **Procurement Policy** – A framework agreement may be explored so that only the best performing ULT freezers are purchased by end users and potentially subsidized by the estates department). The specifications would capture units which both save energy (benefitting estates/building management) and perform most reliably at set point (benefitting end user's samples). It is strongly advised that any units submitted by vendors are also made available for testing so that energy, temperature performance at set point and capacity can be measured under controlled conditions. Manufacturers have recently began to overestimate their available capacity and underestimate their energy consumption in their marketing literature. Energy consumption may be ≥40% higher than published whilst available capacity may be up to 20% lower. Temperature performance (stability and uniformity) will vary greatly between manufacturers. For example, at the -70C set point two manufacturers will have a ≥10C difference in temperatures between compartments. Other units recently tested do not reach the set temperature displayed on their controller. Currently, in the 500-600L capacity range of ULT freezers the Eppendorf F570h unit has the longest lifespan, best combined energy and temperature performance, likewise the F740h/hi leads the 690-790L range.
2. **Replacements** – Following the development of a procurement policy ULT freezers may have their replacement subsidized based upon their energy savings (compared to the existing unit). It is advisable that the candidate units are independently monitored for energy and temperature performance using accurate equipment to ensure precise, accurate measurements are collected. Potential candidate units for replacement are ULT4, ULT13, ULT16, ULT20, ULT25, ULT31, and ULT32 due to their energy consumption.
3. **Behavioral Change** – The following actions would have a positive impact upon running costs:
    - Units are labelled with a best practice guide to help reduce the poor conditions (particularly icing) observed. Following such a guide has a payback of under 1 week.
    - Alongside each guide units would have an inventory, allowing contents to be managed and door openings to be minimized.
    - Best practice/sustainable practice may also be included in staff inductions/training.

Microbiological safety cabinets (Class II)

Class II microbiological safety cabinets (MSC's) are mostly used for tissue culture and provide end user and sample protection through contained and filtered laminar air flow. The air is filtered and then either recirculated or expelled to the outside of the building via ducting. Those units which are ducted have a greater impact upon running costs as heated or cooled air from the building is exhausted outside whilst they are being operated.

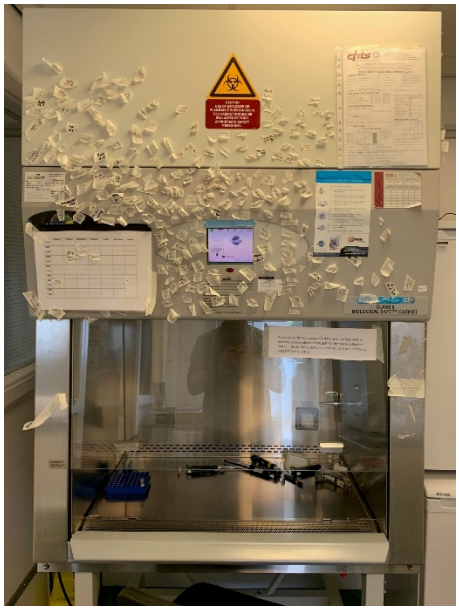


Figure 32. Cabinet currently used in the Swann building.

There were 9 units captured by the audit, all were recirculating. At the time of the audit only two units were on with the sash open. Of these two units one was being worked at with the second being unattended.

Microbiological Safety Cabinets (Class 2) Recommendations and Actions

1. **Procurement Policy & Replacement** – The majority of the units on site were Nuaire models which have a high energy consumption compared to other units on the marketplace. The energy consumption was measured on MSC7, it was 0.571 kWh/h. This, per hour, is double the energy consumption of an energy efficient 570L ULT freezer. Currently, the unit with the lowest energy consumption measured in the **lab environment** is produced by Scanlaf with an energy consumption of 0.133 kWh/h. Unless these units are used 24 hours per day replacing them based on energy savings is not feasible based on the payback period. However, a procurement policy/framework could be put in place to ensure that any new units are energy efficient.

Fume cupboards

Fume cupboards, even when considered efficient are high consumers of energy. Primarily their high consumption is a result of the high volumes of heated or cooled air of which they remove from a building. Of the fume cupboards included in the audit were all 17 were Constant Air Volume (CAV) controlled units. Meaning that regardless of sash height they remove a constant volume of air from the lab.

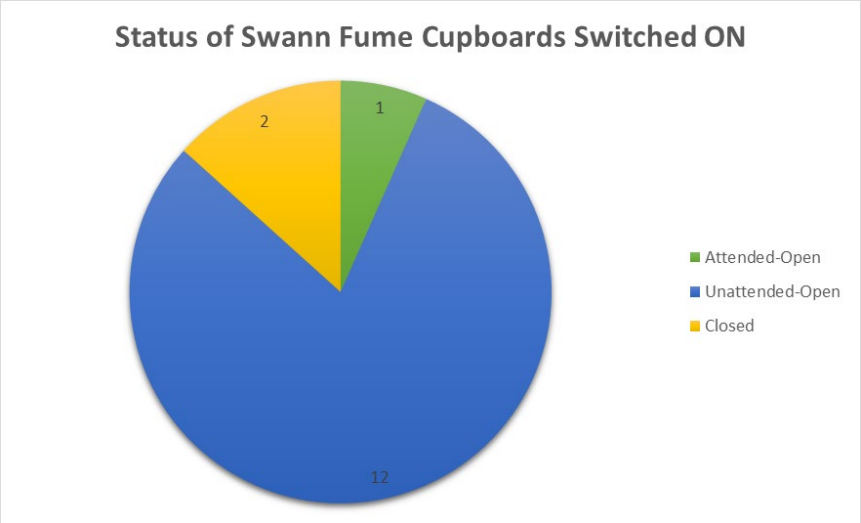


Figure 33. Sash status of the Swann fume cupboards which were turned on.

When observing the usage of the units it was firstly noted whether a unit was on or off. For those units which were on it was then noted if the sash was open or closed. If open, the height was noted. For those units with the sash open it was also noted whether (a) the unit was in use with an end user working at the unit, (b) was the unit left open and unattended or (c) the sash is closed (figure 33). What was observed during the audit was that 80% of units were open and unattended. 13% of units had their sash closed whilst 7% of the on units were open with people working at them. It must also be noted that of the two fume cupboards which were turned off, one had the sash open meaning any chemical fumes inside the unit may not have been contained.

Figure 34. Fume cupboard where the sash has been left open with poor front and contents loading.

The loading of items inside the fume cupboard also has an effect upon the safety of the fume cupboard and its running costs (figure 34). In order to maintain airflow and containment there must

be no items placed in the front 150mm of the unit (known as front spacing). It is also advised that there should be a minimum gap of 25mm between items inside fume cupboard, this 25mm space applies also to spacing between items inside the unit and the inner side walls (known as contents spacing). There should also be no items placed or hanging (such as lab coats) either side of the sash.

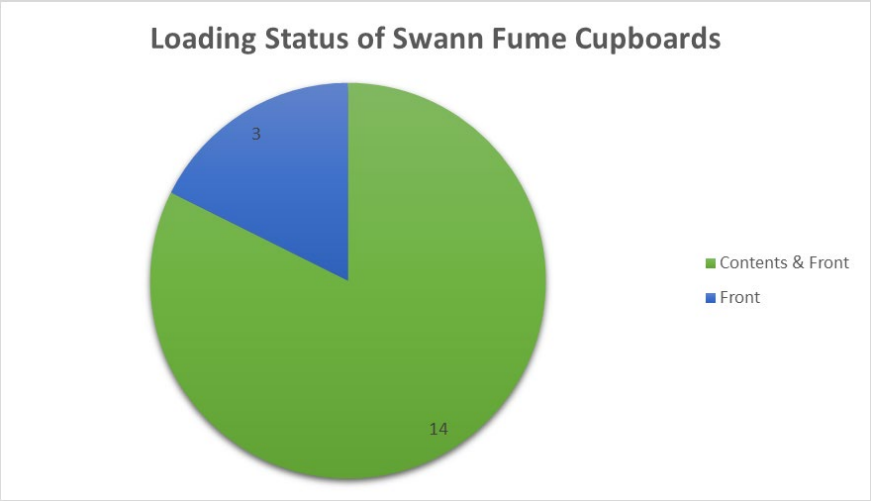


Figure 35. Loading status of audited fume cupboards.

Without such measures exhaust this can have a negative effect upon safety and energy efficiency as exhaust fan speeds need to increase in order to maintain containment. Therefore energy consumption and subsequent running costs will rise. All of the fume cupboards captured by the audit had poor loading (figure 35) with the majority of units (82%) having poor contents and front.

Fume Cupboard Recommendations and Actions

(1) **Behavioral Change & Training** – Fume cupboard best practice training is introduced to staff and students. Units are appropriately labelled and regular checks on usage are carried out to ensure that sash closing and good loading is maintained.

(2) **Upgrades** – The CAV units may be upgraded to Variable Air Volume (VAV) units. The steps to take in order to identify the viable units would be:

- Determine likely life of all cabinets (in terms of need and physical state). Units with under 10 years of usage remaining may not be suitable for upgrading.
- Clearly detail usage and accurate costs to upgrade those suitable units, and then finally, upgrade.

Paybacks for carrying out this work have been calculated (figure 36), this has been included in the Excel document which accompanies this report. On the basis of a £4000 investment per CAV to VAV investment the energy savings (gas and electricity) would provide the University with a payback of <3.5 years. These figures can be adjusted accordingly following the appropriate consultation with Daleflow Ltd.

(3) **Auto Sash Closers** -The fitting of auto sash closers is one solution to reducing fume cupboards being left open and unattended and therefore saving energy. It may very well be the case that at least **12 hours per working day** could be saved by proper sash closing if units are left open overnight. However, what must be considered in the application of the technology is not only the cost on installation costs but also the ongoing cost of

maintenance and its affect upon efficiency and payback. It has been observed in other institutions that auto sash closers can cease to fully close the sash. With some end users reliant upon this automated closing sashes remain open for long periods of time and this will continue until the sash closing mechanism is appropriately adjusted. Therefore it is advised that ***if*** auto sash closers are fitted (at a cost of circa £2000 each on 17 units) that an ongoing cost of maintaining the sash mechanism is also factored into any payback calculation (circa £200/fume cupboard. Furthermore, auto sash closers are not the sole solution and regular checks, audits and training will ensure long term savings. Some organizations ensure sash closing by having a member of staff who closes all units at the end of each day; in some organizations this is part of a job description and paid for, in others it is part of the role of a sustainability champion.

(4) **Policy** –Some institutions have a 3 strike policy on poor fume cupboard practice. If found to be using units poorly (also unsafe) on 3 occasions the member of staff may not use the fume cupboard until re-trained.

(5) **Procurement Policy** – Only VAV units with are specified and purchased for future projects and refurbishments. This must be 'set in stone' to ensure that this aspect is never value engineered out of a project.

Design Costs (CAV)		**Units**
FC Size (typical)	1500	mm
Sash height	500	mm
Sash width	1200	mm
Area of sash	0.6	m2
Design Face Velocity	0.7	m/s
Design Extract Volume (FV*Area)	0.42	m3/s
Leakeage ~%	5	%
Design Extract Volume (FV*Area) include leakeage	0.47	m3/s
Design Extract Volume per hour (sash open)	1692	m3/hr
Operating hours/year 24-7-365	8760	hours
Total Design Volume /year	14821920	m3/year
Cost for running fume cupboard /year(Ref 1)	1586.0416	£
Cost for running fume cupboard /year (per m3)	0.000107006	£
As Found Actual Costs (CAV)		
Actual FV of of FC in bldg	0.7	m/s
Design Face Velocity	0.7	m/s
Actual Extract Volume(mean) (FV*Area)	0.42	m3/s
Leakeage ~%	5	%
Actual Extract Volume (FV*Area) include leakeage	0.441	m3/s
Air volume /hour	1587.6	m3/hr
Operating hours/year 24-7-365	8760	hours
Total volume per year	13907376	m3/year
Actual Cost for running fume cupboard /year	1488.179459	£
Design Running Costs (VAV)		
Actual FV of VAV upgarded unit	0.4	m/s
Operating hours/year (10 hours/day x 260 days/year)	2600	hours
Operating percentage of sash open/day	70	%
Operating hours sash closed/working day	3	hours/day
Operating Hours per year at sash 500mm	2100	hours/year
Design Extract Volume per hour (sash open)	864	m3/hr
Leakeage ~%	5	%
Design Extract Volume (FV*Area) include leakeage	907.2	m3/s
Design extract volume per year (sash open)	1905120	m3/year
Design Extract Volume per hour (sash closed) (25% volume)	423	m3/hr
Work free hours/year (14hr/day x 260 days/year=3640hr + 24/hr/day x 105 days/year =2520 hrs) plus hours shut sash day mode	3000	hrs/year
Low volume usage per year (work free hours/sash shut)	1269000	m3/year
Total extract volume per year	3174120	m3/year
Total running cost per year	£ 339.65	/year
Investment Calculations (VAV)		
Energy saving per year	£ 1,148.53	/year
kWh Electricty Saved per year (£)	£ 914.28	
kWh Electricty saved per year	9142.80	
kWh Gas Saved per year (£)	£ 234.25	
kWh Gas Saved per year	13013.80	
Extract volume saved per year	**10733256**	**m3/year**
Capital investment - VAV supply, installation & commissioning	**£ 4,000.00**	
Return on capital (capital / savings per year)	**3.48**	**years**
Calculated Carbon Usage (CAV Unit)	**6.8890952**	**tonnes/yr**
Saving (using VAV)	**4.988720921**	**tonnes/yr**
Cost per tonne Carbon saved	**£ 801.81**	

Figure 36. Estimated CAV to VAV savings per 1500mm wide fume cupboard.

Drying Cabinets

Drying cabinets are used to carry out the drying or glassware, plasticware and a number of metal instruments used in the laboratory. These units are typically used at temperatures of between 50C and 80C. The audit identified 5 such units ranging in capacity from 200L to 1000L (figure 37).

Figure 37. Old technology, 1000L drying cabinet.

All of the 5 units were older designs whereby the poor temperature control and lack of insulation result in these units consuming high amounts of electricity. It was possible to energy monitor a number of the 1000L drying cabinets, 3 of which are in use with the third being used for storage only. The existing units are used 8.5 hours per day, 5 days per week. Based upon replacing the three 1000L units with two 885L units and one 425L units the following savings and paybacks were calculated (figure 38)

Replacement Cost (£)	£	13,250.00
kWh/Yr Saved		9541.25
kWh/Yr Saved (£)	£	954.13
TCO2/Yr Saved		1.642
Total Savings/Yr (£)	£	1,002.74
Payback Period (Yrs)		13.21

Figure 38. Summary of replacing drying cabinets with E3 units.

Although there are significant savings to be made in energy consumption the payback period may not be currently favorable. This is chiefly due to the existing units only being used for 8.5 hours. This may be improved upon by the following:

- Other drying cabinets are included in the replacement exercise with unit consolidation (3 units for 2 for example) are considered.

- The current E3 units are to be updated with improvements which will increase efficiency ***significantly*** therefore the payback period. – They are due for release September 2019.
- The replacement of these units may be combined with other projects such as fume cupboard CAV to VAV upgrades to produce an average, favorable payback period.

Drying Cabinet Recommendations and Actions

1. **Replacement & Procurement Policy** – Providing paybacks are favorable all old technology across university sites are replaced with energy efficient E3 units. Procurement specifications are developed and applied to a framework agreement so that only energy efficient units are purchased.

Mini Autoclaves

Mini autoclaves or small benchtop autoclaves are typically used for the sterilization of medial and smaller items/apparatus (figure 39). Commonly these units are exclusively used for the sterilization of media. Currently there are six of these units in use in the Swann building.

Figure 39. Mini autoclaves, widely used for media sterilization.

Mini Autoclave Recommendations and Actions

1. **Replacement/Procurement Policy** – The current mini autoclaves are tested alongside alternative technology for those units exclusively used for the sterilization of media. The alternative technology (figure 40) uses microwave technology. This removes the need for water, and furthermore, reduces the energy consumption and cycle run time by circa 70% depending on media type and volume. It's suggested that end users trial this technology and any future requirements for media sterilization of this type are met by this alternative technology.
2. **Procurement** – Potential to establish a procurement agreement to ensure end users can easily purchase the more sustainable option for their requirements.

Figure 40. Alternative media sterilization technology beside existing model used by the University.

Block Heaters

Block heaters provide a dry environment for end users to heat a sample in a tube to a specific temperature. The sample is placed in a metal block which has specific sized apertures and heated. The audit identified 45 units in the Swann building.

Figure 41. Block heater set to 95C, empty.

At temperatures of 80C and above block heaters will use more energy than that of an under bench -20C freezer. Furthermore, this energy consumption is higher with each metal block the unit houses (some units house 3 blocks). Therefore, simply turning these units off when they are not needed is a quick and easy way to reduce energy consumption. AT the time of the audit 25 units (56%) were turned on but empty (figure 41).

Block Heaters Recommendations/Actions

1. **Behavioral Change** – Units are labelled with switch off stickers to help end users maintain their good practice and push that level up to the point where the only unit that are on are being used.
2. **Case Study** – Alternative block heating solutions may be explored whereby the block is replaced by metal bead alternatives which reduce energy consumption.

Water Baths

Water baths are commonly found across life science research. They are commonly used at the 37C set point but are used for temperatures ≤100C (figure 42). The audit identified 22 water baths in the building. Of these units 8 were turned on. Of the units which were on 4 were empty. Of the 22 units only 2 were without their lid.

Figure 42. Baths set to their dedicated temperature as noted on their lids.

Water Baths Recommendations and Actions

1. **Behavioral Change –** Units are fitted with switch off stickers so they are only on during the working day and if needed. Units are always used with their lids which, when used, retain heat, improve efficiency and preserve water.

2. **Replacement/Procurement –** Existing units may be replaced or phased out and replaced with new technology (efficient heat transfer, control and insulation) using water alternatives. This technology is set to be available from October 2019.

Project Summary Table

All projects which may be considered are summarized in the table below.

Project/Activity	Description	Benefits	Requirements	Status
ULT Freezers-Replacement	Existing ULT freezers are energy monitored and then replaced with more energy efficient, sustainable models. Currently the Eppendorf Cryocube series (F570h and F740h) offer energy efficient storage with the highest degree of temperature performance and lifespan (20 years + if well maintained). Without energy monitoring it can only be estimated what the savings would be however its likely an energy consumption saving of over 50% could be achieved.	1. Reduction in energy consumption and air conditioning costs via reduced heat output. 2. End users have either free or subsidised new equipment with a long lifespan.	1. Energy and temperature monitoring (per compartment) of existing, candidate ULT freezers. 2. Payback calculations compared to potential replacement units.	1. Monitoring can be carried out in house to ensure accurate payback calculations 2. Cost to monitor and will vary depending if units in the Swann building only are monitored or if buildings such as plant sciences are included.
Cold Storage-Best Practice Training & Guides	Lab operators from the university (building management, estates, procurement, technicians and researchers) are trained in lab equipment sustainability. Part of the course will highlight the impact of poor practice and the benefits of best practice. Following the training all items of cold storage will be labelled with the appropriate best practice guide consistent with the content of the training course.	1. Reduction in energy consumption of the cold storage units via reduced door openings and better unit condition and temperature set point. 2. Reduced heat output form the cold storage units will result in lower HVAC costs. 3. Longer unit lifespan and reduced likelihood of breakdown/servicing/maintenance costs.	1. Training course tailored for University of Edinburgh research and teaching. 2 Procurement of best practice guides	1. Training and labelling already arranged by the University.
Cold Storage-Procurement Framework	The University establishes a procurement framework for all cold storage items to ensure that only the most sustainable options are bought and used in the laboratory.	1. Reduction in energy consumption and HVAC costs. 2. Time is saved by having an agreement that covers the entire University. 3. University researchers are guaranteed the best price for the most sustainable option for their requirements.	1. Specification of the requirements necessary to identify the most sustainable ULT freezers, freezers, fridges and, if absolutely required, fridge freezers.	1. Procurement specifications for fridges, freezers, ULT freezers including and volume and application selection guide can be developed for £2220.
Drying Cabinet -Replacement & Framework	Existing drying cabinets are replaced with energy efficient units (Genlab E3). Any future requirements for drying cabinets are also covered by the procurement agreement covered by the replacement programme.	1. Reduction in energy consumption (50-80%) and HVAC costs. 2. Time is saved by having an agreement that covers the entire University. 3. University researchers are guaranteed the best price for the most sustainable option for their requirements. 4. End users have new equipment which is safer to use and can be programmed so their operation only reflects working hours.	1. Energy and temperature monitoring of existing, candidate drying cabinets. 2. Payback calculations compared to potential replacement units.	1. Monitoring can be carried out by GLL and will include temperature and energy readings. Cost will depend on number of units and sites.2. Waiting until Q4 2019 or Q1 2020 will allow for comparison to new E3 range which have greater energy savings.
Fume Cupboard-Best Practice Training & Guides	Lab operators from the university (building management, estates, procurement, technicians and researchers) are trained in lab equipment sustainability. Part of the course will highlight the impact of poor fume cupboard practice and the benefits of best practice. Following the training all fume cupboards will be labelled with the appropriate best practice guide consistent with the content of the training course.	1. Reduction in fume cupboard associated running costs (electricity and HVAC costs) associated with better loading and appropriate sash closing. 2. A safer working environment for end users and colleagues.	1. Training course tailored for University of Edinburgh research and teaching. 2 Procurement of best practice guides	1. Training and labelling already arranged by the University. 2. Fume cupboard best practice guides available Q1 2020.
Fume Cupboards-Upgrades/Policy	CAV volume control fume cupboards are upgraded to VAV controlled units. VAV units are only specified for any additional fume cupboards.	1. Reduction in fume cupboard associated running costs (electricity and HVAC costs) associated with better loading and appropriate sash closing will save > £1140/year/unit.	1. Assessment on current CAV systems and quoted costs and time provided by the appropriate vendor.	1. University have the contact details for Daleflow Ltd to discuss this project.
Media Sterilizers - Replacement	Existing media sterilizers units (Prestige brand) are replaced with the more time and energy efficient Enbio microwave technology units.	1. Reduction in cycle time and energy consumption (70-75%). 2. Longer lasting unit compared to Prestige units which reduces the impact upon the budget(s) of the end user.	1. Existing units and candidate Enbio are energy monitored and assessed to establish suitability and savings	1. Monitoring can be carried in in house or via GLL, likewise for the payback calculations. Calculator already included in report.
Water Baths - Procurment & Replacement	Any new water baths are procured based on their low energy consumption.	1. Reduction in energy consumption with replacement water baths being the same price or lower than existing water bath technology.	1. Existing units are compared to new technology units to clarify energy savings. 2. Specifications are written to generate a water bath framework policy to ensure all new units are energy efficient.	1. Monitoring of existing water baths to monitor temperature and energy performance can be carried out by GLL. 2. GLL can write appropriate procurement specifications for water baths for £1110.

Figure 43. Project summary overview.

THE UNIVERSITY of EDINBURGH

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Sustainable Laboratories Steering Group

21st January 2020

Performance of the Freezer Fund

Description of paper
This paper describes the financial and carbon performance of the Freezer Fund, a ring-fenced section of the University of Edinburgh's Sustainable Campus Fund

Action requested
SLSG is asked to note the performance.

Recommendation
It is recommended that the fund continue, as it performs well and provides a useful and impactful incentive to lab users to remove old inefficient freezers and replace them with energy saving equivalents. As well as an energy benefit, there is often a science benefit too, with more consistent and reliable temperatures and better racking/organisation making samples quicker and easier to find.

Background and context
The freezer fund was set up as a ring-fenced section of the Sustainable Campus Fund shortly after the fund was established in 2016.

Discussion (this section can be adapted as appropriate)
Using the Project Tracker spreadsheet the following analysis was produced using figures up to mid-December 2019:

1. Total spend £34,298 (from SCF grants, not including the amounts spent by the recipients - we haven't been tracking this. For example we give a maximum grant of £1,500 per ULT freezer but we don't track if that freezer cost £6k or £9k)
2. Total electricity cost savings £10,674
3. Simple payback 3.8 years
4. Average NPV is £3,131
5. Average IRR is 30%
6. Average ROI is 299%
7. Total annual CO2e savings 32.6tonnes
8. Average £/tonne CO2e saving is £85
9. 23 applications have been received (mostly for a single ULT, two for a pair of ULTs, one for a single -20 freezer). Two applications (one for a pair of freezers) were an 'eco top up' for someone purchasing additional freezers, which obviously we try to discourage unless absolutely necessary.
10. Almost half of all applications (11) have come from only 4 applicants (3 have made 3 applications, 1 has made 2 applications)

Resource implications
The grants given (maximum £1,500) are relatively small, compared to the cost of the ULT (c.£6-9k). There has been a steady but not excessive increase in use of the fund over the past year or so. The usage of the fund is deemed to be within the capacity of the SCF to support.

Risk Management
Discontinuation of the freezer fund could risk reducing the number of new contacts SRS makes through this fund.

Equality & Diversity
No Equality and Diversity implications have been identified relating to this fund.

Next steps/implications
It is recommended the fund continue to be reviewed and 'topped up' as and when the ring-fenced funds are exhausted.

Consultation
The Deputy Director and Head of SRS Programmes has been consulted.

Further information

Author	Presenter
Andrew Arnott	Project Coordinator - Labs
Engagement Team	Department for SRS
08/01/20	

Freedom of Information
This is an open paper.